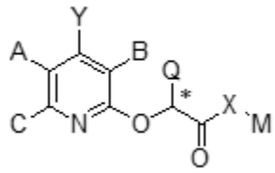
REIVINDICACIONES

1. Un derivado éster del ácido R-piridiloxicarboxílico representado por la fórmula I-1,



I-1

en donde A y B representan cada uno independientemente halógeno o alquilo C_1-C_8;

C representa hidrógeno, halógeno o alquilo C_1-C_8;

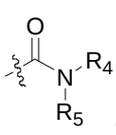
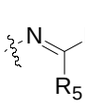
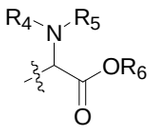
Q representa halógeno, ciano, ciano alquilo C_1-C_8, hidroxi alquilo C_1-C_8, amino, nitro, formilo, alquilo C_1-C_8, alquenilo C_2-C_8, alquinilo C_2-C_8, cicloalquilo C_3-C_8, alcoxi C_1-C_8, alquiltio C_1-C_8, alquilcarbonilo C_1-C_8, alcoxicarbonilo C_1-C_8, alquilo C_1-C_8 alquilamino C_1-C_8 o alquilo C_1-C_8 alcoxi C_1-C_8 con o sin halógeno o arilo, heteroarilo, arilo alquilo C_1-C_8, heteroarilo alquilo C_1-C_8;

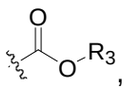
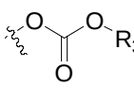
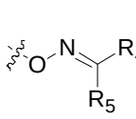
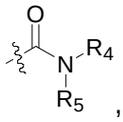
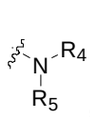
Y representa NR_1R_2, en donde R_1 representa H; alquilo C_1-C_8, sustituido o no sustituido con 1-2 R_{11}; o $-COR_{12}$, R_2 representa H; o alquilo C_1-C_8;

en donde R_{11} representa que está sustituido o que no está sustituido con 1-3 grupos seleccionados del grupo que consiste en halógeno, halo alquilo C_1-C_8;

R_{12} representa H, alquilo C_1-C_{18} o fenilo;

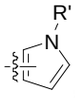
X representa O o S;

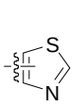
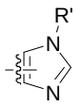
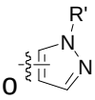
M representa alquenilo C_2-C_8, alquinilo C_2-C_8, cicloalquil C_3-C_8, -(alquilo C_1-C_8)-Z,  ,  o  con o sin halógeno, o heterociclilo, arilo, heteroarilo sustituido o no sustituido;

Z representa  ,  ,  ,  ,  , ciano, nitro, o heterociclilo, arilo, heteroarilo sustituido o no sustituido;

R_3 representa cada uno independientemente alquilo C_1-C_8 o alquenilo C_2-C_8;

R_4, R_5 y R_6 representan cada uno independientemente hidrógeno, alquilo C_1-C_8 o alcoxicarbonilo C_1-C_8;

el término “heterociclilo” se refiere a , , ; el término “arilo” se refiere a fenilo o naftilo; el término “heterociclilo” se refiere a , , ,  , ,

 ,  , , o  , que está sustituido o no sustituido con al menos un grupo seleccionado del grupo que consiste en halógeno, ciano, alquilo C_1-C_6, OR", SR" con o sin halógeno;

R' representa cada uno independientemente hidrógeno o alquilo C_1-C_6 con o sin halógeno;

R" representa cada uno independientemente hidrógeno o alquilo C_1-C_6.

