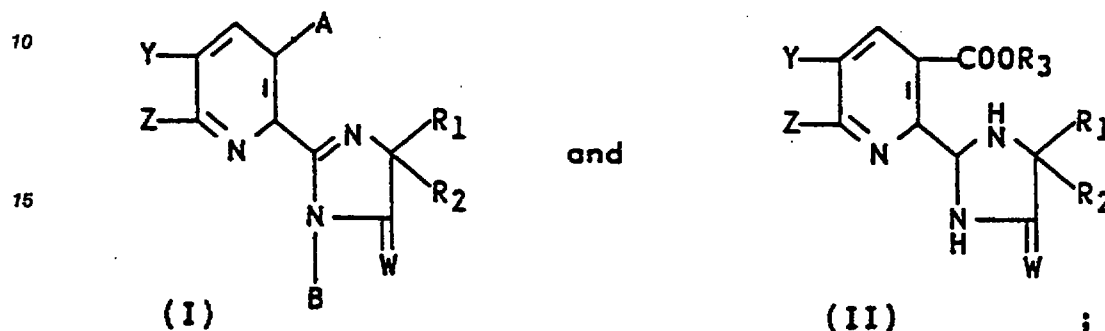


Description

SUMMARY OF THE INVENTION

5 This invention relates to herbicidal, 5(and/or 6) substituted 2-(2-imidazolin-2-yl)nicotinic acids, esters and salts depicted by formula I and 5(and/or 6)substituted 2-(2-imidazolidinyl)nicotinic acids, esters and salts depicted by formula II,



wherein

R₁

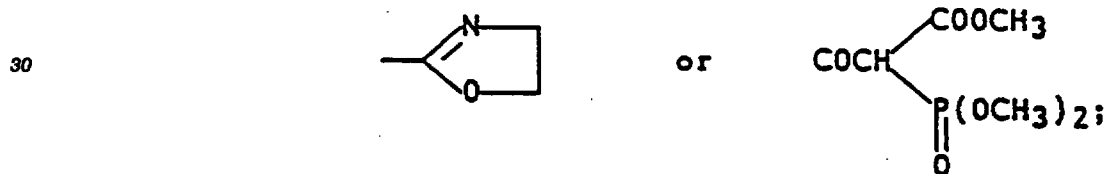
is C₁-C₄ alkyl;

R₂

is C₁-C₄ alkyl;

A

is COOR₃, CONHR₆, CHO, CH₂OH, COCH₃, COC₆H₅, CN, CH₃, CH=NOH, CH₂COOH, CONHOH, CH₂CH₂COOH, CHR₈OH,



R₃ is hydrogen,



45 C₁-C₁₂ alkyl optionally substituted with one of the following groups: C₁-C₃ alkoxy, C₁-C₃ alkylthio, halogen, hydroxyl, C₃-C₆ cycloalkyl, benzyloxy, furyl, phenyl, halophenyl, loweralkylphenyl, loweralkoxyphenyl, nitrophenyl, carboxyl, loweralkoxycarbonyl, cyano or triloweralkylammonium halide;

50 C₃-C₁₂ alkenyl optionally substituted with one of the following groups: C₁-C₃ alkoxy, phenyl, halogen or loweralkoxycarbonyl or with two C₁-C₃ alkoxy groups or two halogen groups;

C₃-C₆ cycloalkyl optionally substituted with one or two C₁-C₃ alkyl groups;

C₃-C₁₆ alkynyl optionally substituted with one or two C₁-C₃ alkyl groups; or

a cation;

55 R₆ is hydrogen, hydroxyl, C₃-alkenyl, C₃-alkynyl or C₁-C₄ alkyl optionally substituted with one hydroxyl or one chlorine group;

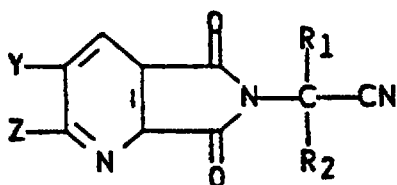
B is H, COR₄ or SO₂R₅, provided that when B is COR₄ or SO₂R₅; A is COOR₃ in which R₃ is other than H or a cation, CH₃ or CN; W is O; and Y and Z are not alkylamino, hydroxyl, or hydroxyloweralkyl;

