



No. 13-110649-00013-0000

Fecha: 2015-04-17 16:21:23 Dep. 2020 DIR.NUEVASCR
Tra. 11 PATENTEIYII Eve: 378 FASENACIONALI
Act. 412 REPOSPRESRECU Folios: 71Señor Superintendente
SUPERINTENDENCIA DE INDUSTRIA Y COM
E. S. D.Trámite : 011
Evento : 378
Actuación : 412Referencia : Expediente No. **13.110.649**
Asunto : Solicitud de patente para: **"COMPOSICIONES PESTICIDAS Y PROCESOS RELACIONADOS"**
Solicitante : **DOW AGROSCIENCES LLC**
Fecha de solicitud : 02 de Mayo de 2013

I. RECURSO VÍA GUBERNATIVA

Yo, Luz Clemencia DE PÁEZ, en mi condición de apoderada de la sociedad **DOW AGROSCIENCES LLC** solicitante de la patente de la referencia, por el presente escrito atentamente manifiesto a usted que debidamente notificada de la Resolución No. **8068** del 27 de Febrero de 2015, interpongo en su contra el recurso de **REPOSICIÓN**, para que sea revocada y en consecuencia se conceda el privilegio de patente de invención para **"COMPOSICIONES PESTICIDAS Y PROCESOS RELACIONADOS"** a favor de **DOW AGROSCIENCES LLC**.

II. OPORTUNIDAD DE LA IMPUGNACIÓN

La Resolución No. **8068** del 27 de Febrero de 2015, con fecha de publicación listado del 03 de Marzo de 2015, fecha de vencimiento del 03 de Abril de 2015, y fecha del término legal 17 de Abril de 2015.

III. LA DECISIÓN RECURRIDA

3.1 Mediante la Resolución objeto de la presente impugnación, el Superintendente de Industria y Comercio decidió:

"EXCELENCIA LEGAL EN UN MUNDO SIN FRONTERAS"

3.1.1 Denegar la patente de invención a la creación titulada: **“COMPOSICIONES PESTICIDAS Y PROCESOS RELACIONADOS”**

3.2 En la parte motiva de la providencia, se mencionaron los siguientes fundamentos:

3.2.1 “Tal como está contemplado en el artículo 14 de la Decisión 486, los usos no son susceptibles de protección, se protegen los productos o procedimientos, donde el producto esté correctamente definido por su conformación o su composición y los procedimientos por la serie de etapas que busquen un fin. El uso no corresponde ni a un producto ni a un procedimiento, sino que es simplemente la aplicación industrial de esos productos o procedimientos.”

3.2.2 “La(s) reivindicación(es) 51 a 65 incluidas en el escrito radicado bajo el No 13-110649-00000-0000 del 2 de mayo de 2013 no puede(n) ser objeto de patente de acuerdo con lo establecido en la norma en comento, por cuanto está(n) referida(s) a un uso, aunque el solicitante la(s) encabeza con la palabra ‘proceso’, en realidad está(n) referida(s) al uso de la composición de la(s) primera(s) reivindicación(es). Nótese que la(s) reivindicación(es) 51 a 65 claramente indica(n) como paso único del supuesto método “la aplicación de una composición de acuerdo con la reivindicación 1...” y la aplicación corresponde a un uso; por lo tanto no es posible conceder para ella(s) el privilegio de patente solicitado.”

3.2.3 “Se aclara a la solicitante que ni la plaga tratada, ni las plantas tratadas, ni el objetivo final del tratamiento representan características técnicas de un eventual método.”

3.2.4 “Que las reivindicaciones 1 a 50, no cumplen con el requisito de nivel inventivo.”

3.2.5 Las características esenciales de la invención de la reivindicación 1 habían sido derivadas de manera evidente previamente en el documento D1, el cual da a conocer derivados de amida heterocíclicos de fórmula (I), que tiene actividad pesticida, así mismo hace referencia a composiciones que los contienen y a métodos de aplicación de los mismos para el control de diversas pestes.

- 3.2.6 “Se le reitera a la solicitante que la materia reclamada no cumple con el requisito de nivel inventivo, puesto que no demostró algún efecto técnico inesperado o sorprendente que pueda entenderse como un salto cualitativo en la técnica.”
- 3.2.7 “Pero además debe tenerse en cuenta la clara falta de concisión del capítulo reivindicatorio, en donde se evidencian extrapolaciones que no se encuentran enteramente sustentadas en la descripción. Tal como se indicó en el estudio anterior, son tantas las posibles estructuras para el compuesto de fórmula (1) que la descripción no divulga de manera suficientemente clara y completa la materia contenida en las reivindicaciones.”
- 3.2.8 “Asimismo, tampoco se encuentra ningún soporte técnico para reclamar, cualquier sal agrícolamente aceptable, hidrato, derivado éster, polimorfo cristalino, etc. Aun menos, se encuentra soporte técnico para la generalidad reclamada en cuanto a las posibles combinaciones con los múltiples ingredientes activos mencionados dentro del capítulo reivindicatorio. La solicitante hizo caso omiso de todas estas recomendaciones hechas por este Despacho y decidió no modificar el capítulo reivindicatorio inicialmente presentado.”

IV. OBJETO DEL RECURSO

De acuerdo con los argumentos que expongo a continuación, solicito atentamente a su Despacho lo siguiente:

1. Revocar la Resolución No. **8068** del 27 de Febrero de 2015.
2. Conceder el privilegio de patente de invención para “**COMPOSICIONES PESTICIDAS Y PROCESOS RELACIONADOS**” a favor de **DOW AGROSCIENCES LLC**.

V. MODIFICACIÓN DE UNA SOLICITUD EN TRÁMITE

En virtud del Artículo 34 de la Decisión 486 de la Comisión de la Comunidad Andina, donde se establece que la modificación de una solicitud es posible en cualquier momento del trámite mientras no implique una ampliación de la solicitud inicial, me permito presentar un nuevo pliego reivindicatorio conformado por 23 reivindicaciones.

A este respecto, atentamente señalamos que el nuevo pliego reivindicatorio modificado y presentado junto con este recurso corresponde a materia más limitada en comparación con el alcance de las reivindicaciones originalmente presentadas de la presente solicitud de patente. De esta forma, es claro que el nuevo pliego reivindicatorio no contiene usos de la invención, sino por el contrario se encuentra dirigida a una composición adecuadamente y claramente definida, lo cual corresponde a materia patentable y que se encuentra dentro del alcance de la solicitud.

Por lo tanto, los argumentos esgrimidos a continuación con respecto a la patentabilidad de la invención, en los términos del capítulo reivindicatorio modificado, resultan plenamente predicables del capítulo reivindicatorio sobre el cual la patente fue negada. En efecto, la no ampliación de la materia en el nuevo pliego es evidencia suficiente de que el presente recurso controvierte el análisis de patentabilidad efectuado por su Despacho, de tal manera que el presente recurso cumple con los requisitos de ley para su aceptación y trámite.

VI. FUNDAMENTOS DEL RECURSO

Respetuosamente me permito disentir de lo expuesto por ese Despacho en la Resolución objeto del presente recurso, toda vez que la presente solicitud sí cumple con los requerimientos de novedad y nivel inventivo exigidos en la Decisión 486, como se demostrará a continuación:

6.1 La presente solicitud sí tiene nivel inventivo

A pesar de lo anterior y con el fin de demostrar que la presente solicitud cumple no sólo con el requerimiento de novedad sino también con el requerimiento de nivel inventivo, se pone de presente lo siguiente:

El artículo 18 de la Decisión 486 señala lo siguiente:

“Artículo 18.- Se considerará que una invención tiene nivel inventivo, si para una persona del oficio normalmente versada en la materia técnica correspondiente, esa invención no hubiese resultado obvia ni se hubiese derivado de manera evidente del estado de la técnica.”

Consecuentemente, una invención se considerará inventiva si la misma no hubiese resultado obvia a partir del arte previo, para una persona del oficio normalmente versada en la materia. Esto a su vez implica que el Examinador a cargo de esta evaluación debe colocarse en el momento exacto en el que el inventor buscaba resolver el problema técnico contemplado en la solicitud y para el cual poseía la literatura y el conocimiento disponibles en dicho momento.

Siguiendo entonces los lineamientos de la Jurisprudencia aplicable al análisis del nivel inventivo de una solicitud de patente, se considera que una anterioridad o una combinación de dos anterioridades puede afectar dicho requerimiento de patentabilidad, si una persona medianamente versada en la materia encuentra enseñanzas o sugerencias claras que, a partir de un conocimiento medio en dicho campo, le permitan llegar de manera obvia a la invención reivindicada. Adicionalmente se considera que una mejora sustancial, un efecto inesperado o una ventaja con respecto al arte previo es un indicio de nivel inventivo, por cuanto aporta un salto tecnológico en la regla técnica.

Respecto a lo anterior, el Tribunal de Justicia de la Comunidad Andina ha expuesto en la Interpretación Prejudicial del proceso 13-IP-2010:

"En este orden de ideas, se puede concluir que una invención goza de nivel inventivo cuando a los ojos de un experto medio en el asunto de que se trate, se necesita algo más que la simple aplicación de los conocimientos técnicos en la materia para llegar a ella, es decir, que de conformidad con el estado de la técnica el invento no es consecuencia clara y directa de dicho estado".

[señalado fuera del texto]

Por lo anterior, se entiende que para que una persona medianamente versada en la materia pudiera derivar de manera obvia una invención, requeriría simplemente aplicar sus conocimientos técnicos. En contraste, todo aquello que va más allá de la simple aplicación de los conocimientos técnicos y que no ha sido revelado en el estado de la técnica, debe ser considerado inventivo.

Con base en lo anterior, respetuosamente manifestamos nuestro desacuerdo con el análisis llevado a cabo por el Examinador y con las conclusiones del mismo y solicitamos atentamente la reconsideración de las razones por las cuales se decidió negar la patente, con base en la siguiente información:

A este respecto, el señor Examinador objetó las reivindicaciones 1 a 50 por carecer de nivel inventivo en vista del documento D1.

En vista de esta objeción, amablemente ponemos de presente en primer lugar que es bien sabido que un compuesto, sus propiedades, y las interacciones de estas propiedades con un organismo vivo, son altamente impredecibles. Así las cosas, en el campo de los insecticidas interacciones profundas e impredecibles pueden ocurrir cuando se cambia así sea un solo átomo. Por ejemplo, a continuación señalamos lo siguiente:

- I. Kagabu S y Medej S, "Stability Comparison of Imidacloprid and Related Compounds under Simulated Sunlight, Hydrolysis Conditions, and to Oxygen". *Biotech. Biochem.*, **59** (6), 980-985, (1995)
 - a. En la Tabla 1, la cual compara el Compuesto 4 con el Compuesto 7, (un cambio de un hidrógeno a un metilo) la LC_{90} disminuyó en un 80%.
 - b. En la Tabla 1, la cual compara el Compuesto 21 con el Compuesto 24, (un cambio de un hidrógeno a un metilo) la LC_{90} aumentó en un 2400%.
 - c. En la Tabla 1, la cual compara el Compuesto 25 con el Compuesto 26, (un cambio de un hidrógeno a un metilo) la LC_{90} disminuyó en un 99%.
 - d. En la Tabla 1, la cual compara el Compuesto 4 con el Compuesto 8, (un cambio de hidrógeno a CF3) la LC_{90} no cambió.
 - e. En la Tabla 1, la cual compara el Compuesto 6 con el Compuesto 8, (un cambio de un Cl a CF3) la LC_{90} aumentó en un 2400%.
- II. Kagabu S, Murata N, Hibino R, Hanzawa M, y Nishimura K, "Insecticidal and Neuroblocking Activities of Thiamethoxam-Type Compounds in the American Cockroach (*Periplaneta americana* L.)" *J. Pesticide Sci.* **30** (2), 111-115 (2005).
 - a. El artículo establece que "Independientemente del anillo heteroaromático, los compuestos NH (**15**, **17**) estaban inactivos en el insecticida, así como pruebas del nervio, mientras que los compuestos de metilo [NCH₃] 16 y 18 fueron muy activos en ambas pruebas" (ver página 114, primera columna).
 - b. El artículo también establece que "incluso un cambio estructural de menor importancia, en este caso únicamente un solo átomo del

heteroanillo, puede dar lugar a una diferencia notable en el comportamiento biológico..." (ver página 114, segunda columna).

- III. Kollmeyer, WD, Flattum RF, Foster JP, Powell JE, Schroeder ME, y Soloway SB, "Discovery of the Nitromethylene Heterocycle Insecticides" *Nicotinoid Insecticides and the Nicotinic Acetylcholine Receptor* (páginas 71-89) Eds Yamamoto I, and Casida JE.
- a. En la Tabla 1, la cual compara el Compuesto 11 con el Compuesto 12, (un cambio de hidrógeno a un metilo) el índice de toxicidad para CEW aumentó aproximadamente en un 2400%.
- b. En la Tabla 1, la cual compara el Compuesto 19 con el Compuesto 20, (un cambio de hidrógeno a un metilo) el índice toxicidad para CEW disminuyó aproximadamente en un 92%.
- IV. Shiga Y, Okada I, y Fukuchi T, "Synthesis and Acaricidal Activity of N-(1,3,4-Thiadiazol-2-yl)cyclopropanecarboxamides" *J. Pesticide Sci.* **28**, 61-63 (2003).
- a. En la Tabla 1, la cual compara el Compuesto 2 con el Compuesto 1, (un cambio de hidrógeno a un metilo) la actividad aumentó de "totalmente inactivo" a 100% de mortalidad (ver el primer párrafo bajo el subtítulo "Resultados y Discusión").
- b. En la Tabla 3, ambos compuestos 12 y 13 (H vs. Metilo) "eran inactivos a 500 ppm" (ver el tercer párrafo bajo el subtítulo "Resultados y Discusión").
- V. Sparks TC, Crouse GD, y Durst D, "Natural products as insecticides: the biology, biochemistry and quantitative structure-activity relationships of spinosyns and spinosoids" *Pest Manag Sci* **57**: 896-905 (2001).
- a. En la Tabla 1, la cual compara Spinosad B con Spinosad A, (un cambio de hidrógeno a metilo) la LC₅₀ disminuyó en un 25%.
- b. En la Tabla 1, la cual compara Spinosad A con Spinosad D, (un cambio de hidrógeno a un metilo) la LC₅₀ aumentó en un 167%.

- VI. Wakita T, Kinoshita K, Kodaka K, Yasui N, Naoi A, y Banba S "Synthesis and Structure Activity Relationships of Dinotefuran Derivatives: Modification in the Tetrahydro-3-furylmethyl Part" *J. Pesticide Sci.* **29** (4), 356-363 (2004).
 - a. En la Tabla 1, la cual compara el Compuesto 2 con el Compuesto 14 o 16, (un cambio de hidrógeno a un metilo) la LC₅₀ aumentó aproximadamente 100,000%.
- VII. La solicitud de patente de Estados Unidos de América U.S. 4,833,158 Method of Combating Termites. En las columnas 9-10, Tabla III, la patente muestra ciertas ureas benzoilfenil comparativas que son 30 veces menos efectivas en el periodo de prueba de la tercera semana, pese a que el cambio era sólo un átomo (cambiando F ya sea por H o por Cl).

En consecuencia, es evidente que el cambio de un átomo es impredecible y puede tener resultados profundos en moléculas insecticidas. En algunos casos la actividad aumenta, en otros disminuye, e incluso en otros no hace ninguna diferencia en absoluto.

Por otro lado, nos referimos al artículo del Dr. Peter Ertl¹, el cual establece que existen aproximadamente 3.1 millones de sustituyentes (como de aproximadamente 2002).

Considerando el vasto número de posibles sustituyentes, la imprevisibilidad en la técnica del insecticida, no es razonable concluir que una persona del oficio normalmente versada en la materia seleccionaría un posible sustituyente de los 3.1 millones de posibles sustituyentes en la técnica, para modificar R1 en D1 para hacer que un piridil que es tomado de una posición preferida en D1 – que es R3 y moverlo a R1. Además, considerando la modificación de la reivindicación 1, en donde se ha eliminado el fragmento "arilo C₆-C₂₀ sustituido o no sustituido, heterociclilo C₁-C₂₀ sustituido o no sustituido" de los sustituyentes R4 y R7, y D1 requiere que R3 y R4 sean un arilo o hetaril, una persona versada en la materia no tiene ninguna motivación para remover estos sustituyentes de D1.

¹ Ertl P. "Cheminformatics Analysis of Organic Substituents: Identification of the Most Common Substituents, Calculation of Substituents Properties, and Automatic Identification of Drug-like Bioisosteric Groups" *J" Chem Inf. Comput. Sci.* **2003**, 43, 374-380. **Para información de esta persona ver la página web del Dr. Ertl <http://www.peter-ertl.com>.**

Por lo tanto, un técnico con conocimientos medios en la materia no estaba en condiciones de plantearse el problema, tampoco de resolverlo en la forma en que se reivindica y tampoco de prever el resultado, por lo que la presente solicitud posee la altura inventiva para que se le conceda el privilegio solicitado.

En consecuencia de lo anterior, la invención de la presente invención tiene nivel inventivo en vista del documento D1 del estado de la técnica citado por el Examinador.

Conclusión

El documento D1 no resulta una anterioridad válida capaz de afectar el nivel inventivo de la invención de la presente solicitud.

En consecuencia, el mérito investigativo de la presente invención ha sido reconocido por otras oficinas de patentes del mundo, las cuales han otorgado patentes para invenciones equivalentes. Tal es el caso de Estados Unidos de América que ha aprobado la solicitud de patente equivalente.

A este respecto, deseamos poner de presente que si bien cada país es autónomo de conceder o negar una solicitud luego de la realización del estudio de fondo, es claro que el hecho de que la novedad y el nivel inventivo de una invención hayan sido reconocidos por varias oficinas a nivel mundial, es un indicio de la patentabilidad de la misma toda vez que (i) el estudio de novedad y nivel inventivo en todas las Oficinas de Patentes del mundo es realizado por personas con conocimientos técnicos en el área de interés que son consideradas personas idóneas para emitir conceptos sobre la patentabilidad de una invención y que (ii) los resultados de los exámenes de novedad o de patentabilidad efectuados respecto a solicitudes extranjeras pueden ser reconocidos como suficientes para acreditar el cumplimiento de las condiciones de patentabilidad de la invención, tal como se señala en el artículo 46 de la Decisión 486:

“Artículo 46.- La oficina nacional competente podrá requerir el informe de expertos o de organismos científicos o tecnológicos que se consideren idóneos, para que emitan opinión sobre la patentabilidad de la invención. Asimismo, cuando lo estime conveniente, podrá requerir informes de otras oficinas de propiedad industrial.

De ser necesario, a efectos del examen de patentabilidad y a requerimiento de la oficina nacional competente, el solicitante proporcionará, en un plazo que no excederá de 3

meses, uno o más de los siguientes documentos relativos a una o más de las solicitudes extranjeras referidas total o parcialmente a la misma invención que se examina:

a) copia de la solicitud extranjera;

b) copia de los resultados de exámenes de novedad o de patentabilidad efectuados respecto a esa solicitud extranjera;

(...)

La oficina nacional competente podrá reconocer los resultados de los exámenes referidos en el literal b) como suficientes para acreditar el cumplimiento de las condiciones de patentabilidad de la invención" (Negrilla fuera del texto).

Por todo lo anterior, consideramos que la presente solicitud cumple a cabalidad con los requerimientos de patentabilidad exigidos por la legislación actual, por lo que atentamente solicitamos en consideración lo siguiente:

VII. PETICIÓN

Por todo lo anterior, solicito a ese Despacho lo siguiente:

7.1 Que al considerar las razones precedentes se revoque la decisión contenida en la Resolución No. **8068** del 27 de Febrero de 2015, en cuanto resuelve negar el privilegio de patente de invención.

7.2. Que se acepte el nuevo pliego reivindicatorio presentado con este escrito, conformado por 23 reivindicaciones.

7.3. Que se otorgue el privilegio de patente de invención para **"COMPOSICIONES PESTICIDAS Y PROCESOS RELACIONADOS"** a favor de **DOW AGROSCIENCES LLC**.

VIII. NOMBRE Y DIRECCIÓN

El nombre y la dirección del solicitante recurrente son los siguientes:

DOW AGROSCIENCES LLC

9330 Zionsville Road,
Indianapolis, Indiana 46268,
Estados Unidos de América

IX. ANEXOS

- Formulario de modificaciones en solicitud pendiente
- Recibo por concepto de presentación de modificaciones a las reivindicaciones por un valor de \$132.000
- Nuevo pliego reivindicatorio conformado por 23 reivindicaciones
- Copia de la Solicitud de patente de Estados Unidos de América, en donde se ha emitido una Notificación de Aprobación (Notice of Allowance)
- Copia del Informe Preliminar Internacional sobre la Patentabilidad

X. NOTIFICACIONES

Atentamente manifiesto a usted que recibiré notificaciones en la Secretaría de su Despacho o en mi oficina de abogada situada en la Carrera 4ª. No. 72-35, piso 4º, de esta ciudad de Bogotá, D.C.

Señor Superintendente,


LUZ CLEMENCIA DE PAEZ

C.C. 35.456.344 de Usaquén

T.P.A. No. 23.555

Mam

COLO-10975-0841-0151-5
SGD\SGD\ID-279535\WPC10975
No. M-2015-279535\SGD



Espacio reservado para el adhesivo de radicación

**DIRECCIÓN DE NUEVAS CREACIONES
MODIFICACIONES Y/O CORRECCIONES**

1. Identificación del Trámite

- ☐ Error material
 - ☒ Patente de Invención
 - ☐ Patente de Modelo de Utilidad
 - ☐ Registro de Diseño Industrial
 - ☐ Esquema de Trazado de Circuitos Integrados

2. Datos del solicitante

Persóna Natural

Persona Jurídica

☒

DOW AGROSCIENCES LLC

Nombre o denominación / Nombre o razón social completa

Nombre representante legal

Tipo de empresa Micro ☐ Pequeña ☐ Mediana ☐ Otra ☐

Documento de identificación: ☐ C.C. ☐ C.E. ☐ NIT ☐ Otro Número

Nacionalidad/País de constitución	Dirección y domicilio del titular	Ciudad
Estados Unidos de América	9330 Zionsville Road, Indianápolis, Indiana 46268, Estados Unidos de América	Indianápolis
Dirección electrónica		No. Fax
clientes@cavelier.com		3 47 36 11



Autorizo expresamente a la Superintendencia de Industria y Comercio para que todas las comunicaciones sean enviadas a través de la dirección de correo electrónico

3. Datos del apoderado:

Apellidos y Nombre
De Páez Luz Clemencia

Documento de identificación
C.C. 35.456.344

Tarjeta profesional
T.P.A. 23.555

Dirección y domicilio		Ciudad
Carrera 4ª No. 72 -35		Bogotá
Dirección electrónica	No. Fax	Número telefónico
cavelier@cavelier.com	2 11 86 50	3 47 36 11

En caso de haber presentado poder general para asuntos que se adelanten ante la Delegatura de Propiedad Industrial, sírvase indicar el número de su radicación o protocolo de poder general

4. Datos del trámite

Corrección:

Expediente No 13.110.649

Aparece

Debe ser

Modificación:

- ☒ **Modificación al capítulo reivindicatorio.**
Presento nuevo capítulo reivindicatorio compuesto por 23 reivindicaciones y pido respetuosamente que el examen de patentabilidad sea realizado sobre estas nuevas reivindicaciones presentadas. Respetuosamente manifiesto que a pesar de eliminar materia del pliego reivindicatorio originalmente presentado, mi representada no renuncia a la protección que pueda obtener sobre dicha materia y además se reserva el derecho de presentar una solicitud divisional que la contenga durante el trámite de la presente solicitud, beneficiándose de la fecha de prioridad inicialmente reivindicada.
- ☐ **Modificación al capítulo descriptivo.**
- ☐ **Modificación al resumen.**
- ☐ **Modificación a los dibujos.**

5. Anexos

- ☒ Comprobante de pago de la tasa para la presentación de la corrección y/o modificación por \$132.000.
- ☒ Documento que contiene las modificaciones o correcciones.
- ☐ Copia de la solicitud y sus anexos en formato magnético.

6. Firma

Nombre y apellidos

LUZ CLEMENCIA DE PAEZ

C.C. 35.456.344 DE Usaquén

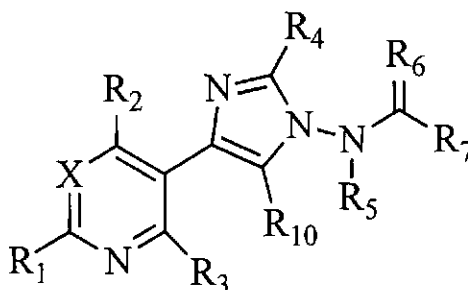
Firma

LUZ CLEMENCIA DE PAEZ

Tarjeta Profesional 23.555

REIVINDICACIONES

1. Una composición que comprende una molécula de acuerdo con la Fórmula 1:



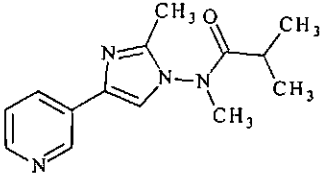
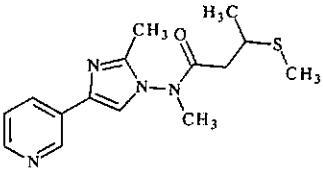
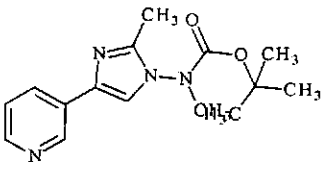
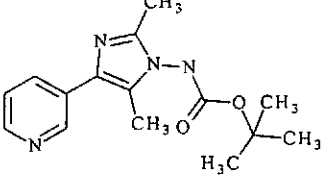
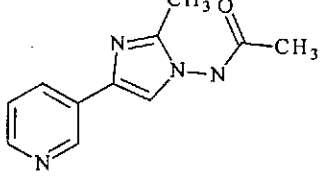
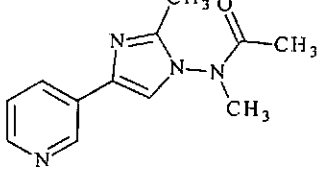
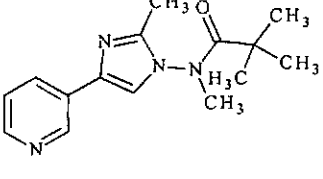
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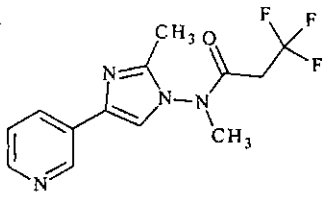
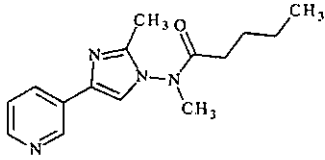
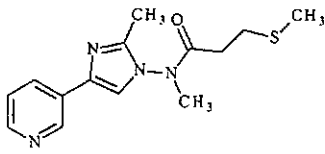
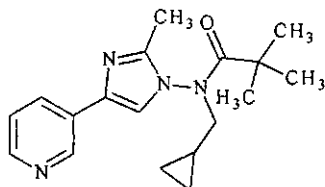
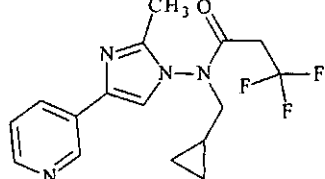
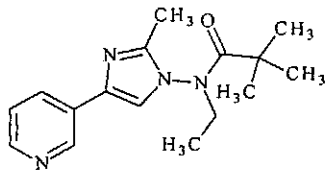
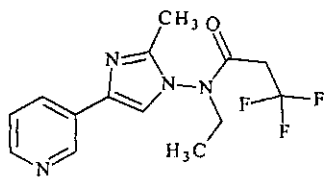
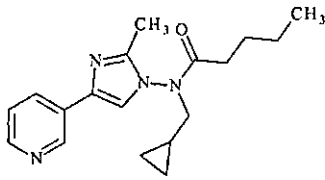
Donde,

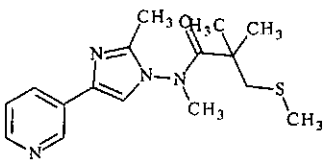
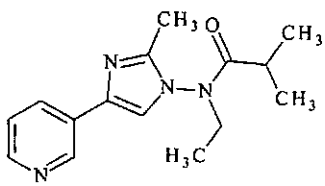
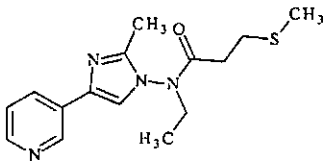
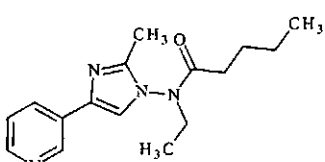
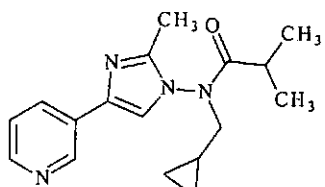
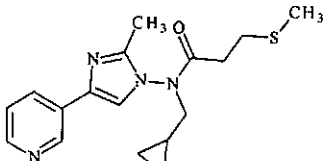
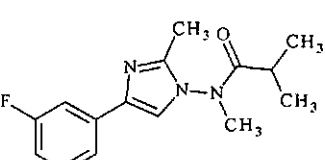
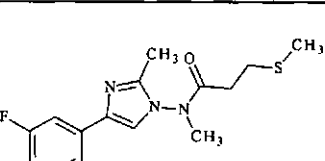
- (a) X es CR₈;
 - (b) R₁ es H;
 - (c) R₂ es H;
 - (d) R₃ es H;
 - (e) R₄ es F, Cl, Br, I, o alquilo C₁-C₆ no sustituido;
 - (f) R₅ es H, sustituido o alquilo C₁-C₆ no sustituido, en el que cada uno de dichos R₅, que está sustituido, tiene uno o más sustituyentes seleccionados de cicloalquilo C₃-C₁₀;
 - (g) R₆ es O, o S;
 - (h) R₇ es sustituido o alquilo C₁-C₆ no sustituido, alcoxi C₁-C₆ no sustituido, o R₉S(O)_nR₉, en el que cada uno de dichos R₇, que está sustituido, tiene uno o más sustituyentes seleccionados de F, Cl, Br, y I ;
 - (i) R₈ es H, F, Cl, Br, o I;
 - (j) R₉ cada uno independientemente es alquilo C₁-C₆ no sustituido;
 - (k) R₁₀ es H, o alquilo C₁-C₆ no sustituido; y
 - (l) n es 0.
2. Una composición de acuerdo con la reivindicación 1, en donde dicha molécula de dicho R₄ es halo o alquilo C₁-C₆ no sustituido.
3. Una composición de acuerdo con la reivindicación 1, en donde dicha molécula de dicho R₄ es F, Cl, o alquilo C₁-C₂ no sustituido.

4. Una composición de acuerdo con la reivindicación 1, en donde dicha molécula de dicho R_4 es Cl o CH_3 .
5. Una composición de acuerdo con la reivindicación 1, en donde dicha molécula de dicho R_5 es un alquilo C_1-C_6 sustituido que está sustituido con un cicloalquilo C_3-C_{10} .
6. Una composición de acuerdo con la reivindicación 1, en donde dicha molécula de dicho R_5 es H, CH_3 , CH_2 -ciclopropilo, o CH_2CH_3 .
7. Una composición de acuerdo con la reivindicación 1 en el que dicha molécula de dicho R_6 es O.
8. Una composición de acuerdo con la reivindicación 1, en donde dicha molécula de dicho R_7 es un alquilo sustituido C_1-C_6 en el que dicho sustituyente es uno o más halos.
9. Una composición de acuerdo con la reivindicación 1, en donde dicha molécula de dicho R_7 es un alquilo sustituido C_1-C_6 en el que dicho sustituyente es uno o más F o Cl o una combinación de los mismos.
10. Una composición de acuerdo con la reivindicación 1 en el que dicha molécula de dicho R_7 es un alquilo sustituido C_1-C_6 en el que dicho sustituyente es uno o más F.
11. Una composición de acuerdo con la reivindicación 1, en donde dicha molécula de dicho R_7 es CH_2CF_3 .
12. Una composición de acuerdo con la reivindicación 1, en donde dicha molécula de dicho R_7 es un alquilo C_1-C_6 no sustituido.
13. Una composición de acuerdo con la reivindicación 1, en donde dicha molécula de dicho R_7 es $CH(CH_3)_2$, CH_3 , $C(CH_3)_3$, o $CH_2CH_2CH_2CH_3$.

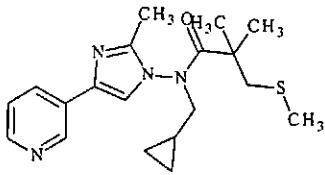
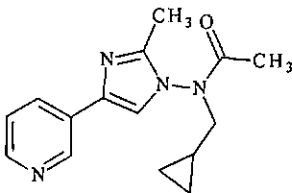
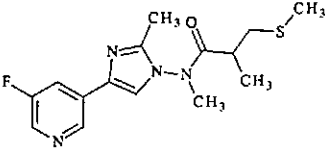
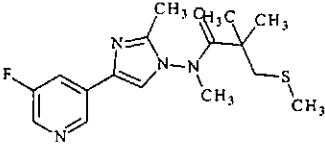
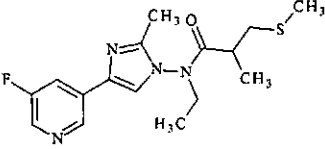
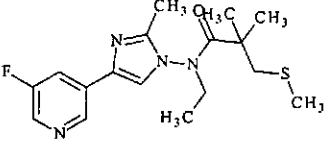
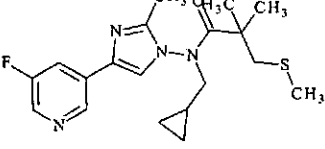
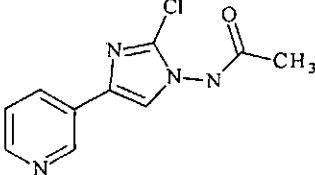
14. Una composición de acuerdo con la reivindicación 1, en donde dicha molécula de dicho R_7 es O (alquilo C_1 - C_6 no sustituido).
15. Una composición de acuerdo con la reivindicación 1, en donde dicha molécula de dicho R_7 es OC (CH₃)₃.
16. Una composición de acuerdo con la reivindicación 1, en donde dicha molécula de dicho R_7 es $R_9S(O)_nR_9$.
17. Una composición de acuerdo con la reivindicación 1, en donde dicha molécula de dicho R_7 es (alquilo C_1 - C_6 no sustituido) S(alquilo C_1 - C_6 no sustituido).
18. Una composición de acuerdo con la reivindicación 1, en donde dicha molécula de dicho R_7 es CH₂CH (CH₃)SCH₃, CH₂CH₂SCH₃, CH(CH₃)₂SCH₃, o CH (CH₃) CH₂SCH₃.
19. Una composición de acuerdo con la reivindicación 1, en donde dicha molécula de dicho R_8 es H o halo.
20. Una composición de acuerdo con la reivindicación 1, en donde dicha molécula de dicho R_8 es H, F, o Cl.
21. Una composición de acuerdo con la reivindicación 1, en donde dicha molécula de dicho R_8 es H o F.
22. Una composición de acuerdo con la reivindicación 1, en donde dicha molécula de dicho R_{10} es H o CH₃.
23. Una composición de acuerdo con la reivindicación 1 en el que dicha molécula se selecciona de:

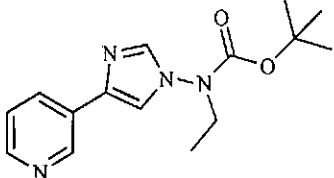
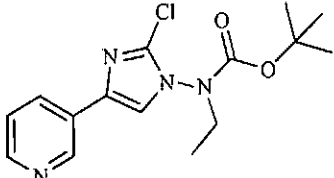
Compuesto No.	Estructura
1	 <chem>CC(C)C(=O)N1C=C(C2=CC=CC=N2)N(C)N1C</chem>
2	 <chem>CC(C)C(=O)N1C=C(C2=CC=CC=N2)N(C)N1C(C)SC</chem>
3	 <chem>CC(C)C(=O)N1C=C(C2=CC=CC=N2)N(C)N1C(C)SC</chem>
4	 <chem>CC(C)C(=O)N1C=C(C2=CC=CC=N2)N(C)N1C(C)SC</chem>
5	 <chem>CC(C)C(=O)N1C=C(C2=CC=CC=N2)N(C)N1C</chem>
6	 <chem>CC(C)C(=O)N1C=C(C2=CC=CC=N2)N(C)N1C</chem>
7	 <chem>CC(C)C(=O)N1C=C(C2=CC=CC=N2)N(C)N1C</chem>

8	 <chem>CN1C(=O)CC(F)(F)F1c2ccncc2</chem>
9	 <chem>CCCCC(=O)N1C(=O)CN(C)C1c2ccncc2</chem>
10	 <chem>CSCCC(=O)N1C(=O)CN(C)C1c2ccncc2</chem>
11	 <chem>CC(C)C(C1CC1)C(=O)N1C(=O)CN(C)C1c2ccncc2</chem>
12	 <chem>C1CC1C(=O)N1C(=O)CN(C)C1c2ccncc2</chem>
13	 <chem>CC(C)CC(=O)N1C(=O)CN(C)C1c2ccncc2</chem>
14	 <chem>C1CC1C(=O)N1C(=O)CN(C)C1c2ccncc2</chem>
15	 <chem>CCCCC(=O)N1C(=O)CN(C)C1c2ccncc2</chem>

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24	<chem>CC(C)C(=O)N1CN(C)C(C2=CC=CC=C2F)=N1</chem>
25	<chem>CC(C)C(=O)N1CN(C)C(C2=CC=CC=C2F)=N1</chem>
26	<chem>CC(C)C(=O)N1CN(C)C(C2=CC=CC=C2F)=N1</chem>
27	<chem>CC(C)C(=O)N1CN(C)C(C2=CC=CC=C2F)=N1</chem>
28	<chem>CC(C)C(=O)N1CN(C)C(C2=CC=CC=C2)=N1</chem>
29	<chem>CC(C)C(=O)N1CN(C)C(C2=CC=CC=C2)=N1</chem>
30	<chem>CC(C)C(=O)N1CN(C)C(C2=CC=CC=C2)=N1</chem>
31	<chem>CC(C)C(=O)N1CN(C)C(C2=CC=CC=C2)=N1</chem>

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US008680121B2

(12) **United States Patent**
Garizi et al.