2. El derivado éster del ácido R-piridiloxicarboxílico según la Reivindicación 1, en donde A y B representan cada uno independientemente halógeno o alquilo C_1-C_6;

C representa hidrógeno, halógeno o alquilo C_1-C_6;

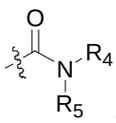
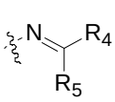
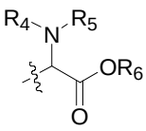
Q representa halógeno, ciano, ciano alquilo C_1-C_6, hidroxi alquilo C_1-C_6, amino, nitro, formilo; alquilo C_1-C_6, alquenilo C_2-C_6, alquinilo C_2-C_6, cicloalquilo C_3-C_6, alcoxi C_1-C_6, alquiltio C_1-C_6, alquilcarbonilo C_1-C_6, alcoxicarbonilo C_1-C_6, alquilo C_1-C_6 alquilamino C_1-C_6 o alquilo C_1-C_6 alcoxi C_1-C_6 con o sin halógeno; o arilo, heteroarilo, arilo alquilo C_1-C_6, heteroarilo alquilo C_1-C_6;

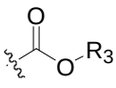
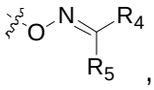
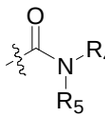
Y representa NR_1R_2, en donde R_1 representa H; alquilo C_1-C_6 sustituido o no sustituido con 1-2 R_{11} o $-COR_{12}$, R_2 representa H o alquilo C_1-C_6;

en donde R_{11} representa o que está sustituido o que no está sustituido con 1-3 grupos seleccionados del grupo que consiste en halo alquilo C_1-C_6;

R_{12} representa H, alquilo C_1-C_{14} o fenilo;

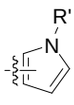
X representa O o S;

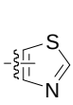
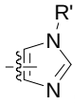
M representa alquenilo C_2-C_6, alquinilo C_2-C_6, cicloalquilo C_3-C_6,-(alquilo C_1-C_6) -Z,  ,  o  con o sin halógeno o heterociclilo, arilo, heteroarilo sustituido o no sustituido;

Z representa  , ,  ,  , , ciano, nitro, o heterociclilo, arilo, heteroarilo sustituido o no sustituido;

R_3 representa cada uno independientemente alquilo C_1-C_6 o alquenilo C_2-C_6;

R_4, R_5 y R_6 representan cada uno independientemente hidrógeno, alquilo C_1-C_6 o alcoxicarbonilo C_1-C_6;

el término "heterociclilo" se refiere a , , ; el término "arilo" se refiere a fenilo o naftilo; el término "heteroarilo" se refiere a , , ,  , ,

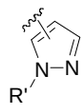
 ,  , , o , que está sustituido con 0,1, 2 o 3 grupos seleccionados del grupo que consiste en halógeno, ciano, alquilo C_1-C_6, OR", SR" con o sin halógeno;

R' representa cada uno independientemente hidrógeno o alquilo C_1-C_6 con o sin flúor, cloro o bromo;

R" representa cada uno independientemente hidrógeno o alquilo C_1-C_6.

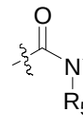
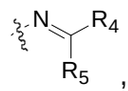
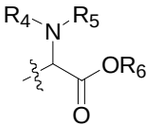
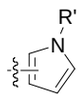
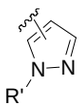
3. El derivado éster del ácido R-piridiloxicarboxílico según la Reivindicación 2, en donde A y B representan cada uno independientemente halógeno o alquilo C_1-C_6;

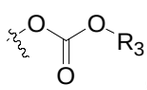
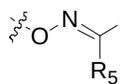
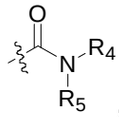
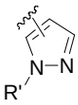
C representa hidrógeno, halógeno o alquilo C_1-C_6;

