



Delegatura de Propiedad Industrial
División de Nuevas Creaciones

SOLICITUD DE

**PATENTE DE INVENCION
PCT ENTRADA EN FASE NACIONAL**

21. EXPEDIENTE No. _____

54. TITULO: HETEROCICLOS MICROBICIDAS

52. CLASIFICACION INTERNACIONAL:

71. SOLICITANTE: SYNGENTA PARTICIPATIONS AG

DOMICILIO: Schwarzwaldallee 215, CH-4058 Basilea --
SUIZA

74. APODERADO: Dra. MARGARITA CASTELLANOS A.

22. BOGOTA, D.C., 08 FEB. 2012



PETITORIO

000001

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO



No. 12-022027- -00000-0000

Fecha: 2012-02-08 15:53:07
Tra. 11 PATENTE IYII
Act. 411 PRESENTACIONDep. 2020 DIR.NUEVASCR
Eve: 378 FASENACIONALI
Folios: 197FORMULARIO UNICO DE SOLICITUD DE PATENTE
PCT
ENTRADA EN FASE NACIONAL

SOLICITUD DE:

①

☒ Patente de Invención.☐ Patente de Modelo de Utilidad.☒ Capítulo I☐ Capítulo II

②

SOLICITANTE (71)

Nombre: SYNGENTA PARTICIPATIONS AG

Dirección: Schwarzwaldallee 215,
CH-4058 Basilea - SUIZA

Nacionalidad o Domicilio: Basilea - SUIZA

Lugar de Constitución: SUIZA

Teléfono: Fax:
E-mail:

IDENTIFICACIÓN

C.C. ☐ NIT ☐C.E. ☐ Otro ☐

Cual _____

Número _____

③

REPRESENTANTE
O APODERADO

Nombre: MARGARITA CASTELLANOS A.

Dirección: CALLE 94A No. 7A-09

Teléfono: 756 0770 Fax: 755 0158

E-mail: info@castellanosyco.com

IDENTIFICACIÓN

C.C. ☒ NIT ☐C.E. ☐ Otro ☐
Cual _____

Número 39'779.654 TPA 70.819

④

INVENTOR (ES) (72)

SARAH SULZER-MOSSE
Syngenta Crop. Protection Münchwilen AG
Schaffhauserstrasse
CH-4332 Stein
SUIZALAURA QUARANTA
Syngenta Crop. Protection Münchwilen AG
Schaffhauserstrasse
CH-4332 Stein
SUIZACLEMENS LAMBERTH
Syngenta Crop. Protection Münchwilen AG
Schaffhauserstrasse
CH-4332 Stein
SUIZAMATHIAS STEPHAN RESPONDEK
Syngenta Crop. Protection Münchwilen AG
Schaffhauserstrasse
CH-4332 Stein
SUIZA

⑤

PCT (86)

Solicitud Internacional No. PCT/EP2010/061464

Fecha 06/08/2010

Publicación Internacional No. WO 2011/018415 A2

Fecha 17/02/2011

⑥

Título (54) HETEROCICLOS MICROBICIDAS

⑦

Clasificación Internacional (51)

⑧

Prioridad

(33) País de Origen

(32) Fecha

(31) Número de Solicitud

SI ☒ NO ☐

EP

12/08/2009

09167741,9

⑨

Comprobante de pago No. 12-0011184 y 12-0011186

Fecha Febrero 3 de 2012

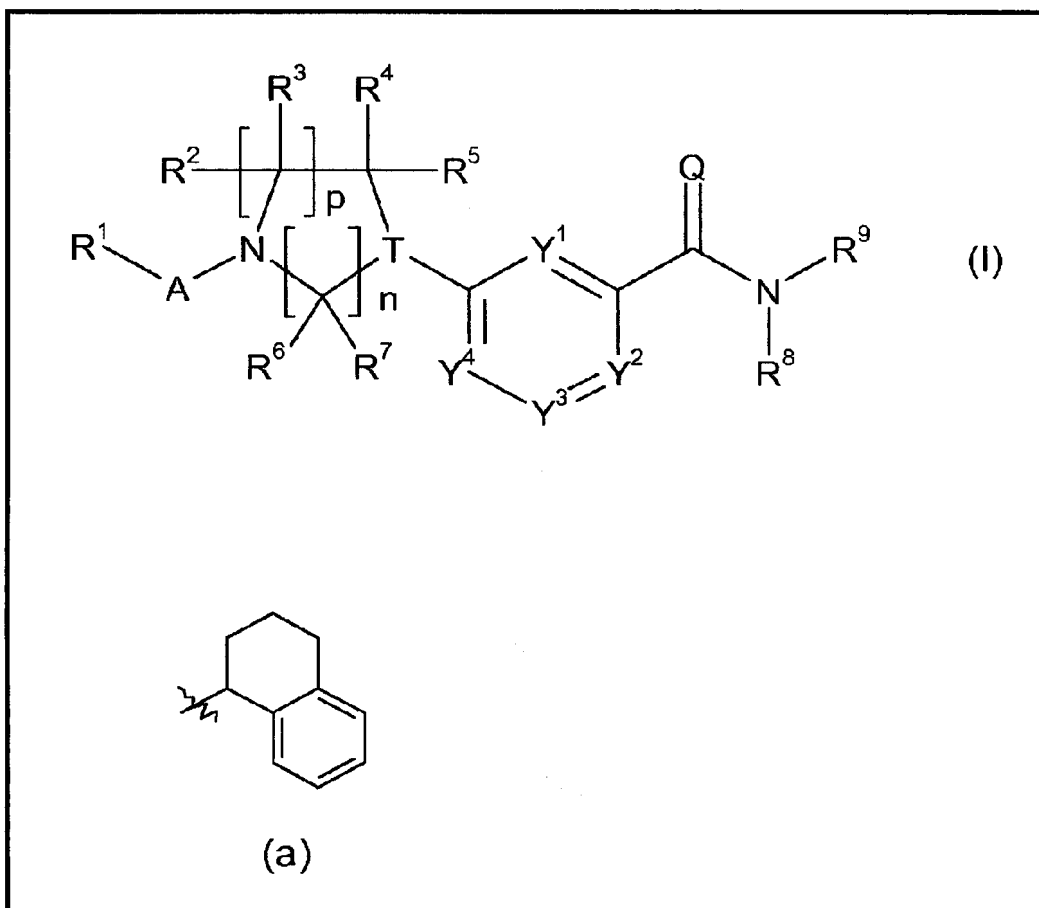
Instrucciones para el diligenciamiento del presente formulario, ver reverso de esta página.

10 Anexos

000002

- ☒ Comprobante de pago de la tasa de presentación de la solicitud.
- ☒ Documento que acredite la existencia y representación legal cuando el solicitante sea persona jurídica.
- ☒ Poderes, si fuere el caso, junto con la sustitución del mismo a mi favor
- ☐ Documento de cesión del inventor al solicitante o a su causante.
- ☐ Declaraciones.
- ☒ Copia de la solicitud internacional (Resumen, descripción, reivindicaciones, dibujos).
- ☒ Traducción de la solicitud internacional al castellano (Resumen, descripción, reivindicaciones, dibujos).
- ☐ Copia del examen preliminar internacional efectuado por la Autoridad Internacional de Examen Preliminar (IPEA).
- ☐ Traducción del examen preliminar internacional efectuado por la IPEA.
- ☐ De ser el caso, copia del contrato de acceso.
- ☐ De ser el caso, documento que acredite la licencia o autorización de uso de conocimientos tradicionales de las comunidades indígenas.
- ☐ De ser el caso, certificado de depósito del material biológico.
- ☒ Arte final 12x12
- ☐ De ser el caso, información sobre otras solicitudes de patente o títulos obtenidos en el extranjero por el mismo titular o su causante, relacionadas parcial o totalmente con la invención de esta solicitud.
- ☐ De ser el caso, modificaciones efectuadas a la solicitud internacional.
- ☒ Otros: Tarjeta Propietario, Extracto para la publicación

11 FIGURA CARACTERISTICA:



12 Solicito la concesión de la patente,

NOMBRE:

MARGARITA CASTELLANOS ABONDANO

FIRMA:

Margarita Castellanos Abondano

C.C. No. 39779.654 Usaquén - TPA 70.819 C.S.J.

08 FEB 2012

Instrucciones para el diligenciamiento del presente formulario, ver reverso de esta página. - MCA/gcb - P2412

000003

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO NIT : 800.176.089-2 - / -					
 Industria y Comercio SUPERINTENDENCIA	RECIBO DE CAJA			No. 12 - 0011184	
				Bogotá D.C., Febrero 03 de 2012 - 14:20:26	
RECIBIDO DE : CASTELLANOS Y Y CO				NI 800.174.641	
*** Soporte del Pago ***					
TIPO PAGO	BANCO	CUENTA	No. PAGO	FECHA PAGO	VR PAGO
CONSIGNACION	BANCO DE BOGOTA	062754387	420505562	03/02/2012	7.335.000.00
*** Conceptos Pagados ***					
CANT.	RENTISTICO	CONCEPTO	Vr.UNDITARIO	Vr.CONCEPTO	
1	50005-01-01 SOLICITUDES	1 TRAMITES DE SOL. DE PATENTE DE INVENCIÓN	590.000.00	590.000.00	
				\$590.000.00	
			=====		
SON: **QUINIENTOS NOVENTA MIL PESOS MONEDA CORRIENTE***					
Responsable: _____					
Recibo de Caja Aplicado al Expediente No. _____					
SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO  No. 12-022027- -00000-0000 Fecha: 2012-02-08 15:53:07 Dep. 2020 DIR.NUEVASCR Tra. 11 PATENTEIYII Eve: 378 FASENACIONALI Act. 411 PRESENTACION Folios: 197					
Sede Centro: Carrera 13 No. 27 - 00 Pisos 3,4,5 y 10 Bogotá, D.C.- Colombia Web: www.sic.gov.co e-mai: info@sic.gov.co Conmutador: (571) 5870000 Fax: (571) 5870284 Línea: 018000-910165 Call Center: (571) 6513240 Febrero 3 de 2012 - 14:20:27					

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO
NIT : 800.176.089-2
- / -

000004

Industria y Comercio
SUPERINTENDENCIA

RECIBO DE CAJA

No. 12 - 0011186

Bogotá D.C., Febrero 03 de 2012 - 14:20:26

RECIBIDO DE : CASTELLANOS Y Y CO NI 800.174.641

*** Soporte del Pago ***

TIPO PAGO	BANCO	CUENTA	No. PAGO	FECHA PAGO	VR. PAGO
CONSIGNACION	BANCO DE BOGOTA	062754387	420505562	03/02/2012	7.335.000.00

*** Conceptos Pagados ***

CANT.	RENTISTICO	CONCEPTO	Vr. UNDITARIO	Vr. CONCEPTO
5	50005-01-01 SOLICITUDES	1607 REIVINDICACION UNITARIA ADICIONAL A LAS 10 INICIALES	30.000.00	150.000.00
				\$150.000.00

SON: **CIENTO CINCUENTA MIL PESOS MONEDA CORRIENTE***

Responsable: _____

Recibo de Caja Aplicado al Expediente No. _____

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO



No. 12-022027- -00000-0000

Fecha: 2012-02-08 15:53:07 Dep. 2020 DIR. NUEVASCR
Tra. 11 PATENTEIYII Eve: 378 FASENACIONALI
Act. 411 PRESENTACION Folios: 197

Sede Centro: Carrera 13 No. 27 - 00 Pisos 3,4,5 y 10 Bogotá, D.C.- Colombia

Web: www.sic.gov.co e-mai: info@sic.gov.co Conmutador: (571) 5870000 Fax: (571) 5870284 Línea: 018000-910165 Call Center: (571) 6513240

, Febrero 3 de 2012 - 14:20:27

COLOMBIA

PODER

El (los) Gregory W. Warren
SYNGENTA PARTICIPATIONS AG

Nombran por el presente a XIMENA CASTELLANOS A. y/o MARGARITA CASTELLANOS A. abogadas con oficinas en la Carrera 9 No. 93-09, Bogotá-Colombia para

y para obtener la protección de mi (nuestra) propiedad Industrial y con este fin autorizamos a dichos apoderados para que nos representen ante cualesquiera autoridades o personas de los órdenes administrativo, contencioso -administrativo y judicial en todo lo relacionado con los siguientes actos y gestiones:

a) Obtención de patentes de invención, modelos y dibujos industriales; registro de marcas de fabrica, de servicio, colectivas o defensivas y de denominaciones de origen, depósito de nombres y enseñas comerciales; su renovación, prórroga, inscripción de traspaso y cambio de nombre o domicilio, cancelación voluntaria y el registro de licencias de uso de esos derechos; b) Para la obtención de registros sanitarios; c) Acciones de oposición, observación, cancelación, nulidad, medidas cautelares y en general los juicios civiles, penales, administrativos o contencioso - administrativos que promovamos o se nos promuevan, pudiendo en todos los actos y gestiones arriba mencionados sustituir éste mandato, transigir, desistir, recibir, cancelar, renunciar, aceptar notificaciones y nombrar apoderados judiciales y extrajudiciales.

Dado y firmado hoy 24 de Marzo de 2004

en Research Triangle Park, Carolina
del Norte 27709
por Gregory W. Warren

(El notario debe suscribir el documento en la pagina siguiente)

(Se requiere legalización consular)

POWER OF ATTORNEY

I (we) the undersigned Gregory W. Warren
Syngenta Participations AG

hereby grant(s) Power of Attorney to XIMENA CASTELLANOS A. and for MARGARITA CASTELLANOS a. attorneys residing at Carrera 9 No. 93-09, Bogota- Colombia, to prosecute

and to obtain the protection of my (our Industrial Property, for which purpose we authorize the said attorneys to represent us before any authorities, or persons, specially those, administrative, contentious and judicial, in all matters concerning the following:

a) Obtention of patents, models and designs, registration of trademarks, service, collective and defensive marks, and of designations of origin; the deposit of trade names and ensgns; its renewal, extension, recordal of assignments, change of name or domicile, voluntary cancellation, and the registration of licenses of use of the above rights; b) For the obtention of Sanitary registrations; c) Actions of opposition, cancellation, nullity, infringement, granting of licenses; and in general the civil, criminal and administrative suits related to those rights; actions and suits instituted by us or against us; and that in all the above matters they may substitute this power of attorney, compromise, desist, cancel, receive, renounce, accept notifications and appoint attorneys in fact, in or out of court.

Given and signed this 24th March 2004

in Research Triangle Park, North Carolina 27709

by Gregory W. Warren

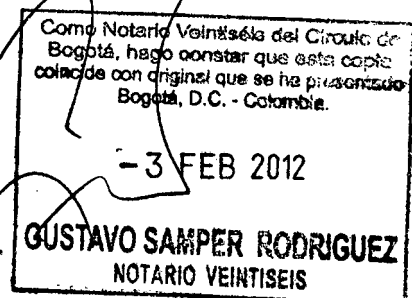
Gregory W. Warren

(Notary shall execute on the other side)

(Consular legalization required)

ALVARO CASTELLANOS M. & CIA
ABOGADOS COLOMBIA

Carrera 9 No. 93-09- P.O.Box 6349 - Bogotá, Colombia
Tels.: (571) 610 74 20 / 60 / 80 - Fax (571) 610 07 06 - e-mail acastell@impset.net.co



COLOMBIA

CERTIFICADO NOTARIAL (Sociedad)

Hoy 24 de Marzo del año 2004

compareció(eron) personalmente Gregory W. Warren a quienes conozco como la(s) personas que firma(n) en representación de la Sociedad (Compañía denominada

Certifico: Syngenta Participations AG

- a) Que es una sociedad/Compañía legalmente constituida y existente de acuerdo con las leyes de
- b) Que el domicilio de dicha Sociedad/Compañía es Basel, Suiza
- c) Que el objeto u objetos para los cuales se otorga el presente poder están comprendidos dentro del objeto social de la mencionada Sociedad /Compañía.
- d) Que el Sr. Gregory W. Warren esta autorizado para otorgar el presente poder. Lo anterior esta probado por medio de los siguientes documentos, que certifico he visto*

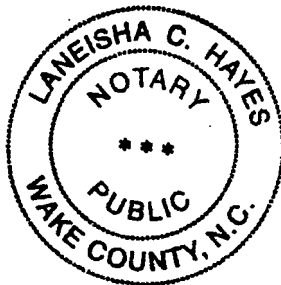
(Ciudad) REsearch Triangle Park

(Estado) Carolina del Norte 27709

Hoy del 24 de Marzo de 2004

(Notario Público) LANEISHA C. HAYES

*Los documentos debe identificarse con fecha y origen.

**ALVARO CASTELLANOS M. & CIA.**

ABOGADOS COLOMBIA

Carrera 9 No. 93-09- P.O.Box 6349 - Bogotá, Colombia
 Tels.: (571) 610 74 20 / 60 / 80 - Fax (571) 610 07 06 - e-mail acastell@impsat.net.co

NOTARIAL (Corporation)

On this 24th day of March of 2004 personally appeared Gregory W. Warren whom I know to be the person(s) who signed this document as representative(s) of the Corporation /Company named Syngenta Participations AG

I certify:

- a) That Syngenta Participations AG is a corporation (Company legally constituted and in existence in accordance with the laws of Basel, Switzerland
- b) That the domicile of said Corporation/Company is Basel, Switzerland
- c) That the purpose or purposes for which the present Power of Attorney is granted are comprised within the object set forth in the charter of the mentioned Corporation/Company.
- d) That Mr. Gregory W. Warren is (are) authorized to grant the present Power of Attorney. The aforementioned was duly proven through the following documents and I duly certify having seen them*: on the 24th day of March, 2004 in Research Triangle Park, North Carolina 27709.

(City) Research Triangle Park

(State) North Carolina, 27709

this 24th day of March of the year 2004

(Notary Public)

Laneisha C. Hayes
 *Documents must be identified with date and origin
 3/24/04 - Research Triangle Park, North Carolina 27709 - Syngenta Biotech, Inc.

Como Notario Veintiséis del Circuito de Bogotá, hago constar que esta copia coincide con original que se ha presentado Bogotá, D.C. - Colombia.

- 3 FEB 2012

GUSTAVO SAMPER RODRIGUEZ
 NOTARIO VEINTISEIS

000007



Wake County Register of Deeds
Post Office Box 1897
Raleigh, North Carolina 27602-1897

Laura M. Riddick
Register Of Deeds

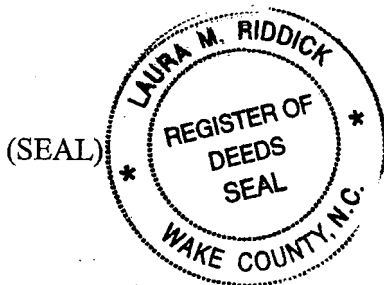
STATE OF NORTH CAROLINA

WAKE COUNTY

**CERTIFICATE OF REGISTER OF DEEDS THAT
NOTARY PUBLIC WAS ACTING NOTARY
AT TIME OF SIGNATURE**

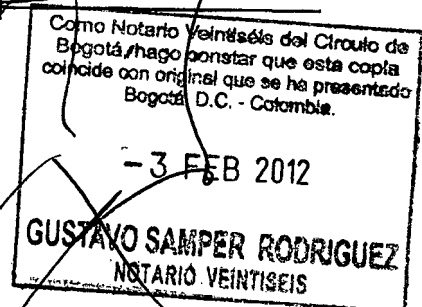
I, LAURA M. RIDDICK, REGISTER OF DEEDS OF THE AFORESAID COUNTY AND STATE, DO HEREBY CERTIFY THAT Laneisha C. Hayes WAS, AT THE TIME OF SIGNING THE FOREGOING (OR ANNEXED) CERTIFICATE, A DULY COMMISSIONED AND QUALIFIED NOTARY PUBLIC IN AND FOR THE COUNTY OF WAKE, STATE OF NORTH CAROLINA, AND AS SUCH FULL FAITH AND CREDIT IS DUE TO HIS OFFICIAL ACTS; AND, FURTHER, THAT HIS SIGNATURE THERETO IS IN HIS OWN PROPER HANDWRITING.

IN TESTIMONY WHEREOF, I HAVE HEREUNTO SET MY HAND AND SEAL OF OFFICE THIS, THE 30TH DAY OF MARCH, 2004.



Laura M. Riddick
REGISTER OF DEEDS

Calvin
DEPUTY / ASSISTANT



APOSTILLE
(Convention de La Haye 5 octobre 1961)

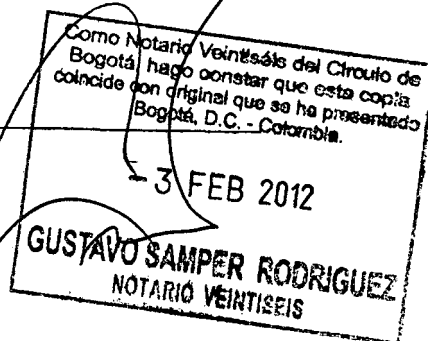
1. COUNTRY: **UNITED STATES OF AMERICA**
2. This Public Document
has been signed by CARLA N. BROWN
3. acting in the capacity of DEPUTY REGISTER OF DEEDS
LAURA M. RIDDICK, REGISTER OF DEEDS
4. bears the seal/stamp of COUNTY OF WAKE, NORTH CAROLINA

CERTIFIED

5. at Raleigh, North Carolina
6. the 1ST DAY OF APRIL, 2004
7. by Deputy Secretary of State, State of North Carolina
8117
8. No. _____
9. Seal/Stamp:
10. Signature



Roberto S. Mosquera



-----TRADUCCION OFICIAL No. -040417-----

de un documento escrito en INGLES, el cual para su identificación
lleva el sello de la Traductora e Intérprete oficial, Res. 2755/68 y
01144/97 de Minjusticia, al igual que la presente.-----

------(Anexos a un poder otorgado por Syngenta
Participations AG)

(fdo) ilegible

3/24/04 Research Triangle Park, NC 27709

ESTADO DE CAROLINA DEL NORTE

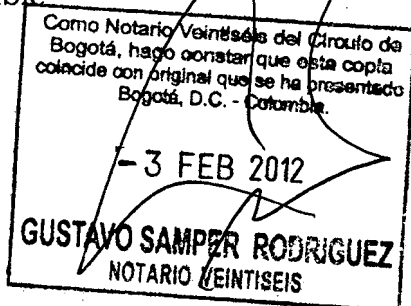
CONDADO DE WAKE

Yo, Laura M. Riddick, Registrador de Escrituras del condado y estado
antes mencionados, certifico por medio del presente que Laneisha C.
Hayes, al momento de firmar este documento era un Notario Público
debidamente comisionado y habilitado en y para el Condado de Wake,
Estado de Carolina del Norte, y como tal debe dars plena fe y crédito a
sus actos oficiales, y además, que su firma en el mismo es de su propia
letra.

En testimonio de lo cual, he impuesto aquí mi firma y sello de oficio,
hoy día 30 de Marzo de 2004.

Laura M. Riddick, Registrador de Escrituras

Por (fdo) ilegible



DORA DUQUE DE BERNAL
TRADUCTORA E INTÉRPRETE OFICIAL
RES. 2755/68 Y 01144/97 - MINJUSTICIA
REP. DE COLOMBIA

Delegado

APOSTILLA

(Convención de La Haya de octubre 5, 1961)

1. País: Estados Unidos de América
 2. Este documento público ha sido firmado por CARLA N. BROWN
 3. actuando en su carácter de Delegado del Registrador de Escrituras
 4. lleva el sello de Laura M. Riddick, Registrador de Escrituras
- Condado de Wake, Carolina del Norte

CERTIFICADO

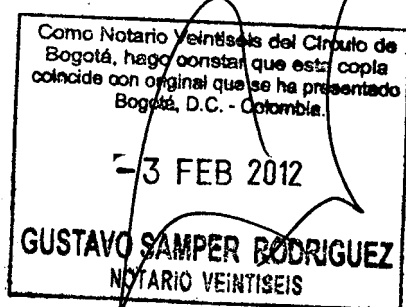
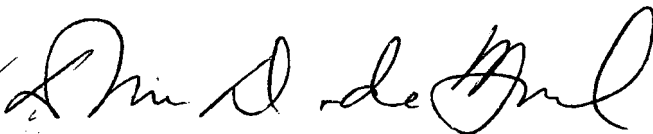
5. En Raleigh. Carolina del Norte
6. el día 1 de Abril de 2004
7. por el Secretario de Estado Delegado, Estado de Carolina del Norte
8. No. 8117
9. Sello: (sello en oblea ocre)

10. Firma

(fdo) Rodney S. Maddox

ES TRADUCCION FIEL Y COMPLETA, a la cual me remito,

Bogotá, Abril 15, 2004



DORA DUQUE DE BERNAL
TRADUCTORA E INTERPRETE OFICIAL
RES. 02755/68 Y 01144/97 - MINJUSTICIA
REP. DE COLOMBIA

LIBRO 2:42
FOLIO 13
[Signature]

MINISTERIO DE
RELACIONES EXTERIORES

210997
Dora Duque
EL EL
GOBIERNO DE LA EMBAJADA
LAS FUNCIONES DE LA EMBAJADA

Como Notario Veintiseis del Circuito de Bogotá, hago constar que esta copia coincide con original que se ha presentado Bogotá, D.C. - Colombia.

- 3 FEB 2012

GUSTAVO SAMPER RODRIGUEZ
NOTARIO VEINTISEIS

EN BLANCO
NOTARIA VEINTISEIS

EN BLANCO
NOTARIA VEINTISEIS

From the INTERNATIONAL BUREAU

PCT**NOTIFICATION OF THE RECORDING
OF A CHANGE**(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

To:

ARUNASALAM, Velautha-Cumaran
Syngenta Crop Protection Münchwilen AG
Patent Department
Schaffhauserstrasse
CH-4332 Stein
SUISSE

Date of mailing (day/month/year)

04 January 2012 (04.01.2012)

Applicant's or agent's file reference

72585-WO-PCT

IMPORTANT NOTIFICATION

International application No.

PCT/EP2010/061464

International filing date (day/month/year)

06 August 2010 (06.08.2010)

The following indications appeared on record concerning:

☒ the applicant☒ the inventor☐ the agent☐ the common representative

Name and Address

SULZER, Sarah
Syngenta Crop Protection
Münchwilen AG
Schaffhauserstrasse
CH-4332 Stein
Switzerland

State of Nationality

FR

State of Residence

CH

Telephone No.

Facsimile No.

E-mail address

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☐ the person☒ the name☐ the address☐ the nationality☐ the residence

Name and Address

SULZER-MOSSE, Sarah
Syngenta Crop Protection
Münchwilen AG
Schaffhauserstrasse
CH-4332 Stein
Switzerland

State of Nationality

FR

State of Residence

CH

Telephone No.

Facsimile No.

E-mail address

☐ Notifications by e-mail authorized

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

☒ the receiving Office☐ the International Searching Authority☐ the Authority(ies) specified for supplementary search☐ the International Preliminary Examining Authority☒ the designated Offices concerned☐ the elected Offices concerned☐ other:The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. +41 22 338 89 70

Authorized officer

Kirchner Maria

e-mail pt06.pct@wipo.int

Telephone No. +41 22 338 74 06

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF THE RECORDING
OF A CHANGE

(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

To:

ARUNASALAM, Velautha-Cumaran
Syngenta Crop Protection Münchwilen AG
Patent Department
Schaffhauserstrasse
CH-4332 Stein
SUISSE

Date of mailing (day/month/year) 04 January 2012 (04.01.2012)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference 72585-WO-PCT	
International application No. PCT/EP2010/061464	International filing date (day/month/year) 06 August 2010 (06.08.2010)

1. The following indications appeared on record concerning:

☒ the applicant ☒ the inventor ☐ the agent ☐ the common representative

Name and Address SULZER, Sarah Syngenta Crop Protection Münchwilen AG Schaffhauserstrasse CH-4332 Stein Switzerland	State of Nationality FR	State of Residence CH
	Telephone No.	
	Facsimile No.	
	E-mail address	

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☐ the person ☒ the name ☐ the address ☐ the nationality ☐ the residence

Name and Address SULZER-MOSSE, Sarah Syngenta Crop Protection Münchwilen AG Schaffhauserstrasse CH-4332 Stein Switzerland	State of Nationality FR	State of Residence CH
	Telephone No.	
	Facsimile No.	
	E-mail address ☐ Notifications by e-mail authorized	

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

☒ the receiving Office	☐ the International Preliminary Examining Authority
☐ the International Searching Authority	☒ the designated Offices concerned
☐ the Authority(ies) specified for supplementary search	☐ the elected Offices concerned
	☐ other:

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer Kirchner Maria
Facsimile No. +41 22 338 89 70	e-mail pt06.pct@wipo.int Telephone No. +41 22 338 74 06

000013



Application Specialist

department.patent@syngenta.com

WO Syngenta Crop Protection Mundwilien AG
Intellectual Property
Schaffhauserstrasse
CH-4332, Stein
Switzerland
Tel:
Fax: +41 61 323 5044

World Intellectual Property Organization
34, chemin des Colombettes
CH-1211 Geneva 20, Switzerland

January 2, 2012

Your Ref:

Our Ref:
72585_WO_PCT1

International Patent Application No.
Applicant

PCT/EP2010/061464
SYNGENTA
PARTICIPATIONS AG

Notification of a change

Dear Sirs,

We hereby notify you of a change to the name of the inventor on record Sarah SULZER.

The name should now read as Sarah SULZER-MOSSE.

Please amend this accordingly and issue an IB306 notice recording the change.

We would appreciate your prompt attention to this matter as the PCT30 deadline is approaching on 12th February 2012 and we need this in order to validate the application in the national offices.

In the name of the applicant


Olivier Sauvageot
European Patent Attorney



Application Specialist

department.patent@syngenta.com

000014

to Syngenta Crop Protection Mundwil AG
Intellectual Property
Schaffhauserstrasse
CH-4332, Stein
Switzerland
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International Patent Application No.
Applicant

PCT/EP2010/061464
SYNGENTA
PARTICIPATIONS AG

Notification of a change

Dear Sirs,

We hereby notify you of a change to the name of the inventor on record Sarah SULZER.

The name should now read as Sarah SULZER-MOSSE.

Please amend this accordingly and issue an IB306 notice recording the change.

We would appreciate your prompt attention to this matter as the PCT30 deadline is approaching on 12th February 2012 and we need this in order to validate the application in the national offices.

In the name of the applicant


Olivier Sauvageot
European Patent Attorney

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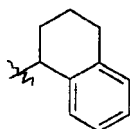
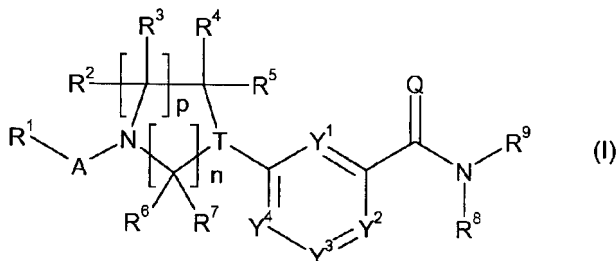
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Declarations under Rule 4.17:

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))

[Continued on next page]

(54) Title: MICROBIOCIDAL HETEROCYCLES



(a)

(57) Abstract: The present invention relates to heterocyclic compounds of formula I which have microbiocidal activity, in particular fungicidal activity as well as methods of using the compounds of formula (I) to control microbes: wherein A is $x-C(R^{10}R^{11})-C(=O)-$, $x-C(R^{12}R^{13})-C(=S)-$, $x-O-C(=O)-$, $x-O-C(=S)-$, $x-N(R^{14})-C(=O)-$, $x-N(R^{15})-C(=S)-$, $x-C(R^{16}R^{17})-SO_2-$ or $X-N=C(R^{30})-$, in each case x indicates the bond that is connected to R^1 ; T is CR^{18} or N; Y^1 , Y^2 , Y^3 , and Y^4 are independently CR^{19} or N; Q is O or S; n is 1 or 2; p is 1 or 2, providing that when n is 2, p is 1. R^1 is phenyl, pyridyl, imidazolyl, or pyrazolyl; wherein the phenyl, pyridyl, imidazolyl and pyrazolyl are each optionally substituted by 1 to 3 substituents independently selected from C_1 - C_4 alkyl, C_1 - C_4 haloalkyl, halogen, cyano, hydroxy and amino; R^2 , R^3 , R^4 , R^5 , R^6 , R^7 , R^{10} , R^{11} , R^{12} , R^{13} , R^{16} , R^{17} , R^{18} , R^{19} and R^{30} each independently are hydrogen, halogen, cyano, C_1 - C_4 alkyl, or C_1 - C_4 haloalkyl; R^8 , R^{14} and R^{15} each independently are hydrogen or C_1 - C_4 alkyl; and R^9 is phenyl, benzyl or group (a): wherein the phenyl, benzyl and group (a) are each optionally substituted with 1 to 3 substituents independently selected from C_1 - C_4 alkyl, C_1 - C_4 haloalkyl, halogen, cyano, hydroxy and amino; or a salt or a N-oxide thereof.

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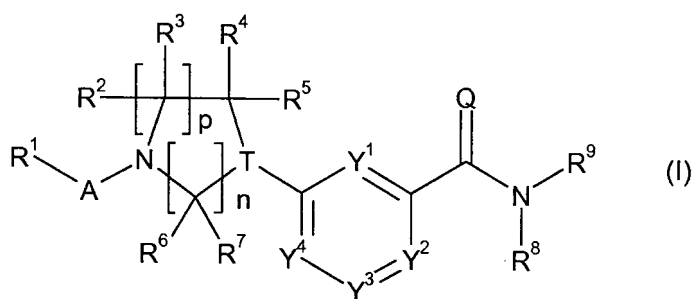
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upon receipt of that report (Rule 48.2(g))*

Microbiocidal Heterocycles

The present invention relates to heterocycles, e.g. as active ingredients, which have microbiocidal activity, in particular fungicidal activity. The invention also relates to preparation of these heterocycles, to heterocyclic derivatives used as intermediates in the
 5 preparation of these heterocycles, to preparation of these intermediates, to agrochemical compositions which comprise at least one of the heterocycles, to preparation of these compositions and to use of the heterocycles or compositions in agriculture or horticulture for controlling or preventing infestation of plants, harvested food crops, seeds or non-living materials by phytopathogenic microorganisms, preferably fungi.

10 Certain heterocycles for use as fungicides are described in WO 2007/014290, WO 2008/013622, WO 2008/013925, WO 2008/091580, WO 2008/091594 and WO 2009/055514.

The present invention provides compounds of formula I:



15 wherein

A is $x\text{-C(R}^{10}\text{R}^{11})\text{-C(=O)-}$, $x\text{-C(R}^{12}\text{R}^{13})\text{-C(=S)-}$, $x\text{-O-C(=O)-}$, $x\text{-O-C(=S)-}$, $x\text{-N(R}^{14})\text{-C(=O)-}$, $x\text{-N(R}^{15})\text{-C(=S)-}$, $x\text{-C(R}^{16}\text{R}^{17})\text{-SO}_2\text{-}$ or $x\text{-N=C(R}^{30})\text{-}$ in each case x indicates the bond that is connected to R¹;

T is CR¹⁸ or N;

20 Y¹, Y², Y³, and Y⁴ are independently CR¹⁹ or N;

Q is O or S;

n is 1 or 2;

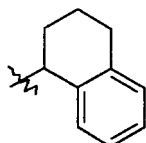
p is 1 or 2, providing that when n is 2, p is 1.

R¹ is phenyl, pyridyl, imidazolyl, or pyrazolyl; wherein the phenyl, pyridyl, imidazolyl and
 25 pyrazolyl are each optionally substituted by 1 to 3 substituents independently selected from C₁-C₄ alkyl, C₁-C₄ haloalkyl, halogen, cyano, hydroxy and amino;

R², R³, R⁴, R⁵, R⁶, R⁷, R¹⁰, R¹¹, R¹², R¹³, R¹⁶, R¹⁷, R¹⁸, R¹⁹ and R³⁰ each independently are hydrogen, halogen, cyano, C₁-C₄alkyl, or C₁-C₄haloalkyl;

R⁸, R¹⁴ and R¹⁵ each independently are hydrogen or C₁-C₄alkyl; and

30 R⁹ is phenyl, benzyl or group (a):



(a)

wherein the phenyl, benzyl and group (a) are each optionally substituted with 1 to 3 substituents independently selected from C₁-C₄ alkyl, C₁-C₄ haloalkyl, halogen, cyano, hydroxy and amino; or a salt or a N-oxide thereof.

Where substituents are indicated as being optionally substituted, this means that they may or may not carry one or more identical or different substituents. Normally not more than three such optional substituents are present at the same time.

The term "halogen" stands for fluorine, chlorine, bromine or iodine.

The term "amino" stands for -NH₂.

Alkyl, alkenyl or alkynyl substituents may be straight-chained or branched. Alkyl on its own or as part of another substituent is, depending upon the number of carbon atoms mentioned, for example, methyl, ethyl, n-propyl, n-butyl, n-pentyl, n-hexyl and the isomers thereof, for example, iso-propyl, iso-butyl, sec-butyl, tert-butyl, iso-amyl or pivaloyl.

A haloalkyl group may contain one or more identical or different halogen atoms and, for example, may stand for CH₂Cl, CHCl₂, CCl₃, CH₂F, CHF₂, CF₃, CF₃CH₂, CH₃CF₂, CF₃CF₂ or CCl₃CCl₂.

The presence of one or more possible asymmetric carbon atoms in a compound of formula I means that the compounds may occur in optically isomeric forms, i.e. enantiomeric or diastereomeric forms. As a result of the presence of a possible aliphatic C=C double bond, geometric isomerism may occur, i.e. cis-trans or (E)-(Z) isomerism. Also atropisomers may occur as a result of restricted rotation about a single bond. Formula I is intended to include all those possible isomeric forms and mixtures thereof. The present invention includes all those possible isomeric forms and mixtures thereof for a compound of formula I. Likewise, formula I is intended to include all possible tautomers. The present invention includes all possible tautomeric forms for a compound of formula I.

In each case, the compounds of formula I according to the invention are in free form, in oxidized form as a N-oxide or in salt form, e.g. an agronomically usable salt form.

N-oxides are oxidized forms of tertiary amines or oxidized forms of nitrogen containing heteroaromatic compounds. They are described for instance in the book "Heterocyclic N-oxides" by A. Albini and S. Pietra, CRC Press, Boca Raton 1991.

Suitable salts of the compounds of formula I include those resulting after addition of acid such as those with an inorganic mineral acid e.g. hydrochloric, hydrobromic, sulphuric, nitric or phosphoric acid, or an organic carboxylic acid e.g. oxalic, tartaric, lactic, butyric,

toluic, hexanoic or phthalic acid, or a sulfonic acid e.g. methane, benzene or toluene sulfonic acid.

Preferably the compound of formula I is a compound wherein:

A is $x\text{-C(R}^{10}\text{R}^{11})\text{-C(=O)-}$, $x\text{-C(R}^{12}\text{R}^{13})\text{-C(=S)-}$, $x\text{-O-C(=O)-}$, $x\text{-O-C(=S)-}$, $x\text{-N(R}^{14})\text{-C(=O)-}$, $x\text{-N(R}^{15})\text{-C(=S)-}$ or $x\text{-C(R}^{16}\text{R}^{17})\text{-SO}_2\text{-}$, in each case x indicates the bond that is connected to R^1 ;

T is CR^{18} or N;

Y^1 , Y^2 , Y^3 , and Y^4 are independently CR^{19} or N;

Q is O or S;

10 n is 1 or 2;

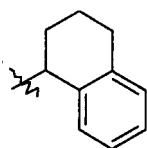
p is 1 or 2, providing that when n is 2, p is 1.

R^1 is phenyl, pyridyl, imidazolyl, or pyrazolyl; wherein the phenyl, pyridyl, imidazolyl and pyrazolyl are each optionally substituted by 1 to 3 substituents independently selected from $\text{C}_1\text{-C}_4$ alkyl, $\text{C}_1\text{-C}_4$ haloalkyl, halogen, cyano, hydroxy and amino;

15 R^2 , R^3 , R^4 , R^5 , R^6 , R^7 , R^{10} , R^{11} , R^{12} , R^{13} , R^{16} , R^{17} , R^{18} and R^{19} each independently are hydrogen, halogen, cyano, $\text{C}_1\text{-C}_4$ alkyl, or $\text{C}_1\text{-C}_4$ haloalkyl;

R^8 , R^{14} and R^{15} each independently are hydrogen or $\text{C}_1\text{-C}_4$ alkyl; and

R^9 is phenyl, benzyl or group (a):



20 (a)

wherein the phenyl, benzyl and group (a) are each optionally substituted with 1 to 3 substituents independently selected from $\text{C}_1\text{-C}_4$ alkyl, $\text{C}_1\text{-C}_4$ haloalkyl, halogen, cyano, hydroxy and amino;

or a salt or a N-oxide thereof.

25 Preferably the compound of formula I is a compound wherein:

A is $x\text{-C(R}^{10}\text{R}^{11})\text{-C(=O)-}$, $x\text{-C(R}^{12}\text{R}^{13})\text{-C(=S)-}$, $x\text{-O-C(=O)-}$, $x\text{-O-C(=S)-}$, or $x\text{-C(R}^{16}\text{R}^{17})\text{-SO}_2\text{-}$, in each case x indicates the bond that is connected to R^1 ;

T is CR^{18} or N;

Y^1 , Y^2 , Y^3 , and Y^4 are independently CR^{19} or N providing that at least 2 of Y^1 , Y^2 , Y^3 , and Y^4

30 are CR^{19} ;

Q is O or S;

n is 1 or 2;

p is 1;

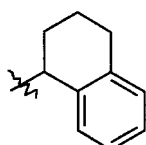
R^1 is phenyl or pyrazolyl; wherein the phenyl and pyrazolyl are each optionally substituted by 1 to 3 substituents independently selected from C_1 - C_4 alkyl, C_1 - C_4 haloalkyl, halogen, cyano, hydroxy, and amino;

$R^2, R^3, R^4, R^5, R^6, R^7, R^{10}, R^{11}, R^{12}, R^{13}, R^{16}, R^{17}, R^{18}$, and R^{19} each independently are

5 hydrogen, halogen, C_1 - C_4 alkyl, C_1 - C_4 haloalkyl;

R^8 is hydrogen or C_1 - C_4 alkyl; and

R^9 is phenyl, benzyl or group (a):



(a)

10 wherein the phenyl, benzyl and group (a) are each optionally substituted with 1 to 3 substituents independently selected from C_1 - C_4 alkyl, C_1 - C_4 haloalkyl, halogen, cyano, hydroxy and amino.

Preferably the compound of formula I is a compound wherein:

A is $x-CR^{10}R^{11}-C(=O)-$, $x-O-C(=O)-$, or $x-CR^{16}R^{17}-SO_2-$, in each case x indicates the bond

15 that is connected to R^1 ;

T is CR^{18} ;

Y^1, Y^2, Y^3 , and Y^4 are independently CR^{19} or N providing that at least 2 of Y^1, Y^2, Y^3 , and Y^4 are CR^{19} and providing that there are no N-N bonds in the ring containing Y^1, Y^2, Y^3 , and Y^4 ;

Q is O or S;

20 n is 1 or 2;

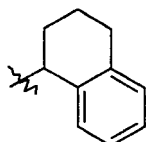
p is 1;

R^1 is phenyl or pyrazolyl, wherein the phenyl and pyrazolyl are each optionally substituted with 1 to 3 substituents independently selected from C_1 - C_4 alkyl, C_1 - C_4 haloalkyl, and halogen;

25 $R^2, R^3, R^4, R^5, R^6, R^7, R^{10}, R^{11}, R^{16}, R^{17}, R^{18}$, and R^{19} each independently are hydrogen, fluoro, or methyl;

R^8 is hydrogen or methyl; and

R^9 is phenyl, benzyl or group (a)



(a)

30 wherein the phenyl, benzyl and group (a) are each optionally substituted with 1 to 3 substituents independently selected from C_1 - C_4 alkyl, C_1 - C_4 haloalkyl, hydroxy and halogen.

Preferably the compound of formula I is a compound wherein:

A is $x\text{-CH}_2\text{-C(=O)-}$, $x\text{-O-C(=O)-}$ or $x\text{-CH}_2\text{-SO}_2\text{-}$, in each case x indicates the bond that is connected to R^1 ;

T is CH;

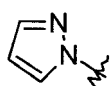
- 5 Y^1 , Y^2 , Y^3 , and Y^4 are independently CH or N providing that at least 2 of Y^1 , Y^2 , Y^3 , and Y^4 are CH and providing that there are no N-N bonds in the ring containing Y^1 , Y^2 , Y^3 , and Y^4 ;

Q is O;

n is 1 or 2;

p is 1;

- 10 R^1 is phenyl or group (b)



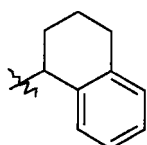
(b)

wherein the phenyl and group (b) are each optionally substituted with 1 to 3 substituents independently selected from halogen, $C_1\text{-C}_4$ alkyl and $C_1\text{-C}_4$ haloalkyl;

- 15 R^2 , R^3 , R^4 , R^5 , R^6 and R^7 are each hydrogen;

R^8 is hydrogen or methyl; and

R^9 is phenyl, benzyl or group (a)



(a)

- 20 wherein the phenyl, benzyl and group (a) are each optionally substituted with 1 to 3 substituents independently selected from $C_1\text{-C}_4$ alkyl, $C_1\text{-C}_4$ haloalkyl, hydroxy and halogen.

Preferably the compound of formula I is a compound wherein:

A is $x\text{-CH}_2\text{-C(=O)-}$, wherein x indicates the bond that is connected to R^1 ;

T is CH;

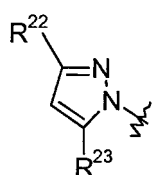
- 25 Y^1 , Y^2 , Y^3 , and Y^4 are independently CH;

Q is O;

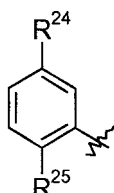
n is 2;

p is 1;

R^1 is selected from group (c) or (d):



(c)



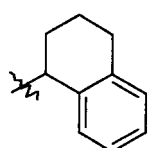
(d)

wherein R^{22} , R^{23} , R^{24} and R^{25} are independently selected from hydrogen, halogen, methyl and halomethyl;

5 R^2 , R^3 , R^4 , R^5 , R^6 , and R^7 are each hydrogen;

R^8 is hydrogen or methyl; and

R^9 is phenyl, benzyl or group (a)



(a)

10 wherein the phenyl, benzyl and group (a) are each optionally substituted with 1 to 3 substituents independently selected from methyl, halomethyl, and halogen.

The invention also relates to compounds of formula I wherein

A is $x\text{-CH}_2\text{-C(=O)-}$, $x\text{-CH}_2\text{C(=S)-}$, $x\text{-OC(=O)-}$, $x\text{-CH}_2\text{SO}_2\text{-}$, in each case x being the bond to R^1 ;

15 T is CH or N;

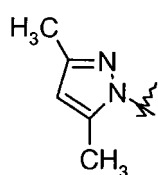
Y^1 , Y^2 , Y^3 , and Y^4 are independently CH or N, providing that at least 2 of Y^1 , Y^2 , Y^3 , and Y^4 are CH and providing that there are no N-N bonds in the ring containing Y^1 , Y^2 , Y^3 ;

Q is O or S;

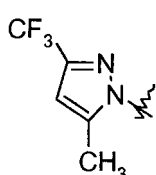
n is 1 or 2;

20 p is 1 or 2, providing that when n is 2, p is 1;

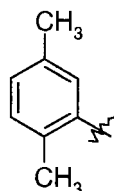
R^1 is group (e), (f), (g), or (h):



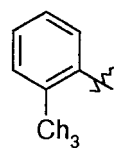
(e)



(f)



(g)

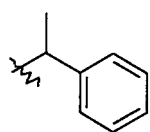


(h)

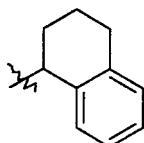
R^2 , R^3 , R^4 , R^5 , R^6 and R^7 are each hydrogen;

25 R^8 is hydrogen or methyl;

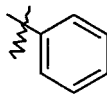
R^9 is group (i), (j), or (k):



(i)



(j)



(k)

The following list provides definitions, including preferred definitions, for substituents A, T, Y¹, Y², Y³, Y⁴, Q, n, p, R¹, R², R³, R⁴, R⁵, R⁶, R⁷, R⁸, R⁹, R¹⁰, R¹¹, R¹², R¹³, R¹⁴, R¹⁵, R¹⁶,
 5 R¹⁷, R¹⁸, R¹⁹, R²², R²³, R²⁴, R²⁵ and R³⁰ with reference to compounds of formula I. For any one of these substituents, any of the definitions given below may be combined with any definition of any other substituent given below. The invention includes compounds of formula having all possible combinations of substituent definitions given below or elsewhere in this document. Generally, in this document any substituent definition may be combined
 10 with any other substituent definition.

A is x-C(R¹⁰R¹¹)-C(=O)-, x-C(R¹²R¹³)-C(=S)-, x-O-C(=O)-, x-O-C(=S)-, x-N(R¹⁴)-C(=O)-, x-N(R¹⁵)-C(=S)- or x-C(R¹⁶R¹⁷)-SO₂-, in each case x indicates the bond that is connected to R¹. Preferably, A is x-C(R¹⁰R¹¹)-C(=O)-, x-C(R¹²R¹³)-C(=S)-, x-O-C(=O)-, x-O-C(=S)-, or x-C(R¹⁶R¹⁷)-SO₂-, in each case x indicates the bond that is connected to R¹.
 15 More preferably, A is x-CR¹⁰R¹¹-C(=O)-, x-O-C(=O)-, or x-CR¹⁶R¹⁷-SO₂-, in each case x indicates the bond that is connected to R¹. Even more preferably, A is x-CH₂-C(=O)-, x-CH₂-C(=S)-, x-OC(=O)-, x-CH₂SO₂-, in each case x indicates the bond that is connected to R¹. Yet more preferably, A is x-CH₂-C(=O)-, x-O-C(=O)- or x-CH₂-SO₂-, in each case x indicates the bond that is connected to R¹. Most preferably, A is x-CH₂-C(=O)-, wherein x
 20 indicates the bond that is connected to R¹.

T is CR¹⁸ or N. Preferably, T is CH or N. Most preferably, T is CH.

n is 1 or 2. Preferably, n is 2.

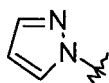
p is 1 or 2, providing that when n is 2, p is 1. Preferably, p is 1.

Y¹, Y², Y³, and Y⁴ are independently CR¹⁹ or N, e.g. Y¹, Y², Y³, and Y⁴ may be
 25 independently CH or N. More preferably, Y¹, Y², Y³, and Y⁴ are independently CR¹⁹ or N providing that at least 2 of Y¹, Y², Y³, and Y⁴ are CR¹⁹. Even more preferably, Y¹, Y², Y³, and Y⁴ are independently CR¹⁹ or N providing that at least 2 of Y¹, Y², Y³, and Y⁴ are CR¹⁹ and providing that there are no N-N bonds in the ring containing Y¹, Y², Y³, and Y⁴. Yet more preferably, Y¹, Y², Y³, and Y⁴ are independently CH or N providing that at least 2 of
 30 Y¹, Y², Y³, and Y⁴ are CH and providing that there are no N-N bonds in the ring containing Y¹, Y², Y³, and Y⁴.

Q is O or S. Preferably, Q is O.

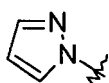
R¹ is phenyl, pyridyl, imidazolyl, or pyrazolyl; wherein the phenyl, pyridyl, imidazolyl and pyrazolyl are each optionally substituted by 1 to 3 substituents independently selected
 35 from C₁-C₄ alkyl, C₁-C₄ haloalkyl, halogen, cyano, hydroxy and amino. Preferably, R¹ is

phenyl or pyrazolyl; wherein the phenyl and pyrazolyl are each optionally substituted by 1 to 3 substituents independently selected from C₁-C₄ alkyl, C₁-C₄ haloalkyl, halogen, cyano, hydroxy, and amino. More preferably, R¹ is phenyl or pyrazolyl, wherein the phenyl and pyrazolyl are each optionally substituted with 1 to 3 substituents independently selected from C₁-C₄ alkyl, C₁-C₄ haloalkyl, and halogen. Yet more preferably, R¹ is phenyl or group (b):



(b)

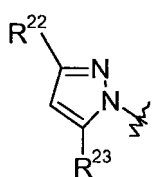
wherein the phenyl and group (b) are each optionally substituted with 1 to 3 substituents independently selected from halogen, C₁-C₄ alkyl and C₁-C₄ haloalkyl. Even more preferably, R¹ is phenyl or group (b):



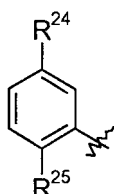
(b)

wherein the phenyl and group (b) are each optionally substituted with 1 to 3 substituents independently selected from halogen, methyl and halomethyl.

In one group of compounds R¹ is selected from group (c) or (d):



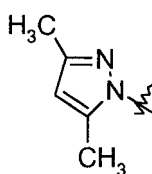
(c)



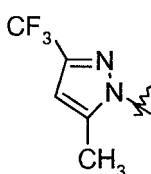
(d)

wherein R²², R²³, R²⁴ and R²⁵ are independently selected from hydrogen, halogen, methyl and halomethyl.