(10) **Patent No.:** **US 8,680,121 B2**
(45) **Date of Patent:** **Mar. 25, 2014**

(54) **PESTICIDAL COMPOSITIONS AND PROCESSES RELATED THERETO**

(75) Inventors: **Negar Garizi**, Westfield, IN (US); **Maurice C. H. Yap**, Zionsville, IN (US); **Tony K. Trullinger**, Westfield, IN (US); **CaSandra Lee McLeod**, Indianapolis, IN (US); **Paul Renee LePlae, Jr.**, Brownsburg, IN (US); **Timothy C. Johnson**, Indianapolis, IN (US); **Ricky Hunter**, Westfield, IN (US); **John F. Daeuble, Sr.**, Carmel, IN (US); **Ann M. Buysse**, Carmel, IN (US)

(73) Assignee: **Dow AgroSciences, LLC.**, Indianapolis, IN (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 84 days.

(21) Appl. No.: **13/285,471**

(22) Filed: **Oct. 31, 2011**

(65) **Prior Publication Data**

US 2012/0110701 A1 May 3, 2012

Related U.S. Application Data

(60) Provisional application No. 61/409,739, filed on Nov. 3, 2010.

(51) **Int. Cl.**
A01N 43/40 (2006.01)

(52) **U.S. Cl.**
USPC 514/341; 424/84; 424/93; 424/405; 424/408; 424/409; 424/417; 424/DIG. 10; 424/DIG. 11; 504/100; 504/103; 504/116.1; 514/918; 514/919; 514/920

(58) **Field of Classification Search**

None

See application file for complete search history.

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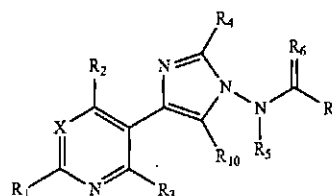
WO	PCT/US11/58571	3/2011
WO	WO/2012/061288	5/2012

Primary Examiner — Neil Levy

(74) *Attorney, Agent, or Firm* — Carl D. Corvin

(57) **ABSTRACT**

This document discloses molecules having the following formula (Formula One)



Formula One

and processes related thereto.

36 Claims, No Drawings

1

**PESTICIDAL COMPOSITIONS AND
PROCESSES RELATED THERETO****CROSS REFERENCE TO RELATED
APPLICATIONS**

This application claims the benefit of U.S. Provisional Patent Application Ser. No. 61/409,379 filed Nov. 3, 2010 the entire disclosure of which is hereby incorporated by reference.

FIELD OF THIS DISCLOSURE

This disclosure is related to the field of processes to produce molecules that are useful as pesticides (e.g., acaricides, insecticides, molluscicides, and nematocides), such molecules, and processes of using such molecules to control pests.

BACKGROUND

Pests cause millions of human deaths around the world each year. Furthermore, there are more than ten thousand species of pests that cause losses in agriculture. The world-wide agricultural losses amount to billions of U.S. dollars each year.

Termites cause damage to all kinds of private and public structures. The world-wide termite damage losses amount to billions of U.S. dollars each year.

Stored food pests eat and adulterate stored food. The world-wide stored food losses amount to billions of U.S. dollars each year, but more importantly, deprive people of needed food.

There is an acute need for new pesticides. Certain pests are developing resistance to pesticides in current use. Hundreds of pest species are resistant to one or more pesticides. The development of resistance to some of the older pesticides, such as DDT, the carbamates, and the organophosphates, is well known. But resistance has even developed to some of the newer pesticides.

Therefore, for many reasons, including the above reasons, a need exists for new pesticides.

DEFINITIONS

The examples given in the definitions are generally non-exhaustive and must not be construed as limiting the invention disclosed in this document. It is understood that a substituent should comply with chemical bonding rules and steric compatibility constraints in relation to the particular molecule to which it is attached.

"Alkenyl" means an acyclic, unsaturated (at least one carbon-carbon double bond), branched or unbranched, substituent consisting of carbon and hydrogen, for example, vinyl, allyl, butenyl, pentenyl, and hexenyl.

"Alkenyloxy" means an alkenyl further consisting of a carbon-oxygen single bond, for example, allyloxy, butenyloxy, pentenyloxy, hexenyloxy.

"Alkoxy" means an alkyl further consisting of a carbon-oxygen single bond, for example, methoxy, ethoxy, propoxy, isopropoxy, butoxy, isobutoxy, and tert-butoxy.

"Alkyl" means an acyclic, saturated, branched or unbranched, substituent consisting of carbon and hydrogen, for example, methyl, ethyl, (C₃)alkyl which represents n-propyl and isopropyl, (C₄)alkyl which represents n-butyl, sec-butyl, isobutyl, and tert-butyl.

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"Alkynyl" means an acyclic, unsaturated (at least one carbon-carbon triple bond), branched or unbranched, substituent consisting of carbon and hydrogen, for example, ethynyl, propargyl, butynyl, and pentynyl.

"Alkynyloxy" means an alkynyl further consisting of a carbon-oxygen single bond, for example, pentynyloxy, hexynyloxy, heptynyloxy, and octynyloxy.

"Aryl" means a cyclic, aromatic substituent consisting of hydrogen and carbon, for example, phenyl, naphthyl, and biphenyl.

"(C_x-C_y)" where the subscripts "x" and "y" are integers such as 1, 2, or 3, means the range of carbon atoms for a substituent—for example, (C₁-C₄)alkyl means methyl, ethyl, n-propyl, isopropyl, n-butyl, sec-butyl, isobutyl, and tert-butyl, each individually.

"Cycloalkenyl" means a monocyclic or polycyclic, unsaturated (at least one carbon-carbon double bond) substituent consisting of carbon and hydrogen, for example, cyclobutenyl, cyclopentenyl, cyclohexenyl, norbornenyl, bicyclo [2.2.2]octenyl, tetrahydronaphthyl, hexahydronaphthyl, and octahydronaphthyl.

"Cycloalkenyloxy" means a cycloalkenyl further consisting of a carbon-oxygen single bond, for example, cyclobutenyloxy, cyclopentenyl, norbornenyloxy, and bicyclo [2.2.2]octenyloxy.

"Cycloalkyl" means a monocyclic or polycyclic, saturated substituent consisting of carbon and hydrogen, for example, cyclopropyl, cyclobutyl, cyclopentyl, norbornyl, bicyclo [2.2.2]octyl, and decahydronaphthyl.

"Cycloalkoxy" means a cycloalkyl further consisting of a carbon-oxygen single bond, for example, cyclopropyloxy, cyclobutyloxy, cyclopentyloxy, norbornyloxy, and bicyclo [2.2.2]octyloxy.

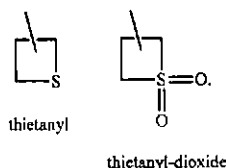
"Halo" means fluoro, chloro, bromo, and iodo.

"Haloalkoxy" means an alkoxy further consisting of, from one to the maximum possible number of identical or different, halos, for example, fluoromethoxy, trifluoromethoxy, 2,2-difluoropropoxy, chloromethoxy, trichloromethoxy, 1,1,2,2-tetrafluorooctoxy, and pentafluorooctoxy.

"Haloalkyl" means an alkyl further consisting of, from one to the maximum possible number of, identical or different, halos, for example, fluoromethyl, trifluoromethyl, 2,2-difluoropropyl, chloromethyl, trichloromethyl, and 1,1,2,2-tetrafluoroethyl.

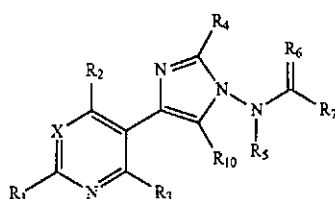
"Heterocyclyl" means a cyclic substituent that may be fully saturated, partially unsaturated, or fully unsaturated, where the cyclic structure contains at least one carbon and at least one heteroatom, where said heteroatom is nitrogen, sulfur, or oxygen. In the case of sulfur, that atom can be in other oxidation states such as a sulfoxide and sulfone. Examples of aromatic heterocyclyls include, but are not limited to, benzofuranyl, benzoisothiazolyl, benzoisoxazolyl, benzoxazolyl, benzothienyl, benzothiazolyl, cinnolinyl, furanyl, imidazolyl, indazolyl, indolyl, isoindolyl, isoquinolinyl, isothiazolyl, isoxazolyl, oxadiazolyl, oxazolyl, oxazolyl, phthalazinyl, pyrazinyl, pyrazolyl, pyrazolyl, pyridazinyl, pyridyl, pyrimidinyl, pyrrolyl, quinazolinyl, quinolinyl, quinoxalinyl, tetrazolyl, thiazolyl, thiazolyl, thienyl, triazinyl, and triazolyl. Examples of fully saturated heterocyclyls include, but are not limited to, piperazinyl, piperidinyl, morpholinyl, pyrrolidinyl, oxetanyl, tetrahydrofuranyl, tetrahydrothienyl and tetrahydropyranyl. Examples of partially unsaturated heterocyclyls include, but are not limited to, 1,2,3,4-tetrahydroquinolinyl, 4,5-dihydro-oxazolyl, 4,5-dihydro-1H-pyrazolyl, 4,5-dihydro-isoxazolyl, and 2,3-dihydro-[1,3,4]-oxadiazolyl. Additional examples include the following

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DETAILED DESCRIPTION

This document discloses molecules having the following formula ("Formula One"):



Formula One

wherein

(a) X is N or CR⁸;

(b) R¹ is H, F, Cl, Br, I, CN, NO₂, substituted or unsubstituted C₁-C₆ alkyl, substituted or unsubstituted C₂-C₆ alkenyl, substituted or unsubstituted C₁-C₆ haloalkyl, substituted or unsubstituted C₁-C₆ haloalkoxy, substituted or unsubstituted C₃-C₁₀ cycloalkyl, substituted or unsubstituted C₃-C₁₀ cycloalkenyl, substituted or unsubstituted C₆-C₂₀ aryl, substituted or unsubstituted C₁-C₂₀ heterocyclyl, OR⁹, C(=X¹)R⁹, C(=X¹)OR⁹, C(=X¹)N(R⁹)₂, N(R⁹)₂, N(R⁹)C(=X¹)R⁹, SR⁹, S(O)_nOR⁹, or R⁹S(O)_nR⁹,

wherein each said R¹, which is substituted, has one or more substituents selected from F, Cl, Br, I, CN, NO₂, C₁-C₆ alkyl, C₂-C₆ alkenyl, C₁-C₆ haloalkyl, C₂-C₆ haloalkenyl, C₁-C₆ haloalkoxy, C₂-C₆ haloalkenyloxy, C₃-C₁₀ cycloalkyl, C₃-C₁₀ cycloalkenyl, C₃-C₁₀ halocycloalkyl, C₃-C₁₀ halocycloalkenyl, OR⁹, S(O)_nOR⁹, C₆-C₂₀ aryl, or C₁-C₂₀ heterocyclyl, (each of which that can be substituted, may optionally be substituted with R⁹);

(c) R² is H, F, Cl, Br, I, CN, NO₂, substituted or unsubstituted C₁-C₆ alkyl, substituted or unsubstituted C₂-C₆ alkenyl, substituted or unsubstituted C₁-C₆ haloalkyl, substituted or unsubstituted C₁-C₆ haloalkoxy, substituted or unsubstituted C₃-C₁₀ cycloalkyl, substituted or unsubstituted C₃-C₁₀ cycloalkenyl, substituted or unsubstituted C₆-C₂₀ aryl, substituted or unsubstituted C₁-C₂₀ heterocyclyl, OR⁹, C(=X¹)R⁹, C(=X¹)OR⁹, C(=X¹)N(R⁹)₂, N(R⁹)₂, N(R⁹)C(=X¹)R⁹, SR⁹, S(O)_nOR⁹, or R⁹S(O)_nR⁹,

wherein each said R², which is substituted, has one or more substituents selected from F, Cl, Br, I, CN, NO₂, C₁-C₆ alkyl, C₂-C₆ alkenyl, C₁-C₆ haloalkyl, C₂-C₆ haloalkenyl, C₁-C₆ haloalkoxy, C₂-C₆ haloalkenyloxy, C₃-C₁₀ cycloalkyl, C₃-C₁₀ cycloalkenyl, C₃-C₁₀ halocycloalkyl, C₃-C₁₀ halocycloalkenyl, OR⁹, S(O)_nOR⁹, C₆-C₂₀ aryl, or C₁-C₂₀ heterocyclyl, (each of which that can be substituted, may optionally be substituted with R⁹);

(d) R³ is H, F, Cl, Br, I, CN, NO₂, substituted or unsubstituted C₁-C₆ alkyl, substituted or unsubstituted C₂-C₆ alkenyl, substituted or unsubstituted C₁-C₆ haloalkyl, substituted or unsubstituted C₁-C₆ haloalkoxy, substituted or

4

unsubstituted C₂-C₆ alkenyloxy, substituted or unsubstituted C₃-C₁₀ cycloalkyl, substituted or unsubstituted C₃-C₁₀ cycloalkenyl, substituted or unsubstituted C₆-C₂₀ aryl, substituted or unsubstituted C₁-C₂₀ heterocyclyl, OR⁹, C(=X¹)R⁹, C(=X¹)OR⁹, C(=X¹)N(R⁹)₂, N(R⁹)₂, N(R⁹)C(=X¹)R⁹, SR⁹, S(O)_nOR⁹, or R⁹S(O)_nR⁹,

wherein each said R³, which is substituted, has one or more substituents selected from F, Cl, Br, I, CN, NO₂, C₁-C₆ alkyl, C₂-C₆ alkenyl, C₁-C₆ haloalkyl, C₂-C₆ haloalkenyl, C₁-C₆ haloalkoxy, C₂-C₆ haloalkenyloxy, C₃-C₁₀ cycloalkyl, C₃-C₁₀ cycloalkenyl, C₃-C₁₀ halocycloalkyl, C₃-C₁₀ halocycloalkenyl, OR⁹, S(O)_nOR⁹, C₆-C₂₀ aryl, or C₁-C₂₀ heterocyclyl, (each of which that can be substituted, may optionally be substituted with R⁹);

(e) R⁴ is H, F, Cl, Br, I, CN, NO₂, substituted or unsubstituted C₁-C₆ alkyl, substituted or unsubstituted C₂-C₆ alkenyl, substituted or unsubstituted C₁-C₆ haloalkyl, substituted or unsubstituted C₁-C₆ haloalkoxy, substituted or unsubstituted C₃-C₁₀ cycloalkyl, substituted or unsubstituted C₃-C₁₀ cycloalkenyl, substituted or unsubstituted C₆-C₂₀ aryl, substituted or unsubstituted C₁-C₂₀ heterocyclyl, OR⁹, C(=X¹)R⁹, C(=X¹)OR⁹, C(=X¹)N(R⁹)₂, N(R⁹)₂, N(R⁹)C(=X¹)R⁹, SR⁹, S(O)_nOR⁹, or R⁹S(O)_nR⁹,

wherein each said R⁴, which is substituted, has one or more substituents selected from F, Cl, Br, I, CN, NO₂, C₁-C₆ alkyl, C₂-C₆ alkenyl, C₁-C₆ haloalkyl, C₂-C₆ haloalkenyl, C₁-C₆ haloalkoxy, C₂-C₆ haloalkenyloxy, C₃-C₁₀ cycloalkyl, C₃-C₁₀ cycloalkenyl, C₃-C₁₀ halocycloalkyl, C₃-C₁₀ halocycloalkenyl, OR⁹, S(O)_nOR⁹, C₆-C₂₀ aryl, or C₁-C₂₀ heterocyclyl, (each of which that can be substituted, may optionally be substituted with R⁹);

(f) R⁵ is H, substituted or unsubstituted C₁-C₆ alkyl, substituted or unsubstituted C₂-C₆ alkenyl, substituted or unsubstituted C₁-C₆ haloalkyl, substituted or unsubstituted C₁-C₆ haloalkoxy, substituted or unsubstituted C₃-C₁₀ cycloalkyl, substituted or unsubstituted C₃-C₁₀ cycloalkenyl, substituted or unsubstituted C₆-C₂₀ aryl, substituted or unsubstituted C₁-C₂₀ heterocyclyl, OR⁹, C(=X¹)R⁹, C(=X¹)OR⁹, C(=X¹)N(R⁹)₂, N(R⁹)₂, N(R⁹)C(=X¹)R⁹, SR⁹, S(O)_nOR⁹, R⁹S(O)_nR⁹, C₁-C₆ alkyl C₆-C₂₀ aryl (wherein the alkyl and aryl can independently be substituted or unsubstituted), C(=X²)R⁹, C(=X¹)X²R⁹, R⁹X²C(=X¹)R⁹, R⁹X²R⁹, C(=O)(C₁-C₆ alkyl)S(O)_n(C₁-C₆ alkyl), C(=O)(C₁-C₆ alkyl)C(=O)O(C₁-C₆ alkyl), (C₁-C₆ alkyl)OC(=O)(C₆-C₂₀ aryl), (C₁-C₆ alkyl)OC(=O)(C₁-C₆ alkyl), C₁-C₆ alkyl-(C₃-C₁₀ cyclohaloalkyl), or (C₁-C₆ alkenyl)C(=O)O(C₁-C₆ alkyl), or R⁹X²C(=X¹)X²R⁹;

wherein each said R⁵, which is substituted, has one or more substituents selected from F, Cl, Br, I, CN, NO₂, C₁-C₆ alkyl, C₂-C₆ alkenyl, C₁-C₆ haloalkyl, C₂-C₆ haloalkenyl, C₁-C₆ haloalkoxy, C₂-C₆ haloalkenyloxy, C₃-C₁₀ cycloalkyl, C₃-C₁₀ cycloalkenyl, C₃-C₁₀ halocycloalkyl, C₃-C₁₀ halocycloalkenyl, OR⁹, S(O)_nOR⁹, C₆-C₂₀ aryl, or C₁-C₂₀ heterocyclyl, R⁹ aryl (each of which that can be substituted, may optionally be substituted with R⁹);

optionally R⁵ and R⁷ can be connected in a cyclic arrangement, where optionally such arrangement can have one or more heteroatoms selected from O, S, or N, in the cyclic structure connecting R⁵ and R⁷;

(g) R⁶ is O, S, NR⁹, or NOR⁹;

(h) R⁷ is substituted or unsubstituted C₁-C₆ alkyl, substituted or unsubstituted C₂-C₆ alkenyl, substituted or unsubstituted C₁-C₆ haloalkyl, substituted or unsubstituted C₁-C₆ haloalkoxy, substituted or unsubstituted C₃-C₁₀ cycloalkyl,

5

substituted or unsubstituted C₃-C₁₀ cycloalkenyl, substituted or unsubstituted C₆-C₂₀ aryl, substituted or unsubstituted C₁-C₂₀ heterocyclyl, OR₉, OR₉S(O)_nR₉, C(=X1)R₉, C(=X1)OR₉, R₉C(=X1)OR₉, R₉X₂C(=X1)R₉X₂R₉, C(=X1)N(R₉)₂, N(R₉)₂, N(R₉)(R₉S(O)_nR₉), N(R₉)C(=X1)R₉, SR₉, S(O)_nOR₉, R₉S(O)_nR₉, C₁-C₆alkylOC(=O)C₁-C₆alkyl, OC₁-C₆alkyl C₁-C₂₀ heterocyclyl, C₁-C₆alkylC₁-C₂₀heterocyclyl, C₁-C₆alkylS(=N-CN)(C₁-C₆alkyl), C₁-C₆alkylS(O)(=N-CN)(C₁-C₆alkyl), C₁-C₆alkylS(O)_n(C₁-C₆alkylC₁-C₂₀heterocyclyl), C₁-C₆alkylS(O)(=N-CN)(C₁-C₆alkyl-C₁-C₂₀heterocyclyl), C₁-C₆alkylNH(C(=O)OC₁-C₆alkyl), C₁-C₆alkylC(=O)OC₁-C₆alkyl, C₁-C₆alkyl(C₆-C₂₀aryl)NH(C(=O)OC₁-C₆alkyl), C₁-C₆alkyl(S-C₁-C₆alkyl)NH(C(=O)OC₁-C₆alkyl), C₁-C₆alkyl(S-C₁-C₆alkyl-C₆-C₂₀aryl)NH(C(=O)OC₁-C₆alkyl), C₁-C₆alkyl(NHC(=O)OC₁-C₆alkylC₆-C₂₀aryl)NH(C(=O)OC₁-C₆alkyl), C₁-C₆alkyl(OC₁-C₆alkylC₆-C₂₀aryl)NH(C(=O)OC₁-C₆alkyl), C₁-C₆alkylN(C₁-C₆alkyl)(C(=O)OC₁-C₆alkyl), C₁-C₆alkylNH(C₁-C₆alkyl), C₆-C₂₀arylSC₁-C₆haloalkyl, C₁-C₆alkyl-N(C₁-C₆alkyl)(C(=O)C₁-C₆alkylC₆-C₂₀aryl), C₁-C₆alkylN(C₁-C₆alkyl)(C₁-C₆alkyl), C₁-C₆alkylN(C₁-C₆alkyl)(S(O)_nC₁-C₆alkyl), C₁-C₆alkylN(C₁-C₆alkyl)(S(O)_nC₁-C₆alkenylC₆-C₂₀aryl), C₁-C₆alkylN(C₁-C₆alkyl)(C(=O)C₁-C₂₀heterocyclyl), C₁-C₆alkylN(C₁-C₆alkyl)(C(=O)OC₁-C₆alkylC₆-C₂₀aryl), NH(C₁-C₆alkylS(O)_nC₁-C₆alkyl), NH(C₁-C₆alkylS(O)_nC₆-C₂₀aryl), C₁-C₆alkyl(S(O)_nC₁-C₆alkyl)(C(=O)C₁-C₆alkylS(O)_n(C₁-C₆alkyl), or R₉S(O)_n(NZ)R₉,

wherein each said R₇, which is substituted, has one or more substituents selected from F, Cl, Br, I, CN, NO₂, C₁-C₆alkyl, C₂-C₆alkenyl, C₁-C₆haloalkyl, C₂-C₆haloalkenyl, C₁-C₆haloalkoxy, C₂-C₆haloalkenyloxy, C₃-C₁₀cycloalkyl, C₃-C₁₀cycloalkenyl, C₃-C₁₀halocycloalkyl, C₃-C₁₀halocycloalkenyl, OR₉, S(O)_nOR₉, C₆-C₂₀aryl, or C₁-C₂₀heterocyclyl, (each of which that can be substituted, may optionally be substituted with R₉), C(=X1)R₉, C(=X1)OR₉, C(=X1)N(R₉)₂, =X₂, N(R₉)₂, S(=X₂)R₉, R₉S(O)_nR₉, S(O)_nN(R₉)₂;

(j) R₈ is H, F, Cl, Br, I, CN, NO₂, substituted or unsubstituted C₁-C₆alkyl, substituted or unsubstituted C₂-C₆alkenyl, substituted or unsubstituted C₁-C₆alkoxy, substituted or unsubstituted C₂-C₆alkenyloxy, substituted or unsubstituted C₃-C₁₀cycloalkyl, substituted or unsubstituted C₃-C₁₀cycloalkenyl, substituted or unsubstituted C₆-C₂₀aryl, substituted or unsubstituted C₁-C₂₀heterocyclyl, OR₉, C(=X1)R₉, C(=X1)OR₉, C(=X1)N(R₉)₂, N(R₉)C(=X1)R₉, SR₉, S(O)_nR₉, S(O)_nOR₉, or R₉S(O)_nR₉,

wherein each said R₈, which is substituted, has one or more substituents selected from F, Cl, Br, I, CN, NO₂, C₁-C₆alkyl, C₂-C₆alkenyl, C₁-C₆haloalkyl, C₂-C₆haloalkenyl, C₁-C₆haloalkoxy, C₂-C₆haloalkenyloxy, C₃-C₁₀cycloalkyl, C₃-C₁₀cycloalkenyl, C₃-C₁₀halocycloalkyl, C₃-C₁₀halocycloalkenyl, OR₉, S(O)_nOR₉, C₆-C₂₀aryl, or C₁-C₂₀heterocyclyl, (each of which that can be substituted, may optionally be substituted with R₉);

(j) R₉ (each independently) is H, CN, substituted or unsubstituted C₁-C₆alkyl, substituted or unsubstituted C₂-C₆alkenyl, substituted or unsubstituted C₁-C₆alkoxy, substituted or unsubstituted C₂-C₆alkenyloxy, substituted or unsubstituted C₃-C₁₀cycloalkyl, substituted or unsubstituted C₃-C₁₀cycloalkenyl, substituted or unsubstituted C₆-C₂₀aryl, substituted or unsubstituted C₁-C₂₀heterocyclyl, S(O)_nC₁-C₆alkyl, N(C₁-C₆alkyl)₂,

wherein each said R₉, which is substituted, has one or more substituents selected from F, Cl, Br, I, CN, NO₂, C₁-C₆

6

alkyl, C₂-C₆alkenyl, C₁-C₆haloalkyl, C₂-C₆haloalkenyl, C₁-C₆haloalkoxy, C₂-C₆haloalkenyloxy, C₃-C₁₀cycloalkyl, C₃-C₁₀cycloalkenyl, C₃-C₁₀halocycloalkyl, C₃-C₁₀halocycloalkenyl, OC₁-C₆alkyl, OC₁-C₆haloalkyl, S(O)_nC₁-C₆alkyl, S(O)_nOC₁-C₆alkyl, C₆-C₂₀aryl, or C₁-C₂₀heterocyclyl;

(k) R₁₀ is H, F, Cl, Br, I, CN, NO₂, substituted or unsubstituted C₁-C₆alkyl, substituted or unsubstituted C₂-C₆alkenyl, substituted or unsubstituted C₁-C₆alkoxy, substituted or unsubstituted C₂-C₆alkenyloxy, substituted or unsubstituted C₃-C₁₀cycloalkyl, substituted or unsubstituted C₃-C₁₀cycloalkenyl, substituted or unsubstituted C₆-C₂₀aryl, OR₉, C(=X1)R₉, C(=X1)OR₉, C(=X1)N(R₉)₂, N(R₉)₂, N(R₉)C(=X1)R₉, SR₉, S(O)_nOR₉, or R₉S(O)_nR₉,

wherein each said R₁₀, which is substituted, has one or more substituents selected from F, Cl, Br, I, CN, NO₂, C₁-C₆alkyl, C₂-C₆alkenyl, C₁-C₆haloalkyl, C₂-C₆haloalkenyl, C₁-C₆haloalkoxy, C₂-C₆haloalkenyloxy, C₃-C₁₀cycloalkyl, C₃-C₁₀cycloalkenyl, C₃-C₁₀halocycloalkyl, C₃-C₁₀halocycloalkenyl, OR₉, S(O)_nOR₉, or C₆-C₂₀aryl, (each of which that can be substituted, may optionally be substituted with R₉);

(l) n is (each independently) 0, 1, or 2;

(m) X₁ is (each independently) O or S;

(n) X₂ is (each independently) O, S, =NR₉, or =NOR₉; and

(o) Z is CN, NO₂, C₁-C₆alkyl(R₉), C(=X1)N(R₉)₂.

Formula One and its subparts (a) through (o) are hereafter referred to as "Embodiment A1".

In another embodiment of this molecule X is CR₈.

In another embodiment of this molecule R₁ is H.

In another embodiment of this molecule R₂ is H.

In another embodiment of this molecule R₃ is H.

In another embodiment of this molecule R₄ is halo or unsubstituted C₁-C₆alkyl.

In another embodiment of this molecule R₄ is F, Cl, or unsubstituted C₁-C₂alkyl.

In another embodiment of this molecule R₄ is Cl, or CH₃.

In another embodiment of this molecule R₅ is H, substituted or unsubstituted C₁-C₆alkyl.

In another embodiment of this molecule R₅ is a substituted C₁-C₆alkyl that is substituted with a C₃-C₁₀cycloalkyl.

In another embodiment of this molecule R₅ is H, CH₃, CH₂-cyclopropyl, or CH₂CH₃.

In another embodiment of this molecule R₆ is O.

In another embodiment of this molecule R₇ is substituted or unsubstituted C₁-C₆alkyl, OR₉, or R₉S(O)_nR₉.

In another embodiment of this molecule R₇ is a substituted C₁-C₆alkyl wherein said substituent is one or more halos.

In another embodiment of this molecule R₇ is a substituted C₁-C₆alkyl wherein said substituent is one or more F or Cl or a combination thereof.

In another embodiment of this molecule R₇ is a substituted C₁-C₆alkyl wherein said substituent is one or more F.

In another embodiment of this molecule R₇ is CH₂CF₃.

In another embodiment of this molecule R₇ is an unsubstituted C₁-C₆alkyl.

In another embodiment of this molecule R₇ is CH(CH₃)₂, CH₃, C(CH₃)₃, or CH₂CH₂CH₂CH₃.

In another embodiment of this molecule R₇ is OR₉.

In another embodiment of this molecule R₇ is O (unsubstituted C₁-C₆alkyl).

In another embodiment of this molecule R₇ is OC(CH₃)₃.

In another embodiment of this molecule R₇ is R₉S(O)_nR₉.

In another embodiment of this molecule R₇ is (unsubstituted C₁-C₆alkyl)S (unsubstituted C₁-C₆alkyl).

7

In another embodiment of this molecule R7 is CH₂CH(CH₃)SCH₃, CH₂CH₂SCH₃, CH(CH₃)₂SCH₃, or CH(CH₃)CH₂SCH₃.

In another embodiment of this molecule R8 is H or halo.

In another embodiment of this molecule R8 is H, F, or Cl.

In another embodiment of this molecule R8 is H or F.

In another embodiment of this molecule R9 is an unsubstituted C₁-C₆ alkyl.

In another embodiment of this molecule R10 is H or unsubstituted C₁-C₆ alkyl.

In another embodiment of this molecule R10 is H or CH₃.

In another embodiment of this molecule n is 0.

Combinations of these embodiments are also envisioned.

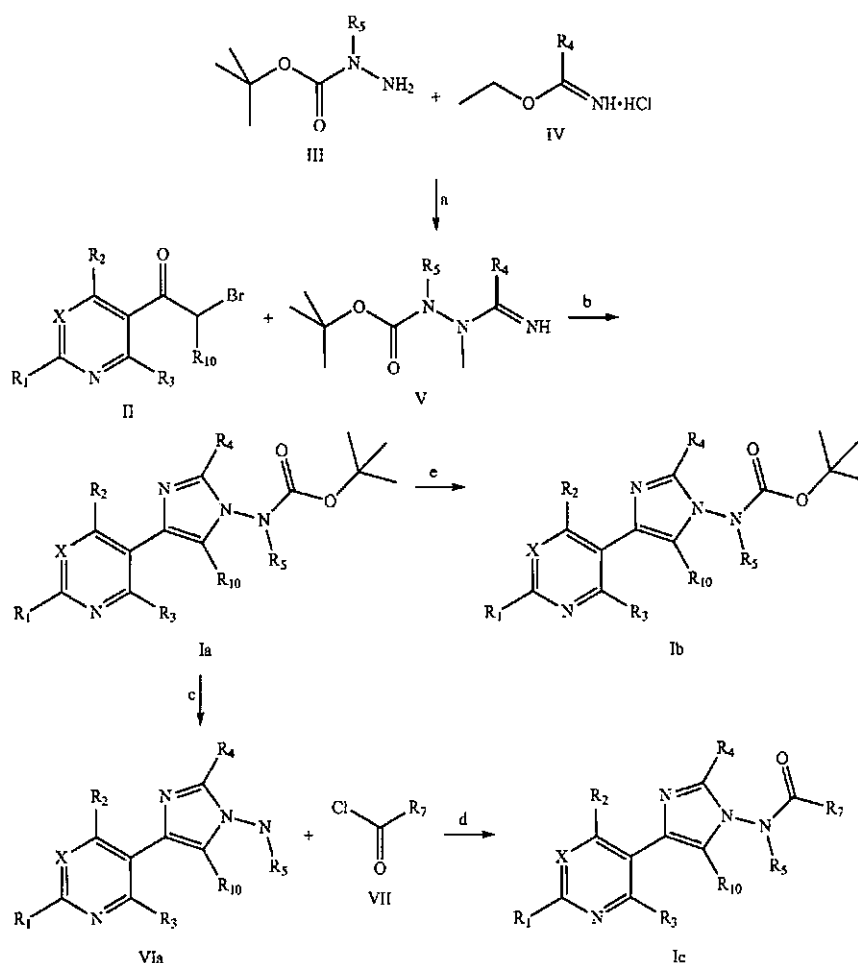
The molecules of Formula One will generally have a molecular mass of about 100 Daltons to about 1200 Daltons. However, it is generally preferred if the molecular mass is from about 120 Daltons to about 900 Daltons, and it is even more generally preferred if the molecular mass is from about 140 Daltons to about 600 Daltons.

The following scheme illustrates an approach to generating 2-methyl imidazolyamines. In step a of Scheme I, treatment of compounds of Formula III with ethyl acetimidate hydrochlorides of Formula IV wherein R5 is as defined in Embodiment A1 and R4 is methyl affords the corresponding aceta-

8

midines of Formula V. In step b of Scheme I, α-bromoketones of Formula II, wherein R1, R2, R3, R10, and X are as defined in Embodiment A1, can be treated with acetamidines of Formula V in the presence of an organic base, such as triethylamine, in a polar protic solvent such as ethyl alcohol to furnish N-Boc-aminoimidazoles of Formula Ia. When R5=H, carbamates of Formula Ia, wherein R1, R2, R3, R4, R10 and X are as defined in Embodiment A1, can be alkylated in the presence of a base such as sodium hydride and an alkyl halide such as iodomethane in an aprotic polar solvent such as N,N-dimethylformamide to yield compounds of Formula Ib, as shown in step c of Scheme I. Deprotection of carbamic acid tert-butyl esters of Formula Ia can be performed as in step c of Scheme I with trifluoroacetic acid (TFA) in a polar aprotic solvent such as dichloromethane (DCM) to yield the aminoimidazoles of Formula VIa, wherein R1, R2, R3, R4, R10, R5 and X are as defined in Embodiment A1. In step d of Scheme I, compounds of the Formula VIa can be treated with an acid chloride of Formula VII, wherein R7 is as defined in Embodiment A1, in the presence of both an organic base, such as N,N-dimethylaminopyridine (DMAP), and an inorganic base, such as potassium carbonate, in a polar aprotic solvent such as 1,2-dichloroethane (DCE) to afford compounds of Formula Ic.

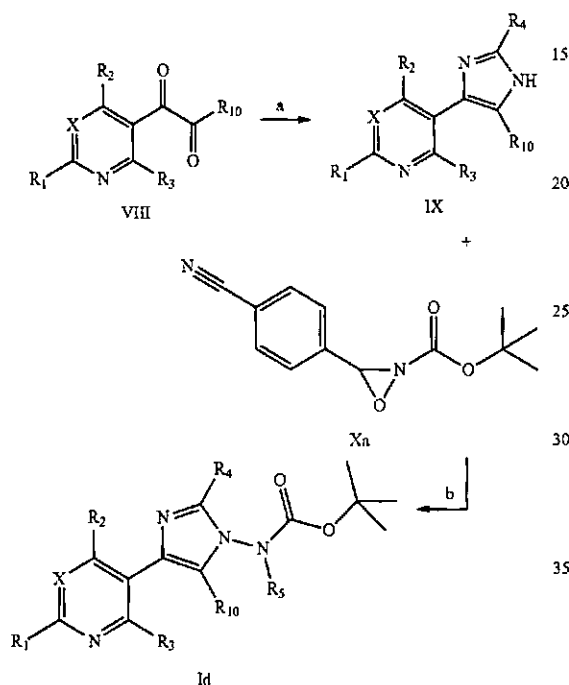
Scheme I



9

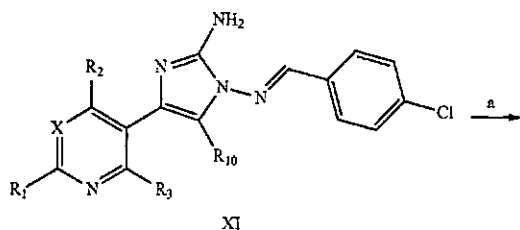
Another approach to generating imidazolylamines is illustrated in Scheme II. Diones of Formula VIII, wherein R₁, R₂, R₃, R₁₀ and X are as defined in Embodiment A1, can be treated with an aldehyde, such as acetaldehyde, a source of ammonia, such as ammonium acetate and a catalyst, such as indium(III)chloride, in a protic solvent, such as methanol to give compounds of Formula IX. Compounds of Formula IX, wherein R₁, R₂, R₃, R₄, R₁₀ and X are as defined in Embodiment A1, can be treated with a base such as sodium hydride in a solvent such as THF and addition of oxaziridines of Formula Xa to afford compounds of Formula Id, wherein R₅ is H.

Scheme II

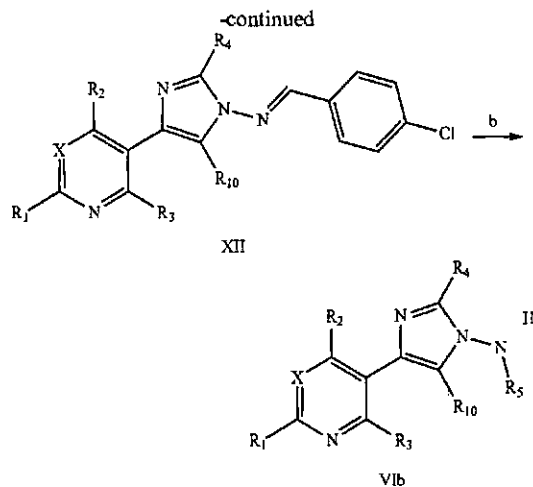


Another approach to generating imidazolylamines is illustrated in Scheme III. Substituted 2-aminoimidazoles of Formula XI were prepared according to the general procedure found in Li and co-workers, *J. Med. Chem.*, 2010, 53, 2409. Treatment of compounds of Formula XI, wherein R₁, R₂, R₃, R₁₀, and X are as defined in Embodiment A1, under Sandmeyer conditions leads to the formation of compounds of Formula XII, wherein R₄ is halogen, as shown in step a of Scheme III. Hydrazones of Formula XII can be transformed to the corresponding amines of Formula VIb, wherein R₅ is H when treated with hydrazine in a polar protic solvent such as 2-methoxyethanol, as shown in step b.