Q representa alquilo C_1-C_6, halo alquilo C_1-C_6, cicloalquilo C_3-C_6, alquenilo C_2-C_6, alquinilo C_2-C_6, halógeno, ciano, amino, nitro, formilo, alcoxi C_1-C_6, alquiltio C_1-C_6, alcoxicarbonilo C_1-C_6, hidroxi alquilo C_1-C_6, alquilo C_1-C_2 alcoxi C_1-C_6, ciano alquilo C_1-C_2, alquilo C_1-C_2 alquilamino C_1-C_6, bencilo, tienilo, tiazolilo,  que está sustituido o que no está sustituido con alquilo C_1-C_6; o fenilo que está sustituido o que no está sustituido con al menos un grupo seleccionado del grupo que consiste en halógeno;

Y representa amino, alquilamino C_1-C_6, alquilcarbonilamino C_1-C_6, fenilcarbonilamino, bencilamino; o furilmetilenamino que está sustituido o que no está sustituido con halo alquilo C_1-C_6;

X representa O o S;

M representa halo alquilo C_1-C_8, cicloalquilo C_3-C_6, alquenilo C_2-C_6, halo alquenilo C_2-C_6, alquinilo C_2-C_6, ciano alquilo C_1-C_2, nitro alquilo C_1-C_2, alquilo C_1-C_2 alcoxicarbonilo C1-C6, alquilo C_1-C_2 alqueniloxicarbonilo C_2-C_6, -(alquilo C_1-C_2)-Z,  ,  ,  , tetrahidrofurilo, piridilo, naftilo,  ,  que está sustituido o que no está sustituido con alquilo C_1-C_6 o fenilo que está sustituido o que no está sustituido con alquilo C_1-C_6 halógeno o alcoxi C_1-C_6;

Z representa  ,  ,  , , tetrahidrofurilo, piridilo,  , tienilo, furilo, naftilo o fenilo que está sustituido o que no está sustituido con al menos un grupo seleccionado del grupo que consiste en alquilo C_1-C_6, halo alquilo C_1-C_6, ciano y halógeno;

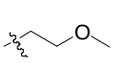
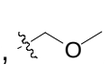
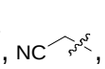
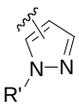
R_3 representa cada uno independientemente alquilo C_1-C_6;

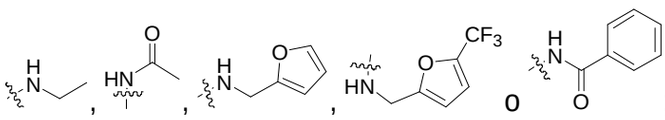
R_4, R_5 y R_6 representan cada uno independientemente hidrógeno, alquilo C_1-C_6 o alcoxicarbonilo C_1-C_6;

R' representa hidrógeno o alquilo C_1-C_6.

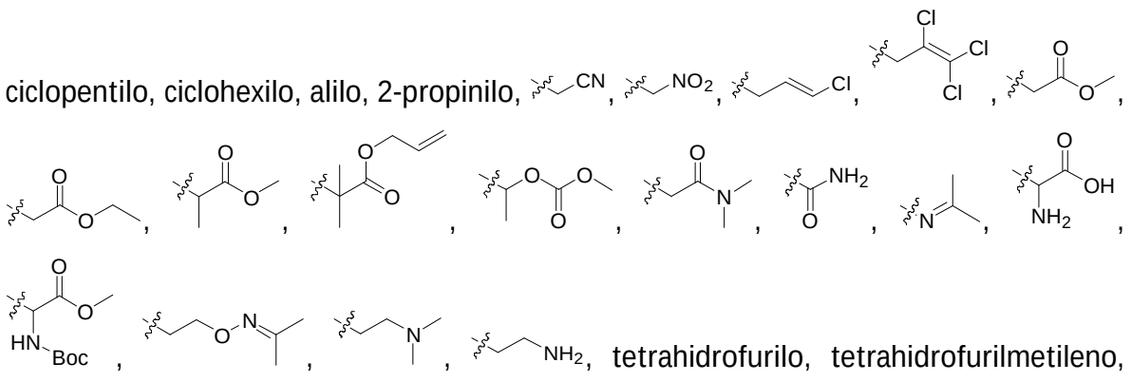
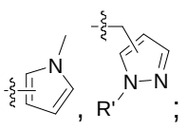
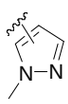
4. El derivado éster del ácido R-piridiloxicarboxílico según la Reivindicación 3, en donde A y B representan cada uno independientemente cloro o metilo;