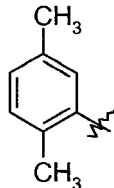
In one group of compounds R¹ is group (e), (f), (g), or (h):



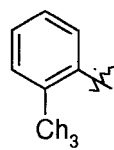
(e)



(f)



(g)



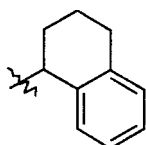
(h)

R², R³, R⁴, R⁵, R⁶, R⁷, R¹⁰, R¹¹, R¹², R¹³, R¹⁶, R¹⁷, R¹⁸ and R¹⁹ each independently are hydrogen, halogen, cyano, C₁-C₄alkyl, or C₁-C₄haloalkyl. More preferably, R², R³, R⁴, R⁵, R⁶, R⁷, R¹⁰, R¹¹, R¹², R¹³, R¹⁶, R¹⁷, R¹⁸, and R¹⁹ each independently are hydrogen, halogen, C₁-C₄alkyl, C₁-C₄haloalkyl. Even more preferably, R², R³, R⁴, R⁵, R⁶, R⁷, R¹⁰, R¹¹, R¹⁶, R¹⁷,

R^{18} , and R^{19} each independently are hydrogen, fluoro, or methyl. Yet more preferably, R^2 , R^3 , R^4 , R^5 , R^6 , R^7 , R^{10} , R^{11} , R^{16} , R^{17} , R^{18} , and R^{19} each are hydrogen.

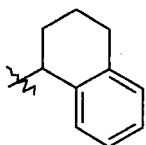
R^8 , R^{14} and R^{15} each independently are hydrogen or C_1 - C_4 alkyl. Preferably, R^8 , R^{14} and R^{15} each independently are hydrogen or methyl. Preferably, R^8 , R^{14} and R^{15} each are

R^9 is phenyl, benzyl or group (a):



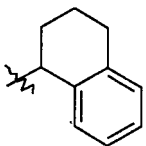
(a)

wherein the phenyl, benzyl and group (a) are each optionally substituted with 1 to 3
10 substituents independently selected from C_1 - C_4 alkyl, C_1 - C_4 haloalkyl, halogen, cyano, hydroxy and amino. Preferably, R^9 is phenyl, benzyl or group (a):



(a)

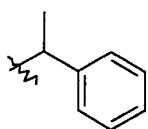
wherein the phenyl, benzyl and group (a) are each optionally substituted with 1 to 3
15 substituents independently selected from C_1 - C_4 alkyl, C_1 - C_4 haloalkyl, hydroxy and halogen. More preferably, R^9 is phenyl, benzyl or group (a):



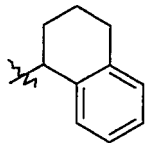
(a)

wherein the phenyl, benzyl and group (a) are each optionally substituted with 1 to 3
20 substituents independently selected from methyl, halomethyl, and halogen.

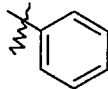
In one group of compounds R^9 is (i), (j), or (k):



(i)



(j)

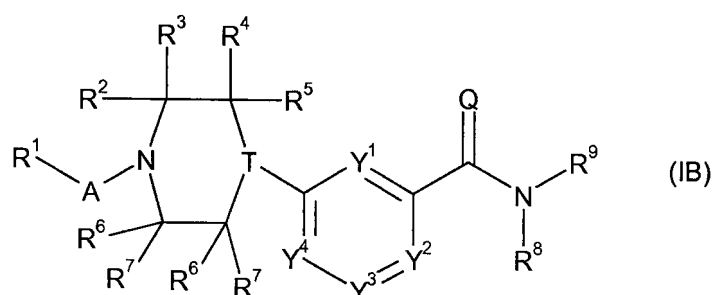


(k)

Preferably, R^{22} is hydrogen or CF_3 . Preferably, R^{23} , R^{24} , and R^{25} are independently
25 hydrogen or methyl.

When n is 2 and p is 1, compounds of formula I have the formula according to formula

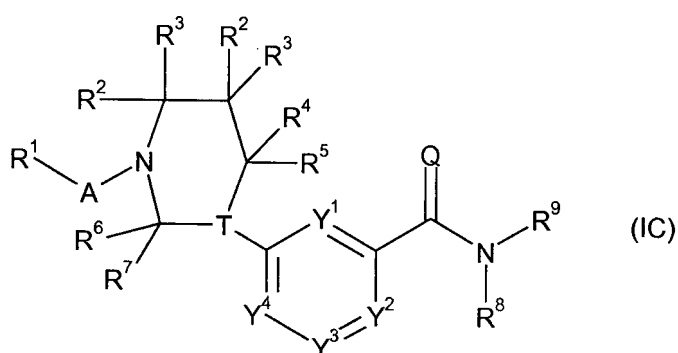
30 IB:



in which A, T, G, Y¹, Y², Y³, Y⁴, Q, R¹, R², R³, R⁴, R⁵, R⁶, R⁷, R⁸, and R⁹ have the definitions as described for formula I.

When n is 1 and p is 2, compounds of formula I have the formula according to formula

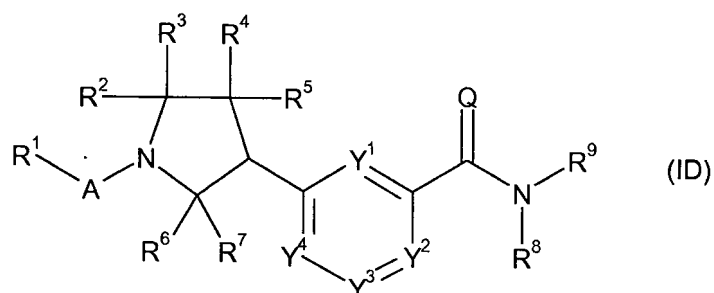
5 IC:



in which A, T, G, Y¹, Y², Y³, Y⁴, Q, R¹, R², R³, R⁴, R⁵, R⁶, R⁷, R⁸, and R⁹ have the definitions as described for formula I.

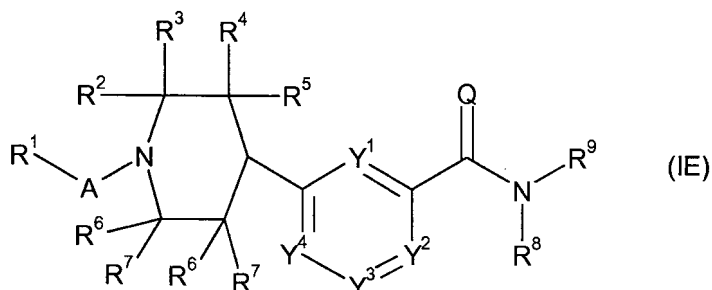
The invention also relates to compounds of formula IA, formula IB, and formula IC as
10 shown above.

The invention also relates to compounds of formula ID:



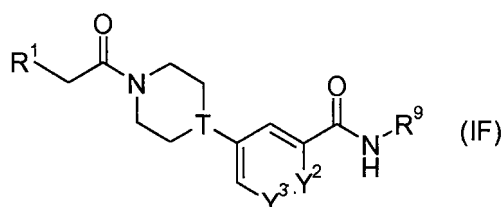
wherein Y¹, Y², Y³, Y⁴, A, Q, R¹, R², R³, R⁴, R⁵, R⁶, R⁷, R⁸, and R⁹ have the definitions as described for formula I as defined above. Preferred definitions of Y¹, Y², Y³, Y⁴, A, Q, R¹, R²,
15 R³, R⁴, R⁵, R⁶, R⁷, R⁸, and R⁹ are as defined above.

The invention also relates to compounds of formula IE:



wherein Y¹, Y², Y³, Y⁴, A, Q, R¹, R², R³, R⁴, R⁵, R⁶, R⁷, R⁸, and R⁹ have the definitions as described for formula I as defined above. Preferred definitions of Y¹, Y², Y³, Y⁴, A, Q, R¹, R², R³, R⁴, R⁵, R⁶, R⁷, R⁸, and R⁹ are as defined above.

The invention also relates to a compound of formula IF:

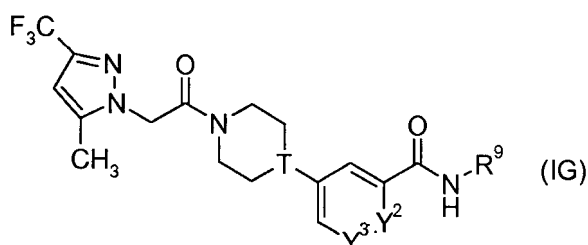


wherein T is N or CH;

Y² and Y³ are both CH, or one of Y³ and Y² is N and the other is CH; and

10 R¹ and R⁹ are as described for a compound of formula I as defined above. Preferred definitions of R¹ and R⁹ are as defined above

The invention also relates to a compound of formula IG:

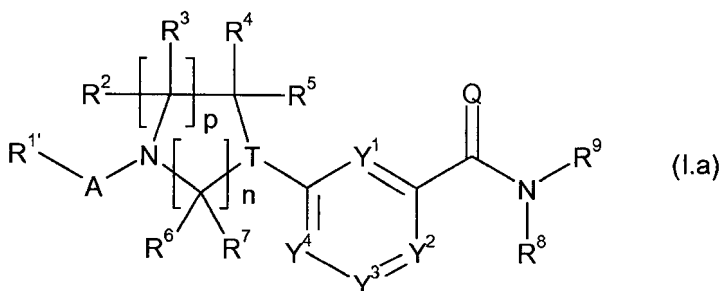


wherein T is N or CH;

15 Y² and Y³ are both CH, or one of Y³ and Y² is N and the other is CH; and

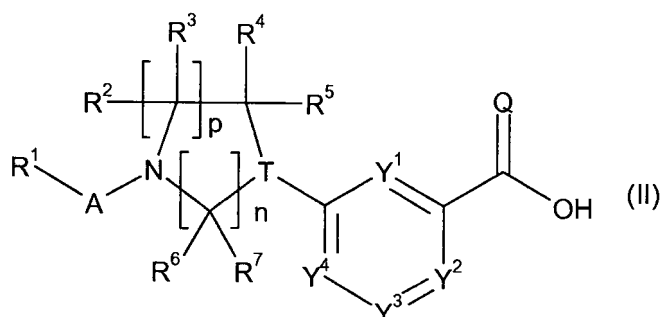
R⁹ is as described for a compound of formula I as defined above. Preferred definitions of R⁹ are as defined above.

The invention also includes compounds of formula I in which R¹ is a protecting group, such as an alkyl group. Accordingly the invention includes compounds of formula I.a:



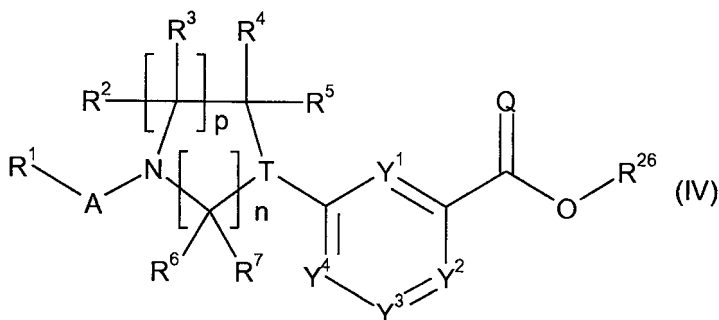
wherein R^1 is C_1 - C_8 alkyl, e.g. C_1 - C_4 alkyl, preferably tert-butyl, and Y^1 , Y^2 , Y^3 , Y^4 , A, Q, T, n, p, R^2 , R^3 , R^4 , R^5 , R^6 , R^7 , R^8 , and R^9 have the definitions as described for formula I as defined above. Preferred definitions of Y^1 , Y^2 , Y^3 , Y^4 , A, Q, T, n, p, R^2 , R^3 , R^4 , R^5 , R^6 , R^7 , R^8 , and R^9 are as defined above.

- 5 The invention also relates to other intermediates useful in the preparation of compounds of formula I. Accordingly, the invention relates to a compound of formula II:



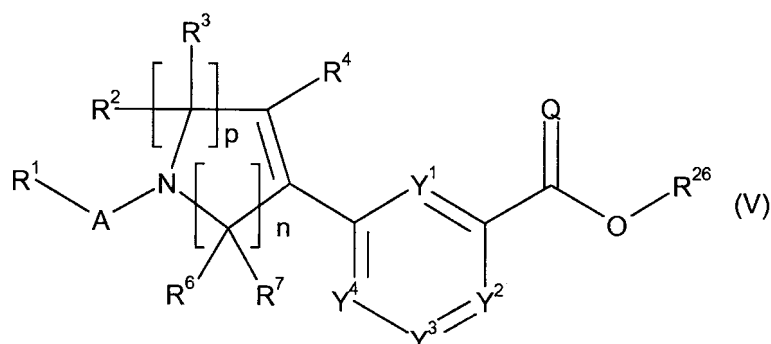
- wherein Y^1 , Y^2 , Y^3 , Y^4 , A, Q, T, n, p, R^1 , R^2 , R^3 , R^4 , R^5 , R^6 and R^7 have the definitions as described for formula I as defined above. Preferred definitions of Y^1 , Y^2 , Y^3 , Y^4 , A, Q, T, n, p, R^1 , R^2 , R^3 , R^4 , R^5 , R^6 and R^7 are as defined above.

The invention relates to a compound of formula IV:



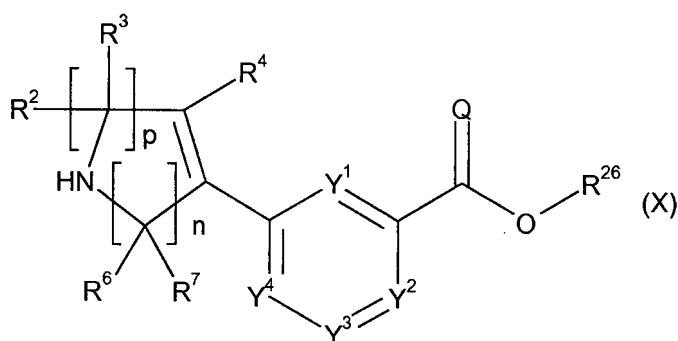
- wherein Y^1 , Y^2 , Y^3 , Y^4 , A, Q, T, n, p, R^1 , R^2 , R^3 , R^4 , R^5 , R^6 and R^7 , have the definitions as described for formula I as defined above, and preferred definitions of Y^1 , Y^2 , Y^3 , Y^4 , A, Q, T, n, p, R^1 , R^2 , R^3 , R^4 , R^5 , R^6 and R^7 are as defined above; and R^{26} is C_1 - C_6 alkyl or optionally substituted aryl. Preferably, R^{26} is C_1 - C_6 alkyl or phenyl optionally substituted with 1 to 3 substituents independently selected from C_1 - C_4 alkyl, C_1 - C_4 haloalkyl, hydroxyl, amino, cyano and halogen.

The invention relates to a compound of formula V:



wherein $Y^1, Y^2, Y^3, Y^4, A, Q, n, p, R^1, R^2, R^3, R^4, R^6$ and R^7 , have the definitions as described for formula I as defined above, and preferred definitions of $Y^1, Y^2, Y^3, Y^4, A, Q, n,$
 5 $p, R^1, R^2, R^3, R^4, R^6$ and R^7 are as defined above; and R^{26} is C_1 - C_6 alkyl or optionally substituted aryl. Preferably, R^{26} is C_1 - C_6 alkyl or phenyl optionally substituted with 1 to 3 substituents independently selected from C_1 - C_4 alkyl, C_1 - C_4 haloalkyl, hydroxyl, amino, cyano and halogen.

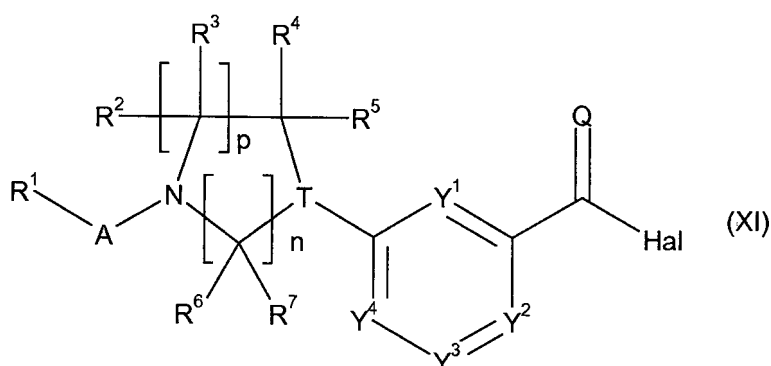
The invention relates to a compound of formula X:



10

wherein $Y^1, Y^2, Y^3, Y^4, Q, n, p, R^2, R^3, R^4, R^6$ and R^7 have the definitions as described for formula I as defined above, and preferred definitions of $Y^1, Y^2, Y^3, Y^4, Q, n, p, R^2, R^3, R^4, R^6$ and R^7 are as defined above; and R^{26} is C_1 - C_6 alkyl or optionally substituted aryl.
 Preferably, R^{26} is C_1 - C_6 alkyl or phenyl optionally substituted with 1 to 3 substituents
 15 independently selected from C_1 - C_4 alkyl, C_1 - C_4 haloalkyl, hydroxyl, amino, cyano and halogen.

The invention relates to a compound of formula XI:



wherein Y¹, Y², Y³, Y⁴, A, Q, n, p, R¹, R², R³, R⁴, R⁵, R⁶ and R⁷, have the definitions as described for formula I as defined above, and preferred definitions of Y¹, Y², Y³, Y⁴, A, Q, n, p, R¹, R², R³, R⁴, R⁵, R⁶ and R⁷ are as defined above; Hal stands for halogen.

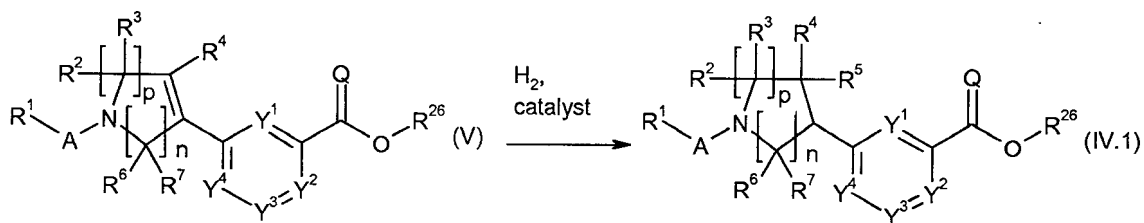
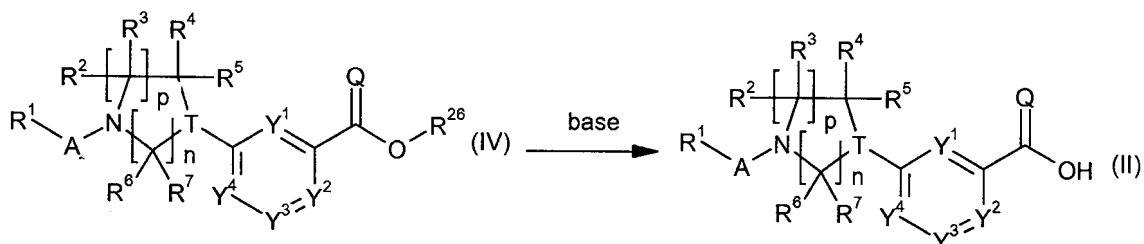
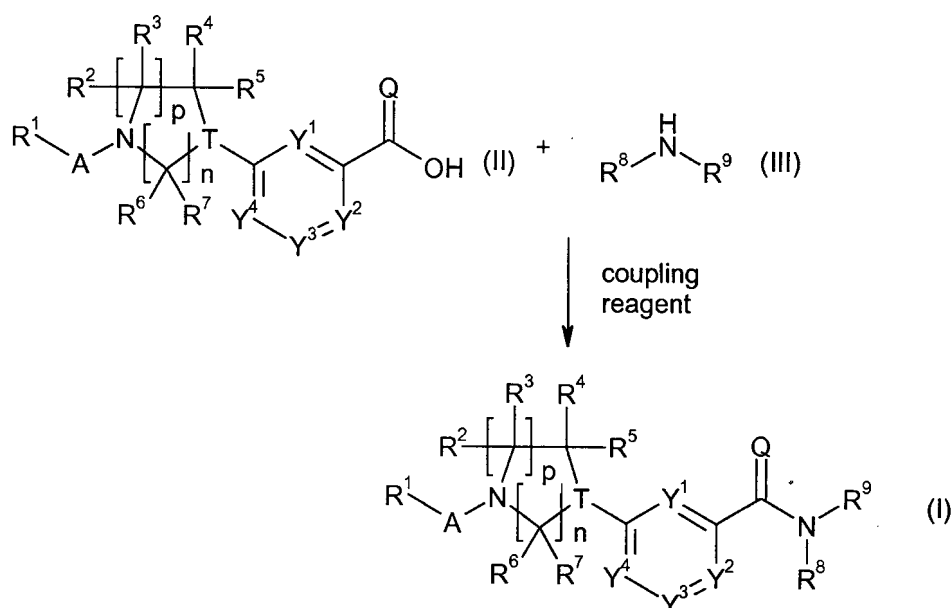
Preferred individual compounds are:

- 3-{1-[2-(5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetyl]-piperidin-4-yl}-N-(R)-1,2,3,4-tetrahydro-naphthalene-1-yl-benzamide (Compound No. I.n.001);
- 3-{1-[2-(5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetyl]-piperidin-4-yl}-N-((R)-1-phenyl-ethyl)-benzamide (Compound No. I.n.003);
- 3-{1-[2-(5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetyl]-piperidin-4-yl}-N-(1,2,3,4-tetrahydro-naphthalene-1-yl)-benzamide (Compound No. I.n.005);
- 3-{1-[2-(5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetyl]-piperidin-4-yl}-N-(1-phenyl-ethyl)-benzamide (Compound No. I.n.007);
- N-benzyl-3-{1-[2-(5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetyl]-piperidin-4-yl}-N-benzamide (Compound No. I.n.009);
- 3-{1-[2-(5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetyl]-piperidin-4-yl}-N-phenyl-benzamide (Compound No. I.n.011);
- 3-{1-[2-(2,5-Dimethyl-phenyl)-acetyl]-piperidin-4-yl}-N-(R)-(1,2,3,4-tetrahydro-naphthalen-1-yl)-benzamide (Compound No. I.n.049);
- 3-{1-[2-(3,5-Dimethyl-pyrazol-1-yl)-acetyl]-piperidin-4-yl}-N-(1,2,3,4-tetrahydro-naphthalen-1-yl)-benzamide (Compound No. I.n.097);
- N-methyl-3-{1-[2-(5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetyl]-piperidin-4-yl}-N-(R)-1,2,3,4-tetrahydro-naphthalene-1-yl-benzamide (Compound No. I.o.001);
- N-methyl-3-{1-[2-(5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetyl]-piperidin-4-yl}-N-((R)-1-phenyl-ethyl)-benzamide (Compound No. I.o.003);
- N-methyl-3-{1-[2-(5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetyl]-piperidin-4-yl}-N-(1,2,3,4-tetrahydro-naphthalene-1-yl)-benzamide (Compound No. I.o.005);
- N-methyl-3-{1-[2-(5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetyl]-piperidin-4-yl}-N-(1-phenyl-ethyl)-benzamide (Compound No. I.o.007);

- 1'-[2-(5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetyl]-1',2',3',4',5',6'-hexahydro-[2,4']bipyridinyl-6-carboxylic acid ((*R*)-1,2,3,4-tetrahydro-naphthalene-1-yl)-amide (Compound No. 1.p.001);
- 1'-[2-(5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetyl]-1',2',3',4',5',6'-hexahydro-[2,4']bipyridinyl-6-carboxylic acid (1,2,3,4-tetrahydro-naphthalene-1-yl)-amide (Compound No. 1.p.005);
- 1'-[2-(5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetyl]-1',2',3',4',5',6'-hexahydro-[2,4']bipyridinyl-6-carboxylic acid (1-phenyl-ethyl)-amide (Compound No. 1.p.007); 1'-[2-(5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetyl]-1',2',3',4',5',6'-hexahydro-
- 10 [3,4']bipyridinyl-5-carboxylic acid -(*R*)-(1,2,3,4-tetrahydro-naphthalen-1-yl)-amide (Compound No. 1.t.001);
- 1'-[2-(5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetyl]-1',2',3',4',5',6'-hexahydro-[4,4']bipyridinyl-2-carboxylic acid -(*R*)-(1,2,3,4-tetrahydro-naphthalen-1-yl)-amide (Compound No. 1.v.001);
- 15 3-{4-[2-(3,5-Dimethyl-pyrazol-1-yl)-acetyl]-piperazin-1-yl}-N-(*R*)-(1,2,3,4-tetrahydro-naphthalen-1-yl)-benzamide (Compound No. 1.z.001); and
- 3-{4-[2-(3,5-Dimethyl-pyrazol-1-yl)-acetyl]-piperazin-1-yl}-N-(1,2,3,4-tetrahydro-naphthalen-1-yl)-benzamide (Compound No. 1.z.005);

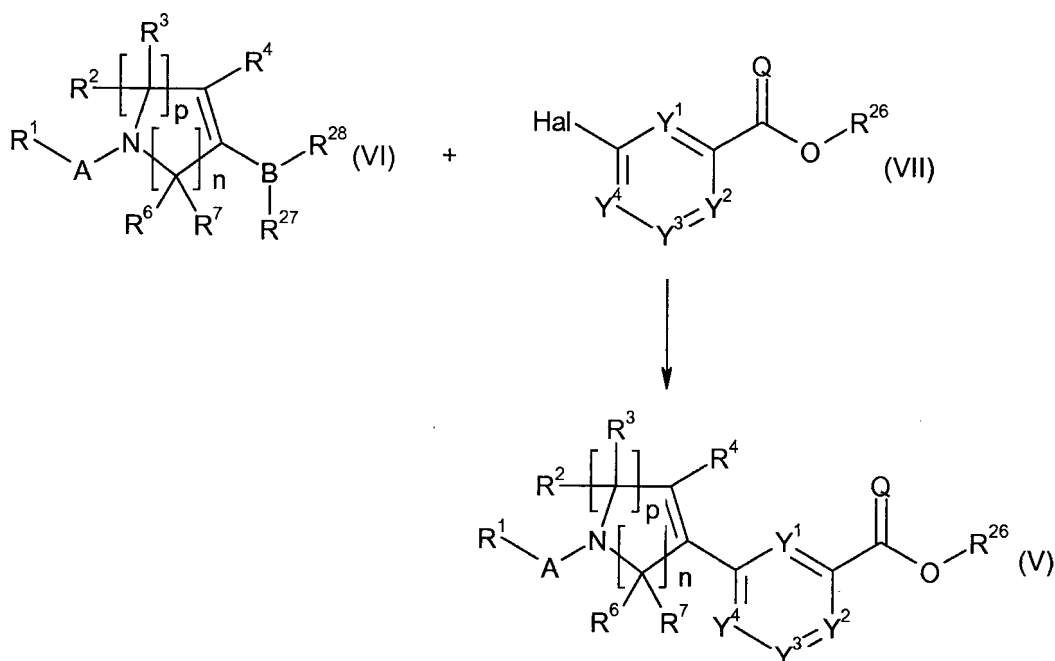
Compounds of formula (I) can be made as shown in the following schemes.

- 20 The compounds of formula I, wherein R^1 , R^2 , R^3 , R^4 , R^5 , R^6 , R^7 , R^8 , R^9 , A, T, Y^1 , Y^2 , Y^3 , and Y^4 , n, p and Q are as defined for formula I, can be obtained by transformation of a compound of formula II, wherein R^1 , R^2 , R^3 , R^4 , R^5 , R^6 , R^7 , A, T, Y^1 , Y^2 , Y^3 , and Y^4 , n, p and Q are as defined for formula I, with a compound of formula III, wherein R^8 and R^9 are as defined for formula I, and a peptide coupling reagent, such as BOP, PyBOP, HATU. This is
- 25 shown in Scheme 1.



The compounds of formula V, wherein R^1 , R^2 , R^3 , R^4 , R^6 , R^7 , A, Y^1 , Y^2 , Y^3 , and Y^4 , n, p and Q are as defined for formula I and R^{26} is C_1 - C_6 alkyl or optionally substituted aryl, can be obtained by transformation of a compound of formula VI, wherein R^2 , R^3 , R^5 , R^6 , R^7 , n, p and A are as defined for formula I and R^{27} and R^{28} are each independently hydroxy or C_1 - C_6 alkyl or together with the interjacent boron atom form a five- or six-membered saturated heterocyclic ring, with a compound of formula VII, wherein Y^1 , Y^2 , Y^3 , and Y^4 and Q are as defined for formula I, R^{26} is C_1 - C_6 alkyl or optionally substituted aryl and Hal is halogen, preferably iodo, bromo or chloro, and a catalyst. This is shown in Scheme 4.

Scheme 4

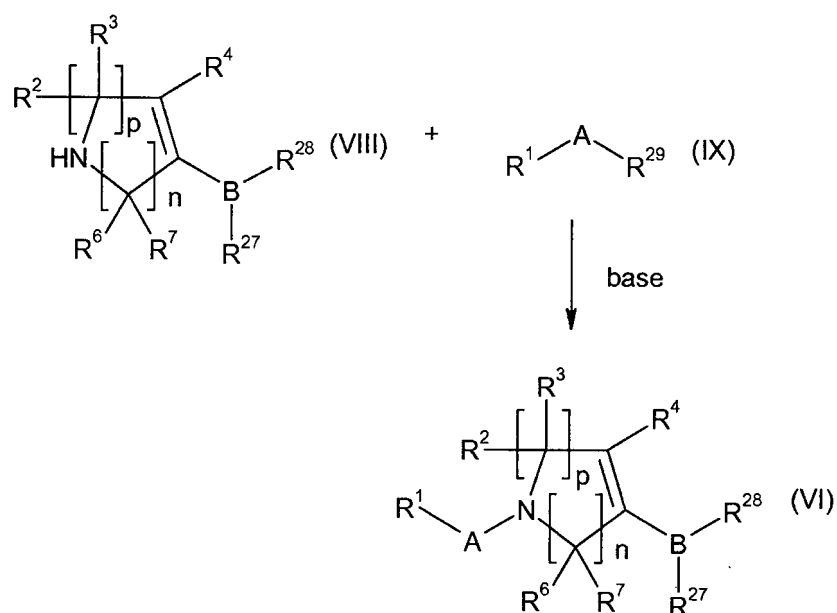


10

The compounds of formula VI, wherein R^1 , R^2 , R^3 , R^4 , R^6 , R^7 , n, p and A are as defined for formula I and R^{27} and R^{28} are each independently hydroxy or C_1 - C_6 alkyl or together with the interjacent boron atom form a five- or six-membered saturated heterocyclic ring, can be obtained by transformation of a compound of formula VIII, wherein R^1 , R^2 , R^3 , R^4 , R^6 , R^7 , n and p are as defined for formula I and R^{27} and R^{28} are each independently hydroxy or C_1 - C_6 alkyl or together with the interjacent boron atom form a five- or six-membered saturated heterocyclic ring, with a compound of formula IX, wherein R^1 and A are as defined for formula I and R^{29} is hydroxy or halogen, preferably, fluoro, chloro or bromo, and a peptide coupling reagent or a base, such as pyridine, triethylamine, ethyl diisopropylamine etc.. This is shown in Scheme 5.

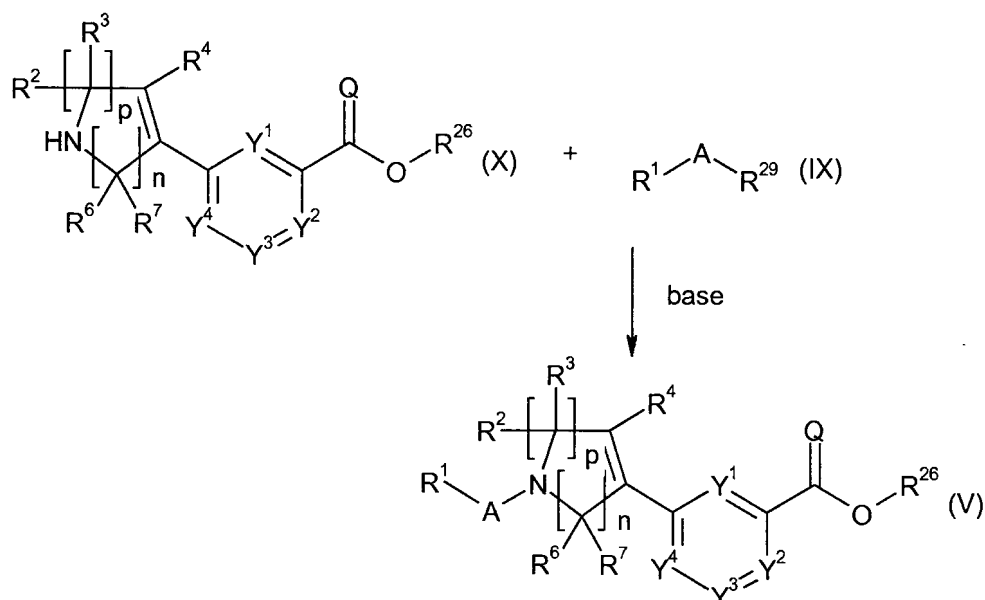
20

Scheme 5



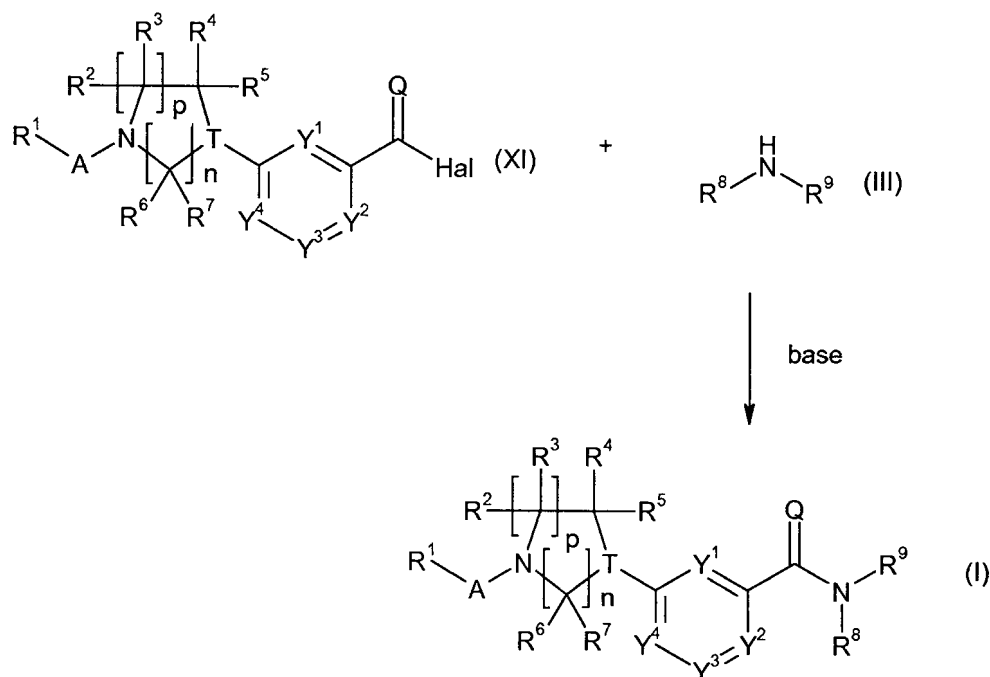
Alternatively, the compounds of formula V, wherein R¹, R², R³, R⁴, R⁶, R⁷, A, Y¹, Y²,
 5 Y³, Y⁴, n, p and Q are as defined for formula I and R²⁶ is C₁-C₆alkyl or optionally substituted
 aryl, can be obtained by transformation of a compound of formula X, wherein R², R³, R⁴, R⁶,
 R⁷, A, Y¹, Y², Y³, Y⁴, n, p and Q are as defined for formula I and R²⁶ is C₁-C₆alkyl or
 optionally substituted aryl, with a compound of formula IX, wherein R¹ and A are as defined
 for formula I and R²⁹ is hydroxy or halogen, preferably, fluoro, chloro or bromo, and a
 10 peptide coupling reagent or a base, such as pyridine, triethylamine, ethyl diisopropylamine
 etc.. This is shown in Scheme 6.

Scheme 6



Alternatively, the compounds of formula I, wherein R^1 , R^2 , R^3 , R^4 , R^5 , R^6 , R^7 , R^8 , R^9 , A, T, Y^1 , Y^2 , Y^3 , Y^4 , n, p and Q are as defined for formula I can be obtained by transformation 5 of a compound of formula XI, wherein R^1 , R^2 , R^3 , R^4 , R^5 , R^6 , R^7 , A, T, Y^1 , Y^2 , Y^3 , Y^4 , n, p and Q are as defined for formula I and Hal is halogen, preferably fluoro, chloro or bromo, with a compound of formula III, wherein R^8 and R^9 are as defined for formula I, with a base, such as pyridine, triethylamine, ethyl diisopropylamine etc.. This is shown in Scheme 7.

Scheme 7

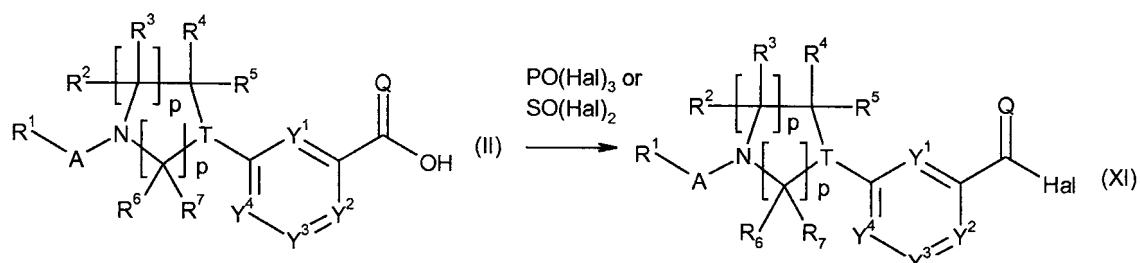


10

The compounds of formula XI, wherein R^1 , R^2 , R^3 , R^4 , R^5 , R^6 , R^7 , A, T, Y^1 , Y^2 , Y^3 , Y^4 , n, p and Q are as defined for formula I and Hal is halogen, preferably fluoro, chloro or bromo, can be obtained by transformation of a compound of formula II, wherein R^1 , R^2 , R^3 , R^4 , R^5 , R^6 , R^7 , A, T, Y^1 , Y^2 , Y^3 , Y^4 , n, p and Q are as defined for formula I, with a phosphoryl

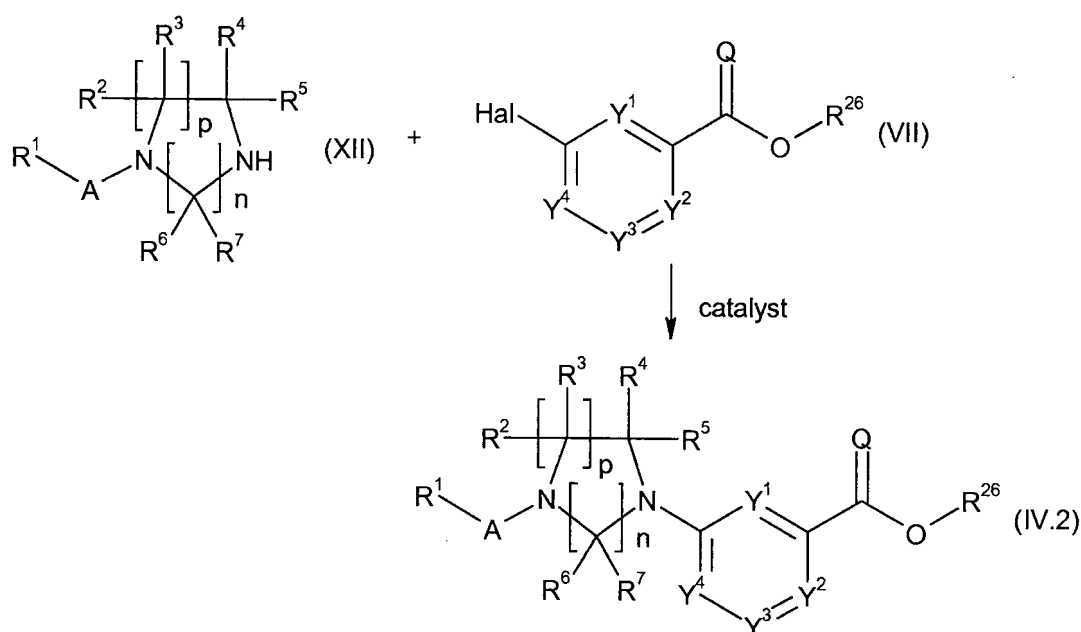
halide, such as phosphoryl chloride or phosphoryl bromide, or a thionyl halide, such as thionyl chloride or thionyl bromide. This is shown in Scheme 8.

Scheme 8



- 5 The compounds of formula IV.2, wherein R^1 , R^2 , R^3 , R^4 , R^5 , R^6 , R^7 , A, Y^1 , Y^2 , Y^3 , Y^4 , n, p and Q are as defined for formula I and R^{26} is C_1 - C_6 alkyl or optionally substituted aryl, can be obtained by transformation of a compound of formula XII, wherein R^1 , R^2 , R^3 , R^4 , R^6 , R^7 , n, p and A are as defined for formula I, with a compound of formula VII, wherein Y^1 , Y^2 , Y^3 , Y^4 and Q are as defined for formula I, R^{26} is C_1 - C_6 alkyl or optionally substituted aryl and Hal is halogen, preferably iodo, bromo or chloro. This is shown in Scheme 9.

Scheme 9



- 15 Surprisingly, it has now been found that the novel compounds of formula I have, for practical purposes, a very advantageous level of biological activity for protecting plants against diseases that are caused by fungi.

The compounds of formula I can be used in the agricultural sector and related fields of use e.g. as active ingredients for controlling plant pests or on non-living materials for control of spoilage microorganisms or organisms potentially harmful to man. The novel compounds are distinguished by excellent activity at low rates of application, by being well

tolerated by plants and by being environmentally safe. They have very useful curative, preventive and systemic properties and may be used for protecting numerous cultivated plants. The compounds of formula I can be used to inhibit or destroy the pests that occur on plants or parts of plants (fruit, blossoms, leaves, stems, tubers, roots) of different crops of
5 useful plants, while at the same time protecting also those parts of the plants that grow later e.g. from phytopathogenic microorganisms.

It is also possible to use compounds of formula I as dressing agents for the treatment of plant propagation material, e.g., seed, such as fruits, tubers or grains, or plant cuttings (for example rice), for the protection against fungal infections as well as against
10 phytopathogenic fungi occurring in the soil. The propagation material can be treated with a composition comprising a compound of formula I before planting: seed, for example, can be dressed before being sown. The active ingredients according to the invention can also be applied to grains (coating), either by impregnating the seeds in a liquid formulation or by coating them with a solid formulation. The composition can also be applied to the planting
15 site when the propagation material is being planted, for example, to the seed furrow during sowing. The invention relates also to such methods of treating plant propagation material and to the plant propagation material so treated.

Furthermore the compounds according to present invention can be used for controlling fungi in related areas, for example in the protection of technical materials,
20 including wood and wood related technical products, in food storage, in hygiene management.

In addition, the invention could be used to protect non-living materials from fungal attack, e.g. lumber, wall boards and paint.

The compounds of formula I are, for example, effective against the phytopathogenic
25 fungi of the following classes: Fungi imperfecti (e.g. *Alternaria* spp.), Basidiomycetes (e.g. *Corticium* spp., *Ceratobasidium* spp., *Waitea* spp., *Thanatephorus* spp., *Rhizoctonia* spp., *Hemileia* spp., *Puccinia* spp., *Phakopsora* spp., *Ustilago* spp., *Tilletia* spp.), Ascomycetes (e.g. *Venturia* spp., *Blumeria* spp., *Erysiphe* spp., *Podosphaera* spp., *Uncinula* spp., *Monilinia* spp., *Sclerotinia* spp., *Colletotrichum* spp., *Glomerella* spp., *Fusarium* spp.,
30 *Gibberella* spp., *Monographella* spp., *Phaeosphaeria* spp., *Mycosphaerella* spp., *Cercospora* spp., *Pyrenophora* spp., *Rhynchosporium* spp., *Magnaporthe* spp., *Gaeumannomyces* spp., *Oculimacula* spp., *Ramularia* spp., *Botryotinia* spp.) and Oomycetes (e.g. *Phytophthora* spp., *Pythium* spp., *Plasmopara* spp., *Peronospora* spp., *Pseudoperonospora* spp. *Bremia* spp.). Outstanding activity is observed against downy
35 mildew (e.g. *Plasmopara viticola*) and late blight (e.g. *Phytophthora infestans*).

Furthermore, the novel compounds of formula I are effective against phytopathogenic gram

negative and gram positive bacteria (e.g. *Xanthomonas* spp, *Pseudomonas* spp, *Erwinia amylovora*, *Ralstonia* spp.) and viruses (e.g. tobacco mosaic virus).

Within the scope of present invention, target crops and/or useful plants to be protected typically comprise the following species of plants: cereal (wheat, barley, rye, oat,
5 rice, maize, sorghum and related species); beet (sugar beet and fodder beet); pomes, drupes and soft fruit (apples, pears, plums, peaches, almonds, cherries, strawberries, raspberries and blackberries); leguminous plants (beans, lentils, peas, soybeans); oil plants (rape, mustard, poppy, olives, sunflowers, coconut, castor oil plants, cocoa beans, groundnuts); cucumber plants (pumpkins, cucumbers, melons); fibre plants (cotton, flax,
10 hemp, jute); citrus fruit (oranges, lemons, grapefruit, mandarins); vegetables (spinach, lettuce, asparagus, cabbages, carrots, onions, tomatoes, potatoes, paprika); lauraceae (avocado, cinnamomum, camphor) or plants such as tobacco, nuts, coffee, eggplants, sugar cane, tea, pepper, vines, hops, bananas and natural rubber plants, as well as turf and ornamentals.

15 The useful plants and / or target crops in accordance with the invention include conventional as well as genetically enhanced or engineered varieties such as, for example, insect resistant (e.g. Bt. and VIP varieties) as well as disease resistant, herbicide tolerant (e.g. glyphosate- and glufosinate-resistant maize varieties commercially available under the trade names RoundupReady® and LibertyLink®) and nematode tolerant varieties. By way
20 of example, suitable genetically enhanced or engineered crop varieties include the Stoneville 5599BR cotton and Stoneville 4892BR cotton varieties.

The term "useful plants" and/or "target crops" is to be understood as including also useful plants that have been rendered tolerant to herbicides like bromoxynil or classes of herbicides (such as, for example, HPPD inhibitors, ALS inhibitors, for example
25 primisulfuron, prosulfuron and trifloxysulfuron, EPSPS (5-enol-pyrovyl-shikimate-3-phosphate-synthase) inhibitors, GS (glutamine synthetase) inhibitors or PPO (protoporphyrinogen-oxidase) inhibitors) as a result of conventional methods of breeding or genetic engineering. An example of a crop that has been rendered tolerant to imidazolinones, e.g. imazamox, by conventional methods of breeding (mutagenesis) is
30 Clearfield® summer rape (Canola). Examples of crops that have been rendered tolerant to herbicides or classes of herbicides by genetic engineering methods include glyphosate- and glufosinate-resistant maize varieties commercially available under the trade names RoundupReady® , Herculex I® and LibertyLink®.

The term "useful plants" and/or "target crops" is to be understood as including also
35 useful plants which have been so transformed by the use of recombinant DNA techniques that they are capable of synthesising one or more selectively acting toxins, such as are known, for example, from toxin-producing bacteria, especially those of the genus *Bacillus*.

The term "useful plants" and/or "target crops" is to be understood as including also useful plants which have been so transformed by the use of recombinant DNA techniques that they are capable of synthesising antipathogenic substances having a selective action, such as, for example, the so-called "pathogenesis-related proteins" (PRPs, see e.g. EP-A-0 5 392 225). Examples of such antipathogenic substances and transgenic plants capable of synthesising such antipathogenic substances are known, for example, from EP-A-0 392 225, WO 95/33818, and EP-A-0 353 191. The methods of producing such transgenic plants are generally known to the person skilled in the art and are described, for example, in the publications mentioned above.

10 The term "locus" of a plant as used herein is intended to embrace the place on which the plants are growing, where the plant propagation materials of the plants are sown or where the plant propagation materials of the plants will be placed into the soil. An example for such a locus is a field, on which crop plants are growing.

The term "plant propagation material" is understood to denote generative parts of the 15 plant, such as seeds, which can be used for the multiplication of the latter, and vegetative material, such as cuttings or tubers, for example potatoes. There may be mentioned for example seeds (in the strict sense), roots, fruits, tubers, bulbs, rhizomes and parts of plants. Germinated plants and young plants which are to be transplanted after germination or after emergence from the soil, may also be mentioned. These young plants may be 20 protected before transplantation by a total or partial treatment by immersion. Preferably "plant propagation material" is understood to denote seeds.

The compounds of formula I may be used in unmodified form or, preferably, together with the adjuvants conventionally employed in the art of formulation. To this end they may be conveniently formulated in known manner to emulsifiable concentrates, coatable pastes, 25 directly sprayable or dilutable solutions or suspensions, dilute emulsions, wettable powders, soluble powders, dusts, granulates, and also encapsulations e.g. in polymeric substances. As with the type of the compositions, the methods of application, such as spraying, atomising, dusting, scattering, coating or pouring, are chosen in accordance with the intended objectives and the prevailing circumstances. The compositions may also contain 30 further adjuvants such as stabilizers, antifoams, viscosity regulators, binders or tackifiers as well as fertilizers, micronutrient donors or other formulations for obtaining special effects.

Suitable carriers and adjuvants, e.g. for agricultural use, can be solid or liquid and are substances useful in formulation technology, e.g. natural or regenerated mineral substances, solvents, dispersants, wetting agents, tackifiers, thickeners, binders or 35 fertilizers. Such carriers are for example described in WO 97/33890.

The compounds of formula I may be used in the form of compositions and can be applied to the crop area or plant to be treated, simultaneously or in succession with further

compounds. These further compounds can be e.g. fertilizers or micronutrient donors or other preparations, which influence the growth of plants. They can also be selective herbicides or non-selective herbicides as well as insecticides, fungicides, bactericides, nematocides, molluscicides or mixtures of several of these preparations, if desired together
5 with further carriers, surfactants or application promoting adjuvants customarily employed in the art of formulation.

The compounds of formula I are normally used in the form of fungicidal compositions for controlling or protecting against phytopathogenic microorganisms, comprising as active ingredient at least one compound of formula I or of at least one preferred individual
10 compound as above-defined, in free form or in agrochemically usable salt form, and at least one of the above-mentioned adjuvants

The invention provides a fungicidal composition comprising at least one compound formula I, an agriculturally acceptable carrier and optionally an adjuvant. An agricultural acceptable carrier is for example a carrier that is suitable for agricultural use. Agricultural
15 carriers are well known in the art. Preferably said fungicidal compositions may comprise an additional fungicidal active ingredient in addition to the compound of formula I.

The compound of formula (I) may be the sole active ingredient of a composition or it may be admixed with one or more additional active ingredients such as an insecticide, fungicide, synergist, herbicide or plant growth regulator where appropriate. An additional
20 active ingredient may, in some cases, result in unexpected synergistic activities. Examples of suitable additional active ingredients include the following: Azoxystrobin (131860-33-8), Dimoxystrobin (149961-52-4), Enestrobin (238410-11-2), Fluoxastrobin (193740-76-0), Kresoxim-methyl (143390-89-0), Metominostrobin (133408-50-1), Orysastrobin (248593-16-0), Picoxystrobin (117428-22-5), Pyraclostrobin (175013-18-0), Azaconazole (60207-31-0),
25 Bromuconazole (116255-48-2), Cyproconazole (94361-06-5), Difenconazole (119446-68-3), Diniconazole (83657-24-3), Diniconazole-M (83657-18-5), Epoxiconazole (13385-98-8), Fenbuconazole (114369-43-6), Fluquinconazole (136426-54-5), Flusilazole (85509-19-9), Flutriafol (76674-21-0), Hexaconazole (79983-71-4), Imazalil (58594-72-2), Imibenconazole (86598-92-7), Ipconazole (125225-28-7), Metconazole (125116-23-6), Myclobutanil (88671-
30 89-0), Oxpoconazole (174212-12-5), Pefurazoate (58011-68-0), Penconazole (66246-88-6), Prochloraz (67747-09-5), Propiconazole (60207-90-1), Prothioconazole (178928-70-6), Simeconazole (149508-90-7), Tebuconazole (107534-96-3), Tetraconazole (112281-77-3), Triadimefon (43121-43-3), Triadimenol (55219-65-3), Triflumizole (99387-89-0), Triticonazole (131983-72-7), Diclobutrazol (76738-62-0), Etaconazole (60207-93-4),
35 Fluconazole (86386-73-4), Fluconazole-cis (112839-32-4), Thiabendazole (148-79-8), Quinconazole (103970-75-8), Fenpiclonil (74738-17-3), Fludioxonil (131341-86-1), Cyprodinil (121552-61-2), Mepanipyrim (110235-47-7), Pyrimethanil (53112-28-0),

Aldimorph (91315-15-0), Dodemorph (1593-77-7), Fenpropimorph (67564-91-4),
 Tridemorph (81412-43-3), Fenpropidin (67306-00-7), Spiroxamine (118134-30-8),
 Isopyrazam (881685-58-1), Sedaxane (874967-67-6), Bixafen (581809-46-3), Penthiopyrad
 (183675-82-3), Fluxapyroxad (907204-31-3), Boscalid (188425-85-6), Penflufen (494793-
 5 67-8), Fluopyram (658066-35-4), Mandipropamid (374726-62-2), Benthiavalicarb (413615-
 35-7), Dimethomorph (110488-70-5), Chlorothalonil (1897-45-6), Fluazinam (79622-59-6),
 Dithianon (3347-22-6), Metrafenone (220899-03-6), Tricyclazole (41814-78-2), Mefenoxam
 (70630-17-0), Metalaxyl (57837-19-1), Acibenzolar (126448-41-7) (Acibenzolar-S-methyl
 (126448-41-7)), Mancozeb (8018-01-7), Ametoctradine (865318-97-4) Cyflufenamid
 10 (180409-60-3), Ipconazole (125225-28-7), Amisulbrom (348635-87-0), Ethaboxam (16650-
 77-3), Fluopicolide (239110-15-7), Fluthianil (304900-25-2), Isotianil (224049-04-1),
 Proquinazid (189278-12-4), Valiphenal (283159-90-0), 1-methyl-cyclopropene (3100-04-7),
 Trifloxystrobin (141517-21-7), Sulfur (7704-34-9), Copper ammoniumcarbonate (CAS
 33113-08-5); Copper oleate (CAS 1120-44-1); Folpet (133-07-3), Quinoxifen (124495-18-
 15 7), Captan (133-06-2), Fenhexamid (126833-17-8), Glufosinate and its salts (51276-47-2,
 35597-44-5 (S-isomer)), Glyphosate (1071-83-6) and its salts (69254-40-6 (Diammonium),
 34494-04-7 (Dimethylammonium), 38641-94-0 (Isopropylammonium), 40465-66-5
 (Monoammonium), 70901-20-1 (Potassium), 70393-85-0 (Sesquisodium), 81591-81-3
 (Trimesium)), 1,3-Dimethyl-1H-pyrazole-4-carboxylic acid (2-dichloromethylene-3-ethyl-1-
 20 methyl-indan-4-yl)-amide, 1,3-Dimethyl-1H-pyrazole-4-carboxylic acid (4'-methylsulfanyl-
 biphenyl-2-yl)-amide, 1,3-Dimethyl-4H-pyrazole-4-carboxylic acid [2-(2,4-dichloro-phenyl)-2-
 methoxy-1-methyl-ethyl]-amide, (5-Chloro-2,4-dimethyl-pyridin-3-yl)-(2,3,4-trimethoxy-6-
 methyl-phenyl)-methanone, (5-Bromo-4-chloro-2-methoxy-pyridin-3-yl)-(2,3,4-trimethoxy-6-
 methyl-phenyl)-methanone, 2-{2-[(E)-3-(2,6-Dichloro-phenyl)-1-methyl-prop-2-en-(E)-
 25 ylideneaminoxymethyl]-phenyl}-2-[(Z)-methoxyimino]-N-methyl-acetamide, 3-[5-(4-Chloro-
 phenyl)-2,3-dimethyl-isoxazolidin-3-yl]-pyridine.