- R₄ is C₁-C₁₁ alkyl, chloromethyl or phenyl optionally substituted with one chloro, one nitro or one methoxy group;
 R₅ is C₁-C₄ alkyl or phenyl optionally substituted with one methyl group;
 W is O;
 5 R₈ is C₁-C₄-alkyl or phenyl;
 Y and Z are each hydrogen, halogen, C₁-C₆ alkyl, C₁-C₄ hydroxyloweralkyl, C₁-C₆ alkoxy, C₁-C₄ alkylthio, formyl, phenoxy, C₁-C₄ haloalkyl, nitro, cyano, C₁-C₄ alkylamino, di-C₁-C₄ loweralkylamino, C₁-C₄ alkylsulfonyl, difluoromethoxy, trifluoromethoxy, 1,1,2,2-tetra-fluoroethoxy, phenyl optionally substituted with one
 10 C₁-C₄ alkyl, C₁-C₄ alkoxy or halogen;
 C₃-C₈ straight or branched alkenyloxy optionally substituted with one to three halogens;
 C₃-C₈ straight or branched alkynyloxy optionally substituted with one to three halogens;
 C₂-C₆ straight or branched alkenyl optionally substituted with phenyl, C₁-C₄ alkoxy or 1 to 3 halogens;
 15 C₂-C₆ straight or branched alkynyl optionally substituted with phenyl, C₁-C₄ alkoxy or 1 to 3 halogens;
 C₃-C₆ cycloalkyl optionally substituted with methyl, halogen or C₁-C₄ alkoxy;
 C₁-C₄ alkylcarbonyl optionally substituted with C₁-C₄ alkoxy or 1 to 3 halogens;
 C₁-C₄ alkylcarbonylamino optionally substituted on nitrogen with C₁-C₂ alkyl or C₁-C₄
 20 alkoxy and on carbon with C₁-C₄ alkoxy or 1 to 3 halogens;
 C₁-C₄ alkylcarbonyloxy optionally substituted with C₁-C₄ alkoxy or 1 to 3 halogens;
 C₁-C₄ alkyl substituted with C₁-C₄ alkoxy, C₁-C₄ alkylthio, C₁-C₄ alkylamino, C₁-C₄ dialkylamino, C₁-C₄ trialkylammonium or C₁-C₄ alkylcarbonyloxy;
 2(or 3)-furyl optionally substituted with halogen or C₁-C₃ alkyl;
 25 2(or 3)-thienyl optionally substituted with halogen or C₁-C₃ alkyl;
 N-methyl-2(or 3)-pyrrolyl;
 hydroxy;
 amino optionally substituted with C₁-C₄ alkoxy or C₁-C₂ alkyl and C₁-C₄ alkoxy;
 2(or 4)-pyridyloxy optionally substituted with C₁-C₄ alkyl, trifluoromethyl or 1 or 2
 30 halogens;
 C₁-C₄ mono or dialkylaminocarbonylamino, optionally substituted on the nitrogen attached to the ring with C₁-C₂ alkyl or C₁-C₄ alkoxy;
 C₁-C₄ alkoxycarbonylamino, optionally substituted on nitrogen with C₁-C₂ alkyl or C₁-C₄ alkoxy;
 35 C₁-C₄ mono or dialkylaminocarbonyloxy;
 Provided that at least one of Y and Z is:
 C₂-C₆ straight or branched alkenyl optionally substituted with phenyl, C₁-C₄ alkoxy or 1 to 3 halogens;
 C₂-C₆ straight or branched alkynyl optionally substituted with phenyl, C₁-C₄ alkoxy or 1 to 3 halogens;
 C₃-C₆ cycloalkyl optionally substituted with methyl, halogen or C₁-C₄ alkoxy;
 40 C₁-C₄ alkylcarbonyl optionally substituted with C₁-C₄ alkoxy or 1 to 3 halogens;
 C₁-C₄ alkylcarbonylamino optionally substituted on nitrogen with C₁-C₂ alkyl or C₁-C₄ alkoxy and on carbon with C₁-C₄ alkoxy or 1 to 3 halogens;
 C₁-C₄ alkyl substituted with C₁-C₄ alkoxy, C₁-C₄ alkylthio, C₁-C₄ alkylamino, C₁-C₄ dialkylamino, C₁-C₄ trialkylammonium or C₁-C₄ alkylcarbonyloxy;
 45 2(or 3)-furyl optionally substituted with halogen or C₁-C₃ alkyl;
 2(or 3)-thienyl optionally substituted with halogen or C₁-C₃ alkyl;
 N-methyl-2(or 3)-pyrrolyl;
 hydroxy;
 amino optionally substituted with C₁-C₄ alkoxy, or C₁-C₂ alkyl and C₁-C₄ alkoxy; or
 50 2(or 4)-pyridyloxy optionally substituted by C₁-C₄ alkyl, trifluoromethyl or 1 to 2 halogens; and
 C₁-C₄ mono or dialkylaminocarbonylamino, optionally substituted on the nitrogen attached to the ring with C₁-C₂ alkyl or C₁-C₄ alkoxy;
 C₁-C₄ alkoxycarbonylamino, optionally substituted on nitrogen with C₁-C₂ alkyl or C₁-C₄ alkoxy;
 C₁-C₄ mono or dialkylaminocarbonyloxy;
 55 Provided also that when Y is hydroxy, Z cannot be hydrogen;
 the N-oxides thereof, provided that R₃ cannot be unsaturated alkyl and Y and Z cannot be alkylthioalkyl, alkylaminoalkyl, dialkylaminoalkyl, trialkylammoniumalkyl, amino, 2(or 4)-pyridyloxy, alkoxylamino or unsaturated alkyl;

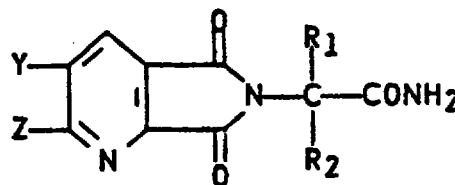
the optical isomers thereof when R_1 and R_2 are not the same;
 the tautomers and geometric isomers thereof; and
 the acid addition salts thereof except when R_3 is a salt forming cation.

The present invention also relates to substituted pyrrolopyridine acetonitriles depicted by formula III,
 5 substituted pyrrolopyridine acetamides illustrated by formula IV, imidazopyrrolopyridinediones illustrated
 formulas V and VI, and carbamoyl nicotinic acids, esters and salts depicted by formula VII. These
 compounds have the structures illustrated below and are useful as intermediates for the preparation of the
 herbicidal nicotinic acids, esters and salts of formulas I and II.

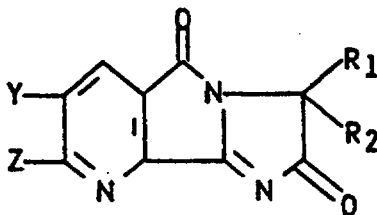
Formula III, IV, V, VI and VII, compounds have the structures:



(III)

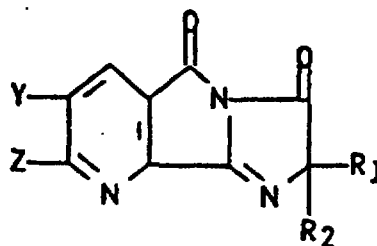


(IV)



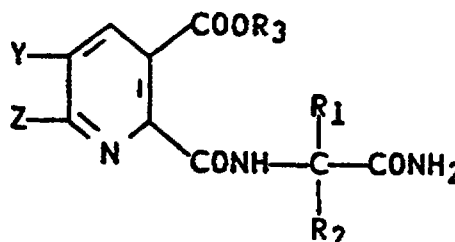
(V)