Scheme III

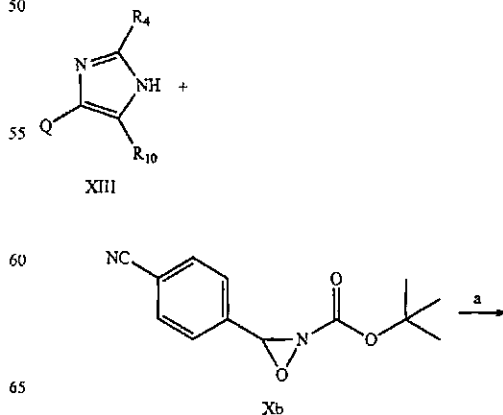


10



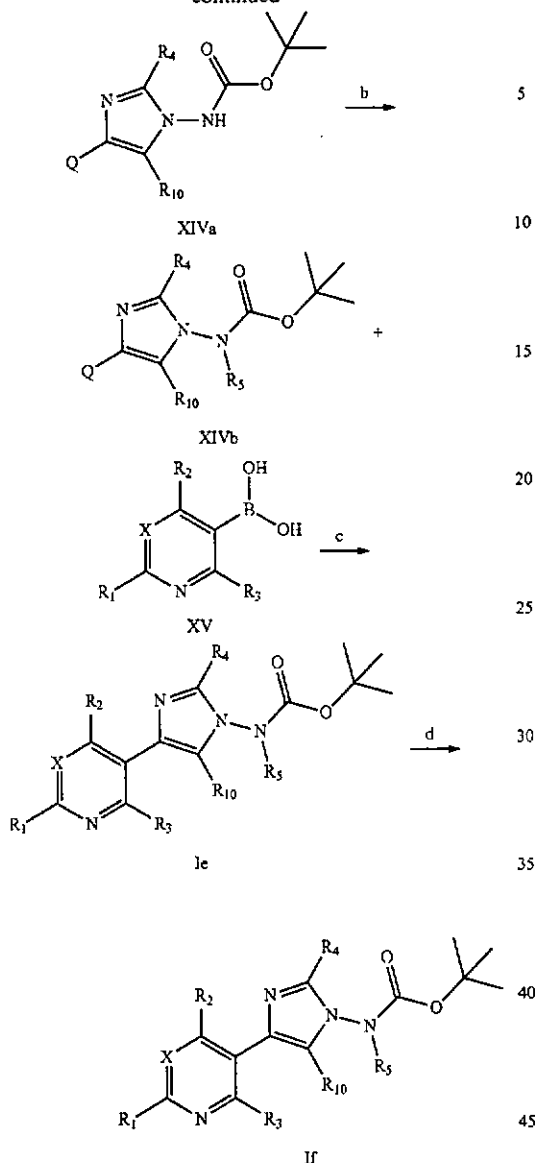
Another approach to generating imidazolylamines is illustrated in Scheme IV. Imidazoles of Formula XIII, wherein R₄ and R₁₀ are as defined in Embodiment A1 and Q is halogen (for example, bromine), can be treated with a base such as sodium hydride in a polar, aprotic solvent such as tetrahydrofuran and an aminating reagent such as oxaziridine of Formula Xb to afford compounds of Formula XIVa, as shown in step a of Scheme IV. Carbamates of Formula XIVa, can be alkylated in the presence of a base such as sodium hydride and an alkyl halide such as iodoethane in a polar aprotic solvent such as N,N-dimethylformamide to yield compounds of Formula XIVb, wherein R₅ is alkyl, as shown in step b. Compounds of Formula XIVb, wherein R₄, R₅ and R₁₀ are as defined in Embodiment A1, can be allowed to react under Suzuki coupling conditions with a boronic acid of Formula XV, wherein X, R₁, R₂ and R₃ are as defined in Embodiment A1, to provide the heterocycle-coupled imidazole of Formula Ic, as shown in step c. When R₄=H, compounds of Formula Ic can be halogenated in the presence of a base such as n-butyllithium in a polar aprotic solvent such as tetrahydrofuran and an electrophilic source of halogen such as hexachloroethane to yield 2-haloimidazoles of Formula If, wherein R₄ is halogen and R₁, R₂, R₃, R₅, R₁₀ and X are as defined in Embodiment A1, as shown in step d.

Scheme IV



11

-continued



EXAMPLES

The examples are for illustration purposes and are not to be construed as limiting the invention disclosed in this document to only the embodiments disclosed in these examples.

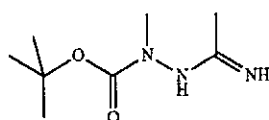
Starting materials, reagents, and solvents that were obtained from commercial sources were used without further purification. Anhydrous solvents were purchased as Sure/Seal™ from Aldrich and were used as received. Melting points were obtained on a Thomas Hoover Unimelt capillary melting point apparatus or an OptiMelt Automated Melting Point System from Stanford Research Systems and are uncorrected. Molecules are given their known names, named according to naming programs within ISIS Draw, ChemDraw or ACD Name Pro. If such programs are unable to name a molecule, the molecule is named using conventional naming

12

rules. All NMR are in ppm (δ) and were recorded at 300, 400, or 600 MHz unless otherwise stated.

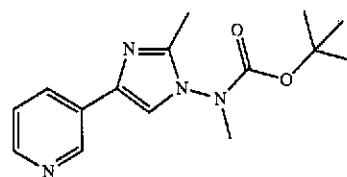
Example 1

Step 1: Preparation of N'-(1-imino-ethyl)-N-methylhydrazinecarboxylic acid tert-butyl ester



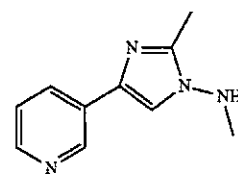
A solution of tert-butyl 1-methylhydrazinecarboxylate (10.0 g, 68.4 mmol), ethyl acetimidate hydrochloride (42.1 g, 342 mmol), and potassium carbonate (94.4 g, 684 mmol) in DMF (150 mL) was heated at 105° C. for 5 hours. The contents were cooled to 0° C. before the precipitated material was collected by vacuum filtration and resuspended in H₂O (100 mL). After 30 minutes of vigorous stirring, the remaining precipitate was collected and dried in a 45° C. vacuum oven overnight to yield the title compound as a white solid (7.56 g, 59.0%); mp 187-189° C.; ¹H NMR (400 MHz, DMSO-d₆) δ 6.28 (br s, 1H), 2.77 (s, 3H), 1.64 (s, 3H), 1.36 (s, 9H).

Step 2: Preparation of Methyl-(2-methyl-4-pyridin-3-yl-imidazol-1-yl)-carbamic acid tert-butyl ester (Compound 3)



To a solution of N'-(1-imino-ethyl)-N-methylhydrazinecarboxylic acid tert-butyl ester (5.00 g, 26.7 mmol) and triethylamine (9.30 mL, 66.8 mmol) in EtOH (100 mL) was added 2-bromo-1-pyridin-3-yl-ethanone hydrobromide (8.99 g, 32.0 mmol), portionwise. The contents were heated at 80° C. for 3 hours before the solvent was removed under reduced pressure and the residue was purified via silica gel chromatography (DCM:MeOH, 10:1) to afford the title compound as an orange oil (1.55 g, 20.1%); ¹H NMR (400 MHz, CDCl₃) δ 8.92 (d, J=2.4 Hz, 1H), 8.43 (dd, J=4.9, 1.4 Hz, 1H), 8.03 (dt, J=8.3, 1.6 Hz, 1H), 7.28 (dd, J=7.7, 4.8 Hz, 1H), 7.21 (s, 1H), 3.38 (s, 3H), 2.36 (s, 3H), 1.43 (s, 9H); ESIMS m/z 289 [(M+H)]⁺.

Step 3: Preparation of Methyl-(2-methyl-4-pyridin-3-yl-imidazole-1-yl)-amine



13

Method A:

A solution of methyl-(2-methyl-4-pyridin-3-yl-imidazole-1-yl)-carbamic acid tert-butyl ester (1.50 g, 5.20 mmol) and trifluoroacetic acid (0.40 mL, 5.20 mmol) in DCM (5 mL) was stirred under ambient conditions for 3 hours. The solvent was removed under reduced pressure and the residue was resuspended in DCM (10 mL) before the addition of triethylamine (1.45 mL, 10.4 mmol). After stirring for 10 minutes the solvent was removed and the residue was purified via silica gel chromatography (DCM:MeOH, 10:1) to afford an inseparable mixture of the title compound and triethylammonium salts (822 mg). The mixture was used without further purification in the subsequent reactions.

Method B:

A solution of tert-butyl methyl(2-methyl-4-(pyridin-3-yl)-1H-imidazol-1-yl)carbamate (2.7 g, 9.4 mmol) in dichloromethane (50 mL) was treated with HCl in dioxane (4M, 20 mL). The mixture was stirred overnight at room temperature. The precipitate was filtered off to give the title compound as a brown solid (1.15 g, 54.5%): ¹H NMR (300 MHz, DMSO-d₆) δ 9.41-9.32 (m, 1H), 8.82-8.56 (m, 3H), 7.97-7.89 (m, 1H), 2.85 (s, 3H), 2.67 (d, J=3.0 Hz, 3H); ESIMS m/z 189 [(M+H)]⁺.

N-Ethyl-2-methyl-4-(pyridin-3-yl)-1H-imidazol-1-amine was prepared in accordance with the procedures disclosed in Example 1, Step 3, Method B: ¹H NMR (300 MHz, DMSO-d₆) δ 9.32 (s, 1H), 8.76-8.69 (m, 2H), 8.57-8.46 (m, 1H), 7.81 (s, 1H), 3.12-3.03 (m, 2H), 2.63 (s, 3H), 1.06 (t, 3H, J=7.2 Hz); ESIMS m/z 203 [(M+H)]⁺.

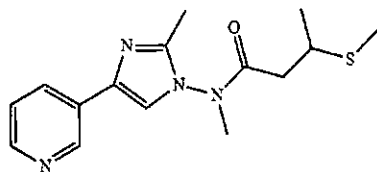
N-(Cyclopropylmethyl)-2-methyl-4-(pyridin-3-yl)-1H-imidazol-1-amine was prepared in accordance with the procedures disclosed in Example 1, Step 3, Method B: ¹H NMR (300 MHz, DMSO-d₆) δ 9.26 (s, 1H), 8.74-8.72 (m, 1H), 8.67-8.59 (m, 1H), 8.51-8.46 (m, 1H), 7.81 (s, 1H), 2.95 (d, 2H, J=7.2 Hz), 2.66 (s, 3H), 0.93-0.86 (m, 1H), 0.46-0.43 (m, 2H), 0.07-0.06 (m, 2H); ESIMS m/z 229 [(M+H)]⁺.

4-(5-Fluoropyridin-3-yl)-N,2-dimethyl-1H-imidazol-1-amine was prepared in accordance with the procedures disclosed in Example 1, Step 3, Method B: ¹H NMR (300 MHz, CD₃OD) δ 9.05 (s, 1H), 8.84 (s, 1H), 8.47-8.44 (m, 2H), 2.97 (s, 3H), 2.74 (s, 3H); ESIMS m/z 207 [(M+H)]⁺.

N-Ethyl-4-(5-fluoropyridin-3-yl)-2-methyl-1H-imidazol-1-amine was prepared in accordance with the procedures disclosed in Example 1, Step 3, Method B: ¹H NMR (300 MHz, CD₃OD) δ 8.99 (s, 1H), 8.80 (s, 1H), 8.41-8.35 (m, 2H), 3.26 (q, J=7.2 Hz, 2H), 2.74 (s, 3H), 1.19 (t, 3H, J=7.2 Hz); ESIMS m/z 221 [(M+H)]⁺.

N-(Cyclopropylmethyl)-4-(5-fluoropyridin-3-yl)-2-methyl-1H-imidazol-1-amine was prepared in accordance with the procedures disclosed in Example 1, Step 3, Method B: ¹H NMR (300 MHz, CD₃OD) δ 8.965 (s, 1H), 8.746 (s, 1H), 8.39-8.30 (m, 2H), 3.08-3.05 (m, 2H), 2.77 (s, 3H), 1.08-0.95 (m, 1H), 0.56-0.56 (m, 2H), 0.19-0.15 (m, 2H); ESIMS m/z 247 [(M+H)]⁺.

Step 4: Preparation of N-Methyl-N-(2-methyl-4-pyridin-3-yl-imidazol-1-yl)-3-methylsulfanyl-butamide (Compound 2)



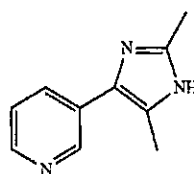
14

A solution of methyl-(2-methyl-4-pyridin-3-yl-imidazole-1-yl)-amine (400 mg, 2.13 mmol), 3-methylsulfanyl-butyl chloride (649 mg, 4.25 mmol), DMAP (260 mg, 2.13 mmol), and potassium carbonate (881 mg, 6.38 mmol) in DCE (5 mL) was heated at 80° C. for 6 hours. The solvent was removed under reduced pressure and the residue was purified via reverse phase chromatography (0 to 100% acetonitrile/water) to furnish the title compound as a brown oil (290 mg, 44.8%): ¹H NMR (400 MHz, CDCl₃) δ 8.94 (br s, 1H), 8.47 (dd, J=5.0, 1.4 Hz, 1H), 8.04 (dt, J=8.2, 1.5 Hz, 1H), 7.36-7.27 (m, 2H), 3.39 (s, 3H), 3.25-3.18 (m, 1H), 2.38 (s, 3H), 2.27-2.19 (m, 2H), 2.02 (s, 3H), 1.24 (d, J=6.2 Hz, 3H); ESIMS m/z 304 [(M+H)]⁺.

Compounds 1, 5-38 were made in accordance with the procedures disclosed in Example 1.

Example 2

Step 1: Preparation of 3-(2,5-Dimethyl-1H-imidazol-4-yl)pyridine



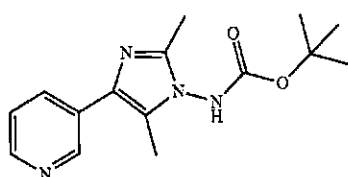
The compound was prepared following the general procedure found in: Sharma, S. D.; Hazarika, P.; Konwar, D. *Tetrahedron Lett.* 2008, 49, 2216. 1-Pyridin-3-yl-propane-1,2-dione (prepared as described in Knaus, E. E.; Avasthi, K.; Redda, K.; Benderly, A. *Can. J. Chem.* 1980, 58(2), 130; 0.50 g, 3.35 mmol), ammonium acetate (0.517 g, 6.71 mmol) and indium (III) chloride (0.074 g, 0.033 mmol) were weighed into a 50 mL round bottomed flask. Methanol (MeOH, 7 mL) and acetaldehyde (0.148 g, 0.190 mL, 3.35 mmol) were added via syringe and the cloudy mixture was stirred vigorously overnight. Analysis by TLC CH₂Cl₂:MeOH/10:1 indicated that some starting material remained. Additional ammonium acetate (0.517 g, 6.71 mmol), indium (III) chloride (0.074 g, 0.033 mmol) and acetaldehyde (0.148 g, 0.190 mL, 3.35 mmol) were added and again allowed to stir overnight. The mixture was filtered through paper with MeOH to remove sediment and concentrated to low volume. The residue was purified via flash silica gel chromatography, CH₂Cl₂:MeOH/10:1 to afford a low R_f-spot-compound. The material was dissolved in a minimum amount of CH₂Cl₂ and treated with sat. NaHCO₃. The resulting precipitate was collected by filtration and washed with water and CH₂Cl₂ and dried to give 0.105 g of a light yellow powder. The layers of the filtrate were separated and the aqueous phase was extracted repeatedly with CH₂Cl₂ and ethyl acetate (EtOAc). The combined extracts were dried over Na₂SO₄, filtered and concentrated to give an additional 0.06 g of the title compound as a yellow orange solid (0.165 g, 28%): mp 179-181° C.; ¹H NMR (300 MHz, CDCl₃) δ 8.85 (bs, 1H), 8.46 (d, J=4.1 Hz, 1H), 7.99

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15

(bs, 1H), 7.31 (dd, J=7.7, 4.7 Hz, 1H), 2.44 (s, 6H); ESIMS m/z 174 [(M+H)]⁺ and 172 [(M-H)]⁻.

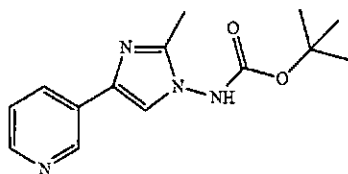
Step 2: Preparation of (2,5-Dimethyl-4-pyridin-3-yl-imidazol-1-yl)-carbamic acid tert-butyl ester (Compound 4)



3-(2,5-Dimethyl-1H-imidazol-4-yl)-pyridine (0.035 g, 0.220 mmol) was weighed into an oven dried, nitrogen swept 10 mL round bottomed flask. Tetrahydrofuran (THF, 1 mL) was added via syringe and the resulting slurry cooled on an ice bath under nitrogen and treated with sodium hydride (0.0097 g, 0.242 mmol 60% dispersion in oil) with stirring. After 10 minutes, 3-(4-cyano-phenyl)-oxaziridine-2-carboxylic acid tert-butyl ester (0.052 g, 0.212 mmol) was added as a solid and the thick yellow slurry allowed to warm to room temperature and stir for 2 hours. The crude reaction mixture was loaded directly onto a flash silica gel column and eluted with CH₂Cl₂:MeOH/10:1 giving (2,5-dimethyl-4-pyridin-3-yl-imidazol-1-yl)-carbamic acid tert-butyl ester as a light yellow oil as a 5:1 mixture with its regioisomer (0.027 g, 46%); IR (film) 3389, 2978, 2930, 1730, 1478, 1275, 1252, 1156, 1017, 951, 711, 573 cm⁻¹; ¹H NMR (300 MHz, DMSO, Major isomer) δ 10.41 (s, 1H), 8.81 (s, 1H), 8.39 (s, 1H), 7.95 (d, J=8.0 Hz, 1H), 7.44-7.28 (m, 1H), 2.21 (s, 3H), 2.18 (s, 3H), 1.46 (s, 9H); ESIMS m/z 289 [(M+H)]⁺ and 287 [(M-H)]⁻.

Example 3

Preparation of tert-Butyl (2-methyl-4-(pyridin-3-yl)-1H-imidazol-1-yl)-carbamate



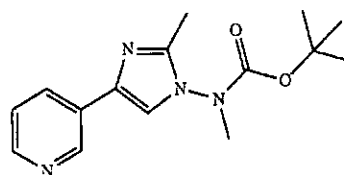
To a mixture of ethyl acetimidate hydrochloride (2.0 g, 16.20 mmol) and triethylamine (3.28 g, 32.4 mmol) in ethanol (40 mL) was added a solution of tert-butyl hydrazinecarboxylate (2.14 g, 16.20 mmol) in ethanol (10 mL) at room temperature. The resulting mixture was stirred at room temperature overnight. Then to the mixture was added a solution of 2-bromo-1-(pyridin-3-yl)ethanone hydrobromide (5.0 g, 17.9 mmol) and triethylamine (4.9 g, 48.6 mmol) in ethanol (20 mL). The reaction mixture was stirred at room temperature for 5 hours then heated to reflux overnight. The solvent was removed under reduced pressure and the residue was purified via silica gel chromatography (dichloromethane:methanol, 10:1) to give the title compound as an orange oil

16

(0.76 g, 17.3%); ¹H NMR (300 MHz, CDCl₃) δ 8.87 (s, 1H), 8.45 (d, 1H, J=6.3 Hz), 8.43 (s, 1H), 8.05 (d, 1H, J=6.3 Hz), 7.33-7.25 (m, 2H), 2.37 (s, 3H), 1.51 (s, 9H); ESIMS m/z 275 [(M+H)]⁺.

Example 4

Preparation of tert-Butyl methyl(2-methyl-4-(pyridin-3-yl)-1H-imidazol-1-yl)carbamate (Compound 3) (another way of making Compound 3)



To a solution of tert-butyl 2-methyl-4-(pyridin-3-yl)-1H-imidazol-1-ylcarbamate (2.0 g, 7.3 mmol) in dry DMF (15 mL) at 0° C. was added sodium hydride (0.35 g, 8.7 mmol, 60% dispersion in oil). The reaction was stirred at 0° C. for 30 minutes and then methyl iodide (1.55 g, 10.9 mmol) was added portionwise. The reaction mixture was stirred at 0° C. for 3 hours before it was warmed to ambient temperature. The reaction was extracted with ethyl acetate (15 mLx2). The organic layer was washed with brine (10 mL), dried over anhydrous sodium sulfate, filtered and concentrated to give the title compound (1.18 g, 56.2%) as an orange oil, which was used in the next step without further purification: ¹H NMR (300 MHz, CDCl₃) δ 8.96 (s, 1H), 8.49 (s, 1H), 8.16-8.13 (m, 1H), 7.38-7.36 (m, 2H), 3.36 (s, 3H), 2.35 (s, 3H), 1.44 (s, 9H); ESIMS m/z 289 [(M+H)]⁺.

tert-Butyl ethyl(2-methyl-4-(pyridin-3-yl)-1H-imidazol-1-yl)carbamate was prepared in accordance with the procedures disclosed in Example 4: ¹H NMR (300 MHz, CDCl₃) δ 8.94 (s, 1H), 8.48-8.46 (m, 1H), 8.09-8.05 (m, 1H), 7.31-7.29 (m, 1H), 7.20 (s, 1H), 3.86-3.67 (m, 2H), 2.34 (s, 3H), 1.44 (s, 9H), 1.21 (t, J=7.2 Hz, 3H); ESIMS m/z 303 [(M+H)]⁺.

tert-Butyl(cyclopropylmethyl)(2-methyl-4-(pyridin-3-yl)-1H-imidazol-1-yl)carbamate was prepared in accordance with the procedures disclosed in Example 4: ¹H NMR (300 MHz, CDCl₃) δ 8.94 (s, 1H), 8.48-8.46 (m, 1H), 8.10-8.06 (m, 1H), 7.31-7.28 (m, 1H), 7.25 (s, 1H), 3.59-3.54 (m, 2H), 2.37 (s, 3H), 1.44 (s, 9H), 1.05-0.93 (m, 1H), 0.56-0.53 (m, 2H), 0.20-0.15 (m, 2H); ESIMS m/z 329 [(M+H)]⁺.

tert-Butyl (4-(5-fluoropyridin-3-yl)-2-methyl-1H-imidazol-1-yl)(methyl)carbamate was prepared in accordance with the procedures disclosed in Example 4: ¹H NMR (300 MHz, CDCl₃) δ 8.72 (s, 1H), 8.31 (d, J=2.7 Hz, 1H), 7.83-7.78 (m, 1H), 7.27 (s, 1H), 3.36 (s, 3H), 2.34 (s, 3H), 1.44 (s, 9H); ESIMS m/z 307 [(M+H)]⁺.

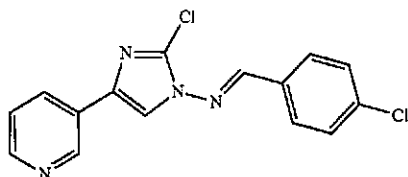
tert-Butyl ethyl(4-(5-fluoropyridin-3-yl)-2-methyl-1H-imidazol-1-yl)carbamate was prepared in accordance with the procedures disclosed in Example 4: ¹H NMR (300 MHz, CDCl₃) δ 8.73 (s, 1H), 8.32-8.31 (m, 1H), 7.84-7.80 (m, 1H), 7.23 (s, 1H), 3.87-3.70 (m, 2H), 2.34 (s, 3H), 1.45 (s, 9H), 1.21 (t, J=7.2 Hz, 3H); ESIMS m/z 321 [(M+H)]⁺.

tert-Butyl(cyclopropylmethyl)(4-(5-fluoropyridin-3-yl)-2-methyl-1H-imidazol-1-yl)carbamate was prepared in accordance with the procedures disclosed in Example 4: ¹H NMR (300 MHz, CDCl₃) δ 8.7 s (s, 1H), 8.30-8.29 (m, 1H), 7.85-7.80 (m, 1H), 7.27 (s, 1H), 3.57-3.54 (m, 2H), 2.37 (s, 3H), 1.44 (s, 9H), 1.02-0.93 (m, 1H), 0.55-0.53 (m, 2H), 0.21-0.17 (m, 2H); ESIMS m/z 347 [(M+H)]⁺.

17

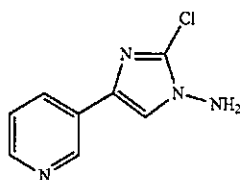
Example 5

Step 1: Preparation of E-2-Chloro-N-(4-chlorobenzylidene)-4-(pyridin-3-yl)-1H-imidazol-1-amine



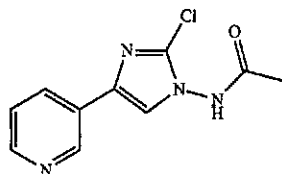
To a solution of (E)-N¹-(4-chlorobenzylidene)-4-(pyridin-3-yl)-1H-imidazole-1,2-diamine (5.3 g, 18 mmol) and CuCl (1.79 g, 18 mmol) in acetonitrile (100 mL) was added isopentyl nitrite (3.15 g, 27 mmol) at 0° C. The reaction mixture was stirred for 1 hour at room temperature, and then heated to 70° C. for 3 hours. The solvent was removed in vacuum, the residue was purified by column chromatography (petroleum ether:ethyl acetate=2:1) to give the title compound (258 mg, 4%) as a white solid: ¹H NMR (300 MHz, CDCl₃) δ 8.99 (s, 1H), 8.55-8.54 (m, 1H), 8.42 (s, 1H), 8.17-8.13 (m, 1H), 7.86-7.83 (m, 3H), 7.50 (d, J=8.4 Hz, 2H), 7.36-7.31 (m, 1H); ESIMS m/z 317 [(M+H)]⁺.

Step 2: Preparation of 2-Chloro-4-(pyridin-3-yl)-1H-imidazol-1-amine



To a solution of E-2-Chloro-N-(4-chlorobenzylidene)-4-(pyridin-3-yl)-1H-imidazol-1-amine (210 mg, 0.66 mmol) in 2-methoxyethanol (5 mL) was added 80% hydrazine hydrate (0.5 mL). The reaction mixture was heated to 130° C. for 1 hour and then the reaction mixture was concentrated. The residue was purified by column chromatography (petroleum ether:ethyl acetate=1:1) to give the title compound (100 mg, 78%) as a yellow solid: ¹H NMR (300 MHz, CDCl₃) δ 8.91 (s, 1H), 8.50-8.49 (m, 1H), 8.06-8.03 (m, 1H), 7.43 (s, 1H), 7.34-7.30 (m, 1H), 4.87 (br, 2H); ESIMS m/z 195 [(M+H)]⁺.

Step 3: Preparation of N-(2-Chloro-4-(pyridin-3-yl)-1H-imidazol-1-yl)acetamide (Compound 39)

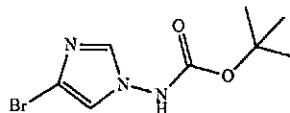


18

To a solution of 2-Chloro-4-(pyridin-3-yl)-1H-imidazol-1-amine (30 mg, 0.15 mmol) and triethylamine (15 mg, 0.15 mmol) in dichloromethane (5 mL) was added acetyl chloride (12 mg, 0.15 mmol) at 0° C. The reaction mixture was stirred for 30 minutes at 0° C. The solvent was removed in vacuum and the residue was purified by prep-TLC (petroleum ether:ethyl acetate=1:2) to give the title compound (10 mg, 27%) as a yellow solid: mp 129-131° C.; ¹H NMR (300 MHz, CDCl₃) δ 10.69 (br, 1H), 8.81-8.80 (m, 1H), 8.44-8.43 (m, 1H), 8.02-8.00 (m, 1H), 7.33 (br s, 2H), 2.20 (s, 3H); ESIMS m/z 237 [(M+H)]⁺.

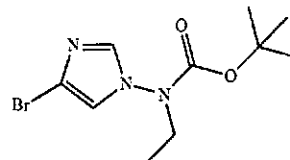
Example 6

Step 1: Preparation of tert-Butyl (4-bromo-1H-imidazol-1-yl)carbamate



4-Bromo-1H-imidazole (3.2 g, 21.8 mmol) was weighed into a 500 mL round bottomed flask equipped with a magnetic stir bar under a nitrogen atmosphere. Anhydrous N,N-dimethylformamide (DMF, 12 mL) was added and the mixture was placed on ice. After 10 minutes the mixture was treated with sodium hydride (0.840 g, 21.0 mmol 60% dispersion in oil). After 5 minutes, the ice bath was removed and the reaction warmed to room temperature. After 15 minutes of vigorous stirring the ice bath was re-inserted and 3-(4-cyanophenyl)-oxaziridine-2-carboxylic acid tert-butyl ester (1.92 g, 7.80 mmol) was added. The reaction was vigorously stirred for 5 minutes and the ice bath was removed. After 5 minutes the mixture was diluted with saturated sodium bicarbonate and extracted with ethyl acetate. The organics were washed with dilute sodium carbonate, dried over sodium sulfate, and concentrated. The residue was purified using silica gel chromatography (0-5% methanol/dichloromethane) to afford the title compound (1.16 g, 4.43 mmol, 57%) as a yellow oil: ¹H NMR (400 MHz, CDCl₃) δ 9.22 (s, 1H), 7.36 (d, J=1.5 Hz, 1H), 6.97 (d, J=1.5 Hz, 1H), 1.48 (s, 9H); ESIMS m/z 262 [(M)]⁺, 260 [(M-2)]⁻.

Step 2: Preparation of tert-Butyl (4-bromo-1H-imidazol-1-yl)(ethyl)carbamate

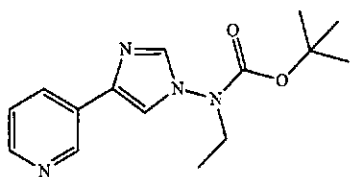


tert-Butyl (4-bromo-1H-imidazol-1-yl)carbamate (1.16 g, 4.43 mmol) was dissolved in N,N-dimethylformamide (DMF, 12 mL) and treated with sodium hydride (0.310 g, 7.75 mmol, 60% dispersion in oil). After 45 minutes, the mixture was cooled on an ice bath and was treated with iodoethane (0.828 g, 5.31 mmol). The ice bath was removed after five minutes of stirring and the reaction was stirred for an addi-

19

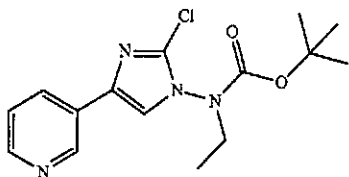
tional 90 minutes. The reaction mixture was diluted with aqueous potassium carbonate (50 mL, 5% w/w) and the product was extracted with ethyl acetate. The organics were washed with 5% aqueous potassium carbonate and brine and dried over sodium sulfate. The organic layer was concentrated and the residue was purified using silica gel chromatography (0-10% methanol/dichloromethane) to afford the title compound (1.023 g, 3.53 mmol, 80%) as a yellow oil: ^1H NMR (400 MHz, CDCl_3) δ 7.37 (d, $J=1.5$ Hz, 1H), 6.93 (d, $J=1.5$ Hz, 1H), 3.71 (q, $J=7.2$ Hz, 2H), 1.44 (s, 9H), 1.16 (t, $J=7.2$ Hz, 3H); ESIMS m/z 290 ($[\text{M}+\text{H}]^+$).

Step 3: Preparation of tert-Butyl ethyl(4-(pyridin-3-yl)-1H-imidazol-1-yl)carbamate (Compound 40)



tert-Butyl (4-bromo-1H-imidazol-1-yl)ethylcarbamate (253.7 mg, 0.874 mmol), pyridin-3-ylboronic acid (113 mg, 0.918 mmol), potassium carbonate (329 mg, 2.39 mmol), water (0.870 mL), absolute ethanol (1.74 mL), and toluene (3.50 mL) were placed into a 10 mL round bottomed flask equipped with condenser and magnetic stirrer. The atmosphere was flushed with nitrogen and tetrakis triphenylphosphine palladium (30.0 mg, 0.026 mmol) was added. The mixture was heated to 110°C . and stirred for 16 hours. The reaction was cooled, the organic layer set aside, and the aqueous layer was extracted with ethyl acetate. All organics were combined, dried over sodium sulfate, and concentrated. The residue was purified using silica gel chromatography (0-25% methanol/dichloromethane) to afford the title compound (81 mg, 0.28 mmol, 32%) as a yellow oil: ^1H NMR (400 MHz, CD_3CN) δ 9.00 (d, $J=2.5$ Hz, 1H), 8.46 (d, $J=4.8$ Hz, 1H), 8.11 (m, 1H), 7.67 (d, $J=1.3$ Hz, 1H), 7.61 (d, $J=1.2$ Hz, 1H), 7.36 (m, 1H), 3.76 (q, $J=7.1$ Hz, 2H), 1.45 (s, 9H), 1.17 (t, $J=7.2$ Hz, 3H); ESIMS m/z 289 ($[\text{M}+\text{H}]^+$).

Step 4: Preparation of tert-Butyl (2-chloro-4-(pyridin-3-yl)-1H-imidazol-1-yl)ethylcarbamate (Compound 41)



A vacuum dried 25 mL round bottomed flask equipped with a magnetic stir bar and containing tert-butyl ethyl(4-(pyridin-3-yl)-1H-imidazol-1-yl)carbamate (77 mg, 0.267 mmol) was charged with anhydrous tetrahydrofuran (THF, 3 mL) and cooled to -78°C . N-butyllithium (0.25 mL 0.675 mmol, 2.5 M in hexanes) was added and the mixture was stirred for 15 minutes. Hexachloroethane (189 mg, 0.80

20

mmol) dissolved in anhydrous THF (1 mL) was added dropwise to the reaction mixture while maintaining a temperature of -78°C . After stirring for 1 hour, the reaction was allowed to warm to room temperature. The reaction mixture was loaded directly on a silica gel column and the THF was removed in a vacuum oven. The crude product was purified using silica gel chromatography (0-25% methanol/dichloromethane) to afford the title compound (3 mg, 0.009 mmol, 3.5%) as a yellow oil: ^1H NMR (600 MHz, CDCl_3) δ 8.92 (d, $J=1.6$ Hz, 1H), 8.50 (dd, $J=4.8, 1.5$ Hz, 1H), 8.06 (dt, $J=7.9, 2.0$ Hz, 1H), 7.33-7.27 (m, 2H), 3.89 (dq, $J=14.5, 7.3$ Hz, 1H), 3.68 (dq, $J=14.3, 7.2$ Hz, 1H), 1.44 (s, 9H), 1.22 (t, $J=7.2$ Hz, 3H); ^{13}C NMR (151 MHz, CDCl_3) δ 152.90, 148.47, 146.02, 136.07, 134.08, 131.81, 128.79, 123.36, 117.66, 83.23, 45.32, 28.04, 13.03; ESIMS m/z 323 ($[\text{M}+\text{H}]^+$).

Example A

Bioassays on Green Peach Aphid ("GPA") (*Myzus persicae*) (MYZUPE)

GPA is the most significant aphid pest of peach trees, causing decreased growth, shriveling of the leaves, and the death of various tissues. It is also hazardous because it acts as a vector for the transport of plant viruses, such as potato virus Y and potato leafroll virus to members of the nightshade/potato family Solanaceae, and various mosaic viruses to many other food crops. GPA attacks such plants as broccoli, burdock, cabbage, carrot, cauliflower, daikon, eggplant, green beans, lettuce, macadamia, papaya, peppers, sweet potatoes, tomatoes, watercress, and zucchini, among other plants. GPA also attacks many ornamental crops such as carnation, chrysanthemum, flowering white cabbage, poinsettia, and roses. GPA has developed resistance to many pesticides.

Certain molecules disclosed in this document were tested against GPA using procedures described in the following example. In the reporting of the results, the "Table 3: GPA (MYZUPE) and sweetpotato whitefly-crawler (BEMITA) Rating Table" was used (See Table Section).

Cabbage seedlings grown in 3-inch pots, with 2-3 small (3-5 cm) true leaves, were used as test substrate. The seedlings were infested with 20-50 GPA (wingless adult and nymph stages) one day prior to chemical application. Four pots with individual seedlings were used for each treatment. Test compounds (2 mg) were dissolved in 2 mL of acetone/methanol (1:1) solvent, forming stock solutions of 1000 ppm test compound. The stock solutions were diluted 5x with 0.025% Tween 20 in H_2O to obtain the solution at 200 ppm test compound. A hand-held aspirator-type sprayer was used for spraying a solution to both sides of cabbage leaves until runoff. Reference plants (solvent check) were sprayed with the diluent only containing 20% by volume of acetone/methanol (1:1) solvent. Treated plants were held in a holding room for three days at approximately 25°C . and ambient relative humidity (RH) prior to grading. Evaluation was conducted by counting the number of live aphids per plant under a microscope. Percent Control was measured by using Abbott's correction formula (W. S. Abbott, "A Method of Computing the Effectiveness of an Insecticide" J. Econ. Entomol. 18 (1925), pp. 265-267) as follows.

$$\text{Corrected \% Control} = 100 \cdot (X - Y) / X$$

where

X = No. of live aphids on solvent check plants and

Y = No. of live aphids on treated plants

The results are indicated in the table entitled "Table 4. Biological Data for GPA (MYZUPE) and sweetpotato whitefly-crawler (BEMITA)" (See Table Section).