Another aspect of invention is related to the use of a compound of formula I or of a
 preferred individual compound as above-defined, of a composition comprising at least one
 compound of formula I or at least one preferred individual compound as above-defined, or
 30 of a fungicidal mixture comprising at least one compound of formula I or at least one
 preferred individual compound as above-defined, in admixture with other fungicides, as
 described above, for controlling or preventing infestation of plants, e.g. useful plants such
 as crop plants, propagation material thereof, e.g. seeds, harvested crops, e.g. harvested
 food crops, or non-living materials by phytopathogenic microorganisms, preferably fungal
 35 organisms.

A further aspect of invention is related to a method of controlling or preventing an
 infestation of plants, e.g. useful plants such as crop plants, propagation material thereof,

e.g. seeds, harvested crops, e.g. harvested food crops, or of non-living materials by phytopathogenic or spoilage microorganisms or organisms potentially harmful to man, especially fungal organisms, which comprises the application of a compound of formula I or of a preferred individual compound as above-defined as active ingredient to the plants, to parts of the plants or to the locus thereof, to the propagation material thereof, or to any part of the non-living materials.

Controlling or preventing means reducing infestation by phytopathogenic or spoilage microorganisms or organisms potentially harmful to man, especially fungal organisms, to such a level that an improvement is demonstrated.

- 10 A preferred method of controlling or preventing an infestation of crop plants by phytopathogenic microorganisms, especially fungal organisms, which comprises the application of a compound of formula I, or an agrochemical composition which contains at least one of said compounds, is foliar application. The frequency of application and the rate of application will depend on the risk of infestation by the corresponding pathogen.
- 15 However, the compounds of formula I can also penetrate the plant through the roots via the soil (systemic action) by drenching the locus of the plant with a liquid formulation, or by applying the compounds in solid form to the soil, e.g. in granular form (soil application). In crops of water rice such granulates can be applied to the flooded rice field. The compounds of formula I may also be applied to seeds (coating) by impregnating the seeds or tubers
- 20 either with a liquid formulation of the fungicide or coating them with a solid formulation.

A formulation, e.g. a composition containing the compound of formula I, and, if desired, a solid or liquid adjuvant or monomers for encapsulating the compound of formula I, may be prepared in a known manner, typically by intimately mixing and/or grinding the compound with extenders, for example solvents, solid carriers and, optionally, surface active compounds (surfactants).

The agrochemical formulations and/or compositions will usually contain from 0.1 to 99% by weight, preferably from 0.1 to 95% by weight, of the compound of formula I, 99.9 to 1% by weight, preferably 99.8 to 5% by weight, of a solid or liquid adjuvant, and from 0 to 25% by weight, preferably from 0.1 to 25% by weight, of a surfactant.

- 30 Advantageous rates of application are normally from 5g to 2kg of active ingredient (a.i.) per hectare (ha), preferably from 10g to 1kg a.i./ha, most preferably from 20g to 600g a.i./ha. When used as seed drenching agent, convenient dosages are from 10mg to 1g of active substance per kg of seeds.

Whereas it is preferred to formulate commercial products as concentrates, the end user will normally use dilute formulations.

The following non-limiting examples illustrate the above-described invention in more detail.

Example 1: This example illustrates the preparation of 3-{1-[2-(5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetyl]-piperidin-4-yl}-N-(R)-1,2,3,4-tetrahydro-naphthalen-1-yl-benzamide (Compound No. I.n.001)

5

a) Preparation of 4-(3-ethoxycarbonyl-phenyl)-3,6-dihydro-2H-pyridine-1-carboxylic acid tert-butyl ester¹

To a solution of ethyl-3-iodobenzoate (10 g, 36.2 mmol) in dioxane (400 mL) were added successively bistriphenylphosphinopalladiumchloride (1.26 g, 1.8 mmol), 4-(4,4,5,5-tetramethyl-[1,3,2]dioxaborolan-2-yl)-3,6-dihydro-2H-pyridine-1-carboxylic acid tert-butyl ester² (13.44 g, 43.46 mmol), and aq. sol. sodium carbonate (11.5 g in 100 mL of water, 108.6 mmol) at RT. After stirring for 3 h at 110°C, solvent was evaporated and the resulting yellow oil was dissolved in ethylacetate (300 mL), washed with brine (300 mL). The organic layer was dried over sodium sulfate, filtered, and evaporated under reduce pressure. The crude mixture was purified by column chromatography on silica gel (ethylacetate/heptane 0:1 to 3:7) to give 4-(3-ethoxycarbonyl-phenyl)-3,6-dihydro-2H-pyridine-1-carboxylic acid tert-butyl ester (11.28 g, 94 %). ¹H-NMR (400 MHz, CDCl₃): δ = 1.39-1.43 (t, 3H), 1.53 (s, 9H), 2.55-2.59 (m, 2H), 3.64 (t, 2H), 4.17-4.22 (m, 2H), 4.35-4.42 (q, 2H), 6.12 (m, 1H), 7.39-7.43 (t, 1H), 7.55-7.58 (m, 1H), 7.91-7.94 (m, 1H), 8.05 (s, 1H). MS: m/z = 332 (M+1).

20

b) Preparation of 4-(3-ethoxycarbonyl-phenyl)-piperidine-1-carboxylic acid tert-butyl ester¹

A solution of 4-(3-ethoxycarbonyl-phenyl)-3,6-dihydro-2H-pyridine-1-carboxylic acid tert-butyl ester (11.28 g, 34.035 mmol) in ethanol (680 mL) was pumped through Pd/C cartridge using H-Cube apparatus (20 °C, 10 bar, 2 mL/min.). The solvent was then evaporated under reduced pressure to give 4-(3-ethoxycarbonyl-phenyl)-piperidine-1-carboxylic acid tert-butyl ester (10.55 g, 93 %), which can be used in the next step without further purification. ¹H-NMR (400 MHz, CDCl₃): δ = 1.39-1.43 (t, 3H), 1.51 (s, 9H), 1.61-1.72 (dq, 1H), 1.78-1.90 (m, 1H), 2.66-2.74 (dt, 1H), 2.74-2.89 (m, 1H), 4.20-4.31 (m, 1H), 4.32-4.42 (q, 2H), 7.39-7.41 (m, 2H), 7.88-7.92 (m, 2H). MS: m/z = 334 (M+1).

30

c) Preparation of 3-piperidin-4-yl-benzoic acid ethyl ester hydrochloride salt¹

¹ 3-Piperidin-4-yl-benzoic acid ethyl ester can also be prepared according to the following reference WO 2004092124 A2 20041028 (Merck & Co., Inc., USA).

² Tetramethyl-[1,3,2]dioxaborolan-2-yl)-3,6-dihydro-2H-pyridine-1-carboxylic acid tert-butyl ester can be prepared according to the following reference : Eastwood, P. R. *Tetrahedron Letters* **2000**, *41*, 3705 or purchased from suitable supplier (CAS 286961-14-6).

To a solution of 4-(3-ethoxycarbonyl-phenyl)-piperidine-1-carboxylic acid tert-butyl ester (10.55 g, 31.64 mmol) was added a solution of 4M HCl in dioxane (79 mL, 316.41 mmol) at RT. After stirring overnight at RT, the solvent was evaporated under reduce pressure. The resulting yellowish viscous oil was triturated with diethylether, and filtered to give 3-piperidin-4-yl-benzoic acid ethyl ester hydrochloride salt (8.53 g, quant.). ¹H-NMR (400 MHz, *d*₆-DMSO): δ = 1.81-1.86 (t, 3H), 1.91-1.98 (m, 3H), 2.50-2.52 (m, 1H (overlap with DMSO), 2.95-3.05 (m, 2H), 3.32-3.39 (m, 2H), 4.31-4.39 (q, 2H), 7.49-7.52 (m, 2H), 7.81-7.83 (m, 2H), 9.5 (br, 2H). MS: *m/z* = 234 ((M-HCl)+1).

10 d) Preparation of 3-{1-[2-(5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetyl]-piperidin-4-yl}-benzoic acid ethyl ester

To a solution of (5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetic acid (5.23 g, 20.75 mmol) in DMF (50 mL) was added diisopropylethylamine (43 mL, 207.58 mmol), followed by 2-(1H-7-azabenzotriazol-1-yl)-1,1,3,3-tetramethyl uronium hexafluorophosphate
15 methanaminium (10.52 g, 22.83 mmol) at RT. After stirring 15 min. at RT, 3-piperidin-4-yl-benzoic acid ethyl ester hydrochloride salt (5.6 g, 20.75 mmol) was added to the reaction mixture. After stirring overnight at RT, solvent was evaporated and the resulting brown oil was dissolved in ethylacetate (200 mL), washed with aq. sat. sodium bicarbonate solution (100 mL) and the aqueous phase was re-extracted with ethylacetate (200 mL). The
20 combined organic layers were washed with 1M HCl solution (400 mL) and brine (400 mL), dried over sodium sulfate, filtered, and evaporated under reduce pressure. The crude mixture was purified by column chromatography on silica gel (ethylacetate/cyclohexane 0:1 to 1:1) to give 3-{1-[2-(5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetyl]-piperidin-4-yl}-benzoic acid ethyl ester (4.35 g, 49.5 %). ¹H-NMR (400 MHz, *d*₆-DMSO): δ = 1.28-1.39 (t, 3H), 1.45-
25 1.55 (m, 1H), 1.65-1.1.79 (m, 1H), 1.80-1.91 (m, 2H), 2.22 (s, 3H), 2.68-2.73 (m, 1H), 2.89-2.95 (m, 1H), 3.99-4.04 (m, 1H), 4.29-4.33 (q, 2H), 4.46-4.52 (m, 1H), 5.21-5.38 (dd, 2H, diastereotopic), 6.50 (s, 1H), 7.47 (t, 1H), 7.55 (d, 1H), 7.80 (s, 1H), 7.81 (d, 1H). MS: *m/z* = 424 (M+1).

30 e) Preparation of 3-{1-[2-(5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetyl]-piperidin-4-yl}-benzoic acid

To a solution of 3-{1-[2-(5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetyl]-piperidin-4-yl}-benzoic acid ethyl ester (4.35 g, 10.27 mmol) in methanol (50 mL) was added aq. solution of sodium hydroxide (2 M, 7.7 mL, 15.41 mmol) at RT. After stirring 4h at RT, the solvent
35 was removed, and the residue was dissolved in THF (30 mL), and aq. solution of lithium hydroxide (121 mg in 5 mL of water) was added at RT. After stirring overnight at RT, the solvent was removed and the residue was dissolved in ethylacetate (50 mL) and the

reaction mixture was acidified with 2M aq. solution of HCl until pH 1-2. After separation of phases, the aq. layer was re-extracted with ethylacetate (20 mL), and the combined organic layers were washed with brine (50 mL), dried over sodium sulfate, filtered, and evaporated under reduce pressure to give 3-{1-[2-(5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetyl]-piperidin-4-yl}-benzoic acid (2.40 g, 59 %), which can be used in the next step without further purification. ¹H-NMR (400 MHz, *d*₆-DMSO): δ = 1.45-1.55 (m, 1H), 1.65-1.1.79 (m, 1H), 1.80-1.91 (m, 2H), 2.22 (s, 3H), 2.67-2.78 (m, 1H), 2.89-2.95 (m, 1H), 3.17-3.24 (m, 1H), 3.95-4.04 (m, 1H), 4.46-4.52 (m, 1H), 5.21-5.38 (dd, 2H, diastereotopic), 6.50 (s, 1H), 7.47 (t, 1H), 7.55 (d, 1H), 7.80 (s, 1H), 7.81 (d, 1H). MS: *m/z* = 396 (*M*+1).

f) Preparation of 3-{1-[2-(5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetyl]-piperidin-4-yl}-N-(*R*)-1,2,3,4-tetrahydro-naphthalen-1-yl-benzamide (Compound No. I.n.001)

To a solution of 3-{1-[2-(5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetyl]-piperidin-4-yl}-benzoic acid (100 mg, 0.25 mmol) in DMF (2 mL) was added diisopropylethylamine (0.16 mL, 0.76 mmol), followed by 2-(1H-7-azabenzotriazol-1-yl)-1,1,3,3-tetramethyl uronium hexafluorophosphate methanaminium (0.128 g, 0.27 mmol) at RT. After stirring 15 min. at RT, (*R*)-(1,2,3,4-tetrahydro-naphthalen-1-yl)amine (0.045 g, 0.25 mmol) was added to the reaction mixture. After stirring 2 h at RT, solvent was evaporated and the resulting brown oil was dissolved in ethylacetate (10 mL), washed with aq. sat. sodium bicarbonate solution (20 mL) and the aqueous phase was re-extracted with ethylacetate (20 mL). The combined organic layers were washed with 1M HCl solution (20 mL) and brine (20 mL), dried over sodium sulfate, filtered, and evaporated under reduce pressure. The crude mixture was purified by column chromatography on silica gel (ethylacetate/cyclohexane 1:1 to 8:2) to give 3-{1-[2-(5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetyl]-piperidin-4-yl}-N-(*R*)-1,2,3,4-tetrahydro-naphthalen-1-yl-benzamide (125 mg, 94 %). ¹H-NMR (400 MHz, *d*₆-DMSO): δ = 1.52-1.61 (m, 1H), 1.68-1.89 (m, 5H), 1.91-2.02 (m, 1H), 2.22 (s, 3H), 2.64-2.92 (m, 4H), 3.15-3.24 (m, 1H), 3.99-4.04 (m, 1H), 4.46-4.52 (m, 1H), 5.19-5.38 (m, 3H), 6.50 (s, 1H), 7.12-7.19 (m, 4H), 7.38 (d, 1H), 7.75 (d, 1H), 7.82 (s, 1H), 8.71 (d, 1H). MS: *m/z* = 525 (*M*+1).

Example 2: This example illustrates the preparation of N-methyl-3-{1-[2-(5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetyl]-piperidin-4-yl}-N-(*R*)-1,2,3,4-tetrahydro-naphthalen-1-yl-benzamide (Compound No. I.o.001)

a) Preparation of N-methyl-3-{1-[2-(5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetyl]piperidin-4-yl}-N-(*R*)-1,2,3,4-tetrahydro-naphthalen-1-yl-benzamide (Compound No. I.o.001)

To a solution of 3-{1-[2-(5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetyl]-piperidin-4-yl}-benzoic acid (320 mg, 0.80 mmol) in DMF (8 mL) was added diisopropylethylamine (1.01 mL, 4.85 mmol), followed by 2-(1H-7-azabenzotriazol-1-yl)-1,1,3,3-tetramethyl uronium hexafluorophosphate methanaminium (0.41 g, 0.89 mmol) at RT. After stirring 15 min. at RT, methyl-(*R*)-1,2,3,4-tetrahydro-naphthalen-1-yl-amine (0.158 g, 0.80 mmol) was added to the reaction mixture. After stirring for 2 h at RT, solvent was evaporated and the resulting brown oil was dissolved in ethylacetate (20 mL), washed with aq. sat. sodium bicarbonate solution (30 mL) and the aqueous phase was re-extracted with ethylacetate (20 mL). The combined organic layers were washed with 1M HCl solution (50 mL) and brine (50 mL), dried over sodium sulfate, filtered, and evaporated under reduce pressure. The crude mixture was purified by column chromatography on silica gel (ethylacetate/cyclohexane 1:1 to 8:2) to give N-methyl-3-{1-[2-(5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetyl]-piperidin-4-yl}-N-(*R*)-1,2,3,4-tetrahydro-naphthalen-1-yl-benzamide (200 mg, 46 %). ¹H-NMR (400 MHz, *d*₆-DMSO): δ = 1.45-1.59 (m, 1H), 1.63-1.91 (m, 5H), 1.91-2.02 (m, 1H), 2.22 (s, 3H), 2.61 (s, 3H), 2.64-2.92 (m, 4H), 3.15-3.24 (m, 1H), 3.99-4.04 (m, 1H), 4.46-4.52 (m, 1H), 5.19-5.38 (m, 2H), 5.74-5.81 (m, 1H), 6.50 (s, 1H), 7.12-7.23 (m, 4H), 7.28-7.47 (m, 4H). MS: *m/z* = 539 (*M*+1).

Example 3: This example illustrates the preparation of N-methyl-3-{1-[2-(5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetyl]-piperidin-4-yl}-N-((*R*)-1-phenyl-ethyl)-benzamide (Compound No. I.o.003)

a) Preparation of N-methyl-3-{1-[2-(5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetyl]-piperidin-4-yl}-N-((*R*)-1-phenyl-ethyl)-benzamide (Compound No. I.o.003)

To a solution of 3-{1-[2-(5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetyl]-piperidin-4-yl}-benzoic acid (320 mg, 0.80 mmol) in DMF (8 mL) was added diisopropylethylamine (1.01 mL, 4.85 mmol), followed by 2-(1H-7-azabenzotriazol-1-yl)-1,1,3,3-tetramethyl uronium hexafluorophosphate methanaminium (0.41 g, 0.89 mmol) at RT. After stirring for 15 min. at RT, Methyl-((*R*)-1-phenyl-ethyl)-amine (0.132 g, 0.80 mmol) was added to the reaction mixture. After stirring for 2h at RT, solvent was evaporated and the resulting brown oil was dissolved in ethylacetate (20 mL), washed with aq. sat. sodium bicarbonate solution (30 mL) and the aqueous phase was re-extracted with ethylacetate (20 mL). The combined organic layers were washed with 1M HCl solution (50 mL) and brine (50 mL), dried over sodium sulfate, filtered, and evaporated under reduce pressure. The crude mixture was purified by column chromatography on silica gel (ethylacetate/cyclohexane 1:1 to 8:2) to give N-methyl-3-{1-[2-(5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetyl]-piperidin-4-yl}-N-((*R*)-1-phenyl-ethyl)-benzamide (170 mg, 41 %). ¹H-NMR (400 MHz, *d*₆-DMSO): δ = 1.55 (d,

3H), 1.62-1.71 (m, 1H), 1.82-1.89 (m, 2H), 1.99 (s, 3H), 2.22 (s, 3H), 2.54-2.73 (m, 3H), 2.81-2.90 (m, 1H), 3.12-3.21 (m, 1H), 3.99-4.04 (m, 1H), 4.46-4.52 (m, 1H), 5.19-5.38 (m, 2H), 6.50 (s, 1H), 7.12-7.41 (m, 9H). MS: $m/z = 513$ (M+1)

- 5 Example 4: This example illustrates the preparation of 1'-[2-(5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetyl]-1',2',3',4',5',6'-hexahydro-[2,4']bipyridinyl-6-carboxylic acid methyl-(1,2,3,4-tetrahydro-naphthalen-1-yl)-amide (Compound No. I.q.005)

- 10 a) Preparation of 3',6'-dihydro-2'H-[2,4']bipyridinyl-6,1'-dicarboxylic acid 1'-tert-butyl ester 6-ethyl ester

To a solution of 6-bromo-pyridine-2-carboxylic acid ethyl ester (1 g, 4.35 mmol) in dioxane (40 mL) were added successively bistrisphenylphosphinopalladium chloride (0.152 g, 0.217 mmol), 4-(4,4,5,5-tetramethyl-[1,3,2]dioxaborolan-2-yl)-3,6-dihydro-2H-pyridine-1-carboxylic acid tert-butyl ester² (1.61 g, 5.21 mmol), and aq. sol. sodium carbonate (1.38 g, 15 in 10 mL of water, 13.04 mmol) at RT. After stirring 3 h at 110°C, solvent was evaporated and the resulting yellow oil was dissolved in ethylacetate (30 mL), washed with brine (30 mL). The organic layer was dried over sodium sulfate, filtered, and evaporated under reduce pressure. The crude mixture was purified by column chromatography on silica gel (ethylacetate/heptane 0:1 to 3:7) to give 3',6'-dihydro-2'H-[2,4']bipyridinyl-6,1'-dicarboxylic acid 1'-tert-butyl ester 6-ethyl ester (1.13 g, 78 %). ¹H-NMR (400 MHz, *d*₆-DMSO): $\delta = 1.31$ -1.38 (t, 3H), 1.47 (s, 9H), 2.55-2.59 (m, 2H), 3.51-3.59 (m, 2H), 4.08-4.12 (m, 2H), 4.31-4.37 (q, 2H), 6.74 (m, 1H), 7.75-7.79 (d, 1H), 7.88-7.91 (m, 1H), 7.92-7.99 (t, 1H). MS: $m/z = 333$ (M+1).

- 25 b) Preparation of 3',4',5',6'-tetrahydro-2'H-[2,4']bipyridinyl-6,1'-dicarboxylic acid 1'-tert-butyl ester 6-ethyl ester

A solution of 3',6'-dihydro-2'H-[2,4']bipyridinyl-6,1'-dicarboxylic acid 1'-tert-butyl ester 6-ethyl ester (1.12 g, 3.37 mmol) in ethanol (67 mL) was pumped through Pd/C cartridge using H-Cube apparatus (20 °C, 10 bar, 2 mL/min.). The solvent was then evaporated under reduce pressure to give 3',4',5',6'-tetrahydro-2'H-[2,4']bipyridinyl-6,1'-dicarboxylic acid 1'-tert-butyl ester 6-ethyl ester (1.001 g, 89 %), which can be used in the next step without further purification. ¹H-NMR (400 MHz, *d*₆-DMSO): $\delta = 1.31$ -1.38 (t, 3H), 1.47 (s, 9H), 1.55-1.65 (m, 2H), 1.79-1.88 (m, 2H), 2.91-2.99 (m, 2H), 3.42-3.48 (m, 1H), 4.05-4.12 (m, 2H), 4.31-4.37 (q, 2H), 7.55 (d, 1H), 7.84-7.92 (m, 2H). MS: $m/z = 333$ (M+1). MS: $m/z = 335$ (M+1).

c) Preparation of 3',4',5',6'-tetrahydro-2'H-[2,4']bipyridinyl-6,1'-dicarboxylic acid 1'-tert-butyl ester

To a solution of 3',4',5',6'-tetrahydro-2'H-[2,4']bipyridinyl-6,1'-dicarboxylic acid 1'-tert-butyl ester 6-ethyl ester (100 mg, 0.3 mmol) in methanol (5 mL) was added aq. solution of sodium hydroxide (2 M, 0.23 mL, 0.5 mmol) at RT. After stirring for 4 h at RT, the solvent was removed, and the residue was dissolved in THF (5 mL), and aq. solution of lithium hydroxide (7 mg in 1 mL of water) was added at RT. After stirring overnight at RT, the solvent was removed and the residue was dissolved in ethylacetate (10 mL) and the reaction mixture was acidified with 2M aq. solution of HCl until pH 2-3. After separation of phases, the aq. layer was re-extracted with ethylacetate (10 mL), and the combined organic layers were washed with brine (10 mL), dried over sodium sulfate, filtered, and evaporated under reduce pressure to give 3',4',5',6'-tetrahydro-2'H-[2,4']bipyridinyl-6,1'-dicarboxylic acid 1'-tert-butyl ester (45 mg, 49 %), which can be used in the next step without further purification. ¹H-NMR (400 MHz, *d*₆-DMSO): δ = 1.43 (s, 9H), 1.58-1.68 (m, 2H), 1.81-1.84 (m, 2H), 2.84-2.96 (m, 2H), 3.27-3.39 (m, 1H), 4.07-4.10 (m, 2H), 7.52-7.54 (d, 1H), 7.86-7.92 (m, 2H). MS: *m/z* = 329 (M+23).

d) Preparation of 6-[methyl-(1,2,3,4-tetrahydro-naphthalen-1-yl)-carbamoyl]-3',4',5',6'-tetrahydro-2'H-[2,4']bipyridinyl-1'-carboxylic acid tert-butyl ester

To a solution of 3',4',5',6'-tetrahydro-2'H-[2,4']bipyridinyl-6,1'-dicarboxylic acid 1'-tert-butyl ester (150 mg, 0.49 mmol), methyl-(*R*)-1,2,3,4-tetrahydro-naphthalen-1-yl-amine (0.079 g, 0.49 mmol), and diisopropylethylamine (0.50 mL, 0.49 mmol) in DMF (10 mL) was added dropwise BOP (238 mg, 0.49 mmol) at RT. After stirring overnight at RT, the reaction mixture was poured on water (10 mL) and extracted with ethylacetate (20 mL). The aqueous phase was re-extracted with ethylacetate (20 mL). The combined organic layers were washed with aq. sat. sodium bicarbonate solution (30 mL), 1M HCl solution (30 mL) and brine (30 mL), dried over sodium sulfate, filtered, and evaporated under reduce pressure. The crude mixture was purified by column chromatography on silica gel (ethylacetate/hexane 4:1) to give 6-[methyl-(1,2,3,4-tetrahydro-naphthalen-1-yl)-carbamoyl]-3',4',5',6'-tetrahydro-2'H-[2,4']bipyridinyl-1'-carboxylic acid tert-butyl ester (215 mg, 97 %). ¹H-NMR (400 MHz, CDCl₃): δ = 1.47 (s, 9H), 1.64-2.05 (m, 8H), 2.18-2.22 (m, 1H), 2.72-2.81 (m, 4H), 2.82 (s, 3H), 4.15-4.25 (m, 2H), 5.15-5.20 (m, 1H), 7.18-7.25 (m, 5H), 7.53-7.71 (m, 1H), 7.73-7.74 (m, 1H).

e) Preparation of 1',2',3',4',5',6'-hexahydro-[2,4']bipyridinyl-6-carboxylic acid methyl-(1,2,3,4-tetrahydro-naphthalen-1-yl)-amide hydrochloride salt

To a solution of 6-[methyl-(1,2,3,4-tetrahydro-naphthalen-1-yl)-carbamoyl]-3',4',5',6'-tetrahydro-2'H-[2,4']bipyridinyl-1'-carboxylic acid tert-butyl ester (202 mg, 0.45 mmol) was added a solution of 4M HCl in dioxane (1.13 mL, 4.5 mmol) at RT. After stirring overnight at RT, the solvent was evaporated under reduce pressure to give 1',2',3',4',5',6'-hexahydro-5 [2,4']bipyridinyl-6-carboxylic acid methyl-(1,2,3,4-tetrahydro-naphthalen-1-yl)-amide hydrochloride salt (162 mg, 93%). ¹H-NMR (400 MHz, *d*₆-DMSO): δ = 1.83-2.02 (m, 6H), 2.51 (s, 3H), 2.52-2.59 (m, 2H), 2.71-3.03 (m, 2H), 3.29-3.38 (m, 2H), 3.97-4.05 (m, 2H), 4.78-4.83 (m, 1H), 7.08-7.23 (m, 4H), 7.36-7.41 (m, 1H), 7.52-7.55 (m, 1H), 7.90-7.95 (m, 1H), 8.81 (br, 1H), 9.04 (br, 1H).

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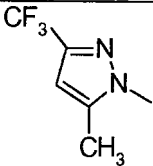
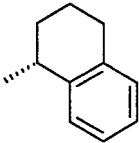
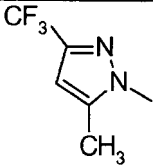
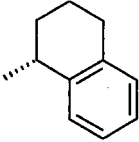
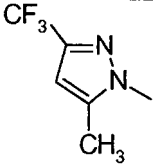
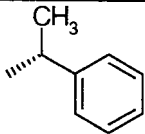
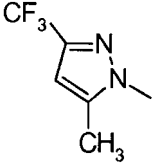
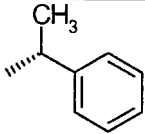
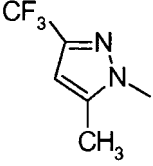
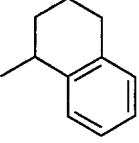
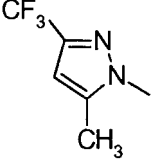
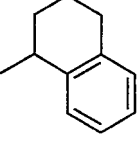
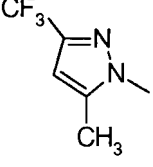
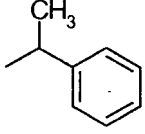
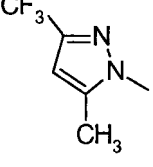
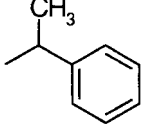
f) Preparation of 1'-[2-(5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetyl]-1',2',3',4',5',6'-hexahydro-[2,4']bipyridinyl-6-carboxylic acid methyl-(1,2,3,4-tetrahydro-naphthalen-1-yl)-amide (Compound No. I.q.005)

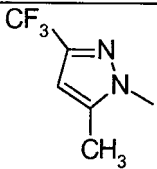
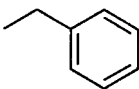
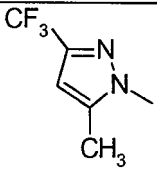
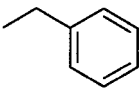
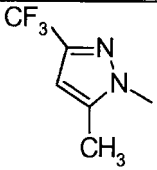
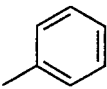
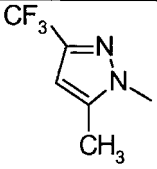
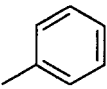
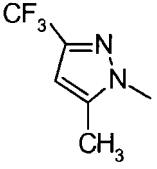
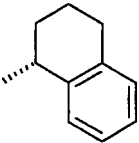
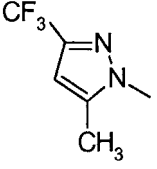
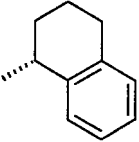
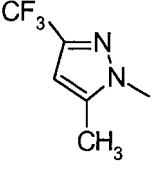
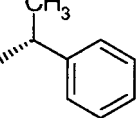
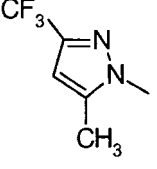
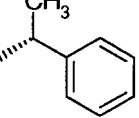
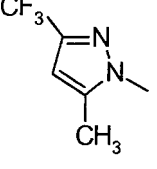
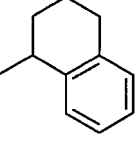
To a solution of (5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetic acid (81 mg, 0.39 mmol), 1',2',3',4',5',6'-hexahydro-[2,4']bipyridinyl-6-carboxylic acid methyl-(1,2,3,4-tetrahydro-naphthalen-1-yl)-amide hydrochloride salt (150 mg, 0.39 mmol), and diisopropylethylamine (0.41 mL, 0.39 mmol) in DMF (10 mL) was added dropwise BOP (191 mg, 0.39 mmol) at RT. After stirring overnight at RT, the reaction mixture was poured on water (10 mL) and extracted with ethylacetate (20 mL). The aqueous phase was re-15 extracted with ethylacetate (20 mL). The combined organic layers were washed with aq. sat. sodium bicarbonate solution (30 mL), 1M HCl solution (30 mL) and brine (30 mL), dried over sodium sulfate, filtered, and evaporated under reduce pressure. The crude mixture was purified by column chromatography on silica gel (ethylacetate) to give 1'-[2-(5-methyl-3-trifluoromethyl-pyrazol-1-yl)-acetyl]-1',2',3',4',5',6'-hexahydro-[2,4']bipyridinyl-6-carboxylic acid methyl-(1,2,3,4-tetrahydro-naphthalen-1-yl)-amide (150 mg, 71 %). M.p 62-65°C. ¹H-NMR (400 MHz, CDCl₃): δ = 1.67-2.02 (m, 6H), 2.18-2.22 (m, 1H), 2.30 (s, 3H), 2.71 (s, 3H), 2.72-2.75 (m, 2H), 3.17-3.27 (m, 2H), 3.97-4.05 (m, 2H), 4.58-4.78 (m, 2H), 4.96 (s, 2H), 5.05-5.15 (m, 1H), 6.33 (s, 1H), 7.10-7.24 (m, 4H), 7.28-7.32 (m, 1H), 7.57-7.58 (m, 1H), 7.76-7.78 (m, 1H).

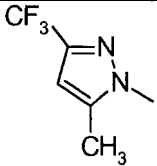
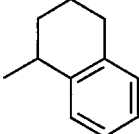
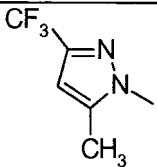
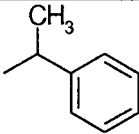
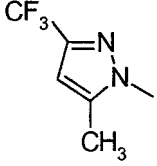
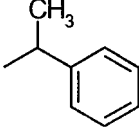
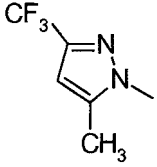
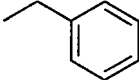
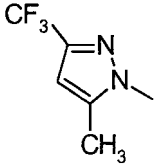
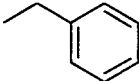
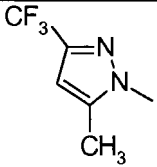
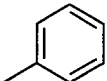
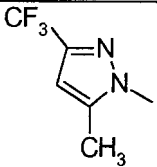
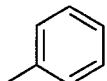
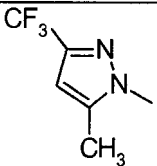
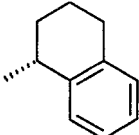
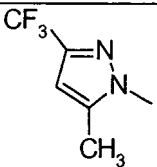
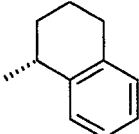
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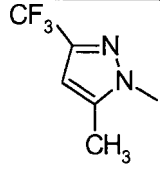
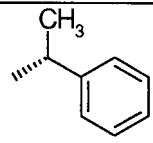
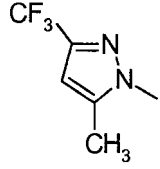
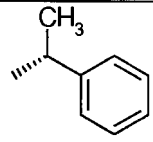
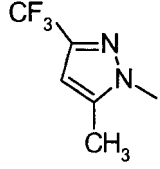
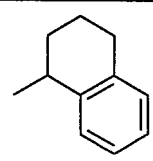
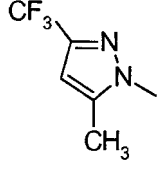
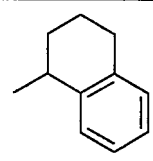
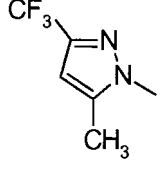
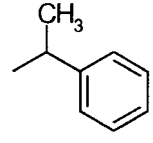
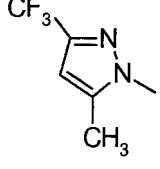
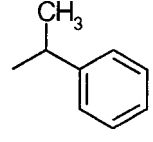
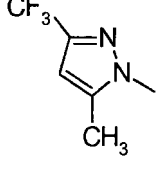
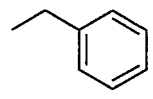
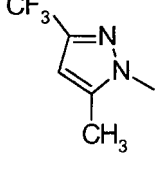
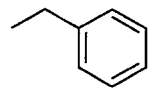
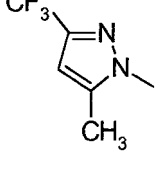
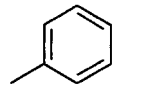
Table 1 below illustrates examples of individual compounds of formula I according to the invention.

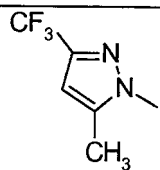
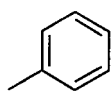
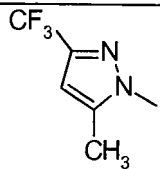
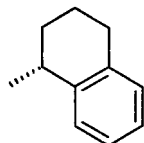
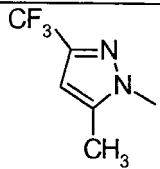
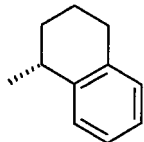
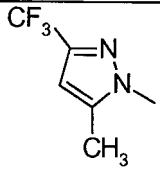
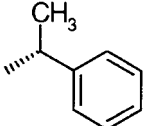
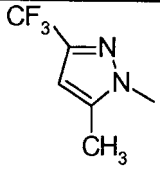
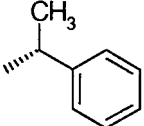
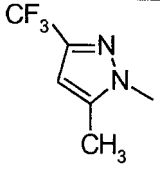
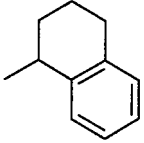
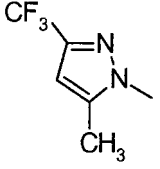
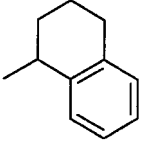
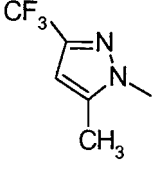
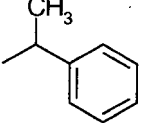
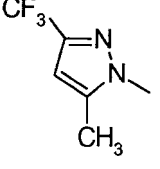
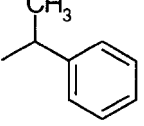
Table 1: individual compounds of formula I according to the invention

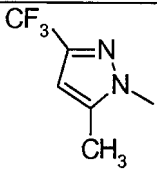
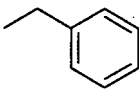
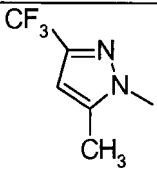
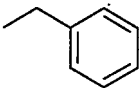
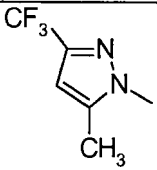
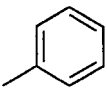
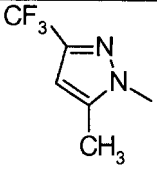
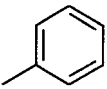
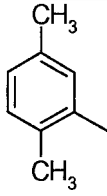
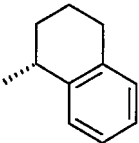
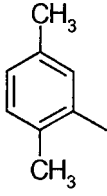
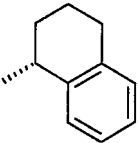
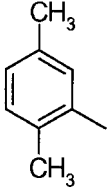
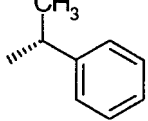
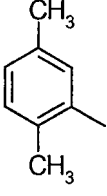
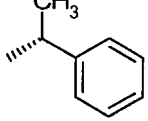
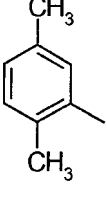
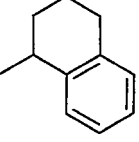
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002		-CH ₂ C(=O)-	S	
003		-CH ₂ C(=O)-	O	
004		-CH ₂ C(=O)-	S	
005		-CH ₂ C(=O)-	O	
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007		-CH ₂ C(=O)-	O	
008		-CH ₂ C(=O)-	S	

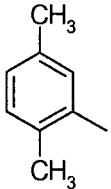
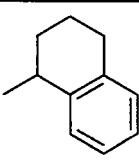
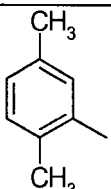
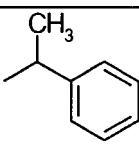
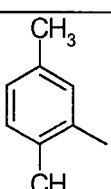
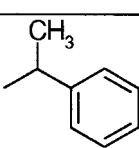
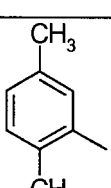
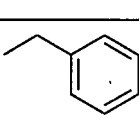
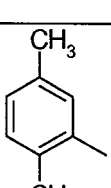
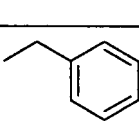
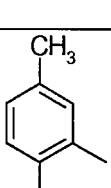
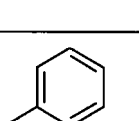
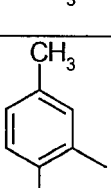
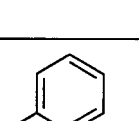
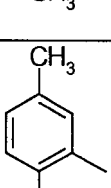
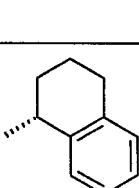
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010		-CH ₂ C(=O)-	S	
011		-CH ₂ C(=O)-	O	
012		-CH ₂ C(=O)-	S	
013		-CH ₂ C(=S)-	O	
014		-CH ₂ C(=S)-	S	
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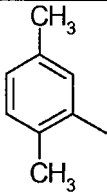
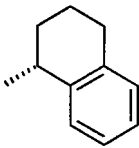
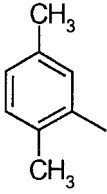
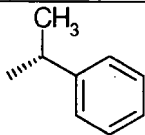
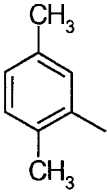
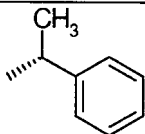
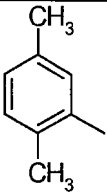
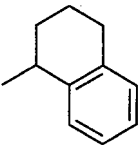
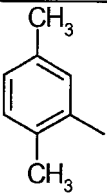
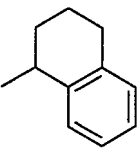
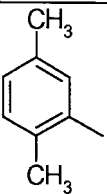
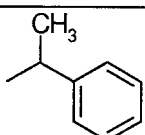
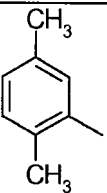
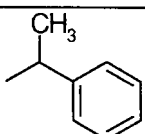
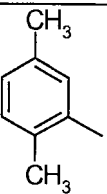
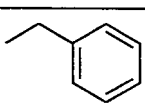
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019		-CH ₂ C(=S)-	O	
020		-CH ₂ C(=S)-	S	
021		-CH ₂ C(=S)-	O	
022		-CH ₂ C(=S)-	S	
023		-CH ₂ C(=S)-	O	
024		-CH ₂ C(=S)-	S	
025		-OC(=O)-	O	
026		-OC(=O)-	S	

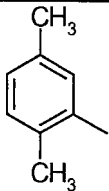
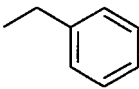
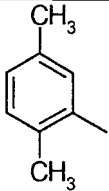
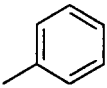
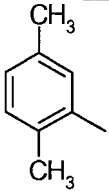
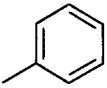
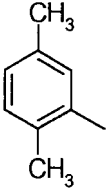
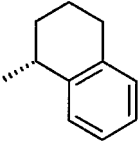
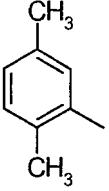
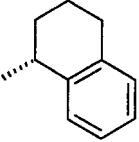
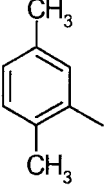
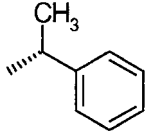
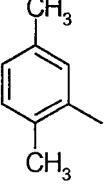
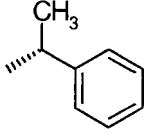
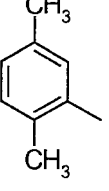
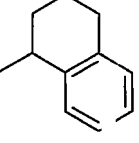
027		-OC(=O)-	O	
028		-OC(=O)-	S	
029		-OC(=O)-	O	
030		-OC(=O)-	S	
031		-OC(=O)-	O	
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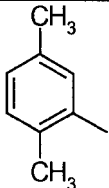
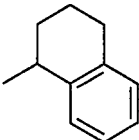
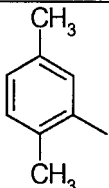
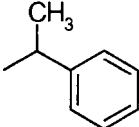
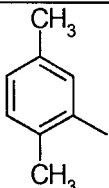
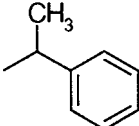
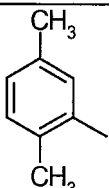
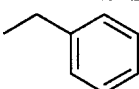
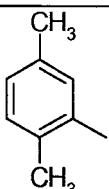
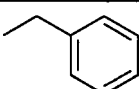
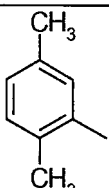
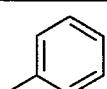
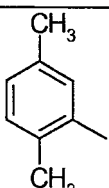
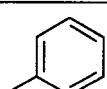
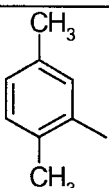
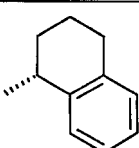
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038		-CH ₂ SO ₂ ⁻	S	
039		-CH ₂ SO ₂ ⁻	O	
040		-CH ₂ SO ₂ ⁻	S	
041		-CH ₂ SO ₂ ⁻	O	
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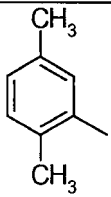
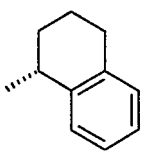
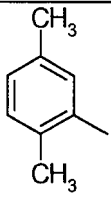
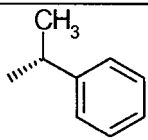
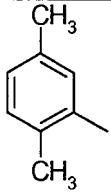
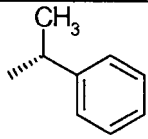
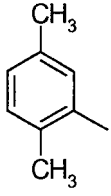
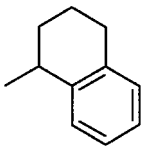
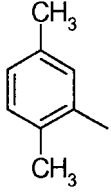
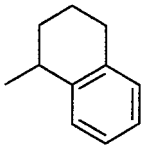
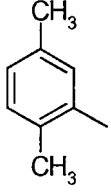
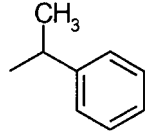
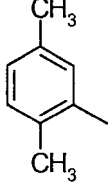
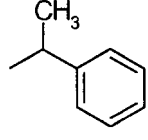
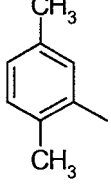
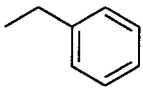
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046		-CH ₂ SO ₂ -	S	
047		-CH ₂ SO ₂ -	O	
048		-CH ₂ SO ₂ -	S	
049		-CH ₂ C(=O)-	O	
050		-CH ₂ C(=O)-	S	
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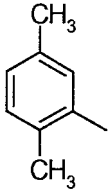
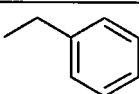
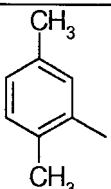
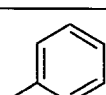
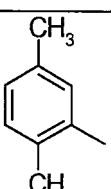
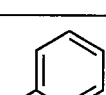
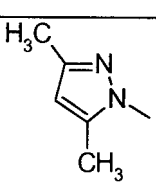
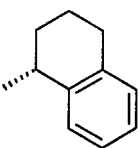
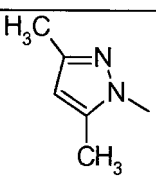
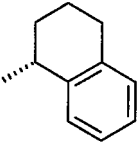
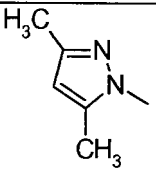
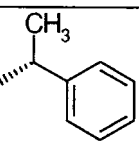
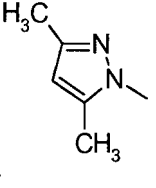
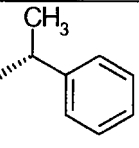
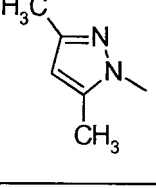
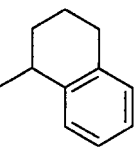
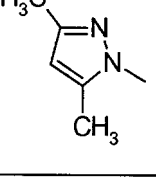
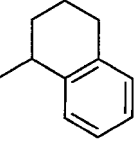
054		$-\text{CH}_2\text{C}(=\text{O})-$	S	
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056		$-\text{CH}_2\text{C}(=\text{O})-$	S	
057		$-\text{CH}_2\text{C}(=\text{O})-$	O	
058		$-\text{CH}_2\text{C}(=\text{O})-$	S	
059		$-\text{CH}_2\text{C}(=\text{O})-$	O	
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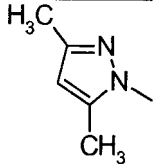
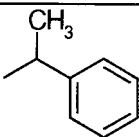
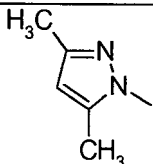
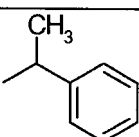
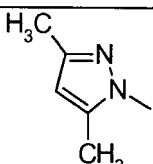
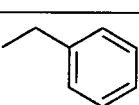
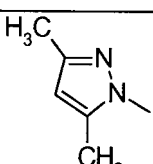
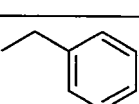
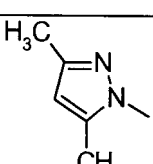
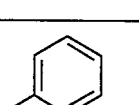
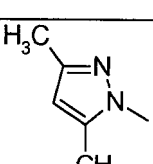
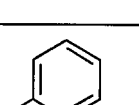
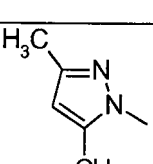
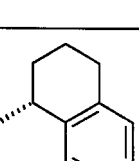
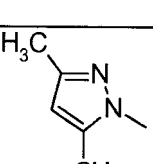
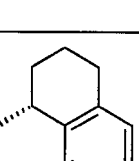
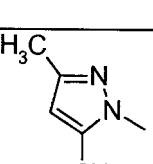
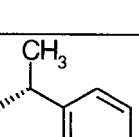
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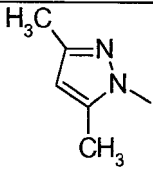
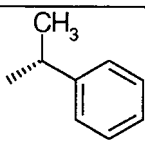
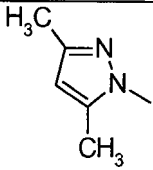
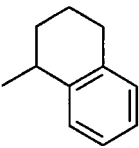
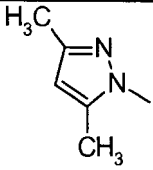
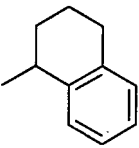
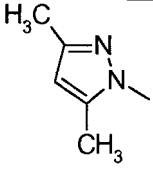
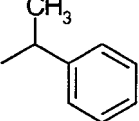
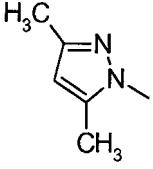
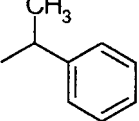
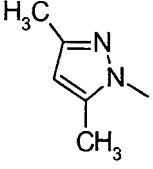
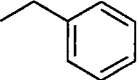
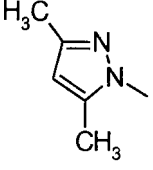
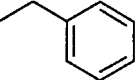
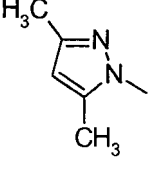
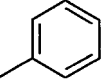
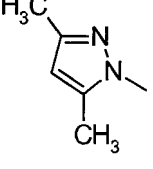
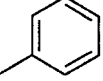
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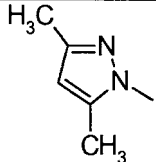
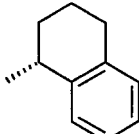
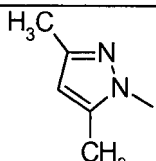
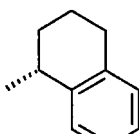
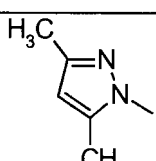
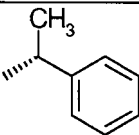
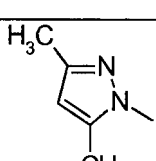
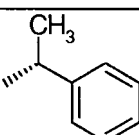
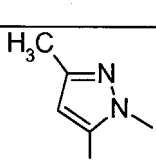
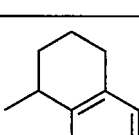
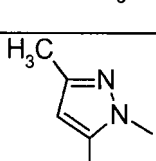
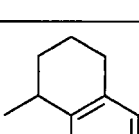
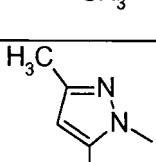
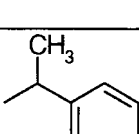
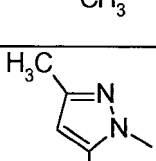
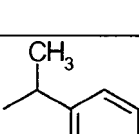
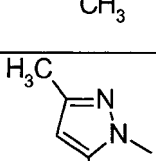
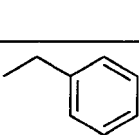
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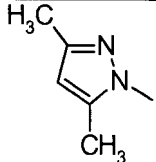
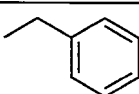
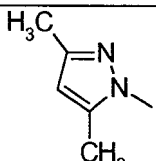
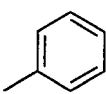
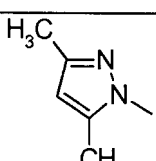
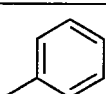
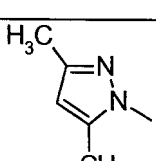
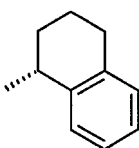
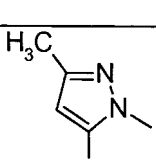
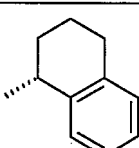
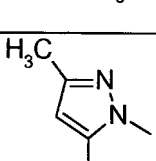
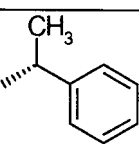
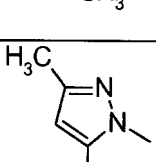
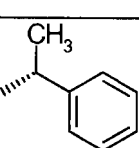
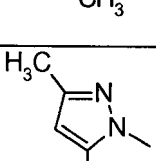
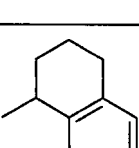
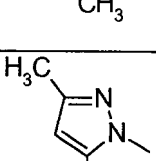
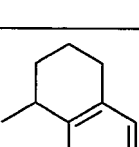
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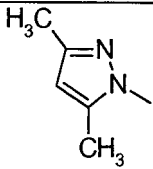
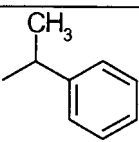
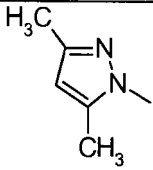
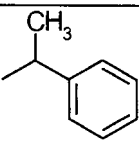
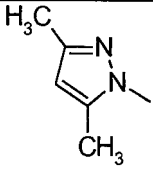
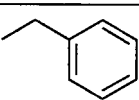
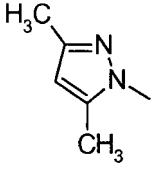
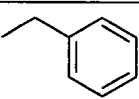
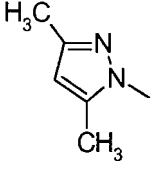
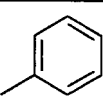
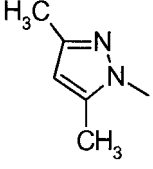
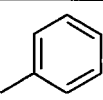
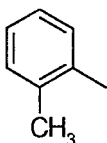
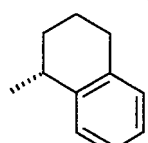
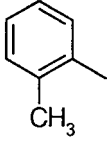
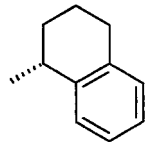
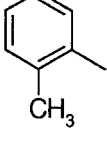
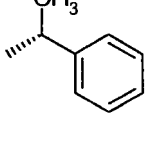
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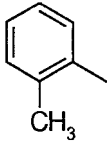
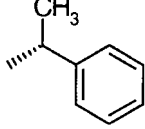
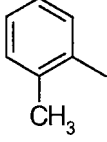
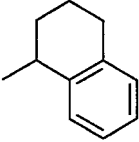
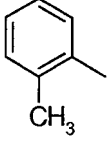
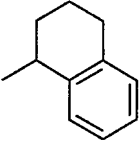
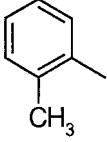
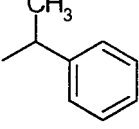
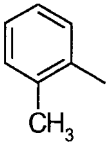
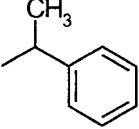
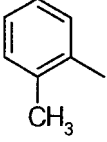
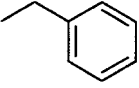
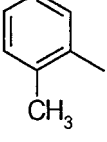
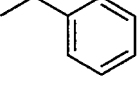
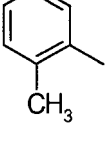
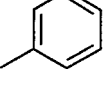
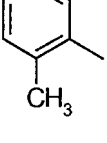
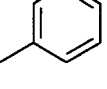
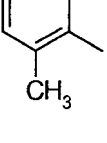
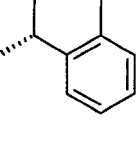
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107		-CH ₂ C(=O)-	O	
108		-CH ₂ C(=O)-	S	
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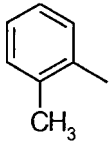
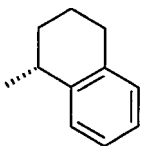
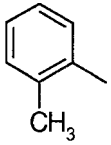
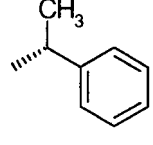
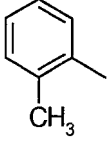
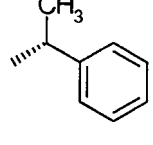
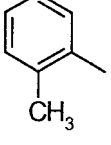
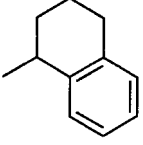
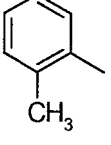
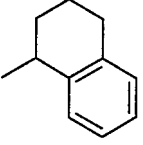
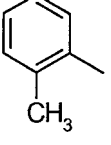
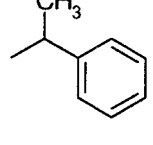
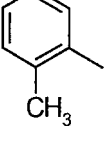
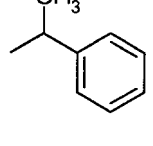
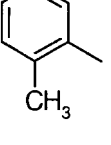
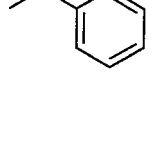
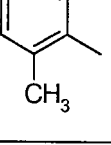
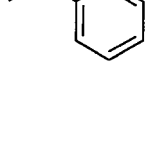
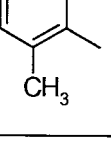
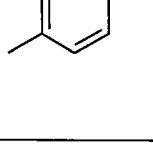
112		-CH ₂ C(=S)-	S	
113		-CH ₂ C(=S)-	O	
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115		-CH ₂ C(=S)-	O	
116		-CH ₂ C(=S)-	S	
117		-CH ₂ C(=S)-	O	
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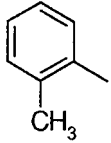
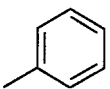
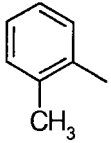
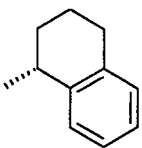
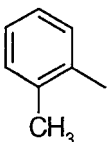
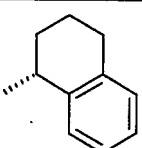
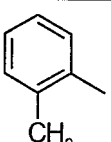
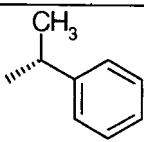
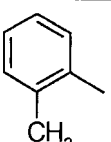
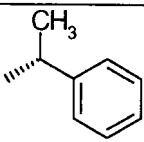
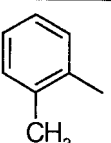
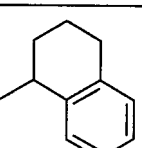
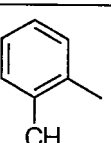
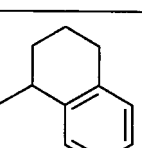
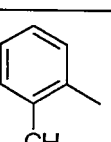
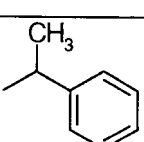
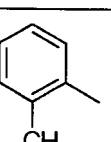
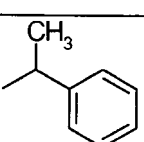
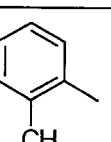
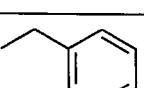
121		-OC(=O)-	O	
122		-OC(=O)-	S	
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124		-OC(=O)-	S	
125		-OC(=O)-	O	
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128		-OC(=O)-	S	
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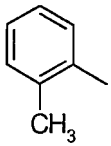
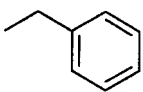
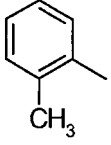
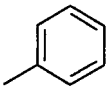
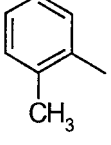
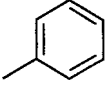
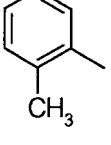
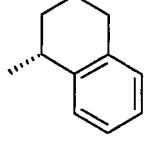
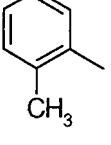
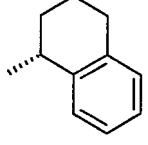
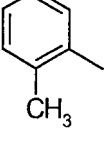
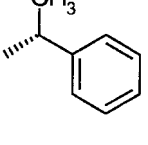
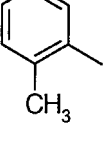
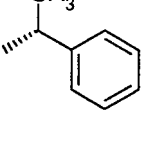
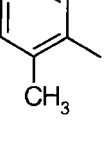
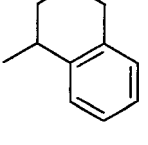
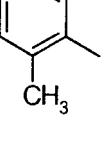
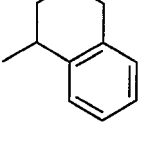
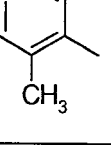
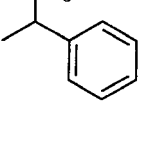
130		-OC(=O)-	S	
131		-OC(=O)-	O	
132		-OC(=O)-	S	
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135		-CH ₂ SO ₂ -	O	
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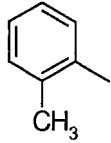
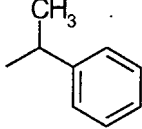
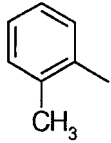
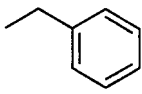
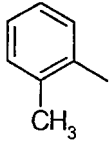
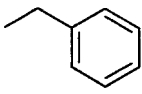
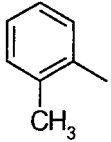
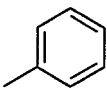
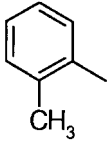
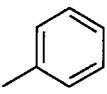
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142		-CH ₂ SO ₂ -	S	
143		-CH ₂ SO ₂ -	O	
144		-CH ₂ SO ₂ -	S	
145		-CH ₂ C(=O)-	O	
146		-CH ₂ C(=O)-	S	
147		-CH ₂ C(=O)-	O	