C representa hidrógeno, flúor, cloro, bromo o metilo;

Q representa metilo, etilo, propilo, isopropilo, ciclopropilo, vinilo, etinilo, flúor, cloro, bromo, ciano, amino, nitro, formilo, metoxi, metiltio, metoxicarbonilo, monoclorometilo, monofluorometilo, difluorometilo, trifluorometilo, 2-cloroetilo, 2,2,2-trifluoroetilo, hidroximetilo,  ,  ,  , , bencilo, tiazolilo que está sustituido o que no está sustituido con cloro, tienilo,  que está sustituido o que no está sustituido con metilo o flúor; o fenilo que está sustituido o que no está sustituido con al menos un cloro;

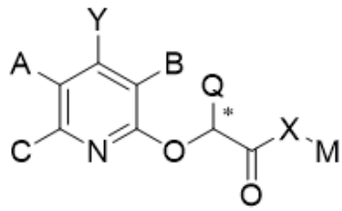
Y representa NH_2,  ;

X representa O o S;

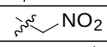
M representa 2-fluoroetilo, 2-cloroetilo, 2-bromoetilo, 2,2-difluoroetilo, 2,2,2-trifluoroetilo, 4,4,4-trifluorobutilo, 2,2,3,3,3-pentafluoropropilo, ciclopropilo, ciclobutilo, ciclopentilo, ciclohexilo, alilo, 2-propinilo,  , tetrahidrofurilo, tetrahidrofurilmetileno, piridilo, piridilmetileno, naftilo, naftilmetileno, furilmetileno, tienilmetileno,  ;  que está sustituido o que no está sustituido con metilo; fenilo que está sustituido o que no está sustituido con metilo, cloro, metoxi o isopropilo; o bencilo que está sustituido o que no está sustituido con trifluorometilo, bromo, cloro, flúor, ciano o metilo;

R' representa hidrógeno o metilo.

5. El derivado éster del ácido R-piridiloxicarboxílico según la Reivindicación 4, que se selecciona de



I-1

No.	A	B	C	Q	X	Y	M
2-263	Cl	Cl	F	CH_3	O	NH_2	
2-264	Cl	Cl	F	CH_3	O	NH_2	
2-265	Cl	Cl	F	CH_3	O	NH_2	
2-266	Cl	Cl	F	CH_3	S	NH_2	
2-267	Cl	Cl	F	CH_3	O	NH_2	
2-268	Cl	Cl	F	CH_3	O	NH_2	
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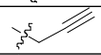
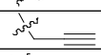
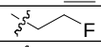
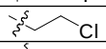
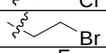
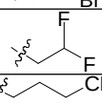
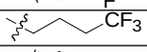
2-274	Cl	Cl	F	CH_3	S	NH_2	
2-275	Cl	Cl	F	CH_3	O	NH_2	
2-276	Cl	Cl	F	CH_3	O	NH_2	
2-277	Cl	Cl	F	CH_3	O	NH_2	
2-278	Cl	Cl	F	CH_3	O	NH_2	
2-279	Cl	Cl	F	CH_3	O	NH_2	
2-280	Cl	Cl	F	CH_3	O	NH_2	
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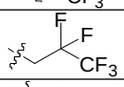
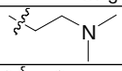
2-282	Cl	Cl	F	CH_3	O	NH_2	
2-283	Cl	Cl	F	CH_3	O	NH_2	
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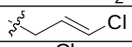
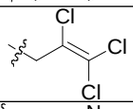
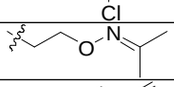
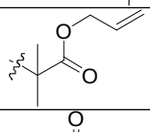
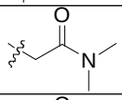
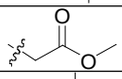
2-285	Cl	Cl	F	CH_3	O	NH_2	
2-286	Cl	Cl	F	CH_3	O	NH_2	
2-287	Cl	Cl	F	CH_3	O	NH_2	
2-288	Cl	Cl	F	CH_3	O	NH_2	
2-289	Cl	Cl	F	CH_3	O	NH_2	
2-290	Cl	Cl	F	CH_3	S	NH_2	
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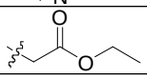
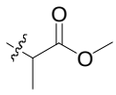
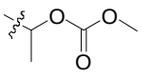
2-294	Cl	Cl	F	CH_3	O	NH_2	
2-295	Cl	Cl	F	CH_3	O	NH_2	
2-296	Cl	Cl	F	CH_3	O	NH_2	