(VI)



and

(VII)



wherein R_1 , R_2 , R_3 , Y and Z are as described above.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A preferred group of compounds of this invention are the 5(and/or 6)substituted 2-(2-imidazolin-2-yl)-nicotinic acid, esters and salts represented by formula I above, wherein A, B, W, R_1 and R_2 are as described in said claim 1, and one of Y and Z represents hydrogen or methyl while the other of Y and Z represents

- C_2 - C_6 straight or branched alkenyl optionally substituted with phenyl, C_1 - C_4 alkoxy or 1 to 3 halogens;
- C_2 - C_6 straight or branched alkynyl optionally substituted with phenyl, C_1 - C_4 alkoxy or 1 to 3 halogens;
- C_3 - C_6 cycloalkyl optionally substituted with methyl, halogen or C_1 - C_4 alkoxy;
- C_1 - C_4 alkylcarbonyl optionally substituted with C_1 - C_4 alkoxy or 1 to 3 halogens;
- C_1 - C_4 alkylcarbonylamino optionally substituted on nitrogen with C_1 - C_2 alkyl or C_1 - C_4 alkoxy and on carbon with C_1 - C_4 alkoxy or 1 to 3 halogens;
- C_1 - C_4 alkyl substituted with C_1 - C_4 alkoxy, C_1 - C_4 alkylthio, C_1 - C_4 alkylamino, C_1 - C_4 dialkylamino, C_1 - C_4 trialkylammonium or C_1 - C_4 alkylcarbonyloxy;
- 2(or 3)-furyl optionally substituted with halogen or C_1 - C_3 alkyl;
- 2(or 3)-thienyl optionally substituted with halogen or C_1 - C_3 alkyl;
- N-methyl-2(or 3)-pyrrolyl;
- hydroxy;
- amino optionally substituted with C_1 - C_4 alkoxy or C_1 - C_2 alkyl and C_1 - C_4 alkoxy;
- 2(or 4)-pyridyloxy optionally substituted with C_1 - C_4 alkyl, trifluoromethyl or 1 or 2 halogens;
- C_1 - C_4 mono or dialkylaminocarbonylamino, optionally substituted on the nitrogen attached to the ring with C_1 - C_2 alkyl or C_1 - C_4 alkoxy;
- C_1 - C_4 alkoxy carbonylamino, optionally substituted on nitrogen with C_1 - C_2 alkyl or C_1 - C_4 alkoxy;
- C_1 - C_4 mono or dialkylaminocarbonyloxy;
- the N-oxides thereof, provided that R_3 cannot be unsaturated alkyl;
- the optical isomers thereof when R_1 and R_2 are not the same;
- the tautomers and geometric isomers thereof; and
- the acid addition salts thereof except when R_3 is a salt forming cation.

In this application the term cation means all cations, but preferably alkali metals, alkaline earth metals, ammonium, organic ammonium and inorganic metals such as copper, nickel, zinc, silver, lead, manganese, cobalt or iron.

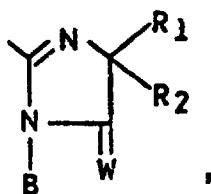
The term organic ammonium means a positively charged nitrogen atom joined to from one to four aliphatic groups, each containing from one to twenty carbon atoms and preferably one to six carbon atoms.

The compounds of the present invention are analogs of 2-(2-imidazolin-2-yl)pyridines of M. Los, described in the EPO application 81103638.3 published December 16, 1981 and EPO patent specification publication number 0,041,623; published July 28, 1985. However, the compounds of the present invention differ from those of M. Los in the 5(and/or 6) substitution of the pyridine ring. These differences may appear to be minimal but, in fact, are significant since they represent novel substitution of the imidazolinones and can provide new avenues to other herbicidally useful products or plant growth regulating agents.

Heretofore, 5(and/or 6) substitution on the pyridine ring was limited by the unavailability of methods for the preparation of substituted intermediates that would yield the 5(and/or 6) alkenyl, alkynyl, cycloalkyl, alkylcarbonyl, alkylcarbonylamino, 2(or 3)-furyl, 2(or 3)-thienyl or 2(or 4) pyridyloxy formula I-VII compounds of the present invention.

It is therefore an object of the present invention to provide 5(and/or 6)substituted 2-(2-imidazolin-2-yl)-nicotinic acids, esters and salts and 5(and/or 6)substituted intermediates therefore.

In the following descriptions for the preparation of the formula I 5(and/or 6) substituted 2-(2-imidazolin-2-yl)nicotinic acids, esters and salts, the imidazolinyl function, has the following structure:



wherein R_1 , R_2 , B and W are as described above; however, to avoid the repeated use of this structure in the specification, a specific imidazolinyl function is used as representative of the above structure. The specific imidazolinyl function is (4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl), and is used in the specification simply as a convenience in describing the reactions in which the above illustrated function can be involved. In practice, the structure can be substituted for the above-said terminology and the substituents identified as R_1 , R_2 , B and W, can be any of those selected from definitions for R_1 , R_2 , B and W mentioned above.

In accordance with this invention, 6-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)pyridine-3-carboxaldehyde is prepared by oxidation of 2-(5-hydroxymethyl-2-pyridyl)-4-isopropyl-4-methyl-2-imidazolin-5-one with manganese dioxide at an elevated temperature in the presence of an inert organic solvent such as a chlorinated hydrocarbon.

The thus prepared carboxaldehyde can then be converted to the desired 2-(5-alkenyl-2-pyridyl)-4-isopropyl-4-methyl-5-oxo-2-imidazolin-4-one by reaction of said aldehyde with the appropriate alkyl triphenylphosphonium halide in the presence of an alkali metal hydride, mineral oil and dimethylsulfoxide. Lithiation of this 5-alkenyl derivative, using methyl lithium and carbon dioxide in the presence of tetrahydrofuran, affords the corresponding, herbicidally active, 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-alkenylnicotinic acid.

Esterification of the thus prepared nicotinic acid can then be achieved by reaction of said acid with ethereal diazoalkane, preferably in the presence of an inert organic solvent such as chlorinated hydrocarbon.

Preparation of the 5(and/or 6)substituted nicotinic acids wherein the 5(and/or 6)substitution is alkenyl, alkylcarbonyl, 2(or 3)-furyl or 2(or 3)-thienyl, can be accomplished from the appropriate 5(and/or 6)-substituted-2,3-dicarboxylate.