Example B

Insecticidal Test for Sweetpotato Whitefly-Crawler (*Bemisia tabaci*) (BEMITA) in Foliar Spray Assay

Cotton plants grown in 3-inch pots, with 1 small (3-5 cm) true leaf, were used as test substrate. The plants were placed in a room with whitefly adults. Adults were allowed to deposit eggs for 2-3 days. After a 2-3 day egg-laying period, plants were taken from the adult whitefly room. Adults were blown off leaves using a hand-held Devilbiss sprayer (23 psi). Plants with egg infestation (100-300 eggs per plant) were placed in a holding room for 5-6 days at 82° F. and 50% RH for egg hatch and crawler stage to develop. Four cotton plants were used for each treatment. Compounds (2 mg) were dissolved in 1 mL of acetone solvent, forming stock solutions of 2000 ppm. The stock solutions were diluted 10x with 0.025% Tween 20 in H₂O to obtain a test solution at 200 ppm. A hand-held Devilbiss sprayer was used for spraying a solution to both sides of cotton leaf until runoff. Reference plants (solvent check) were sprayed with the diluent only. Treated plants were held in a holding room for 8-9 days at approximately 82° F. and 50% RH prior to grading. Evaluation was conducted by counting the number of live nymphs per plant under a microscope. Insecticidal activity was measured by using Abbott's correction formula and presented in "Table 4. Biological Data for GPA (MYZUPE) and sweetpotato whitefly-crawler (BEMITA)" (see column "BEMITA"):

$$\text{Corrected \% Control} = 100 * (X - Y) / X$$

where

X=No. of live nymphs on solvent check plants

Y=No. of live nymphs on treated plants

Pesticidally Acceptable Acid Addition Salts, Salt Derivatives, Solvates, Ester Derivatives, Polymorphs, Isotopes and Radionuclides

Molecules of Formula One may be formulated into pesti- cidentally acceptable acid addition salts. By way of a non- lim- iting example, an amine function can form salts with hydro- chloric, hydrobromic, sulfuric, phosphoric, acetic, benzoic, citric, malonic, salicylic, malic, fumaric, oxalic, succinic, tartaric, lactic, gluconic, ascorbic, maleic, aspartic, benzene- sulfonic, methanesulfonic, ethanesulfonic, hydroxymethane- sulfonic, and hydroxyethanesulfonic acids. Additionally, by way of a non-limiting example, an acid function can form salts including those derived from alkali or alkaline earth metals and those derived from ammonia and amines. Examples of preferred cations include sodium, potassium, and magnesium.

Molecules of Formula One may be formulated into salt derivatives. By way of a non-limiting example, a salt deriva- tive can be prepared by contacting a free base with a sufficient amount of the desired acid to produce a salt. A free base may be regenerated by treating the salt with a suitable dilute aqueous base solution such as dilute aqueous sodium hydroxide (NaOH), potassium carbonate, ammonia, and sodium bicar- bonate. As an example, in many cases, a pesticide, such as 2,4-D, is made more water-soluble by converting it to its dimethylamine salt.

Molecules of Formula One may be formulated into stable complexes with a solvent, such that the complex remains intact after the non-complexed solvent is removed. These

complexes are often referred to as "solvates." However, it is particularly desirable to form stable hydrates with water as the solvent.

Molecules of Formula One may be made into ester deriva- tives. These ester derivatives can then be applied in the same manner as the invention disclosed in this document is applied.

Molecules of Formula One may be made as various crystal polymorphs. Polymorphism is important in the development of agrochemicals since different crystal polymorphs or struc- tures of the same molecule can have vastly different physical properties and biological performances.

Molecules of Formula One may be made with different isotopes. Of particular importance are molecules having ²H (also known as deuterium) in place of ¹H.

Molecules of Formula One may be made with different radionuclides. Of particular importance are molecules having ¹⁴C.

Stereoisomers

Molecules of Formula One may exist as one or more ste- reoisomers. Thus, certain molecules can be produced as race- mic mixtures. It will be appreciated by those skilled in the art that one stereoisomer may be more active than the other stereoisomers. Individual stereoisomers may be obtained by known selective synthetic procedures, by conventional syn- thetic procedures using resolved starting materials, or by conventional resolution procedures. Certain molecules dis- closed in this document can exist as two or more isomers. The various isomers include geometric isomers, diastereomers, and enantiomers. Thus, the molecules disclosed in this docu- ment include geometric isomers, racemic mixtures, indi- vidual stereoisomers, and optically active mixtures. It will be appreciated by those skilled in the art that one isomer may be more active than the others. The structures disclosed in the present disclosure are drawn in only one geometric form for clarity, but are intended to represent all geometric forms of the molecule.

Combinations

Molecules of Formula One may also be used in combina- tion (such as, in a compositional mixture, or a simultaneous or sequential application) with one or more compounds having acaricidal, algicidal, avicidal, bactericidal, fungicidal, herbi- cidal, insecticidal, molluscicidal, nematocidal, rodenticidal, or virucidal properties. Additionally, the molecules of For- mula One may also be used in combination (such as, in a compositional mixture, or a simultaneous or sequential appli- cation) with compounds that are antifeedants, bird repellents, chemosterilants, herbicide safeners, insect attractants, insect repellents, mammal repellents, mating disrupters, plant acti- vators, plant growth regulators, or synergists. Examples of such compounds in the above groups that may be used with the Molecules of Formula One are—(3-ethoxypropyl)mer- cury bromide, 1,2-dichloropropane, 1,3-dichloropropene, 1-methylcyclopropene, 1-naphthol, 2-(octylthio)ethanol, 2,3,5-tri-iodobenzoic acid, 2,3,6-TBA, 2,3,6-TBA-dimethy- lammonium, 2,3,6-TBA-lithium, 2,3,6-TBA-potassium, 2,3, 6-TBA-sodium, 2,4,5-T, 2,4,5-T-2-butoxypropyl, 2,4,5-T-2- ethylhexyl, 2,4,5-T-3-butoxypropyl, 2,4,5-TB, 2,4,5-T- butomethyl, 2,4,5-T-butetyl, 2,4,5-T-butyl, 2,4,5-T-isobutyl, 2,4,5-T-isooctyl, 2,4,5-T-isopropyl, 2,4,5-T-methyl, 2,4,5-T- pentyl, 2,4,5-T-sodium, 2,4,5-T-triethylammonium, 2,4,5-T- trolamine, 2,4-D, 2,4-D-2-butoxypropyl, 2,4-D-2-ethyl- hexyl, 2,4-D-3-butoxypropyl, 2,4-D-ammonium, 2,4-DB, 2,4-DB-butyl, 2,4-DB-dimethylammonium, 2,4-DB-isooctyl, 2,4-DB-potassium, 2,4-DB-sodium, 2,4-D-butetyl, 2,4-D- butyl, 2,4-D-diethylammonium, 2,4-D-dimethylammonium, 2,4-D-diolamine, 2,4-D-dodecylammonium, 2,4-DEB, 2,4- DEP, 2,4-D-ethyl, 2,4-D-heptylammonium, 2,4-D-isobutyl,

2,4-D-isooctyl, 2,4-D-isopropyl, 2,4-D-isopropylammonium, 2,4-D-lithium, 2,4-D-mecetyl, 2,4-D-methyl, 2,4-D-octyl, 2,4-D-pentyl, 2,4-D-potassium, 2,4-D-propyl, 2,4-D-sodium, 2,4-D-tefuryl, 2,4-D-tetradecylammonium, 2,4-D-triethylammonium, 2,4-D-tris(2-hydroxypropyl)ammonium, 2,4-D-trolamine, 2IP, 2-methoxyethylmercury chloride, 2-phenylphenol, 3,4-DA, 3,4-DB, 3,4-DP, 4-aminopyridine, 4-CPA, 4-CPA-potassium, 4-CPA-sodium, 4-CPB, 4-CPP, 4-hydroxyphenethyl alcohol, 8-hydroxyquinoline sulfate, 8-phenylmercurioxyquinoline, abamectin, abscisic acid, ACC, acephate, accquinocyl, acetamiprid, acethion, acetochlor, acetophos, acetoprole, acibenzolar, acibenzolar-5-methyl, acifluorfen, acifluorfen-methyl, acifluorfen-sodium, aclonifen, acrep, acrinathrin, acrolein, acrylonitrile, acypetacs, acypetacs-copper, acypetacs-zinc, alachlor, alany-carb, albendazole, aldicarb, aldimorph, aldoxycarb, aldrin, allethrin, allicin, allidochlor, allosamidin, alloxylid, alloxylid-sodium, allyl alcohol, allylcarb, alorac, alpha-cypermethrin, alpha-endosulfan, ametoctradin, ametrudione, ametryn, amibuzin, amicarbazone, amicarbazol, amidithion, amidosulfur, amidosulfuron, aminocarb, aminocyclopyrachlor, aminocyclopyrachlor-methyl, aminocyclopyrachlor-potassium, aminopyralid, aminopyralid-potassium, aminopyralid-tris(2-hydroxypropyl)ammonium, amiprofos-methyl, amiprofos, amisulbrom, amiton, amiton oxalate, amitraz, amitrole, ammonium sulfamate, ammonium α -naphthalenecetate, amobam, ampropylfos, anabasine, ancymidol, anilazine, anilofos, anisuron, anthraquinone, antu, apholate, aramite, arsenous oxide, asomate, aspirin, asulam, asulam-potassium, asulam-sodium, athidathion, atraton, atrazine, aureofungin, aviglycine, aviglycine hydrochloride, azaconazole, azadirachtin, azafenidin, azame-thiophos, azimsulfuron, azinphos-ethyl, azinphos-methyl, aziprotryne, azithiram, azobenzene, azocyclotin, azothoate, azoxystrobin, baculmedes, barban, barium hexafluorosili-cate, barium polysulfide, barthrin, BCPC, beflubutamid, benalaxyl, benalaxyl-M, benazolin, benazolin-dimethylam-monium, benazolin-ethyl, benazolin-potassium, bencarba-zone, benclothiaz, bendiocarb, benfluralin, benfuracarb, ben-furesate, benodanil, benomyl, benoxacor, benoxafos, benquinox, bensulfuron, bensulfuron-methyl, bensulide, bensultap, bentalluron, bentazone, bentazonc-sodium, benthiavalicarb, benthiavalicarb-isopropyl, benthiazole, ben-tranil, benzadox, benzadox-ammonium, benzalkonium chlo-ride, benzamacril, benzamacril-isobutyl, benzamorl, ben-zfendizone, benzipram, benzobicyclon, benzofenap, benzofluor, benzohydroxamic acid, benzoximate, benzoyl-prop, benzoylprop-ethyl, benzthiazuron, benzyl benzoate, benzyladenine, berberine, berberine chloride, beta-cy-fluthrin, beta-cypermethrin, bethoxazin, bicycloporyne, bifenazate, bifenox, bifenthrin, bifujunzhi, bilanafos, bilanafos-sodium, binapacryl, bingqingxiao, bioallethrin, bioethanomethrin, biopermethrin, bioresmethrin, biphenyl, bisazir, bismethiazol, bispyribac, bispyribac-sodium, bistrifluoron, bitertanol, bithionol, bixafen, blasticidin-S, borax, Bordeaux mixture, boric acid, boscalid, brassinolide, brassi-nolide-ethyl, brevicomin, brodifacoum, brofenvalerate, brof-luthrin, bromacil, bromacil-lithium, bromacil-sodium, bromadiolone, bromethalin, bromethrin, bromfeninfos, bro-moacetamide, bromobonil, bromobutide, bromocyclen, bromo-DDT, bromofenoxim, bromophos, bromophos-ethyl, bromopropylate, bromothalonil, bromoxynil, bromoxynil butyrate, bromoxynil heptanoate, bromoxynil octanoate, bro-moxynil-potassium, brompyrazon, bromuconazole, bro-nopol, bucarpolate, bufencarb, buminafos, bupirimate, buprofezin, Burgundy mixture, busulfan, butacarb, butachlor, butafenacil, butamifos, butathiofos, butenachlor, butethrin,

buthidazole, buthiobate, buthiuron, butocarboxim, butonate, butopyronoxyl, butoxycarboxim, butralin, butoxydim, butu-ron, butylamine, butylate, cacodylic acid, cadusafos, cafens-trole, calcium arsenate, calcium chlorate, calcium cyana-mide, calcium polysulfide, calvinphos, cambendichlor, camphechlor, camphor, captafol, captan, carbamorph, car-banolate, carbaryl, carbasulam, carbendazim, carbendazim benzenesulfonate, carbendazim sulfite, carbetamide, carbo-furan, carbon disulfide, carbon tetrachloride, carbophe-nothion, carbosulfan, carboxazole, carboxide, carboxin, carfentrazone, carfentrazone-ethyl, carpropamid, cartap, car-tap hydrochloride, carvacrol, carvone, CIDEA, cellocidin, CEPc, ceralure, Cheshunt mixture, chinomethionat, chito-san, chlobenthiazole, chlormethoxyfen, chloralose, chloram-ben, chloramben-ammonium, chloramben-diolamine, chloramben-methyl, chloramben-methylammonium, chloramben-sodium, chloramine phosphorus, chlorampheni-col, chloraniformethan, chloranil, chloranoceryl, chlorantra-niliprole, chlorazifop, chlorazifop-propargyl, chlorazine, chlorbenside, chlorbenzuron, chlorbicyclen, chlorbromuron, chlorbufam, chlordane, chlordecone, chlordimeform, chlo-rdimeform hydrochloride, chlorempenthrin, chlorethoxyfos, chloreturon, chlorfenac, chlorfenac-ammonium, chlorfenac-sodium, chlorfenapyr, chlorfenazole, chlorfenethol, chlor-fenprop, chlorfenson, chlorfensulphide, chlorfenvinphos, chlorfluazuron, chlorflurazole, chlorfluren, chlorfluren-me-thyl, chlorflurcaol, chlorflurenol-methyl, chloridazon, chlo-rimuron, chlorimuron-ethyl, chlormephos, chlormequat, chlormequat chloride, chlormidine, chlornitrofen, chloroben-zilate, chlorodinitronaphthalenes, chloroform, chloromebu-form, chloromethiuron, chloroneb, chlorophacinone, chlo-rophacinone-sodium, chloropicrin, chloropon, chloropropylate, chlorothalonil, chlorotoluron, chloroxuron, chloroxynil, chlorphonium, chlorphonium chloride, chlor-phoxim, chlorprazophos, chlorprocarb, chlorpropham, chlo-ppyrifos, chlorpyrifos-methyl, chlorquinox, chlorsulfuron, chlorthal, chlorthal-dimethyl, chlorthal-monomethyl, chlorthi-amid, chlorthiophos, chlozolinate, choline chloride, chro-mafenozide, cinerin I, cinerin II, cinerins, cinidon-ethyl, cin-methylin, cinosulfuron, ciobutide, cisanilide, cismethrin, clethodim, climbazole, cliodinate, clodinafop, clodinafop-propargyl, cloethocarb, clofencet, clofencet-potassium, clofenteczinc, clofibric acid, clofop, clofop-isobutyl, cloma-zone, clomeprop, cloprop, cloproxydim, clopyralid, clopy-ralid-methyl, clopyralid-olamine, clopyralid-potassium, clo-pyralid-tris(2-hydroxypropyl)ammonium, cloquintocet, cloquintocet-mexyl, cloransulam, cloransulam-methyl, clos-antel, clothianidin, clotrimazole, cloxyfonac, cloxyfonac-so-dium, CMA, codlure, colophionate, copper acetate, copper acetoarsenite, copper arsenate, copper carbonate, basic, cop-per hydroxide, copper naphthenate, copper oleate, copper oxychloride, copper silicate, copper sulfate, copper zinc chro-mate, coumachlor, coumafuryl, coumaphos, coumatetralyl, coumithoate, coumoxystrobin, CPMC, CPMF, CPPC, cre-dazine, cresol, crimidine, crotamiton, crotoxyphos, crufo-mate, cryolite, cue-lure, cufraneb, cumyluron, cuprobam, cuprous oxide, curcumenol, cyanamide, cyanatryn, cyana-zine, cyanofenphos, cyanophos, cyanthoate, cyantraniliprole, cyazofamid, cybutryne, cyclafuramid, cyclanilide, cyclethrin, cycloate, cycloheximide, cycloprate, cyclopro-thrin, cyclosulfamuron, cycloxydim, cycluron, cyenopy-rafen, cyflufenamid, cyflumetofen, cyfluthrin, cyhalofop, cyhalofop-butyl, cyhalothrin, cyhexatin, cymiazole, cymiaz-ole hydrochloride, cymoxanil, cyometrinil, cypendazole, cypermethrin, cyperquat, cyperquat chloride, cyphenothrin, cyprazine, cyprazole, cyproconazole, cyprodinil, cypro-furam, cypromid, cyprosulfamide, cyromazine, cythioate,

daimuron, dalapon, dalapon-calcium, dalapon-magnesium, dalapon-sodium, daminozide, dayoutong, dazomet, dazomet-sodium, DBCP, d-camphor, DCIP, DCPTA, DDT, debacarb, decafenin, decarbofuran, dehydroacetic acid, delachlor, deltamethrin, demephion, demephion-O, demephion-S, demeton, demeton-methyl, demeton-O, demeton-O-methyl, demeton-S, demeton-S-methyl, demeton-S-methylsulphon, desmedipham, desmetryn, d-fanshiluquebingjuzhi, diafenthuron, dialifos, di-allate, diamidafos, diatomaceous earth, diazinon, dibutyl phthalate, dibutyl succinate, dicamba, dicamba-diglycolamine, dicamba-dimethylammonium, dicamba-diolamine, dicamba-isopropylammonium, dicamba-methyl, dicamba-olamine, dicamba-potassium, dicamba-sodium, dicamba-trolamine, dicapthon, dichlobenil, dichlofenthion, dichlofluanid, dichlone, dichloralurea, dichlorbenzuron, dichlorflurenol, dichlorflurenol-methyl, dichlormate, dichlormid, dichlorophen, dichlorprop, dichlorprop-2-ethylhexyl, dichlorprop-butetyl, dichlorprop-dimethylammonium, dichlorprop-ethylammonium, dichlorprop-isocetyl, dichlorprop-methyl, dichlorprop-P, dichlorprop-P-2-ethylhexyl, dichlorprop-P-dimethylammonium, dichlorprop-potassium, dichlorprop-sodium, dichlorvos, dichlozoline, diclobutrazol, diclocymet, diclofop, diclofop-methyl, diclomezine, diclomezine-sodium, dicloran, diclosulam, dicofol, dicoumarol, dicresyl, dicrotophos, dicyclanil, dicyclonon, dieldrin, dienochlor, diethamquat, diethamquat dichloride, diethatyl, diethatyl-ethyl, diethofencarb, dietholate, diethyl pyrocarbonate, diethyltoluamide, difenacoum, difenoconazole, difenopenten, difenopenten-ethyl, difenoxuron, difenzoquat, difenzoquat metilsulfate, difethialone, diflovidazin, diflubenzuron, diflufenican, diflufenzopyr, diflufenzopyr-sodium, diflumetorim, dikegulac, dikegulac-sodium, dilor, dimatif, dimethachlor, dimetan, dimethacarb, dimethachlor, dimethametryn, dimethenamid, dimethenamid-P, dimethipin, dimethirimol, dimethoate, dimethomorph, dimethrin, dimethyl carbate, dimethyl phthalate, dimethylvinphos, dimetilan, dimexano, dimidazon, dimoxystrobin, dinex, dinex-diclexine, dingjunczuo, diniconazole, diniconazole-M, dinitramine, dinobuton, dinocap, dinocap-4, dinocap-6, dinoceton, dinofenate, dinopenton, dinoprop, dinosam, dinoseb, dinoseb acetate, dinoseb-ammonium, dinoseb-diolamine, dinoseb-sodium, dinoseb-trolamine, dinosulfon, dinotefuran, dinoterb, dinoterb acetate, dinoterbon, difenolan, dioxabenzofos, dioxacarb, dioxathion, diphacinone, diphacinone-sodium, diphenamid, diphenyl sulfone, diphenylamine, dipropalin, dipropetryn, dipyrithione, diquat, diquat dibromide, disparlure, disul, disulfuram, disulfoton, disul-sodium, ditalimfos, dithianon, dithicofos, dithioether, dithiopyr, diuron, d-limonene, DMPA, DNOC, DNOC-ammonium, DNOC-potassium, DNOC-sodium, dodemorph, dodemorph acetate, dodemorph benzoate, dodicin, dodicin hydrochloride, dodicin-sodium, dodine, dosenapyn, dominicalure, doramectin, drazoxolon, DSMA, dufulin, EBEP, EBP, ecdysterone, edifenphos, eglinazine, eglinazine-ethyl, emamectin, emamectin benzoate, EMPC, empenthrin, endosulfan, endothal, endothal-diammonium, endothal-dipotassium, endothal-disodium, endothion, endrin, enestroburin, EPN, epochocone, epofenonane, epoxiconazole, eprinomectin, epronaz, EPTC, erbon, ergocalciferol, erlujixiancaoan, esdepallétrine, esfenvalerate, esprocarb, etacelasil, etaconazole, etaphos, etem, ethaboxam, ethachlor, ethalfuralin, ethametsulfuron, ethametsulfuron-methyl, ethapochlor, ethephon, ethidimuron, ethiofencarb, ethiolate, ethion, ethiozin, ethiprole, ethirimol, ethoate-methyl, ethofumesate, ethohexadiol, ethoprophos, ethoxyfen, ethoxyfen-ethyl, ethox-

yquin, ethoxysulfuron, ethychlozate, ethyl formate, ethyl α -naphthaleneacetate, ethyl-DDD, ethylene, ethylene dibromide, ethylene dichloride, ethylene oxide, ethylcin, ethylmercury 2,3-dihydroxypropyl mercaptide, ethylmercury acetate, ethylmercury bromide, ethylmercury chloride, ethylmercury phosphate, etinofen, etnipromid, etobenzanid, etofenprox, etoxazole, etridiazole, etrimfos, eugenol, EXD, famoxadone, famphur, fenamidone, fenaminosulf, fenamiphos, fenapanil, fenarimol, fenasulam, fenazafflor, fenazaphin, fenbuconazole, fenbutatin oxide, fenchlorazole, fenchlorazole-ethyl, fenchlorphos, fenclorim, fenethacarb, fenfluthrin, fenfuram, fenhexamid, fenitropan, fenitrothion, fenjuantong, fenobucarb, fenoprop, fenoprop-3-butoxypropyl, fenoprop-butomethyl, fenoprop-butetyl, fenoprop-butyl, fenoprop-isocetyl, fenoprop-methyl, fenoprop-potassium, fenothiocarb, fenoxacrim, fenoxanil, fenoxaprop, fenoxaprop-ethyl, fenoxaprop-P, fenoxaprop-P-ethyl, fenoxasulfone, fenoxycarb, fempiclonil, fempirithrin, fenpropathrin, fenpropidin, fenpropimorph, fenpyrazaminc, fenpyroximate, fenridazon, fenridazon-potassium, fenridazon-propyl, fen-son, fensulfothion, fenteracol, fenthiaprop, fenthiaprop-ethyl, fenthion, fenthion-ethyl, fentin, fentin acetate, fentin chloride, fentin hydroxide, fentrazamide, fentrifanil, fenuron, fenuron TCA, fenvalerate, ferbam, ferimzone, ferrous sulfate, fipronil, flamprop, flamprop-isopropyl, flamprop-M, flamprop-methyl, flamprop-M-isopropyl, flamprop-M-methyl, flazasulfuron, floucoumafen, flometoquin, flonicamid, florasulam, fluacrypyrim, fluazifop, fluazifop-butyl, fluazifop-methyl, fluazifop-P, fluazifop-P-butyl, fluazinam, fluazolate, fluazuron, flubendiamide, flubenzimine, flucarbazone, flucarbazone-sodium, flucetosulfuron, fluchloralin, flucosufuron, flucyclohexuron, flucythrinate, fludioxonil, fluenetil, fluensulfone, flufenacet, flufenerim, flufenican, flufenoxuron, flufenprover, flufenpyr, flufenpyr-ethyl, flufiprole, flumethrin, flumetoxer, flumetralin, flumetsulam, flumezin, flumiclorac, flumiclorac-pentyl, flumioxazin, flumipropyn, flumorph, flumometuron, fluopicolide, fluopyram, fluorbenside, fluoridamid, fluoroacetamide, fluorodifen, fluoroglycofen, fluoroglycofen-ethyl, fluoroimide, fluoromidine, fluoronitrofen, fluothiuuron, fluotrimazole, fluoxastrobil, flupoxam, flupropacil, flupropadine, flupropionate, flupropionate-sodium, flupyradifurone, flupyrsulfuron, flupyrsulfuron-methyl, flupyrsulfuron-methyl-sodium, fluquinconazole, flurazole, flurenol, flurenol-butyl, flurenol-methyl, fluridone, fluorochloridone, fluoroxypyr, fluoroxypyr-butomethyl, fluoroxypyr-methyl, flurprimidol, flursulamid, flurtamone, flusilazole, flusulfamide, fluthiacet, fluthiacet-methyl, flutianil, flutolanil, flutriafol, flualinate, fluxapyroxad, fluxofenim, folpet, fomesafen, fomesafen-sodium, fonofos, foramsulfuron, forchlorfenuron, formaldehyde, formetanate, formetanate hydrochloride, formothion, formiparanate, formiparanate hydrochloride, fosamine, fosamine-ammonium, fosetyl, fosetyl-aluminum, fosmethilan, fospirate, fosthiate, fosthietan, frontaline, fuberidazole, fucaojing, fucaomi, funaihecaloling, fuphenthionurea, furalane, furalaxyl, furamethrin, furametpyr, furathiocarb, furcarbanil, furconazole, furconazole-cis, furethrin, furfural, furilazole, furnecyclohex, furophanate, furyloxyfen, gamma-cyhalothrin, gamma-HCH, genit, gibberellic acid, gibberellins, gliflor, glufosinate, glufosinate-ammonium, glufosinate-P, glufosinate-P-ammonium, glufosinate-P-sodium, glyodin, glyoxime, glyphosate, glyphosate-diammonium, glyphosate-dimethylammonium, glyphosate-isopropylammonium, glyphosate-monoammonium, glyphosate-potassium, glyphosate-sesquisodium, glyphosate-trimesium, glyphosine, gossypilure, grandlure, griseofulvin, guazatine, guazatine acetates, halacrine, halfenprox, halofenozide, halosafen, halosulfuron, halosulfuron-methyl,

haloxydine, haloxyfop, haloxyfop-etotyl, haloxyfop-methyl, haloxyfop-P, haloxyfop-P-etotyl, haloxyfop-P-methyl, haloxyfop-sodium, HCH, hemel, hempa, HEOD, heptachlor, heptenophos, heptopargil, heterophos, hexachloroacetone, hexachlorobenzene, hexachlorobutadiene, hexachlorophene, hexaconazole, hexaflumuron, hexaflurate, hexylure, hexamide, hexazinone, hexylthiofos, hexythiazox, HHDN, holo-sulf, huancaiwo, huangcaoling, huanjunzuo, hydramethyl-non, hydrargaphen, hydrated lime, hydrogen cyanide, hydroprene, hymexazol, hyquincarb, IAA, IBA, icaridin, imazalil, imazalil nitrate, imazalil sulfate, imazamethabenz, imazamethabenz-methyl, imazamox, imazamox-ammonium, imazapic, imazapic-ammonium, imazapyr, imazapyr-isopropylammonium, imazaquin, imazaquin-ammonium, imazaquin-methyl, imazaquin-sodium, imazethapyr, imazethapyr-ammonium, imazosulfuron, imibenconazole, imicyafos, imidacloprid, imidaclothiz, iminocadine, iminocadine triacetate, iminocadine trialbesilate, imiprothrin, inabefide, indanofan, indaziflam, indoxacarb, inezin, iodo-bonil, iodicarb, iodomethane, iodosulfuron, iodosulfuron-methyl, iodosulfuron-methyl-sodium, iofensulfuron, iofensulfuron-sodium, ioxylin, ioxylin octanoate, ioxylin-lithium, ioxylin-sodium, ipazine, ipconazole, ipfencarba-zone, iprobenfos, iprodione, iprovalicarb, iprymidam, ipsdi-enol, ipsenol, IPSP, isamidofos, isazofos, isobenzan, isocarbamid, isocarbophos, isocil, isodrin, isofenphos, isofenphos-methyl, isolan, isomethiozin, isonoruron, isopoli-nate, isoprocab, isopropalin, isoprothiolane, isoproturon, isoprazam, isopyrimol, isothioate, isotianil, isouron, isov-aledione, isoxaben, isoxachlortole, isoxadifen, isoxadifen-ethyl, isoxaflutole, isoxapyrifop, isoxathion, ivermectin, izo-pamfos, japonilure, japothrins, jasmolin I, jasmolin II, jasmonic acid, jiahuangchongzong, jiajizengxiaolin, jiax-iangjunzhi, jiecaowan, jiecaoxi, jodfenphos, juvenile hor-mone I, juvenile hormone II, juvenile hormone III, kadethrin, karbutilate, karetazan, karetazan-potassium, kasugamycin, kasugamycin hydrochloride, kejunlin, kelevan, ketospiradox, ketospiradox-potassium, kinetin, kinoprene, kresoxim-me-thyl, kuicaoxi, lactofen, lambda-cyhalothrin, latilure, lead arsenate, lenacil, lepimectin, leptophos, lindane, lineatin, linuron, lirimos, litlure, looplure, lufenuron, lvdinjunzhi, lvxiancaolin, lythidathion, MAA, malathion, maleic hydrazide, malonoben, maltodextrin, MAMA, mancopper, mancozeb, mandipropamid, maneb, matrine, mazidox, MCPA, MCPA-2-ethylhexyl, MCPA-butyl, MCPA-butyl, MCPA-dimethylammonium, MCPA-diolamine, MCPA-ethyl, MCPA-isobutyl, MCPA-isocetyl, MCPA-isopropyl, MCPA-methyl, MCPA-olamine, MCPA-potassium, MCPA-sodium, MCPA-thioethyl, MCPA-trolamine, MCPB, MCPB-ethyl, MCPB-methyl, MCPB-sodium, mebenil, mecarbam, mecarbinzid, mecarphon, mecoprop, mecoprop-2-ethyl-hexyl, mecoprop-dimethylammonium, mecoprop-diola-mine, mecoprop-ethadyl, mecoprop-isocetyl, mecoprop-me-thyl, mecoprop-P, mecoprop-P-2-ethylhexyl, mecoprop-P-dimethylammonium, mecoprop-P-isobutyl, mecoprop-potassium, mecoprop-P-potassium, mecoprop-sodium, mecoprop-trolamine, medimeform, medinoterb, medinoterb acetate, medlure, mefenacet, mefenpyr, mefenpyr-diethyl, mefluidide, mefluidide-diolamine, mefluidide-potassium, megatomoic acid, menazon, mepanipyrin, meperfluthrin, mephenate, mephosfolan, mepiquat, mepiquat chloride, mepiquat pentaborate, mepronil, meptyldinocap, mercuric chloride, mercuric oxide, mercurous chloride, merphos, mesoprazine, mesosulfuron, mesosulfuron-methyl, mesotri-one, mesulfen, mesulfenfos, metaflumizone, metalaxyl, metalaxyl-M, metaldehyde, metam, metam-ammonium, metamifop, metamitron, metam-potassium, metam-sodium,

metazachlor, metazosulfuron, metazoxolon, metconazole, metepa, metflurazon, methabenzthiazuron, methacrifos, methalpropalin, methamidophos, methasulfocarb, meth-azole, methifuroxam, methidathion, methiobencarb, methio-carb, methiopyrisulfuron, methiotepa, methiozolin, methi-uron, methocrotophos, methometon, methomyl, methoprene, methoprotynce, methoquin-butyl, methothrin, methoxychlor, methoxyfenozide, methoxyphenone, methyl apholate, methyl bromide, methyl eugenol, methyl iodide, methyl isothiocyanate, methylacetophos, methylchloroform, meth-ylidymron, methylene chloride, methylmercury benzoate, methylmercury dicyandiamide, methylmercury pentachlo-rophenoxide, methylneodecanamide, metiram, metobenzu-ron, metobromuron, metofluthrin, metolachlor, metolcarb, 15 metominostrobin, metosulam, metoxadiazon, metoxuron, metrafenone, metribuzin, metsulfovax, metsulfuron, metsul-furon-methyl, mevinphos, mexacarbate, mieshuan, milbe-mectin, milbemycin oxime, milneb, mipafox, mirex, MNAF, moguchun, molinate, molosultap, monalide, monisouron, 20 monochloroacetic acid, monocrotophos, monolinuron, monosulfuron, monosulfuron-ester, monuron, monuron TCA, morfamquat, morfamquat dichloride, moroxydine, moroxydine hydrochloride, morphothion, morzid, moxidec-tin, MSMA, muscalure, myclobutanil, myclozolin, N-(eth-ylmercury)-p-toluenesulphonanilide, nabam, naftalofos, 25 naled, naphthalene, naphthaleneacetamide, naphthalic anhy-dride, naphthoxyacetic acids, naproanilide, napropamide, naptalam, naptalam-sodium, natamycin, neburon, niclosa-mide, niclosamide-olamine, nicosulfuron, nicotine, niflurid-ide, nipyraclufen, nitenpyram, nithiazine, nitralin, nitrapyrin, 30 nitrilacarb, nitrofen, nitrofluorfen, nitrostyrene, nitrothal-iso-propyl, norbormide, norflurazon, normicotine, noruron, nov-aluron, noviflumuron, nuarimol, OCH, octachlorodipropyl ether, octhilineone, ofurace, omethoate, orbencarb, orflalure, 35 ortho-dichlorobenzene, orthosulfamuron, orythalure, orysas-trobin, oryzalin, osthol, ostramone, oxabetrinil, oxadiargyl, oxadiazon, oxadixyl, oxamate, oxamyl, oxapyrazon, oxapy-razon-dimolamine, oxapyrazon-sodium, oxasulfuron, oxazi-clomefone, oxine-copper, oxolinic acid, oxpoconazole, 40 oxpoconazole fumarate, oxycarboxin, oxydemeton-methyl, oxydeprofos, oxydisulfoton, oxyfluorfen, oxymatrine, oxytetracycline, oxytetracycline hydrochloride, paclobutra-zol, paichongding, para-dichlorobenzene, parafluoron, paraquat, paraquat dichloride, paraquat dimethylsulfate, para-45 athon, parathion-methyl, parinol, pebulate, pefurazolate, pel-argonic acid, penconazole, penycuron, pendimethalin, pen-flufen, penfluoron, penoxsulam, pentachlorophenol, pentanochlor, penthiopyrad, pentmethrin, pentoxazone, per-fluidone, permethrin, pethoxamid, phenamacril, phenazine 50 oxide, phenisopham, phenkapton, phenmedipham, phenme-dipham-ethyl, phenobenzuron, phenothrin, phenproxiide, phenthoate, phenylmercuriurea, phenylmercury acetate, phe-nylmercury chloride, phenylmercury derivative of pyrocat-echol, phenylmercury nitrate, phenylmercury salicylate, 55 phorate, phosacetim, phosalone, phosdiphen, phosfolan, phosfolan-methyl, phosglycin, phosmet, phosnichlor, phos-phamidon, phosphine, phosphocarb, phosphorus, phostin, phoxim, phoxim-methyl, phthalide, picloram, picloram-2-ethylhexyl, picloram-isocetyl, picloram-methyl, picloram-60 olamine, picloram-potassium, picloram-triethylammonium, picloram-tris(2-hydroxypropyl)ammonium, picolinafen, picoxystrobin, pindone, pindone-sodium, pinoxaden, piper-alin, piperonyl butoxide, piperonyl cyclonene, piperophos, piproctanyl, piproctanyl bromide, piprotal, pirimetaphos, pir-imicarb, pirimioxyphos, pirimiphos-ethyl, pirimiphos-me-65 thyl, plifenate, polycarbamate, polyoxins, polyoxorim, poly-oxorim-zinc, polythialan, potassium arsenite, potassium