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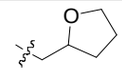
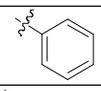
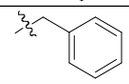
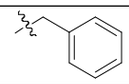
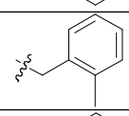
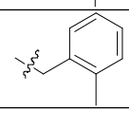
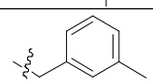
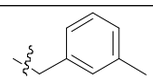
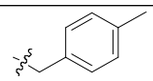
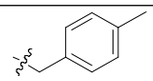
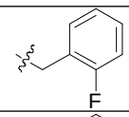
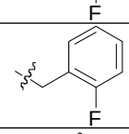
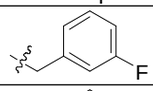
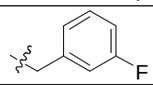
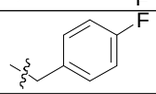
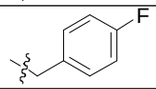
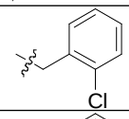
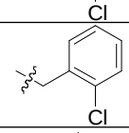
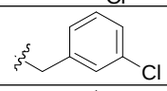
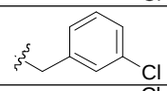
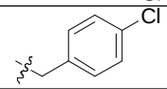
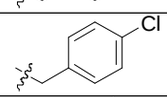
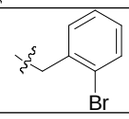
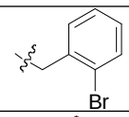
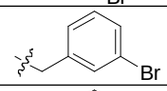
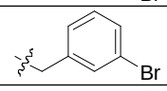
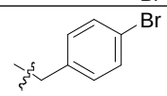
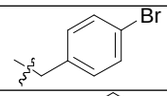
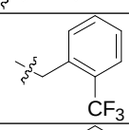
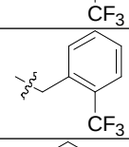
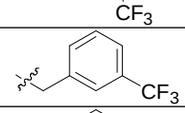
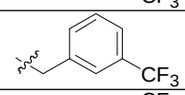
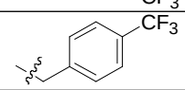
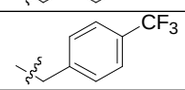
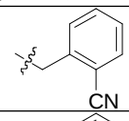
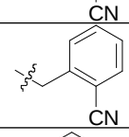
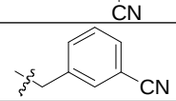
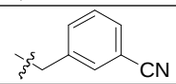
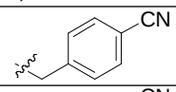
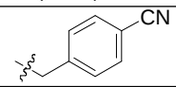
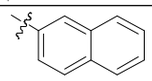
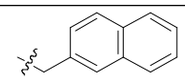
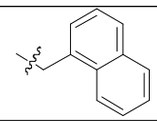
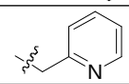
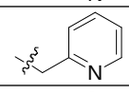
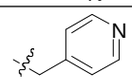
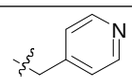
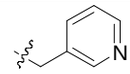
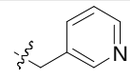
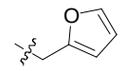
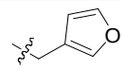
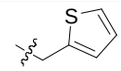
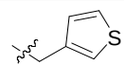
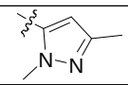
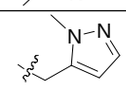
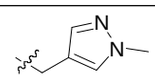
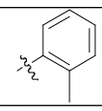
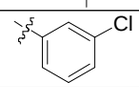
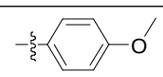
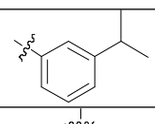
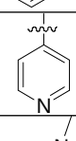
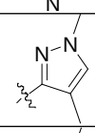
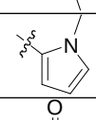
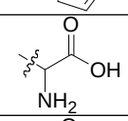
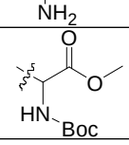
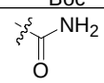
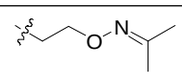
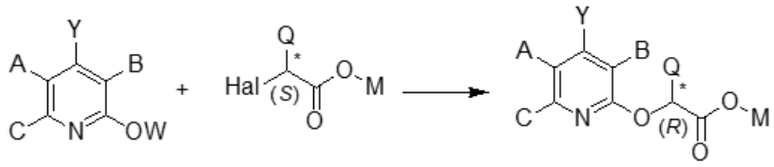
2-298	Cl	Cl	F	CH_3	O	NH_2	
2-299	Cl	Cl	F	CH_3	O	NH_2	
2-300	Cl	Cl	F	CH_3	O	NH_2	
2-301	Cl	Cl	F	CH_3	S	NH_2	
2-302	Cl	Cl	F	CH_3	O	NH_2	
2-303	Cl	Cl	F	CH_3	S	NH_2	
2-304	Cl	Cl	F	CH_3	O	NH_2	
2-305	Cl	Cl	F	CH_3	S	NH_2	
2-306	Cl	Cl	F	CH_3	O	NH_2	
2-307	Cl	Cl	F	CH_3	S	NH_2	
2-308	Cl	Cl	F	CH_3	O	NH_2	
2-309	Cl	Cl	F	CH_3	S	NH_2	
2-310	Cl	Cl	F	CH_3	O	NH_2	
2-311	Cl	Cl	F	CH_3	S	NH_2	
2-312	Cl	Cl	F	CH_3	O	NH_2	
2-313	Cl	Cl	F	CH_3	S	NH_2	
2-314	Cl	Cl	F	CH_3	O	NH_2	
2-315	Cl	Cl	F	CH_3	S	NH_2	
2-316	Cl	Cl	F	CH_3	O	NH_2	
2-317	Cl	Cl	F	CH_3	S	NH_2	
2-318	Cl	Cl	F	CH_3	O	NH_2	
2-319	Cl	Cl	F	CH_3	S	NH_2	
2-320	Cl	Cl	F	CH_3	O	NH_2	