In this method the appropriately substituted 5(and/or 6)pyridine-2,3-dicarboxylate is converted to the corresponding acid by heating with a strong base, such as an alkali metal hydroxide, and then acidifying the reaction mixture with a strong mineral acid. Heating of the thus formed acid with acetic anhydride, preferably in the presence of pyridine and 1,2-dimethoxyethane, yields the 5(and/or 6)substituted pyridine-2,3-dicarboxylic anhydride. The 5(and/or 6)substituted pyridine-2,3-dicarboxylic anhydride is then reacted with an aminocarboxamide to yield an isomeric mixture of the 5(and/or 6)substituted carbamoylnicotinic acid and the 5(and/or 6)substituted carbamoylpicolinic acid. This reaction is carried out using approximately equimolar amounts of the anhydride and the carboxamide, in the presence of an inert organic solvent such

as a chlorinated hydrocarbon or a low-boiling ether such as THF, diethyl ether, or dimethoxyethane. When the reaction is essentially complete, the product mixture is heated with base to give a mixture of the 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl) 5-(and/or 6) substituted nicotinic acid and the 3-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-(and/or 6)substituted picolinic acid. Conversion of this acid mixture to the corresponding esters can then be achieved by reaction of said mixture with acetic anhydride, preferably in the presence of an inert organic solvent such as toluene, xylene, benzene or the like. The reaction provides a mixture of the tricyclic diones of formulas V and VI which can be ring opened with an alkali metal alkoxide to yield a mixture of the 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl) 5-(and/or 6) substituted nicotinate and the 3-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl) 5-(and/or 6)substituted picolinate.

Conversion of the alkyl 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl) 5-(and/or 6)alkenyl nicotinate or the corresponding 5-(and/or 6)alkylthioalkyl or alkoxyalkylnicotinates to the corresponding acid can be achieved by reaction of the ester with alcoholic alkali metal hydroxide at an elevated temperature. After heating the reaction mixture is cooled and acidified with a strong mineral acid. The reaction is concentrated and then partitioned between a chlorinated hydrocarbon solvent and water.

Preparation of formula I, 5-(and/or 6)haloalkyl 2-(2-imidazolin-2-yl)nicotinate can be achieved by reacting an alkyl 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-alkylnicotinate with an N-halosuccinimide and benzoyl peroxide in the presence of an inert organic solvent such a chlorinated hydrocarbon. This reaction is generally conducted at an elevated temperature, preferably under a blanket of inert gas. The reaction yields the alkyl 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-(and/or 6)-(1-haloalkyl)nicotinate. If this reaction is conducted using an imidazolyl function in which B is COR₄ as described above, the COR₄ function is retained during the reaction but can be removed from the product ester by reaction thereof with aqueous alcohol and a strong mineral acid. These reactions are exemplified by examples 9 and 10 described in detail below. The thus obtained alkyl 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-(and/or 6)-(1-haloalkyl)nicotinate can then be used as the starting material for the preparation of the corresponding formula I 5-(and/or 6)alkyl substituted with alkylcarbonyloxy 2-(2-imidazolin-2-yl)nicotinate. The reaction involves the treatment of the 5-(and/or 6)-1-(haloalkyl)nicotinate referred to above, with an organic acid and an alkali metal salt of said organic acid.

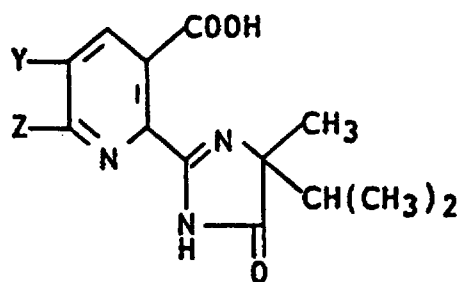
Treatment of the thus prepared formula I 2-(2-imidazolin-2-yl)nicotinate, having a 5-(and/or 6)alkyl substituent substituted with an alkylcarbonyloxy function, with an alkali metal alkoxide in a lower aliphatic alcohol provides the corresponding 5-(and/or 6)hydroxyloweralkyl function on the pyridine ring of the 2-(2-imidazolin-2-yl)nicotinate.

Treatment of this 5-(and/or 6)hydroxy loweralkyl 2-(2-imidazolin-2-yl)nicotinate with pyridinium dichromate and pyridinium trifluoroacetate in the presence of an inert organic solvent such as a chlorinated hydrocarbon, then yields the corresponding 5-(and/or 6)alkylcarbonyl 2-(2-imidazolin-2-yl)nicotinate.

To obtain the formula I, 5-(and/or 6)alkylthioalkyl substituted 2-(2-imidazolin-2-yl)nicotinate of this invention, a formula I 5-(and/or 6)haloalkyl 2-(2-imidazolin-2-yl)nicotinate is dissolved in absolute methanol, treated with a 50% oil dispersion of alkali metal hydride and then with an alkyl mercaptan. These additions are generally made while maintaining the temperature of the mixture below about -5°C. Thereafter, the mixture is acidified with acetic acid to pH 4 and then concentrated in vacuo. The residue can be dissolved in methylene chloride, washed with aqueous sodium bicarbonate, reconcentrated in vacuo and the product recovered.

Additional methods for the preparation of the compounds of this invention are described in the examples below.