148		$-\text{CH}_2\text{C}(=\text{O})-$	S	
149		$-\text{CH}_2\text{C}(=\text{O})-$	O	
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153		$-\text{CH}_2\text{C}(=\text{O})-$	O	
154		$-\text{CH}_2\text{C}(=\text{O})-$	S	
155		$-\text{CH}_2\text{C}(=\text{O})-$	O	
156		$-\text{CH}_2\text{C}(=\text{O})-$	S	
157		$-\text{CH}_2\text{C}(=\text{S})-$	O	

158		-CH ₂ C(=S)-	S	
159		-CH ₂ C(=S)-	O	
160		-CH ₂ C(=S)-	S	
161		-CH ₂ C(=S)-	O	
162		-CH ₂ C(=S)-	S	
163		-CH ₂ C(=S)-	O	
164		-CH ₂ C(=S)-	S	
165		-CH ₂ C(=S)-	O	
166		-CH ₂ C(=S)-	S	
167		-CH ₂ C(=S)-	O	

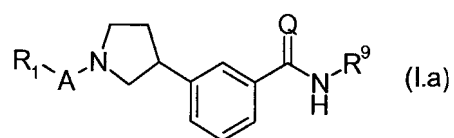
168		$-\text{CH}_2\text{C}(=\text{S})-$	S	
169		$-\text{OC}(=\text{O})-$	O	
170		$-\text{OC}(=\text{O})-$	S	
171		$-\text{OC}(=\text{O})-$	O	
172		$-\text{OC}(=\text{O})-$	S	
173		$-\text{OC}(=\text{O})-$	O	
174		$-\text{OC}(=\text{O})-$	S	
175		$-\text{OC}(=\text{O})-$	O	
176		$-\text{OC}(=\text{O})-$	S	
177		$-\text{OC}(=\text{O})-$	O	

178		-OC(=O)-	S	
179		-OC(=O)-	O	
180		-OC(=O)-	S	
181		-CH ₂ SO ₂ ⁻	O	
182		-CH ₂ SO ₂ ⁻	S	
183		-CH ₂ SO ₂ ⁻	O	
184		-CH ₂ SO ₂ ⁻	S	
185		-CH ₂ SO ₂ ⁻	O	
186		-CH ₂ SO ₂ ⁻	S	
187		-CH ₂ SO ₂ ⁻	O	

188		- CH ₂ SO ₂ ⁻	S	
189		- CH ₂ SO ₂ ⁻	O	
190		- CH ₂ SO ₂ ⁻	S	
191		- CH ₂ SO ₂ ⁻	O	
192		- CH ₂ SO ₂ ⁻	S	

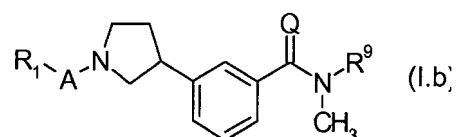
where

a) 192 compounds of formula (I.a):



5 wherein A, Q, R¹ and R⁹ are as defined in Table 1.

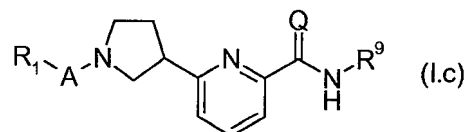
b) 192 compounds of formula (I.b):



wherein A, Q, R¹ and R⁹ are as defined in Table 1.

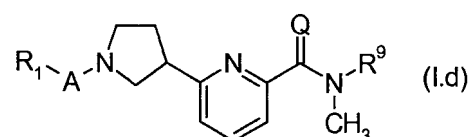
10

c) 192 compounds of formula (I.c):



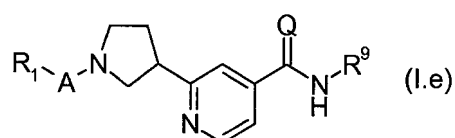
wherein A, Q, R¹ and R⁹ are as defined in Table 1.

d) 192 compounds of formula (I.d):



5 wherein A, Q, R¹ and R⁹ are as defined in Table 1.

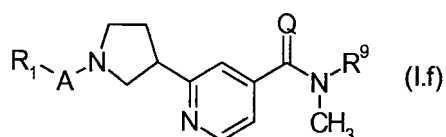
e) 192 compounds of formula (I.e):



wherein A, Q, R¹ and R⁹ are as defined in Table 1.

10

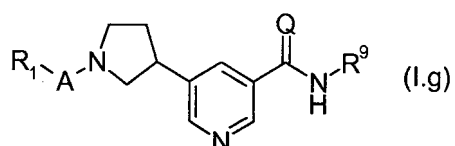
f) 192 compounds of formula (I.f):



wherein A, Q, R¹ and R⁹ are as defined in Table 1.

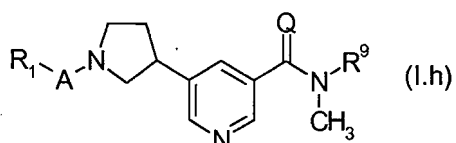
15

g) 192 compounds of formula (I.g):



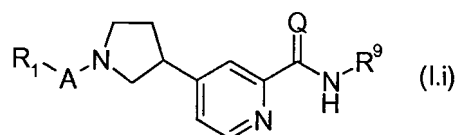
wherein A, Q, R¹ and R⁹ are as defined in Table 1.

20 h) 192 compounds of formula (I.h):



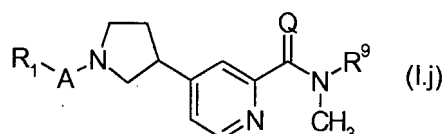
wherein A, Q, R¹ and R⁹ are as defined in Table 1.

i) 192 compounds of formula (I.i):



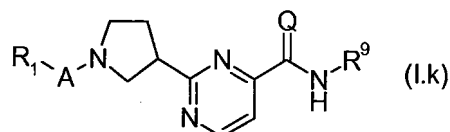
wherein A, Q, R¹ and R⁹ are as defined in Table 1.

5 j) 192 compounds of formula (I.j):



wherein A, Q, R¹ and R⁹ are as defined in Table 1.

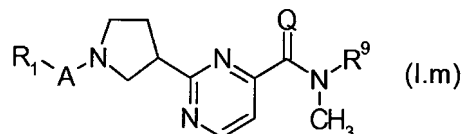
k) 192 compounds of formula (I.k):



10

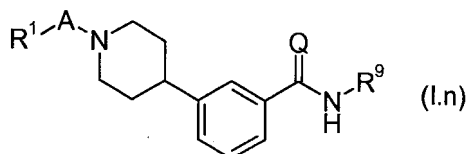
wherein A, Q, R¹ and R⁹ are as defined in Table 1.

m) 192 compounds of formula (I.m):



15 wherein A, Q, R¹ and R⁹ are as defined in Table 1.

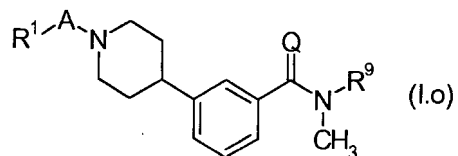
n) 192 compounds of formula (I.n):



wherein A, Q, R¹ and R⁹ are as defined in Table 1.

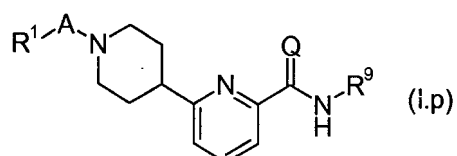
20

o) 192 compounds of formula (I.o):



wherein A, Q, R¹ and R⁹ are as defined in Table 1.

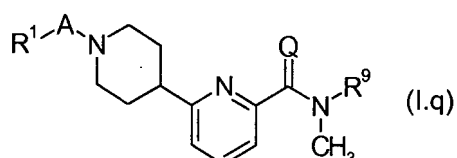
p) 192 compounds of formula (l.p):



wherein A, Q, R¹ and R⁹ are as defined in Table 1.

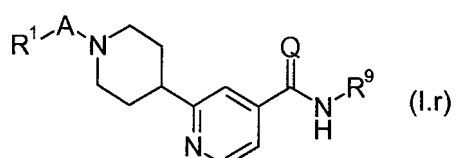
5

q) 192 compounds of formula (l.q):



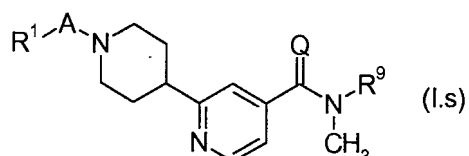
wherein A, Q, R¹ and R⁹ are as defined in Table 1.

10 r) 192 compounds of formula (l.r):



wherein A, Q, R¹ and R⁹ are as defined in Table 1.

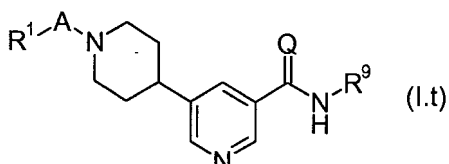
s) 192 compounds of formula (l.s):



15

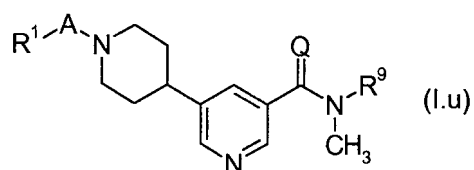
wherein A, Q, R¹ and R⁹ are as defined in Table 1.

t) 192 compounds of formula (l.t):



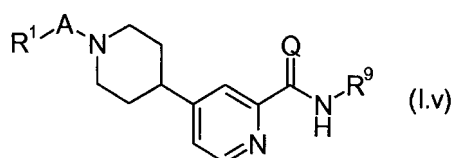
20 wherein A, Q, R¹ and R⁹ are as defined in Table 1.

u) 192 compounds of formula (I.u):



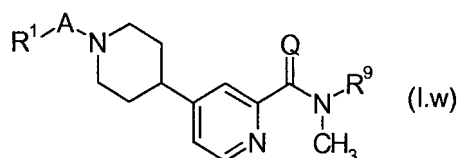
wherein A, Q, R¹ and R⁹ are as defined in Table 1.

5 v) 192 compounds of formula (I.v):



wherein A, Q, R¹ and R⁹ are as defined in Table 1.

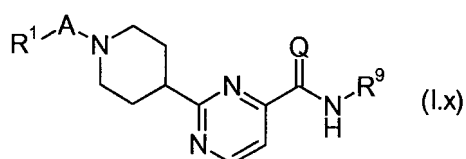
w) 192 compounds of formula (I.w):



10

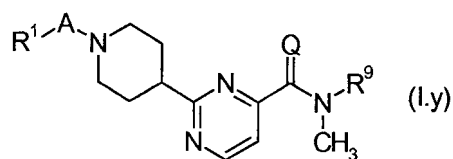
wherein A, Q, R¹ and R⁹ are as defined in Table 1.

x) 192 compounds of formula (I.x):



15 wherein A, Q, R¹ and R⁹ are as defined in Table 1.

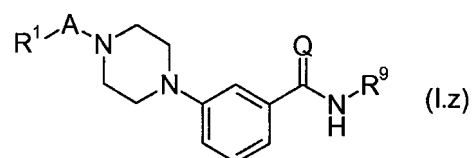
y) 192 compounds of formula (I.y):



wherein A, Q, R¹ and R⁹ are as defined in Table 1.

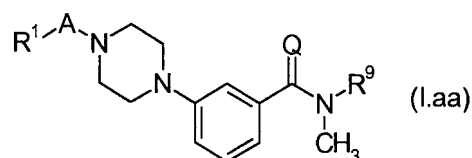
20

z) 192 compounds of formula (I.z):



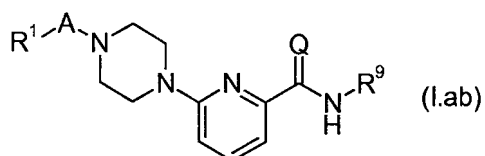
wherein A, Q, R¹ and R⁹ are as defined in Table 1.

5 aa) 192 compounds of formula (I.aa):



wherein A, Q, R¹ and R⁹ are as defined in Table 1.

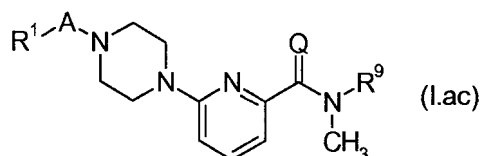
ab) 192 compounds of formula (I.ab):



10

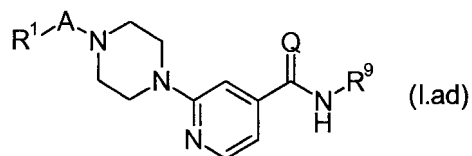
wherein A, Q, R¹ and R⁹ are as defined in Table 1.

ac) 192 compounds of formula (I.ac):



15 wherein A, Q, R¹ and R⁹ are as defined in Table 1.

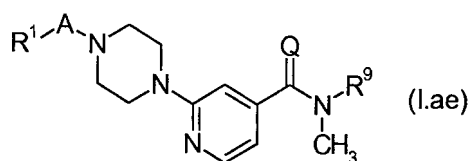
ad) 192 compounds of formula (I.ad):



wherein A, Q, R¹ and R⁹ are as defined in Table 1.

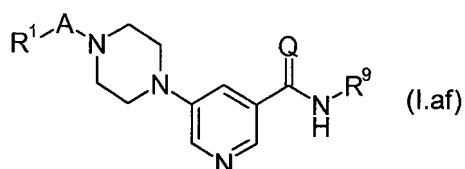
20

ae) 192 compounds of formula (I.ae):



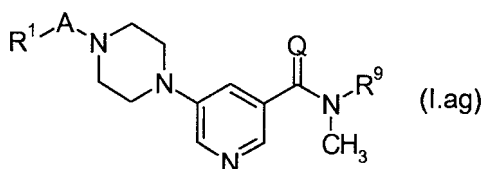
wherein A, Q, R¹ and R⁹ are as defined in Table 1.

5 af) 192 compounds of formula (I.af):



wherein A, Q, R¹ and R⁹ are as defined in Table 1.

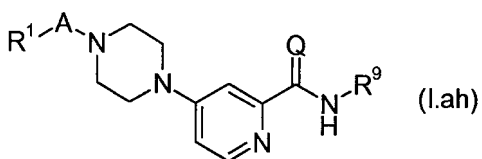
ag) 192 compounds of formula (I.ag):



10

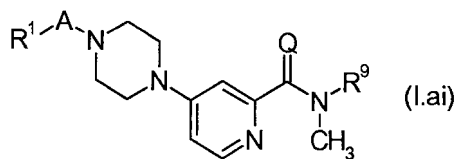
wherein A, Q, R¹ and R⁹ are as defined in Table 1.

ah) 192 compounds of formula (I.ah):



15 wherein A, Q, R¹ and R⁹ are as defined in Table 1.

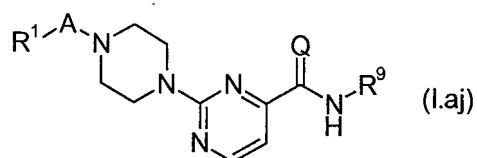
ai) 192 compounds of formula (I.ai):



wherein A, Q, R¹ and R⁹ are as defined in Table 1.

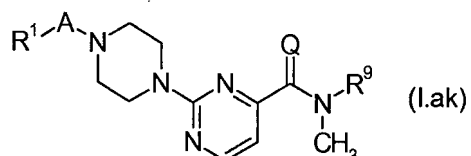
20

aj) 192 compounds of formula (I.aj):



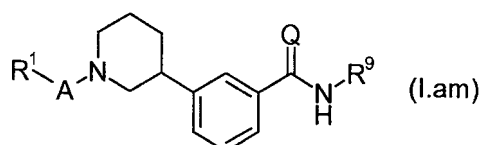
wherein A, Q, R¹ and R⁹ are as defined in Table 1.

5 ak) 192 compounds of formula (I.ak):



wherein A, Q, R¹ and R⁹ are as defined in Table 1.

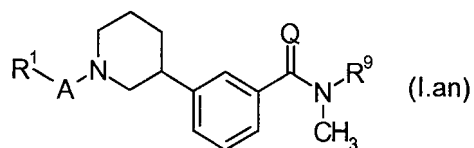
am) 192 compounds of formula (I.am):



10

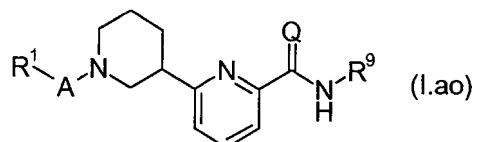
wherein A, Q, R¹ and R⁹ are as defined in Table 1.

an) 192 compounds of formula (I.an):



15 wherein A, Q, R¹ and R⁹ are as defined in Table 1.

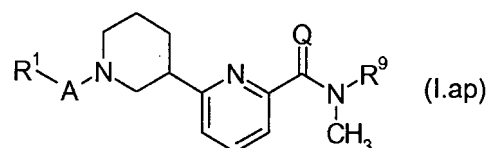
ao) 192 compounds of formula (I.ao):



wherein A, Q, R¹ and R⁹ are as defined in Table 1.

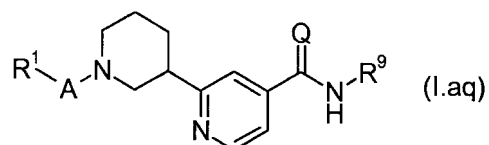
20

ap) 192 compounds of formula (I.ap):



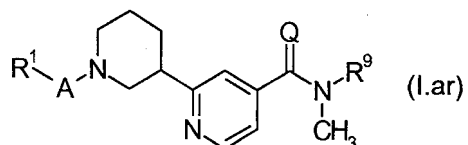
wherein A, Q, R¹ and R⁹ are as defined in Table 1.

5 aq) 192 compounds of formula (I.aq):



wherein A, Q, R¹ and R⁹ are as defined in Table 1.

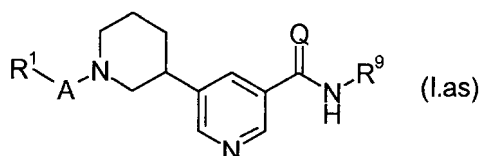
ar) 192 compounds of formula (I.ar):



10

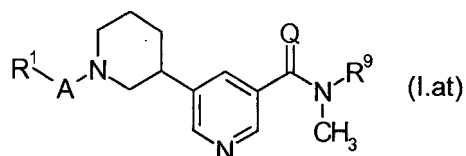
wherein A, Q, R¹ and R⁹ are as defined in Table 1.

as) 192 compounds of formula (I.as):



15 wherein A, Q, R¹ and R⁹ are as defined in Table 1.

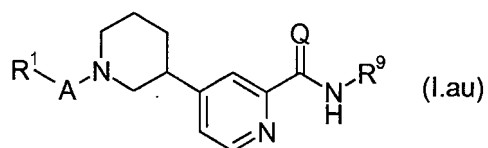
at) 192 compounds of formula (I.at):



wherein A, Q, R¹ and R⁹ are as defined in Table 1.

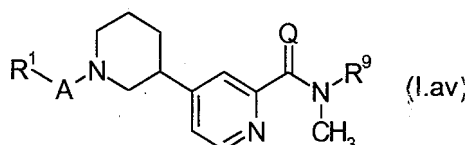
20

au) 192 compounds of formula (I.au):



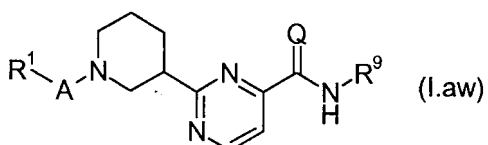
wherein A, Q, R¹ and R⁹ are as defined in Table 1.

5 av) 192 compounds of formula (I.av):



wherein A, Q, R¹ and R⁹ are as defined in Table 1.

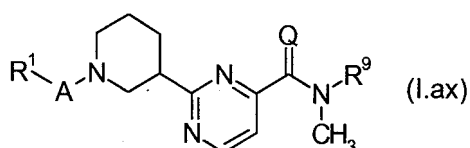
aw) 192 compounds of formula (I.aw):



10

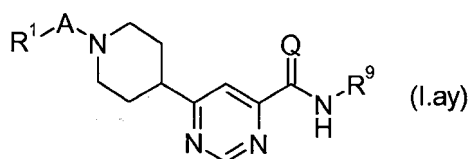
wherein A, Q, R¹ and R⁹ are as defined in Table 1.

ax) 192 compounds of formula (I.ax):



15 wherein A, Q, R¹ and R⁹ are as defined in Table 1.

ay) 192 compounds of formula (I.ay):



wherein A, Q, R¹ and R⁹ are as defined in Table 1.

20

Throughout this description, temperatures are given in degrees Celsius and "m.p." means melting point. LC/MS means Liquid Chromatography Mass Spectroscopy and the description of the apparatus and the method is: (HP 1100 HPLC from Agilent, Phenomenex Gemini C18, 3 µm particle size, 110 Angström, 30 x 3 mm

- column, 1.7mL/min., 60 °C, H₂O + 0.05% HCOOH (95%) / CH₃CN/MeOH 4:1 + 0.04% HCOOH (5%) – 2 min. – CH₃CN/MeOH 4:1 + 0.04% HCOOH (5%) – 0.8 min., ZQ Mass Spectrometer from Waters, ionization method: electrospray (ESI), Polarity: positive ions, Capillary (kV) 3.00, Cone (V) 30.00, Extractor (V) 2.00, Source Temperature (°C) 100, Desolvation Temperature (°C) 250, Cone Gas Flow (L/Hr) 50, Desolvation Gas Flow (L/Hr) 400)).

Table 2: Melting point and LC/MS data for compounds of Table 1

Compound No.	Melting point (°C)	LC/MS
I.n.001		Rt = 1.97 min. ; MS: m/z = 525 (M+1)
I.n.003	215-217	
I.n.005		Rt = 1.96 min. ; MS: m/z = 525 (M+1)
I.n.009		Rt = 3.46 min. ; MS: m/z = 485 (M+1)
I.n.011		Rt = 1.85 min. ; MS: m/z = 471 (M+1)
I.n.049		Rt = 2.08 min. ; MS: m/z = 481 (M+1)
I.n.073		Rt = 2.17 min. ; MS: m/z = 483 (M+1)
I.n.085		Rt = 2.12 min. ; MS: m/z = 517 (M+1)
I.n.097		Rt = 1.80 min. ; MS: m/z = 471 (M+1)
I.n.169		Rt = 2.11 min. ; MS: m/z = 469 (M+1)
I.o.001		Rt = 2.03 min. ; MS: m/z = 539 (M+1)
I.o.003		Rt = 1.95 min. ; MS: m/z = 513 (M+1)
I.o.009		Rt = 1.88 min. ; MS: m/z = 499 (M+1)
I.p.001		Rt = 1.97 min. ; MS: m/z = 526 (M+1)

l.p.003		Rt = 1.92 min. ; MS: m/z = 500 (M+1)
l.p.005		Rt = 2.01 min. ; MS: m/z = 526 (M+1)
l.p.009		Rt = 1.87 min. ; MS: m/z = 486 (M+1)
l.p.011		Rt = 1.92 min. ; MS: m/z = 472 (M+1)
l.p.049		Rt = 2.09 min. ; MS: m/z = 482 (M+1)
l.p.073		Rt = 2.18 min. ; MS: m/z = 484 (M+1)
l.p.085		Rt = 2.14 min. ; MS: m/z = 518 (M+1)
l.p.097		Rt = 1.82 min. ; MS: m/z = 472 (M+1)
l.q.001		Rt = 1.94 min. ; MS: m/z = 540 (M+1)
l.q.005	62-65	
l.z.001	210	
l.z.005		Rt = 1.91 min. ; MS: m/z = 526 (M+1)
l.z.011		Rt = 1.78 min. ; MS: m/z = 472 (M+1)
l.z.073	183-185	
l.z.085	186-189	
l.aa.001		Rt = 1.98 min. ; MS: m/z = 540 (M+1)
l.aa.011		Rt = 1.79 min. ; MS: m/z = 486 (M+1)
l.v.001		Rt = 2.02 min. ; MS: m/z = 526 (M+1)
l.w.001		Rt = 1.88 min. ; MS: m/z = 540 (M+1)
l.r.001		Rt = 1.84min. ; MS: m/z = 526 (M+1)
l.ay.001		Rt = 1.99 min. ; MS: m/z = 527 (M+1)
l.aw.001		Rt = 1.94min. ; MS: m/z = 527 (M+1)
l.t.001	140	
l.u.001		Rt = 1.85 min. ; MS: m/z = 540 (M+1)

The compounds according to the present invention can be prepared according to the above-mentioned reaction schemes, in which, unless otherwise stated, the definition of each variable is as defined above for a compound of formula (I).

5 Biological examples

Phytophthora infestans / tomato / leaf disc preventative (tomato late blight)

Tomato leaf disks are placed on water agar in multiwell plates (24-well format) and sprayed with the formulated test compound diluted in water. The leaf disks are inoculated with a spore suspension of the fungus 1 day after application. The
10 inoculated leaf disks are incubated at 16°C and 75% rh under a light regime of 24 h darkness followed by 12 h light / 12 h darkness in a climate cabinet and the activity of a compound is assessed as percent disease control compared to untreated when an appropriate level of disease damage appears in untreated check leaf disks (5 – 7 days after application).

15 Compound I.n.001, I.n.003, I.n.005, I.n.009, I.n.011, I.n.049, I.n.097, I.t.001, I.v.001, I.z.001 and I.z.005 at 200 ppm give at least 80% disease control in this test when compared to untreated control leaf disks under the same conditions, which show extensive disease development.

20 *Phytophthora infestans* / potato / preventative (potato late blight)

2-week old potato plants cv. Bintje are sprayed in a spray chamber with the formulated test compound diluted in water. The test plants are inoculated by spraying them with a sporangia suspension 2 days after application. The inoculated test plants are incubated at 18° C with 14 h light/day and 100 % rh in a growth chamber and the percentage leaf
25 area covered by disease is assessed when an appropriate level of disease appears on untreated check plants (5 – 7 days after application).

Compound I.n.001, I.n.003, I.n.005, I.n.009, I.n.049, I.v.001, I.z.001 and I.z.005 at 200 ppm give at least 80% disease control in this test when compared to untreated control leaf disks under the same conditions, which show extensive disease
30 development.

Phytophthora infestans / potato / long lasting (potato late blight)

2-week old potato plants cv. Bintje are sprayed in a spray chamber with the formulated test compound diluted in water. The test plants are inoculated by spraying them with a
35 sporangia suspension 6 days after application. The inoculated test plants are incubated at 18° C with 14 h light/day and 100 % rh in a growth chamber and the percentage leaf

area covered by disease is assessed when an appropriate level of disease appears on untreated check plants (9 – 11 days after application).

Compounds I.n.001, I.n.003, I.n.005, I.n.097, I.t.001, I.v.001, I.z.001 at 200 ppm give at least 80% disease control in this test when compared to untreated control leaf disks under the same conditions, which show extensive disease development.

Phytophthora infestans / potato / curative (potato late blight)

2-week old potato plants cv. Bintje are inoculated by spraying them with a sporangia suspension one day before application. The inoculated plants are sprayed in a spray chamber with the formulated test compound diluted in water. The inoculated test plants are incubated at 18° C with 14 h light/day and 100 % rh in a growth chamber and the percentage leaf area covered by disease is assessed when an appropriate level of disease appears on untreated check plants (3 – 4 days after application).

Compounds I.n.001, I.n.003, I.n.005, I.n.009, I.v.001, I.z.001 and I.z.005 at 200 ppm give at least 80% disease control in this test when compared to untreated control leaf disks under the same conditions, which show extensive disease development.

Plasmopara viticola / grape / leaf disc preventative (grape downy mildew)

Grape vine leaf disks are placed on water agar in multiwell plates (24-well format) and sprayed with the formulated test compound diluted in water. The leaf disks are inoculated with a spore suspension of the fungus 1 day after application. The inoculated leaf disks are incubated at 19°C and 80% rh under a light regime of 12 h light / 12 h darkness in a climate cabinet and the activity of a compound is assessed as percent disease control compared to untreated when an appropriate level of disease damage appears in untreated check leaf disks (6 – 8 days after application).

Compounds I.n.001, I.n.003, I.n.005, I.n.009, I.n.011, I.n.049, I.n.097, I.t.001, I.v.001, I.z.001 and I.z.005 at 200 ppm give at least 80% disease control in this test when compared to untreated control leaf disks under the same conditions, which show extensive disease development.

Plasmopara viticola / grape / preventative (grape downy mildew)

5-week old grape seedlings cv. Gutedel are sprayed in a spray chamber with the formulated test compound diluted in water. The test plants are inoculated by spraying a sporangia suspension on their lower leaf surface one day after application. The inoculated test plants are incubated at 22° C and 100% rh in a greenhouse and the percentage leaf area covered by disease is assessed when an appropriate level of disease appears on untreated check plants (6 – 8 days after application).

Compounds I.n.001, I.n.003, I.n.005, I.n.009, I.n.011, I.v.001, I.z.001 and I.z.005 at 200 ppm give at least 80% disease control in this test when compared to untreated control leaf disks under the same conditions, which show extensive disease development.

5

Plasmopara viticola / grape / long lasting (grape downy mildew)

5-week old grape seedlings cv. Gutedel are sprayed in a spray chamber with the formulated test compound diluted in water. The test plants are inoculated by spraying a sporangia suspension on their lower leaf surface 6 days after application. The inoculated test plants are incubated at 22° C and 100% rh in a greenhouse and the percentage leaf area covered by disease is assessed when an appropriate level of disease appears on untreated check plants (11 – 13 days after application).

10

Compounds I.n.001, I.n.003, I.n.005, I.n.009, I.t.001, I.v.001, I.z.001 and I.z.005 at 200 ppm give at least 80% disease control in this test when compared to untreated control leaf disks under the same conditions, which show extensive disease development.

15

Plasmopara viticola / grape / curative (grape downy mildew)

5-week-old grape seedlings cv. Gutedel are inoculated by spraying a sporangia suspension on their lower leaf surface one day before application. The inoculated grape plants are sprayed in a spray chamber with the formulated test compound diluted in water. The inoculated test plants are incubated at 22° C and 100% rh in a greenhouse and the percentage leaf area covered by disease is assessed when an appropriate level of disease appears on untreated check plants (4 – 6 days after application).

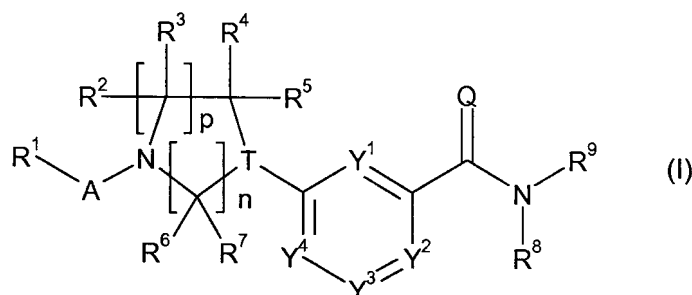
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25

Compound I.n.001, I.n.003, I.n.005, I.n.009, I.n.049, I.v.001 and I.z.001 at 200 ppm give at least 80% disease control in this test when compared to untreated control leaf disks under the same conditions, which show extensive disease development.

What is claimed is:

1. A compound of formula I:



wherein

A is $x\text{-C(R}^{10}\text{R}^{11}\text{)-C(=O)-}$, $x\text{-C(R}^{12}\text{R}^{13}\text{)-C(=S)-}$, $x\text{-O-C(=O)-}$, $x\text{-O-C(=S)-}$, $x\text{-N(R}^{14}\text{)-C(=O)-}$, $x\text{-N(R}^{15}\text{)-C(=S)-}$ or $x\text{-C(R}^{16}\text{R}^{17}\text{)-SO}_2\text{-}$, $x\text{-N=C(R}^{30}\text{)-}$, in each case x indicates the bond

that is connected to R¹;

T is CR¹⁸ or N;

Y¹, Y², Y³, and Y⁴ are independently CR¹⁹ or N;

Q is O or S;

n is 1 or 2;

p is 1 or 2, providing that when n is 2, p is 1.

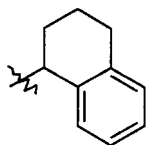
R¹ is phenyl, pyridyl, imidazolyl, or pyrazolyl; wherein the phenyl, pyridyl, imidazolyl and pyrazolyl are each optionally substituted by 1 to 3 substituents independently selected from C₁-C₄ alkyl, C₁-C₄ haloalkyl, halogen, cyano, hydroxy and amino;

R², R³, R⁴, R⁵, R⁶, R⁷, R¹⁰, R¹¹, R¹², R¹³, R¹⁶, R¹⁷, R¹⁸, R¹⁹ and R³⁰ each independently

are hydrogen, halogen, cyano, C₁-C₄alkyl, or C₁-C₄haloalkyl;

R⁸, R¹⁴ and R¹⁵ each independently are hydrogen or C₁-C₄alkyl; and

R⁹ is phenyl, benzyl or group (a):

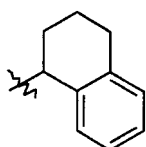


(a)

wherein the phenyl, benzyl and group (a) are each optionally substituted with 1 to 3 substituents independently selected from C₁-C₄ alkyl, C₁-C₄ haloalkyl, halogen, cyano, hydroxy and amino;

or a salt or a N-oxide thereof.

2. The compound according to claim 1, wherein
 A is $x\text{-C(R}^{10}\text{R}^{11})\text{-C(=O)-}$, $x\text{-C(R}^{12}\text{R}^{13})\text{-C(=S)-}$, $x\text{-O-C(=O)-}$, $x\text{-O-C(=S)-}$, or $x\text{-C(R}^{16}\text{R}^{17})\text{-SO}_2\text{-}$, in each case x indicates the bond that is connected to R^1 ;
 T is CR^{18} or N;
 5 Y^1 , Y^2 , Y^3 , and Y^4 are independently CR^{19} or N providing that at least 2 of Y^1 , Y^2 , Y^3 , and Y^4 are CR^{19} ;
 Q is O or S;
 n is 1 or 2;
 p is 1;
 10 R^1 is phenyl or pyrazolyl; wherein the phenyl and pyrazolyl are each optionally substituted by 1 to 3 substituents independently selected from $\text{C}_1\text{-C}_4$ alkyl, $\text{C}_1\text{-C}_4$ haloalkyl, halogen, cyano, hydroxy, and amino;
 R^2 , R^3 , R^4 , R^5 , R^6 , R^7 , R^{10} , R^{11} , R^{12} , R^{13} , R^{16} , R^{17} , R^{18} , and R^{19} each independently are hydrogen, halogen, $\text{C}_1\text{-C}_4$ alkyl, $\text{C}_1\text{-C}_4$ haloalkyl;
 15 R^8 is hydrogen or $\text{C}_1\text{-C}_4$ alkyl; and
 R^9 is phenyl, benzyl or group (a):



(a)

- wherein the phenyl, benzyl and group (a) are each optionally substituted with 1 to 3
 20 substituents independently selected from $\text{C}_1\text{-C}_4$ alkyl, $\text{C}_1\text{-C}_4$ haloalkyl, halogen, cyano, hydroxy and amino.

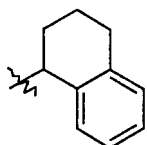
3. The compound according to claim 1, wherein
 A is $x\text{-CR}^{10}\text{R}^{11}\text{-C(=O)-}$, $x\text{-O-C(=O)-}$, or $x\text{-CR}^{16}\text{R}^{17}\text{-SO}_2\text{-}$, in each case x indicates the
 25 bond that is connected to R^1 ;
 T is CR^{18} ;
 Y^1 , Y^2 , Y^3 , and Y^4 are independently CR^{19} or N providing that at least 2 of Y^1 , Y^2 , Y^3 , and Y^4 are CR^{19} and providing that there are no N-N bonds in the ring containing Y^1 , Y^2 , Y^3 , and Y^4 ;
 30 Q is O or S;
 n is 1 or 2;
 p is 1;

R¹ is phenyl or pyrazolyl, wherein the phenyl and pyrazolyl are each optionally substituted with 1 to 3 substituents independently selected from C₁-C₄ alkyl, C₁-C₄ haloalkyl, and halogen;

R², R³, R⁴, R⁵, R⁶, R⁷, R¹⁰, R¹¹, R¹⁶, R¹⁷, R¹⁸, and R¹⁹ each independently are hydrogen, fluoro, or methyl;

R⁸ is hydrogen or methyl; and

R⁹ is phenyl, benzyl or group (a):



(a)

wherein the phenyl, benzyl and group (a) are each optionally substituted with 1 to 3 substituents independently selected from C₁-C₄ alkyl, C₁-C₄ haloalkyl, hydroxy and halogen.

4. The compound according to claim 1, wherein

A is x-CH₂-C(=O)-, x-O-C(=O)- or x-CH₂-SO₂-, in each case x indicates the bond that is connected to R¹;

T is CH;

Y¹, Y², Y³, and Y⁴ are independently CH or N providing that at least 2 of Y¹, Y², Y³, and Y⁴ are CH and providing that there are no N-N bonds in the ring containing Y¹, Y², Y³,

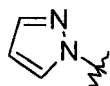
and Y⁴;

Q is O;

n is 1 or 2;

p is 1;

R¹ is phenyl or group (b):



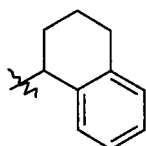
(b)

wherein the phenyl and group (b) are each optionally substituted with 1 to 3 substituents independently selected from halogen, C₁-C₄ alkyl and C₁-C₄ haloalkyl;

R², R³, R⁴, R⁵, R⁶ and R⁷ are each hydrogen;

R⁸ is hydrogen or methyl; and

R⁹ is phenyl, benzyl or group (a):



(a)

wherein the phenyl, benzyl and group (a) are each optionally substituted with 1 to 3 substituents independently selected from C₁-C₄ alkyl, C₁-C₄ haloalkyl, hydroxy and halogen.

5. The compound according to claim 1, wherein

A is x-CH₂-C(=O)-, wherein x indicates the bond that is connected to R¹;

T is CH;

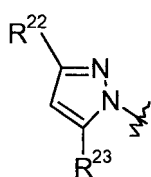
10 Y¹, Y², Y³, and Y⁴ are independently CH;

Q is O;

n is 2;

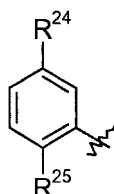
p is 1;

R¹ is selected from group (c) or (d):



15

(c)



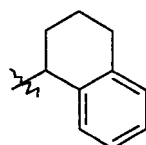
(d)

wherein R²², R²³, R²⁴ and R²⁵ are independently selected from hydrogen, halogen, methyl and halomethyl;

R², R³, R⁴, R⁵, R⁶, and R⁷ are each hydrogen;

20 R⁸ is hydrogen or methyl; and

R⁹ is phenyl, benzyl or group (a):



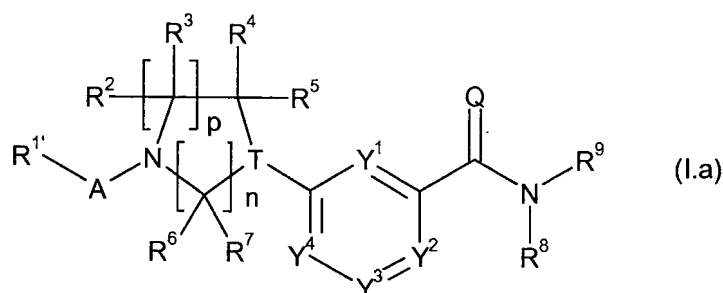
(a)

wherein the phenyl, benzyl and group (a) are each optionally substituted with 1 to 3 substituents independently selected from methyl, halomethyl, and halogen.

6. The compound according to any one of claims 1 to 5, wherein at least three of Y¹, Y², Y³ and Y⁴ are CH and the other of Y¹, Y², Y³ and Y⁴ is CH or N.

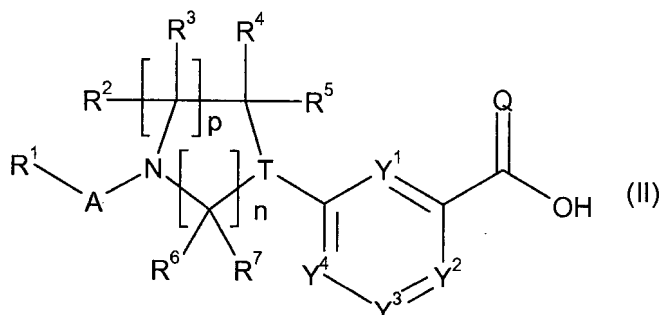
7. The compound according to any one claims 1 to 6, wherein Y^2 is N.
8. The compound according to any one of claims 1 to 7, wherein p is 1 and n is 2.
9. The compound according to any one of claims 1 to 8, wherein R^2 , R^3 , R^4 , R^5 , R^6 and R^7 are H.
10. The compound according to any one of claims 1 to 9, wherein Q is O.

11. A compound of formula I.a:



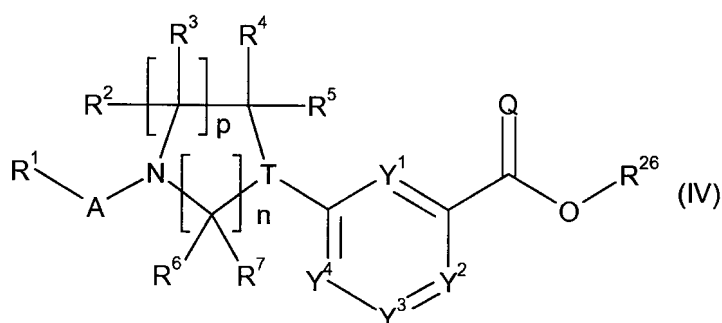
wherein R^1 is C_1 - C_8 alkyl and Y^1 , Y^2 , Y^3 , Y^4 , A , Q , T , n , p , R^2 , R^3 , R^4 , R^5 , R^6 , R^7 , R^8 , and R^9 have the definitions as described for formula I as defined in any one of claims 1 to 10;

or a compound of formula II:



wherein Y^1 , Y^2 , Y^3 , Y^4 , A , Q , T , n , p , R^1 , R^2 , R^3 , R^4 , R^5 , R^6 and R^7 have the definitions as described for formula I as defined in any one of claims 1 to 10;

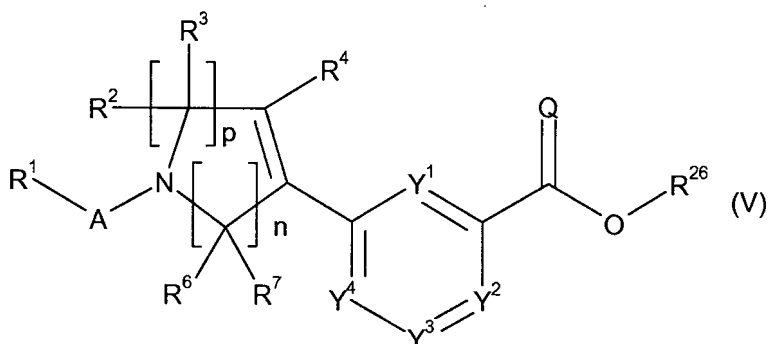
or a compound of formula IV:



wherein Y^1 , Y^2 , Y^3 , Y^4 , A, Q, T, n, p, R^1 , R^2 , R^3 , R^4 , R^5 , R^6 and R^7 have the definitions as described for formula I as defined in any one of claims 1 to 10; and R^{26} is C_1 - C_6 alkyl or optionally substituted aryl;

5

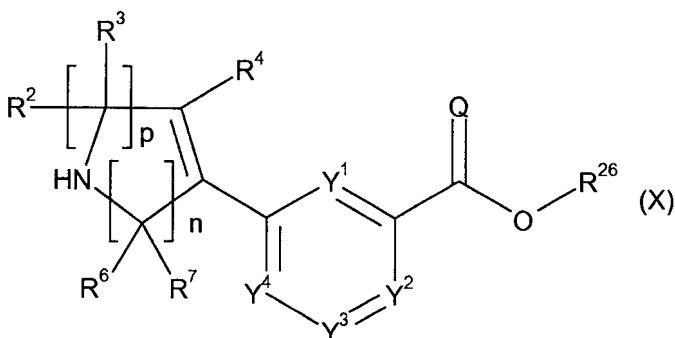
or a compound of formula V:



wherein Y^1 , Y^2 , Y^3 , Y^4 , A, Q, n, p, R^1 , R^2 , R^3 , R^4 , R^6 and R^7 , have the definitions as described for formula I as defined in any one of claims 1 to 10; and

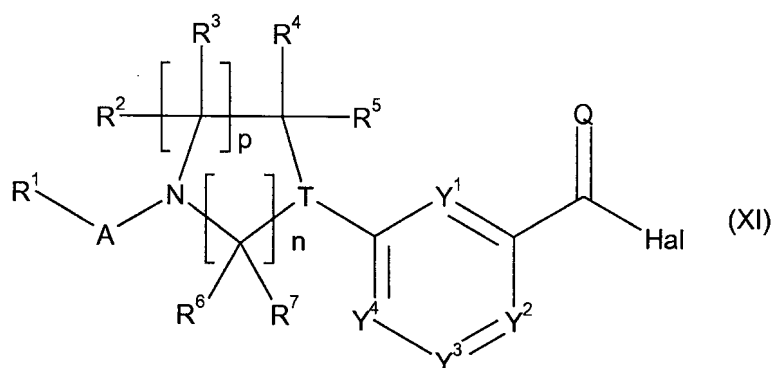
10 R^{26} is C_1 - C_6 alkyl or optionally substituted aryl;

or a compound of formula X:



15 wherein Y^1 , Y^2 , Y^3 , Y^4 , Q, n, p, R^2 , R^3 , R^4 , R^6 and R^7 have the definitions as described for formula I as defined in any one of claims 1 to 10; and R^{26} is C_1 - C_6 alkyl or optionally substituted aryl;

or a compound of formula XI:



wherein $Y^1, Y^2, Y^3, Y^4, A, Q, n, p, R^1, R^2, R^3, R^4, R^5, R^6$ and R^7 , have the definitions as described for formula I as defined in any one of claims 1 to 10; and Hal stands for halogen.