2-321	Cl	Cl	F	CH_3	S	NH_2	
2-322	Cl	Cl	F	CH_3	O	NH_2	
2-323	Cl	Cl	F	CH_3	S	NH_2	
2-324	Cl	Cl	F	CH_3	O	NH_2	
2-325	Cl	Cl	F	CH_3	S	NH_2	
2-327	Cl	Cl	F	CH_3	O	NH_2	
2-328	Cl	Cl	F	CH_3	S	NH_2	
2-329	Cl	Cl	F	CH_3	O	NH_2	
2-330	Cl	Cl	F	CH_3	S	NH_2	
2-331	Cl	Cl	F	CH_3	O	NH_2	
2-332	Cl	Cl	F	CH_3	S	NH_2	
2-333	Cl	Cl	F	CH_3	O	NH_2	
2-334	Cl	Cl	F	CH_3	S	NH_2	
2-335	Cl	Cl	F	CH_3	O	NH_2	
2-336	Cl	Cl	F	CH_3	S	NH_2	
2-337	Cl	Cl	F	CH_3	O	NH_2	
2-338	Cl	Cl	F	CH_3	S	NH_2	
2-339	Cl	Cl	F	CH_3	S	NH_2	
2-340	Cl	Cl	F	CH_3	O	NH_2	
2-341	Cl	Cl	F	CH_3	O	NH_2	
2-342	Cl	Cl	F	CH_3	O	NH_2	
2-343	Cl	Cl	F	CH_3	S	NH_2	
2-344	Cl	Cl	F	CH_3	O	NH_2	
2-345	Cl	Cl	F	CH_3	S	NH_2	