Among the compounds of this invention that can be prepared by the methods described above and/or exemplified below are those having the following structure:



<u>Y</u>	<u>Z</u>
vinyl	hydrogen
1-propenyl	hydrogen
allyl	hydrogen
allyl	allyl
3-methoxy propenyl	hydrogen
3-chloropropenyl	methoxy
2-trichloromethylvinyl	hydrogen
1-chlorovinyl	dimethylamino
2-chlorovinyl	hydrogen
isopropenyl	hydrogen
2-phenylvinyl (cis)	hydrogen
2-phenylvinyl (trans)	hydrogen
ethynyl	hydrogen
1-propynyl	hydrogen
2-propynyl	ethoxy
3-chloro-1-propynyl	hydrogen
3-methoxy-1-propynyl	hydrogen
3-phenyl-1-propynyl	hydrogen
2-trichloromethyl-1-ethynyl	cyano
2-chloro-1-ethynyl	hydrogen
cyclopropyl	p-tolyl
cyclopropyl	hydrogen

	<u>Y</u>	<u>Z</u>
	cyclopropyl	methoxy
5	cyclobutyl	hydrogen
	cyclobutyl	phenyl
	cyclopentyl	hydrogen
10	cyclohexyl	hydrogen
	2,2-dimethyl-1-cyclopropyl	hydrogen
	2-methyl-1-cyclohexyl	hydrogen
	2-chloro-1-cyclohexyl	hydrogen
15	2-chloro-1-cyclopropyl	hydrogen
	2-methoxy-1-cyclohexyl	hydrogen
	2-methoxy-1-cyclopropyl	hydrogen
20	acetyl	hydrogen
	propionyl	hydrogen
	butyryl	hydrogen
25	methoxyacetyl	hydrogen
	butoxy acetyl	hydrogen
	chloroacetyl	hydrogen
30	dichloroacetyl	hydrogen
	trichloroacetyl	hydrogen
	2-chloropropionyl	hydrogen
	3-chloropropionyl	hydrogen
35	acetamido	hydrogen
	propionamido	hydrogen
	butyramido	hydrogen
40	chloroacetamido	hydrogen
	dichloroacetamido	hydrogen
	trichloroacetamido	hydrogen
45	methoxyacetamido	hydrogen
	2-chloropropionamido	hydrogen
	3-chloropropionamido	hydrogen

50

55

	<u>Y</u>	<u>Z</u>
5	N-methylacetamido	hydrogen
	N-ethylacetamido	hydrogen
	N-methoxyacetamido	hydrogen
	N-butoxyacetamido	hydrogen
10	N-methylpropionamido	hydrogen
	N-methoxypropionamido	hydrogen
	N-methylchloroacetamido	hydrogen
15	N-methoxychloroacetamido	hydrogen
	N-methyldichloroacetamido	hydrogen
	N-methoxydichloroacetamido	hydrogen
20	acetoxymethyl	hydrogen
	acetoxymethyl	acetamido
	propionyloxy	hydrogen
	butyryloxy	hydrogen
25	methoxyacetoxymethyl	hydrogen
	chloroacetoxymethyl	hydrogen
	dichloroacetoxymethyl	hydrogen
30	trichloroacetoxymethyl	hydrogen
	2-chloropropionyloxy	hydrogen
	3-chloropropionyloxy	hydrogen
35	2,2-dichloropropionyloxy	hydrogen
	methoxymethyl	hydrogen
	methoxymethyl	methoxymethyl
40	ethoxymethyl	hydrogen
	<u>n</u> -propoxymethyl	hydrogen
	<u>i</u> -propoxymethyl	hydrogen
	<u>n</u> -butoxymethyl	hydrogen
45	<u>i</u> -butoxymethyl	hydrogen
	<u>sec</u> -butoxymethyl	hydrogen
	<u>tert</u> -butoxymethyl	hydrogen
50		
55		

	<u>Y</u>	<u>Z</u>
	2-methoxyethyl	3-thienyl
5	2-methoxyethyl	hydrogen
	2-ethoxyethyl	hydrogen
	2-methoxypropyl	hydrogen
10	3-methoxypropyl	hydrogen
	2-methoxy-2-methylethyl	hydrogen
	methylthiomethyl	hydrogen
15	methylthiomethyl	2-furyl
	ethylthiomethyl	hydrogen
	propylthiomethyl	hydrogen
20	butylthiomethyl	hydrogen
	1-methylthioethyl	hydrogen
	2-methylthioethyl	hydrogen
	1-methylthiopropyl	hydrogen
25	2-methyl-2-methylthioethyl	hydrogen
	methylaminomethyl	hydrogen
	methylaminomethyl	p-chlorophenyl
30	ethylaminomethyl	hydrogen
	<u>n</u> -propylaminomethyl	hydrogen
	<u>i</u> -propylaminomethyl	hydrogen
35	<u>n</u> -butylaminomethyl	hydrogen
	<u>i</u> -butylaminomethyl	hydrogen
	<u>sec</u> -butylaminomethyl	hydrogen
40	<u>tert</u> -butylaminomethyl	hydrogen
	2-methylaminoethyl	hydrogen
	2-methylaminopropyl	hydrogen
	2-methylaminobutyl	hydrogen
45	2-methyl-2-methylaminoethyl	hydrogen
	3-methylaminopropyl	hydrogen

50

55

	<u>Y</u>	<u>Z</u>
	dimethylaminomethyl	hydrogen
5	diethylaminomethyl	hydrogen
	methyl(ethyl)aminomethyl	hydrogen
	dipropylaminomethyl	hydrogen
10	methyl(propyl)aminomethyl	hydrogen
	ethyl(propyl)aminomethyl	hydrogen
	1-dimethylaminoethyl	hydrogen
	2-dimethylaminoethyl	hydrogen
15	1-diethylaminoethyl	hydrogen
	2-diethylaminoethyl	hydrogen
	3-dimethylaminopropyl	hydrogen
20	(trimethylammonium)methyl	hydrogen
	(triethylammonium)methyl	hydrogen
	1-(trimethylammonium)ethyl	hydrogen
25	2-(trimethylammonium)ethyl	hydrogen
	3-(trimethylammonium)propyl	hydrogen
	acetoxymethyl	hydrogen
30	propionyloxymethyl	hydrogen
	butyroyloxymethyl	hydrogen
	1-acetoxyethyl	hydrogen
	2-acetoxyethyl	hydrogen
35	3-acetoxypropyl	hydrogen
	2-acetoxy-2-methylethyl	hydrogen
	2-furyl	hydrogen
40	3-furyl	hydrogen
	3-chloro-2-furyl	hydrogen
	4-chloro-2-furyl	hydrogen
45	5-chloro-2-furyl	hydrogen
	2-chloro-3-furyl	hydrogen
	4-chloro-3-furyl	hydrogen
50	5-chloro-3-furyl	hydrogen