5

12. A compound according to claim 11, wherein R^{26} is C_1 - C_6 alkyl or phenyl optionally substituted with 1 to 3 substituents independently selected from C_1 - C_4 alkyl, C_1 - C_4 haloalkyl, hydroxyl, amino, cyano and halogen.

10

13. A fungicidal composition comprising at least one compound as defined in any one of claims 1 to 10 and an agriculturally acceptable carrier, optionally comprising an adjuvant, and optionally comprising at least one additional fungicidally active compound.

15

14. A method of controlling or preventing an infestation of plants, propagation material thereof, harvested crops or non-living materials by phytopathogenic or spoilage microorganisms or organisms potentially harmful to man, which comprises the application of a compound as defined in any one of claims 1 to 10 to the plant, to parts of the plant or to the locus thereof, or to the propagation material thereof, or to any part of the non-living materials.

20

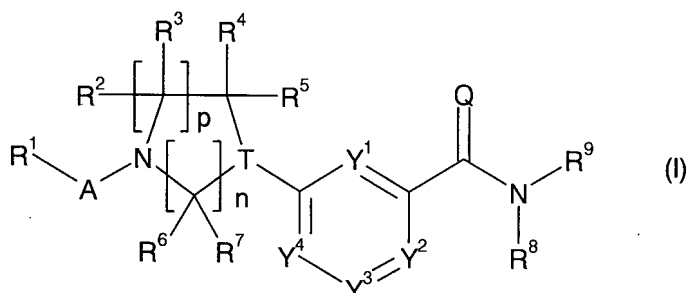
15. The method according to claim 14, wherein the phytopathogenic microorganisms are fungal organisms.

HETEROCICLOS MICROBICIDAS

La presente invención trata acerca de heterociclos, por ejemplo como ingredientes activos, los cuales tienen actividad microbicida, en particular actividad fungicida. También, la invención trata acerca de la preparación de estos heterociclos, de derivados heterocíclicos utilizados como intermediarios en la preparación de estos heterociclos, de la preparación de estos intermediarios, de composiciones agroquímicas las cuales comprenden al menos uno de los heterociclos, de la preparación de estas composiciones y del uso de los heterociclos o de las composiciones en la agricultura o la horticultura, para controlar o evitar la infestación de plantas, cultivos comestibles cosechados, semillas o materiales no vivientes, por parte de microorganismos fitopatógenos, preferiblemente hongos.

Ciertos heterociclos utilizados como fungicidas son descritos en los documentos WO 2007/014290, WO 2008/013622, WO 2008/013925, WO 2008/091580, WO 2008/091594 y WO 2009/055514.

La presente invención provee compuestos de fórmula I:



en donde

A es $x\text{-C(R}^{10}\text{R}^{11}\text{)-C(=O)-}$, $x\text{-C(R}^{12}\text{R}^{13}\text{)-C(=S)-}$, $x\text{-O-C(=O)-}$, $x\text{-O-C(=S)-}$, $x\text{-N(R}^{14}\text{)-C(=O)-}$, $x\text{-N(R}^{15}\text{)-C(=S)-}$, $x\text{-C(R}^{16}\text{R}^{17}\text{)-SO}_2\text{-}$ o $x\text{-N=C(R}^{30}\text{)-}$ en cada caso x representa el enlace que está conectado a R¹;

T es CR¹⁸ o N;

Y¹, Y², Y³, y Y⁴ son independientemente CR¹⁹ o N;

Q es O o S;

n es 1 o 2;

p es 1 o 2, con la condición de que cuando n es 2, p es 1.

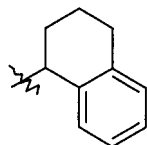
R¹ es fenilo, piridilo, imidazolilo, o pirazolilo; en donde cada uno de fenilo, piridilo, imidazolilo y pirazolilo están sustituidos opcionalmente con entre 1 y 3 sustituyentes

- 5 escogidos independientemente entre alquilo C₁-C₄, haloalquilo C₁-C₄, halógeno, ciano, hidroxí y amino;

R², R³, R⁴, R⁵, R⁶, R⁷, R¹⁰, R¹¹, R¹², R¹³, R¹⁶, R¹⁷, R¹⁸, R¹⁹ y R³⁰ son, cada uno independientemente, hidrógeno, halógeno, ciano, alquilo C₁-C₄, o haloalquilo C₁-C₄;

R⁸, R¹⁴ y R¹⁵ son, cada uno independientemente, hidrógeno o alquilo C₁-C₄; y

- 10 R⁹ es fenilo, bencilo o el grupo (a):



(a)

en donde cada uno de fenilo, bencilo y el grupo (a) están sustituidos opcionalmente con entre 1 y 3 sustituyentes escogidos independientemente entre alquilo C₁-C₄, haloalquilo

- 15 C₁-C₄, halógeno, ciano, hidroxí y amino;

o una sal o un N-óxido del mismo.

Cuando se indica que los sustituyentes están sustituidos opcionalmente, esto significa que puede que los mismos incluyan, o no incluyan, uno o más sustituyentes idénticos o diferentes. Normalmente, no más de tres de tales sustituyentes opcionales

- 20 están presentes al mismo tiempo.

El término "halógeno" se refiere a flúor, cloro, bromo o yodo.

El término "amino" se refiere a -NH₂.

Los sustituyentes alquilo, alquenilo o alquinilo pueden ser lineales o ramificados.

Como sustituyente individual o como parte de otro sustituyente, alquilo es, dependiendo

- 25 del número de átomos de carbono mencionados, por ejemplo, metilo, etilo, n-propilo, n-

butilo, n-pentilo, n-hexilo y los isómeros de los mismos, por ejemplo, iso-propilo, iso-butilo, sec-butilo, terc-butilo, iso-amilo o pivaloilo.

Un grupo haloalquilo puede contener uno o más átomos de halógeno, idénticos o diferentes y, por ejemplo, puede corresponder a CH_2Cl , CHCl_2 , CCl_3 , CH_2F , CHF_2 , CF_3 ,
5 CF_3CH_2 , CH_3CF_2 , CF_3CF_2 o CCl_3CCl_2 .

La presencia de uno o más átomos asimétricos de carbono posibles en un compuesto de fórmula I significa que los compuestos pueden existir en formas isoméricas ópticas, es decir formas enantioméricas o diastereoisoméricas. Como un resultado de la presencia de un enlace doble alifático $\text{C}=\text{C}$ posible, se puede presentar isomería
10 geométrica, es decir isomería cis-trans o (E)-(Z). También, se pueden presentar atropoisómeros como resultado de la rotación restringida con respecto a un enlace sencillo. Se pretende que la Fórmula I incluya todas aquellas formas isoméricas y mezclas de las mismas que sean posibles. La presente invención incluye a todas aquellas formas isoméricas y mezclas de las mismas que sean posibles para un compuesto de fórmula I.
15 De forma similar, se pretende que la Fórmula I incluya a todos los tautómeros posibles. La presente invención incluye a todas las formas tautoméricas posibles para un compuesto de fórmula I.

En cada caso, los compuestos de fórmula I de conformidad con la invención están en forma libre, en forma oxidada como un N-óxido o en forma de sal, por ejemplo una
20 forma de sal utilizable agronómicamente.

Los N-óxidos son formas oxidadas de aminas terciarias o formas oxidadas de compuestos heteroaromáticos nitrogenados. Por ejemplo, son descritos en el libro "Heterocyclic N-oxides" por A. Albini y S. Pietra, CRC Press, Boca Raton 1991.

Las sales adecuadas de los compuestos de fórmula I incluyen a aquellas que se
25 producen tras la adición de ácido, tal y como aquellas formadas con un ácido inorgánico mineral, por ejemplo ácido clorhídrico, bromhídrico, sulfúrico, nítrico o fosfórico, o un ácido carboxílico orgánico, por ejemplo ácido oxálico, tartárico, láctico, butírico, toluico,

hexanoico o ftálico, o un ácido sulfónico, por ejemplo ácido metano, benceno o tolueno sulfónico.

Preferiblemente el compuesto de fórmula I es un compuesto en donde:

A es $x-C(R^{10}R^{11})-C(=O)-$, $x-C(R^{12}R^{13})-C(=S)-$, $x-O-C(=O)-$, $x-O-C(=S)-$, $x-N(R^{14})-C(=O)-$, $x-N(R^{15})-C(=S)-$ o $x-C(R^{16}R^{17})-SO_2-$, en cada caso x representa el enlace que está conectado a R^1 ;

T es CR^{18} o N;

Y^1 , Y^2 , Y^3 , y Y^4 son independientemente CR^{19} o N;

Q es O o S;

10 n es 1 o 2;

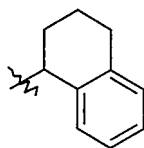
p es 1 o 2, con la condición de que cuando n es 2, p es 1.

R^1 es fenilo, piridilo, imidazolilo, o pirazolilo; en donde cada uno de fenilo, piridilo, imidazolilo y pirazolilo están sustituidos opcionalmente con entre 1 y 3 sustituyentes escogidos independientemente entre alquilo C_1-C_4 , haloalquilo C_1-C_4 , halógeno, ciano, 15 hidroxi y amino;

R^2 , R^3 , R^4 , R^5 , R^6 , R^7 , R^{10} , R^{11} , R^{12} , R^{13} , R^{16} , R^{17} , R^{18} y R^{19} son, cada uno independientemente, hidrógeno, halógeno, ciano, alquilo C_1-C_4 , o haloalquilo C_1-C_4 ;

R^8 , R^{14} y R^{15} son, cada uno independientemente, hidrógeno o alquilo C_1-C_4 ; y

R^9 es fenilo, bencilo o el grupo (a):



20

(a)

en donde cada uno de fenilo, bencilo y el grupo (a) están sustituidos opcionalmente con entre 1 y 3 sustituyentes escogidos independientemente entre alquilo C_1-C_4 , haloalquilo C_1-C_4 , halógeno, ciano, hidroxi y amino;

25 o una sal o un N-óxido del mismo.

Preferiblemente el compuesto de fórmula I es un compuesto en donde:

A es $x-C(R^{10}R^{11})-C(=O)-$, $x-C(R^{12}R^{13})-C(=S)-$, $x-O-C(=O)-$, $x-O-C(=S)-$, o $x-C(R^{16}R^{17})-SO_2-$,

en cada caso x representa el enlace que está conectado a R^1 ;

T es CR^{18} o N;

- 5 Y^1 , Y^2 , Y^3 , y Y^4 son independientemente CR^{19} o N con la condición de que al menos 2 entre Y^1 , Y^2 , Y^3 , y Y^4 sean CR^{19} ;

Q es O o S;

n es 1 o 2;

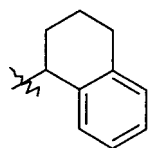
p es 1;

- 10 R^1 es fenilo o pirazolilo; en donde cada uno de fenilo y pirazolilo están sustituidos opcionalmente con entre 1 y 3 sustituyentes escogidos independientemente entre alquilo C_1-C_4 , haloalquilo C_1-C_4 , halógeno, ciano, hidroxilo, y amino;

R^2 , R^3 , R^4 , R^5 , R^6 , R^7 , R^{10} , R^{11} , R^{12} , R^{13} , R^{16} , R^{17} , R^{18} , y R^{19} son, cada uno independientemente, hidrógeno, halógeno, alquilo C_1-C_4 , haloalquilo C_1-C_4 ;

- 15 R^8 es hidrógeno o alquilo C_1-C_4 ; y

R^9 es fenilo, bencilo o el grupo (a):



(a)

- en donde cada uno de fenilo, bencilo y el grupo (a) están sustituidos opcionalmente con entre 1 y 3 sustituyentes escogidos independientemente entre alquilo C_1-C_4 , haloalquilo C_1-C_4 , halógeno, ciano, hidroxilo y amino.
- 20

Preferiblemente el compuesto de fórmula I es un compuesto en donde:

A es $x-CR^{10}R^{11}-C(=O)-$, $x-O-C(=O)-$, o $x-CR^{16}R^{17}-SO_2-$, en cada caso x representa el enlace que está conectado a R^1 ;

- 25 T es CR^{18} ;

Y^1, Y^2, Y^3 , y Y^4 son independientemente CR^{19} o N con la condición de que al menos 2 entre Y^1, Y^2, Y^3 , y Y^4 sean CR^{19} y con la condición de que no haya enlaces N-N en el anillo que contiene a Y^1, Y^2, Y^3 , y Y^4 ;

Q es O o S;

5 n es 1 o 2;

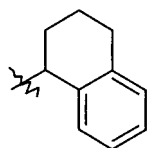
p es 1;

R^1 es fenilo o pirazolilo, en donde cada uno de fenilo y pirazolilo están sustituidos opcionalmente con entre 1 y 3 sustituyentes escogidos independientemente entre alquilo C_1-C_4 , haloalquilo C_1-C_4 , y halógeno;

10 $R^2, R^3, R^4, R^5, R^6, R^7, R^{10}, R^{11}, R^{16}, R^{17}, R^{18}$, y R^{19} son, cada uno independientemente, hidrógeno, fluoro, o metilo;

R^8 es hidrógeno o metilo; y

R^9 es fenilo, bencilo o el grupo (a)



15 (a)

en donde cada uno de fenilo, bencilo y el grupo (a) están sustituidos opcionalmente con entre 1 y 3 sustituyentes escogidos independientemente entre alquilo C_1-C_4 , haloalquilo C_1-C_4 , hidroxilo y halógeno.

Preferiblemente el compuesto de fórmula I es un compuesto en donde:

20 A es $x-CH_2-C(=O)-$, $x-O-C(=O)-$ o $x-CH_2-SO_2-$, en cada caso x representa el enlace que está conectado a R^1 ;

T es CH;

Y^1, Y^2, Y^3 , y Y^4 son independientemente CH o N con la condición de que al menos 2 entre Y^1, Y^2, Y^3 , y Y^4 sean CH y con la condición de que no haya enlaces N-N en el anillo que

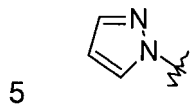
25 contiene a Y^1, Y^2, Y^3 , y Y^4 ;

Q es O;

n es 1 o 2;

p es 1;

R¹ es fenilo o el grupo (b)



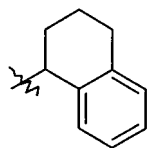
(b)

en donde cada uno de fenilo y grupo (b) están sustituidos opcionalmente con entre 1 y 3 sustituyentes escogidos independientemente entre halógeno, alquilo C₁-C₄ y haloalquilo C₁-C₄;

10 R², R³, R⁴, R⁵, R⁶ y R⁷ son, cada uno, hidrógeno;

R⁸ es hidrógeno o metilo; y

R⁹ es fenilo, bencilo o el grupo (a):



(a)

15 en donde cada uno de fenilo, bencilo y el grupo (a) están sustituidos opcionalmente con entre 1 y 3 sustituyentes escogidos independientemente entre alquilo C₁-C₄, haloalquilo C₁-C₄, hidroxí y halógeno.

Preferiblemente el compuesto de fórmula I es un compuesto en donde:

A es x-CH₂-C(=O)-, en donde x representa el enlace que está conectado a R¹;

20 T es CH;

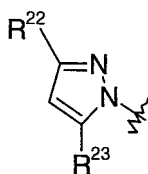
Y¹, Y², Y³, y Y⁴ son independientemente CH;

Q es O;

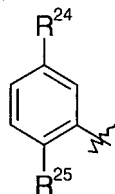
n es 2;

p es 1;

R^1 es escogido entre los grupos (c) o (d):



(c)



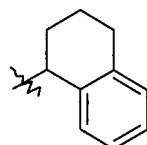
(d)

- en donde R^{22} , R^{23} , R^{24} y R^{25} son escogidos independientemente entre hidrógeno, halógeno, metilo y halometilo;

R^2 , R^3 , R^4 , R^5 , R^6 , y R^7 son, cada uno, hidrógeno;

R^8 es hidrógeno o metilo; y

R^9 es fenilo, bencilo o el grupo (a)



(a)

10

en donde cada uno de fenilo, bencilo y el grupo (a) están sustituidos opcionalmente con entre 1 y 3 sustituyentes escogidos independientemente entre metilo, halometilo, y halógeno.

También, la invención trata acerca de compuestos de fórmula I en donde

- 15 A es $x-CH_2-C(=O)-$, $x-CH_2C(=S)-$, $x-OC(=O)-$, $x-CH_2SO_2-$, en cada caso x es el enlace con R^1 ;

T es CH o N;

Y^1 , Y^2 , Y^3 , y Y^4 son independientemente CH o N, con la condición de que al menos 2 entre Y^1 , Y^2 , Y^3 , y Y^4 sean CH y con la condición de que no haya enlaces N-N en el anillo que

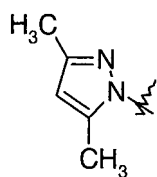
- 20 contiene a Y^1 , Y^2 , Y^3 ;

Q es O o S;

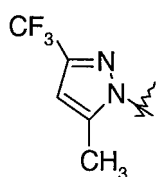
n es 1 o 2;

p es 1 o 2, con la condición de que cuando n es 2, p es 1;

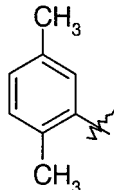
R^1 es el grupo (e), (f), (g), o (h):



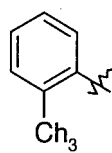
(e)



(f)



(g)

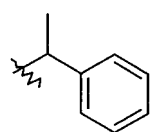


(h)

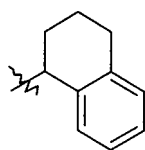
R^2 , R^3 , R^4 , R^5 , R^6 y R^7 son, cada uno, hidrógeno;

5 R^8 es hidrógeno o metilo;

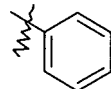
R^9 es el grupo (i), (j), o (k):



(i)



(j)



(k)

La lista siguiente provee definiciones, incluyendo a las definiciones preferidas, de
 10 los sustituyentes A, T, Y^1 , Y^2 , Y^3 , Y^4 , Q, n, p, R^1 , R^2 , R^3 , R^4 , R^5 , R^6 , R^7 , R^8 , R^9 , R^{10} , R^{11} ,
 R^{12} , R^{13} , R^{14} , R^{15} , R^{16} , R^{17} , R^{18} , R^{19} , R^{22} , R^{23} , R^{24} , R^{25} y R^{30} con respecto a los compuestos
 de fórmula I. Para cualesquiera de estos sustituyentes, cualesquiera de las definiciones
 dadas más adelante pueden ser combinadas con cualquier definición de cualquier otro
 sustituyente, dada más adelante. La invención incluye compuestos de fórmula, los cuales
 15 tienen todas las combinaciones posibles de las definiciones de sustituyentes dadas más
 adelante o en cualquier otro lugar de este documento. Por lo general, en este documento
 cualquier definición de sustituyente puede ser combinada con cualquier otra definición de
 sustituyente.

A es $x-C(R^{10}R^{11})-C(=O)-$, $x-C(R^{12}R^{13})-C(=S)-$, $x-O-C(=O)-$, $x-O-C(=S)-$, $x-N(R^{14})-$
 20 $C(=O)-$, $x-N(R^{15})-C(=S)-$ o $x-C(R^{16}R^{17})-SO_2-$, en cada caso x representa el enlace que está
 conectado a R^1 . Preferiblemente, A es $x-C(R^{10}R^{11})-C(=O)-$, $x-C(R^{12}R^{13})-C(=S)-$, $x-O-$
 $C(=O)-$, $x-O-C(=S)-$, o $x-C(R^{16}R^{17})-SO_2-$, en cada caso x representa el enlace que está
 conectado a R^1 . Más preferiblemente, A es $x-CR^{10}R^{11}-C(=O)-$, $x-O-C(=O)-$, o $x-CR^{16}R^{17}-$

SO₂-, en cada caso x representa el enlace que está conectado a R¹. Aún más preferiblemente, A es x-CH₂-C(=O)-, x-CH₂C(=S)-, x-OC(=O)-, x-CH₂SO₂-, en cada caso x representa el enlace que está conectado a R¹. Todavía más preferiblemente, A es x-CH₂-C(=O)-, x-O-C(=O)- o x-CH₂-SO₂-, en cada caso x representa el enlace que está
 5 conectado a R¹. Lo más preferible es que A sea x-CH₂-C(=O)-, en donde x representa el enlace que está conectado a R¹.

T es CR¹⁸ o N. Preferiblemente, T es CH o N. Lo más preferible es que T sea CH.

n es 1 o 2. Preferiblemente, n es 2.

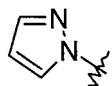
p es 1 o 2, con la condición de que cuando n es 2, p es 1. Preferiblemente, p es 1.

10 Y¹, Y², Y³, y Y⁴ son independientemente CR¹⁹ o N, por ejemplo Y¹, Y², Y³, y Y⁴ pueden ser, independientemente, CH o N. Más preferiblemente, Y¹, Y², Y³, y Y⁴ son independientemente CR¹⁹ o N con la condición de que al menos 2 entre Y¹, Y², Y³, y Y⁴ sean CR¹⁹. Aún más preferiblemente, Y¹, Y², Y³, y Y⁴ son independientemente CR¹⁹ o N con la condición de que al menos 2 entre Y¹, Y², Y³, y Y⁴ son CR¹⁹ y con la condición de
 15 que no haya enlaces N-N en el anillo que contiene a Y¹, Y², Y³, y Y⁴. Todavía más preferiblemente, Y¹, Y², Y³, y Y⁴ son independientemente CH o N con la condición de que al menos 2 entre Y¹, Y², Y³, y Y⁴ sean CH y con la condición de que no haya enlaces N-N en el anillo que contiene a Y¹, Y², Y³, y Y⁴.

Q es O o S. Preferiblemente, Q es O.

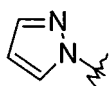
20 R¹ es fenilo, piridilo, imidazolilo, o pirazolilo; en donde cada uno de fenilo, piridilo, imidazolilo y pirazolilo están sustituidos opcionalmente con entre 1 y 3 sustituyentes escogidos independientemente entre alquilo C₁-C₄, haloalquilo C₁-C₄, halógeno, ciano, hidroxí y amino. Preferiblemente, R¹ es fenilo o pirazolilo; en donde cada uno de fenilo y pirazolilo están sustituidos opcionalmente con entre 1 y 3 sustituyentes escogidos
 25 independientemente entre alquilo C₁-C₄, haloalquilo C₁-C₄, halógeno, ciano, hidroxí, y amino. Más preferiblemente, R¹ es fenilo o pirazolilo, en donde cada uno de fenilo y pirazolilo están sustituidos opcionalmente con entre 1 y 3 sustituyentes escogidos

independientemente entre alquilo C₁-C₄, haloalquilo C₁-C₄, y halógeno. Todavía más preferiblemente, R¹ es fenilo o el grupo (b):



(b)

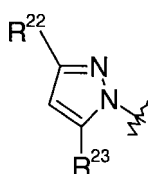
- 5 en donde cada uno de fenilo y grupo (b) están sustituidos opcionalmente con entre 1 y 3 sustituyentes escogidos independientemente entre halógeno, alquilo C₁-C₄ y haloalquilo C₁-C₄. Aún más preferiblemente, R¹ es fenilo o el grupo (b):



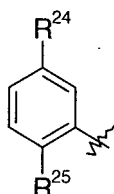
(b)

- 10 en donde cada uno de fenilo y grupo (b) están sustituidos opcionalmente con entre 1 y 3 sustituyentes escogidos independientemente entre halógeno, metilo y halometilo.

En un grupo de compuestos R¹ es escogido entre los grupos (c) o (d):



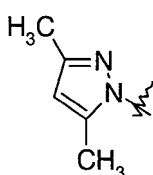
(c)



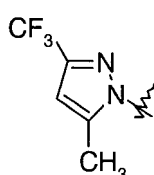
(d)

- 15 en donde R²², R²³, R²⁴ y R²⁵ son escogidos independientemente entre hidrógeno, halógeno, metilo y halometilo.

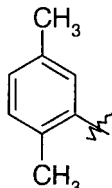
En un grupo de compuestos R¹ es el grupo (e), (f), (g), o (h):



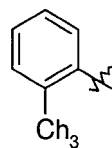
(e)



(f)



(g)



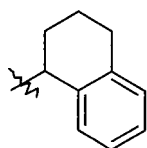
(h)

- $R^2, R^3, R^4, R^5, R^6, R^7, R^{10}, R^{11}, R^{12}, R^{13}, R^{16}, R^{17}, R^{18}$ y R^{19} son, cada uno independientemente, hidrógeno, halógeno, ciano, alquilo C_1-C_4 , o haloalquilo C_1-C_4 . Más preferiblemente, $R^2, R^3, R^4, R^5, R^6, R^7, R^{10}, R^{11}, R^{12}, R^{13}, R^{16}, R^{17}, R^{18}$, y R^{19} son, cada uno independientemente, hidrógeno, halógeno, alquilo C_1-C_4 , haloalquilo C_1-C_4 . Aún más preferiblemente, $R^2, R^3, R^4, R^5, R^6, R^7, R^{10}, R^{11}, R^{16}, R^{17}, R^{18}$, y R^{19} son, cada uno independientemente, hidrógeno, fluoro, o metilo. Todavía más preferiblemente, $R^2, R^3, R^4, R^5, R^6, R^7, R^{10}, R^{11}, R^{16}, R^{17}, R^{18}$, y R^{19} son, cada uno, hidrógeno.

R^8, R^{14} y R^{15} son, cada uno independientemente, hidrógeno o alquilo C_1-C_4 . Preferiblemente, R^8, R^{14} y R^{15} son, cada uno independientemente, hidrógeno o metilo.

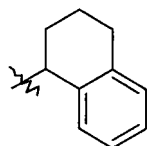
- 10 Preferiblemente, R^8, R^{14} y R^{15} son, cada uno, hidrógeno.

R^9 es fenilo, bencilo o el grupo (a):



(a)

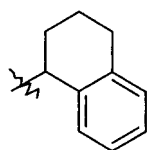
- en donde cada uno de fenilo, bencilo y el grupo (a) están sustituidos opcionalmente con entre 1 y 3 sustituyentes escogidos independientemente entre alquilo C_1-C_4 , haloalquilo C_1-C_4 , halógeno, ciano, hidroxilo y amino. Preferiblemente, R^9 es fenilo, bencilo o el grupo (a):



(a)

- 20 en donde cada uno de fenilo, bencilo y el grupo (a) están sustituidos opcionalmente con entre 1 y 3 sustituyentes escogidos independientemente entre alquilo C_1-C_4 , haloalquilo C_1-C_4 , hidroxilo y halógeno.

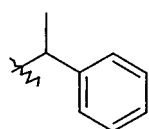
Más preferiblemente, R^9 es fenilo, bencilo o el grupo (a):



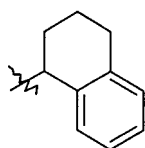
(a)

en donde cada uno de fenilo, bencilo y el grupo (a) están sustituidos opcionalmente con entre 1 y 3 sustituyentes escogidos independientemente entre metilo, halometilo, y
5 halógeno.

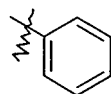
En un grupo de compuestos R^9 es (i), (j), o (k):



(i)



(j)



(k)

Preferiblemente, R^{22} es hidrógeno o CF_3 . Preferiblemente, R^{23} , R^{24} , y R^{25} son
10 independientemente hidrógeno o metilo.

R^{30} es hidrógeno, halógeno, ciano, alquilo C_1-C_4 , o haloalquilo C_1-C_4 .
Preferiblemente, R^{30} es hidrógeno, halógeno, alquilo C_1-C_4 , o haloalquilo C_1-C_4 .
Preferiblemente, R^{30} es hidrógeno, fluoro, o metilo. Más preferiblemente, R^{30} es
hidrógeno.

15 En un grupo de compuestos al menos dos entre Y^1 , Y^2 , Y^3 y Y^4 son CH y los otros
entre Y^1 , Y^2 , Y^3 y Y^4 son CH o N.

En un grupo de compuestos al menos tres entre Y^1 , Y^2 , Y^3 y Y^4 son CH y el otro
entre Y^1 , Y^2 , Y^3 y Y^4 son CH o N.

En un grupo de compuestos Y^1 y Y^4 son CH, uno entre Y^2 y Y^3 es CH y el otro
20 entre Y^2 y Y^3 es CH o N.

En un grupo de compuestos Y^1 , Y^2 y Y^4 son CH, y Y^3 es N.

En un grupo de compuestos Y^1 , Y^3 y Y^4 son CH, y Y^2 es N.

En un grupo de compuestos Y^1 , Y^2 , Y^3 y Y^4 son CH.

En un grupo de compuestos Y^2 es N.

En un grupo de compuestos Y^3 es N.

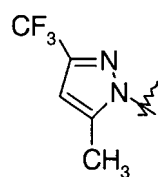
En un grupo de compuestos p es 1 y n es 2.

En un grupo de compuestos R^2 , R^3 , R^4 , R^5 , R^6 y R^7 son H.

5 En un grupo de compuestos Q es O.

En un grupo de compuestos A es $x-CH_2-C(=O)-$, en donde x representa al enlace que está conectado a R^1 .

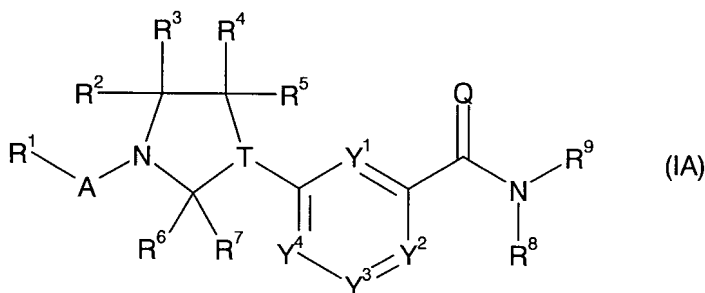
En un grupo de compuestos R^1 es el grupo (f)



10 (f)

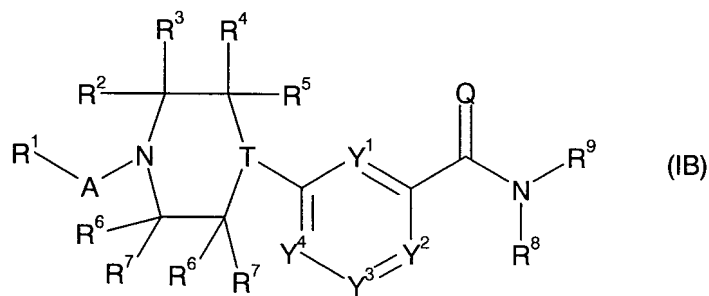
En un grupo de compuestos R^8 es hidrógeno.

Para evitar dudas, cuando n es 1 y p es 1, los compuestos de fórmula I tienen la fórmula de conformidad con la fórmula IA:



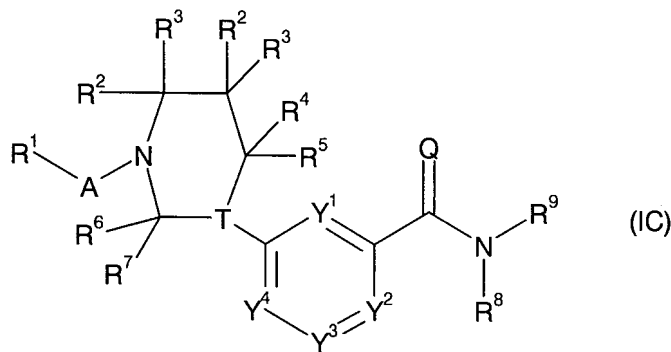
15 en la cual A, T, Y^1 , Y^2 , Y^3 , Y^4 , Q, R^1 , R^2 , R^3 , R^4 , R^5 , R^6 , R^7 , R^8 , y R^9 tienen las definiciones tales como fueron descritas para la fórmula I.

Cuando n es 2 y p es 1, los compuestos de fórmula I tienen la fórmula de conformidad con la fórmula IB:



en la cual A, T, G, Y¹, Y², Y³, Y⁴, Q, R¹, R², R³, R⁴, R⁵, R⁶, R⁷, R⁸, y R⁹ tienen las definiciones tales como fueron descritas para la fórmula I.

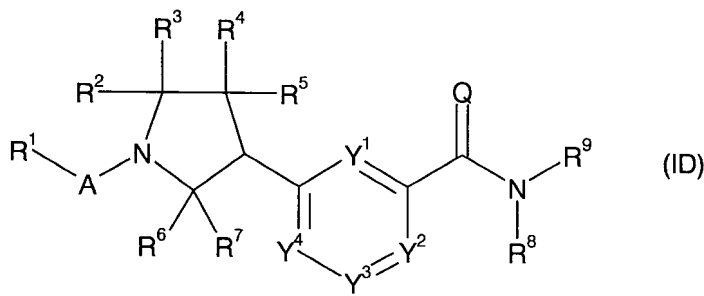
5 Cuando n es 1 y p es 2, los compuestos de fórmula I tienen la fórmula de conformidad con la fórmula IC:



en la cual A, T, G, Y¹, Y², Y³, Y⁴, Q, R¹, R², R³, R⁴, R⁵, R⁶, R⁷, R⁸, y R⁹ tienen las definiciones tales como fueron descritas para la fórmula I.

10 También, la invención trata acerca de compuestos de fórmula IA, fórmula IB, y fórmula IC, tal y como se mostró anteriormente.

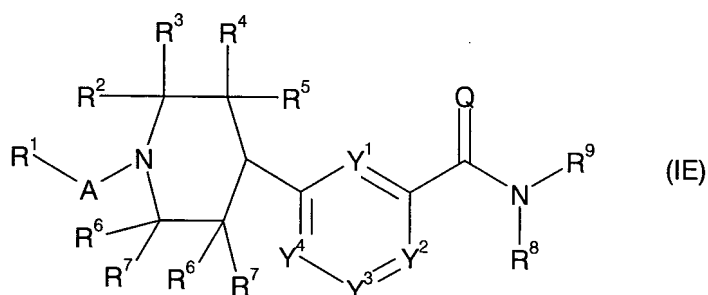
También, la invención trata acerca de compuestos de fórmula ID:



en donde Y¹, Y², Y³, Y⁴, A, Q, R¹, R², R³, R⁴, R⁵, R⁶, R⁷, R⁸, y R⁹ tienen las definiciones tales como fueron descritas para la fórmula I, tal y como se definió

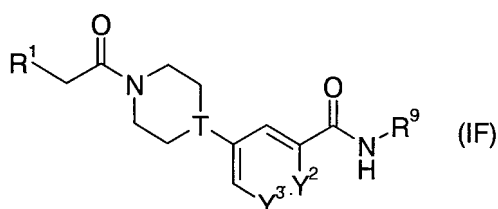
anteriormente. Las definiciones preferidas de Y^1 , Y^2 , Y^3 , Y^4 , A, Q, R^1 , R^2 , R^3 , R^4 , R^5 , R^6 , R^7 , R^8 , y R^9 son tales como se definió anteriormente.

También, la invención trata acerca de compuestos de fórmula IE:



- 5 en donde Y^1 , Y^2 , Y^3 , Y^4 , A, Q, R^1 , R^2 , R^3 , R^4 , R^5 , R^6 , R^7 , R^8 , y R^9 tienen las definiciones tales como fueron descritas para la fórmula I, tal y como se definió anteriormente. Las definiciones preferidas de Y^1 , Y^2 , Y^3 , Y^4 , A, Q, R^1 , R^2 , R^3 , R^4 , R^5 , R^6 , R^7 , R^8 , y R^9 son tal y como se definió anteriormente.

También, la invención trata acerca de un compuesto de fórmula IF:



10

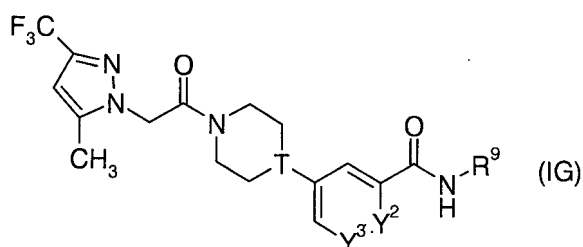
en donde T es N o CH;

Y^2 y Y^3 son: ambos CH, o uno entre Y^3 y Y^2 es N y el otro es CH; y

R^1 y R^9 son tales como se describieron para un compuesto de fórmula I, tal y como se definió anteriormente. Las definiciones preferidas de R^1 y R^9 son tales como se definieron

15 anteriormente

También, la invención trata acerca de un compuesto de fórmula IG:



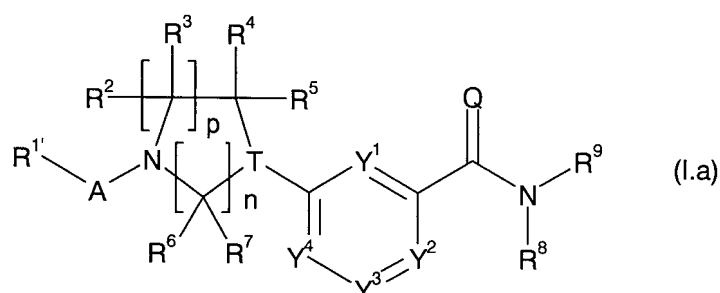
en donde T es N o CH;

Y^2 y Y^3 son: ambos CH, o uno entre Y^3 y Y^2 es N y el otro es CH; y

R^9 es tal y como se describió para un compuesto de fórmula I, tal y como se definió anteriormente. Las definiciones preferidas de R^9 son tales como se definieron

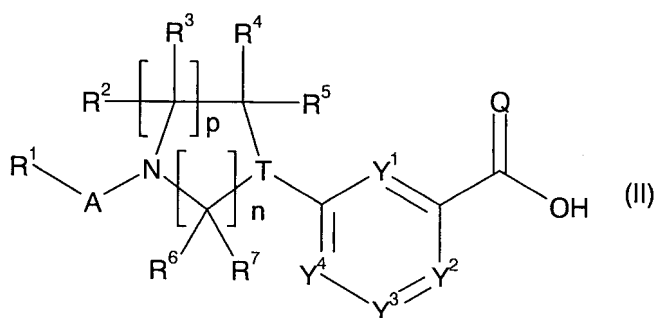
5 anteriormente.

También, la invención incluye compuestos de fórmula I en los cuales R^1 es un grupo protector, tal y como un grupo alquilo. Por consiguiente, la invención incluye compuestos de fórmula I.a:



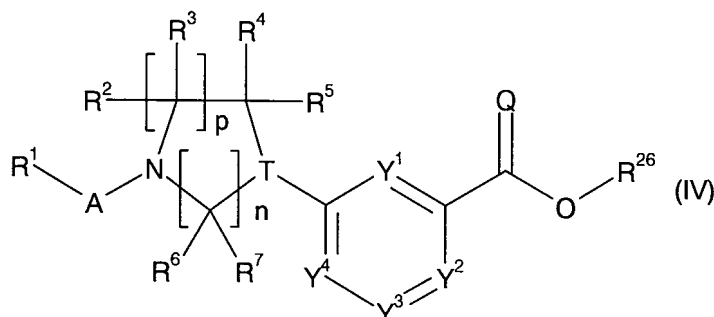
10 en donde $R^{1'}$ es alquilo C_1-C_8 , por ejemplo alquilo C_1-C_4 , preferiblemente terc-butilo, y Y^1 , Y^2 , Y^3 , Y^4 , A, Q, T, n, p, R^2 , R^3 , R^4 , R^5 , R^6 , R^7 , R^8 , y R^9 tienen las definiciones tales como fueron descritas para la fórmula I, tal y como se definió anteriormente. Las definiciones preferidas de Y^1 , Y^2 , Y^3 , Y^4 , A, Q, T, n, p, R^2 , R^3 , R^4 , R^5 , R^6 , R^7 , R^8 , y R^9 son tales como se definieron anteriormente.

15 **También, la invención trata acerca de otros intermediarios útiles para la preparación de los** compuestos de fórmula I. Por consiguiente, la invención trata acerca de un compuesto de fórmula II:



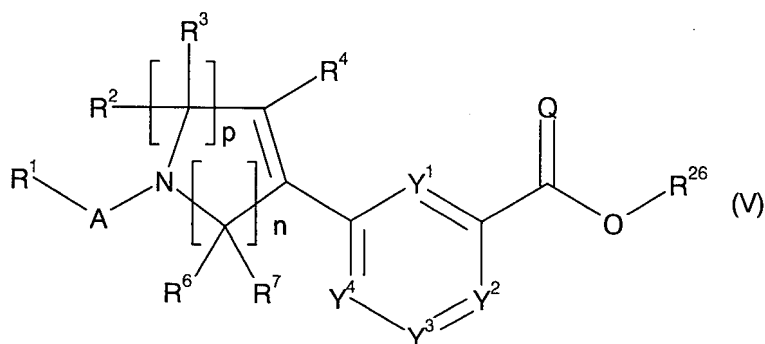
en donde Y^1 , Y^2 , Y^3 , Y^4 , A, Q, T, n, p, R^1 , R^2 , R^3 , R^4 , R^5 , R^6 y R^7 tienen las definiciones tales como fueron descritas para la fórmula I, tal y como se definió anteriormente. Las definiciones preferidas de Y^1 , Y^2 , Y^3 , Y^4 , A, Q, T, n, p, R^1 , R^2 , R^3 , R^4 , R^5 , R^6 y R^7 son tales como se definieron anteriormente.

5 La invención trata acerca de un compuesto de fórmula IV:



en donde Y^1 , Y^2 , Y^3 , Y^4 , A, Q, T, n, p, R^1 , R^2 , R^3 , R^4 , R^5 , R^6 y R^7 , tienen las definiciones tales como fueron descritas para la fórmula I, tal y como se definió anteriormente, y las definiciones preferidas de Y^1 , Y^2 , Y^3 , Y^4 , A, Q, T, n, p, R^1 , R^2 , R^3 , R^4 , R^5 , R^6 y R^7 son tales como se definieron anteriormente; y R^{26} es alquilo C_1-C_6 o arilo sustituido opcionalmente. Preferiblemente, R^{26} es alquilo C_1-C_6 o fenilo sustituidos opcionalmente con entre 1 y 3 sustituyentes escogidos independientemente entre alquilo C_1-C_4 , haloalquilo C_1-C_4 , hidroxilo, amino, ciano y halógeno.

La invención trata acerca de un compuesto de fórmula V:

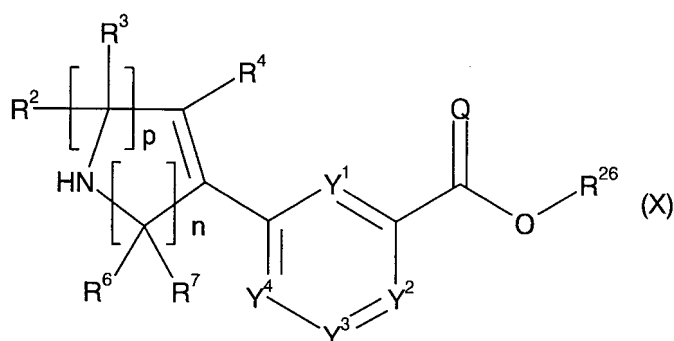


15

en donde Y^1 , Y^2 , Y^3 , Y^4 , A, Q, n, p, R^1 , R^2 , R^3 , R^4 , R^6 y R^7 , tienen las definiciones tales como fueron descritas para la fórmula I, tal y como se definió anteriormente, y las definiciones preferidas de Y^1 , Y^2 , Y^3 , Y^4 , A, Q, n, p, R^1 , R^2 , R^3 , R^4 , R^6 y R^7 son tales como

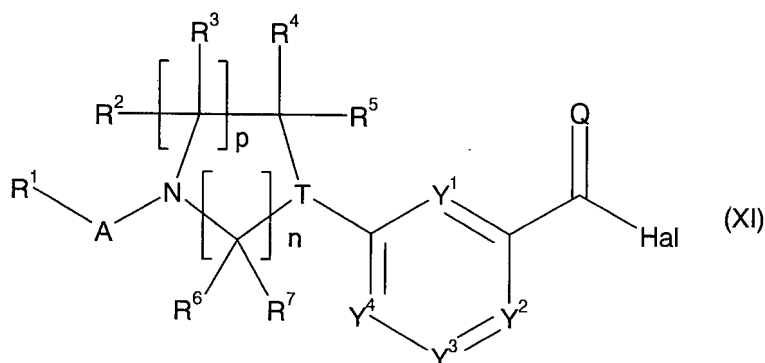
se definieron anteriormente; y R^{26} es alquilo C_1-C_6 o arilo sustituido opcionalmente. Preferiblemente, R^{26} es alquilo C_1-C_6 o fenilo sustituidos opcionalmente con entre 1 y 3 sustituyentes escogidos independientemente entre alquilo C_1-C_4 , haloalquilo C_1-C_4 , hidroxilo, amino, ciano y halógeno.

5 La invención trata acerca de un compuesto de fórmula X:



en donde Y^1 , Y^2 , Y^3 , Y^4 , Q , n , p , R^2 , R^3 , R^4 , R^6 y R^7 tienen las definiciones tales como fueron descritas para la fórmula I, tal y como se definió anteriormente, y las definiciones preferidas de Y^1 , Y^2 , Y^3 , Y^4 , Q , n , p , R^2 , R^3 , R^4 , R^6 y R^7 son tales como se definieron anteriormente; y R^{26} es alquilo C_1-C_6 o arilo sustituido opcionalmente. Preferiblemente, R^{26} es alquilo C_1-C_6 o fenilo sustituidos opcionalmente con entre 1 y 3 sustituyentes escogidos independientemente entre alquilo C_1-C_4 , haloalquilo C_1-C_4 , hidroxilo, amino, ciano y halógeno.

La invención trata acerca de un compuesto de fórmula XI:



en donde Y^1 , Y^2 , Y^3 , Y^4 , A , Q , n , p , R^1 , R^2 , R^3 , R^4 , R^5 , R^6 y R^7 , tienen las definiciones tales como fueron descritas para la fórmula I, tal y como se definió anteriormente, y las

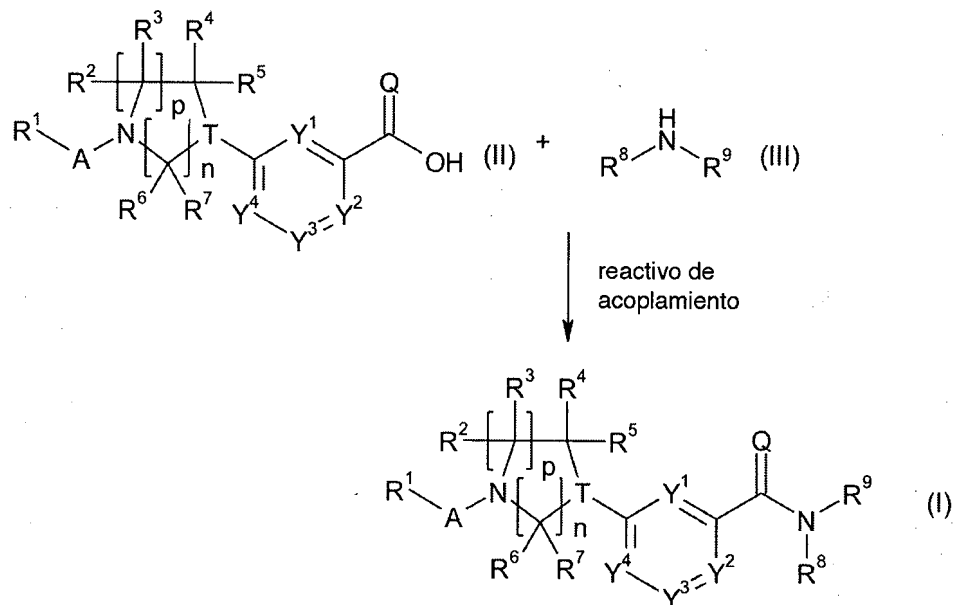
definiciones preferidas de Y¹, Y², Y³, Y⁴, A, Q, n, p, R¹, R², R³, R⁴, R⁵, R⁶ y R⁷ son tales como se definieron anteriormente; Hal se refiere a halógeno.

Los compuestos individuales preferidos son:

- 3-{1-[2-(5-metil-3-trifluorometil-pirazol-1-il)-acetil]-piperidin-4-il}-N-(*R*)-1,2,3,4-tetrahidro-
5 naftalen-1-il-benzamida (Compuesto No. I.n.001);
- 3-{1-[2-(5-metil-3-trifluorometil-pirazol-1-il)-acetil]-piperidin-4-il}-N-((*R*)-1-fenil-etil)-
benzamida (Compuesto No. I.n.003);
- 3-{1-[2-(5-metil-3-trifluorometil-pirazol-1-il)-acetil]-piperidin-4-il}-N-(1,2,3,4-tetrahidro-
naftalen-1-il)-benzamida (Compuesto No. I.n.005);
- 10 3-{1-[2-(5-metil-3-trifluorometil-pirazol-1-il)-acetil]-piperidin-4-il}-N-(1-fenil-etil)-benzamida
(Compuesto No. I.n.007);
- N-bencil-3-{1-[2-(5-metil-3-trifluorometil-pirazol-1-il)-acetil]-piperidin-4-il}-N-benzamida
(Compuesto No. I.n.009);
- 3-{1-[2-(5-metil-3-trifluorometil-pirazol-1-il)-acetil]-piperidin-4-il}-N-fenil-benzamida
15 (Compuesto No. I.n.011);
- 3-{1-[2-(2,5-Dimetil-fenil)-acetil]-piperidin-4-il}-N-(*R*)-(1,2,3,4-tetrahidro-naftalen-1-il)-
benzamida (Compuesto No. I.n.049);
- 3-{1-[2-(3,5-Dimetil-pirazol-1-il)-acetil]-piperidin-4-il}-N-(1,2,3,4-tetrahidro-naftalen-1-il)-
benzamida (Compuesto No. I.n.097);
- 20 N-metil-3-{1-[2-(5-metil-3-trifluorometil-pirazol-1-il)-acetil]-piperidin-4-il}-N-(*R*)-1,2,3,4-
tetrahidro-naftalen-1-il-benzamida (Compuesto No. I.o.001);
- N-metil-3-{1-[2-(5-metil-3-trifluorometil-pirazol-1-il)-acetil]-piperidin-4-il}-N-((*R*)-1-fenil-etil)-
benzamida (Compuesto No. I.o.003);
- N-metil-3-{1-[2-(5-metil-3-trifluorometil-pirazol-1-il)-acetil]-piperidin-4-il}-N-(1,2,3,4-
25 tetrahidro-naftalen-1-il)-benzamida (Compuesto No. I.o.005);
- N-metil-3-{1-[2-(5-metil-3-trifluorometil-pirazol-1-il)-acetil]-piperidin-4-il}-N-(1-fenil-etil)-
benzamida (Compuesto No. I.o.007);

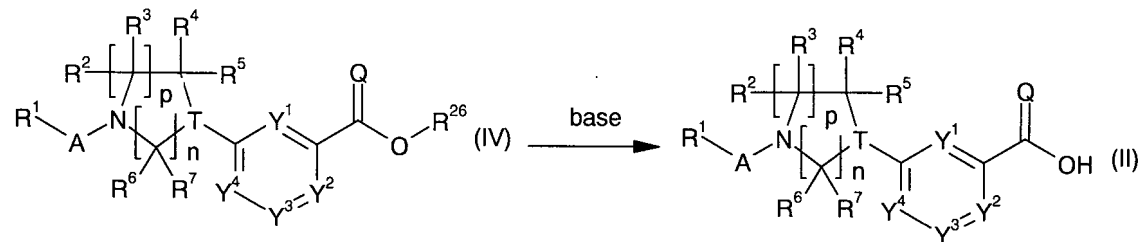
- ((*R*)-1,2,3,4-tetrahydro-naftalen-1-il)-amida del ácido 1'-[2-(5-metil-3-trifluorometil-pirazol-1-il)-acetil]-1',2',3',4',5',6'-hexahidro-[2,4']bipiridinil-6-carboxílico (Compuesto No. 1.p.001);
- (1,2,3,4-tetrahydro-naftalen-1-il)-amida del ácido 1'-[2-(5-metil-3-trifluorometil-pirazol-1-il)-acetil]-1',2',3',4',5',6'-hexahidro-[2,4']bipiridinil-6-carboxílico (Compuesto No. 1.p.005);
- 5 (1-fenil-etil)-amida del ácido 1'-[2-(5-metil-3-trifluorometil-pirazol-1-il)-acetil]-1',2',3',4',5',6'-hexahidro-[2,4']bipiridinil-6-carboxílico (Compuesto No. 1.p.007); (*R*)-(1,2,3,4-tetrahydro-naftalen-1-il)-amida del ácido 1'-[2-(5-metil-3-trifluorometil-pirazol-1-il)-acetil]-1',2',3',4',5',6'-hexahidro-[3,4']bipiridinil-5-carboxílico (Compuesto No. 1.t.001);
- (*R*)-(1,2,3,4-tetrahydro-naftalen-1-il)-amida del ácido 1'-[2-(5-metil-3-trifluorometil-pirazol-1-il)-acetil]-1',2',3',4',5',6'-hexahidro-[4,4']bipiridinil-2-carboxílico (Compuesto No. 1.v.001);
- 10 3-{4-[2-(3,5-Dimetil-pirazol-1-il)-acetil]-piperazin-1-il}-N-(*R*)-(1,2,3,4-tetrahydro-naftalen-1-il)-benzamida (Compuesto No. 1.z.001); y
- 3-{4-[2-(3,5-Dimetil-pirazol-1-il)-acetil]-piperazin-1-il}-N-(1,2,3,4-tetrahydro-naftalen-1-il)-benzamida (Compuesto No. 1.z.005);
- 15 Los compuestos de fórmula (I) pueden ser preparados según lo mostrado en los esquemas siguientes.
- Los compuestos de fórmula I, en donde R^1 , R^2 , R^3 , R^4 , R^5 , R^6 , R^7 , R^8 , R^9 , A, T, Y^1 , Y^2 , Y^3 , y Y^4 , n, p y Q son tales como los definidos para la fórmula I; pueden ser obtenidos mediante la transformación de un compuesto de fórmula II, en donde R^1 , R^2 , R^3 , R^4 , R^5 ,
- 20 R^6 , R^7 , A, T, Y^1 , Y^2 , Y^3 , y Y^4 , n, p y Q son tales como los definidos para la fórmula I, con un compuesto de fórmula III, en donde R^8 y R^9 son tales como los definidos para la fórmula I, y un reactivo de acoplamiento peptídico, tal y como BOP, PyBOP, HATU. Esto se muestra en el Esquema 1.