2-346	Cl	Cl	F	CH_3	O	NH_2	
2-347	Cl	Cl	F	CH_3	S	NH_2	
2-348	Cl	Cl	F	CH_3	O	NH_2	
2-349	Cl	Cl	F	CH_3	O	NH_2	
2-350	Cl	Cl	F	CH_3	O	NH_2	
2-351	Cl	Cl	F	CH_3	O	NH_2	
2-352	Cl	Cl	F	CH_3	O	NH_2	
2-353	Cl	Cl	F	CH_3	O	NH_2	
2-354	Cl	Cl	F	CH_3	O	NH_2	
2-355	Cl	Cl	F	CH_3	O	NH_2	
2-357	Cl	Cl	F	CH_3	S	NH_2	
2-358	Cl	Cl	F	CH_3	S	NH_2	
2-360	Cl	Cl	F	CH_3	S	NH_2	
2-363	Cl	Cl	F	CH_3	S	NH_2	
2-365	Cl	Cl	F	CH_3	S	NH_2	
2-368	Cl	Cl	F	CH_3	S	NH_2	
2-371	Cl	Cl	F	CH_3	O	NH_2	
2-372	Cl	Cl	F	CH_3	O	NH_2	
2-373	Cl	Cl	F	CH_3	S	NH_2	
2-386	Cl	Cl	CH_3	CH_3	O	NH_2	

6. Un método de preparación del éster derivado del ácido R-piridiloxicarboxílico según cualquiera de las Reivindicaciones 1-5, que comprende los siguientes pasos:

se hace reaccionar un compuesto de fórmula III con un compuesto de fórmula II para obtener un compuesto de fórmula I-1-1; el esquema de reacción es el siguiente:

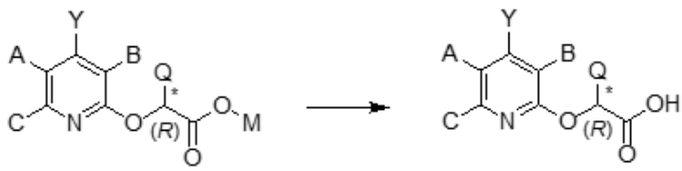


III II I-1-1

en donde, W representa un metal alcalino, preferiblemente K, Na; Hal representa halógeno, preferiblemente Br, Cl; la reacción se lleva a cabo en presencia de un catalizador y un disolvente, preferiblemente, el catalizador es TBAB y el disolvente es uno o más seleccionados del grupo que consiste en DCM, DCE, ACN, THF, DMF;

o cuando X es S, el método de preparación comprende además las siguientes etapas:

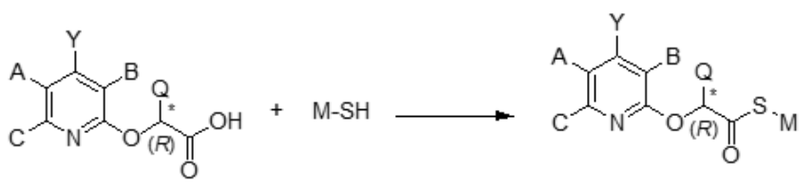
el compuesto de fórmula I-1-1 se hace reaccionar en presencia de una solución acuosa de hidróxido de litio y un disolvente para obtener un compuesto de fórmula I; el esquema de reacción es el siguiente:



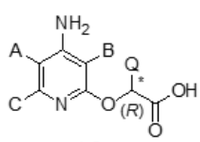
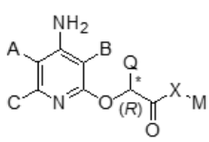
I-1-1 I

preferiblemente, el disolvente es uno o más seleccionados del grupo que consiste en metanol, etanol e isopropanol; y

el compuesto de fórmula I se hace reaccionar con M-SH para obtener un compuesto de fórmula I-1-2; el esquema de reacción es el siguiente:



I I-1-2

en donde, la reacción se lleva a cabo en presencia de un deshidratante y un disolvente, preferiblemente el deshidratante es DCC y el disolvente es uno o más seleccionados del grupo que consiste en diclorometano, dicloroetano, acetonitrilo, N, N-dimetilformamida, N,N-dimetilacetamida, dimetilsulfóxido, tetrahidrofurano, tolueno, xileno; o, cuando Y representa NR_1R_2 (R_1, R_2 no son hidrógeno al mismo tiempo), se obtiene al hacer reaccionar un compuesto de fórmula I-2  I-2 o un compuesto de fórmula I-1-3  I-1-3 con un haluro correspondiente;

en donde, el haluro es preferiblemente cloruro o bromuro; la reacción se lleva a cabo en presencia de una base y un disolvente, en donde la base es una o más seleccionadas del grupo que consiste en hidróxido de sodio, hidróxido de potasio, carbonato de sodio, carbonato de potasio, bicarbonato de sodio y carbonato de cesio; el disolvente es uno o más seleccionados del grupo que consiste en THF, 1,4-dioxano, tolueno, 1,2-dicloroetano, acetato de etilo, acetonitrilo, DMF, acetona, diclorometano y cloroformo; se añade opcionalmente un catalizador, preferiblemente DMAP, durante la reacción;

en donde A, B, C, Y, Q y M se definen como en cualquiera de las Reivindicaciones 1-4;

"TBAB" representa bromuro de tetrabutilamonio, "DCM" representa diclorometano, "DCE" representa dicloroetano, "ACN" representa acetonitrilo, "THF" representa tetrahidrofurano, "DMF" representa N,N-dimetilformamida, "DCC" representa 1,3-diclohexilcarbodiimida, y "DMAP" representa 4-dimetilaminopiridina.

7. Una composición herbicida que comprende (i) al menos un derivado de éster del ácido piridiloxicarboxílico de tipo R según cualquiera de las Reivindicaciones 1-5; preferiblemente, que comprende además (iii) auxiliares de formulación agroquímicamente aceptables.

8. Un método para controlar una maleza que comprende aplicar una cantidad herbicidamente efectiva de al menos un derivado de éster del ácido piridiloxicarboxílico de tipo R según cualquiera de las Reivindicaciones 1-5 o la composición herbicida según la Reivindicación 7 en una planta o en un área de maleza, preferiblemente, la planta es arroz, o la maleza es una maleza gramínea (como *Echinochloa crusgalli, Digitaria sanguinalis, Semen Euphorbiae Lathyridis*) o una maleza de hoja ancha (como *Monochoria Vaginalis, Abutilon theophrasti Medic., Galium aparine*).