55

	<u>Y</u>	<u>Z</u>
	3-methyl-2-furyl	hydrogen
5	5-methyl-2-furyl	hydrogen
	2-methyl-3-furyl	hydrogen
	5-methyl-3-furyl	hydrogen
10	2-thienyl	hydrogen
	3-thienyl	hydrogen
	3-chloro-2-thienyl	hydrogen
	4-chloro-2-thienyl	hydrogen
15	5-chloro-2-thienyl	hydrogen
	2-chloro-3-thienyl	hydrogen
	4-chloro-3-thienyl	hydrogen
20	5-chloro-3-thienyl	hydrogen
	3-methyl-2-thienyl	hydrogen
	5-methyl-2-thienyl	hydrogen
25	2-methyl-3-thienyl	hydrogen
	5-methyl-3-thienyl	hydrogen
	5-bromo-2-furyl	hydrogen
	5-bromo-2-thienyl	hydrogen
30	N-methyl-2-pyrrolyl	hydrogen
	N-methyl-3-pyrrolyl	hydrogen
	amino	hydrogen
35	methoxyamino	hydrogen
	ethoxyamino	hydrogen
	<u>n</u> -propyloxyamino	hydrogen
40	<u>i</u> -propyloxyamino	hydrogen
	<u>n</u> -butoxyamino	hydrogen
	<u>i</u> -butoxyamino	hydrogen
	<u>sec</u> -butoxyamino	hydrogen
45	<u>tert</u> -butoxyamino	hydrogen
	methyl(methoxy)amino	hydrogen
	ethyl(methoxy)amino	hydrogen
50	methyl(ethoxy)amino	hydrogen
	ethyl(ethoxy)amino	hydrogen

55

	<u>Y</u>	<u>Z</u>
	2-pyridyloxy	hydrogen
5	4-pyridyloxy	hydrogen
	3-fluoro-2-pyridyloxy	hydrogen
	3-chloro-2-pyridyloxy	hydrogen
10	3-methyl-2-pyridyloxy	hydrogen
	3,5-dichloro-2-pyridyloxy	hydrogen
	3,5-difluoro-2-pyridyloxy	hydrogen
15	5-trifluoromethyl-2-pyridyloxy	hydrogen
	3-fluoro-5-trifluoromethyl-2-pyridyloxy	hydrogen
20	hydrogen	vinyl
	hydrogen	1-propenyl
	hydrogen	allyl
25	hydrogen	3-methoxypropenyl
	hydrogen	3-chloropropenyl
	hydrogen	2-trichloromethyl
30		vinyl
	hydrogen	1-chlorovinyl
	hydrogen	2-chlorovinyl
	hydrogen	isopropenyl
35	hydrogen	2-phenylvinyl(cis)
	hydrogen	2-phenylvinyl(trans)
	hydrogen	ethynyl
40	hydrogen	1-propynyl
	hydrogen	2-propynyl
	hydrogen	3-chloro-1-propynyl
45	hydrogen	3-methoxy-1-propynyl
	hydrogen	3-phenyl-1-propynyl
	hydrogen	2-trichloromethyl-
50		ethynyl
	hydrogen	2-chloro-1-ethynyl

55

	<u>Y</u>	<u>Z</u>
5	trifluoromethoxy	1-chlorovinyl
	methylthio	2-chlorovinyl
	methylsulfonyl	ethynyl
	2-chlorovinyl	2-chlorovinyl
10	hydrogen	cyclopropyl
	phenyl	cyclopropyl
	hydrogen	cyclobutyl
15	hydrogen	cyclopentyl
	hydrogen	cyclohexyl
	hydrogen	2,2-dimethyl-1-cyclo-
20		propyl
	hydrogen	2-methyl-1-cyclohexyl
	hydrogen	2-methoxy-1-cyclopropyl
	hydrogen	acetyl
25	dimethylamino	acetyl
	hydrogen	propionyl
	hydrogen	butyryl
30	hydrogen	methoxyacetyl
	hydrogen	butoxyacetyl
	2-thienyl	chloroacetyl
35	hydrogen	chloroacetyl
	hydrogen	dichloroacetyl
	hydrogen	trichloroacetyl
40	hydrogen	2-chloropropionyl
	hydrogen	3-chloropropionyl
	hydrogen	acetamido
	hydrogen	propionamido
45	hydrogen	butyramido
	hydrogen	chloroacetamido
	hydrogen	dichloroacetamido
50	hydrogen	trichloroacetamido
55		

<u>Y</u>	<u>Z</u>
hydrogen	methoxyacetamido
5 hydrogen	2-chloropropionamido
hydrogen	3-chloropropionamido
hydrogen	N-methylacetamido
10 hydrogen	N-ethylacetamido
hydrogen	N-methoxyacetamido
hydrogen	N-butoxyacetamido
15 hydrogen	N-methylpropionamido
hydrogen	N-methoxypropionamido
hydrogen	N-methylchloroacetamido
20 hydrogen	N-methoxychloroacetamido
hydrogen	N-methyldichloroacetamido
hydrogen	N-methoxydichloro-
	acetamido
25 hydrogen	acetoxymethyl
hydrogen	propionyloxy
hydrogen	butyryloxy
30 hydrogen	methoxyacetoxymethyl
hydrogen	chloroacetoxymethyl
hydrogen	dichloroacetoxymethyl
hydrogen	trichloroacetoxymethyl
35 hydrogen	2-chloropropionyloxy
hydrogen	3-chloropropionyloxy
hydrogen	2,2-dichloropropionyloxy
40 hydrogen	methoxymethyl
hydrogen	ethoxymethyl
hydrogen	<u>n</u> -propoxymethyl
45 hydrogen	<u>i</u> -propoxymethyl
hydrogen	<u>n</u> -butoxymethyl
hydrogen	<u>i</u> -butoxymethyl
50 hydrogen	<u>sec</u> -butoxymethyl
hydrogen	<u>tert</u> -butoxymethyl