Esquema 1



Los compuestos de fórmula II, en donde R¹, R², R³, R⁴, R⁵, R⁶, R⁷, A, T, Y¹, Y², Y³, y Y⁴, n, p y Q son tales como los definidos para la fórmula I; pueden ser obtenidos mediante la saponificación de un compuesto de fórmula IV, en donde R¹, R², R³, R⁴, R⁵, R⁶, R⁷, A, T, Y¹, Y², Y³, y Y⁴, n, p y Q son tales como los definidos para la fórmula I y R²⁶ es alquilo C₁-C₆ o arilo sustituido opcionalmente, con una base, tal y como el hidróxido de potasio, hidróxido de sodio, hidróxido de litio, carbonato de potasio, carbonato de sodio, etc.. Esto se muestra en el Esquema 2.

Esquema 2



Los compuestos de fórmula IV.1, en donde R¹, R², R³, R⁴, R⁵, R⁶, R⁷, A, Y¹, Y², Y³, y Y⁴, n, p y Q son tales como los definidos para la fórmula I y R²⁶ es alquilo C₁-C₆ o arilo sustituido opcionalmente, pueden ser obtenidos mediante la reducción de un compuesto de fórmula V, en donde R¹, R², R³, R⁴, R⁶, R⁷, A, Y¹, Y², Y³, y Y⁴, n, p y Q son tales como

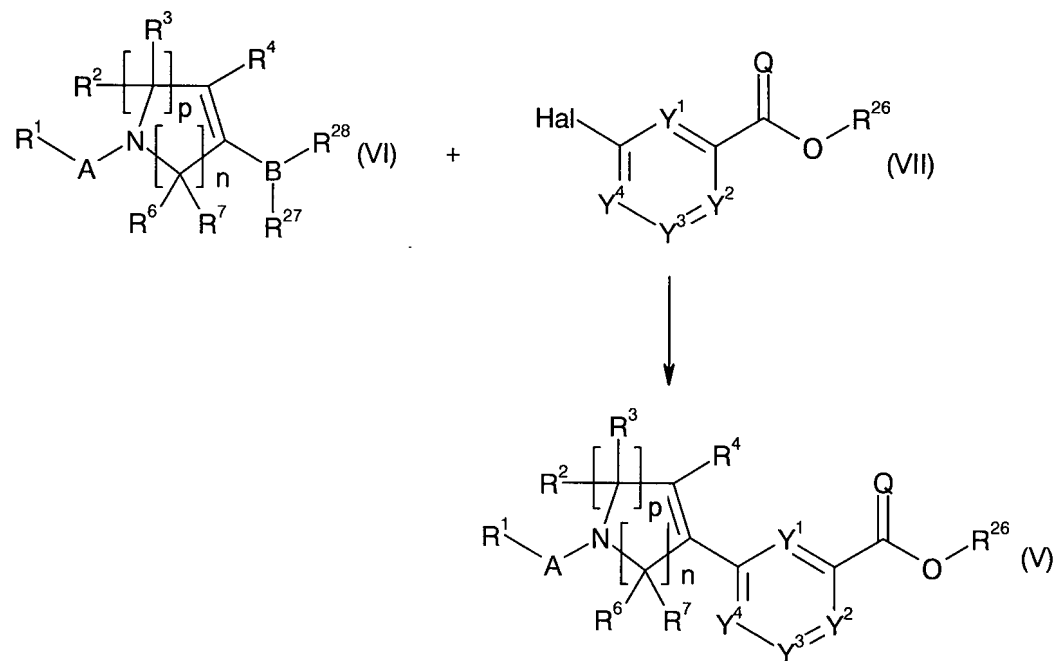
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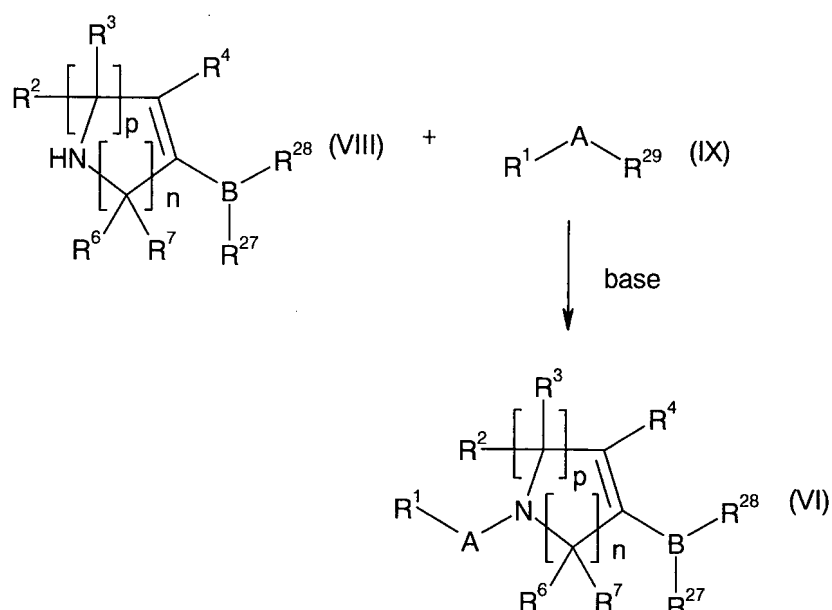
Los compuestos de fórmula V, en donde R^1 , R^2 , R^3 , R^4 , R^6 , R^7 , A, Y^1 , Y^2 , Y^3 , y Y^4 , n, p y Q son tales como los definidos para la fórmula I y R^{26} es C_1 - C_6 alquilo o arilo sustituido opcionalmente; pueden ser obtenidos mediante la transformación de un compuesto de fórmula VI, en donde R^2 , R^3 , R^5 , R^6 , R^7 n, p y A son tales como los definidos para la fórmula I y R^{27} y R^{28} son, cada uno independientemente, hidroxilo o alquilo C_1 - C_6 o junto con el átomo de boro intercalado forman un anillo heterocíclico saturado de cinco o seis miembros, con un compuesto de fórmula VII, en donde Y^1 , Y^2 , Y^3 , y Y^4 y Q son tales como los definidos para la fórmula I, R^{26} es alquilo C_1 - C_6 o arilo sustituido opcionalmente y Hal es halógeno, preferiblemente iodo, bromo o cloro, y un catalizador. Esto se muestra en el Esquema 4.

Esquema 4



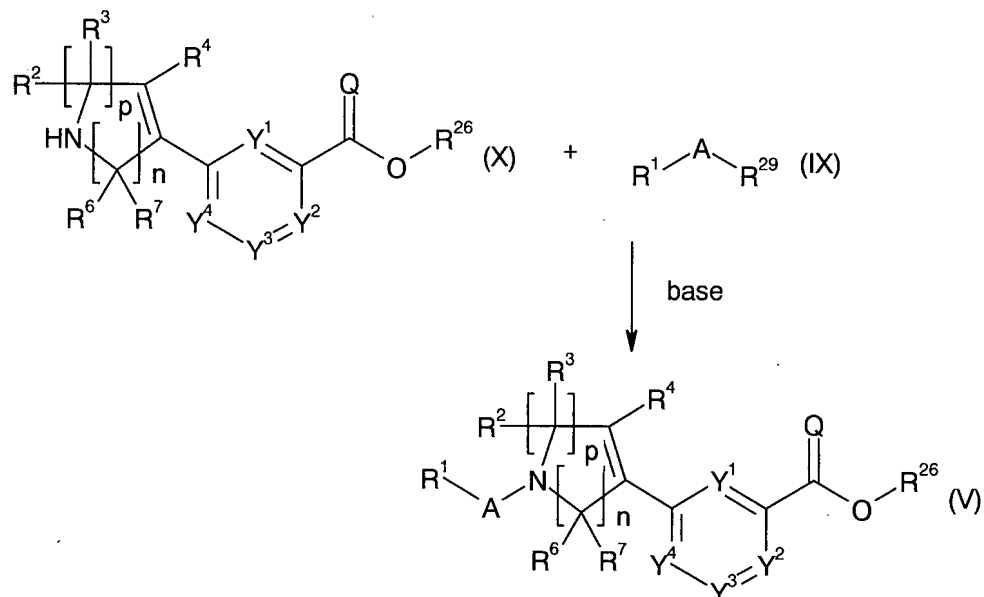
Los compuestos de fórmula VI, en donde R¹, R², R³, R⁴, R⁶, R⁷, n, p y A son tales como los definidos para la fórmula I y R²⁷ y R²⁸ son, cada uno independientemente, hidroxilo o alquilo C₁-C₆ o junto con el átomo de boro intercalado forman un anillo heterocíclico saturado de cinco o seis miembros; pueden ser obtenidos mediante la transformación de un compuesto de fórmula VIII, en donde R¹, R², R³, R⁴, R⁶, R⁷, n y p son tales como los definidos para la fórmula I y R²⁷ y R²⁸ son, cada uno independientemente, hidroxilo o alquilo C₁-C₆ o junto con el átomo de boro intercalado forman un anillo heterocíclico saturado de cinco o seis miembros, con un compuesto de fórmula IX, en donde R¹ y A son tales como los definidos para la fórmula I y R²⁹ es hidroxilo o halógeno, preferiblemente, fluoro, cloro o bromo, y un reactivo de acoplamiento peptídico o a base, tal y como piridina, trietilamina, etildiisopropilamina, etc.. Esto se muestra en el Esquema 5.

Esquema 5



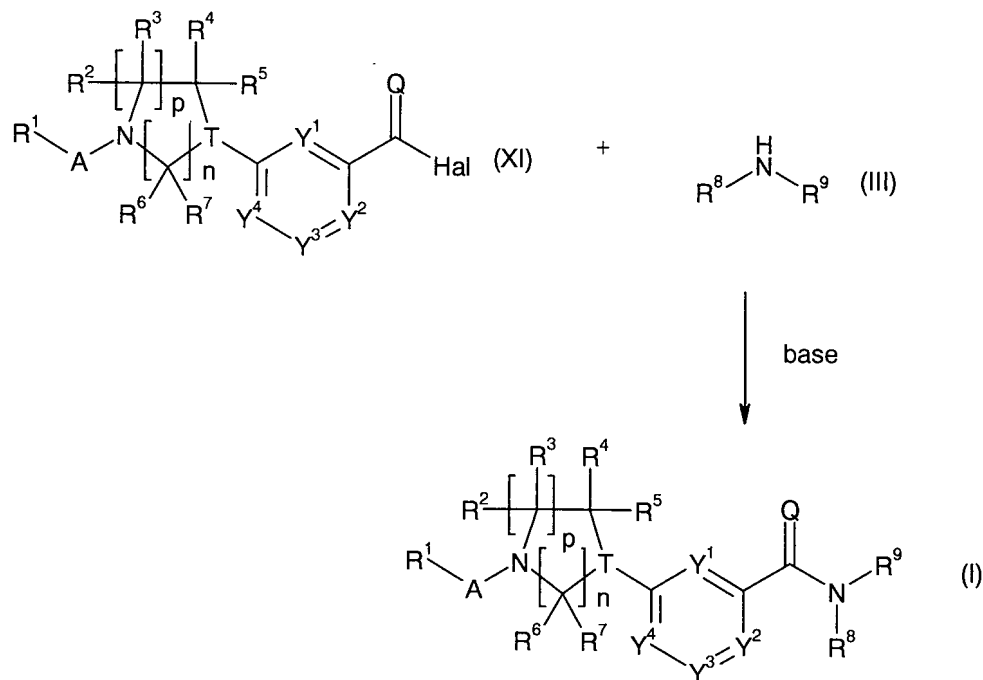
Alternativamente, los compuestos de fórmula V, en donde R^1 , R^2 , R^3 , R^4 , R^6 , R^7 , A, Y^1 , Y^2 , Y^3 , Y^4 , n, p y Q son tales como los definidos para la fórmula I y R^{26} es alquilo C_1-C_6 o arilo sustituido opcionalmente; pueden ser obtenidos mediante la transformación de un compuesto de fórmula X, en donde R^2 , R^3 , R^4 , R^6 , R^7 , A, Y^1 , Y^2 , Y^3 , Y^4 , n, p y Q son tales como los definidos para la fórmula I y R^{26} es alquilo C_1-C_6 o arilo sustituido opcionalmente, con un compuesto de fórmula IX, en donde R^1 y A son tales como los definidos para la fórmula I y R^{29} es hidroxilo o halógeno, preferiblemente, fluoro, cloro o bromo, y un reactivo de acoplamiento peptídico o a base, tal y como piridina, trietilamina, etildiisopropilamina, etc.. Esto se muestra en el Esquema 6.

Esquema 6



Alternativamente, los compuestos de fórmula I, en donde R^1 , R^2 , R^3 , R^4 , R^5 , R^6 , R^7 , R^8 , R^9 , A, T, Y^1 , Y^2 , Y^3 , Y^4 , n, p y Q son tales como los definidos para la fórmula I; pueden ser obtenidos mediante la transformación de un compuesto de fórmula XI, en donde R^1 , R^2 , R^3 , R^4 , R^5 , R^6 , R^7 , A, T, Y^1 , Y^2 , Y^3 , Y^4 , n, p y Q son tales como los definidos para la fórmula I y Hal es halógeno, preferiblemente fluoro, cloro o bromo, con un compuesto de fórmula III, en donde R^8 y R^9 son tales como los definidos para la fórmula I, con una base, tal y como piridina, trietilamina, etildiisopropilamina, etc.. Esto se muestra en el Esquema

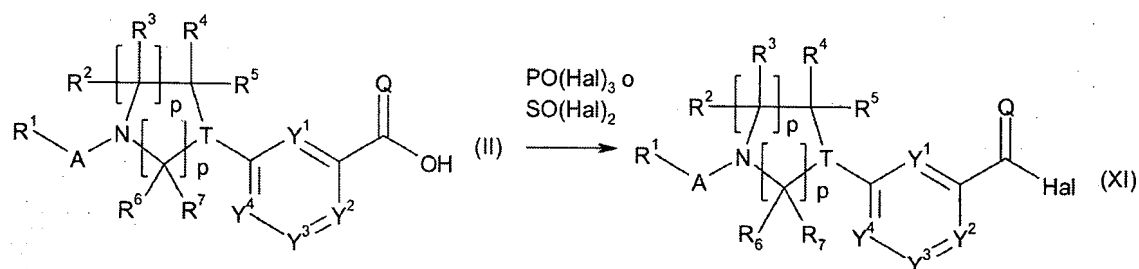
10 7.

Esquema 7

Los compuestos de fórmula XI, en donde R^1 , R^2 , R^3 , R^4 , R^5 , R^6 , R^7 , A, T, Y^1 , Y^2 , Y^3 , Y^4 , n, p y Q son tales como los definidos para la fórmula I y Hal es halógeno, preferiblemente fluoro, cloro o bromo, pueden ser obtenidos mediante la transformación

5 de un compuesto de fórmula II, en donde R^1 , R^2 , R^3 , R^4 , R^5 , R^6 , R^7 , A, T, Y^1 , Y^2 , Y^3 , Y^4 , n, p y Q son tales como los definidos para la fórmula I, con un haluro de fosforilo, tal y como cloruro de fosforilo o bromuro de fosforilo, o un haluro de tionilo, tal y como cloruro de tionilo o bromuro de tionilo. Esto se muestra en el Esquema 8.

10

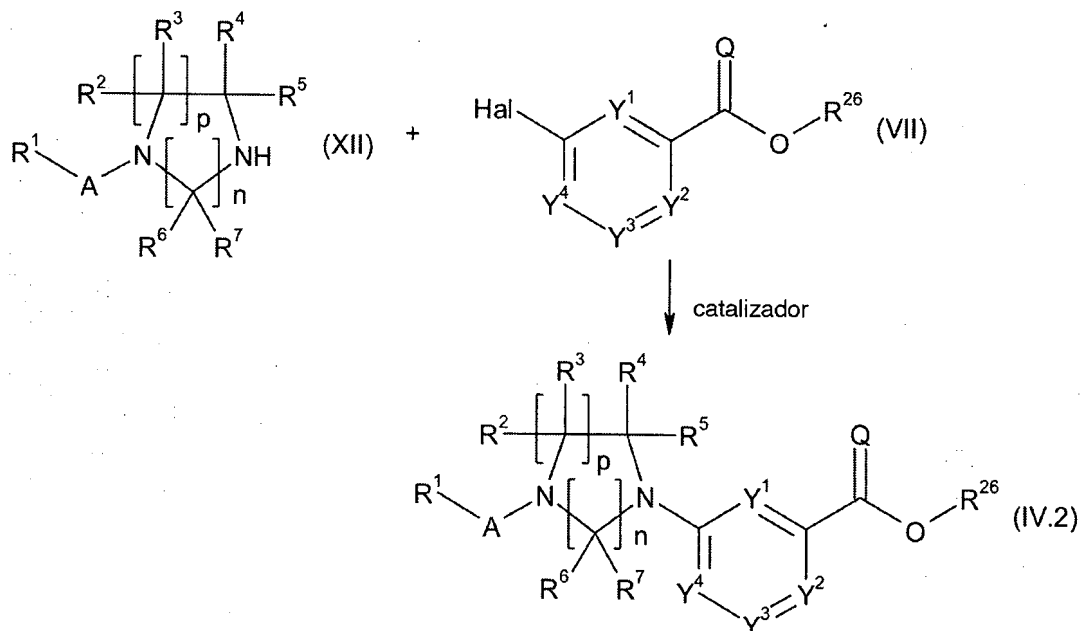
Esquema 8

Los compuestos de fórmula IV.2, en donde R^1 , R^2 , R^3 , R^4 , R^5 , R^6 , R^7 , A, Y^1 , Y^2 , Y^3 , Y^4 , n, p y Q son tales como los definidos para la fórmula I y R^{26} es alquilo $\text{C}_1\text{-C}_6$ o arilo sustituido opcionalmente; pueden ser obtenidos mediante la transformación de un

compuesto de fórmula XII, en donde R^1 , R^2 , R^3 , R^4 , R^6 , R^7 , n , p y A son tales como los definidos para la fórmula I, con un compuesto de fórmula VII, en donde Y^1 , Y^2 , Y^3 , Y^4 y Q son tales como los definidos para la fórmula I, R^{26} es alquilo C_1 - C_6 o arilo sustituido opcionalmente y Hal es halógeno, preferiblemente yodo, bromo o cloro. Esto se muestra

5 en el Esquema 9.

Esquema 9



10 Sorprendentemente, se ha descubierto que los compuestos novedosos de fórmula I tienen, para propósitos prácticos, un grado muy ventajoso de actividad biológica para la protección de plantas contra enfermedades que son provocadas por hongos.

Los compuestos de fórmula I pueden ser utilizados en el sector agrícola y en campos de utilización relacionados, por ejemplo como ingredientes activos para el control
15 de plagas de plantas o en materiales no vivientes, para el control de microorganismos causantes de deterioro o de organismos potencialmente dañinos para el hombre. Los compuestos novedosos se distinguen por tener una excelente actividad con tasas de aplicación bajas, por ser bien tolerados por las plantas y por ser ambientalmente seguros.

Tienen propiedades curativas, preventivas y sistémicas, muy útiles y pueden ser utilizados para la protección de muchas plantas cultivadas. Los compuestos de fórmula I pueden ser utilizados para inhibir o destruir las plagas que se presentan en plantas o partes de plantas (frutos, flores, hojas, tallos, tubérculos, raíces) de diferentes cultivos de plantas
5 útiles, mientras que al mismo tiempo se protege también a aquellas partes de las plantas que crecen posteriormente, por ejemplo, de microorganismos fitopatógenos.

También, es posible utilizar los compuestos de fórmula I como agentes de recubrimiento para el tratamiento de material de propagación de plantas, *por ejemplo*, semillas, tales como frutas, tubérculos o granos, o esquejes (por ejemplo arroz), para la
10 protección contra infecciones fúngicas, así como contra hongos fitopatógenos presentes en el suelo. El material de propagación puede ser tratado con una composición que comprende un compuesto de fórmula I antes de ser plantado: las semillas, por ejemplo, pueden ser recubiertas antes de ser sembradas. Los ingredientes activos, de conformidad con la invención, también pueden ser aplicados a granos (recubrimiento), ya sea mediante
15 la impregnación de las semillas en una formulación líquida o mediante el recubrimiento de las mismas con una formulación sólida. También, la composición puede ser aplicada al sitio de plantación cuando el material de propagación está siendo plantado, por ejemplo, al surco de las semillas durante la siembra. También, la invención trata acerca de tales métodos para el tratamiento del material de propagación de plantas y acerca del material
20 de propagación de plantas tratado de tal forma.

Adicionalmente, los compuestos de conformidad con la presente invención pueden ser utilizados para el control de hongos en áreas relacionadas, por ejemplo en la protección de materiales técnicos, incluyendo a madera y productos técnicos relacionados con madera, en almacenamiento de alimentos, en gestión de higiene.

25 Además, la invención podría ser utilizada para proteger materiales no vivientes del ataque por hongos, por ejemplo, madera, paneles de madera laminada y pintura.

Los compuestos de fórmula I son, por ejemplo, efectivos contra los hongos fitopatógenos de las clases siguientes: Hongos imperfectos (por ejemplo *Alternaria* spp.), Basidiomicetes (por ejemplo *Corticium* spp., *Ceratobasidium* spp., *Waitea* spp., *Thanatephorus* spp., *Rhizoctonia* spp., *Hemileia* spp., *Puccinia* spp., *Phakopsora* spp., *Ustilago* spp., *Tilletia* spp.), Ascomicetes (por ejemplo *Venturia* spp., *Blumeria* spp., *Erysiphe* spp., *Podosphaera* spp., *Uncinula* spp., *Monilinia* spp., *Sclerotinia* spp., *Colletotrichum* spp., *Glomerella* spp., *Fusarium* spp., *Gibberella* spp., *Monographella* spp., *Phaeosphaeria* spp., *Mycosphaerella* spp., *Cercospora* spp., *Pyrenophora* spp., *Rhynchosporium* spp., *Magnaporthe* spp., *Gaeumannomyces* spp., *Oculimacula* spp., *Ramularia* spp., *Botryotinia* spp.) y Oomicetes (por ejemplo *Phytophthora* spp., *Pythium* spp., *Plasmopara* spp., *Peronospora* spp., *Pseudoperonospora* spp., *Bremia* spp). Se observa una actividad sobresaliente contra el moho o mildiú (en inglés, downy mildew) (por ejemplo *Plasmopara viticola*) y el tizón tardío (por ejemplo *Phytophthora infestans*). Adicionalmente, los compuestos novedosos de fórmula I son efectivos contra bacterias fitopatógenas gram negativas y gram positivas (por ejemplo *Xanthomonas* spp, *Pseudomonas* spp, *Erwinia amylovora*, *Ralstonia* spp.) y virus (por ejemplo el virus del mosaico del tabaco).

Dentro del alcance de la presente invención, los cultivos objetivo y/o plantas útiles que van a ser protegidos comprenden típicamente a las siguientes especies de plantas:

cereal (trigo, cebada, centeno, avena, arroz, maíz, sorgo y las especies relacionadas); remolacha (remolacha azucarera y remolacha forrajera); pomos, drupas y frutas suaves (manzanas, peras, ciruelas, melocotones, almendras, cerezas, fresas, frambuesas y moras); plantas leguminosas (frijoles, lentejas, guisantes, frijoles de soya); plantas oleaginosas (colza, mostaza, amapola, aceitunas, girasoles, coco, ricino, granos de cacao, cacahuates); plantas cucurbitáceas (calabazas, pepinos, melones); plantas de fibra (algodón, lino, cáñamo, yute); frutas cítricas (naranjas, limones, toronjas, mandarinas); vegetales (espinaca, lechuga, espárrago, repollos, zanahorias, cebollas, tomates, papas o

patatas, pimentón dulce); lauráceas (aguacate, canela, alcanfor) o plantas tales como el tabaco, nueces, café, berenjena, caña de azúcar, té, pimienta, vides, lúpulo, bananos y plantas de hule natural, así como césped y plantas ornamentales.

Las plantas útiles y / o cultivos objetivo de conformidad con la invención incluyen a
5 variedades convencionales así como variedades mejoradas o modificadas genéticamente
tales como, por ejemplo, variedades resistentes a insectos (por ejemplo las variedades Bt.
y VIP) así como resistentes a enfermedades, tolerantes a herbicidas (por ejemplo por
ejemplo, variedades de maíz resistentes al glifosato y al glufosinato, disponibles
comercialmente bajo las marcas comerciales RoundupReady® y LibertyLink®) y
10 tolerantes a nematodos. A manera de ejemplo, las variedades de cultivos mejoradas o
modificadas genéticamente incluyen a las variedades de algodón Stoneville 5599BR y
Stoneville 4892BR.

El término "plantas útiles" y/o "cultivos objetivo" debe ser entendido también como si
incluyera a plantas útiles que han sido hechas tolerantes a herbicidas tales como
15 bromoxinilo o clases de herbicidas (tales como, por ejemplo, inhibidores de la HPPD,
inhibidores de la ALS, por ejemplo primisulfurón, prosulfurón y trifloxisulfurón, inhibidores
de la EPSPS (siglas en inglés de la 5-enol-piruvil-shikimato-3-fosfato-sintasa), inhibidores
de la GS (glutamina sintetasa) o inhibidores de la PPO (protoporfirinogen-oxidasa)) como
un resultado de métodos convencionales de reproducción o de ingeniería genética. Un
20 ejemplo de un cultivo que ha sido hecho tolerante a las imidazolinonas, por ejemplo
imazamox, mediante métodos convencionales de reproducción (mutagénesis) es la colza
(Canola) Clearfield®. Ejemplos de cultivos que han sido hechos tolerantes mediante
métodos de ingeniería genética, incluyen por ejemplo, variedades de maíz resistentes al
glifosato y al glufosinato, disponibles comercialmente bajo las marcas comerciales
25 RoundupReady®, Herculex I® y LibertyLink®.

El término "plantas útiles" y/o "cultivos objetivo" debe ser entendido también como si
incluyera a plantas útiles, las cuales han sido transformadas mediante el uso de técnicas

de ADN recombinante y que son capaces de sintetizar una o más toxinas de acción selectiva, tales como las conocidas, por ejemplo, de bacterias productoras de toxinas, especialmente aquellas del género *Bacillus*.

El término "plantas útiles" y/o "cultivos objetivo" debe ser entendido también como si
5 incluyera a plantas útiles, las cuales han sido transformadas mediante el uso de técnicas de ADN recombinante y que son capaces de sintetizar sustancias antipatogénicas que tienen acción selectiva, tales como, por ejemplo, las denominadas "proteínas relacionadas con patogénesis" (PRP, véase por ejemplo EP-A-0 392 225). Ejemplos de tales sustancias antipatogénicas y plantas transgénicas capaces de sintetizar tales sustancias
10 antipatogénicas son conocidas, por ejemplo, a partir de EP-A-0 392 225, WO 95/33818, y EP-A-0 353 191. Por lo general, los métodos para la producción de tales plantas transgénicas son conocidos por las personas con conocimientos de la técnica y son descritos, por ejemplo, en las publicaciones mencionadas anteriormente.

Tal y como se emplea en este documento, se pretende que el término "locus" de
15 una planta abarque el lugar en el cual están creciendo las plantas, en donde los materiales de propagación de plantas son sembrados o en donde los materiales de propagación de plantas van a ser colocados dentro del suelo. Un ejemplo de tal locus es un campo, en el cual están creciendo las plantas.

Se entiende que el término "material de propagación de plantas" denota partes
20 generativas de la planta, tales como semillas, las cuales pueden ser utilizadas para la multiplicación de aquellas, y material vegetativo, tales como esquejes o tubérculos, por ejemplo papas o patatas. Se pueden mencionar por ejemplo semillas (en el sentido estricto), raíces, frutos, tubérculos, bulbos, rizomas y partes de plantas. Se pueden mencionar también plantas germinadas y plántulas que van a ser trasplantadas después
25 de la germinación o después de brotar del suelo. Estas plántulas pueden ser protegidas antes del trasplante mediante inmersión total o parcial. Preferiblemente se entiende que "material de propagación de plantas" indica a las semillas.

Los compuestos de fórmula I pueden ser utilizados en forma no modificada, preferiblemente, junto con los adyuvantes que son empleados convencionalmente en el campo de la formulación. Para tal fin, pueden ser formulados convenientemente de manera conocida para producir concentrados que se pueden emulsionar, pastas para
5 recubrimientos, disoluciones o suspensiones para aspersión directa o diluida, emulsiones diluidas, polvos humectables, polvos solubles, polvos, granulados y también encapsulados por ejemplo en sustancias poliméricas. Al igual que con el tipo de composiciones, los métodos de aplicación, tales como aspersión, atomización, espolvoreo, dispersión, recubrimiento o vertido, son escogidos según los objetivos
10 deseados y las circunstancias existentes. Las composiciones pueden contener también adyuvantes adicionales, tales como estabilizadores, antiespumantes, reguladores de viscosidad, aglutinantes o promotores de adhesividad, así como fertilizantes, donadores de micronutrientes u otras formulaciones para la obtención de efectos especiales.

Los vehículos y adyuvantes adecuados, por ejemplo para ser utilizados en
15 agricultura, pueden ser sólidos o líquidos y son sustancias útiles en las tecnologías de formulación, por ejemplo sustancias minerales naturales o regeneradas, disolventes, dispersantes, agentes humectantes, promotores de adhesividad, espesantes, aglutinantes o fertilizantes. Tales vehículos son descritos, por ejemplo, en el documento WO 97/33890.

Los compuestos de fórmula I pueden ser utilizados en forma de composiciones y
20 pueden ser aplicados al área de cultivo o a la planta que va a ser tratada, en forma simultánea, o sucesiva, con compuestos adicionales. Por ejemplo, estos compuestos adicionales pueden ser fertilizantes, donadores de micronutrientes u otras preparaciones, los cuales ejercen influencia sobre el crecimiento de las plantas. Pueden ser también herbicidas selectivos o herbicidas no selectivos, así como insecticidas, fungicidas,
25 bactericidas, nematocidas, molusquicidas o mezclas de varias de estas preparaciones, si se desea junto con los vehículos, surfactantes o adyuvantes promotores de aplicación adicionales, los cuales son empleados comúnmente en el campo de la formulación.

Normalmente, los compuestos de fórmula I son utilizados en forma de composiciones fungicidas para el control de, o para la protección contra, microorganismos fitopatógenos, las cuales comprenden como ingrediente activo a al menos un compuesto de fórmula I o de al menos un compuesto individual preferido, tal y como uno de los
5 definidos anteriormente, en forma libre o en forma de sal utilizable agroquímicamente, y al menos a uno de los adyuvantes mencionados anteriormente

La invención provee una composición fungicida que comprende al menos un compuesto de fórmula I, un vehículo aceptable para ser utilizado en agricultura y opcionalmente un adyuvante. Por ejemplo, un vehículo aceptable para ser utilizado en
10 agricultura es un vehículo que es adecuado para ser utilizado en agricultura. Los vehículos para agricultura son ampliamente conocidos en la técnica. Preferiblemente dichas composiciones fungicidas pueden comprender un ingrediente activo fungicida adicional además del compuesto de fórmula I.

El compuesto de fórmula (I) puede ser el único ingrediente activo de una
15 composición o puede ser mezclado con uno o más ingredientes activos adicionales, tales como un insecticida, fungicida, sinérgico, herbicida o regulador del crecimiento de plantas, donde sea apropiado. En algunos casos, un ingrediente activo adicional puede producir actividades sinérgicas inesperadas. Ejemplos de ingredientes activos adicionales incluyen a los siguientes: Azoxistrobin(131860-33-8), Dimoxistrobin(149961-52-4), Enestrobin
20 (238410-11-2), Fluoxastrobin (193740-76-0), Kresoxim-metilo (143390-89-0), Metominostrobin (133408-50-1), Orisaastrobin (248593-16-0), Picoxistrobin(117428-22-5), Piraclostrobin (175013-18-0), Azaconazol (60207-31-0), Bromuconazol (116255-48-2), Ciproconazol (94361-06-5), Difenconazol (119446-68-3), Diniconazol (83657-24-3), Diniconazol-M (83657-18-5), Epoxiconazol (13385-98-8), Fenbuconazol (114369-43-6),
25 Fluquinconazol (136426-54-5), Flusilazol (85509-19-9), Flutriafol (76674-21-0), Hexaconazol (79983-71-4), Imazalil (58594-72-2), Imibenconazol (86598-92-7), Ipconazol (125225-28-7), Metconazol (125116-23-6), Miclobutanil (88671-89-0), Oxpoconazol

- (174212-12-5), Pefurazoato (58011-68-0), Penconazol (66246-88-6), Procloraz (67747-09-5), Propiconazol (60207-90-1), Protioconazol (178928-70-6), Simeconazol (149508-90-7), Tebuconazol (107534-96-3), Tetraconazol (112281-77-3), Triadimefon (43121-43-3), Triadimenol (55219-65-3), Triflumizol (99387-89-0), Triticonazol (131983-72-7),
- 5 Diclobutrazol (76738-62-0), Etaconazol (60207-93-4), Fluconazol (86386-73-4), Fluconazol-cis (112839-32-4), Tiabendazol (148-79-8), Quinconazol (103970-75-8), Fenpiclonil (74738-17-3), Fludioxonil (131341-86-1), Ciprodinil (121552-61-2), Mepanipirim (110235-47-7), Pirimetanil (53112-28-0), Aldimorf (91315-15-0), Dodemorf (1593-77-7), Fenpropimorf (67564-91-4), Tridemorf (81412-43-3), Fenpropidin (67306-00-7),
- 10 Espiroxamina (118134-30-8), Isopirazam (881685-58-1), Sedaxano (874967-67-6), Bixafen (581809-46-3), Pentiopirad (183675-82-3), Fluxapiroxad (907204-31-3), Boscalid (188425-85-6), Penflufen (494793-67-8), Fluopiram (658066-35-4), Mandipropamid (374726-62-2), Bentiavalicarb (413615-35-7), Dimetomorf (110488-70-5), Clorotalonilo (1897-45-6), Fluazinam (79622-59-6), Ditianon (3347-22-6), Metrafenona (220899-03-6),
- 15 Triciclazol (41814-78-2), Mefenoxam (70630-17-0), Metalaxilo (57837-19-1), Acibenzolar (126448-41-7) (Acibenzolar-S-metilo (126448-41-7)), Mancozeb (8018-01-7), Ametoctradina (865318-97-4) Ciflufenamid (180409-60-3), Ipconazol (125225-28-7), Amisulbrom (348635-87-0), Etaboxam (16650-77-3), Fluopicolida (239110-15-7), Flutianil (304900-25-2), Isotianil (224049-04-1), Proquinazid (189278-12-4), Valifenal (283159-90-0),
- 20 0), 1-metil-ciclopropeno (3100-04-7), Trifloxistrobin(141517-21-7), azufre (7704-34-9), Amoniocarbonato de cobre (CAS 33113-08-5); Oleato de cobre (CAS 1120-44-1); Folpet (133-07-3), Quinoxifen (124495-18-7), Captan (133-06-2), Fenhexamid (126833-17-8), Glufosinato y su sales (51276-47-2, 35597-44-5 (Isómero S)), Glifosato (1071-83-6) y su sales (69254-40-6 (Diamonio), 34494-04-7 (Dimetilamonio), 38641-94-0 (Isopropilamonio),
- 25 40465-66-5 (Monoamonio), 70901-20-1 (Potasio), 70393-85-0 (Sesquisodio), 81591-81-3 (Trimesio)), (2-diclorometilen-3-etil-1-metil-indan-4-il)-amida del ácido 1,3-Dimetil-1H-pirazol-4-carboxílico, (4'-metilsulfanil-bifenil-2-il)-amida del ácido 1,3-Dimetil-1H-pirazol-4-

carboxílico, [2-(2,4-dicloro-fenil)-2-metoxi-1-metil-etil]-amida del ácido 1,3-Dimetil-4H-pirazol-4-carboxílico, (5-Cloro-2,4-dimetil-piridin-3-il)-(2,3,4-trimetoxi-6-metil-fenil)-metanona, (5-Bromo-4-cloro-2-metoxi-piridin-3-il)-(2,3,4-trimetoxi-6-metil-fenil)-metanona, 2-{2-[(E)-3-(2,6-Dicloro-fenil)-1-metil-prop-2-en-(E)-ilidenaminooximetil]-fenil}-2-[(Z)-metoxiimino]-N-metil-acetamida, 3-[5-(4-Cloro-fenil)-2,3-dimetil-isoxazolidin-3-il]-piridina.

Otra faceta de la invención trata acerca del uso de un compuesto de fórmula I o de un compuesto individual preferido tal y como uno de los definidos anteriormente, de una composición que comprende al menos un compuesto de fórmula I o al menos un compuesto individual preferido tal y como uno de los definidos anteriormente, o una mezcla fungicida que comprende al menos un compuesto de fórmula I o al menos un compuesto individual preferido tal y como uno de los definidos anteriormente, mezclado con otros fungicidas, tal y como se describió anteriormente, para controlar o evitar la infestación de plantas, por ejemplo, plantas útiles tales como plantas de cultivo, material de propagación de las mismas, por ejemplo semillas, cultivos cosechados, por ejemplo cultivos comestibles cosechados, o materiales no vivientes, por parte de microorganismos fitopatógenos, preferiblemente organismos fúngicos.

Una faceta adicional de la invención trata acerca de un método para controlar o evitar una infestación de plantas, por ejemplo, plantas útiles tales como plantas de cultivo, material de propagación de las mismas, por ejemplo semillas, cultivos cosechados, por ejemplo cultivos comestibles cosechados, o materiales no vivientes por parte de microorganismos fitopatógenos o causantes de deterioro o de organismos potencialmente dañinos para el hombre, especialmente organismos fúngicos, el cual incluye la aplicación de un compuesto de fórmula I o de un compuesto individual preferido tal y como uno de los definidos anteriormente como ingrediente activo a las plantas, a partes de las plantas o al locus de las mismas, al material de propagación de las mismas, o a cualquier parte de los materiales no vivientes.

Controlar o prevenir significa reducir la infestación por parte de microorganismos fitopatógenos o causantes de deterioro o de organismos potencialmente dañinos para el hombre, especialmente organismos fúngicos, hasta un nivel tal que se demuestre una mejoría.

- 5 Un método preferido para controlar o evitar una infestación de plantas de cultivo por parte de microorganismos fitopatógenos, especialmente organismos fúngicos, el cual incluye la aplicación de un compuesto de fórmula I, o una composición agroquímica que contiene al menos uno de tales compuestos, es la aplicación foliar. La frecuencia de aplicación y la tasa de aplicación van a depender del riesgo de infestación por parte del
- 10 patógeno correspondiente. Sin embargo, los compuestos de fórmula I pueden también penetrar la planta a través de las raíces, por medio del suelo (acción sistémica) al impregnar el locus de la planta con una formulación líquida, o al aplicar los compuestos en forma sólida en el suelo, por ejemplo en forma granular (aplicación en suelo). En cultivos de arroz anegado, tales granulados pueden ser aplicados al campo de arroz inundado.
- 15 Los compuestos de fórmula I pueden ser aplicados también, a las semillas (recubrimiento) al impregnar las semillas o tubérculos ya sea con una formulación líquida del fungicida o recubriéndolos con una formulación sólida.

Una formulación, por ejemplo una composición que contiene al compuesto de fórmula I, y, si se desea, un adyuvante sólido o líquido o monómeros para encapsular al

20 compuesto de fórmula I, puede ser preparada en una manera conocida, típicamente al mezclar muy bien y/o moler el compuesto con diluyentes, por ejemplo disolventes, vehículos sólidos y, opcionalmente, compuestos tensoactivos (surfactantes).

Usualmente las formulaciones agroquímicas y/o composiciones van a contener entre 0.1 y 99% por masa, preferiblemente entre 0.1 y 95% por masa, del compuesto de

25 fórmula I, entre 99.9 y 1% por masa, preferiblemente entre 99.8 y 5% por masa, de un adyuvante sólido o líquido, y entre 0 y 25% por masa, preferiblemente entre 0.1 y 25% por masa, de un surfactante.

Normalmente, las tasas de aplicación que son ventajosas están entre 5g y 2kg de ingrediente activo (i.a.) por hectárea (ha), preferiblemente entre 10g y 1kg i.a./ha, lo más preferible es que estén entre 20g y 600g i.a./ha. Cuando son utilizados como agentes para aplicación en semillas mediante impregnación, las dosis convenientes son entre

5 10mg y 1g de sustancia activa por kg de semillas.

Aunque es preferible formular los productos comerciales como concentrados, el usuario final normalmente va a utilizar formulaciones diluidas.

Los siguientes ejemplos no limitantes ilustran con mayor detalle la invención descrita anteriormente.

10

Ejemplo 1: Este ejemplo ilustra la preparación de la 3-{1-[2-(5-metil-3-trifluorometil-pirazol-1-il)-acetil]-piperidin-4-il}-N-(R)-1,2,3,4-tetrahidro-naftalen-1-il-benzamida (Compuesto No. I.n.001)

15 a) Preparación del éster terc-butílico del ácido 4-(3-etoxicarbonil-fenil)-3,6-dihidro-2H-piridina-1-carboxílico¹

A una disolución de etil-3-yodobenzoato (10 g, 36.2 mmol) en dioxano (400 mL) se añadieron sucesivamente cloruro de bis(trifenilfosfina)paladio (II) (1.26 g, 1.8 mmol), éster terc-butílico del ácido 4-(4,4,5,5-tetrametil-[1,3,2]dioxaborolan-2-il)-3,6-dihidro-2H-piridina-

20 1-carboxílico² (13.44 g, 43.46 mmol), disolución acuosa de carbonato de sodio (11.5 g en 100 mL de agua, 108.6 mmol) a temperatura ambiente. Después de agitar por 3 h a 110°C, el disolvente fue evaporado y el aceite amarillo resultante fue disuelto en acetato de etilo (300 mL), lavado con cloruro de sodio saturado (300 mL). La capa orgánica fue

¹ El éster etílico del ácido 3-piperidin-4-il-benzoico puede ser preparado también según lo mostrado en la referencia siguiente: WO 2004092124 A2 20041028 (Merck & Co., Inc., USA).

² El éster terc-butílico del ácido tetrametil-[1,3,2]dioxaborolan-2-il)-3,6-dihidro-2H-piridina-1-carboxílico puede ser preparado según lo mostrado en la referencia siguiente: Eastwood, P. R. *Tetrahedron Letters* **2000**, 41, 3705 o comprado a un proveedor adecuado (CAS 286961-14-6).

secada sobre sulfato de sodio, filtrada y evaporada bajo presión reducida. La mezcla cruda fue purificada mediante cromatografía de columna en gel de sílice (acetato de etilo/heptano entre 0:1 y 3:7) para dar el éster terc-butílico del ácido 4-(3-etoxycarbonil-fenil)-3,6-dihidro-2H-piridina-1-carboxílico (11.28 g, 94 %). ^1H -RMN (400 MHz, CDCl_3): δ = 1.39-1.43 (t, 3H), 1.53 (s, 9H), 2.55-2.59 (m, 2H), 3.64 (t, 2H), 4.17-4.22 (m, 2H), 4.35-4.42 (q, 2H), 6.12 (m, 1H), 7.39-7.43 (t, 1H), 7.55-7.58 (m, 1H), 7.91-7.94 (m, 1H), 8.05 (s, 1H). EM: m/z = 332 ($M+1$).

10 b) Preparación del éster terc-butílico del ácido 4-(3-etoxycarbonil-fenil)-piperidina-1-carboxílico¹

Una disolución del éster terc-butílico del ácido 4-(3-etoxycarbonil-fenil)-3,6-dihidro-2H-piridina-1-carboxílico (11.28 g, 34.035 mmol) en etanol (680 mL) fue bombeada a través de un cartucho de Pd/C utilizando un aparato H-Cube (20 °C, 10 bar, 2 mL/min.). Luego, el disolvente fue evaporado bajo presión reducida para dar el éster terc-butílico del ácido 4-(3-etoxycarbonil-fenil)-piperidina-1-carboxílico (10.55 g, 93 %), el cual puede ser utilizado en el paso siguiente sin purificación adicional. ^1H -RMN (400 MHz, CDCl_3): δ = 1.39-1.43 (t, 3H), 1.51 (s, 9H), 1.61-1.72 (dq, 1H), 1.78-1.90 (m, 1H), 2.66-2.74 (dt, 1H), 2.74-2.89 (m, 1H), 4.20-4.31 (m, 1H), 4.32-4.42 (q, 2H), 7.39-7.41 (m, 2H), 7.88-7.92 (m, 2H). EM: m/z = 334 ($M+1$).

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c) Preparación del clorhidrato del éster del ácido 3-piperidin-4-il-benzoico¹

A una disolución del éster terc-butílico del ácido 4-(3-etoxycarbonil-fenil)-piperidina-1-carboxílico ácido (10.55 g, 31.64 mmol) se añadió una disolución de HCl 4M en dioxano (79 mL, 316.41 mmol) a temperatura ambiente. Después de agitar durante toda la noche a temperatura ambiente, el disolvente fue evaporado bajo presión reducida. El aceite viscoso amarillento resultante fue triturado con éter dietílico y filtrado para dar el clorhidrato del éster etílico del ácido 3-piperidin-4-il-benzoico (8.53 g, cuant.). ^1H -RMN

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(400 MHz, d_6 -DMSO): δ = 1.81-1.86 (t, 3H), 1.91-1.98 (m, 3H), 2.50-2.52 (m, 1H (traslape con el DMSO)), 2.95-3.05 (m, 2H), 3.32-3.39 (m, 2H), 4.31-4.39 (q, 2H), 7.49-7.52 (m, 2H), 7.81-7.83 (m, 2H), 9.5 (br, 2H). EM: m/z = 234 ((M-HCl)+1).

- 5 d) Preparación del éster etílico del ácido 3-{1-[2-(5-metil-3-trifluorometil-pirazol-1-il)-acetil]-piperidin-4-il}-benzoico

A una disolución del ácido (5-metil-3-trifluorometil-pirazol-1-il)-acético (5.23 g, 20.75 mmol) en DMF (50 mL) se añadió diisopropiletilamina (43 mL, 207.58 mmol), seguida por hexafluorofosfato de 2-(1H-7-azabenzotriazol-1-il)-1,1,3,3-tetrametiluronio metanamino
10 (10.52 g, 22.83 mmol) a temperatura ambiente. Después de agitar por 15 min. a temperatura ambiente, se añadió el clorhidrato del éster etílico del ácido 3-piperidin-4-il-benzoico (5.6 g, 20.75 mmol) a la mezcla de reacción. Después de agitar durante toda la noche a temperatura ambiente, el disolvente fue evaporado y el aceite café resultante fue disuelto en acetato de etilo (200 mL), lavado con una disolución acuosa saturada de
15 bicarbonato de sodio (100 mL) y la fase acuosa fue re-extraída con acetato de etilo (200 mL). Las capas orgánicas combinadas fueron lavadas con una disolución de HCl 1M (400 mL) y cloruro de sodio saturado (400 mL), secadas sobre sulfato de sodio, filtradas y evaporadas bajo presión reducida. La mezcla cruda fue purificada mediante cromatografía de columna en gel de sílice (acetato de etilo/ciclohexano entre 0:1 y 1:1) para dar el éster
20 etílico del ácido 3-{1-[2-(5-metil-3-trifluorometil-pirazol-1-il)-acetil]-piperidin-4-il}-benzoico (4.35 g, 49.5 %). ^1H -RMN (400 MHz, d_6 -DMSO): δ = 1.28-1.39 (t, 3H), 1.45-1.55 (m, 1H), 1.65-1.1.79 (m, 1H), 1.80-1.91 (m, 2H), 2.22 (s, 3H), 2.68-2.73 (m, 1H), 2.89-2.95 (m, 1H), 3.99-4.04 (m, 1H), 4.29-4.33 (q, 2H), 4.46-4.52 (m, 1H), 5.21-5.38 (dd, 2H, diastereotópicos), 6.50 (s, 1H), 7.47 (t, 1H), 7.55 (d, 1H), 7.80 (s, 1H), 7.81 (d, 1H). EM:
25 m/z = 424 (M+1).

e) Preparación del ácido 3-{1-[2-(5-metil-3-trifluorometil-pirazol-1-il)-acetil]-piperidin-4-il}-benzoico

A una disolución del éster etílico del ácido 3-{1-[2-(5-metil-3-trifluorometil-pirazol-1-il)-acetil]-piperidin-4-il}-benzoico (4.35 g, 10.27 mmol) en metanol (50 mL) se añadió una
5 disolución acuosa de hidróxido de sodio (2 M, 7.7 mL, 15.41 mmol) a temperatura ambiente. Después de agitar por 4h a temperatura ambiente, el disolvente fue removido y el residuo fue disuelto en THF (30 mL) y se añadió una disolución acuosa de hidróxido de litio (121 mg en 5 mL de agua) a temperatura ambiente. Después de agitar durante toda la noche a temperatura ambiente, el disolvente fue removido y el residuo fue disuelto en
10 acetato de etilo (50 mL) y la mezcla de reacción fue acidificada con una disolución acuosa de HCl 2M hasta alcanzar un pH entre 1 y 2. Después de la separación de las fases, la capa acuosa fue re-extraída con acetato de etilo (20 mL), y las capas orgánicas combinadas fueron lavadas con cloruro de sodio saturado (50 mL), secadas sobre sulfato de sodio, filtradas y evaporadas bajo presión reducida para dar el ácido 3-{1-[2-(5-metil-3-trifluorometil-pirazol-1-il)-acetil]-piperidin-4-il}-benzoico (2.40 g, 59 %), el cual puede ser
15 utilizado en el paso siguiente sin purificación adicional. ^1H -RMN (400 MHz, d_6 -DMSO): δ = 1.45-1.55 (m, 1H), 1.65-1.1.79 (m, 1H), 1.80-1.91 (m, 2H), 2.22 (s, 3H), 2.67-2.78 (m, 1H), 2.89-2.95 (m, 1H), 3.17-3.24 (m, 1H), 3.95-4.04 (m, 1H), 4.46-4.52 (m, 1H), 5.21-5.38 (dd, 2H, diastereotópicos), 6.50 (s, 1H), 7.47 (t, 1H), 7.55 (d, 1H), 7.80 (s, 1H), 7.81 (d, 1H). EM: m/z = 396 (M+1).

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f) Preparación de la 3-{1-[2-(5-metil-3-trifluorometil-pirazol-1-il)-acetil]-piperidin-4-il}-N-(R)-1,2,3,4-tetrahidro-naftalen-1-il-benzamida (Compuesto No. I.n.001)

A una disolución del ácido 3-{1-[2-(5-metil-3-trifluorometil-pirazol-1-il)-acetil]-
25 piperidin-4-il}-benzoico (100 mg, 0.25 mmol) en DMF (2 mL) se añadió diisopropiletilamina (0.16 mL, 0.76 mmol), seguido por hexafluorofosfato de 2-(1H-7-azabenzotriazol-1-il)-1,1,3,3-tetrametiluronio metanaminio (0.128 g, 0.27 mmol) a temperatura ambiente.