azide, potassium cyanate, potassium gibberellate, potassium naphthenate, potassium polysulfide, potassium thiocyanate, potassium α -naphthaleneacetate, pp-DDT, prallethrin, precocene I, precocene II, precocene III, pretilachlor, primidophos, primisulfuron, primisulfuron-methyl, probenazole, prochloraz, prochloraz-manganese, proclonol, procyzazine, procymidone, prodiamine, profenofos, profluzol, profluralin, profluthrin, profoxydim, proglazine, proglazine-ethyl, prohexadione, prohexadione-calcium, prohydrojasmon, promaclyl, promecarb, prometon, prometryn, promurit, propachlor, propamidine, propamidine dihydrochloride, propamocarb, propamocarb hydrochloride, propanil, propaphos, propaquizafop, propargite, proparthrin, propazine, propetamphos, propham, propiconazole, propineb, propisochlor, propoxur, propoxycarbazono, propoxycarbazono-sodium, propyl isome, propyrisulfuron, propyzamide, proquinazid, prosuler, prosulfalin, prosulfocarb, prosulfuron, prothidathion, prothiocarb, prothiocarb hydrochloride, prothioconazole, prothiofos, prothoate, protrifenbutyl, proxan, proxan-sodium, prynachlor, pydanon, pymetozine, pyracarbolid, pyraclofos, pyracloil, pyraclostrobin, pyraflufen, pyraflufen-ethyl, pyrafluprole, pyramat, pyrametostrobin, pyraoxystrobin, pyrasulfotole, pyrazolynate, pyrazophos, pyrazosulfuron, pyrazosulfuron-ethyl, pyrazothion, pyrazoxifen, pyresmethrin, pyrethrin I, pyrethrin II, pyrethrins, pyribambenz-isopropyl, pyribambenz-propyl, pyribencarb, pyribenzoxim, pyributicarb, pyriclor, pyridaben, pyridafol, pyridalyl, pyridaphenthion, pyridate, pyridinitril, pyrifenoxy, pyrifluquinazon, pyrifthalid, pyrimethanil, pyrimidifen, pyriminobac, pyriminobac-methyl, pyrimisulfan, pyrimite, pyrinuron, pyriofenone, pyriprole, pyripropanol, pyriproxyfen, pyriothiobac, pyriothiobac-sodium, pyrolan, pyroquilon, pyroxasulfone, pyroxsulam, pyroxychlor, pyroxyfur, quassia, quinaacetol, quinaacetol sulfate, quinalphos, quinalphos-methyl, quinaamid, quinclozax, quiconazole, quinnerac, quinoelamine, quinoanamid, quinothion, quinoxifen, quintiofos, quintozone, quizalofop, quizalofop-ethyl, quizalofop-P, quizalofop-P-ethyl, quizalofop-P-tefuryl, quwenzhi, quyinding, rabenzazole, raxoxanide, rebemide, resmethrin, rhodethanil, rhodajaponin-III, ribavirin, rimsulfuron, rotenone, ryania, saffluenacil, saijunmao, saisentong, salicylanilide, sanguinarine, santonin, schradan, scilloiridos, sebutiylazine, secbumeton, sedaxane, selamectin, semiamitraz, semiamitraz chloride, sesamex, sesamol, sethoxydim, shuangjiancaolin, siduron, siglure, silafluofen, silatran, silica gel, silthiofos, simazine, simeconazole, simeton, simetryn, sintofen, SMA, S-metolachlor, sodium arsenite, sodium azide, sodium chlorate, sodium fluoride, sodium fluoroacetate, sodium hexafluorosilicate, sodium naphthenate, sodium orthophenylphenoxide, sodium pentachlorophenoxide, sodium polysulfide, sodium thiocyanate, sodium α -naphthaleneacetate, sophamide, spinetoram, spinosad, spiroadicofen, spiromesifen, spirotetramat, spiroxamine, streptomycin, streptomycin sesquisulfate, strychnine, sulcatol, sulcofuron, sulcofuron-sodium, sulcotrione, sulfallate, sulfentrazone, sulfuram, sulfuramid, sulfometuron, sulfometuron-methyl, sulfosulfuron, sulfotep, sulfoxaxlor, sulfoxide, sulfoxime, sulfur, sulfuric acid, sulfuryl fluoride, sulglycapin, sulprofos, sultropen, swep, tau-fluvalinate, tavoron, tazimcarb, TCA, TCA-ammonium, TCA-calcium, TCA-ethadyl, TCA-magnesium, TCA-sodium, TDE, tebuconazole, tebufenozide, tebufenpyrad, tebufloquin, tebupirimfos, tebutam, tebutiuron, tecloflalam, tecnazene, tecoram, teflubenzuron, tefluthrin, tefurylirone, tembotrione, temephos, tepa, TEPP, tepaloxymid, tetrachlorin, terbacil, terbucarb, terbutylchlor, terbutofen, terbutofen, terbutoylazine, terbutryn, tetcyclacis, tetrachloroethane, tetrachlorvinphos, tetraconazole, tetradifon,

tertrafluoron, tetramethrin, tetramethylfluorin, tetramine, ter-
nactactin, tetrasul, thallium sulfate, thenylchlor, theta-cyper-
methrin, thiabendazole, thiacloprid, thiadifluor, thia-
methoxam, thiapronil, thiazafuoron, thiazopyr, thicrofos,
thicyofen, thidiazimin, thidiazuron, thiencarbazone, thien-
carbazone-methyl, thifensulfuron, thifensulfuron-methyl,
thifluzamide, thiobencarb, thiocarboxime, thiochlorfenphim,
thiocyclam, thiocyclam hydrochloride, thiocyclam oxalate,
thiodiazole-copper, thiodicarb, thiofanox, thiofluoaximate,
thiohempa, thiomersal, thiometon, thionazin, thiophanate,
thiophanate-methyl, thioquinox, thiosemicarbazide, thiosul-
tap, thiosultap-diammonium, thiosultap-disodium, thiosul-
tap-monosodium, thiotepa, thiram, thuringiensin, tiadinil,
tiaojian, tiocarbazil, tioclorim, tioxyimid, tirpate, tolclofos-
methyl, tolfenpyrad, tolylfuanid, tolylmercury acetate,
topramezone, tralkoxydim, tralocyttrin, tralomethrin, tral-
opyril, transfluthrin, transpermethrin, tretamine, triacontan-
ol, triadimefon, triadimenol, triafamone, tri-allate, triamphos,
triapenthenol, triarathene, triarimol, triasulfuron, triazamate,
triabzutil, triaziflam, triazophos, triazoxide, tribenuron, tribe-
nuron-methyl, tribufos, tributyltin oxide, tricamba, trichla-
mide, trichlorfon, trichlormetaphos-3, trichloronat, triclopyr,
triclopyr-butetyl, triclopyr-ethyl, triclopyr-triethylammo-
nium, tricyclazole, tridemorph, tridiphane, trietazine, trifen-
morph, trifenofos, trifloxystrobin, trifloxysulfuron, triflox-
ysulfuron-sodium, triflumizole, triflumuron, trifluralin,
triflusulfuron, triflusulfuron-methyl, trifop, trifop-methyl,
trifopsime, triforine, trihydroxytriazine, trimedlure, tri-
methacarb, trimeturon, trinexapac, trinexapac-ethyl, triprene,
tripropindan, triptolide, tritac, triticonazole, tritosulfuron
trunc-call, uniconazole, uniconazole-P, urbacide, uredopa,
valerate, validamycin, valifenalate, valone, vamidothion,
vanguard, vaniliprole, vernolate, vinclozolin, warfarin, war-
farin-potassium, warfarin-sodium, xiaochongliulin, xin-
junan, xiwojunan, XMC, xylachlor, xylenols, xylycarb,
yishijing, zarilamid, zcatin, zengxiaoan, zeta-cypermethrin,
zinc naphthenate, zinc phosphide, zinc thiazole, zineb, ziram,
zolaprosfos, zoxamide, zuomihuanglong, α -chlorohydrin,
 α -ccdydsonc, α -multistriatin, and α -naphthalenecacetic acid.
For more information consult the "COMPENDIUM OF PESTICIDE
COMMON NAMES" located at [http://www.alanwood.net/pesti-
cides/index.html](http://www.alanwood.net/pesti-
cides/index.html). Also consult "THE PESTICIDE MANUAL" 14th
Edition, edited by C D S Tomlin, copyright 2006 by British
Crop Production Council, or its prior or more recent editions.
Bionepesticides

Molecules of Formula One may also be used in combination (such as in a compositional mixture, or a simultaneous or sequential application) with one or more biopesticides. The term "biopesticide" is used for microbial biological pest control agents that are applied in a similar manner to chemical pesticides. Commonly these are bacterial, but there are also examples of fungal control agents, including *Trichoderma* spp. and *Ampeomyces quisqualis* (a control agent for grape powdery mildew). *Bacillus subtilis* are used to control plant pathogens. Weeds and rodents have also been controlled with microbial agents. One well-known insecticide example is *Bacillus thuringiensis*, a bacterial disease of Lepidoptera, Coleoptera, and Diptera. Because it has little effect on other organisms, it is considered more environmentally friendly than synthetic pesticides. Biological insecticides include products based on:

1. entomopathogenic fungi (e.g. *Metarhizium anisopliae*);
2. entomopathogenic nematodes (e.g. *Steinernema feltiae*); and
3. entomopathogenic viruses (e.g. *Cydia pomonella* granulovirus).

Other examples of entomopathogenic organisms include, but are not limited to, baculoviruses, bacteria and other prokaryotic organisms, fungi, protozoa and Microsporidia. Biologically derived insecticides include, but not limited to, rotenone, veratridine, as well as microbial toxins; insect tolerant or resistant plant varieties; and organisms modified by recombinant DNA technology to either produce insecticides or to convey an insect resistant property to the genetically modified organism. In one embodiment, the molecules of Formula One may be used with one or more biopesticides in the area of seed treatments and soil amendments. *The Manual of Biocontrol Agents* gives a review of the available biological insecticide (and other biology-based control) products. Copping L. G. (ed.) (2004). *The Manual of Biocontrol Agents* (formerly the *Biopesticide Manual*) 3rd Edition. British Crop Production Council (BCPC), Farnham, Surrey UK.

Other Active Compounds

Molecules of Formula One may also be used in combination (such as in a compositional mixture, or a simultaneous or sequential application) with one or more of the following:

1. 3-(4-chloro-2,6-dimethylphenyl)-4-hydroxy-8-oxa-1-azaspiro[4,5]dec-3-en-2-one;
2. 3-(4'-chloro-2,4-dimethyl[1,1'-biphenyl]-3-yl)-4-hydroxy-8-oxa-1-azaspiro[4,5]dec-3-en-2-one;
3. 4-[(6-chloro-3-pyridinyl)methyl]methylamino]-2(5H)-furanone;
4. 4-[(6-chloro-3-pyridinyl)methyl]cyclopropylamino]-2(5H)-furanone;
5. 3-chloro-N2-[(1S)-1-methyl-2-(methylsulfonyl)ethyl]-N1-[2-methyl-4-[1,2,2,2-tetrafluoro-1-(trifluoromethyl)ethyl]phenyl]-1,2-benzenedicarboxamide;
6. 2-cyano-N-ethyl-4-fluoro-3-methoxy-benzenesulfonamide;
7. 2-cyano-N-ethyl-3-methoxy-benzenesulfonamide;
8. 2-cyano-3-difluoromethoxy-N-ethyl-4-fluoro-benzenesulfonamide;
9. 2-cyano-3-fluoromethoxy-N-ethyl-benzenesulfonamide;
10. 2-cyano-6-fluoro-3-methoxy-N,N-dimethyl-benzenesulfonamide;
11. 2-cyano-N-ethyl-6-fluoro-3-methoxy-N-methyl-benzenesulfonamide;
12. 2-cyano-3-difluoromethoxy-N,N-dimethylbenzenesulfonamide;
13. 3-(difluoromethyl)-N-[2-(3,3-dimethylbutyl)phenyl]-1-methyl-1H-pyrazole-4-carboxamide;
14. N-ethyl-2,2-dimethylpropionamide-2-(2,6-dichloro- α,α,α -trifluoro-p-tolyl)hydrazono;
15. N-ethyl-2,2-dichloro-1-methylcyclopropane-carboxamide-2-(2,6-dichloro- α,α,α -trifluoro-p-tolyl)hydrazono nicotine;
16. O-[(E)-[2-(4-chloro-phenyl)-2-cyano-1-(2-trifluoromethylphenyl)-vinyl]]S-methyl thiocarbonate;
17. (E)-N1-[(2-chloro-1,3-thiazol-5-ylmethyl)]-N2-cyano-N1-methylacetamide;
18. 1-(6-chloropyridin-3-ylmethyl)-7-methyl-8-nitro-1,2,3,5,6,7-hexahydro-imidazo[1,2-a]pyridin-5-ol;
19. 4-[4-chlorophenyl-(2-butyldine-hydrazono)methyl]] phenyl mesylate; and
20. N-Ethyl-2,2-dichloro-1-methylcyclopropanecarboxamide-2-(2,6-dichloro- α,α,α -trifluoro-p-tolyl) hydrazono.

Synergistic Mixtures

Molecules of Formula One may be used with certain active compounds to form synergistic mixtures where the mode of action of such compounds compared to the mode of action of the molecules of Formula One are the same, similar, or different. Examples of modes of action include, but are not

limited to: acetylcholinesterase inhibitor; sodium channel modulator; chitin biosynthesis inhibitor; GABA and glutamate-gated chloride channel antagonist; GABA and glutamate-gated chloride channel agonist; acetylcholine receptor agonist; acetylcholine receptor antagonist; MET 1 inhibitor; Mg-stimulated ATPase inhibitor; nicotinic acetylcholine receptor; Midgut membrane disrupter; oxidative phosphorylation disrupter; and ryanodine receptor (RyRs). Generally, weight ratios of the molecules of Formula One in a synergistic mixture with another compound are from about 10:1 to about 1:10, in another embodiment from about 5:1 to about 1:5, and in another embodiment from about 3:1, and in another embodiment about 1:1.

Formulations

A pesticide is rarely suitable for application in its pure form. It is usually necessary to add other substances so that the pesticide can be used at the required concentration and in an appropriate form, permitting ease of application, handling, transportation, storage, and maximum pesticide activity. Thus, pesticides are formulated into, for example, baits, concentrated emulsions, dusts, emulsifiable concentrates, fumigants, gels, granules, microencapsulations, seed treatments, suspension concentrates, suspoemulsions, tablets, water soluble liquids, water dispersible granules or dry flowables, wettable powders, and ultra low volume solutions. For further information on formulation types see "Catalogue of Pesticide Formulation Types and International Coding System" Technical Monograph no 2, 5th Edition by CropLife International (2002).

Pesticides are applied most often as aqueous suspensions or emulsions prepared from concentrated formulations of such pesticides. Such water-soluble, water-suspendable, or emulsifiable formulations are either solids, usually known as wettable powders, or water dispersible granules, or liquids usually known as emulsifiable concentrates, or aqueous suspensions. Wettable powders, which may be compacted to form water dispersible granules, comprise an intimate mixture of the pesticide, a carrier, and surfactants. The concentration of the pesticide is usually from about 10% to about 90% by weight. The carrier is usually selected from among the attapulgite clays, the montmorillonite clays, the diatomaceous earths, or the purified silicates. Effective surfactants, comprising from about 0.5% to about 10% of the wettable powder, are found among sulfonated lignins, condensed naphthalenesulfonates, naphthalenesulfonates, alkylbenzenesulfonates, alkyl sulfates, and non-ionic surfactants such as ethylene oxide adducts of alkyl phenols.

Emulsifiable concentrates of pesticides comprise a convenient concentration of a pesticide, such as from about 50 to about 500 grams per liter of liquid dissolved in a carrier that is either a water miscible solvent or a mixture of water-immiscible organic solvent and emulsifiers. Useful organic solvents include aromatics, especially xylenes and petroleum fractions, especially the high-boiling naphthalenic and olefinic portions of petroleum such as heavy aromatic naphtha. Other organic solvents may also be used, such as the terpenic solvents including rosin derivatives, aliphatic ketones such as cyclohexanone, and complex alcohols such as 2-ethoxyethanol. Suitable emulsifiers for emulsifiable concentrates are selected from conventional anionic and non-ionic surfactants.

Aqueous suspensions comprise suspensions of water-insoluble pesticides dispersed in an aqueous carrier at a concentration in the range from about 5% to about 50% by weight. Suspensions are prepared by finely grinding the pesticide and vigorously mixing it into a carrier comprised of water and surfactants. Ingredients, such as inorganic salts and synthetic or natural gums may also be added, to increase the

density and viscosity of the aqueous carrier. It is often most effective to grind and mix the pesticide at the same time by preparing the aqueous mixture and homogenizing it in an implement such as a sand mill, ball mill, or piston-type homogenizer.

Pesticides may also be applied as granular compositions that are particularly useful for applications to the soil. Granular compositions usually contain from about 0.5% to about 10% by weight of the pesticide, dispersed in a carrier that comprises clay or a similar substance. Such compositions are usually prepared by dissolving the pesticide in a suitable solvent and applying it to a granular carrier which has been pre-formed to the appropriate particle size, in the range of from about 0.5 to about 3 mm. Such compositions may also be formulated by making a dough or paste of the carrier and compound and crushing and drying to obtain the desired granular particle size.

Dusts containing a pesticide are prepared by intimately mixing the pesticide in powdered form with a suitable dusty agricultural carrier, such as kaolin clay, ground volcanic rock, and the like. Dusts can suitably contain from about 1% to about 10% of the pesticide. They can be applied as a seed dressing or as a foliage application with a dust blower machine.

It is equally practical to apply a pesticide in the form of a solution in an appropriate organic solvent, usually petroleum oil, such as the spray oils, which are widely used in agricultural chemistry.

Pesticides can also be applied in the form of an aerosol composition. In such compositions the pesticide is dissolved or dispersed in a carrier, which is a pressure-generating propellant mixture. The aerosol composition is packaged in a container from which the mixture is dispensed through an atomizing valve.

Pesticide baits are formed when the pesticide is mixed with food or an attractant or both. When the pests eat the bait they also consume the pesticide. Baits may take the form of granules, gels, flowable powders, liquids, or solids. They can be used in pest harborages.

Fumigants are pesticides that have a relatively high vapor pressure and hence can exist as a gas in sufficient concentrations to kill pests in soil or enclosed spaces. The toxicity of the fumigant is proportional to its concentration and the exposure time. They are characterized by a good capacity for diffusion and act by penetrating the pest's respiratory system or being absorbed through the pest's cuticle. Fumigants are applied to control stored product pests under gas proof sheets, in gas sealed rooms or buildings or in special chambers.

Pesticides can be microencapsulated by suspending the pesticide particles or droplets in plastic polymers of various types. By altering the chemistry of the polymer or by changing factors in the processing, microcapsules can be formed of various sizes, solubility, wall thicknesses, and degrees of penetrability. These factors govern the speed with which the active ingredient within is released, which in turn, affects the residual performance, speed of action, and odor of the product.

Oil solution concentrates are made by dissolving pesticide in a solvent that will hold the pesticide in solution. Oil solutions of a pesticide usually provide faster knockdown and kill of pests than other formulations due to the solvents themselves having pesticidal action and the dissolution of the waxy covering of the integument increasing the speed of uptake of the pesticide. Other advantages of oil solutions include better storage stability, better penetration of crevices, and better adhesion to greasy surfaces.

Another embodiment is an oil-in-water emulsion, wherein the emulsion comprises oily globules which are each provided with a lamellar liquid crystal coating and are dispersed in an aqueous phase, wherein each oily globule comprises at least one compound which is agriculturally active, and is individually coated with a monolamellar or oligolamellar layer comprising: (1) at least one non-ionic lipophilic surface-active agent, (2) at least one non-ionic hydrophilic surface-active agent and (3) at least one ionic surface-active agent, wherein the globules having a mean particle diameter of less than 800 nanometers. Further information on the embodiment is disclosed in U.S. patent publication 20070027034 published Feb. 1, 2007, having patent application Ser. No. 11/495,228. For ease of use, this embodiment will be referred to as "OIWE".

For further information consult "Insect Pest Management" 2nd Edition by D. Dent, copyright CAB International (2000). Additionally, for more detailed information consult "Handbook of Pest Control—The Behavior, Life History, and Control of Household Pests" by Arnold Mallis, 9th Edition, copyright 2004 by GLE Media Inc.

Other Formulation Components

Generally, when the molecules disclosed in Formula One are used in a formulation, such formulation can also contain other components. These components include, but are not limited to, (this is a non-exhaustive and non-mutually exclusive list) wetters, spreaders, stickers, penetrants, buffers, sequestering agents, drift reduction agents, compatibility agents, anti-foam agents, cleaning agents, and emulsifiers. A few components are described forthwith.

A wetting agent is a substance that when added to a liquid increases the spreading or penetration power of the liquid by reducing the interfacial tension between the liquid and the surface on which it is spreading. Wetting agents are used for two main functions in agrochemical formulations: during processing and manufacture to increase the rate of wetting of powders in water to make concentrates for soluble liquids or suspension concentrates; and during mixing of a product with water in a spray tank to reduce the wetting time of wettable powders and to improve the penetration of water into water-dispersible granules. Examples of wetting agents used in wettable powder, suspension concentrate, and water-dispersible granule formulations are: sodium lauryl sulfate; sodium dioctyl sulfosuccinate; alkyl phenol ethoxylates; and aliphatic alcohol ethoxylates.

A dispersing agent is a substance which adsorbs onto the surface of particles and helps to preserve the state of dispersion of the particles and prevents them from reaggregating. Dispersing agents are added to agrochemical formulations to facilitate dispersion and suspension during manufacture, and to ensure the particles redispense into water in a spray tank. They are widely used in wettable powders, suspension concentrates and water-dispersible granules. Surfactants that are used as dispersing agents have the ability to adsorb strongly onto a particle surface and provide a charged or steric barrier to reaggregation of particles. The most commonly used surfactants are anionic, non-ionic, or mixtures of the two types. For wettable powder formulations, the most common dispersing agents are sodium lignosulfonates. For suspension concentrates, very good adsorption and stabilization are obtained using polyelectrolytes, such as sodium naphthalene sulfonate formaldehyde condensates. Tristyrylphenol ethoxylate phosphate esters are also used. Non-ionics such as alkylarylethylene oxide condensates and EO-PO block copolymers are sometimes combined with anionics as dispersing agents for suspension concentrates. In recent years, new types of very high molecular weight polymeric surfactants have been

developed as dispersing agents. These have very long hydrophobic 'backbones' and a large number of ethylene oxide chains forming the 'teeth' of a 'comb' surfactant. These high molecular weight polymers can give very good long-term stability to suspension concentrates because the hydrophobic backbones have many anchoring points onto the particle surfaces. Examples of dispersing agents used in agrochemical formulations are: sodium lignosulfonates; sodium naphthalene sulfonate formaldehyde condensates; tristyrylphenol ethoxylate phosphate esters; aliphatic alcohol ethoxylates; alkyl ethoxylates; EO-PO block copolymers; and graft copolymers.

An emulsifying agent is a substance which stabilizes a suspension of droplets of one liquid phase in another liquid phase. Without the emulsifying agent the two liquids would separate into two immiscible liquid phases. The most commonly used emulsifier blends contain alkylphenol or aliphatic alcohol with twelve or more ethylene oxide units and the oil-soluble calcium salt of dodecylbenzenesulfonic acid. A range of hydrophilic-lipophile balance ("HLB") values from 8 to 18 will normally provide good stable emulsions. Emulsion stability can sometimes be improved by the addition of a small amount of an EO-PO block copolymer surfactant.

A solubilizing agent is a surfactant which will form micelles in water at concentrations above the critical micelle concentration. The micelles are then able to dissolve or solubilize water-insoluble materials inside the hydrophobic part of the micelle. The types of surfactants usually used for solubilization are non-ionic, sorbitan monooleates, sorbitan monooleate ethoxylates, and methyl oleate esters.

Surfactants are sometimes used, either alone or with other additives such as mineral or vegetable oils as adjuvants to spray-tank mixes to improve the biological performance of the pesticide on the target. The types of surfactants used for bioenhancement depend generally on the nature and mode of action of the pesticide. However, they are often non-ionic such as: alkyl ethoxylates; linear aliphatic alcohol ethoxylates; aliphatic amine ethoxylates.

A carrier or diluent in an agricultural formulation is a material added to the pesticide to give a product of the required strength. Carriers are usually materials with high absorptive capacities, while diluents are usually materials with low absorptive capacities. Carriers and diluents are used in the formulation of dusts, wettable powders, granules and water-dispersible granules.

Organic solvents are used mainly in the formulation of emulsifiable concentrates, oil-in-water emulsions, suspensions, and ultra low volume formulations, and to a lesser extent, granular formulations. Sometimes mixtures of solvents are used. The first main groups of solvents are aliphatic paraffinic oils such as kerosene or refined paraffins. The second main group (and the most common) comprises the aromatic solvents such as xylene and higher molecular weight fractions of C9 and C10 aromatic solvents. Chlorinated hydrocarbons are useful as cosolvents to prevent crystallization of pesticides when the formulation is emulsified into water. Alcohols are sometimes used as cosolvents to increase solvent power. Other solvents may include vegetable oils, seed oils, and esters of vegetable and seed oils.

Thickeners or gelling agents are used mainly in the formulation of suspension concentrates, emulsions and suspensions to modify the rheology or flow properties of the liquid and to prevent separation and settling of the dispersed particles or droplets. Thickening, gelling, and anti-settling agents generally fall into two categories, namely water-insoluble particulates and water-soluble polymers. It is possible to produce suspension concentrate formulations using clays

and silicas. Examples of these types of materials, include, but are not limited to, montmorillonite, bentonite, magnesium aluminum silicate, and attapulgite. Water-soluble polysaccharides have been used as thickening-gelling agents for many years. The types of polysaccharides most commonly used are natural extracts of seeds and seaweeds or are synthetic derivatives of cellulose. Examples of these types of materials include, but are not limited to, guar gum; locust bean gum; carrageenan; alginates; methyl cellulose; sodium carboxymethyl cellulose (SCMC); hydroxyethyl cellulose (HEC). Other types of anti-settling agents are based on modified starches, polyacrylates, polyvinyl alcohol and polyethylene oxide. Another good anti-settling agent is xanthan gum.

Microorganisms can cause spoilage of formulated products. Therefore preservation agents are used to eliminate or reduce their effect. Examples of such agents include, but are not limited to: propionic acid and its sodium salt; sorbic acid and its sodium or potassium salts; benzoic acid and its sodium salt; p-hydroxybenzoic acid sodium salt; methyl p-hydroxybenzoate; and 1,2-benzisothiazolin-3-one (BIT).

The presence of surfactants often causes water-based formulations to foam during mixing operations in production and in application through a spray tank. In order to reduce the tendency to foam, anti-foam agents are often added either during the production stage or before filling into bottles. Generally, there are two types of anti-foam agents, namely silicones and non-silicones. Silicones are usually aqueous emulsions of dimethyl polysiloxane, while the non-silicone anti-foam agents are water-insoluble oils, such as octanol and nonanol, or silica. In both cases, the function of the anti-foam agent is to displace the surfactant from the air-water interface.

"Green" agents (e.g., adjuvants, surfactants, solvents) can reduce the overall environmental footprint of crop protection formulations. Green agents are biodegradable and generally derived from natural and/or sustainable sources, e.g. plant and animal sources. Specific examples are: vegetable oils, seed oils, and esters thereof, also alkoxyated alkyl polyglucosides.

For further information, see "Chemistry and Technology of Agrochemical Formulations" edited by D. A. Knowles, copyright 1998 by Kluwer Academic Publishers. Also see "Insecticides in Agriculture and Environment—Retrospects and Prospects" by A. S. Perry, I. Yamamoto, I. Ishaaya, and R. Perry, copyright 1998 by Springer-Verlag.

Pests

In general, the molecules of Formula One may be used to control pests e.g. beetles, earwigs, cockroaches, flies, aphids, scales, whiteflies, leafhoppers, ants, wasps, termites, moths, butterflies, lice, grasshoppers, locusts, crickets, fleas, thrips, bristletails, mites, ticks, nematodes, and symphylans.

In another embodiment, the molecules of Formula One may be used to control pests in the Phyla Nematoda and/or Arthropoda.

In another embodiment, the molecules of Formula One may be used to control pests in the Subphyla Chelicerata, Myriapoda, and/or Hexapoda.

In another embodiment, the molecules of Formula One may be used to control pests in the Classes of Arachnida, Symphyla, and/or Insecta.

In another embodiment, the molecules of Formula One may be used to control pests of the Order Anoplura. A non-exhaustive list of particular genera includes, but is not limited to, *Haematopinus* spp., *Hoplopleura* spp., *Linognathus* spp., *Pediculus* spp., and *Polyplax* spp. A non-exhaustive list of particular species includes, but is not limited to, *Haematopinus asini*, *Haematopinus suis*, *Linognathus setosus*, *Linog-*

nathus ovillus, *Pediculus humanus capitis*, *Pediculus humanus humanus*, and *Pthirus pubis*.

In another embodiment, the molecules of Formula One may be used to control pests of the Order Coleoptera. A non-exhaustive list of particular genera includes, but is not limited to, *Acanthoscelides* spp., *Agriotes* spp., *Anthonomus* spp., *Apion* spp., *Apogonia* spp., *Aulacophora* spp., *Bruchus* spp., *Cerosterna* spp., *Cerotoma* spp., *Ceutorhynchus* spp., *Chaetocnema* spp., *Colaspis* spp., *Ctenicera* spp., *Curculio* spp., *Cyclocephala* spp., *Diabrotica* spp., *Hypera* spp., *Ips* spp., *Lyctus* spp., *Megascelis* spp., *Meligethes* spp., *Otiorynchus* spp., *Pantomorus* spp., *Phyllophaga* spp., *Phyllotreta* spp., *Rhizotrogus* spp., *Rhynchites* spp., *Rhynchophorus* spp., *Scolytus* spp., *Sphenophorus* spp., *Sitophilus* spp., and *Tribolium* spp. A non-exhaustive list of particular species includes, but is not limited to, *Acanthoscelides oblectus*, *Agrilus planipennis*, *Anoplophora glabripennis*, *Anthonomus grandis*, *Ataenius spretulus*, *Atomaria linearis*, *Bothynoderes punctiventris*, *Bruchus pisorum*, *Callosobruchus maculatus*, *Carpophilus hemipterus*, *Cassida vittata*, *Cerotoma trifurcata*, *Ceutorhynchus assimilis*, *Ceutorhynchus napi*, *Conoderus scalaris*, *Conoderus stigmatus*, *Conotrachelus nenuphar*, *Cotinix nitida*, *Crioceris asparagi*, *Cryptolestes ferrugineus*, *Cryptolestes pusillus*, *Cryptolestes turcicus*, *Cylindrocaptus adpersus*, *Deporaus marginatus*, *Dermestes lardarius*, *Dermestes maculatus*, *Epilachna varivestis*, *Faustinus cubae*, *Hyllobius pales*, *Hypera postica*, *Hypothenemus hampei*, *Lasioderma serricornis*, *Leptinotarsa decemlineata*, *Liogenys fuscus*, *Liogenys suturalis*, *Lissorhoptrus oryzophilus*, *Maecolaspis jolivetii*, *Melanotus communis*, *Meligethes aeneus*, *Melolontha melolontha*, *Oberea brevis*, *Oberea linearis*, *Oryctes rhinoceros*, *Oryzaephilus mercator*, *Oryzaephilus surinamensis*, *Oulema melanopus*, *Oulema oryzae*, *Phyllophaga cuyabana*, *Popillia japonica*, *Prostephanus truncatus*, *Rhyzopertha dominica*, *Sitona lineatus*, *Sitophilus granarius*, *Sitophilus oryzae*, *Sitophilus zeamais*, *Stegobium paniceum*, *Tribolium castaneum*, *Tribolium confusum*, *Trogoderma variabile*, and *Zabrus tenebrioides*.

In another embodiment, the molecules of Formula One may be used to control pests of the Order Dermoptera.

In another embodiment, the molecules of Formula One may be used to control pests of the Order Blattaria. A non-exhaustive list of particular species includes, but is not limited to, *Blattella germanica*, *Blatta orientalis*, *Parcoblatta pennsylvanica*, *Periplaneta americana*, *Periplaneta australasiae*, *Periplaneta brunnea*, *Periplaneta fuliginosa*, *Pycnoscelus surinamensis*, and *Supella longipalpa*.

In another embodiment, the molecules of Formula One may be used to control pests of the Order Diptera. A non-exhaustive list of particular genera includes, but is not limited to, *Aedes* spp., *Agromyza* spp., *Anastrepha* spp., *Anopheles* spp., *Bactrocera* spp., *Ceratitidis* spp., *Chrysops* spp., *Cochliomyia* spp., *Contarinia* spp., *Culex* spp., *Dasineura* spp., *Delia* spp., *Drosophila* spp., *Fannia* spp., *Hylemyia* spp., *Liriomyza* spp., *Musca* spp., *Phorbia* spp., *Tabanus* spp., and *Tipula* spp. A non-exhaustive list of particular species includes, but is not limited to, *Agromyza frontella*, *Anastrepha suspensa*, *Anastrepha ludens*, *Anastrepha obliqua*, *Bactrocera cucurbitae*, *Bactrocera dorsalis*, *Bactrocera invadens*, *Bactrocera zonata*, *Ceratitidis capitata*, *Dasineura brassicae*, *Delia platura*, *Fannia canicularis*, *Fannia scalaris*, *Gasterophilus intestinalis*, *Gracillia perseae*, *Haemaphys irritans*, *Hypoderma lineatum*, *Liriomyza brassicae*, *Melophagus ovinus*, *Musca autumnalis*, *Musca domestica*, *Oestrus ovis*, *Oscinella frit*, *Pegomya betae*, *Psila rosae*, *Rhagoletis cerasi*, *Rhagoletis pomonella*, *Rhagoletis mendax*, *Sitodiplosis mosellana*, and *Stomoxys calcitrans*.

In another embodiment, the molecules of Formula One may be used to control pests of the Order Hemiptera. A non-exhaustive list of particular genera includes, but is not limited to, *Adelges* spp., *Aulacaspis* spp., *Aphrophora* spp., *Aphis* spp., *Bemisia* spp., *Ceroplastes* spp., *Chionaspis* spp., *Chrysomphalus* spp., *Coccus* spp., *Empoasca* spp., *Lepidosaphes* spp., *Lagynotomus* spp., *Lygus* spp., *Macrosiphum* spp., *Nephotettix* spp., *Nezara* spp., *Philaenus* spp., *Phytocoris* spp., *Piezodorus* spp., *Planococcus* spp., *Pseudococcus* spp., *Rhopalosiphum* spp., *Saissetia* spp., *Therioaphis* spp., *Toumeyella* spp., *Toxoptera* spp., *Trialeurodes* spp., *Triatoma* spp. and *Unaspis* spp. A non-exhaustive list of particular species includes, but is not limited to, *Acrosternum hilare*, *Acyrtosiphon pisum*, *Aleyrodes proletella*, *Aleurodicus dispersus*, *Aleurothrixus floccosus*, *Anrasca biguttula biguttula*, *Aonidiella aurantii*, *Aphis gossypii*, *Aphis glycines*, *Aphis pomi*, *Aulacorthum solani*, *Bemisia argentifolii*, *Bemisia tabaci*, *Blissus leucopterus*, *Brachycorynella asparagi*, *Brevemia rehi*, *Brevicoryne brassicae*, *Calocoris norvegicus*, *Ceroplastes rubens*, *Cimex hemipterus*, *Cimex lectularius*, *Dagbertus fasciatus*, *Dichelops furcatus*, *Diuraphis noxia*, *Diaphorina citri*, *Dysaphis plantaginea*, *Dysdercus sutellus*, *Edessa mediatubunda*, *Eriosoma lanigerum*, *Eurygaster maura*, *Euschistus heros*, *Euschistus servus*, *Helopeltis antonii*, *Helopeltis theivora*, *Icerya purchasi*, *Idioscopus nitidulus*, *Laodelphax striatellus*, *Leptocoris oratorius*, *Leptocoris varicornis*, *Lygus hesperus*, *Macronellus coccis*, *Macrosiphum euphorbiae*, *Macrosiphum graminum*, *Macrosiphum rosae*, *Macrostelus quadrilineatus*, *Mahanarva frimbiolata*, *Metopolophium dirhodum*, *Mictis longicornis*, *Myzus persicae*, *Nephotettix cinctipes*, *Neurocolpus longirostris*, *Nezara viridula*, *Nilaparvata lugens*, *Parlatoria pergandii*, *Parlatoria ziziphi*, *Peregrinus maidis*, *Phylloxera vitifoliae*, *Physokermes piceae*, *Phytocoris californicus*, *Phytocoris relativus*, *Piezodorus guildinii*, *Poecilolapsus lineatus*, *Psallus vaccinicola*, *Pseudocysta perseae*, *Pseudococcus brevipes*, *Quadraspidiotus perniciosus*, *Rhopalosiphum maidis*, *Rhopalosiphum padi*, *Saissetia oleae*, *Scaptocoris castanea*, *Schizaphis graminum*, *Sitobion avenae*, *Sogatella furcifera*, *Trialeurodes vaporariorum*, *Trialeurodes abutiloneus*, *Unaspis yanonensis*, and *Zulia entriana*.

In another embodiment, the molecules of Formula One may be used to control pests of the Order Hymenoptera. A non-exhaustive list of particular genera includes, but is not limited to, *Acromyrmex* spp., *Atta* spp., *Camponotus* spp., *Diprion* spp., *Formica* spp., *Monomorium* spp., *Neodiprion* spp., *Pogonomyrmex* spp., *Polistes* spp., *Solenopsis* spp., *Vespula* spp., and *Xylocopa* spp. A non-exhaustive list of particular species includes, but is not limited to, *Athalia rosae*, *Atta texana*, *Iridomyrmex humilis*, *Monomorium minimum*, *Monomorium pharaonis*, *Solenopsis invicta*, *Solenopsis geminata*, *Solenopsis molesta*, *Solenopsis richteri*, *Solenopsis xyloni*, and *Tapinoma sessile*.

In another embodiment, the molecules of Formula One may be used to control pests of the Order Isoptera. A non-exhaustive list of particular genera includes, but is not limited to, *Coptotermes* spp., *Cornitermes* spp., *Cryptotermes* spp., *Heterotermes* spp., *Kaloterms* spp., *Incisitermes* spp., *Macrotermes* spp., *Marginitermes* spp., *Microcerotermes* spp., *Procornitermes* spp., *Reticulitermes* spp., *Schedorhinotermes* spp., and *Zootermopsis* spp. A non-exhaustive list of particular species includes, but is not limited to, *Coptotermes curvignathus*, *Coptotermes frenchi*, *Coptotermes formosanus*, *Heterotermes aureus*, *Microtermes obesi*, *Reticulitermes banyulensis*, *Reticulitermes grassei*, *Reticulitermes flavipes*, *Reticulitermes hageni*, *Reticulitermes hesperus*, *Reticulitermes*

mes santonensis, *Reticulitermes speratus*, *Reticulitermes tibialis*, and *Reticulitermes virginicus*.