55

<u>Y</u>	<u>Z</u>
hydrogen	2-methoxyethyl
hydrogen	2-ethoxyethyl
5 hydrogen	2-methoxypropyl
hydrogen	3-methoxypropyl
hydrogen	2-methoxy-2-methylethyl
10 hydrogen	methylthiomethyl
hydrogen	ethylthiomethyl
hydrogen	propylthiomethyl
15 hydrogen	butylthiomethyl
hydrogen	1-methylthioethyl
hydrogen	2-methylthioethyl
20 hydrogen	1-methylthiopropyl
hydrogen	2-methyl-2-methylthio-ethyl
hydrogen	methylaminomethyl
25 hydrogen	ethylaminomethyl
hydrogen	<u>n</u> -propylaminomethyl
hydrogen	<u>i</u> -propylaminomethyl
30 hydrogen	<u>n</u> -butylaminomethyl
hydrogen	<u>i</u> -butylaminomethyl
hydrogen	<u>sec</u> -butylaminomethyl
35 hydrogen	<u>tert</u> -butylaminomethyl
hydrogen	2-methylaminoethyl
hydrogen	2-methylaminopropyl
40 hydrogen	2-methylaminobutyl
hydrogen	2-methyl-2-methylamino-ethyl
hydrogen	3-methylaminopropyl
45 hydrogen	dimethylaminomethyl
hydrogen	diethylaminomethyl
hydrogen	methyl(ethyl)aminomethyl
50 hydrogen	dipropylaminomethyl

55

	<u>Y</u>	<u>Z</u>
	hydrogen	methyl(propyl)aminomethyl
5	hydrogen	ethyl(propyl)aminomethyl
	hydrogen	1-dimethylaminoethyl
	hydrogen	2-dimethylaminoethyl
10	hydrogen	1-diethylaminoethyl
	hydrogen	2-diethylaminoethyl
	hydrogen	3-dimethylaminopropyl
15	hydrogen	(trimethylammonium)methyl
	hydrogen	(triethylammonium)methyl
	hydrogen	1-(trimethylammonium)- ethyl
20	hydrogen	2-(trimethylammonium)- ethyl
	hydrogen	3-(trimethylammonium)- propyl
25	hydrogen	acetoxymethyl
	hydrogen	propionyloxymethyl
30	hydrogen	butyroyloxymethyl
	hydrogen	1-acetoxyethyl
	hydrogen	2-acetoxyethyl
35	hydrogen	3-acetoxypropyl
	hydrogen	2-acetoxy-2-methylethyl
	hydrogen	2-furyl
	hydrogen	3-furyl
40	hydrogen	3-chloro-2-furyl
	hydrogen	4-chloro-2-furyl
	hydrogen	5-chloro-2-furyl
45	hydrogen	2-chloro-3-furyl
	hydrogen	4-chloro-3-furyl
	hydrogen	5-chloro-3-furyl
50	hydrogen	3-methyl-2-furyl
	hydrogen	5-methyl-2-furyl

55

	<u>Y</u>	<u>Z</u>
	hydrogen	2-methyl-3-furyl
5	hydrogen	5-methyl-3-furyl
	hydrogen	2-thienyl
	hydrogen	3-thienyl
10	hydrogen	3-chloro-2-thienyl
	hydrogen	4-chloro-2-thienyl
	hydrogen	5-chloro-2-thienyl
	hydrogen	2-chloro-3-thienyl
15	hydrogen	4-chloro-3-thienyl
	hydrogen	5-chloro-3-thienyl
	hydrogen	3-methyl-2-thienyl
20	hydrogen	5-methyl-2-thienyl
	hydrogen	2-methyl-3-thienyl
	hydrogen	5-methyl-3-thienyl
25	hydrogen	5-bromo-2-furyl
	hydrogen	5-bromo-2-thienyl
	hydrogen	N-methyl-2-pyrrolyl
30	hydrogen	N-methyl-3-pyrrolyl
	hydrogen	amino
	hydrogen	methoxyamino
	hydrogen	ethoxyamino
35	hydrogen	<u>n</u> -propyloxyamino
	hydrogen	<u>i</u> -propyloxyamino
	hydrogen	<u>n</u> -butoxyamino
40	hydrogen	<u>i</u> -butoxyamino
	hydrogen	<u>sec</u> -butoxyamino
	hydrogen	<u>tert</u> -butoxyamino
45	hydrogen	methyl(methoxy)amino
	hydrogen	ethyl(methoxy)amino
	hydrogen	methyl(ethoxy)amino
50	hydrogen	ethyl(ethoxy)amino
55		

	<u>Y</u>	<u>Z</u>
	hydrogen	2-pyridyloxy
5	hydrogen	4-pyridyloxy
	hydrogen	3-fluoro-2-pyridyloxy
	hydrogen	3-chloro-2-pyridyloxy
10	hydrogen	3-methyl-2-pyridyloxy
	hydrogen	3,5-dichloro-2-pyridyloxy
	hydrogen	3,5-difluoro-2-pyridyloxy
15	hydrogen	5-trifluoromethyl-2-pyridyloxy
	hydrogen	3-fluoro-5-trifluoro-methyl-2-pyridyloxy
20	hydrogen	hydroxy
	vinyl	methyl
	1-propenyl	methyl
25	allyl	methyl
	3-methoxypropenyl	methyl
	3-chloropropenyl	methyl
30	2-trichloromethylvinyl	methyl
	1-chlorovinyl	methyl
	2-chlorovinyl	methyl
	isopropenyl	methyl
35	2-phenylvinyl(cis)	methyl
	2-phenylvinyl(trans)	methyl
	ethynyl	methyl
40	1-propynyl	methyl
	2-propynyl	methyl
	3-chloro-1-propynyl	methyl
45	3-methoxy-1-propynyl	methyl
	3-phenyl-1-propynyl	methyl
	2-trichloromethyl-1-ethynyl	methyl
50	2-chloro-1-ethynyl	methyl