Después de agitar por 15 min. a temperatura ambiente, se añadió (*R*)-(1,2,3,4-tetrahydro-naftalen-1-il)amina (0.045 g, 0.25 mmol) a la mezcla de reacción. Después de agitar por 2 h a temperatura ambiente, el disolvente fue evaporado y el aceite café resultante fue disuelto en acetato de etilo (10 mL), lavado con una disolución acuosa saturada de bicarbonato de sodio (20 mL) y la fase acuosa fue re-extraída con acetato de etilo (20 mL). Las capas orgánicas combinadas fueron lavadas con una disolución de HCl 1M (20 mL) y cloruro de sodio saturado (20 mL), secadas sobre sulfato de sodio, filtradas y evaporadas bajo presión reducida. La mezcla cruda fue purificada mediante cromatografía de columna en gel de sílice (acetato de etilo/ciclohexano entre 1:1 y 8:2) para dar la 3-{1-[2-(5-metil-3-trifluorometil-pirazol-1-il)-acetil]-piperidin-4-il}-N-(*R*)-1,2,3,4-tetrahydro-naftalen-1-il-benzamida (125 mg, 94 %). ¹H-RMN (400 MHz, *d*₆-DMSO): δ = 1.52-1.61 (m, 1H), 1.68-1.89 (m, 5H), 1.91-2.02 (m, 1H), 2.22 (s, 3H), 2.64-2.92 (m, 4H), 3.15-3.24 (m, 1H), 3.99-4.04 (m, 1H), 4.46-4.52 (m, 1H), 5.19-5.38 (m, 3H), 6.50 (s, 1H), 7.12-7.19 (m, 4H), 7.38 (d, 1H), 7.75 (d, 1H), 7.82 (s, 1H), 8.71 (d, 1H). EM: *m/z* = 525 (M+1).

Ejemplo 2: Este ejemplo ilustra la preparación de la N-metil-3-{1-[2-(5-metil-3-trifluorometil-pirazol-1-il)-acetil]-piperidin-4-il}-N-(*R*)-1,2,3,4-tetrahydro-naftalen-1-il-benzamida

(Compuesto No. I.o.001)

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a) Preparación de la N-metil-3-{1-[2-(5-metil-3-trifluorometil-pirazol-1-il)-acetil]piperidin-4-il}-N-(*R*)-1,2,3,4-tetrahydro-naftalen-1-il-benzamida (Compuesto No. I.o.001)

A una disolución del ácido 3-{1-[2-(5-metil-3-trifluorometil-pirazol-1-il)-acetil]-piperidin-4-il}- benzoico (320 mg, 0.80 mmol) en DMF (8 mL) se añadió diisopropiletilamina (1.01 mL, 4.85 mmol), seguida por hexafluorofosfato de 2-(1H-7-azabenzotriazol-1-il)-1,1,3,3-tetrametiluronio metanaminio (0.41 g, 0.89 mmol) a

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temperatura ambiente. Después de agitar por 15 min a temperatura ambiente, se añadió metil-((*R*))-1,2,3,4-tetrahidro-naftalen-1-il-amina (0.158 g, 0.80 mmol) a la mezcla de reacción. Después de agitar por 2 h a temperatura ambiente, el disolvente fue evaporado y el aceite café resultante fue disuelto en acetato de etilo (20 mL), lavado con una
5 disolución acuosa saturada de bicarbonato de sodio (30 mL) y la fase acuosa fue re-extraída con acetato de etilo (20 mL). Las capas orgánicas combinadas fueron lavadas con una disolución de HCl 1M (50 mL) y cloruro de sodio saturado (50 mL), secadas sobre sulfato de sodio, filtradas y evaporadas bajo presión reducida. La mezcla cruda fue purificada mediante cromatografía de columna en gel de sílice (acetato de
10 etilo/ciclohexano entre 1:1 y 8:2) para dar la N-metil-3-{1-[2-(5-metil-3-trifluorometil-pirazol-1-il)-acetil]-piperidin-4-il}-N-((*R*))-1,2,3,4-tetrahidro-naftalen-1-il-benzamida (200 mg, 46 %).
¹H-RMN (400 MHz, *d*₆-DMSO): δ = 1.45-1.59 (m, 1H), 1.63-1.91 (m, 5H), 1.91-2.02 (m, 1H), 2.22 (s, 3H), 2.61 (s, 3H), 2.64-2.92 (m, 4H), 3.15-3.24 (m, 1H), 3.99-4.04 (m, 1H), 4.46-4.52 (m, 1H), 5.19-5.38 (m, 2H), 5.74-5.81 (m, 1H), 6.50 (s, 1H), 7.12-7.23 (m, 4H),
15 7.28-7.47 (m, 4H). EM: m/z = 539 (M+1).

Ejemplo 3: Este ejemplo ilustra la preparación de la N-metil-3-{1-[2-(5-metil-3-trifluorometil-pirazol-1-il)-acetil]-piperidin-4-il}-N-((*R*))-1-fenil-etil)-benzamida (Compuesto No. I.o.003)

20 a) Preparación de la N-metil-3-{1-[2-(5-metil-3-trifluorometil-pirazol-1-il)-acetil]-piperidin-4-il}-N-((*R*))-1-fenil-etil)-benzamida (Compuesto No. I.o.003)

A una disolución del ácido 3-{1-[2-(5-metil-3-trifluorometil-pirazol-1-il)-acetil]-piperidin-4-il}-benzoico (320 mg, 0.80 mmol) en DMF (8 mL) se añadió diisopropiletilamina (1.01 mL, 4.85 mmol), seguida por hexafluorofosfato de 2-(1H-7-azabenzotriazol-1-il)-
25 1,1,3,3-tetrametiluronio metanaminio (0.41 g, 0.89 mmol) a temperatura ambiente. Después de agitar por 15 min. a temperatura ambiente, se añadió metil-((*R*))-1-fenil-etil)-amina (0.132 g, 0.80 mmol) a la mezcla de reacción. Después de agitar por 2h a

temperatura ambiente, el disolvente fue evaporado y el aceite café resultante fue disuelto en acetato de etilo (20 mL), lavado con una disolución acuosa saturada de bicarbonato de sodio (30 mL) y la fase acuosa fue re-extraída con acetato de etilo (20 mL). Las capas orgánicas combinadas fueron lavadas con una disolución de HCl 1M (50 mL) y cloruro de sodio saturado (50 mL), secadas sobre sulfato de sodio, filtradas y evaporadas bajo presión reducida. La mezcla cruda fue purificada mediante cromatografía de columna en gel de sílice (acetato de etilo/ciclohexano entre 1:1 y 8:2) para dar la N-metil-3-{1-[2-(5-metil-3-trifluorometil-pirazol-1-il)-acetil]-piperidin-4-il}-N-((*R*)-1-fenil-etil)-benzamida (170 mg, 41 %). ¹H-RMN (400 MHz, *d*₆-DMSO): δ = 1.55 (d, 3H), 1.62-1.71 (m, 1H), 1.82-1.89 (m, 2H), 1.99 (s, 3H), 2.22 (s, 3H), 2.54-2.73 (m, 3H), 2.81-2.90 (m, 1H), 3.12-3.21 (m, 1H), 3.99-4.04 (m, 1H), 4.46-4.52 (m, 1H), 5.19-5.38 (m, 2H), 6.50 (s, 1H), 7.12-7.41 (m, 9H). EM: *m/z* = 513 (*M*+1)

Ejemplo 4: Este ejemplo ilustra la preparación de la metil-(1,2,3,4-tetrahidro-naftalen-1-il)-amida del ácido 1'-[2-(5-metil-3-trifluorometil-pirazol-1-il)-acetil]-1',2',3',4',5',6'-hexahidro-[2,4']bipiridinil-6-carboxílico (Compuesto No. I.q.005)

a) Preparación del éster 1'-terc-butílico 6-etílico del ácido 3',6'-dihidro-2'H-[2,4']bipiridinil-6,1'-dicarboxílico

A una disolución del éster etílico del ácido 6-bromo-piridina-2-carboxílico (1 g, 4.35 mmol) en dioxano (40 mL) se añadieron sucesivamente cloruro de bis(trifenilfosfina)paladio (II) (0.152 g, 0.217 mmol), éster terc-butílico del ácido 4-(4,4,5,5-tetrametil-[1,3,2]dioxaborolan-2-il)-3,6-dihidro-2H-piridina-1-carboxílico² (1.61 g, 5.21 mmol), disolución acuosa de carbonato de sodio (1.38 g en 10 mL de agua, 13.04 mmol) a temperatura ambiente. Después de agitar por 3 h a 110°C, el disolvente fue evaporado y el aceite amarillo resultante fue disuelto en acetato de etilo (30 mL), lavado con cloruro de sodio saturado (30 mL). La capa orgánica fue secada sobre sulfato de sodio, filtrada y

evaporada bajo presión reducida. La mezcla cruda fue purificada mediante cromatografía de columna en gel de sílice (acetato de etilo/heptano entre 0:1 y 3:7) para dar el éster 1'-terc-butílico 6-etílico del ácido 3',6'-dihidro-2'H-[2,4']bipiridinil-6,1'-dicarboxílico (1.13 g, 78 %). ¹H-RMN (400 MHz, *d*₆-DMSO): δ = 1.31-1.38 (t, 3H), 1.47 (s, 9H), 2.55-2.59 (m, 2H), 3.51-3.59 (m, 2H), 4.08-4.12 (m, 2H), 4.31-4.37 (q, 2H), 6.74 (m, 1H), 7.75-7.79 (d, 1H), 7.88-7.91 (m, 1H), 7.92-7.99 (t, 1H). EM: *m/z* = 333 (*M*+1).

b) Preparación del éster 1'-terc-butílico 6-etílico del ácido 3',4',5',6'-tetrahidro-2'H-[2,4']bipiridinil-6,1'-dicarboxílico

10 Una disolución del éster 1'-terc-butílico 6-etílico del ácido 3',6'-dihidro-2'H-[2,4']bipiridinil-6,1'-dicarboxílico (1.12 g, 3.37 mmol) en etanol (67 mL) fue bombeada a través de un cartucho de Pd/C utilizando un aparato H-Cube (20 °C, 10 bar, 2 mL/min.). Luego, el disolvente fue evaporado bajo presión reducida para dar el éster 1'-terc-butílico 6-etílico del ácido 3',4',5',6'-tetrahidro-2'H-[2,4']bipiridinil-6,1'-dicarboxílico (1.001 g, 89 %), el cual puede ser utilizado en el paso siguiente sin purificación adicional. ¹H-RMN (400 MHz, *d*₆-DMSO): δ = 1.31-1.38 (t, 3H), 1.47 (s, 9H), 1.55-1.65 (m, 2H), 1.79-1.88 (m, 2H), 2.91-2.99 (m, 2H), 3.42-3.48 (m, 1H), 4.05-4.12 (m, 2H), 4.31-4.37 (q, 2H), 7.55 (d, 1H), 7.84-7.92 (m, 2H). EM: *m/z* = 333 (*M*+1). EM: *m/z* = 335 (*M*+1).

20 c) Preparación del éster 1'-terc-butílico del ácido 3',4',5',6'-tetrahidro-2'H-[2,4']bipiridinil-6,1'-dicarboxílico

25 A una disolución del éster 1'-terc-butílico 6-etílico del ácido 3',4',5',6'-tetrahidro-2'H-[2,4']bipiridinil-6,1'-dicarboxílico (100 mg, 0.3 mmol) en metanol (5 mL) se añadió una disolución acuosa de hidróxido de sodio (2 M, 0.23 mL, 0.5 mmol) a temperatura ambiente. Después de agitar por 4 h a temperatura ambiente, el disolvente fue removido, y el residuo fue disuelto en THF (5 mL), y se añadió una disolución acuosa de hidróxido de litio (7 mg en 1 mL de agua) a temperatura ambiente. Después de agitar durante toda

la noche a temperatura ambiente, el disolvente fue removido y el residuo fue disuelto en acetato de etilo (10 mL) y la mezcla de reacción fue acidificada con una disolución acuosa de HCl 2M hasta alcanzar un pH entre 2 y 3. Después de la separación de las fases, la
5 combinadas fueron lavadas con cloruro de sodio saturado (10 mL), secadas sobre sulfato de sodio, filtradas y evaporadas bajo presión reducida para dar el éster 1'-terc-butílico del ácido 3',4',5',6'-tetrahydro-2'H-[2,4']bipiridinil-6,1'-dicarboxílico (45 mg, 49 %), el cual puede ser utilizado en el paso siguiente sin purificación adicional. ¹H-RMN (400 MHz, *d*₆-DMSO):
□ = 1.43 (s, 9H), 1.58-1.68 (m, 2H), 1.81-1.84 (m, 2H), 2.84-2.96 (m, 2H), 3.27-3.39 (m,
10 1H), 4.07-4.10 (m, 2H), 7.52-7.54 (d, 1H), 7.86-7.92 (m, 2H). EM: m/z = 329 (M+23).

d) Preparación del éster terc-butílico del ácido 6-[metil-(1,2,3,4-tetrahydro-naftalen-1-il)-carbamoil]-3',4',5',6'-tetrahydro-2'H-[2,4']bipiridinil-1'-carboxílico

A una disolución del éster 1'-terc-butílico del ácido 3',4',5',6'-tetrahydro-2'H-[2,4']bipiridinil-6,1'-dicarboxílico (150 mg, 0.49 mmol), metil-(*R*)-1,2,3,4-tetrahydro-naftalen-
15 1-il-amina (0.079 g, 0.49 mmol), y diisopropiletilamina (0.50 mL, 0.49 mmol) en DMF (10 mL) se añadió gota a gota BOP (238 mg, 0.49 mmol) a temperatura ambiente. Después de agitar durante toda la noche a temperatura ambiente, la mezcla de reacción fue vertida en agua (10 mL) y extraída con acetato de etilo (20 mL). La fase acuosa fue re-extraída
20 con acetato de etilo (20 mL). Las capas orgánicas combinadas fueron lavadas con una disolución acuosa saturada de bicarbonato de sodio (30 mL), disolución de HCl 1M (30 mL) y cloruro de sodio saturado (30 mL), secadas sobre sulfato de sodio, filtradas y evaporadas bajo presión reducida. La mezcla cruda fue purificada mediante cromatografía de columna en gel de sílice (acetato de etilo/hexano 4:1) para dar el éster terc-butílico del
25 ácido 6-[metil-(1,2,3,4-tetrahydro-naftalen-1-il)-carbamoil]-3',4',5',6'-tetrahydro-2'H-[2,4']bipiridinil-1'-carboxílico (215 mg, 97 %). ¹H-RMN (400 MHz, CDCl₃): □ = 1.47 (s, 9H),

1.64-2.05 (m, 8H), 2.18-2.22 (m, 1H), 2.72-2.81 (m, 4H), 2.82 (s, 3H), 4.15-4.25 (m, 2H), 5.15-5.20 (m, 1H), 7.18-7.25 (m, 5H), 7.53-7.71 (m, 1H), 7.73-7.74 (m, 1H).

e) Preparación del clorhidrato de la metil-(1,2,3,4-tetrahidro-naftalen-1-il)-amida del ácido
5 1',2',3',4',5',6'-hexahidro-[2,4']bipiridinil-6-carboxílico

A una disolución del éster terc-butílico del ácido 6-[metil-(1,2,3,4-tetrahidro-naftalen-1-il)-carbamoil]-3',4',5',6'-tetrahidro-2'H-[2,4']bipiridinil-1'-carboxílico (202 mg, 0.45 mmol) se añadió una disolución de HCl 4M en dioxano (1.13 mL, 4.5 mmol) a temperatura ambiente. Después de agitar durante toda la noche a temperatura ambiente,
10 el disolvente fue evaporado bajo presión reducida para dar el clorhidrato de la metil-(1,2,3,4-tetrahidro-naftalen-1-il)-amida del ácido 1',2',3',4',5',6'-hexahidro-[2,4']bipiridinil-6-carboxílico (162 mg, 93%). ¹H-RMN (400 MHz, *d*₆-DMSO): δ = 1.83-2.02 (m, 6H), 2.51 (s, 3H), 2.52-2.59 (m, 2H), 2.71-3.03 (m, 2H), 3.29-3.38 (m, 2H), 3.97-4.05 (m, 2H), 4.78-4.83 (m, 1H), 7.08-7.23 (m, 4H), 7.36-7.41 (m, 1H), 7.52-7.55 (m, 1H), 7.90-7.95 (m, 1H), 8.81
15 (br, 1H), 9.04 (br, 1H).

f) Preparación de la metil-(1,2,3,4-tetrahidro-naftalen-1-il)-amida del ácido 1'-[2-(5-metil-3-trifluorometil-pirazol-1-il)-acetil]-1',2',3',4',5',6'-hexahidro-[2,4']bipiridinil-6-carboxílico

(Compuesto No. I.q.005)

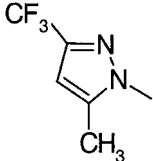
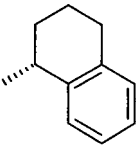
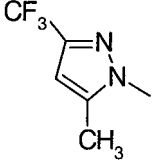
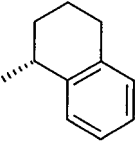
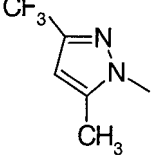
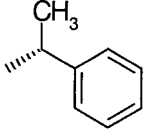
20 A una disolución del ácido (5-metil-3-trifluorometil-pirazol-1-il)-acético (81 mg, 0.39 mmol), clorhidrato de la metil-(1,2,3,4-tetrahidro-naftalen-1-il)-amida del ácido 1',2',3',4',5',6'-hexahidro-[2,4']bipiridinil-6-carboxílico (150 mg, 0.39 mmol), y diisopropiletilamina (0.41 mL, 0.39 mmol) en DMF (10 mL) se añadió gota a gota BOP (191 mg, 0.39 mmol) a temperatura ambiente. Después de agitar durante toda la noche a
25 temperatura ambiente, la mezcla de reacción fue vertida en agua (10 mL) y extraída con acetato de etilo (20 mL). La fase acuosa fue re-extraída con acetato de etilo (20 mL). Las capas orgánicas combinadas fueron lavadas con una disolución acuosa saturada de

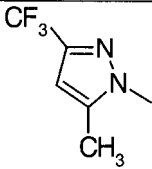
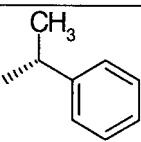
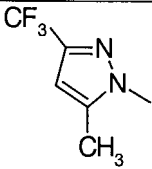
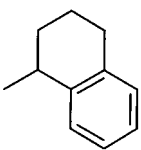
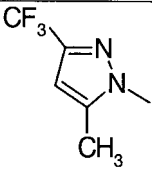
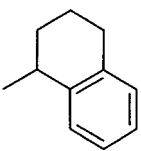
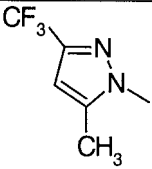
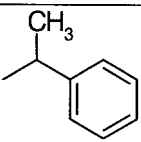
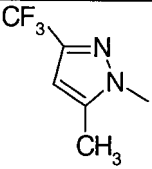
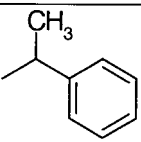
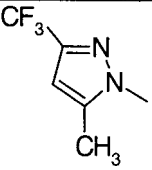
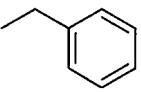
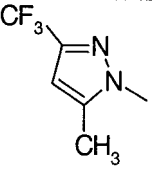
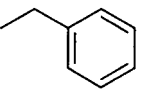
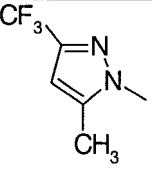
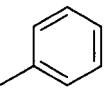
bicarbonato de sodio (30 mL), disolución de HCl 1M (30 mL) y cloruro de sodio saturado (30 mL), secadas sobre sulfato de sodio, filtradas y evaporadas bajo presión reducida. La mezcla cruda fue purificada mediante cromatografía de columna en gel de sílice (acetato de etilo) para dar la metil-(1,2,3,4-tetrahidro-naftalen-1-il)-amida del ácido 1'-[2-(5-metil-3-trifluorometil-pirazol-1-il)-acetil]-1',2',3',4',5',6'-hexahidro-[2,4']bipiridinil-6-carboxílico (150 mg, 71 %). p.f. 62-65°C. ¹H-RMN (400 MHz, CDCl₃): δ = 1.67-2.02 (m, 6H), 2.18-2.22 (m, 1H), 2.30 (s, 3H), 2.71 (s, 3H), 2.72-2.75 (m, 2H), 3.17-3.27 (m, 2H), 3.97-4.05 (m, 2H), 4.58-4.78 (m, 2H), 4.96 (s, 2H), 5.05-5.15 (m, 1H), 6.33 (s, 1H), 7.10-7.24 (m, 4H), 7.28-7.32 (m, 1H), 7.57-7.58 (m, 1H), 7.76-7.78 (m, 1H).

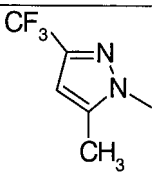
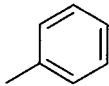
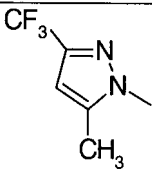
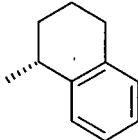
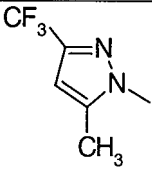
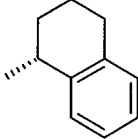
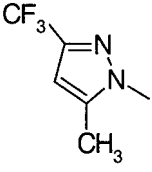
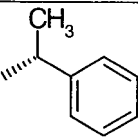
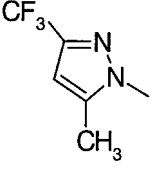
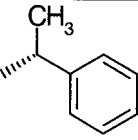
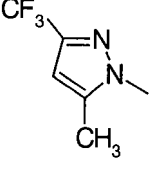
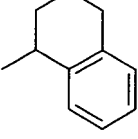
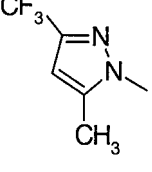
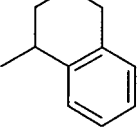
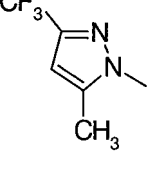
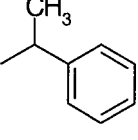
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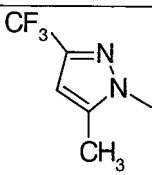
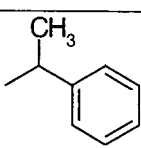
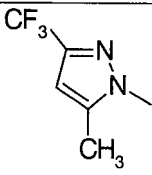
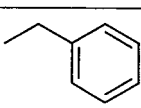
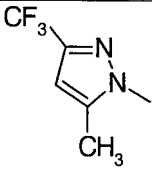
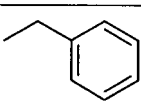
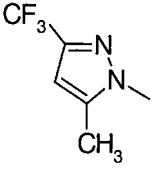
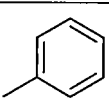
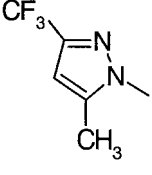
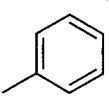
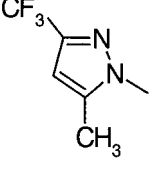
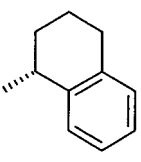
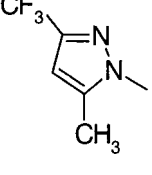
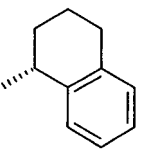
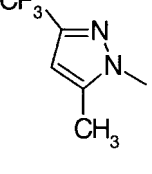
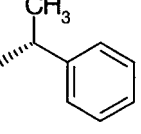
La Tabla 1, que se muestra a continuación, ilustra ejemplos de los compuestos individuales de fórmula I de conformidad con la invención.

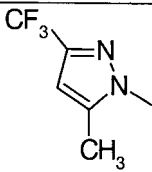
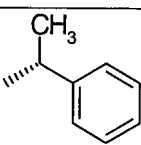
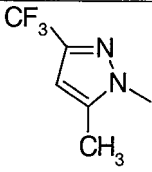
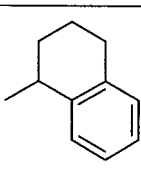
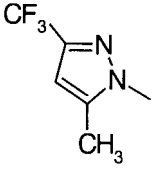
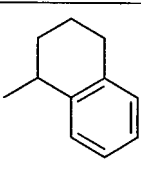
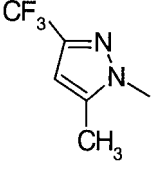
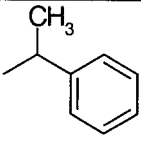
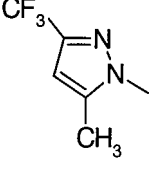
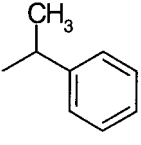
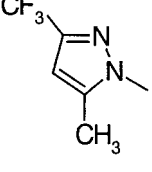
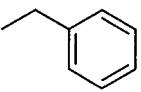
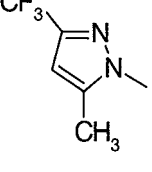
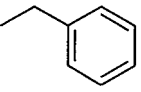
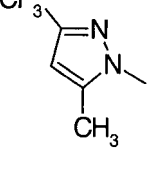
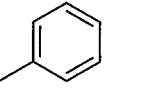
Tabla 1: compuestos individuales de fórmula I de conformidad con la invención

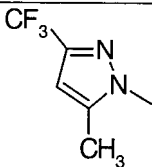
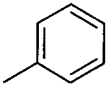
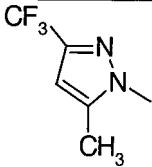
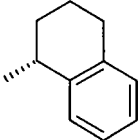
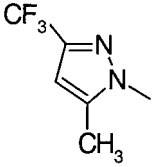
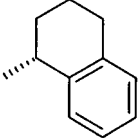
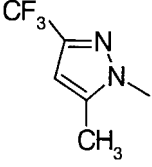
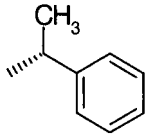
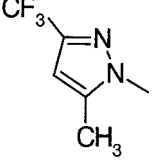
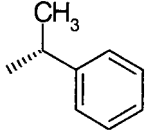
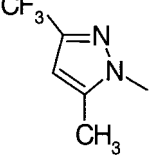
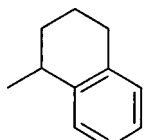
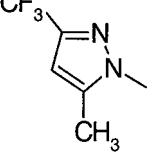
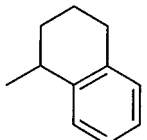
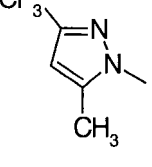
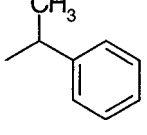
Compuesto No.	R ¹	A	Q	R ⁹
001		-CH ₂ C(=O)-	O	
002		-CH ₂ C(=O)-	S	
003		-CH ₂ C(=O)-	O	

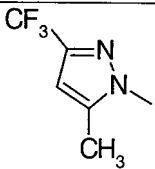
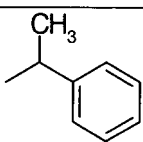
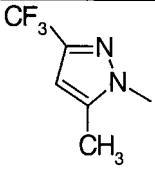
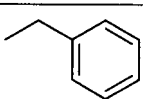
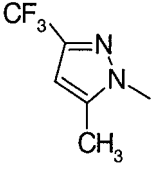
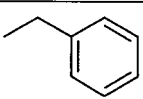
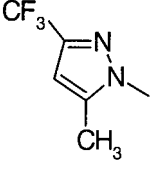
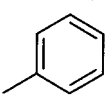
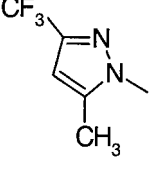
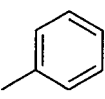
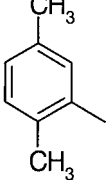
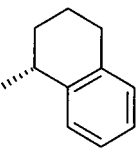
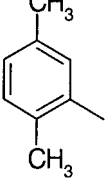
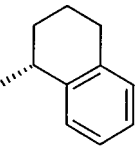
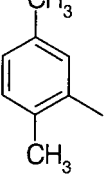
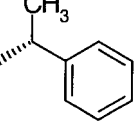
004		-CH ₂ C(=O)-	S	
005		-CH ₂ C(=O)-	O	
006		-CH ₂ C(=O)-	S	
007		-CH ₂ C(=O)-	O	
008		-CH ₂ C(=O)-	S	
009		-CH ₂ C(=O)-	O	
010		-CH ₂ C(=O)-	S	
011		-CH ₂ C(=O)-	O	

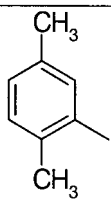
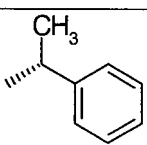
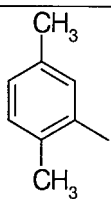
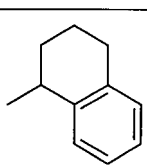
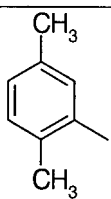
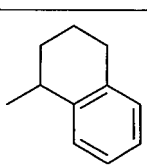
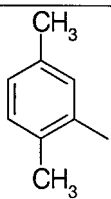
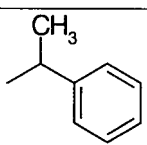
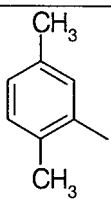
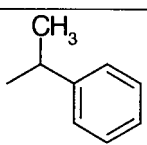
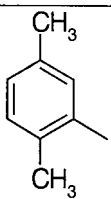
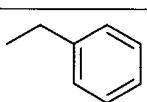
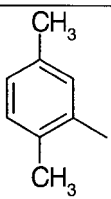
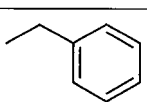
012		-CH ₂ C(=O)-	S	
013		-CH ₂ C(=S)-	O	
014		-CH ₂ C(=S)-	S	
015		-CH ₂ C(=S)-	O	
016		-CH ₂ C(=S)-	S	
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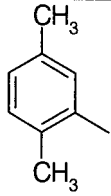
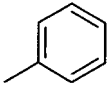
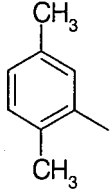
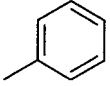
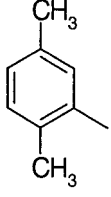
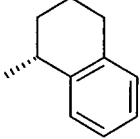
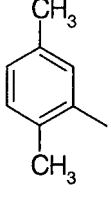
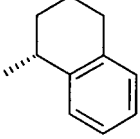
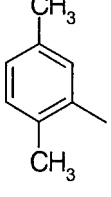
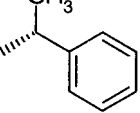
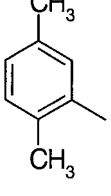
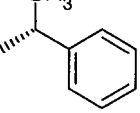
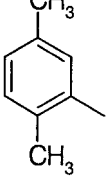
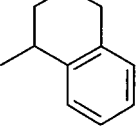
020		-CH ₂ C(=S)-	S	
021		-CH ₂ C(=S)-	O	
022		-CH ₂ C(=S)-	S	
023		-CH ₂ C(=S)-	O	
024		-CH ₂ C(=S)-	S	
025		-OC(=O)-	O	
026		-OC(=O)-	S	
027		-OC(=O)-	O	

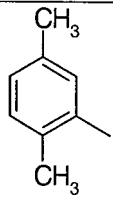
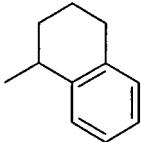
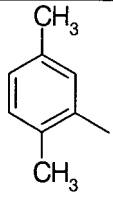
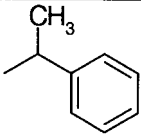
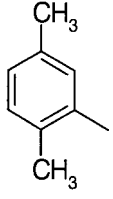
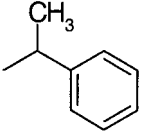
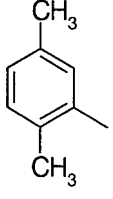
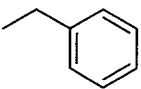
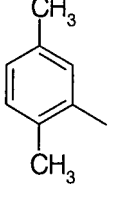
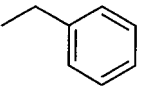
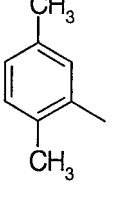
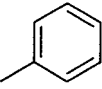
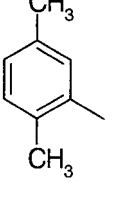
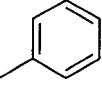
028		-OC(=O)-	S	
029		-OC(=O)-	O	
030		-OC(=O)-	S	
031		-OC(=O)-	O	
032		-OC(=O)-	S	
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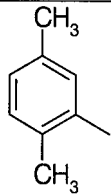
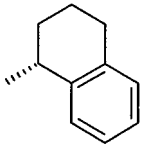
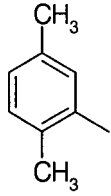
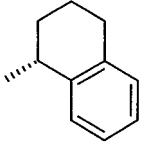
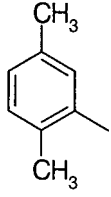
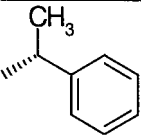
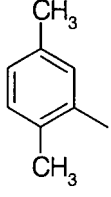
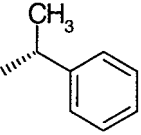
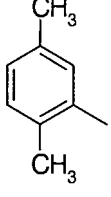
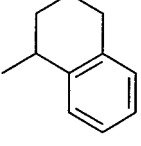
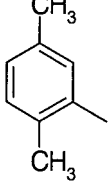
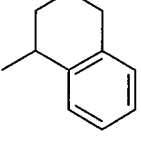
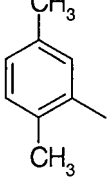
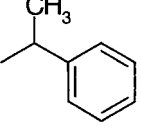
036		-OC(=O)-	S	
037		-CH ₂ SO ₂ -	O	
038		-CH ₂ SO ₂ -	S	
039		-CH ₂ SO ₂ -	O	
040		-CH ₂ SO ₂ -	S	
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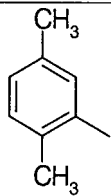
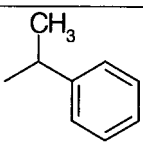
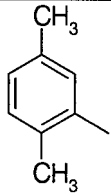
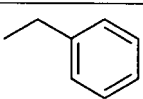
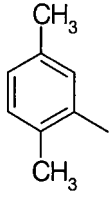
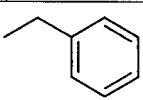
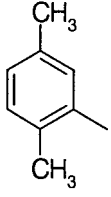
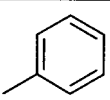
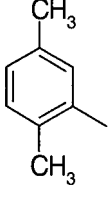
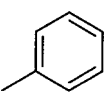
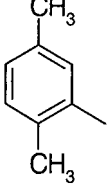
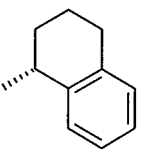
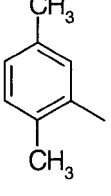
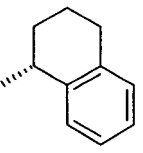
044		- CH ₂ SO ₂ -	S	
045		- CH ₂ SO ₂ -	O	
046		- CH ₂ SO ₂ -	S	
047		- CH ₂ SO ₂ -	O	
048		- CH ₂ SO ₂ -	S	
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050		-CH ₂ C(=O)-	S	
051		-CH ₂ C(=O)-	O	

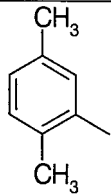
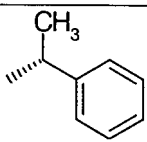
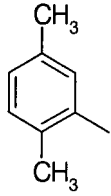
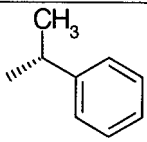
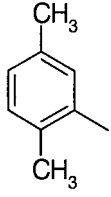
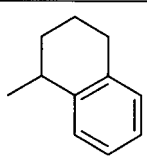
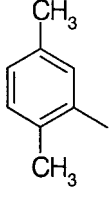
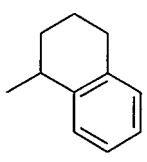
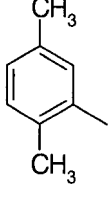
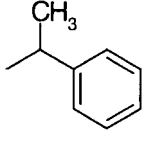
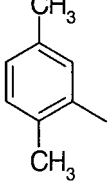
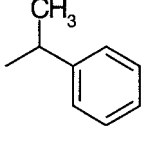
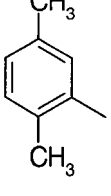
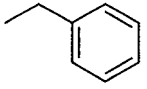
052		-CH ₂ C(=O)-	S	
053		-CH ₂ C(=O)-	O	
054		-CH ₂ C(=O)-	S	
055		-CH ₂ C(=O)-	O	
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058		-CH ₂ C(=O)-	S	

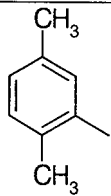
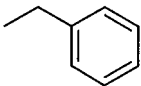
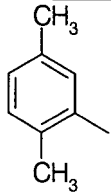
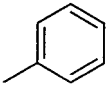
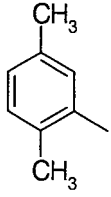
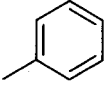
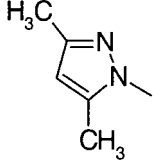
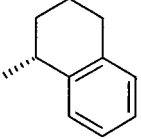
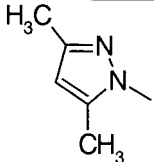
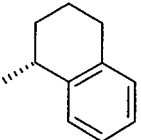
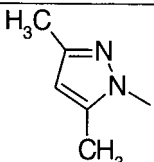
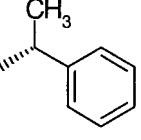
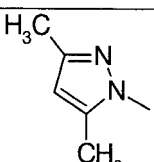
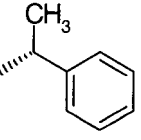
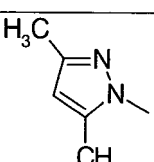
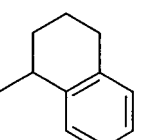
059		$-\text{CH}_2\text{C}(=\text{O})-$	O	
060		$-\text{CH}_2\text{C}(=\text{O})-$	S	
061		$-\text{CH}_2\text{C}(=\text{S})-$	O	
062		$-\text{CH}_2\text{C}(=\text{S})-$	S	
063		$-\text{CH}_2\text{C}(=\text{S})-$	O	
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065		$-\text{CH}_2\text{C}(=\text{S})-$	O	

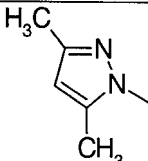
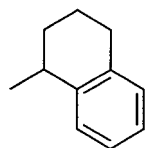
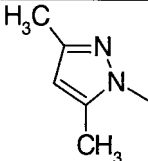
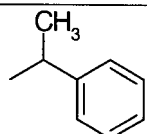
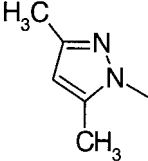
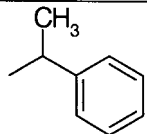
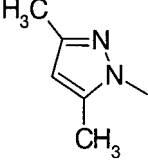
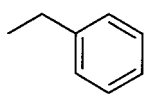
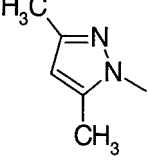
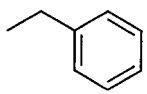
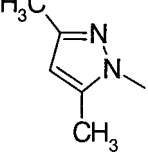
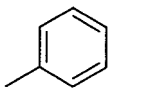
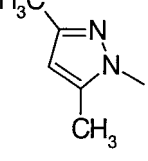
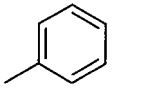
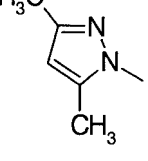
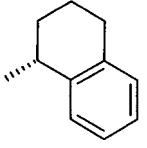
066		$-\text{CH}_2\text{C}(=\text{S})-$	S	
067		$-\text{CH}_2\text{C}(=\text{S})-$	O	
068		$-\text{CH}_2\text{C}(=\text{S})-$	S	
069		$-\text{CH}_2\text{C}(=\text{S})-$	O	
070		$-\text{CH}_2\text{C}(=\text{S})-$	S	
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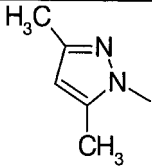
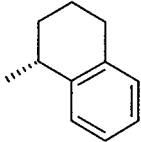
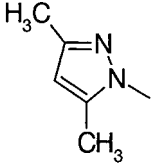
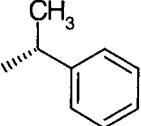
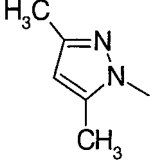
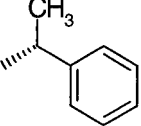
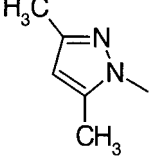
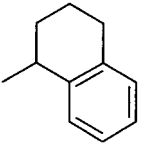
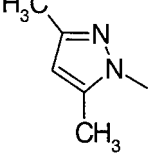
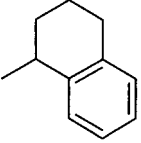
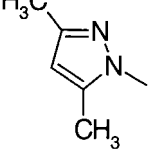
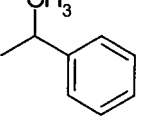
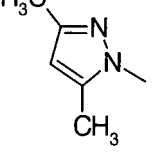
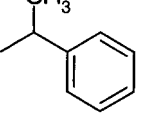
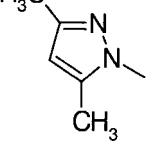
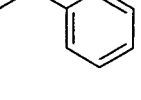
073		-OC(=O)-	O	
074		-OC(=O)-	S	
075		-OC(=O)-	O	
076		-OC(=O)-	S	
077		-OC(=O)-	O	
078		-OC(=O)-	S	
079		-OC(=O)-	O	

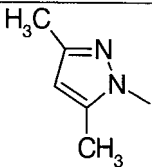
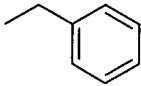
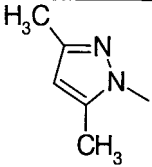
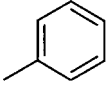
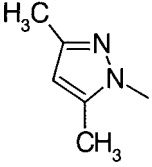
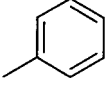
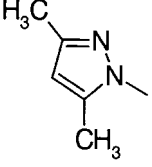
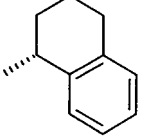
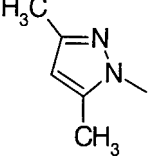
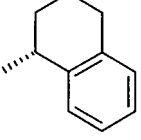
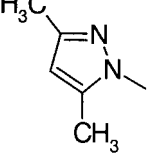
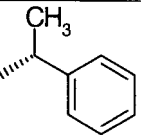
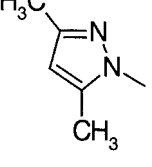
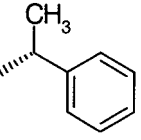
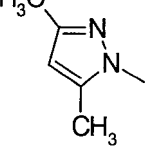
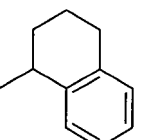
080		-OC(=O)-	S	
081		-OC(=O)-	O	
082		-OC(=O)-	S	
083		-OC(=O)-	O	
084		-OC(=O)-	S	
085		-CH ₂ SO ₂ -	O	
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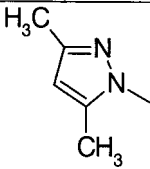
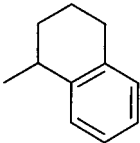
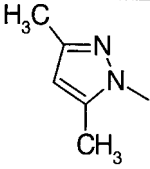
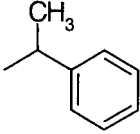
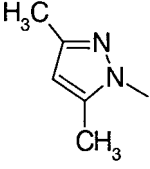
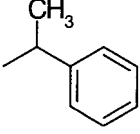
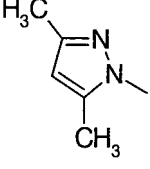
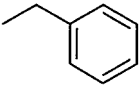
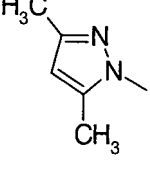
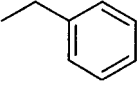
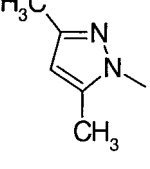
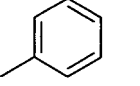
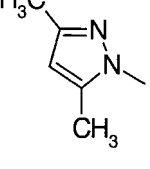
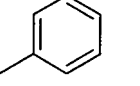
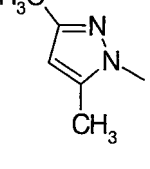
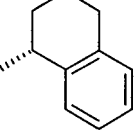
087		- CH ₂ SO ₂ ⁻	O	
088		- CH ₂ SO ₂ ⁻	S	
089		- CH ₂ SO ₂ ⁻	O	
090		- CH ₂ SO ₂ ⁻	S	
091		- CH ₂ SO ₂ ⁻	O	
092		-CH ₂ SO ₂ ⁻	S	
093		- CH ₂ SO ₂ ⁻	O	

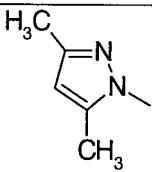
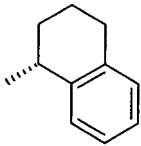
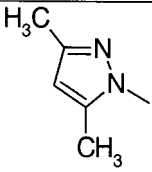
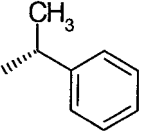
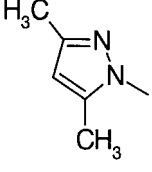
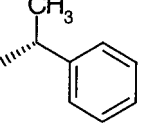
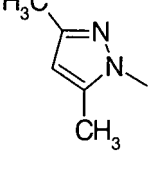
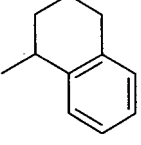
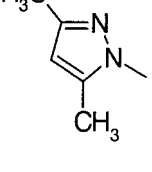
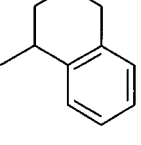
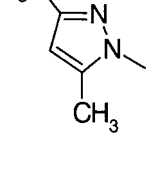
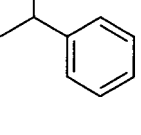
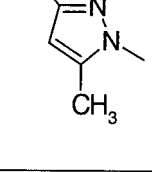
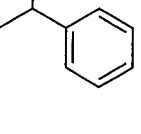
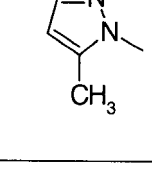
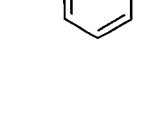
094		- CH ₂ SO ₂ -	S	
095		- CH ₂ SO ₂ -	O	
096		- CH ₂ SO ₂ -	S	
097		-CH ₂ C(=O)-	O	
098		-CH ₂ C(=O)-	S	
099		-CH ₂ C(=O)-	O	
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101		-CH ₂ C(=O)-	O	

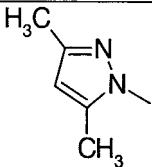
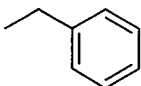
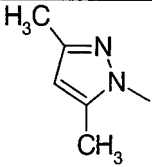
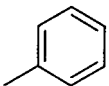
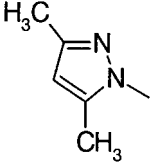
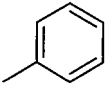
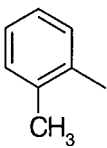
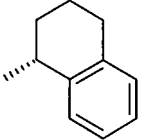
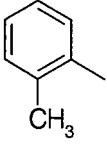
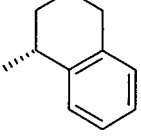
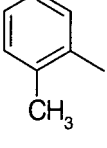
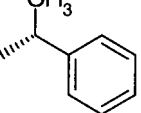
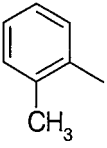
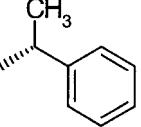
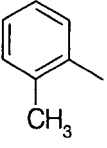
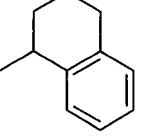
102		$-\text{CH}_2\text{C}(=\text{O})-$	S	
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105		$-\text{CH}_2\text{C}(=\text{O})-$	O	
106		$-\text{CH}_2\text{C}(=\text{O})-$	S	
107		$-\text{CH}_2\text{C}(=\text{O})-$	O	
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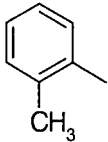
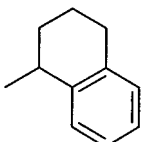
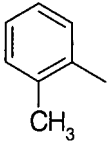
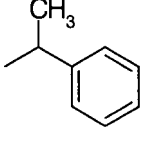
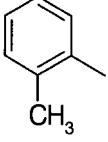
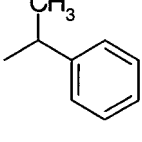
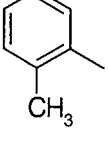
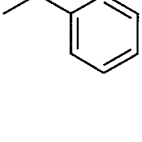
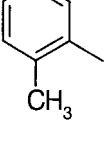
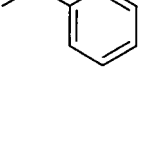
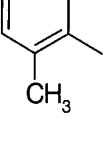
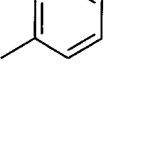
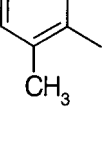
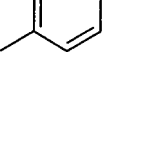
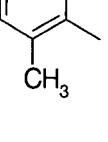
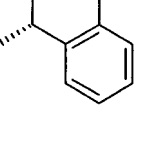
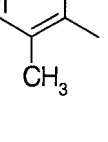
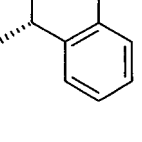
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112		$-\text{CH}_2\text{C}(=\text{S})-$	S	
113		$-\text{CH}_2\text{C}(=\text{S})-$	O	
114		$-\text{CH}_2\text{C}(=\text{S})-$	S	
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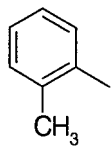
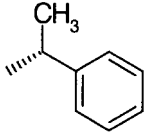
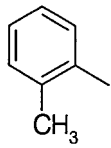
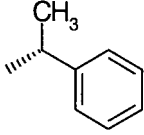
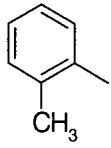
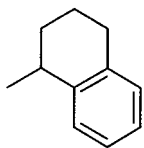
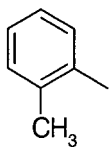
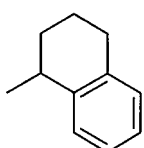
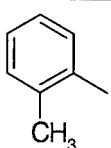
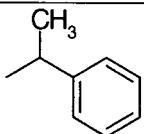
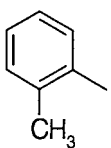
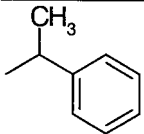
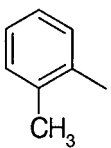
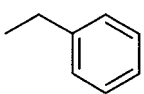
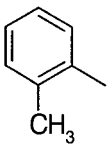
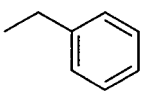
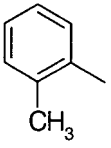
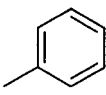
118		$-\text{CH}_2\text{C}(=\text{S})-$	S	
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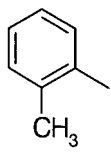
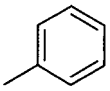
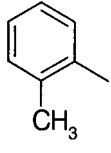
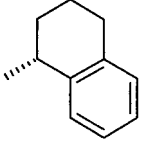
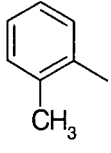
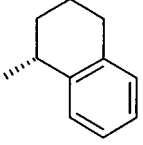
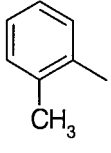
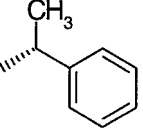
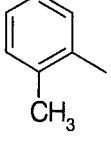
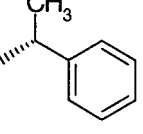
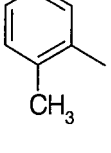
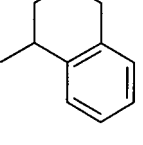
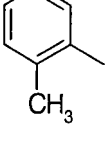
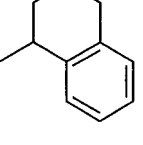
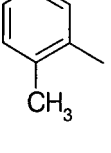
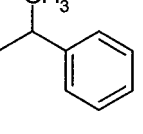
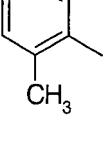
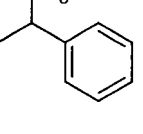
126		-OC(=O)-	S	
127		-OC(=O)-	O	
128		-OC(=O)-	S	
129		-OC(=O)-	O	
130		-OC(=O)-	S	
131		-OC(=O)-	O	
132		-OC(=O)-	S	
133		-CH ₂ SO ₂ -	O	

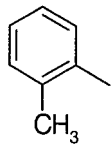
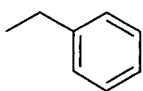
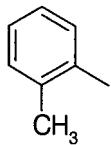
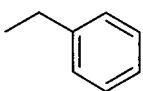
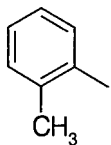
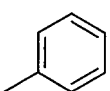
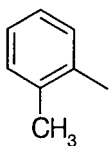
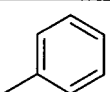
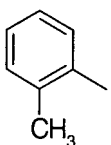
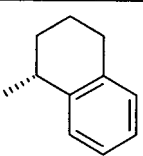
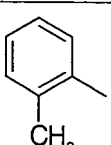
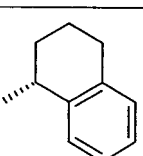
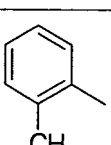
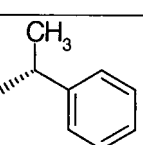
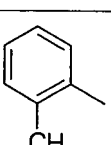
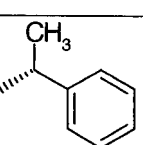
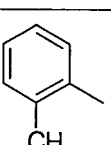
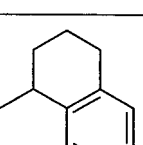
134		- CH ₂ SO ₂ ⁻	S	
135		- CH ₂ SO ₂ ⁻	O	
136		- CH ₂ SO ₂ ⁻	S	
137		- CH ₂ SO ₂ ⁻	O	
138		- CH ₂ SO ₂ ⁻	S	
139		- CH ₂ SO ₂ ⁻	O	
140		- CH ₂ SO ₂ ⁻	S	
141		-CH ₂ SO ₂ ⁻	O	