In another embodiment, the molecules of Formula One may be used to control pests of the Order Lepidoptera. A non-exhaustive list of particular genera includes, but is not limited to, *Adoxophyes* spp., *Agrotis* spp., *Argyrotaenia* spp., *Cacoecia* spp., *Caloptilia* spp., *Chilo* spp., *Chrysodeixis* spp., *Colias* spp., *Crambus* spp., *Diaphania* spp., *Diatraea* spp., *Earias* spp., *Ephestia* spp., *Epimecis* spp., *Feltia* spp., *Gortyna* spp., *Helicoverpa* spp., *Heliothis* spp., *Indarbela* spp., *Lithocolletis* spp., *Loxagrotis* spp., *Malacosoma* spp., *Peridroma* spp., *Phyllonorycter* spp., *Pseudaletia* spp., *Sesamia* spp., *Spodoptera* spp., *Synanthedon* spp., and *Yponomeuta* spp. A non-exhaustive list of particular species includes, but is not limited to, *Achaea janata*, *Adoxophyes orana*, *Agrotis ipsilon*, *Alabama argillacea*, *Amorbia cuneana*, *Amyeloides transitella*, *Anacamptodes defectaria*, *Anarsia lineatella*, *Anomis sabulifera*, *Anticarsia gemmatilis*, *Archips argyrospila*, *Archips rosana*, *Argyrotaenia citrana*, *Autographa gamma*, *Bonagota cranaodes*, *Borbo cinara*, *Bucculatrix thurberiella*, *Capua reticulana*, *Carposina niponensis*, *Chlumetia transversa*, *Choristoneura rosaceana*, *Cnaphalocrocis medinalis*, *Conopomorpha cramerella*, *Cossus cossus*, *Cydia caryana*, *Cydia funebrana*, *Cydia molesta*, *Cydia nigricana*, *Cydia pomonella*, *Darna diducta*, *Diatraea saccharalis*, *Diatraea grandiosella*, *Earias insulana*, *Earias vittella*, *Ecdytolopha aurantianum*, *Elasmopalpus lignosellus*, *Ephestia cautella*, *Ephestia elutella*, *Ephestia kuehniella*, *Epinotia aporema*, *Epiphyas postvittana*, *Erionota thrax*, *Eupoecilia ambiguella*, *Euxoa auxiliaris*, *Grapholita molesta*, *Hedylepta indicata*, *Helicoverpa armigera*, *Helicoverpa zea*, *Heliothis virescens*, *Hellula undalis*, *Keiferia lycopersicella*, *Leucinodes orbonalis*, *Leucoptera coffeella*, *Leucoptera malifoliella*, *Lobesia botrana*, *Loxagrotis albicosta*, *Lymantria dispar*, *Lyonetia clerkella*, *Mahasena corbeti*, *Mamestra brassicae*, *Maruca testulalis*, *Metisa plana*, *Mythimna unipuncta*, *Neoleucinodes elegantalis*, *Nymphula depunctalis*, *Operophtera brumata*, *Ostrinia nubilalis*, *Oxydia vesulia*, *Pandemis cerasana*, *Pandemis heparana*, *Papilio demodocus*, *Pectinophora gossypiella*, *Peridroma saucia*, *Perileucoptera coffeella*, *Phthorimaea operculella*, *Phyllocnistis citrella*, *Pieris rapae*, *Plathypena scabra*, *Plodia interpunctella*, *Plutella xylostella*, *Polychrosis viteana*, *Prays endocarpa*, *Prays oleae*, *Pseudaletia unipuncta*, *Pseudoplusia includens*, *Rachiplusia nu*, *Scirpophaga incertulas*, *Sesamia inferens*, *Sesamia nonagrioides*, *Setora nitens*, *Sitotroga cerealella*, *Sparganothis pilleriana*, *Spodoptera exigua*, *Spodoptera frugiperda*, *Spodoptera eridania*, *Thecla basilides*, *Tineola bisselliella*, *Trichoplusia ni*, *Tuta absoluta*, *Zeuzera coffeae*, and *Zeuzera pyrina*.

In another embodiment, the molecules of Formula One may be used to control pests of the Order Mallophaga. A non-exhaustive list of particular genera includes, but is not limited to, *Anaticola* spp., *Bovicola* spp., *Chelopistes* spp., *Goniodes* spp., *Menacanthus* spp., and *Trichodectes* spp. A non-exhaustive list of particular species includes, but is not limited to, *Bovicola bovis*, *Bovicola caprae*, *Bovicola ovis*, *Chelopistes meleagridis*, *Goniodes dissimilis*, *Goniodes gigas*, *Menacanthus stramineus*, *Menopon gallinae*, and *Trichodectes canis*.

In another embodiment, the molecules of Formula One may be used to control pests of the Order Orthoptera. A non-exhaustive list of particular genera includes, but is not limited to, *Melanoplus* spp., and *Pterophylla* spp. A non-exhaustive list of particular species includes, but is not limited to, *Anabrus simplex*, *Gryllotalpa africana*, *Gryllotalpa australis*, *Gryllotalpa brachyptera*, *Gryllotalpa hexadactyla*,

Locusta migratoria, *Microcentrum retinerve*, *Schistocerca gregaria*, and *Scudderella furcata*.

In another embodiment, the molecules of Formula One may be used to control pests of the Order Siphonaptera. A non-exhaustive list of particular species includes, but is not limited to, *Ceratophyllus gallinae*, *Ceratophyllus niger*, *Ctenocephalides canis*, *Ctenocephalides felis*, and *Pulex irritans*.

In another embodiment, the molecules of Formula One may be used to control pests of the Order Thysanoptera. A non-exhaustive list of particular genera includes, but is not limited to, *Caliothrips* spp., *Frankliniella* spp., *Scirtothrips* spp., and *Thrips* spp. A non-exhaustive list of particular species includes, but is not limited to, *Frankliniella fusca*, *Frankliniella occidentalis*, *Frankliniella schultzei*, *Frankliniella williamsi*, *Heliothrips haemorrhoidalis*, *Rhipiphorothrips cruentatus*, *Scirtothrips citri*, *Scirtothrips dorsalis*, and *Taeniothrips rhopalantennalis*, *Thrips hawaiiensis*, *Thrips nigropilosus*, *Thrips orientalis*, *Thrips tabaci*.

In another embodiment, the molecules of Formula One may be used to control pests of the Order Thysanura. A non-exhaustive list of particular genera includes, but is not limited to, *Lepisma* spp. and *Thermobia* spp.

In another embodiment, the molecules of Formula One may be used to control pests of the Order Acarina. A non-exhaustive list of particular genera includes, but is not limited to, *Acarus* spp., *Aculops* spp., *Boophilus* spp., *Demodex* spp., *Dermacentor* spp., *Eritrimerus* spp., *Eriophyes* spp., *Ixodes* spp., *Oligonychus* spp., *Panonychus* spp., *Rhizoglyphus* spp., and *Tetranychus* spp. A non-exhaustive list of particular species includes, but is not limited to, *Acarapis woodi*, *Acarus siro*, *Aceria mangiferae*, *Aculops lycopersici*, *Aculus pelekassi*, *Aculus schlechtendali*, *Amblyomma americanum*, *Brevipalpus obovatus*, *Brevipalpus phoenicis*, *Dermacentor variabilis*, *Dermatophagoides pteronyssinus*, *Eotetranychus carpini*, *Notoedres cati*, *Oligonychus coffeae*, *Oligonychus ilicis*, *Panonychus citri*, *Panonychus ulmi*, *Phyllocoptruta oleivora*, *Polyphagotarsonemus latus*, *Rhipicephalus sanguineus*, *Sarcoptes scabiei*, *Tegolophus perseaeiflorae*, *Tetranychus urticae*, and *Varroa destructor*.

In another embodiment, the molecules of Formula One may be used to control pest of the Order Symphyla. A non-exhaustive list of particular species includes, but is not limited to, *Scutigereilla immaculata*.

In another embodiment, the molecules of Formula One may be used to control pests of the Phylum Nematoda. A non-exhaustive list of particular genera includes, but is not limited to, *Aphelenchoides* spp., *Belonolaimus* spp., *Cricone-mella* spp., *Ditylenchus* spp., *Heterodera* spp., *Hirschmanniella* spp., *Hoplolaimus* spp., *Meloidogyne* spp., *Pratylenchus* spp., and *Radopholus* spp. A non-exhaustive list of particular species includes, but is not limited to, *Dirofilaria immitis*, *Heterodera zaeae*, *Meloidogyne incognita*, *Meloidogyne javanica*, *Onchocerca volvulus*, *Radopholus similis*, and *Rotylenchulus reniformis*.

For additional information consult "HANDBOOK OF PEST CONTROL—THE BEHAVIOR, LIFE HISTORY, AND CONTROL OF HOUSEHOLD PESTS" by Arnold Mallis, 9th Edition, copyright 2004 by GIE Media Inc.

Applications

Molecules of Formula One are generally used in amounts from about 0.01 grams per hectare to about 5000 grams per hectare to provide control. Amounts from about 0.1 grams per hectare to about 500 grams per hectare are generally preferred, and amounts from about 1 gram per hectare to about 50 grams per hectare are generally more preferred.

The area to which a molecule of Formula One is applied can be any area inhabited (or maybe inhabited, or traversed by) a pest, for example: where crops, trees, fruits, cereals, fodder species, vines, turf and ornamental plants, are growing; where domesticated animals are residing; the interior or exterior surfaces of buildings (such as places where grains are stored), the materials of construction used in building (such as impregnated wood), and the soil around buildings. Particular crop areas to use a molecule of Formula One include areas where apples, corn, sunflowers, cotton, soybeans, canola, wheat, rice, sorghum, barley, oats, potatoes, oranges, alfalfa, lettuce, strawberries, tomatoes, peppers, crucifers, pears, tobacco, almonds, sugar beets, beans and other valuable crops are growing or the seeds thereof are going to be planted. It is also advantageous to use ammonium sulfate with a molecule of Formula One when growing various plants.

Controlling pests generally means that pest populations, pest activity, or both, are reduced in an area. This can come about when: pest populations are repulsed from an area; when pests are incapacitated in or around an area; or pests are exterminated, in whole, or in part, in or around an area. Of course, a combination of these results can occur. Generally, pest populations, activity, or both are desirably reduced more than fifty percent, preferably more than 90 percent. Generally, the area is not in or on a human; consequently, the locus is generally a non-human area.

The molecules of Formula One may be used in mixtures, applied simultaneously or sequentially, alone or with other compounds to enhance plant vigor (e.g. to grow a better root system, to better withstand stressful growing conditions). Such other compounds are, for example, compounds that modulate plant ethylene receptors, most notably 1-methylcyclopropene (also known as 1-MCP). Furthermore, such molecules may be used during times when pest activity is low, such as before the plants that are growing begin to produce valuable agricultural commodities. Such times include the early planting season when pest pressure is usually low.

The molecules of Formula One can be applied to the foliar and fruiting portions of plants to control pests. The molecules will either come in direct contact with the pest, or the pest will consume the pesticide when eating leaf, fruit mass, or extracting sap, that contains the pesticide. The molecules of Formula One can also be applied to the soil, and when applied in this manner, root and stem feeding pests can be controlled. The roots can absorb a molecule taking it up into the foliar portions of the plant to control above ground chewing and sap feeding pests.

Generally, with baits, the baits are placed in the ground where, for example, termites can come into contact with, and/or be attracted to, the bait. Baits can also be applied to a surface of a building, (horizontal, vertical, or slant surface) where, for example, ants, termites, cockroaches, and flies, can come into contact with, and/or be attracted to, the bait. Baits can comprise a molecule of Formula One.

The molecules of Formula One can be encapsulated inside, or placed on the surface of a capsule. The size of the capsules can range from nanometer size (about 100-900 nanometers in diameter) to micrometer size (about 10-900 microns in diameter).

Because of the unique ability of the eggs of some pests to resist certain pesticides, repeated applications of the molecules of Formula One may be desirable to control newly emerged larvae.

Systemic movement of pesticides in plants may be utilized to control pests on one portion of the plant by applying (for example by spraying an area) the molecules of Formula One to a different portion of the plant. For example, control of

foliar-feeding insects can be achieved by drip irrigation or furrow application, by treating the soil with for example pre- or post-planting soil drench, or by treating the seeds of a plant before planting.

Seed treatment can be applied to all types of seeds, including those from which plants genetically modified to express specialized traits will germinate. Representative examples include those expressing proteins toxic to invertebrate pests, such as *Bacillus thuringiensis* or other insecticidal toxins, those expressing herbicide resistance, such as "Roundup Ready" seed, or those with "stacked" foreign genes expressing insecticidal toxins, herbicide resistance, nutrition-enhancement, drought resistance, or any other beneficial traits. Furthermore, such seed treatments with the molecules of Formula One may further enhance the ability of a plant to better withstand stressful growing conditions. This results in a healthier, more vigorous plant, which can lead to higher yields at harvest time. Generally, about 1 gram of the molecules of Formula One to about 500 grams per 100,000 seeds is expected to provide good benefits, amounts from about 10 grams to about 100 grams per 100,000 seeds is expected to provide better benefits, and amounts from about 25 grams to about 75 grams per 100,000 seeds is expected to provide even better benefits.

It should be readily apparent that the molecules of Formula One may be used on, in, or around plants genetically modified to express specialized traits, such as *Bacillus thuringiensis* or other insecticidal toxins, or those expressing herbicide resistance, or those with "stacked" foreign genes expressing insecticidal toxins, herbicide resistance, nutrition-enhancement, or any other beneficial traits.

The molecules of Formula One may be used for controlling endoparasites and ectoparasites in the veterinary medicine sector or in the field of non-human animal keeping. The molecules of Formula One are applied, such as by oral administration in the form of, for example, tablets, capsules, drinks, granules, by dermal application in the form of, for example, dipping, spraying, pouring on, spotting on, and dusting, and by parenteral administration in the form of, for example, an injection.

The molecules of Formula One may also be employed advantageously in livestock keeping, for example, cattle, sheep, pigs, chickens, and geese. They may also be employed advantageously in pets such as, horses, dogs, and cats. Particular pests to control would be fleas and ticks that are bothersome to such animals. Suitable formulations are administered orally to the animals with the drinking water or feed. The dosages and formulations that are suitable depend on the species.

The molecules of Formula One may also be used for controlling parasitic worms, especially of the intestine, in the animals listed above.

The molecules of Formula One may also be employed in therapeutic methods for human health care. Such methods include, but are limited to, oral administration in the form of, for example, tablets, capsules, drinks, granules, and by dermal application.

Pests around the world have been migrating to new environments (for such pest) and thereafter becoming a new invasive species in such new environment. The molecules of Formula One may also be used on such new invasive species to control them in such new environment.

The molecules of Formula One may also be used in an area where plants, such as crops, are growing (e.g. pre-planting, planting, pre-harvesting) and where there are low levels (even no actual presence) of pests that can commercially damage such plants. The use of such molecules in such area is to

43

benefit the plants being grown in the area. Such benefits, may include, but are not limited to, improving the health of a plant, improving the yield of a plant (e.g. increased biomass and/or increased content of valuable ingredients), improving the vigor of a plant (e.g. improved plant growth and/or greener leaves), improving the quality of a plant (e.g. improved content or composition of certain ingredients), and improving the tolerance to abiotic and/or biotic stress of the plant.

Before a pesticide can be used or sold commercially, such pesticide undergoes lengthy evaluation processes by various governmental authorities (local, regional, state, national, and international). Voluminous data requirements are specified by regulatory authorities and must be addressed through data generation and submission by the product registrant or by a third party on the product registrant's behalf, often using a

44

computer with a connection to the World Wide Web. These governmental authorities then review such data and if a determination of safety is concluded, provide the potential user or seller with product registration approval. Thereafter, in that locality where the product registration is granted and supported, such user or seller may use or sell such pesticide.

A molecule according to Formula One can be tested to determine its efficacy against pests. Furthermore, mode of action studies can be conducted to determine if said molecule has a different mode of action than other pesticides. Thereafter, such acquired data can be disseminated, such as by the internet, to third parties.

The headings in this document are for convenience only and must not be used to interpret any portion hereof.
Table Section

TABLE 1

Compound Number and Structure		
Compound No.	Appearance	Structure
1		
2		
3	Orange Oil	
4		
5	Semi-solid	

TABLE 1-continued

Compound Number and Structure		
Compound No.	Appearance	Structure
6	Yellow Oil	
7	Yellow Oil	
8	Yellow Solid	
9	Yellow Oil	
10	Yellow Oil	
11	Yellow Oil	

47
TABLE 1-continued

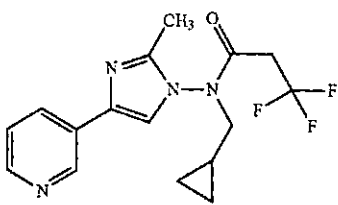
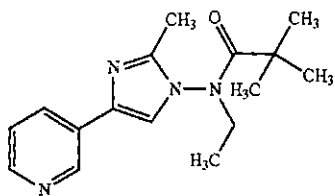
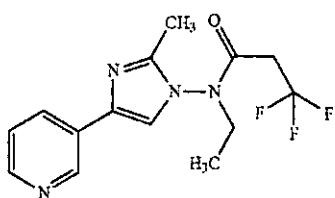
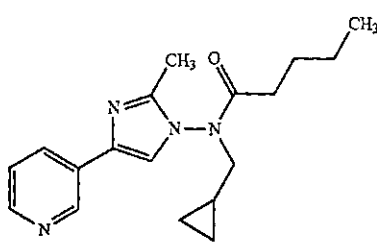
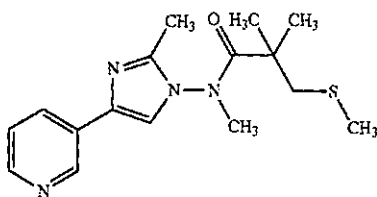
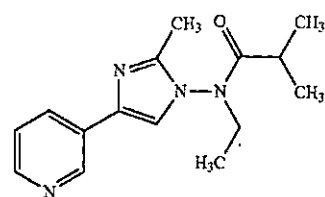
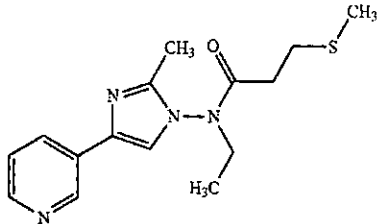
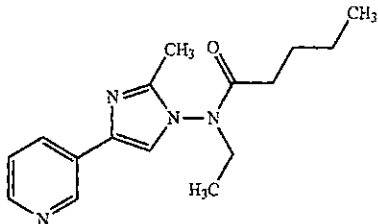
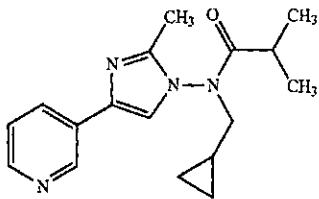
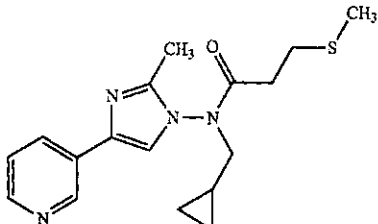
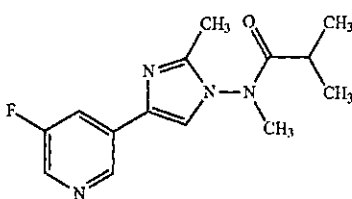
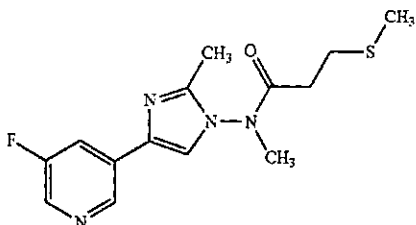
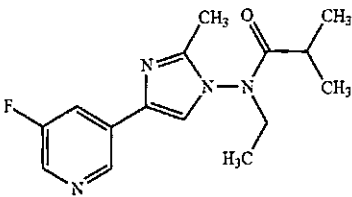
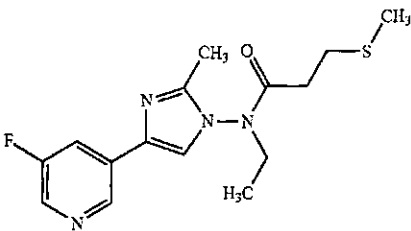
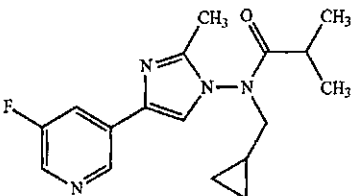
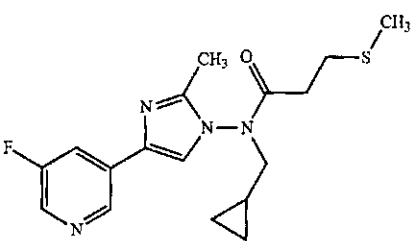
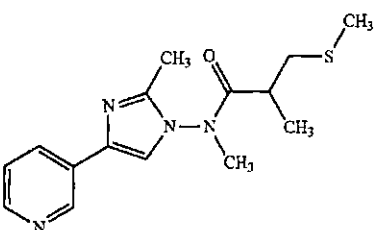
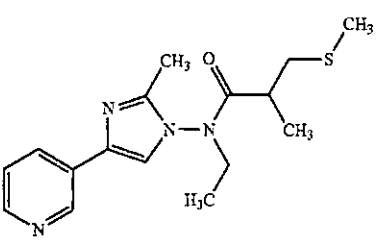
Compound Number and Structure	
Compound No.	Appearance
Structure	
12	Yellow Oil
	
13	Yellow Solid
	
14	Yellow Solid
	
15	Yellow Oil
	
16	Yellow Oil
	
17	Yellow Oil
	

TABLE 1-continued

Compound Number and Structure		
Compound No.	Appearance	Structure
18	Yellow Oil	
19	Yellow Oil	
20	Yellow Oil	
21	Yellow Oil	
22	Yellow Oil	
23	Yellow Oil	

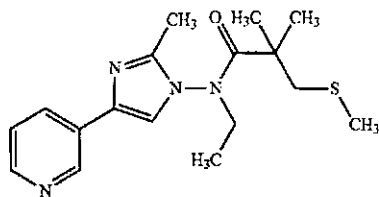
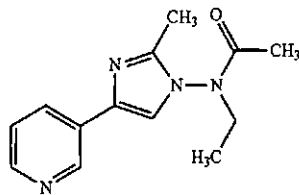
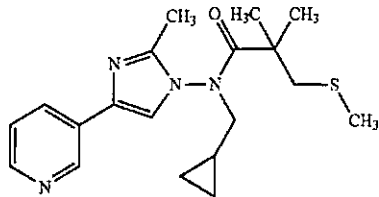
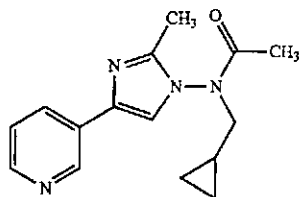
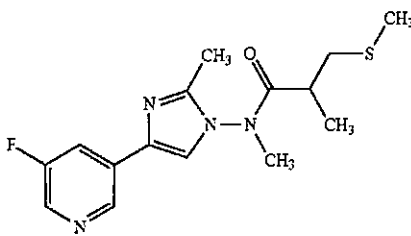
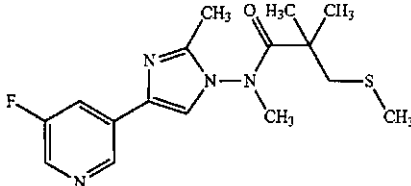
47

TABLE 1-continued

Compound Number and Structure	
Compound No.	Appearance
Structure	
24	Yellow Oil
	
25	White Oil
	
26	Yellow Oil
	
27	White Oil
	
28	Yellow Oil
	
29	Yellow Oil
	

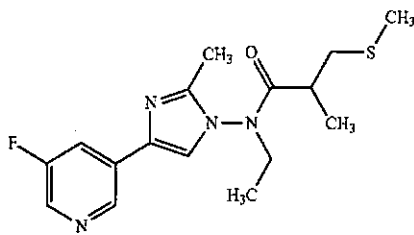
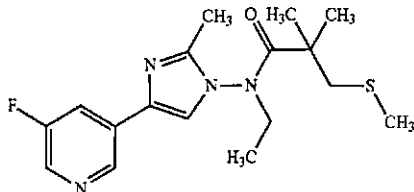
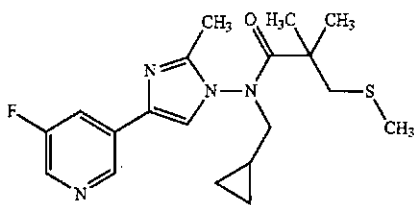
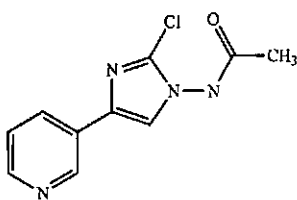
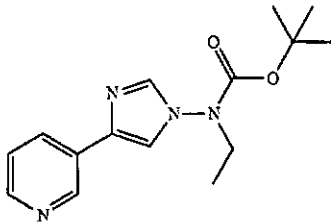
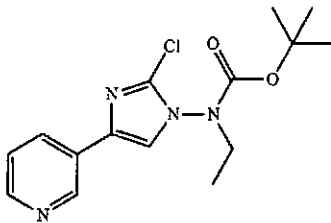
5

53
TABLE 1-continued

Compound Number and Structure	
Compound No.	Appearance
Structure	
30	Yellow Oil
	
31	Yellow Oil
	
32	Yellow Oil
	
33	White Oil
	
34	White Oil
	
35	Yellow Oil
	

51

TABLE 1-continued

Compound Number and Structure	
Compound No.	Structure
36	Yellow Oil
	
37	White Oil
	
38	Yellow Oil
	
39	Brown Solid
	
40	Yellow Oil
	
41	Yellow Oil
	

52

TABLE 2

Analytical Data					
Compound No.	MP (° C.)	IR (cm ⁻¹)	Mass	HNMR	CNMR
1	122-125		ESIMS m/z 259 (M + 1)	¹ H NMR (400 MHz, DMSO-d ₆) δ 8.97 (br s, 1H), 8.42 (dd, J = 4.8, 1.5 Hz, 1H), 8.12-8.01 (m, 2H), 7.41-7.38 (m, 1H), 3.27 (s, 3H), 2.24 (s, 3H), 2.19-2.09 (m, 1H), 0.98 (d, J = 7.2 Hz, 6H).	
2		1682	ESIMS m/z 304 (M + 1)	¹ H NMR (400 MHz, CDCl ₃) δ 8.94 (br s, 1H), 8.47 (dd, J = 5.0, 1.4 Hz, 1H), 8.04 (dt, J = 8.2, 1.5 Hz, 1H), 7.36-7.27 (m, 2H), 3.39 (s, 3H), 3.25-3.18 (m, 1H), 2.38 (s, 3H), 2.27-2.19 (m, 2H), 2.02 (s, 3H), 1.24 (d, J = 6.2 Hz, 3H).	
3		1717	ESIMS m/z 289 (M + 1)	¹ H NMR (400 MHz, CDCl ₃) δ 8.92 (d, J = 2.4 Hz, 1H), 8.43 (dd, J = 4.9, 1.4 Hz, 1H), 8.03 (dt, J = 8.3, 1.6 Hz, 1H), 7.28 (dd, J = 7.7, 4.8 Hz, 1H), 7.21 (s, 1H), 3.38 (s, 3H), 2.36 (s, 3H), 1.43 (s, 9H).	
4		3389, 2978, 2930, 1730, 1478, 1275, 1252, 1156, 1017, 951, 711, 573	ESIMS m/z 289 (M + 1), 287 (M - 1)	¹ H NMR (300 MHz, DMSO, Major isomer) δ 10.41 (s, 1H), 8.81 (s, 1H), 8.39 (s, 1H), 7.95 (d, J = 8.0 Hz, 1H), 7.44-7.28 (m, 1H), 2.21 (s, 3H), 2.18 (s, 3H), 1.46 (s, 9H).	
5			ESIMS m/z 217 [(M + H)] ⁺	¹ H NMR (300 MHz, CDCl ₃) δ 10.87 (s, 1H), 8.76 (s, 1H), 8.36 (br s, 1H), 7.96 (d, J = 7.7, 1H), 7.31-7.20 (m, 2H), 2.25 (s, 3H), 2.13 (s, 3H).	¹³ C NMR (76 MHz, CDCl ₃) δ 169.11, 147.16, 146.66, 145.81, 135.00, 132.92, 124.15, 116.96, 30.11, 21.26, 12.22.
6			ESIMS m/z 231 [(M + H)] ⁺	¹ H NMR (300 MHz, CDCl ₃) δ 8.98-8.87 (m, 1H), 8.50 (s, 1H), 8.07 (dd, J = 7.6, 2.0 Hz, 1H), 7.36-7.31 (m, 1H), 7.30-7.28 (m, 1H), 3.35 (s, 3H), 2.38 (d, J = 1.3 Hz, 3H), 1.84 (s, 3H).	¹³ C NMR (76 MHz, CDCl ₃) δ 171.74, 148.65, 146.34, 145.35, 137.32, 132.34, 129.32, 123.94, 114.61, 36.83, 20.20, 12.15.
7			ESIMS m/z 273 [(M + H)] ⁺	¹ H NMR (300 MHz, CDCl ₃) δ 8.93 (s, 1H), 8.47 (s, 1H), 8.11-8.02 (m, 1H), 7.30 (d, J = 1.4 Hz, 1H), 7.30 (d, J = 2.1 Hz, 3H), 2.37 (d, J = 2.1 Hz, 3H), 1.13 (d, J = 2.1 Hz, 9H).	¹³ C NMR (76 MHz, CDCl ₃) δ 153.30, 148.16, 146.33, 136.37, 132.44, 123.63, 116.04, 40.57, 28.44, 27.49, 16.33, 12.63, 12.61.
8	130.9-131.5		ESIMS m/z 299 [(M + H)] ⁺	¹ H NMR (300 MHz, CDCl ₃) δ 8.96 (s, 1H), 8.54 (d, J = 4.3 Hz, 1H), 8.08 (d, J = 7.9 Hz, 1H), 7.39-7.31 (m, 1H), 7.30 (s, 1H), 3.43 (s, 3H), 3.05-2.78 (m, 2H), 2.41 (s, 3H).	

53

TABLE 2-continued

Analytical Data					
Compound No.	MP (° C.)	IR (cm ⁻¹)	Mass	HNMR	CNMR
9			ESIMS	¹ H NMR (300 MHz, CDCl ₃) δ 8.95 (s, 1H),	¹³ C NMR (76 MHz, CDCl ₃) δ 174.17,
			m/z	8.51 (s, 1H), 8.08 (d, J = 7.9 Hz, 1H), 7.33 (dd, J = 7.6, 5.0 Hz, 1H), 7.26 (s, 1H), 3.38 (s, 3H), 2.37 (s, 3H), 2.12-1.92 (m, 2H), 1.60 (dt, J = 14.8, 7.3 Hz, 2H), 1.35-1.20 (m, 2H), 0.86 (t, J = 7.2 Hz, 3H).	147.97, 146.43, 145.42, 136.73, 132.21, 123.65, 114.79, 37.11, 31.51, 30.09, 26.99, 22.56, 14.33, 12.43.
			273 ([M + H] ⁺).		
10			ESIMS	¹ H NMR (300 MHz, CDCl ₃) δ 8.97-8.89 (d, J = 2.4 Hz, 1H),	¹³ C NMR (76 MHz, CDCl ₃) δ 172.34,
			m/z	8.54-8.44 (m, 1H), 8.11-7.98 (m, 1H), 7.35-7.28 (m, 2H), 3.42-3.38 (s, 3H), 2.85-2.66 (t, J = 6.9 Hz, 2H), 2.42-2.38 (s, 3H), 2.37-2.16 (m, 2H), 2.09-2.00 (s, 3H).	148.63, 146.47, 145.34, 137.05, 132.21, 128.84, 123.56, 114.79, 37.14, 31.46, 29.22, 16.10, 12.38.
			291 ([M + H] ⁺).		
11			ESIMS	¹ H NMR (300 MHz, CDCl ₃) δ 8.92 (s, 1H),	¹³ C NMR (76 MHz, CDCl ₃) δ 177.72,
			m/z	8.47 (s, 1H), 8.08 (d, J = 7.8 Hz, 1H), 7.38-7.23 (m, 2H), 3.81 (dd, J = 14.1, 7.1 Hz, 1H), 3.30 (dd, J = 14.2, 7.1 Hz, 1H), 2.39 (s, 3H), 1.21 (s, 3H), 1.12 (s, 9H), 0.96-0.80 (m, 1H), 0.54-0.43 (m, 2H), 0.08 (d, J = 4.7 Hz, 2H).	148.07, 147.05, 146.11, 135.23, 132.08, 129.62, 123.72, 117.42, 56.21, 40.51, 29.96, 28.76, 27.70, 12.70, 8.86, 4.34, 3.33.
			313 ([M + H] ⁺).		
12			ESIMS	¹ H NMR (300 MHz, CDCl ₃) δ 8.96 (s, 1H),	¹³ C NMR (76 MHz, CDCl ₃) δ 164.22,
			m/z	8.52 (s, 1H), 8.10 (dd, J = 8.0, 1.9 Hz, 1H), 7.36 (dd, J = 8.4, 5.2 Hz, 1H), 7.31 (s, 1H), 3.86-3.71 (m, 1H), 3.66-3.52 (m, 1H), 3.05-2.79 (m, 2H), 2.43 (s, 3H), 0.89 (ddd, J = 7.6, 4.9, 2.7 Hz, 1H), 0.63-0.52 (m, 2H), 0.22 (t, J = 3.8 Hz, 2H).	148.46, 146.04, 137.03, 132.33, 129.01, 125.67, 123.65, 122.27, 115.77, 53.92, 37.26, 36.87, 36.47, 36.07, 12.21, 8.56, 4.20, 3.44.
			339 ([M + H] ⁺).		
13			ESIMS	¹ H NMR (300 MHz, CDCl ₃) δ 8.95 (s, 1H),	¹³ C NMR (76 MHz, CDCl ₃) δ 177.89,
			m/z	8.51 (s, 1H), 8.09 (dt, J = 8.0, 1.8 Hz, 1H), 7.32 (m, 1H), 7.27 (s, 1H), 4.14 (dq, J = 14.3, 7.2 Hz, 1H), 3.40 (dq, J = 14.1, 7.1 Hz, 1H), 2.39 (s, 3H), 1.26-1.17 (m, 3H), 1.14 (s, 9H).	148.35, 146.90, 135.90, 132.36, 129.57, 123.88, 117.53, 47.56, 40.55, 29.93, 28.66, 27.64, 12.88.
			287 ([M + H] ⁺).		
14			ESIMS	¹ H NMR (300 MHz, CDCl ₃) δ 8.98 (d, J = 2.2 Hz, 1H), 8.52 (s, 1H),	¹³ C NMR (76 MHz, CDCl ₃) δ 148.88,
			m/z	8.17-7.99 (m, 1H), 7.43-7.29 (m, 1H), 4.13 (dq, J = 14.4, 7.3 Hz, 1H), 3.68 (dq, J = 14.2, 7.1 Hz, 1H), 2.85 (dt, J = 17.6, 8.2 Hz, 2H), 2.40 (s, 3H), 1.20 (t, J = 7.2 Hz, 3H).	146.66, 146.01, 132.54, 129.05, 125.45, 123.94, 121.78, 115.69, 44.82, 37.08, 36.61, 29.96, 12.59, 12.19.
			313 ([M + H] ⁺).		

51

US 8,680,121 B2

61

62

TABLE 2-continued

Analytical Data					
Compound No.	MP (° C.)	IR (cm ⁻¹)	Mass	HNMR	CNMR
15			ESIMS m/z 313 ([M + H] ⁺)	¹ H NMR (300 MHz, CDCl ₃) δ 8.95 (s, 1H), 8.50 (d, J = 4.8 Hz, 1H), 8.09 (d, J = 7.9 Hz, 1H), 7.33 (dd, J = 8.0, 4.9 Hz, 1H), 7.27-7.26 (m, 2H), 3.82-3.65 (m, 1H), 3.65-3.51 (m, 1H), 2.40 (s, 3H), 2.08-1.92 (m, 2H), 1.59 (p, J = 7.4 Hz, 2H), 1.34-1.15 (m, 4H), 1.01-0.91 (m, 1H), 0.85 (t, J = 7.3 Hz, 3H), 0.54 (d, J = 8.0 Hz, 2H), 0.18 (t, J = 4.6 Hz, 2H).	¹³ C NMR (76 MHz, CDCl ₃) δ 154.33, 153.77, 148.52, 146.65, 132.25, 123.85, 115.84, 53.59, 31.69, 29.94, 26.85, 24.05, 22.55, 14.06, 12.42, 9.17, 4.24, 3.70.
16			ESIMS m/z 319 ([M + H] ⁺)	¹ H NMR (301 MHz, CDCl ₃) δ 8.98 (s, 1H), 8.51 (s, 1H), 8.21 (d, J = 7.6 Hz, 1H), 7.51-7.34 (m, 2H), 3.36 (s, 3H), 2.84 (d, J = 12.7 Hz, 1H), 2.69-2.58 (m, 1H), 2.45 (s, 3H), 2.15 (s, 3H), 1.24 (s, 3H), 1.15 (d, J = 8.7 Hz, 3H).	¹³ C NMR (76 MHz, CDCl ₃) δ 176.05, 146.89, 146.39, 144.66, 135.66, 133.74, 124.44, 116.68, 47.84, 46.51, 40.76, 30.03, 26.48, 25.90, 18.35, 12.69.
17			ESIMS m/z 273 ([M + H] ⁺)	¹ H NMR (300 MHz, CDCl ₃) δ 8.93 (s, 1H), 8.48 (s, 1H), 8.06 (d, J = 7.9 Hz, 1H), 7.30 (dd, J = 7.6, 4.8 Hz, 1H), 7.22 (s, 1H), 4.03 (dt, J = 14.3, 7.1 Hz, 1H), 3.61 (dq, J = 14.1, 7.1 Hz, 1H), 2.35 (s, 3H), 2.21 (s, 1H), 1.20-1.15 (m, 3H), 1.08 (d, J = 6.4 Hz, 6H).	¹³ C NMR (76 MHz, CDCl ₃) δ 148.36, 146.47, 146.18, 136.36, 132.27, 123.80, 116.23, 44.53, 30.11, 20.70, 19.54, 12.97, 12.45.
18			ESIMS m/z 305 ([M + H] ⁺)	¹ H NMR (301 MHz, CDCl ₃) δ 8.92 (s, 1H), 8.47 (s, 1H), 8.06 (d, J = 7.9 Hz, 1H), 7.31 (dd, J = 7.4, 4.1 Hz, 1H), 7.26-7.23 (m, 1H), 4.06 (dq, J = 14.4, 7.1 Hz, 1H), 3.64 (dq, J = 14.3, 7.2 Hz, 1H), 2.75 (t, J = 6.7 Hz, 2H), 2.38 (s, 3H), 2.26 (dd, J = 13.5, 6.7 Hz, 2H), 2.01 (s, 3H), 1.19 (t, J = 7.5 Hz, 3H).	¹³ C NMR (76 MHz, CDCl ₃) δ 171.98, 148.24, 146.28, 146.10, 136.77, 132.45, 129.43, 123.89, 116.06, 44.51, 32.22, 29.39, 16.31, 12.90, 12.49.
19			ESIMS m/z 287 ([M + H] ⁺)	¹ H NMR (300 MHz, CDCl ₃) δ 8.95 (s, 1H), 8.50 (s, 1H), 8.08 (d, J = 7.8 Hz, 1H), 7.32 (t, J = 6.0 Hz, 1H), 7.21 (s, 1H), 4.05 (dd, J = 13.9, 7.0 Hz, 1H), 3.65 (dd, J = 14.0, 7.0 Hz, 1H), 2.37 (s, 3H), 1.96 (s, 2H), 1.59 (t, J = 7.3 Hz, 2H), 1.25-1.16 (m, 5H), 0.85 (t, J = 7.2 Hz, 3H).	¹³ C NMR (76 MHz, CDCl ₃) δ 148.26, 146.37, 146.12, 132.35, 123.88, 115.97, 44.36, 31.88, 30.03, 26.93, 22.64, 14.16, 12.98, 12.48.
20			ESIMS m/z 299 ([M + H] ⁺)	¹ H NMR (300 MHz, CDCl ₃) δ 8.92 (s, 1H), 8.47 (s, 1H), 8.05 (d, J = 7.4 Hz, 1H), 7.26 (s, 2H), 3.79-3.61 (m, 1H), 3.55 (dd, J = 14.1, 7.2 Hz, 1H), 2.37 (s, 3H), 2.25 (s, 1H), 1.08 (d, J = 5.9 Hz, 6H), 0.92 (s, 1H), 0.51 (d, J = 7.5 Hz, 2H), 0.14 (d, J = 3.9 Hz, 2H).	¹³ C NMR (76 MHz, CDCl ₃) δ 148.32, 146.47, 136.48, 132.20, 129.47, 123.78, 116.11, 53.77, 30.00, 20.76, 19.52, 12.49, 9.25, 4.38, 3.73.