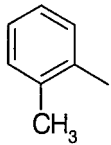
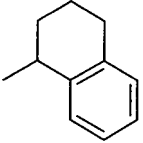
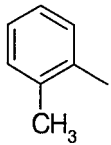
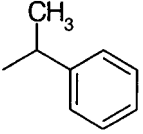
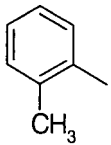
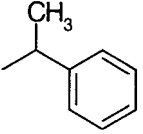
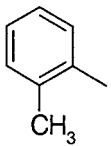
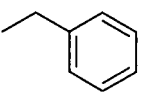
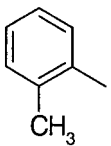
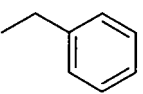
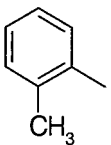
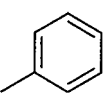
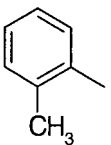
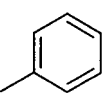
142		- CH ₂ SO ₂ -	S	
143		- CH ₂ SO ₂ -	O	
144		- CH ₂ SO ₂ -	S	
145		-CH ₂ C(=O)-	O	
146		-CH ₂ C(=O)-	S	
147		-CH ₂ C(=O)-	O	
148		-CH ₂ C(=O)-	S	
149		-CH ₂ C(=O)-	O	

150		$-\text{CH}_2\text{C}(=\text{O})-$	S	
151		$-\text{CH}_2\text{C}(=\text{O})-$	O	
152		$-\text{CH}_2\text{C}(=\text{O})-$	S	
153		$-\text{CH}_2\text{C}(=\text{O})-$	O	
154		$-\text{CH}_2\text{C}(=\text{O})-$	S	
155		$-\text{CH}_2\text{C}(=\text{O})-$	O	
156		$-\text{CH}_2\text{C}(=\text{O})-$	S	
157		$-\text{CH}_2\text{C}(=\text{S})-$	O	
158		$-\text{CH}_2\text{C}(=\text{S})-$	S	

159		$-\text{CH}_2\text{C}(=\text{S})-$	O	
160		$-\text{CH}_2\text{C}(=\text{S})-$	S	
161		$-\text{CH}_2\text{C}(=\text{S})-$	O	
162		$-\text{CH}_2\text{C}(=\text{S})-$	S	
163		$-\text{CH}_2\text{C}(=\text{S})-$	O	
164		$-\text{CH}_2\text{C}(=\text{S})-$	S	
165		$-\text{CH}_2\text{C}(=\text{S})-$	O	
166		$-\text{CH}_2\text{C}(=\text{S})-$	S	
167		$-\text{CH}_2\text{C}(=\text{S})-$	O	

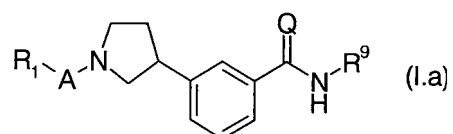
168		$-\text{CH}_2\text{C}(=\text{S})-$	S	
169		$-\text{OC}(=\text{O})-$	O	
170		$-\text{OC}(=\text{O})-$	S	
171		$-\text{OC}(=\text{O})-$	O	
172		$-\text{OC}(=\text{O})-$	S	
173		$-\text{OC}(=\text{O})-$	O	
174		$-\text{OC}(=\text{O})-$	S	
175		$-\text{OC}(=\text{O})-$	O	
176		$-\text{OC}(=\text{O})-$	S	

177		-OC(=O)-	O	
178		-OC(=O)-	S	
179		-OC(=O)-	O	
180		-OC(=O)-	S	
181		-CH ₂ SO ₂ -	O	
182		-CH ₂ SO ₂ -	S	
183		-CH ₂ SO ₂ -	O	
184		-CH ₂ SO ₂ -	S	
185		-CH ₂ SO ₂ -	O	

186		$-\text{CH}_2\text{SO}_2^-$	S	
187		$-\text{CH}_2\text{SO}_2^-$	O	
188		$-\text{CH}_2\text{SO}_2^-$	S	
189		$-\text{CH}_2\text{SO}_2^-$	O	
190		$-\text{CH}_2\text{SO}_2^-$	S	
191		$-\text{CH}_2\text{SO}_2^-$	O	
192		$-\text{CH}_2\text{SO}_2^-$	S	

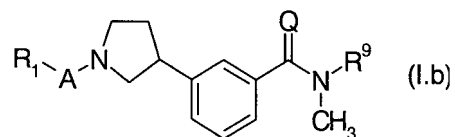
donde

a) 192 compuestos de fórmula (I.a):



5 en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

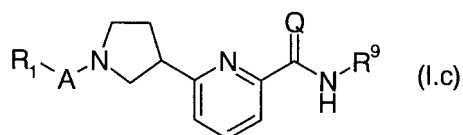
b) 192 compuestos de fórmula (I.b):



en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

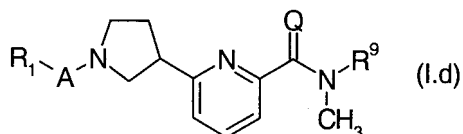
5

c) 192 compuestos de fórmula (I.c):



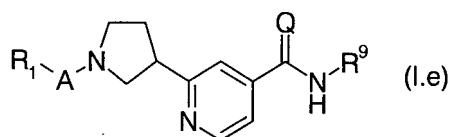
en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

10 d) 192 compuestos de fórmula (I.d):



en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

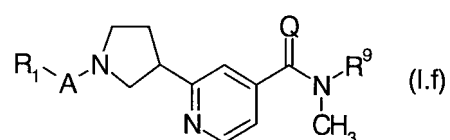
e) 192 compuestos de fórmula (I.e):



15

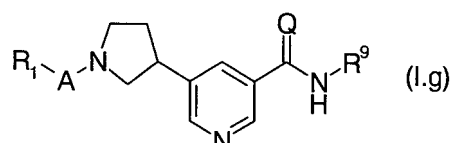
en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

f) 192 compuestos de fórmula (I.f):



en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

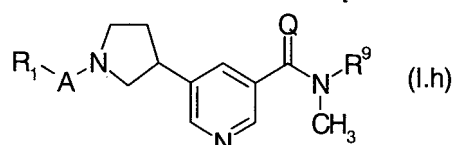
g) 192 compuestos de fórmula (I.g):



5

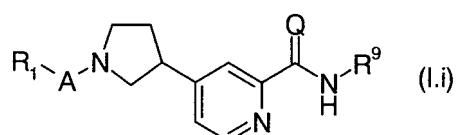
en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

h) 192 compuestos de fórmula (I.h):



10 en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

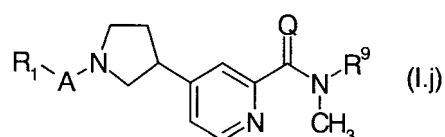
i) 192 compuestos de fórmula (I.i):



en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

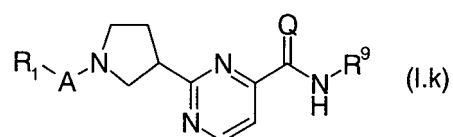
15

j) 192 compuestos de fórmula (I.j):



en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

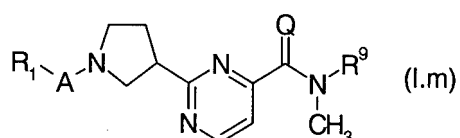
k) 192 compuestos de fórmula (l.k):



en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

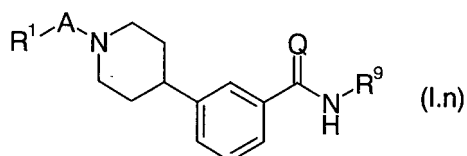
5

m) 192 compuestos de fórmula (l.m):



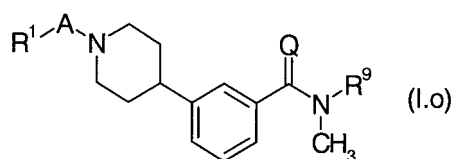
en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

10 n) 192 compuestos de fórmula (l.n):



en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

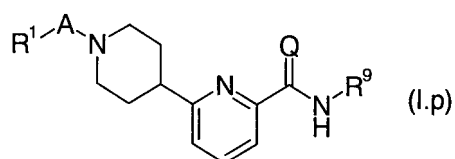
o) 192 compuestos de fórmula (l.o):



15

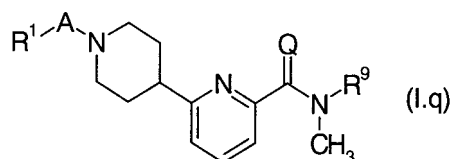
en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

p) 192 compuestos de fórmula (l.p):



en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

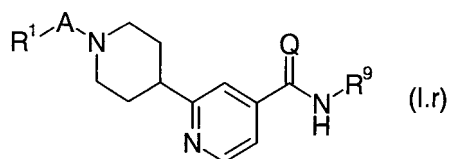
q) 192 compuestos de fórmula (I.q):



5

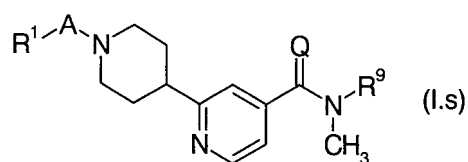
en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

r) 192 compuestos de fórmula (I.r):



10 en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

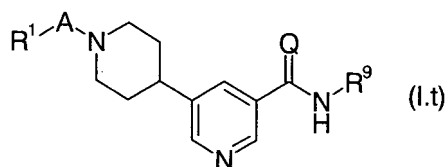
s) 192 compuestos de fórmula (I.s):



en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

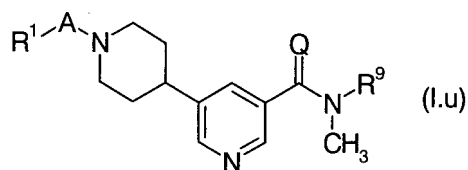
15

t) 192 compuestos de fórmula (I.t):



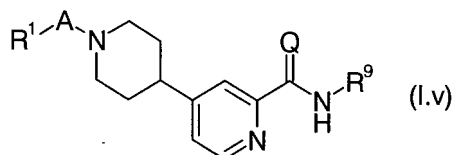
en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

u) 192 compuestos de fórmula (I.u):



5 en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

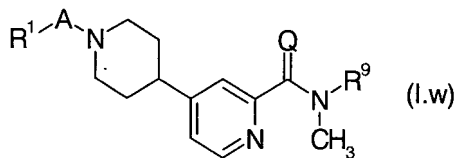
v) 192 compuestos de fórmula (I.v):



en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

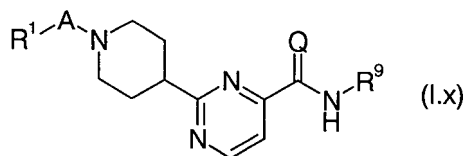
10

w) 192 compuestos de fórmula (I.w):



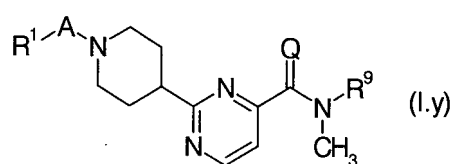
en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

15 x) 192 compuestos de fórmula (I.x):



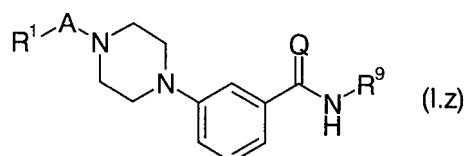
en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

y) 192 compuestos de fórmula (I.y):



en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

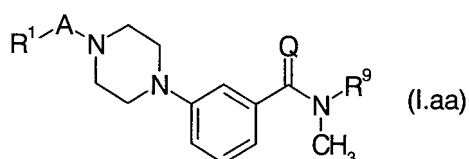
z) 192 compuestos de fórmula (I.z):



5

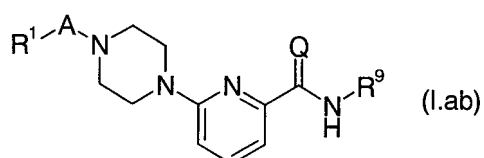
en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

aa) 192 compuestos de fórmula (I.aa):



10 en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

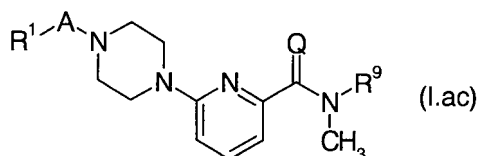
ab) 192 compuestos de fórmula (I.ab):



en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

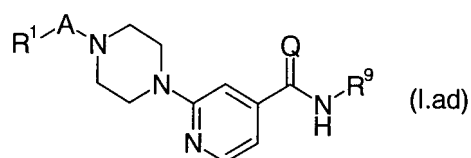
15

ac) 192 compuestos de fórmula (I.ac):



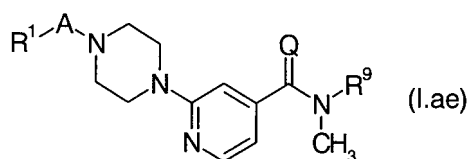
en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

ad) 192 compuestos de fórmula (I.ad):



5 en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

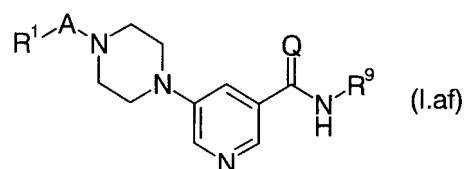
ae) 192 compuestos de fórmula (I.ae):



en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

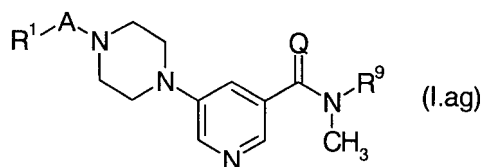
10

af) 192 compuestos de fórmula (I.af):



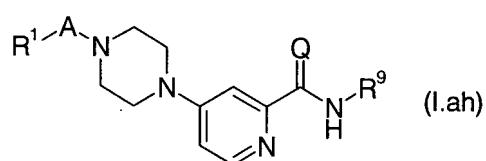
en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

15 ag) 192 compuestos de fórmula (I.ag):



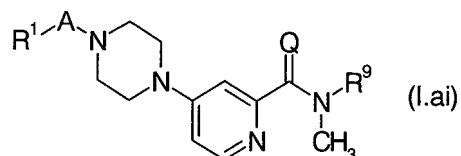
en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

ah) 192 compuestos de fórmula (I.ah):



en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

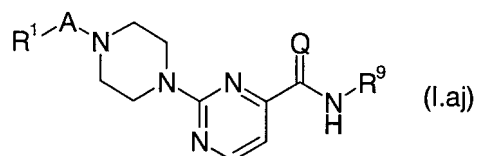
ai) 192 compuestos de fórmula (I.ai):



5

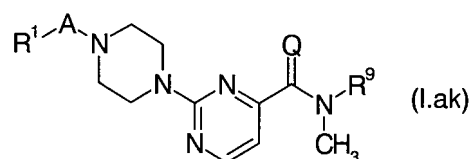
en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

aj) 192 compuestos de fórmula (I.aj):



10 en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

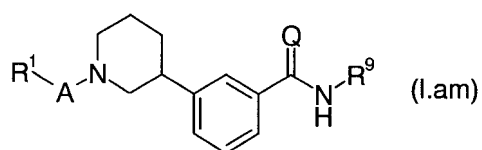
ak) 192 compuestos de fórmula (I.ak):



en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

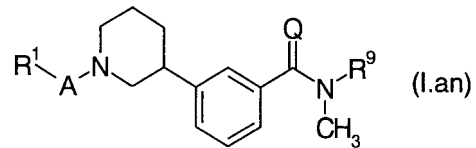
15

am) 192 compuestos de fórmula (I.am):



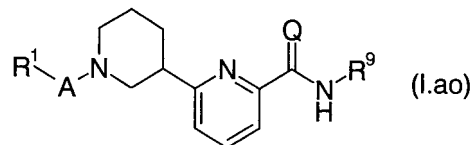
en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

an) 192 compuestos de fórmula (I.an):



5 en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

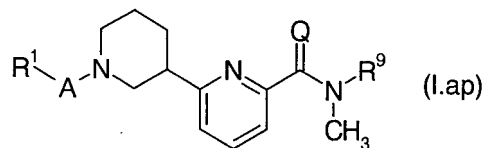
ao) 192 compuestos de fórmula (I.ao):



en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

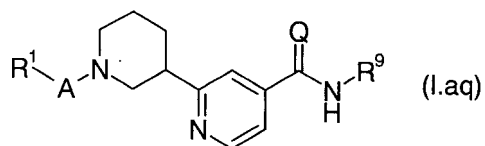
10

ap) 192 compuestos de fórmula (I.ap):



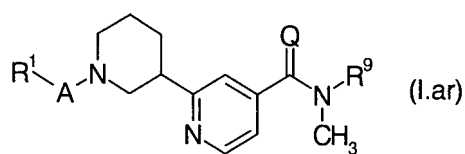
en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

15 aq) 192 compuestos de fórmula (I.aq):



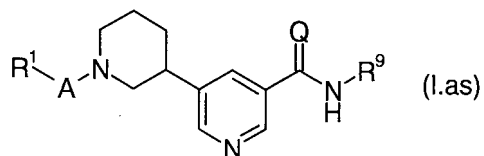
en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

ar) 192 compuestos de fórmula (I.ar):



en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

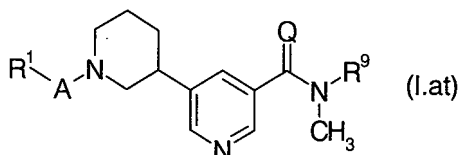
as) 192 compuestos de fórmula (I.as):



5

en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

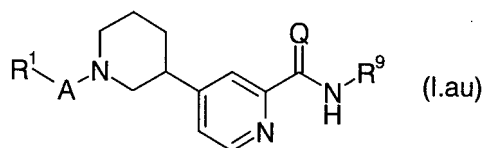
at) 192 compuestos de fórmula (I.at):



10

en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

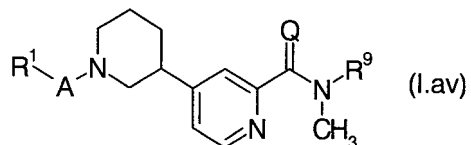
au) 192 compuestos de fórmula (I.au):



en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

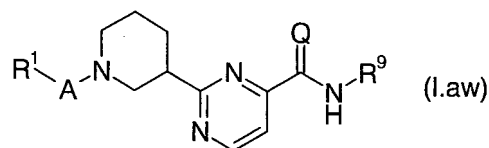
15

av) 192 compuestos de fórmula (I.av):



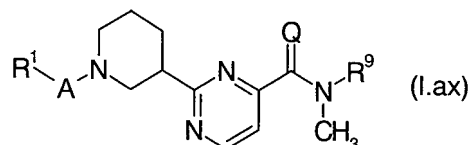
en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

aw) 192 compuestos de fórmula (I.aw):



5 en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

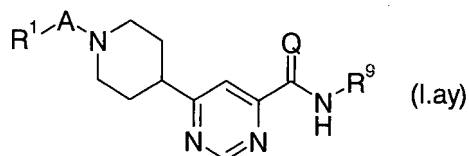
ax) 192 compuestos de fórmula (I.ax):



en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

10

ay) 192 compuestos de fórmula (I.ay):



en donde A, Q, R¹ y R⁹ son tales como fueron definidos en la Tabla 1.

15 A lo largo de esta descripción, las temperaturas se dan en grados Celsius y “p.f.”
significa punto de fusión. CL/EM significa cromatografía líquida/espectrometría de masas
y la descripción del aparato y el método es la siguiente: (HPLC HP 1100 de Agilent,
columna Phenomenex Gemini C18, tamaño de partícula 3 µm, 110 Angström, de 30 x 3
mm, 1.7mL/min., 60 °C, H₂O + HCOOH 0.05% (95%) / CH₃CN/MeOH 4:1 + HCOOH
20 0.04% (5%) – 2 min. – CH₃CN/MeOH 4:1 + HCOOH 0.04% (5%) – 0.8 min.,
espectrómetro de masas ZQ de Waters, método de ionización: electroaspersión (ESI),

polaridad: iones positivos, capilar (kV) 3.00, cono (V) 30.00, extractor (V) 2.00, temperatura de la fuente (°C) 100, temperatura de desolvatación (°C) 250, flujo de gas del cono (L/h) 50, flujo de gas de desolvatación (L/h) 400)).

5 Tabla 2: Datos de punto de fusión y CL/EM para los compuestos de la Tabla 1

Compuesto No.	Punto de fusión (°C)	CL/EM
I.n.001		Tr = 1.97 min. ; EM: m/z = 525 (M+1)
I.n.003	215-217	
I.n.005		Tr = 1.96 min. ; EM: m/z = 525 (M+1)
I.n.009		Tr = 3.46 min. ; EM: m/z = 485 (M+1)
I.n.011		Tr = 1.85 min. ; EM: m/z = 471 (M+1)
I.n.049		Tr = 2.08 min. ; EM: m/z = 481 (M+1)
I.n.073		Tr = 2.17 min. ; EM: m/z = 483 (M+1)
I.n.085		Tr = 2.12 min. ; EM: m/z = 517 (M+1)
I.n.097		Tr = 1.80 min. ; EM: m/z = 471 (M+1)
I.n.169		Tr = 2.11 min. ; EM: m/z = 469 (M+1)
I.o.001		Tr = 2.03 min. ; EM: m/z = 539 (M+1)
I.o.003		Tr = 1.95 min. ; EM: m/z = 513 (M+1)
I.o.009		Tr = 1.88 min. ; EM: m/z = 499 (M+1)
I.p.001		Tr = 1.97 min. ; EM: m/z = 526 (M+1)
I.p003		Tr = 1.92 min. ; EM: m/z = 500 (M+1)
I.p.005		Tr = 2.01 min. ; EM: m/z = 526 (M+1)
I.p.009		Tr = 1.87 min. ; EM: m/z = 486 (M+1)
I.p.011		Tr = 1.92 min. ; EM: m/z = 472 (M+1)

l.p.049		Tr = 2.09 min. ; EM: m/z = 482 (M+1)
l.p.073		Tr = 2.18 min. ; EM: m/z = 484 (M+1)
l.p.085		Tr = 2.14 min. ; EM: m/z = 518 (M+1)
l.p.097		Tr = 1.82 min. ; EM: m/z = 472 (M+1)
l.q.001		Tr = 1.94 min. ; EM: m/z = 540 (M+1)
l.q.005	62-65	
l.z.001	210	
l.z.005		Tr = 1.91 min. ; EM: m/z = 526 (M+1)
l.z.011		Tr = 1.78 min. ; EM: m/z = 472 (M+1)
l.z.073	183-185	
l.z.085	186-189	
l.aa.001		Tr = 1.98 min. ; EM: m/z = 540 (M+1)
l.aa.011		Tr = 1.79 min. ; EM: m/z = 486 (M+1)
l.v.001		Tr = 2.02 min. ; EM: m/z = 526 (M+1)
l.w.001		Tr = 1.88 min. ; EM: m/z = 540 (M+1)
l.r.001		Tr = 1.84min. ; EM: m/z = 526 (M+1)
l.ay.001		Tr = 1.99 min. ; EM: m/z = 527 (M+1)
l.aw.001		Tr = 1.94min. ; EM: m/z = 527 (M+1)
l.t.001	140	
l.ü.001		Tr = 1.85 min. ; EM: m/z = 540 (M+1)

Los compuestos de conformidad la presente invención pueden ser preparados de conformidad con los esquemas de reacción mencionados anteriormente, en los cuales, a menos de que se indique algo diferente, la definición de cada variable es tal y como se definió anteriormente para un compuesto de fórmula (I).

Ejemplos biológicos*Phytophthora infestans* / tomate / disco de hoja, preventivo (tizón tardío del tomate)

Los discos de hoja de tomate son colocados en agar agua en placas de hoyos múltiples (formato de 24 hoyos) y atomizados con el compuesto de prueba formulado, diluido en
5 agua. Los discos de hoja son inoculados con una suspensión de esporas del hongo 1 día después de la aplicación. Los discos de hoja inoculados son incubados a 16°C y 75% HR bajo un régimen de luz de 24 h de oscuridad, seguidas por 12 h luz / 12 h de oscuridad, en una vitrina de clima controlado y la actividad de un compuesto es evaluada como el porcentaje de control de la enfermedad, en comparación con las muestras sin tratar,
10 cuando un nivel apropiado de daño por la enfermedad aparece en los discos de hoja de control, sin tratar (5 – 7 días después de la aplicación).

Los compuestos l.n.001, l.n.003, l.n.005, l.n.009, l.n.011, l.n.049, l.n.097, l.t.001, l.v.001, l.z.001 y l.z.005, a 200 ppm, dan al menos un 80% de control de la enfermedad en esta prueba, cuando son comparados con los discos de hoja de control, sin tratar, bajo
15 las mismas condiciones, los cuales muestran un desarrollo muy significativo de la enfermedad.

Phytophthora infestans / papa o patata / preventivo (tizón tardío de la papa o la patata)

Las plantas de papa o patata (variedad Bintje) de 2 semanas son rociadas en una cámara
20 de rociado con el compuesto de prueba formulado, diluido en agua. Las plantas de prueba son inoculadas al rociarlas con una suspensión de los esporangios, 2 días después de la aplicación. Las plantas de prueba inoculadas son incubadas a 18° C con 14h de luz/día y 100 % HR, en una cámara de crecimiento y el porcentaje del área de la hoja cubierto por la enfermedad es evaluado cuando un nivel apropiado de la enfermedad aparece en las
25 plantas de control, sin tratar (5 – 7 días después de la aplicación).

Los compuestos l.n.001, l.n.003, l.n.005, l.n.009, l.n.049, l.v.001, l.z.001 y l.z.005, a 200 ppm, dan al menos un 80% de control de la enfermedad en esta prueba, cuando son

comparados con los discos de hoja de control, sin tratar, bajo las mismas condiciones, los cuales muestran un desarrollo muy significativo de la enfermedad.

Phytophthora infestans / papa o patata / duración prolongada (tizón tardío de la papa o la patata)

5 Las plantas de papa o patata (variedad Bintje) de 2 semanas son rociadas en una cámara de rociado con el compuesto de prueba formulado, diluido en agua. Las plantas de prueba son inoculadas al rociarlas con una suspensión de los esporangios, 6 días después de la aplicación. Las plantas de prueba inoculadas son incubadas a 18° C con 14h de luz/día y
10 100 % HR, en una cámara de crecimiento y el porcentaje del área de la hoja cubierto por la enfermedad es evaluado cuando un nivel apropiado de la enfermedad aparece en las plantas de control, sin tratar (9 – 11 días después de la aplicación).

Los compuestos I.n.001, I.n.003, I.n.005, I.n.097, I.t.001, I.v.001, I.z.001, a 200 ppm, dan al menos un 80% de control de la enfermedad en esta prueba, cuando son
15 comparados con los discos de hoja de control, sin tratar, bajo las mismas condiciones, los cuales muestran un desarrollo muy significativo de la enfermedad.

Phytophthora infestans / papa o patata / curativo (tizón tardío de la papa o la patata)

Las plantas de papa o patata (variedad Bintje) de 2 semanas son inoculadas al rociarlas
20 con una suspensión de esporangios, un día antes de la aplicación. Las plantas inoculadas son rociadas en una cámara de rociado con el compuesto de prueba formulado, diluido en agua. Las plantas de prueba inoculadas son incubadas a 18° C con 14h de luz/día y 100 % HR, en una cámara de crecimiento y el porcentaje del área de la hoja cubierto por la enfermedad es evaluado cuando un nivel apropiado de la enfermedad aparece en las
25 plantas de control, sin tratar (3 – 4 días después de la aplicación).

Los compuestos I.n.001, I.n.003, I.n.005, I.n.009, I.v.001, I.z.001 y I.z.005 a 200 ppm dan al menos un 80% de control de la enfermedad en esta prueba, cuando son

comparados con los discos de hoja de control, sin tratar, bajo las mismas condiciones, los cuales muestran un desarrollo muy significativo de la enfermedad.

Plasmopara viticola / uva / disco de hoja, preventivo (moho o mildiú de la uva)

- 5 Los discos de hoja de vid son colocados en agar agua en placas de hoyos múltiples (formato de 24 hoyos) y atomizados con el compuesto de prueba formulado, diluido en agua. Los discos de hoja son inoculados con una suspensión de esporas del hongo, 1 día después de la aplicación. Los discos de hoja inoculados son incubados a 19°C y 80% HR bajo un régimen de luz de 12 h luz / 12 h de oscuridad en una vitrina de clima controlado y
- 10 la actividad de un compuesto es evaluada como el porcentaje de control de daño por la enfermedad, en comparación con las muestras sin tratar, cuando un nivel apropiado de daño por la enfermedad aparece en los discos de hoja de control, sin tratar (6 – 8 días después de la aplicación).

- Los compuestos I.n.001, I.n.003, I.n.005, I.n.009, I.n.011, I.n.049, I.n.097, I.t.001, I.v.001, I.z.001 y I.z.005, a 200, ppm dan al menos un 80% de control de la enfermedad en esta prueba, cuando son comparados con los discos de hoja de control, sin tratar, bajo las mismas condiciones, los cuales muestran un desarrollo muy significativo de la enfermedad.

20 *Plasmopara viticola* / uva / preventivo (moho o mildiú de la uva)

- Plántulas de vid (variedad Gutedel) de 5 semanas, son rociadas en una cámara de rociado con el compuesto de prueba formulado, diluido en agua. Las plantas de prueba son inoculadas al rociarlas con una suspensión de esporangios en la superficie inferior de la hoja, un día después de la aplicación. Las plantas de prueba inoculadas son incubadas
- 25 a 22° C y 100% HR en un invernadero y el porcentaje del área de la hoja cubierto por la enfermedad es evaluado cuando un nivel apropiado de la enfermedad aparece en las plantas de control, sin tratar (6 – 8 días después de la aplicación).

Los compuestos I.n.001, I.n.003, I.n.005, I.n.009, I.n.011, I.v.001, I.z.001 y I.z.005, a 200 ppm, dan al menos un 80% de control de la enfermedad en esta prueba, cuando son comparados con los discos de hoja de control, sin tratar, bajo las mismas condiciones, los cuales muestran un desarrollo muy significativo de la enfermedad.

5

Plasmopara viticola / uva / duración prolongada (moho o mildiú de la uva)

Plántulas de vid (variedad Gutedel) de 5 semanas, son rociadas en una cámara de rociado con el compuesto de prueba formulado, diluido en agua. Las plantas de prueba son inoculadas al rociarlas con una suspensión de esporangios en la superficie inferior de la hoja, 6 días después de la aplicación. Las plantas de prueba inoculadas son incubadas a 22° C y 100% HR en un invernadero y el porcentaje del área de la hoja cubierto por la enfermedad es evaluado cuando un nivel apropiado de la enfermedad aparece en las plantas de control, sin tratar (11 – 13 días después de la aplicación).

Los compuestos I.n.001, I.n.003, I.n.005, I.n.009, I.t.001, I.v.001, I.z.001 y I.z.005, a 200 ppm, dan al menos un 80% de control de la enfermedad en esta prueba, cuando son comparados con los discos de hoja de control, sin tratar, bajo las mismas condiciones, los cuales muestran un desarrollo muy significativo de la enfermedad.

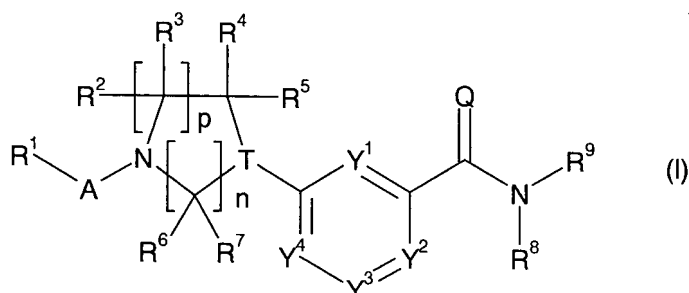
Plasmopara viticola / uva / curativo (moho o mildiú de la uva)

Plántulas de vid (variedad Gutedel) de 5 semanas, son inoculadas al rociarlas con una suspensión de esporangios en la superficie inferior de la hoja, un día antes de la aplicación. Las plantas de vid inoculadas son rociadas en una cámara de rociado con el
5 compuesto de prueba formulado, diluido en agua. Las plantas de prueba inoculadas son incubadas a 22° C y 100% HR en un invernadero y el porcentaje del área de la hoja cubierto por la enfermedad es evaluado cuando un nivel apropiado de la enfermedad aparece en las plantas de control, sin tratar (4 – 6 días después de la aplicación).

Los compuestos l.n.001, l.n.003, l.n.005, l.n.009, l.n.049, l.v.001 y l.z.001, a 200
10 ppm, dan al menos un 80% de control de la enfermedad en esta prueba, cuando son comparados con los discos de hoja de control, sin tratar, bajo las mismas condiciones, los cuales muestran un desarrollo muy significativo de la enfermedad.

REIVINDICACIONES

1. Un compuesto de fórmula I:



5

en donde

A es $x-C(R^{10}R^{11})-C(=O)-$, $x-C(R^{12}R^{13})-C(=S)-$, $x-O-C(=O)-$, $x-O-C(=S)-$, $x-N(R^{14})-C(=O)-$, $x-N(R^{15})-C(=S)-$ o $x-C(R^{16}R^{17})-SO_2-$, $x-N=C(R^{30})-$, en cada caso x representa el enlace que

- 10 está conectado a R^1 ;

T es CR^{18} o N;

Y^1 , Y^2 , Y^3 , y Y^4 son independientemente CR^{19} o N;

Q es O o S;

n es 1 o 2;

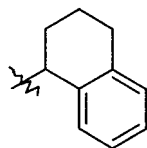
- 15 p es 1 o 2, con la condición de que cuando n es 2, p es 1.

R^1 es fenilo, piridilo, imidazolilo, o pirazolilo; en donde cada uno de fenilo, piridilo, imidazolilo y pirazolilo están sustituidos opcionalmente con entre 1 y 3 sustituyentes escogidos independientemente entre alquilo C_1-C_4 , haloalquilo C_1-C_4 , halógeno, ciano, hidroxilo y amino;

- 20 R^2 , R^3 , R^4 , R^5 , R^6 , R^7 , R^{10} , R^{11} , R^{12} , R^{13} , R^{16} , R^{17} , R^{18} , R^{19} y R^{30} son, cada uno independientemente, hidrógeno, halógeno, ciano, alquilo C_1-C_4 , o haloalquilo C_1-C_4 ;

R^8 , R^{14} y R^{15} son, cada uno independientemente, hidrógeno o alquilo C_1-C_4 ; y

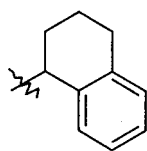
R^9 es fenilo, bencilo o el grupo (a):



(a)

en donde cada uno de fenilo, bencilo y el grupo (a) están sustituidos opcionalmente con entre 1 y 3 sustituyentes escogidos independientemente entre alquilo C₁-C₄, haloalquilo C₁-C₄, halógeno, ciano, hidroxí y amino;
 5 o una sal o un N-óxido del mismo.

2. El compuesto de conformidad con la reivindicación 1, en donde
 A es x-C(R¹⁰R¹¹)-C(=O)-, x-C(R¹²R¹³)-C(=S)-, x-O-C(=O)-, x-O-C(=S)-, o x-C(R¹⁶R¹⁷)-SO₂-,
 10 en cada caso x representa el enlace que está conectado a R¹;
 T es CR¹⁸ o N;
 Y¹, Y², Y³, y Y⁴ son independientemente CR¹⁹ o N con la condición de que al menos 2 entre Y¹, Y², Y³, y Y⁴ sean CR¹⁹;
 Q es O o S;
 15 n es 1 o 2;
 p es 1;
 R¹ es fenilo o pirazolilo; en donde cada uno de fenilo y pirazolilo están sustituidos opcionalmente con entre 1 y 3 sustituyentes escogidos independientemente entre alquilo C₁-C₄, haloalquilo C₁-C₄, halógeno, ciano, hidroxí, y amino;
 20 R², R³, R⁴, R⁵, R⁶, R⁷, R¹⁰, R¹¹, R¹², R¹³, R¹⁶, R¹⁷, R¹⁸, y R¹⁹ son, cada uno independientemente, hidrógeno, halógeno, alquilo C₁-C₄, haloalquilo C₁-C₄;
 R⁸ es hidrógeno o alquilo C₁-C₄; y
 R⁹ es fenilo, bencilo o el grupo (a):



(a)

en donde cada uno de fenilo, bencilo y el grupo (a) están sustituidos opcionalmente con entre 1 y 3 sustituyentes escogidos independientemente entre alquilo C₁-C₄, haloalquilo C₁-C₄, halógeno, ciano, hidroxilo y amino.

3. El compuesto de conformidad con la reivindicación 1, en donde

A es x-CR¹⁰R¹¹-C(=O)-, x-O-C(=O)-, o x-CR¹⁶R¹⁷-SO₂-, en cada caso x representa el enlace que está conectado a R¹;

10 T es CR¹⁸;

Y¹, Y², Y³, y Y⁴ son independientemente CR¹⁹ o N con la condición de que al menos 2 entre Y¹, Y², Y³, y Y⁴ sean CR¹⁹ y con la condición de que no haya enlaces N-N en el anillo que contiene a Y¹, Y², Y³, y Y⁴;

Q es O o S;

15 n es 1 o 2;

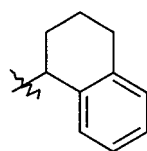
p es 1;

R¹ es fenilo o pirazolilo, en donde cada uno de fenilo y pirazolilo están sustituidos opcionalmente con entre 1 y 3 sustituyentes escogidos independientemente entre alquilo C₁-C₄, haloalquilo C₁-C₄, y halógeno;

20 R², R³, R⁴, R⁵, R⁶, R⁷, R¹⁰, R¹¹, R¹⁶, R¹⁷, R¹⁸, y R¹⁹ son, cada uno independientemente, hidrógeno, fluoro, o metilo;

R⁸ es hidrógeno o metilo; y

R⁹ es fenilo, bencilo o el grupo (a):



(a)

en donde cada uno de fenilo, bencilo y el grupo (a) están sustituidos opcionalmente con entre 1 y 3 sustituyentes escogidos independientemente entre alquilo C₁-C₄, haloalquilo C₁-C₄, hidroxi y halógeno.

4. El compuesto de conformidad con la reivindicación 1, en donde

A es x-CH₂-C(=O)-, x-O-C(=O)- o x-CH₂-SO₂-, en cada caso x representa el enlace que está conectado a R¹;

10 T es CH;

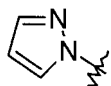
Y¹, Y², Y³, y Y⁴ son independientemente CH o N con la condición de que al menos 2 entre Y¹, Y², Y³, y Y⁴ sean CH y con la condición de que no haya enlaces N-N en el anillo que contiene a Y¹, Y², Y³, y Y⁴;

Q es O;

15 n es 1 o 2;

p es 1;

R¹ es fenilo o el grupo (b):



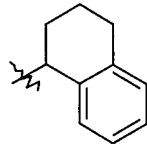
(b)

20 en donde cada uno de fenilo y grupo (b) están sustituidos opcionalmente con entre 1 y 3 sustituyentes escogidos independientemente entre halógeno, alquilo C₁-C₄ y haloalquilo C₁-C₄;

R², R³, R⁴, R⁵, R⁶ y R⁷ son, cada uno, hidrógeno;

R⁸ es hidrógeno o metilo; y

R^9 es fenilo, bencilo o el grupo (a):



(a)

en donde cada uno de fenilo, bencilo y el grupo (a) están sustituidos opcionalmente con
5 entre 1 y 3 sustituyentes escogidos independientemente entre alquilo C_1 - C_4 , haloalquilo C_1 - C_4 , hidroxí y halógeno.

5. El compuesto de conformidad con la reivindicación 1, en donde

A es $x-CH_2-C(=O)-$, en donde x representa el enlace que está conectado a R^1 ;

10 T es CH;

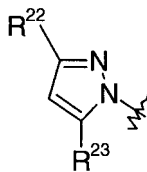
Y^1 , Y^2 , Y^3 , y Y^4 son independientemente CH;

Q es O;

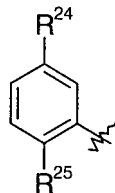
n es 2;

p es 1;

15 R^1 es escogido entre los grupos (c) o (d):



(c)



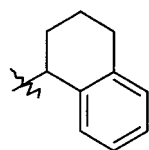
(d)

en donde R^{22} , R^{23} , R^{24} y R^{25} son escogidos independientemente entre hidrógeno, halógeno, metilo y halometilo;

20 R^2 , R^3 , R^4 , R^5 , R^6 , y R^7 son, cada uno, hidrógeno;

R^8 es hidrógeno o metilo; y

R^9 es fenilo, bencilo o el grupo (a):



(a)

en donde cada uno de fenilo, bencilo y el grupo (a) están sustituidos opcionalmente con entre 1 y 3 sustituyentes escogidos independientemente entre metilo, halometilo, y
5 halógeno.

6. El compuesto de conformidad con cualesquiera de las reivindicaciones 1 a 5, en donde al menos tres entre Y^1 , Y^2 , Y^3 y Y^4 son CH y el otro entre Y^1 , Y^2 , Y^3 y Y^4 es CH o N.

10 7. El compuesto de conformidad con cualesquiera de las reivindicaciones 1 a 6, en donde Y^2 es N.

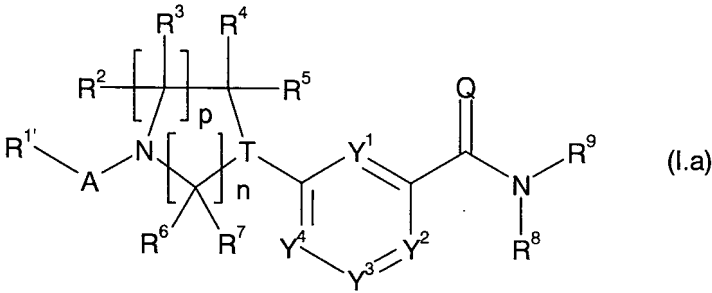
8. El compuesto de conformidad con cualesquiera de las reivindicaciones 1 a 7, en donde p es 1 y n es 2.

15

9. El compuesto de conformidad con cualesquiera de las reivindicaciones 1 a 8, en donde R^2 , R^3 , R^4 , R^5 , R^6 y R^7 son H.

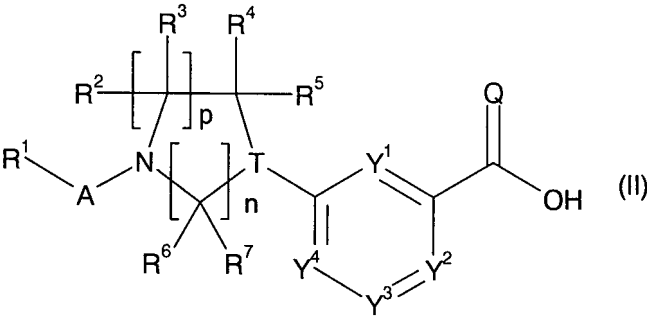
10. El compuesto de conformidad con cualesquiera de las reivindicaciones 1 a 9, en
20 donde Q es O.

11. Un compuesto de fórmula I.a:



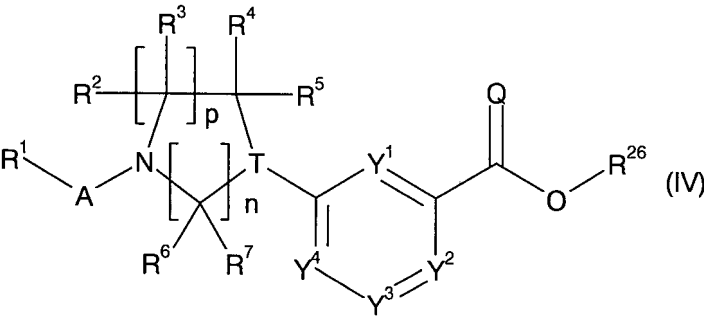
en donde R^{1'} es alquilo C₁-C₈ y Y¹, Y², Y³, Y⁴, A, Q, T, n, p, R², R³, R⁴, R⁵, R⁶, R⁷, R⁸, y R⁹ tienen las definiciones tales como fueron descritas para la fórmula I, tal y como se definió en cualesquiera de las reivindicaciones 1 a 10;

o un compuesto de fórmula II:



en donde Y¹, Y², Y³, Y⁴, A, Q, T, n, p, R¹, R², R³, R⁴, R⁵, R⁶ y R⁷ tienen las definiciones tales como fueron descritas para la fórmula I, tal y como se definió en cualesquiera de las reivindicaciones 1 a 10;

o un compuesto de fórmula IV:

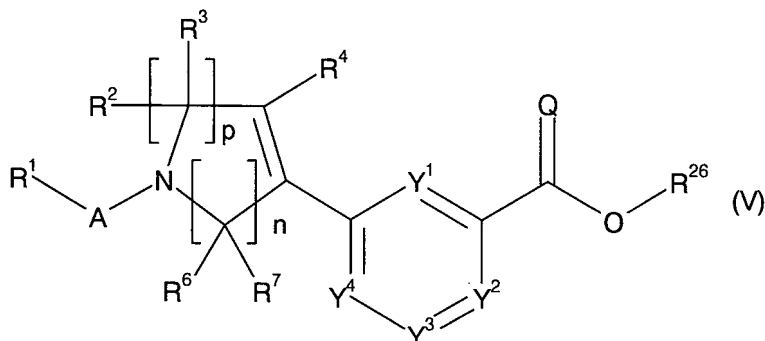


en donde Y^1 , Y^2 , Y^3 , Y^4 , A, Q, T, n, p, R^1 , R^2 , R^3 , R^4 , R^5 , R^6 y R^7 tienen las definiciones tales como fueron descritas para la fórmula I, tal y como se definió en cualesquiera de las reivindicaciones 1 a 10; y

R^{26} es alquilo C_1 - C_6 o arilo sustituido opcionalmente;

5

o un compuesto de fórmula V:

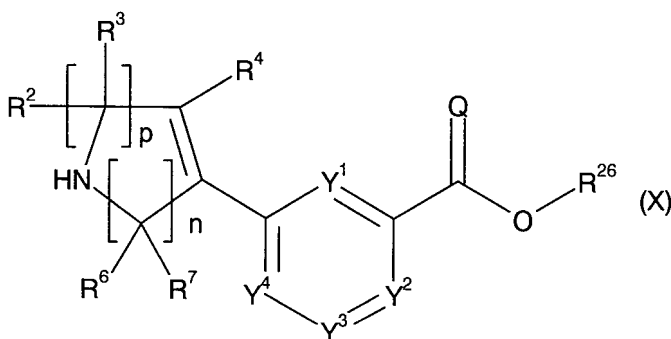


en donde Y^1 , Y^2 , Y^3 , Y^4 , A, Q, n, p, R^1 , R^2 , R^3 , R^4 , R^6 y R^7 , tienen las definiciones tales como fueron descritas para la fórmula I, tal y como se definió en cualesquiera de las reivindicaciones 1 a 10; y

10

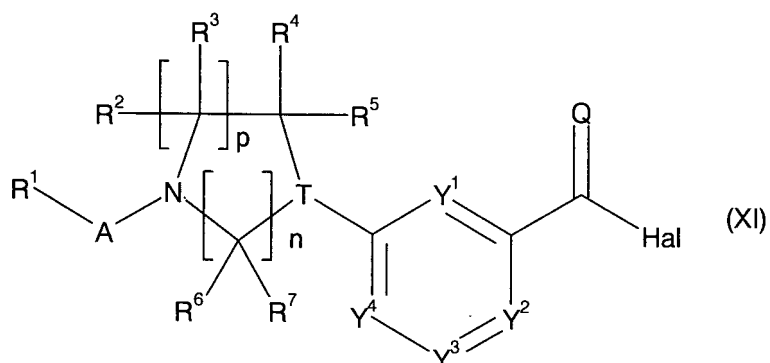
R^{26} es alquilo C_1 - C_6 o arilo sustituido opcionalmente;

o un compuesto de fórmula X:



15 en donde Y^1 , Y^2 , Y^3 , Y^4 , Q, n, p, R^2 , R^3 , R^4 , R^6 y R^7 tienen las definiciones tales como fueron descritas para la fórmula I, tal y como se definió en cualesquiera de las reivindicaciones 1 a 10; y R^{26} es alquilo C_1 - C_6 o arilo sustituido opcionalmente;

o un compuesto de fórmula XI:



en donde Y^1 , Y^2 , Y^3 , Y^4 , A, Q, n, p, R^1 , R^2 , R^3 , R^4 , R^5 , R^6 y R^7 , tienen las definiciones tales como fueron descritas para la fórmula I, tal y como se definió en cualesquiera de las reivindicaciones 1 a 10; y Hal se refiere a halógeno.

12. Un compuesto de conformidad con la reivindicación 11, en donde R^{26} es alquilo C_1 - C_6 o fenilo sustituidos opcionalmente con entre 1 y 3 sustituyentes escogidos independientemente entre alquilo C_1 - C_4 , haloalquilo C_1 - C_4 , hidroxilo, amino, ciano y halógeno.

13. Una composición fungicida que comprende al menos un compuesto tal y como los definidos en cualesquiera de las reivindicaciones 1 a 10 y un vehículo aceptable para ser utilizado en agricultura, la cual comprende opcionalmente un adyuvante y comprende opcionalmente al menos un compuesto adicional con actividad fungicida.

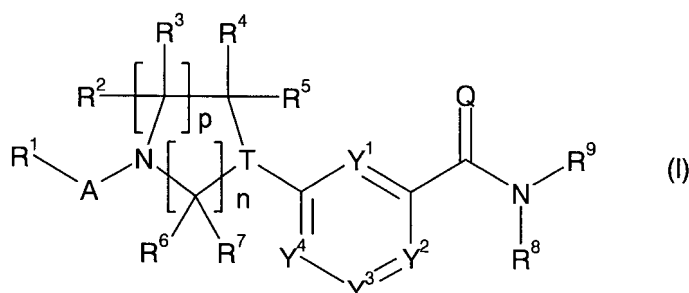
14. Un método para controlar o evitar una infestación de plantas, material de propagación de las mismas, cultivos cosechados o materiales no vivientes, por parte de microorganismos fitopatógenos o causantes de deterioro o de organismos potencialmente dañinos para el hombre, el cual incluye la aplicación de un compuesto tal y como los definidos en cualesquiera de las reivindicaciones 1 a 10 a la planta, a partes de las

plantas o al locus de las mismas, o al material de propagación de las mismas, o a cualquier parte de los materiales no vivientes.

15. El método de conformidad con la reivindicación 14, en donde los microorganismos
5 fitopatógenos son organismos fúngicos.

RESUMEN

La presente invención trata acerca de compuestos heterocíclicos de fórmula I los cuales tiene actividad microbicida, en particular actividad fungicida así como acerca de métodos de utilización de los compuestos de fórmula I para controlar microbios:



en donde

10 A es $x-C(R^{10}R^{11})-C(=O)-$, $x-C(R^{12}R^{13})-C(=S)-$, $x-O-C(=O)-$, $x-O-C(=S)-$, $x-N(R^{14})-C(=O)-$, $x-N(R^{15})-C(=S)-$, $x-C(R^{16}R^{17})-SO_2-$ o $x-N=C(R^{30})-$, en cada caso x representa el enlace que está conectado a R^1 ;

T es CR¹⁸ o N;

Y^1, Y^2, Y^3 , y Y^4 son independientemente CR^{19} o N :

15 Q es O o S;

n es 1 o 2;

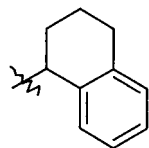
p es 1 o 2, con la condición de que cuando n es 2, p es 1.

R¹ es fenilo, piridilo, imidazolilo, o pirazolilo; en donde cada uno de fenilo, piridilo, imidazolilo y pirazolilo están sustituidos opcionalmente con entre 1 y 3 sustituyentes escogidos independientemente entre alquilo C₁-C₄, haloalquilo C₁-C₄, halógeno, ciano, hidroxí y amino;

R², R³, R⁴, R⁵, R⁶, R⁷, R¹⁰, R¹¹, R¹², R¹³, R¹⁶, R¹⁷, R¹⁸, R¹⁹ y R³⁰ son, cada uno independientemente, hidrógeno, halógeno, ciano, alquilo C₁-C₄, o haloalquilo C₁-C₄;

R^8 , R^{14} y R^{15} son, cada uno independientemente, hidrógeno o alquilo C_1 - C_4 ; y

R^9 es fenilo, bencilo o el grupo (a):



(a)

5

en donde cada uno de fenilo, bencilo y el grupo (a) están sustituidos opcionalmente con entre 1 y 3 sustituyentes escogidos independientemente entre alquilo C_1 - C_4 , haloalquilo C_1 - C_4 , halógeno, ciano, hidroxí y amino; o una sal o un N-óxido del mismo.

10

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☐ ☐ ☐ ☐ ☐ Indicación que se solicita una patente Datos de identificación del solicitante o de la persona que presenta la solicitud Descripción de la invención Dibujos de ser estos pertinentes Comprobante de pago de las tasas establecidas (de ser el caso formato de descuento) Completa ☐ Incompleta ☐	
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☒ ☒ ☒ ☐ ☒ Indicación que se solicita una PCT Datos de identificación del solicitante o de la persona que presenta la solicitud Copia de la solicitud en español, tal como fue presentada inicialmente (capítulo descriptivo, reivindicatorio, resumen) Dibujos de ser estos pertinentes Comprobante de pago de las tasas establecidas (de ser el caso formato de descuento) Completa ☒ Incompleta ☐	
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