55

TABLE 2-continued

Analytical Data					
Compound No.	MP (° C.)	IR (cm ⁻¹)	Mass	¹ H NMR	¹³ C NMR
21			ESIMS m/z 331 ([M + H] ⁺).	¹ H NMR (300 MHz, CDCl ₃) δ 8.95 (s, 1H), 8.50 (s, 1H), 8.09 (d, J = 7.9 Hz, 1H), 7.30 (s, 2H), 3.82-3.67 (m, 1H), 3.67-3.53 (m, 1H), 2.78 (t, J = 6.9 Hz, 2H), 2.42 (s, 3H), 2.31 (t, J = 6.8 Hz, 2H), 2.04 (s, 3H), 0.95 (dd, J = 9.8, 5.2 Hz, 1H), 0.55 (d, J = 7.8 Hz, 2H), 0.19 (t, J = 3.9 Hz, 2H).	¹³ C NMR (76 MHz, CDCl ₃) δ 172.12, 148.48, 146.53, 146.29, 136.78, 132.21, 129.33, 123.67, 115.82, 53.83, 32.19, 29.41, 16.32, 12.56, 9.23, 4.44, 3.89.
22			ESIMS m/z 277 ([M + H] ⁺).	¹ H NMR (300 MHz, CDCl ₃) δ 8.73 (s, 1H), 8.34 (d, J = 2.3 Hz, 1H), 7.82 (ddd, J = 9.6, 2.7, 1.7 Hz, 1H), 7.30 (s, 1H), 3.38 (s, 3H), 2.37 (s, 3H), 2.17-1.94 (m, 1H), 1.10 (d, J = 6.5 Hz, 6H).	¹³ C NMR (76 MHz, CDCl ₃) δ 146.17, 142.30, 136.75, 136.43, 119.19, 118.93, 115.93, 37.40, 29.77, 29.60, 20.49, 19.41, 12.06.
23			ESIMS m/z 309 ([M + H] ⁺).	¹ H NMR (300 MHz, CDCl ₃) δ 8.74 (s, 1H), 8.35 (s, 1H), 7.81 (d, J = 9.3 Hz, 1H), 7.32 (s, 1H), 3.39 (s, 3H), 2.77 (t, J = 6.8 Hz, 2H), 2.39 (s, 3H), 2.30 (dt, J = 13.9, 6.8 Hz, 2H), 2.03 (s, 3H).	¹³ C NMR (76 MHz, CDCl ₃) δ 161.87, 158.47, 145.96, 142.37, 136.90, 136.58, 119.19, 118.94, 115.66, 37.25, 31.88, 29.30, 16.21, 12.13.
24			ESIMS m/z 291 ([M + H] ⁺).	¹ H NMR (300 MHz, CDCl ₃) δ 8.75 (s, 1H), 8.36 (s, 1H), 7.83 (d, J = 9.3 Hz, 1H), 7.26 (s, 1H), 4.06 (dq, J = 14.1, 7.1 Hz, 2H), 3.63 (dq, J = 14.2, 7.2 Hz, 2H), 2.37 (s, 3H), 2.29-2.14 (m, 1H), 1.20 (t, J = 7.2 Hz, 3H), 1.10 (d, J = 6.4 Hz, 6H).	¹³ C NMR (76 MHz, CDCl ₃) δ 177.82, 146.53, 142.21, 136.64, 136.33, 119.24, 118.98, 117.05, 44.55, 30.24, 30.10, 20.76, 19.60, 13.08, 12.50.
25			ESIMS m/z 323 ([M + H] ⁺).	¹ H NMR (300 MHz, CDCl ₃) δ 8.73 (s, 1H), 8.35 (s, 1H), 7.82 (d, J = 9.6 Hz, 1H), 7.29 (s, 1H), 4.08 (dq, J = 14.0, 7.0 Hz, 1H), 3.66 (dq, J = 14.1, 7.1 Hz, 1H), 2.76 (t, J = 6.9 Hz, 2H), 2.39 (s, 3H), 2.26 (br s, 2H), 2.03 (s, 3H), 1.20 (t, J = 7.2 Hz, 3H).	¹³ C NMR (76 MHz, CDCl ₃) δ 171.95, 146.41, 142.25, 136.65, 136.45, 119.12, 118.91, 116.81, 44.54, 32.20, 29.46, 16.31, 13.00, 12.58, 7.71.
26			ESIMS m/z 317 ([M + H] ⁺).	¹ H NMR (300 MHz, CDCl ₃) δ 8.74 (s, 1H), 8.34 (s, 1H), 7.83 (d, J = 9.4 Hz, 1H), 7.32 (s, 1H), 3.82-3.66 (m, 1H), 3.64-3.48 (m, 1H), 2.39 (s, 3H), 2.26 (br s, 1H), 1.10 (d, J = 6.4 Hz, 6H), 0.92 (t, J = 13.1, 6.3 Hz, 1H), 0.53 (d, J = 7.7 Hz, 2H), 0.16 (t, J = 4.1 Hz, 2H).	¹³ C NMR (76 MHz, CDCl ₃) δ 170.65, 154.09, 146.75, 142.12, 136.49, 136.20, 135.22, 131.18, 119.25, 118.99, 116.98, 29.99, 20.83, 19.60, 12.54, 9.34, 4.49, 3.81.
27			ESIMS m/z 349 ([M + H] ⁺).	¹ H NMR (300 MHz, CDCl ₃) δ 8.74 (s, 1H), 8.36 (d, J = 2.6 Hz, 1H), 7.84 (dt, J = 9.6, 2.4 Hz, 1H), 7.34 (s, 1H), 3.76 (dd, J = 14.4, 7.4 Hz, 1H), 3.65-3.53 (m, 1H), 2.78 (t, J = 6.9 Hz, 2H), 2.42 (s, 3H), 2.37-2.23 (m, 2H), 2.05 (s, 3H), 1.03-0.88 (m, 1H), 0.55 (d, J = 7.4 Hz, 2H), 0.18 (t, J = 3.9 Hz, 2H).	¹³ C NMR (76 MHz, CDCl ₃) δ 171.95, 161.77, 158.29, 146.73, 142.14, 136.60, 136.30, 131.17, 119.27, 119.01, 116.71, 53.82, 32.28, 30.11, 29.47, 16.44, 12.58, 9.29, 4.53, 3.89.

56

TABLE 2-continued

Analytical Data					
Compound No.	MP (° C.)	IR (cm ⁻¹)	Mass	HNMR	CNMR
28			ESIMS m/z 305 ([M + H] ⁺).	¹ H NMR (300 MHz, CDCl ₃) δ 8.97 (s, 1H), 8.52 (s, 1H), 8.11 (t, J = 7.1 Hz, 1H), 7.48 (s, 0.5H), 7.36 (s, 1H), 7.29 (s, 0.5H), 3.42 (s, 3H), 2.95-2.80 (m, 1H), 2.54-2.43 (m, 2H), 2.41 (s, 3H), 2.00 (d, J = 13.3 Hz, 3H), 1.16 (t, J = 7.2 Hz, 3H).	¹³ C NMR (76 MHz, CDCl ₃) δ 176.76, 148.16, 146.21, 132.54, 116.13, 115.28, 39.07, 38.18, 37.55, 36.55, 35.41, 19.62, 18.68, 16.90, 12.32.
29			ESIMS m/z 319 ([M + H] ⁺).	¹ H NMR (300 MHz, CDCl ₃) δ 8.91 (s, 1H), 8.45 (d, J = 4.5 Hz, 1H), 8.12-7.99 (m, 1H), 7.42 (s, 0.5H), 7.30 (d, J = 5.6 Hz, 1H), 7.26 (s, 0.5H), 4.11 (dd, J = 13.8, 6.9 Hz, 1H), 3.57 (dq, J = 13.8, 6.9 Hz, 1H), 2.95-2.73 (m, 1H), 2.55-2.42 (m, 2H), 2.36 (s, 3H), 1.95 (d, J = 14.8 Hz, 3H), 1.30-1.01 (m, 6H).	¹³ C NMR (76 MHz, CDCl ₃) δ 176.42, 148.08, 146.08, 132.32, 123.96, 117.37, 116.50, 44.77, 40.20, 39.12, 38.11, 35.56, 18.63, 16.84, 12.95, 12.45.
30			ESIMS m/z 333 ([M + H] ⁺).	¹ H NMR (301 MHz, CDCl ₃) δ 8.92 (s, 1H), 8.46 (d, J = 4.1 Hz, 1H), 8.05 (d, J = 7.9 Hz, 1H), 7.37 (s, 1H), 7.32-7.27 (m, 1H), 4.13 (dq, J = 14.3, 7.2 Hz, 1H), 3.39 (dq, J = 14.1, 7.1 Hz, 1H), 2.81 (d, J = 12.6 Hz, 1H), 2.58 (d, J = 12.6 Hz, 1H), 2.42 (s, 3H), 2.12 (s, 3H), 1.17 (t, J = 7.2 Hz, 3H), 1.09 (d, J = 6.8 Hz, 6H).	¹³ C NMR (76 MHz, CDCl ₃) δ 175.70, 148.33, 146.93, 146.46, 136.00, 132.29, 123.83, 117.50, 48.08, 47.85, 46.66, 30.08, 26.45, 25.95, 18.42, 13.04, 12.70.
31			ESIMS m/z 245 ([M + H] ⁺).	¹ H NMR (300 MHz, CDCl ₃) δ 8.98 (s, 1H), 8.52 (s, 1H), 8.11 (d, J = 7.3 Hz, 1H), 7.33 (d, J = 7.7 Hz, 1H), 7.30 (s, 1H), 4.04 (t, J = 6.5 Hz, 1H), 3.68 (dd, J = 13.5, 6.6 Hz, 1H), 2.40 (s, 3H), 1.87 (s, 3H), 1.23 (d, J = 6.2 Hz, 3H).	¹³ C NMR (76 MHz, CDCl ₃) δ 172.33, 171.04, 148.26, 146.35, 145.86, 132.37, 123.82, 115.86, 44.22, 20.66, 12.96, 12.46, 7.78.
32			ESIMS m/z 359 ([M + H] ⁺).	¹ H NMR (301 MHz, CDCl ₃) δ 8.91 (s, 1H), 8.44 (s, 1H), 8.05 (dt, J = 7.9, 1.8 Hz, 1H), 7.41 (s, 1H), 7.32-7.24 (m, 1H), 3.84 (dd, J = 14.1, 7.2 Hz, 1H), 3.33 (dd, J = 14.1, 7.2 Hz, 1H), 2.81 (d, J = 12.7 Hz, 1H), 2.57 (d, J = 12.6 Hz, 1H), 2.43 (s, 3H), 2.11 (s, 3H), 1.10 (d, J = 8.5 Hz, 6H), 0.89 (ddd, J = 12.1, 7.4, 2.6 Hz, 1H), 0.48 (ddd, J = 7.7, 4.1, 2.6 Hz, 2H), 0.10 (dt, J = 6.5, 3.1 Hz, 2H).	¹³ C NMR (76 MHz, CDCl ₃) δ 175.95, 172.32, 148.33, 147.19, 146.48, 135.89, 132.21, 123.82, 117.54, 56.75, 48.14, 46.84, 26.53, 25.98, 18.43, 13.15, 8.98, 4.64, 3.78.
33			ESIMS m/z 271 ([M + H] ⁺).	¹ H NMR (300 MHz, CDCl ₃) δ 8.97 (s, 1H), 8.52 (s, 1H), 8.10 (d, J = 7.9 Hz, 1H), 7.34-7.32 (m, 1H), 7.31 (s, 1H), 3.85-3.67 (m, 1H), 3.67-3.54 (m, 1H), 2.43 (s, 3H), 1.89 (s, 3H), 0.96 (ddd, J = 12.4, 7.7, 4.8 Hz, 1H), 0.56 (d, J = 7.8 Hz, 2H), 0.20 (t, J = 4.6 Hz, 2H).	¹³ C NMR (76 MHz, CDCl ₃) δ 171.14, 148.35, 146.48, 146.24, 136.66, 132.28, 123.77, 115.45, 53.57, 20.63, 12.57, 9.77, 9.33, 4.45, 3.94.

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TABLE 2-continued

Analytical Data					
Compound No.	MP (° C.)	IR (cm ⁻¹)	Mass	¹ H NMR	¹³ C NMR
34			ESIMS m/z 323 ([M + H] ⁺).	¹ H NMR (300 MHz, CDCl ₃) δ 8.75 (s, 1H), 8.37 (s, 1H), 7.91-7.75 (m, 1H), 7.52 (s, 0.5H), 7.32 (s, 0.5H), 3.42 (s, 3H), 2.99-2.79 (m, 1H), 2.55-2.44 (m, 2H), 2.42 (s, 3H), 2.02 (d, J = 12.8 Hz, 3H), 1.17 (t, J = 6.7 Hz, 3H).	¹³ C NMR (76 MHz, CDCl ₃) δ 176.70, 145.86, 142.09, 136.74, 119.18, 116.83, 115.94, 39.07, 38.17, 37.62, 36.60, 35.47, 32.32, 23.11, 18.71, 16.87, 12.27.
35			ESIMS m/z 337 ([M + H] ⁺).	¹ H NMR (301 MHz, CDCl ₃) δ 8.74 (s, 1H), 8.35 (d, J = 2.1 Hz, 1H), 7.83 (dt, J = 9.6, 2.2 Hz, 1H), 7.45 (s, 1H), 3.36 (s, 3H), 2.83-2.77 (m, 1H), 2.69-2.60 (m, 1H), 2.46 (s, 3H), 2.16 (s, 3H), 1.16 (d, J = 7.4 Hz, 6H).	¹³ C NMR (76 MHz, CDCl ₃) δ 176.01, 146.99, 142.17, 136.61, 136.30, 119.27, 119.01, 116.89, 47.91, 46.59, 45.63, 40.80, 30.10, 26.52, 25.98, 25.23, 18.42, 12.73.
36			ESIMS m/z 337 ([M + H] ⁺).	¹ H NMR (300 MHz, CDCl ₃) δ 8.74 (s, 1H), 8.33 (s, 1H), 7.80 (d, J = 8.5 Hz, 1H), 7.47 (s, 0.5H), 7.28 (s, 0.5H), 4.21-3.98 (m, 1H), 3.57 (dd, J = 13.3, 6.7 Hz, 1H), 2.85 (dq, J = 23.7, 13.2, 11.6 Hz, 1H), 2.47-2.43 (m, 2H), 2.37 (s, 3H), 1.96 (d, J = 14.0 Hz, 3H), 1.24-1.01 (m, 6H).	¹³ C NMR (76 MHz, CDCl ₃) δ 176.30, 146.93, 146.29, 141.89, 136.15, 135.01, 118.99, 118.14, 117.23, 44.78, 39.11, 38.08, 36.83, 35.63, 18.66, 16.84, 12.84, 12.40.
37			ESIMS m/z 351 ([M + H] ⁺).	¹ H NMR (300 MHz, CDCl ₃) δ 8.77 (s, 1H), 8.36 (s, 1H), 7.85 (d, J = 9.5 Hz, 1H), 7.43 (s, 1H), 4.16 (dq, J = 14.3, 7.2 Hz, 1H), 3.44 (dq, J = 14.1, 7.1 Hz, 1H), 2.83 (d, J = 12.7 Hz, 1H), 2.62 (d, J = 12.7 Hz, 1H), 2.45 (s, 3H), 2.16 (s, 3H), 1.20 (t, J = 7.2 Hz, 3H), 1.14 (d, J = 2.7 Hz, 6H).	¹³ C NMR (76 MHz, CDCl ₃) δ 175.61, 147.23, 142.17, 136.65, 136.23, 134.79, 119.21, 118.84, 118.27, 48.07, 47.85, 46.68, 26.41, 26.06, 18.44, 13.01, 12.73.
38			ESIMS m/z 377 ([M + H] ⁺).	¹ H NMR (300 MHz, CDCl ₃) δ 8.77 (s, 1H), 8.36 (s, 1H), 7.91-7.74 (m, 1H), 7.49 (s, 1H), 3.89 (dd, J = 14.1, 7.2 Hz, 1H), 3.38 (dd, J = 14.2, 7.2 Hz, 1H), 2.90-2.80 (m, 1H), 2.68-2.58 (m, 1H), 2.47 (s, 3H), 2.16 (s, 3H), 1.15 (d, J = 4.7 Hz, 6H), 0.93 (tdd, J = 12.2, 6.1, 2.6 Hz, 1H), 0.53 (dd, J = 7.8, 3.5 Hz, 2H), 0.14 (dd, J = 7.9, 3.7 Hz, 2H).	¹³ C NMR (76 MHz, CDCl ₃) δ 175.83, 147.51, 142.19, 136.50, 136.19, 134.60, 119.13, 118.94, 118.23, 56.80, 48.07, 46.86, 26.50, 26.06, 18.45, 13.11, 8.98, 4.65, 3.78.
39	129-131		ESIMS m/z 237 ([M + H] ⁺).	¹ H NMR (300 MHz, CDCl ₃) δ 10.68 (s, 1H), 8.80 (s, 1H), 8.43 (s, 1H), 8.01 (d, J = 7.5 Hz, 1H), 7.33 (s, 2H), 2.20 (s, 3H).	
40			ESIMS m/z 289 ([M + H] ⁺).	¹ H NMR (400 MHz, CD ₃ CN) δ 9.00 (d, J = 2.5 Hz, 1H), 8.46 (d, J = 4.8 Hz, 1H), 8.11 (m, 1H), 7.67 (d, J = 1.3 Hz, 1H), 7.61 (d, J = 1.2 Hz, 1H), 7.36 (m, 1H), 3.76 (q, J = 7.1 Hz, 2H), 1.45 (s, 9H), 1.17 (t, J = 7.2 Hz, 3H).	

TABLE 2-continued

Analytical Data					
Compound No.	MP (° C.)	IR (cm ⁻¹)	Mass	HNMR	CNMR
41			ESIMS m/z 323 ([M + H] ⁺)	¹ H NMR (600 MHz, CDCl ₃) δ 8.92 (d, J = 1.6 Hz, 1H), 8.50 (dd, J = 4.8, 1.5 Hz, 1H), 8.06 (dt, J = 7.9, 2.0 Hz, 1H), 7.33-7.27 (m, 2H), 3.89 (dq, J = 14.5, 7.3 Hz, 1H), 3.68 (dq, J = 14.3, 7.2 Hz, 1H), 1.44 (s, 9H), 1.22 (t, J = 7.2 Hz, 3H).	¹³ C NMR (151 MHz, CDCl ₃) δ 152.90, 148.47, 146.02, 136.07, 134.08, 131.81, 128.79, 123.36, 117.66, 83.23, 45.32, 28.04, 13.03.

TABLE 3

MYZUPE and BEMITA Rating Table GPA and BEMITA Rating Table	
% Control (or Mortality)	Rating
80-100	A
More than 0-Less than 80	B
Not Tested	C
No activity noticed in this bioassay	D

TABLE 4

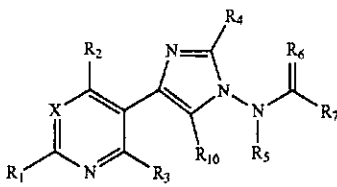
Biological Data for MYZUPE and BEMITA		
Compound No.	MYZUPE % Ctrl @ 200 ppm	BEMITA % Ctrl @ 200 ppm
1	B	B
2	B	D
3	B	B
4	D	B
5	A	A
6	B	A
7	B	A
8	B	A
9	B	A
10	B	A
11	B	A
12	D	A
13	D	B
14	D	D
15	B	A
16	D	D
17	B	B
18	A	A
19	B	A
20	B	D
21	B	A
22	B	A
23	A	A
24	B	B
25	B	A
26	B	B
27	B	A
28	C	C
29	C	C
30	C	C
31	C	C
32	C	C
33	C	C
34	C	C
35	C	C
36	C	C
37	C	C

TABLE 4-continued

Biological Data for MYZUPE and BEMITA		
Compound No.	MYZUPE % Ctrl @ 200 ppm	BEMITA % Ctrl @ 200 ppm
38	C	C
39	C	C
40	C	C
41	B	A

We claim:

1. A composition comprising a molecule according to Formula One:



wherein

- (a) X is CR8;
 - (b) R1 is H;
 - (c) R2 is H;
 - (d) R3 is H
 - (e) R4 is H, F, Cl, Br, I, or unsubstituted C₁-C₆ alkyl;
 - (f) R5 is H, substituted or unsubstituted C₁-C₆ alkyl wherein said substituted C₁-C₆ alkyl has a C₃-C₁₀ cycloalkyl;
 - (g) R6 is O;
 - (h) R7 is substituted or unsubstituted C₁-C₆ alkyl OR9 R9S(O)_nR9, wherein each said R7, which is substituted, has one or more substituents selected from F, Cl, Br, or I;
 - (i) R8 is H, F, Cl, Br, or I;
 - (j) R9 (each independently) is unsubstituted C₁-C₆ alkyl;
 - (k) R10 is H or unsubstituted C₁-C₆ alkyl; and
 - (l) n is (each independently) 0.
2. A composition according to claim 1 wherein said molecule said R4 is F, Cl, or unsubstituted C₁-C₂ alkyl.
3. A composition according to claim 1 wherein said molecule said R4 is Cl, or CH₃.
4. A composition according to claim 1 wherein said molecule said R5 is H, CH₃, CH₂-cyclopropyl, or CH₂CH₃.

5a

US 8,680,121 B2

71

5. A composition according to claim 1 wherein said molecule said R7 is a substituted C₁-C₆ alkyl wherein said substituent is one or more F or Cl or a combination thereof.
6. A composition according to claim 1 wherein said molecule said R7 is a substituted C₁-C₆ alkyl wherein said substituent is one or more F.
7. A composition according to claim 1 wherein said molecule said R7 is CH₂CF₃.
8. A composition according to claim 1 wherein said molecule said R7 is a unsubstituted C₁-C₆ alkyl.
9. A composition according to claim 1 wherein said molecule said R7 is CH(CH₃)₂, CH₃, C(CH₃)₃, or CH₂CH₂CH₂CH₃.
10. A composition according to claim 1 wherein said molecule said R7 is OR9.
11. A composition according to claim 1 wherein said molecule said R7 is O (unsubstituted C₁-C₆ alkyl).
12. A composition according to claim 1 wherein said molecule said R7 is OC(OH)₃.
13. A composition according to claim 1 wherein said molecule said R7 is R9S(O)_nR9.
14. A composition according to claim 1 wherein said molecule said R7 is (unsubstituted C₁-C₆ alkyl)S (unsubstituted C₁-C₆ alkyl).
15. A composition according to claim 1 wherein said molecule said R7 is CH₂CH(CH₃)SCH₃, CH₂CH₂SCH₃, CH(CH₃)₂SCH₃, or CH(CH₃)CH₂SCH₃.
16. A composition according to claim 1 wherein said molecule said R8 is H, F, or Cl.
17. A composition according to claim 1 wherein said molecule said R8 is H or F.
18. A composition according to claim 1 wherein said molecule said R10 is H or CH₃.
19. A composition according to claim 1 wherein said molecule is selected from

Compound No.	Structure
1	
2	
3	

72

-continued

Compound No.	Structure
4	
5	
6	
7	
8	
9	
10	

US 8,680,121 B2

73

-continued

Compound No.	Structure
11	
12	
13	
14	
15	
16	
17	

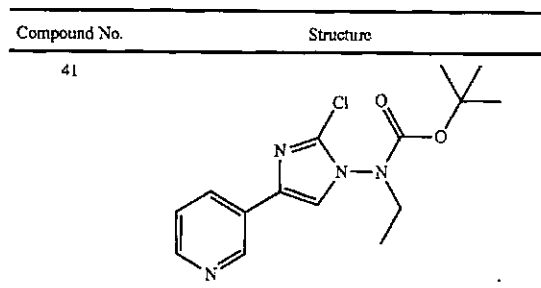
74

-continued

Compound No.	Structure
18	
19	
20	
21	
22	
23	

US 8,680,121 B2

75 -continued		76 -continued	
Compound No.	Structure	Compound No.	Structure
24		5	
25		10	
26		15	
27		20	
28		25	
29		30	
30		35	
		40	
		45	
		50	
		55	
		60	
		65	



20. A composition according to claim 1 further comprising:

(a) one or more compounds having acaricidal, algicidal, avicidal, bactericidal, fungicidal, herbicidal, insecticidal, molluscicidal, nematocidal, rodenticidal, or virucidal properties; or

(b) one or more compounds that are antifeedants, bird repellents, chemosterilants, herbicide safeners, insect attractants, insect repellents, mammal repellents, mating disrupters, plant activators, plant growth regulators, or synergists; or

(c) both (a) and (b).

21. A composition according to claim 1 wherein further comprising one or more compounds selected from: (3-ethoxypropyl)mercury bromide, 1,2-dichloropropane, 1,3-dichloropropane, 1-methylcyclopropane, 1-naphthol, 2-(octylthio)ethanol, 2,3,5-tri-iodobenzoic acid, 2,3,6-TBA, 2,3,6-TBA-dimethylammonium, 2,3,6-TBA-lithium, 2,3,6-TBA-potassium, 2,3,6-TBA-sodium, 2,4,5-T, 2,4,5-T-2-butoxypropyl, 2,4,5-T-2-ethylhexyl, 2,4,5-T-3-butoxypropyl, 2,4,5-TB, 2,4,5-T-butomethyl, 2,4,5-T-butyl, 2,4,5-T-butyl, 2,4,5-T-isobutyl, 2,4,5-T-isooctyl, 2,4,5-T-isopropyl, 2,4,5-T-methyl, 2,4,5-T-pentyl, 2,4,5-T-sodium, 2,4,5-T-triethylammonium, 2,4,5-T-trolamine, 2,4-D, 2,4-D-2-butoxypropyl, 2,4-D-2-ethylhexyl, 2,4-D-3-butoxypropyl, 2,4-D-ammonium, 2,4-DB, 2,4-DB-butyl, 2,4-DB-dimethylammonium, 2,4-DB-isooctyl, 2,4-DB-potassium, 2,4-DB-sodium, 2,4-D-butyl, 2,4-D-butyl, 2,4-D-diethylammonium, 2,4-D-dimethylammonium, 2,4-D-dioliamine, 2,4-D-dodecylammonium, 2,4-DEB, 2,4-DEP, 2,4-D-ethyl, 2,4-D-heptylammonium, 2,4-D-isobutyl, 2,4-D-isooctyl, 2,4-D-isopropyl, 2,4-D-isopropylammonium, 2,4-D-lithium, 2,4-D-meptyl, 2,4-D-methyl, 2,4-D-octyl, 2,4-D-pentyl, 2,4-D-potassium, 2,4-D-propyl, 2,4-D-sodium, 2,4-D-terfuryl, 2,4-D-tetradecylammonium, 2,4-D-triethylammonium, 2,4-D-tris(2-hydroxypropyl)ammonium, 2,4-D-trolamine, 2iP, 2-methoxyethylmercury chloride, 2-phenylphenol, 3,4-DA, 3,4-DB, 3,4-DP, 4-aminopyridine, 4-CPA, 4-CPA-potassium, 4-CPA-sodium, 4-CPB, 4-CPP, 4-hydroxyphenethyl alcohol, 8-hydroxyquinoline sulfate, 8-phenylmercurioxyquinoline, abamectin, abscisic acid, ACC, acephate, acequinocyl, acetamiprid, acethion, acetochlor, acetophos, acetoprole, acibenzolar, acibenzolar-S-methyl, acifluorfen, acifluorfen-methyl, acifluorfen-sodium, acionifen, acrep, acrinathrin, acrolein, acrylonitrile, acypetacs, acypetacs-copper, acypetacs-zinc, alachlor, alany-carb, albandazole, aldicarb, aldimorph, aldoxycarb, aldrin, allethrin, allicin, alldochlor, allosamidin, alloxymid, alloxymid-sodium, allyl alcohol, allylcarb, alorac, alpha-cypermethrin, alpha-endosulfan, ametocradin, ametridione, ametryn, amibuzin, amicarbazone, amicarbazol, amidithion, amidoflomet, amidosulfuron, aminocarb, aminocyclopyrachlor, aminocyclopyrachlor-methyl, aminocyclopyrachlor-potassium, aminopyralid, aminopyralid-potas-

sium, aminopyralid-tris(2-hydroxypropyl)ammonium, amiprofos-methyl, amiprofos, amisulbrom, amiton, amiton oxalate, amitraz, amitrole, ammonium sulfate, ammonium alpha-naphthaleneacetate, amobam, ampropylfos, anabasine, ancymidol, anilazine, anilosfos, anisuron, anthraquinone, antu, apholate, aramite, arsenous oxide, asomate, aspirin, asulam, asulam-potassium, asulam-sodium, athidathion, atraton, atrazine, aureofungin, aviglycine, aviglycine hydrochloride, azaconazole, azadirachtin, azafenidin, azame-thiphos, azimsulfuron, azinphos-ethyl, azinphos-methyl, aziprotryne, azithiram, azobenzene, azocyclotin, azothoate, azoxystrobin, bachmedesh, barban, barium hexafluorsilicate, barium polysulfide, barthrin, BCPC, beflubutamid, benalaxyl, benalaxyl-M, benazolin, benazolin-dimethylammonium, benazolin-ethyl, benazolin-potassium, bencazone, benclorhiaz, bendiocarb, benfluralin, benfuracarb, benfuresate, benodanil, benomyl, benoxacor, benoxafos, benquinox, bensulfuron, bensulfuron-methyl, bensulide, bencultap, bentazone, bentazone-sodium, benthiavalicarb, benthiavalicarb-isopropyl, benthiazole, bentranil, benzadox, benzadox-ammonium, benzalkonium chloride, benzamacril, benzamacril-isobutyl, benzamorf, benzendazole, benzipram, benzobicyclon, benzofenap, benzoifluor, benzohydroxamic acid, benzoximate, benzoyl-prop, benzoylprop-ethyl, benzthiazuron, benzyl benzoate, benzyladenine, berberine, berberine chloride, beta-cyfluthrin, beta-cypermethrin, bethoxazin, bicyclopyrone, bifentazate, bifentox, bifenthrin, bifujunzhi, bilanafos, bilanafos-sodium, binapacryl, bingqingxiao, bioallethrin, bioethanomethrin, biopernethrin, bioresmethrin, biphenyl, bisazir, bismethiazol, bispyribac, bispyribac-sodium, bistrifluoron, biteranol, bithionol, bixafen, blasticidin-S, borax, Bordeaux mixture, boric acid, boscalid, brassinolide, brassinolide-ethyl, brevicomin, brodifacoum, brofenvalerate, brofluthrin, bromacil, bromacil-lithium, bromacil-sodium, bromadiolone, bromethalin, bromethrin, bromfenavinfos, bromoacetamide, bromobonil, bromobutide, bromocyclen, bromo-DDT, bromofenoxim, bromophos, bromophos-ethyl, bromopropylate, bromothalonil, bromoxynil, bromoxynil butyrate, bromoxynil heptanoate, bromoxynil octanoate, bromoxynil-potassium, brompyrazon, bromuconazole, bromopol, bucarpolate, bufencarb, buminafos, bupirimate, buprofezin, Burgundy mixture, busulfan, butacarb, butachlor, butafenacil, butamifos, butathiofos, butenachlor, butethrin, buthidazole, buthiobate, buthiuron, butocarboxim, butonate, butopyronoxyl, butoxycarboxim, butralin, butoxydim, buturon, butylamine, butylate, cacodylic acid, cadusafos, cafens-trole, calcium arsenate, calcium chlorate, calcium cyanamide, calcium polysulfide, calvinphos, cambendichlor, camphechlor, camphor, captafol, captan, carbamorph, carbanolate, carbaryl, carbasulam, carbendazim, carbendazim benzenesulfonate, carbendazim sulfite, carbetamide, carbofuran, carbon disulfide, carbon tetrachloride, carbophenothion, carbosulfan, carboxazole, carboxide, carboxin, carfentrazone, carfentrazone-ethyl, carpropamid, cartap, cartap hydrochloride, carvacrol, carvone, CDEA, cellocidin, CEPC, ceralure, Cheshunt mixture, chinomethionat, chitosan, chlobenthiazole, chlomeoxyfen, chloralose, chloramben, chloramben-ammonium, chloramben-diolamine, chloramben-methyl, chloramben-methylammonium, chloramben-sodium, chloramine phosphorus, chloramphenicol, chloraniformethan, chloranil, chloranocryl, chlorantraniliprole, chlorazifop, chlorazifop-propargyl, chlorazine, chlorbenside, chlorbenzuron, chlorbicyclon, chlorbromuron, chlorbufam, chlordan, chlordane, chlordimeform, chlordimeform hydrochloride, chlormepenthrin, chlorthoxyfos, chloreturon, chlorfenac, chlorfenac-ammonium, chlorfenac-

sodium, chlorfenapyr, chlorfenazole, chlorfenethol, chlorfenprop, chlorfenson, chlorfensulphide, chlorfenvinphos, chlorfluazuron, chlorflurazole, chlorfluren, chlorfluren-methyl, chlorflurenol, chlorflurenol-methyl, chloridazon, chlorimuron, chlorimuron-ethyl, chlormephos, chlormequat, chlormequat chloride, chlormidine, chlormitofen, chlorobenzilate, chlorodinitronaphthalenes, chloroform, chloromebuthion, chloromethiuron, chloroneb, chlorophacinone, chlorophacinone-sodium, chloropicrin, chloropon, chloropropylate, chlorothalonil, chlorotoluron, chloroxuron, chloroxylin, chlorphonium, chlorphonium chloride, chlorphoxim, chlorprazophos, chlorprocarb, chlorpropham, chlorpyrifos, chlorpyrifos-methyl, chlorquinox, chlorsulfuron, chlorthal, chlorthal-dimethyl, chlorthal-monomethyl, chlorthiamid, chlorthiophos, chlozolate, choline chloride, chromafenozide, cinerin I, cinerin II, cinerins, cinidon-ethyl, cismethrin, cinosulfuron, ciobutide, cisanilide, cismethrin, clethodim, climebuzole, cliodinate, clodinafop, clodinafop-propargyl, cloethocarb, clofencet, clofencet-potassium, clofentezine, clofibric acid, clofop, clofop-isobutyl, clomazone, clomeprop, cloprop, cloproxydim, clopyralid, clopyralid-methyl, clopyralid-olamine, clopyralid-potassium, clopyralid-tris(2-hydroxypropyl)ammonium, cloquintocet, cloquintocet-methyl, cloransulam, cloransulam-methyl, clorantel, clothianidin, clotrimazole, cloxyfop, cloxyfop-sodium, CMA, codlure, colophonate, copper acetate, copper acetoarsenite, copper arsenate, copper carbonate, basic, copper hydroxide, copper naphthenate, copper oleate, copper oxychloride, copper silicate, copper sulfate, copper zinc chromate, coumachlor, coumafuryl, coumaphos, coumatetril, coumthioate, coumoxystrobin, CPMC, CPMF, CPPC, creazine, cresol, crimidine, crotamiton, crotoxyphos, cruformate, cryolite, cue-lure, cufraneb, cumyluron, cuprobam, cuprous oxide, curcumenol, cyanamide, cyanatrin, cyanazine, cyanofenphos, cyanophos, cyanthoate, cyantraniliprole, cyazofamid, cybutryne, cyclafuramid, cyclanilide, cyclothrin, cycloate, cycloheximide, cycloprate, cycloprothrin, cyclosulfamuron, cycloxydim, cycluron, cyenopyrafen, cyflufenamid, cyflumetofen, cyfluthrin, cyhalofop, cyhalofop-butyl, cyhalothrin, cyhexatin, cymiazole, cymiazole hydrochloride, cymoxanil, cyometrinil, cypendazole, cypermethrin, cyperquat, cyperquat chloride, cyphenothrin, cyprazine, cyprazole, cyproconazole, cyprodinil, cyproflum, cypromid, cyprosulfamide, cyromazine, cythioate, daimuron, dalapon, dalapon-calcium, dalapon-magnesium, dalapon-sodium, daminozide, dayoutong, dazomet, dazomet-sodium, DBCP, d-camphor, DCIP, DCPTA, DDT, debacarb, decapentin, decarbofuran, dehydroacetic acid, delachlor, deltamethrin, demephion, demephion-O, demephion-S, demeton, demeton-methyl, demeton-O, demeton-O-methyl, demeton-S, demeton-S-methyl, demeton-S-methylsulphon, desmedipham, desmetryn, d-fanshiliuquebingjuzhi, diafenthuron, dialifos, di-allate, diamidafos, diatomaceous earth, diazinon, dibutyl phthalate, dibutyl succinate, dicamba, dicamba-diglycolamine, dicamba-dimethylammonium, dicamba-diolamine, dicamba-isopropylammonium, dicamba-methyl, dicamba-olamine, dicamba-potassium, dicamba-sodium, dicamba-trolamine, dicapthion, dichlobenil, dichlofenthion, dichlofluanid, dichlone, dichloralurea, dichlorbenzuron, dichlorflurenol, dichlorflurenol-methyl, dichlormate, dichlormid, dichlorophen, dichlorprop, dichlorprop-2-ethylhexyl, dichlorprop-butyl, dichlorprop-dimethylammonium, dichlorprop-ethylammonium, dichlorprop-isocetyl, dichlorprop-methyl, dichlorprop-P, dichlorprop-P-2-ethylhexyl, dichlorprop-P-dimethylammonium, dichlorprop-potassium, dichlorprop-sodium, dichlorvos, dichlozoline, diclobutrazol,

diclocymet, diclofop, diclofop-methyl, diclomezine, diclomezine-sodium, dicloran, diclosulam, dicofol, dicoumarol, dicresyl, dicrotophos, dicyclanil, dicyclonon, dieldrin, dienochlor, diethamquat, diethamquat dichloride, diethatyl, diethatyl-ethyl, diethofencarb, dietholate, diethyl pyrocarbonate, diethyltoluamide, difenacoum, difenoconazole, difenopenten, difenopenten-ethyl, difenoxuron, difenzoquat, difenzoquat metilsulfate, difethialone, diflovidazin, diflubenzuron, diflufenican, diflufenzopyr, diflufenzopyr-sodium, diflumetorim, dikegulac, dikogulac-sodium, dilor, dimatif, dimefuthrin, dimefox, dimefuron, dimepiperate, dimetachlone, dimetan, dimethacarb, dimethachlor, dimethametryn, dimethenamid, dimethenamid-P, dimethipin, dimethirimol, dimethoate, dimethomorph, dimethrin, dimethyl carbate, dimethyl phthalate, dimethylvinphos, dimetilan, dimexano, dimidazon, dimoxystrobin, dinex, dinex-dicexine, dingjunczuo, diniconazole, diniconazole-M, dinitramine, dinobuton, dinocap, dinocap-4, dinocap-6, dinoceton, dinofenate, dinopenton, dinoprop, dinosam, dinoseb, dinoseb acetate, dinoseb-ammonium, dinoseb-diolamine, dinoseb-sodium, dinoseb-trolamine, dinosulfon, dinotefuran, dinoterb, dinoterb acetate, dinoterbon, difenolan, dioxabenzofos, dioxacarb, dioxathion, diphacinone, diphacinone-sodium, diphenamid, diphenyl sulfone, diphenylamine, dipropalin, dipropetryn, dipyrithione, diquat, diquat dibromide, disparlure, disul, disulfuram, disulfoton, disul-sodium, ditalimfos, dithianon, dithicofos, dithioether, dithiopyr, diuron, d-limonene, DMPA, DNOC, DNOC-ammonium, DNOC-potassium, DNOC-sodium, dodemorph, dodemorph acetate, dodemorph benzoate, dodicin, dodicin hydrochloride, dodicin-sodium, dodine, dosenapyn, dominicalure, doramectin, drazoxolon, DSMA, dufulin, EBEP, EBP, ecdysterone, edifenphos, eglinazone, eglinazone-ethyl, emamectin, emamectin benzoate, EMPC, empenthrin, endosulfan, endothal, endothal-diammonium, endothal-dipotassium, endothal-disodium, endothion, endrin, enestroburin, EPN, epocholeone, epofenonane, epoxiconazole, eprinomectin, epronaz, EPTC, erbon, ergocalciferol, erlutixiancaaoan, esdepalléthrine, esfenvalerate, esprocarb, etacelasil, etaconazole, etaphos, etem, ethaboxam, ethachlor, ethalfuralin, ethametsulfuron, ethametsulfuron-methyl, ethapochlor, ethephon, ethidimuron, ethiofencarb, ethiolate, ethion, ethiozin, ethiprole, ethirimol, ethoate-methyl, ethofumesate, ethohexadiol, ethoprophos, ethoxyfen, ethoxyfen-ethyl, ethoxyquin, ethoxysulfuron, ethychlozate, ethyl formate, ethyl α -naphthalenecacetate, ethyl-DDD, ethylene, ethylene dibromide, ethylene dichloride, ethylene oxide, ethylcin, ethylmercury 2,3-dihydroxypropyl mercaptide, ethylmercury acetate, ethylmercury bromide, ethylmercury chloride, ethylmercury phosphate, etinofen, etinpromid, etobenzanid, etofenprox, etoxazole, etridiazole, etrimfos, eugenol, EXD, famoxadone, famphur, fenamidone, fenaminosulf, fenamiphos, fenapanil, fenarimol, fenasulam, fenazaflor, fenazaquin, fenbuconazole, fenbutatin oxide, fenchlorazole, fenchlorazole-ethyl, fenchlorphos, fenclorim, fenethiacarb, fenfluthrin, fenfuram, fenhexamid, fenitropan, fenitrothion, fenjuntong, fenobucarb, fenoprop, fenoprop-3-butoxypropyl, fenoprop-butomethyl, fenoprop-butotyl, fenoprop-butyl, fenoprop-isocetyl, fenoprop-methyl, fenoprop-potassium, fenothiocarb, fenoxacrim, fenoxanil, fenoxaprop, fenoxaprop-ethyl, fenoxaprop-P, fenoxaprop-P-ethyl, fenoxasulfone, fenoxycarb, fempiclonil, fempirithrin, fenpropathrin, fenpropidin, fenpropimorph, fenpyrazamine, fenpyroximate, fenridazon, fenridazon-potassium, fenridazon-propyl, fen-sen, fensulfthion, fenteracol, fenthiaprop, fenthiaprop-ethyl, fenthion, fenthion-ethyl, fentin, fentin acetate, fentin chloride, fentin hydroxide, fentrazamide, fentrifanil, fenuron,

fenuron TCA, fenvalerate, ferbam, ferimzone, ferrous sulfate, fipronil, flamprop, flamprop-isopropyl, flamprop-M, flamprop-methyl, flamprop-M-isopropyl, flamprop-M-methyl, flazasulfuron, floucoumafen, flometoquin, flonicamid, florasulam, fluacrypyrim, fluazifop, fluazifop-butyl, fluazifop-methyl, fluazifop-P, fluazifop-P-butyl, fluazinam, fluazolate, fluazuron, flubendiamide, flubenziminc, flucarbazone, flucarbazone-sodium, flucetosulfuron, fluchloralin, flucofuron, flucycloxuron, flucythrinate, fludioxonil, flufenetil, fluensulfone, flufenacet, flufenimer, flufenican, flufenoxuron, flufenprox, flufenpyr, flufenpyr-ethyl, flufiprole, flumethrin, flumetover, flumetralin, flumetsulam, flumezin, flumiclorac, flumiclorac-pentyl, flumioxazin, flumipropyn, flumorph, flumeturon, flupicolide, flupopyram, flurbenside, fluridamid, fluoroacetamide, fluorodifen, fluoroglycofen, fluoroglycofen-ethyl, fluoroimide, fluoromidine, fluoronitrofen, fluothiuuron, fluotrimazole, fluoxastobin, flupoxam, flupropacil, flupropadine, flupropionate, flupropionate-sodium, flupyradifurone, flupyr-sulfuron, flupyr-sulfuron-methyl, flupyr-sulfuron-methyl-sodium, fluquinconazole, flurazole, flurenol, flurenol-butyl, flurenol-methyl, fluridone, fluorchloridone, fluoroxypry, fluoroxypry-butomethyl, fluoroxypry-meptyl, flurprimidol, flursulam, flurtamone, flusilazole, flusulfamide, fluthiacet, fluthiacet-methyl, flutianil, flutolanil, flutriafol, fluvinate, fluxapyroxad, fluxofenim, folpet, fomesafen, fomesafen-sodium, fonofos, foramsulfuron, forchlorfenuron, formaldehyde, formetanate, formetanate hydrochloride, formothion, formiparanate, formiparanate hydrochloride, fosamine, fosamine-ammonium, fosetyl, fosetyl-aluminum, fosmethilan, fospirate, fothiazate, fothietan, frontaline, fuberidazole, fucapir, fucanil, furalaxyl, furamethrin, furametpyr, furathiocarb, furcarbanil, furconazole, furconazole-cis, furethrin, furfural, furilazole, furmecycloz, furophate, furoxyfen, gamma-cyhalothrin, gamma-HCH, genit, gibberellic acid, gibberellins, gliflor, glufosinate, glufosinate-ammonium, glufosinate-P, glufosinate-P-ammonium, glufosinate-P-sodium, glyodin, glyoxime, glyphosate, glyphosate-diammonium, glyphosate-dimethylammonium, glyphosate-isopropylammonium, glyphosate-monoammonium, glyphosate-potassium, glyphosate-sesquisodium, glyphosate-trimesium, glyphosine, gossypure, grandlure, griseofulvin, guazatine, guazatine acetates, halacrinat, halfenprox, halofenozide, halosafen, halosulfuron, halosulfuron-methyl, haloxydine, haloxyfop, haloxyfop-etotyl, haloxyfop-methyl, haloxyfop-P, haloxyfop-P-etotyl, haloxyfop-P-methyl, haloxyfop-sodium, HCH, hemel, hempa, HEOD, heptachlor, heptenophos, heptopargil, heterophos, hexachloroacetone, hexachlorobenzene, hexachlorobutadiene, hexachlorophene, hexaconazole, hexaflumuron, hexaflurate, hexylure, hexamide, hexazinone, hexylthiofos, hexylthiazox, HHND, holo-sulf, huancaiwu, huangcaoling, huanjunzuo, hydramethylnon, hydrargaphen, hydrated lime, hydrogen cyanide, hydroprone, hymexazol, hyquincarb, IAA, IBA, icaridin, imazalil, imazalil nitrate, imazalil sulfate, imazamethabenz, imazamethabenz-methyl, imazamox, imazamox-ammonium, imazapic, imazapic-ammonium, imazapyr, imazapyr-isopropylammonium, imazaquin, imazaquin-ammonium, imazaquin-methyl, imazaquin-sodium, imazethapyr, imazethapyr-ammonium, imazosulfuron, imibenconazole, imicyafos, imidacloprid, imidaclothiz, iminocetadine, iminocetadine triacetate, iminocetadine triethylsulfate, imiprothrin, inabenside, indanofan, indaziflam, indoxacarb, inezin, iodonil, iodicarb, iodomethane, iodosulfuron, iodosulfuron-methyl, iodosulfuron-methyl-sodium, iofensulfuron, iofensulfuron-sodium, ioxynil, ioxynil octanoate, ioxynil-lithium, ioxynil-sodium, ipazine, ipconazole, ipfencarba-

zone, iprobenfos, iprodione, iprovalicarb, iprymidam, ipsdienol, ipsenol, IPSP, isamidofos, isazofos, isobenzan, isocarbamid, isocarbophos, isocil, isodrin, isofenphos, isofenphos-methyl, isolan, isomethiozin, isononuron, isopon-linate, isoprocarb, isopropalin, isoprothiolane, isoproturon, isopyrazam, isopyrimol, isothioate, isotianil, isouron, isoval-dione, isoxaben, isoxachlortole, isoxadifen, isoxadifen-ethyl, isoxaflutole, isoxapyrifop, isoxathion, ivermectin, izo-pamfos, japonilure, japothers, jasmolin I, jasmolin II, jasmonic acid, jiahuangchongzong, jiajizengxiaolin, jia-xiangjunzhi, jiecaowan, jiecaoxi, jodfenphos, juvenile hor-mone I, juvenile hormone II, juvenile hormone III, kadethrin, karbutilate, karetan, karetan-potassium, kasugamycin, kasugamycin hydrochloride, kejunlin, kelevan, ketospiradox, 15 ketospiradox-potassium, kinetin, kinoprene, kresoxim-me-thyl, kuicaoxi, lactofen, lambda-cyhalothrin, latilure, lead arsenate, lenacil, lepimectin, leptophos, lindane, lineatin, linuron, lirimfos, litlure, loopleure, lufenuron, lvdinjunzhi, lvxiancaolin, lythidathion, MAA, malathion, maleic hydrazide, malonoben, maltodextrin, MAMA, mancopper, mancozeb, mandipropamid, maneb, matrine, mazidox, MCPA, MCPA-2-ethylhexyl, MCPA-butyl, MCPA-butyl, MCPA-dimethylammonium, MCPA-diolamine, MCPA-ethyl, MCPA-isobutyl, MCPA-isocetyl, MCPA-isopropyl, 25 MCPA-methyl, MCPA-olamine, MCPA-potassium, MCPA-sodium, MCPA-thioethyl, MCPA-trolamine, MCPB, MCPB-ethyl, MCPB-methyl, MCPB-sodium, mebenil, mecarbam, mecarbinzid, mecarphon, mecoprop, mecoprop-2-ethyl-hexyl, mecoprop-dimethylammonium, mecoprop-diola-mine, mecoprop-ethadyl, mecoprop-isocetyl, mecoprop-me-thyl, mecoprop-P, mecoprop-P-2-ethylhexyl, mecoprop-P-dimethylammonium, mecoprop-P-isobutyl, mecoprop-potassium, mecoprop-P-potassium, mecoprop-sodium, mecoprop-trolamine, medimeform, medinoterb, medinoterb acetate, medlure, mefenacet, mefenpyr, mefenpyr-diethyl, 35 mefluidide, mefluidide-diolamine, mefluidide-potassium, megatomoic acid, menazon, mepanipyrim, mepfluthrin, mephenate, mephosfolan, mepiquat, mepiquat chloride, mepiquat pentaborate, mepronil, meptyldinocap, mercuric chloride, mercuric oxide, mercurous chloride, merphos, mesoprazine, mesosulfuron, mesosulfuron-methyl, mesotri-one, mesulfen, mesulfenfos, metaflumizone, metalaxyl, metalaxyl-M, metaldehyde, metam, metam-ammonium, metamifop, metamitron, metam-potassium, metam-sodium, 45 metazachlor, metazoxsulfuron, metazoxolon, metconazole, metepa, metflurazon, methabenzthiazuron, methacrifos, methalpropalin, methamidophos, methasulfocarb, meth-azole, methfuroxam, methidathion, methiobencarb, methio-carb, methiopyrisulfuron, methiotepa, methiozolin, methi-uron, methocrotophos, methometon, methomyl, methoprene, methoprotlyne, methoquin-butyl, methothrin, methoxychlor, methoxyfenozide, methoxyphenone, methyl apholate, methyl bromide, methyl eugenol, methyl iodide, methyl isothiocyanate, methylacetophos, methylchloroform, meth-55 yldymron, methylene chloride, methylmercury benzoate, methylmercury dicyandiamide, methylmercury pentachlo-rophenoxide, methylneodecanamide, metiram, metobenzu-ron, metobromuron, metofluthrin, metolachlor, metolcarb, metominostrobin, metosulam, metoxadiazone, metoxuron, 60 metrafenone, metribuzin, metsulfovax, metsulfuron, metsul-furon-methyl, mevinphos, mexacarbate, mieshuan, milbe-mectin, milbemycin oxime, milneb, mipafos, mirax, MNAF, moguchun, molinate, molosultap, monalide, monisouron, monochloroacetic acid, monocrotophos, monolinuron, 65 monosulfuron, monosulfuron-ester, monuron, monuron TCA, morfamquat, morfamquat dichloride, moroxydine, moroxydine hydrochloride, morphothion, morzid, moxidec-

tin, MSMA, muscalure, myclobutanol, myclozolin, N-(ethylmercury)-p-toluenesulphonanilide, nabam, naftalofos, naled, naphthalene, naphthaleneacetamide, naphthalic anhydride, naphthoxyacetic acids, naproanilide, napropamide, naptalam, naptalam-sodium, natamycin, neburon, niclosamide, niclosamide-olamine, nicosulfuron, nicotine, nifluridide, nipyraclufen, nitenpyram, nithiazine, nitalin, nitrpyrin, nitrilacarb, nitrofen, nitrofluorfen, nitrostyrene, nitrothial-isopropyl, norbormide, norflurazon, nornicotine, noruron, nov-aluron, noviflumuron, nuarimol, OCH, octachlorodipropyl ether, octhiline, ofurace, omethoate, orbencarb, orfuralure, ortho-dichlorobenzene, orthosulfamuron, oryctalure, orysastobin, oryzalin, osthol, ostramonc, oxabetrinil, oxadiargyl, oxadiazon, oxadixyl, oxamate, oxamyl, oxapyrazon, oxapyrazon-dimolamine, oxapyrazon-sodium, oxasulfuron, oxaziclomefone, oxine-copper, oxolinic acid, oxpoconazole, oxpoconazole fumarate, oxycarboxin, oxydemeton-methyl, oxydeprofos, oxydisulfoton, oxyfluorfen, oxymatrine, oxytetracycline, oxytetracycline hydrochloride, paclobutrazol, paichongding, para-dichlorobenzene, parafluron, paraquat, paraquat dichloride, paraquat dimethylsulfate, parathion, parathion-methyl, parinol, pebulate, pefurazate, pelargonin acid, penconazole, pencycuron, pendimethalin, penflufen, penfluoron, penoxsulfam, pentachlorophenol, pentachlorol, penthiopyrad, pentmethrin, pentoxazone, perfluidone, permethrin, pethoxamid, phenamacril, phenazine oxide, phenisopham, phenkapton, phenmedipham, phenmedipham-ethyl, phenobenzuron, phenothrin, phenproxide, phenothate, phenylmercuriurea, phenylmercury acetate, phenylmercury chloride, phenylmercury derivative of pyrocatechol, phenylmercury nitrate, phenylmercury salicylate, phorate, phosacetim, phosalone, phosdiphen, phosfolan, phosfolan-methyl, phosglycin, phosmet, phosnichlor, phosphamidon, phosphine, phosphocarb, phosphorus, phostin, phoxim, phoxim-methyl, phthalide, picloram, picloram-2-ethylhexyl, picloram-isooctyl, picloram-methyl, picloram-olamine, picloram-potassium, picloram-triethylammonium, picloram-tris(2-hydroxypropyl)ammonium, picolinafen, picoxystrobin, pindone, pindone-sodium, pinoxaden, piperalin, piperonyl butoxide, piperonyl cyclonene, piperophos, piproctanyl, piproctanyl bromide, piprotal, pirimetaphos, pirimicarb, pirimioxyphos, pirimiphos-ethyl, pirimiphos-methyl, plifenate, polycarbamate, polyoxins, polyoxorim, polyoxorim-zinc, polythialan, potassium arsenite, potassium azide, potassium cyanate, potassium gibberellate, potassium naphthenate, potassium polysulfide, potassium thiocyanate, potassium α -naphthaleneacetate, pp'-DDT, prallethrin, precocene I, precocene II, precocene III, pretilachlor, primidophos, primisulfuron, primisulfuron-methyl, probenazole, prochloraz, prochloraz-manganese, proclonol, procyzine, procymidone, prodiamine, profenofos, profluzol, profluralin, profluthrin, profoxydim, proglinazine, proglinazine-ethyl, prohexadione, prohexadione-calcium, prohydrojasmon, promacryl, promecarb, prometron, prometryn, promurit, propachlor, propamidine, propamidine dihydrochloride, propamocarb, propamocarb hydrochloride, propanil, propaphos, propaquizafop, propargite, proparthrin, propazine, propetamphos, propham, propiconazole, propineb, propisochlor, propoxur, propoxycarbazon, propoxycarbazon-sodium, propyl isome, propyrisulfuron, propyzamide, proquinazid, prosuler, prosulfalin, prosulfocarb, prosulfuron, prothidathion, prothiocarb, prothiocarb hydrochloride, prothioconazole, prothiofos, prothoate, protrifenbut, proxan, proxan-sodium, prynachlor, pydanon, pymetrozine, pyracarbolid, pyraclofos, pyraclofen, pyraclostrobin, pyraflufen, pyraflufen-ethyl, pyrafluprole, pyramat, pyrametostrobin, pyraoxystrobin, pyrasulfotole, pyrazolynate, pyrazophos,

pyrazosulfuron, pyrazosulfuron-ethyl, pyrazothion, pyrazoxyfen, pyresmethrin, pyrethrin I, pyrethrin II, pyrethrins, pyribambenz-isopropyl, pyribambenz-propyl, pyribencarb, pyribenzoxim, pyributicarb, pyriclor, pyridaben, pyridafol, pyridalyl, pyridaphenthion, pyridate, pyridinil, pyrifenoxy, pyrifluquinazon, pyrifthalid, pyrimethanil, pyrimidifen, pyriminobac, pyriminobac-methyl, pyrimisulfan, pyrimite, pyrinuron, pyriofenone, pyriprole, pyripropanol, pyriproxifen, pyriothobac, pyriothobac-sodium, pyrolan, pyroquilon, pyroxasulfone, pyroxsulam, pyroxychlor, pyroxyfur, quassia, quinacetol, quinacetol sulfate, quinalphos, quinalphos-methyl, quinazamid, quinclozac, quinclozole, quinmerac, quinclozamine, quinonamid, quinothion, quinoxifen, quintiofos, quintozone, quizalofop, quizalofop-ethyl, quizalofop-P, quizalofop-P-ethyl, quizalofop-P-tefuryl, quwenzhi, quyingding, rabenzazole, rafoxanide, rebemidc, resmethrin, rhodethanil, rhodojaponin-III, ribavirin, rimsulfuron, rotenone, ryania, saflufenacil, saijunmao, saisentong, salicylanilide, sanguinarine, santolin, schradan, scilliroside, sebuthylazine, secbumeton, sedaxane, selamectin, semiamitraz, semiamitraz chloride, sesamex, sesamol, sethoxydim, shuangjiaancolin, siduron, siglure, silafluofen, silatran, silica gel, silthiofam, simazine, simeconazole, simeton, simetryn, sintofen, SMA, S-metolachlor, sodium arsenite, sodium azide, sodium chlorate, sodium fluoride, sodium fluoroacetate, sodium hexafluorosilicate, sodium naphthenate, sodium orthophenylphenoxide, sodium pentachlorophenoxide, sodium polysulfide, sodium thiocyanate, sodium α -naphthaleneacetate, sophamide, spinetoram, spinosad, spirodiclofen, spiroresifen, spirotramat, spiroxamine, streptomycin, streptomycin sesquisulfate, strychnine, sulcatol, sulcofuron, sulcofuron-sodium, sulcotrione, sulfallate, sulfentazone, sulfuram, sulfuramid, sulfometuron, sulfometuron-methyl, sulfosulfuron, sulfotep, sulfoxafflor, sulfoxide, sulfoxime, sulfur, sulfuric acid, sulfuric fluoride, sulglycapin, sulprofos, sultropen, swep, tau-fluvalinate, tavoron, tazimcarb, TCA, TCA-ammonium, TCA-calcium, TCA-ethadyl, TCA-magnesium, TCA-sodium, TDE, tebuconazole, tebufenozide, tebufenpyrad, tebufloquin, tebutirimfos, tebutam, tebutiuron, tecloftalam, tecnazene, tecoram, teflubenzuron, tefluthrin, tefuryltrione, tembotrione, temephos, tepa, TEPP, tepraloxydim, terallethrin, terbacil, terbucarb, terbutylchlor, terbutos, terbumeton, terbuthylazine, terbutryn, tetcyclacis, tetrachloroethane, tetrachlorvinphos, tetraconazole, tetradifon, tetrafluron, tetramethrin, tetramethylfluthrin, tetramine, tetranactin, tetrasul, thallium sulfate, thenylchlor, theta-cypermethrin, thiaabenzazole, thiachlorid, thiadifluor, thiamethoxam, thiapronil, thiazafuor, thiazopyr, thicofos, thicyofen, thidiazimin, thidiazuron, thien carbazon, thien carbazon-methyl, thifensulfuron, thifensulfuron-methyl, thifluzamide, thiobencarb, thiocarbazine, thiochlorfenphim, thiocyclam, thiocyclam hydrochloride, thiocyclam oxalate, thiodiazole-copper, thiodicarb, thiofanox, thiofluoximate, thiohempa, thiomersal, thiometon, thionazin, thiophanate, thiophanate-methyl, thioquinox, thiosemicarbazide, thiosulap, thiosulap-diammonium, thiosulap-disodium, thiosulap-monosodium, thiotepa, thiram, thuringiensin, tiadinil, tiaojiean, tiocarbamil, tioclorim, tioxyimid, tirpate, tolclorfen-methyl, tolclorpyrad, tolylfluorid, tolylmercury acetate, topramezone, tralkoxydim, tralocyclin, tralomethrin, tralopyril, transfluthrin, transpermethrin, tretamine, triaccontanol, triadimefon, triadimenol, triafamone, tri-allate, triamiphos, triapenthenol, triarathene, triarimol, triasulfuron, triazamate, triazbutil, triaziflam, triazophos, triazoxide, tribenuron, tribenuron-methyl, tribufos, tributyltin oxide, tricamba, trichlamine, trichlorfon, trichlorometaphos-3, trichloronate, triclopyr, triclopyr-butotyl, triclopyr-ethyl, triclopyr-triethylammo-

nium, tricyclazole, tridemorph, tridiphane, trietazine, trifen-
morph, trifenofos, trifloxystrobin, trifloxysulfuron, triflox-
ysulfuron-sodium, triflumizole, triflumuron, trifluralin,
triflusulfuron, triflusulfuron-methyl, trifop, trifop-methyl,
trifopsime, triforine, trihydroxytriazine, trimedlure, tri-
methacarb, trimeturon, trinexapac, trinexapac-ethyl, triprene,
tripropindan, triptolide, tritac, triticonazole, tritosulfuron,
trunc-call, uniconazole, uniconazole-P, urbacide, uredepa,
valerate, validamycin, valifenalate, valone, vamidothion,
vanguard, vaniliprole, vernolate, vinclozolin, warfarin, war-
farin-potassium, warfarin-sodium, xiaochongliulin, xin-
junan, xiwojunan, XMC, xylachlor, xylenols, xylylcarb,
yishijing, zarilamid, zecatin, zengxiaoan, zeta-cypermethrin,
zinc naphthenate, zinc phosphide, zinc thiazole, zineb, ziram,
zolaprosfos, zoxamide, zuomihuanglong, α -chlorohydrin,
 α -ecdysone, α -multistriatin, and α -naphthaleneacetic acid.

22. A composition according to claim 1 further comprising
an agriculturally acceptable carrier.

23. A composition according to claim 1 wherein said mol-
ecule is in the form of a pesticidally acceptable acid addition
salt.

24. A composition according to claim 1 wherein said mol-
ecule is in the form of a salt derivative.

25. A composition according to claim 1 wherein said mol-
ecule is in the form a hydrate.

26. A composition according to claim 1 wherein said mol-
ecule is in the form an ester derivative.

27. A composition according to claim 1 wherein said mol-
ecule is in the form a crystal polymorph.

28. A composition according to claim 1 wherein said mol-
ecule has a ^2H in place of ^1H .

29. A composition according to claim 1 wherein said mol-
ecule has a ^{14}C in place of a ^{12}C .

30. A composition according to claim 1 further comprising
a biopesticide.

31. A composition according to claim 1 further comprising
one or more of the following compounds:

- (a) 3-(4-chloro-2,6-dimethylphenyl)-4-hydroxy-8-oxa-1-
azaspiro[4,5]dec-3-en-2-one;
- (b) 3-(4'-chloro-2,4-dimethyl[1,1'-biphenyl]-3-yl)-4-hy-
droxy-8-oxa-1-azaspiro[4,5]dec-3-en-2-one;
- (c) 4-[[[(6-chloro-3-pyridinyl)methyl]methylamino]-2
(5H)-furanone];
- (d) 4-[[[(6-chloro-3-pyridinyl)methyl]cyclopropylamino]-
2(5H)-furanone];
- (e) 3-chloro-N2-[(1S)-1-methyl-2-(methylsulfonyl)
ethyl]-N1-[2-methyl-4-[1,2,2,2-tetrafluoro-1-(trifluo-
romethyl)ethyl]phenyl]-1,2-benzenedicarboxamide;
- (f) 2-cyano-N-ethyl-4-fluoro-3-methoxy-benzenesulfona-
mide;
- (g) 2-cyano-N-ethyl-3-methoxy-benzenesulfonamide;

(h) 2-cyano-3-difluoromethoxy-N-ethyl-4-fluoro-benze-
nesulfonamide;

(i) 2-cyano-3-fluoromethoxy-N-ethyl-benzenesulfona-
mide;

(j) 2-cyano-6-fluoro-3-methoxy-N,N-dimethyl-benzene-
sulfonamide;

(k) 2-cyano-N-ethyl-6-fluoro-3-methoxy-N-methyl-ben-
zenesulfonamide;

(l) 2-cyano-3-difluoromethoxy-N,N-dimethylbenzene-
sulfonamide;

(m) 3-(difluoromethyl)-N-[2-(3,3-dimethylbutyl)phenyl]-
1-methyl-1H-pyrazole-4-carboxamide;

(n) N-ethyl-2,2-dimethylpropionamide-2-(2,6-dichloro-
 α,α,α -trifluoro-p-tolyl)hydrazone;

(o) N-ethyl-2,2-dichloro-1-methylcyclopropane-carboxa-
mide-2-(2,6-dichloro- α,α,α -trifluoro-p-tolyl)hydra-
zone nicotine;

(p) O-[(E)-[2-(4-chloro-phenyl)-2-cyano-1-(2-trifluo-
romethylphenyl)-vinyl]]S-methyl thiocarbonate;

(q) (E)-N1-[(2-chloro-1,3-thiazol-5-ylmethyl)]-N2-cy-
ano-N1-methylacetamidine;

(r) 1-(6-chloropyridin-3-ylmethyl)-7-methyl-8-nitro-1,2,
3,5,6,7-hexahydroimidazo[1,2-a]pyridin-5-ol;

(s) 4-[4-chlorophenyl-(2-butyldine-hydrazono)methyl]]
phenyl mesylate; and

(t) N-Ethyl-2,2-dichloro-1-methylcyclopropanecarboxa-
mide-2-(2,6-dichloro- α,α,α -trifluoro-p-
tolyl)hydrazone.

32. A composition according to claim 1 further comprising
a compound having one or more of the following modes of
action: acetylcholinesterase inhibitor; sodium channel modu-
lator; chitin biosynthesis inhibitor; GABA and glutamate-
gated chloride channel antagonist; GABA and glutamate-
gated chloride channel agonist; acetylcholine receptor
agonist; acetylcholine receptor antagonist; MET 1 inhibitor;
Mg-stimulated ATPase inhibitor; nicotinic acetylcholine
receptor; Midgut membrane disrupter; oxidative phosphory-
lation disrupter, and ryanodine receptor (RyRs).

33. A composition according to claim 1 further comprising
a seed.

34. A composition according to claim 1 further comprising
a seed that has been genetically modified to express one or
more specialized traits.

35. A composition according to claim 1 wherein said com-
position is encapsulated inside, or placed on the surface of, a
capsule.

36. A composition according to claim 1 wherein said com-
position is encapsulated inside, or placed on the surface of, a
capsule, wherein said capsule has a diameter of about 100-
900 nanometers or about 10-900 microns.

* * * * *

PCT/US2011/058571 07.01.2013

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:
CARL D. CORVIN
DOW AGROSCIENCES LLC
9330 ZIONSVILLE ROAD
INDIANAPOLIS, IN 46268
USA

PCT

NOTIFICATION OF TRANSMITTAL OF
INTERNATIONAL PRELIMINARY
REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)

(PCT Rule 71.1)

Date of mailing
(day/month/year) 07 JAN 2013

Applicant's or agent's file reference

68546-WO-PCT

IMPORTANT NOTIFICATION

International application No.

PCT/US11/58571

International filing date (day/month/year)

31 October 2011 (31.10.2011)

Priority date (day/month/year)

03 November 2010 (03.11.2010)

Applicant

DOW AGROSCIENCES LLC

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary report on patentability and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices)(Article 39(1))(see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary report on patentability. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the *PCT Applicant's Guide*.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed invention is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

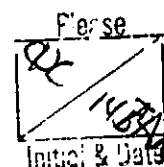
Name and mailing address of the IPEA/ US

Mail Stop PCT, Attn: IPEA/US
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
Facsimile No. (571) 273-3201

Authorized officer

NEIL LEVY
Telephone No. 571-272-0600

Form PCT/IPEA/416 (January 2004)



PCT/US2011/08571 07.01.2013

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 68546-WO-PCT	FOR FURTHER ACTION		See Form PCT/IPEA/416
International application No. PCT/US11/58571	International filing date (day/month/year) 31 October 2011 (31.10.2011)	Priority date (day/month/year) 03 November 2010 (03.11.2010)	
International Patent Classification (IPC) or national classification and IPC IPC: IPC(8)-A01N 43/50; A61K 31/415 A01N 43/50; A61K 31/415(2006.01) USPC: USPC- 514/315.365-366			
Applicant DOW AGROSCIENCES LLC			
1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36. 2. This REPORT consists of a total of <u>3</u> sheets, including this cover sheet. 3. This report is also accompanied by ANNEXES, comprising: a. ☒ (sent to the applicant and to the International Bureau) a total of <u>37</u> sheets, as follows: ☒ sheets of the description, claims and/or drawings which have been amended and/or sheets containing rectifications authorized by this Authority, unless those sheets were superseded or cancelled, and any accompanying letters (see Rules 46.5, 66.8, 70.16, 91.2, and Section 607 of the Administrative Instructions). ☐ sheets containing rectifications, where the decision was made by this Authority not to take them into account because they were not authorized by or notified to this Authority at the time when this Authority began to draw up this report, and any accompanying letters (Rules 66.4bis, 70.2(e), 70.16 and 91.2). ☐ superseded sheets and any accompanying letters, where this Authority either considers that the superseding sheets contain an amendment that goes beyond the disclosure in the international application as filed, or the superseding sheets were not accompanied by a letter indicating the basis for the amendments in the application as filed, as indicated in item 4 of Box No.I and the Supplemental Box (see Rule 70.16(b)). b. ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) _____ containing a sequence listing, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see paragraph 3bis of Annex C of the Administrative Instructions).			
4. This report contains indications relating to the following items: ☒ Box No. I Basis of the report ☐ Box No. II Priority ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability ☐ Box No. IV Lack of unity of invention ☒ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement ☐ Box No. VI Certain documents cited ☐ Box No. VII Certain defects in the international application ☐ Box No. VIII Certain observations on the international application			
Date of submission of the demand 29 August 2012 (29.08.2012)		Date of completion of this report 13 December 2012 (13.12.2012)	
Name and mailing address of the IPEA/ US Mail Stop PCT, Attn: IPEA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-3201		Authorized officer NEIL LEVY Telephone No. 571-272-0600	

Form PCT/IPEA/409 (cover sheet) (July 2011)

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/US11/58571

Box No. I Basis of the report

1. With regard to the language, this report is based on:

- ☒ the international application in the language in which it was filed.
- ☐ a translation of the international application into English which is the language of a translation furnished for the purposes of:
- ☐ international search (Rules 12.3(a) and 23.1(b)).
 - ☐ publication of the international application (Rule 12.4(a)).
 - ☐ international preliminary examination (Rules 55.2(a) and/or 55.3(a) and (b)).

2. With regard to the elements of the international application, this report is based on (replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):

- ☐ the international application as originally filed/furnished
- ☒ the description:
- pages 1-79 as originally filed/furnished
- pages* NONE received by this Authority on _____
- pages* NONE received by this Authority on _____
- ☒ the claims:
- pages NONE as originally filed/furnished
- pages* NONE as amended (together with any statement) under Article 19
- pages* 80-81 received by this Authority on 29 August 2012 (29.08.2012)
- pages* NONE received by this Authority on _____
- ☐ the drawings:
- pages NONE as originally filed/furnished
- pages* NONE received by this Authority on _____
- pages* NONE received by this Authority on _____
- ☐ a sequence listing - see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing (specify): _____

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since either they are considered to go beyond the disclosure as filed, or they were not accompanied by a letter indicating the basis for the amendments in the application as filed, as indicated in the Supplemental Box (Rules 70.2(c) and (c-bis)):

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing (specify): _____

5. ☐ This report has been established:

- ☐ taking into account the rectification of an obvious mistake authorized by or notified to this Authority under Rule 91 (Rules 66.1(d-bis) and 70.2(e)).
- ☐ without taking into account the rectification of an obvious mistake authorized by or notified to this Authority under Rule 91 (Rules 66.4bis) and 70.2(e)).

6. ☐ Supplementary international search report(s) from Authority(ies) _____ has/have been received and taken into account in establishing this report (Rule 45bis.8(b) and (c)).

* If item 4 applies, some or all of those sheets may be marked "superseded."

International application No.
PCT/US11/58571

Form PCT/IPEA/409 (Box No. V) (July 2011)

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

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**Industria y Comercio**
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*** Soporte del Pago ***

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RECIBO DE CA	SIC ** RECIBO **	999999999	41847	16/04/2015	32.000.00

*** Conceptos Pagados ***

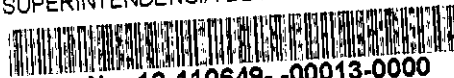
CANT. RENTISTICO	CONCEPTO	Vr.UNDITARIO	Vr.CONCEPTO
1 50005-01-03 CAMBIO DE MODALIDAD Y MODIFICACIONES EN CREACION CORRECCION A SOLICITUD EN TRAMITE / MODIFICA		132.000.00	132.000.00
			\$132.000.00

SON: **CIENTO TREINTA Y DOS MIL PESOS MONEDA CORRIENTE***

Responsable: _____

Recibo de Caja Aplicado al Expediente No. _____

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO



No. 13-110649- 00013-0000

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