	<u>Y</u>	<u>Z</u>
	cyclopropyl	methyl
5	cyclobutyl	methyl
	cyclopentyl	methyl
	cyclohexyl	methyl
10	2,2-dimethyl-1-cyclopropyl	methyl
	2-methyl-1-cyclohexyl	methyl
	2-chloro-1-cyclohexyl	methyl
15	2-chloro-1-cyclopropyl	methyl
	2-methoxy-1-cyclohexyl	methyl
	2-methoxy-1-cyclopropyl	methyl
20	acetyl	methyl
	propionyl	methyl
	butyryl	methyl
	methoxyacetyl	methyl
25	butoxyacetyl	methyl
	chloroacetyl	methyl
	dichloroacetyl	methyl
30	trichloroacetyl	methyl
	2-chloropropionyl	methyl
	3-chloropropionyl	methyl
35	acetamido	methyl
	propionamido	methyl
	butyramido	methyl
40	chloroacetamido	methyl
	dichloroacetamido	methyl
	trichloroacetamido	methyl
	methoxyacetamido	methyl
45	2-chloropropionamido	methyl
	3-chloropropionamido	methyl
	N-methylacetamido	methyl
50	N-ethylacetamido	methyl

55

	<u>Y</u>	<u>Z</u>
	N-methoxyacetamido	methyl
5	N-butoxyacetamido	methyl
	N-methylpropionamido	methyl
	N-methoxypropionamido	methyl
10	N-methylchloroacetamido	methyl
	N-methoxychloroacetamido	methyl
	N-methyldichloroacetamido	methyl
15	N-methoxydichloroacetamido	methyl
	acetoxy	methyl
	propionyloxy	methyl
	butyroyloxy	methyl
20	methoxyacetoxy	methyl
	chloroacetoxy	methyl
	dichloroacetoxy	methyl
25	trichloroacetoxy	methyl
	2-chloropropionyloxy	methyl
	3-chloropropionyloxy	methyl
30	2,2-dichloropropionyloxy	methyl
	methoxymethyl	methyl
	ethoxymethyl	methyl
35	<u>n</u> -propoxymethyl	methyl
	<u>i</u> -propoxymethyl	methyl
	<u>n</u> -butoxymethyl	methyl
	<u>i</u> -butoxymethyl	methyl
40	<u>sec</u> -butoxymethyl	methyl
	<u>tert</u> -butoxymethyl	methyl
	2-methoxyethyl	methyl
45	2-ethoxyethyl	methyl
	2-methoxypropyl	methyl
	3-methoxypropyl	methyl
50	2-methoxy-2-methylethyl	methyl

55

	<u>Y</u>	<u>Z</u>
	methylthiomethyl	methyl
5	ethylthiomethyl	methyl
	propylthiomethyl	methyl
	butylthiomethyl	methyl
10	1-methylthioethyl	methyl
	2-methylthioethyl	methyl
	1-methylthiopropyl	methyl
15	2-methyl-2-methylthioethyl	methyl
	methylaminomethyl	methyl
	ethylaminomethyl	methyl
	<u>n</u> -propylaminomethyl	methyl
20	<u>i</u> -propylaminomethyl	methyl
	<u>n</u> -butylaminomethyl	methyl
	<u>i</u> -butylaminomethyl	methyl
25	<u>sec</u> -butylaminomethyl	methyl
	<u>tert</u> -butylaminomethyl	methyl
	2-methylaminoethyl	methyl
30	2-methylaminopropyl	methyl
	2-methylaminobutyl	methyl
	2-methyl-2-methylaminoethyl	methyl
35	3-methylaminopropyl	methyl
	dimethylaminomethyl	methyl
	diethylaminomethyl	methyl
40	methyl(ethyl)aminomethyl	methyl
	dipropylaminomethyl	methyl
	methyl(propyl)aminomethyl	methyl
	ethyl(propyl)aminomethyl	methyl
45	1-dimethylaminoethyl	methyl
	2-dimethylaminoethyl	methyl
	1-diethylaminoethyl	methyl
50	2-diethylaminoethyl	methyl
	3-dimethylaminopropyl	methyl

55

	<u>Y</u>	<u>Z</u>
	(trimethylammonium)methyl	methyl
5	(triethylammonium)methyl	methyl
	1-(trimethylammonium)ethyl	methyl
	2-(trimethylammonium)ethyl	methyl
10	3-(trimethylammonium)propyl	methyl
	acetoxymethyl	methyl
	propionyloxymethyl	methyl
	butyroyloxymethyl	methyl
15	1-acetoxyethyl	methyl
	2-acetoxyethyl	methyl
	3-acetoxypropyl	methyl
20	2-acetoxy-2-methylethyl	methyl
	2-furyl	methyl
	3-furyl	methyl
25	3-chloro-2-furyl	methyl
	4-chloro-2-furyl	methyl
	5-chloro-2-furyl	methyl
	2-chloro-3-furyl	methyl
30	4-chloro-3-furyl	methyl
	5-chloro-3-furyl	methyl
	3-methyl-2-furyl	methyl
35	5-methyl-2-furyl	methyl
	2-methyl-3-furyl	methyl
	5-methyl-3-furyl	methyl
	2-thienyl	methyl
40	3-thienyl	methyl
	3-chloro-2-thienyl	methyl
	4-chloro-2-thienyl	methyl
45	5-chloro-2-thienyl	methyl
	2-chloro-3-thienyl	methyl
	4-chloro-3-thienyl	methyl
50	5-chloro-3-thienyl	methyl
	3-methyl-2-thienyl	methyl

55

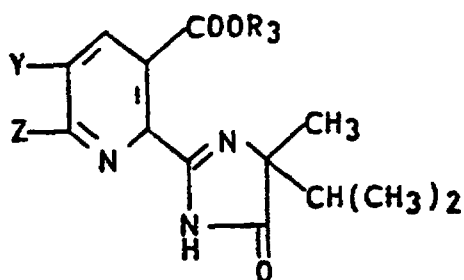
	<u>Y</u>	<u>Z</u>
	5-methyl-2-thienyl	methyl
5	2-methyl-3-thienyl	methyl
	5-methyl-3-thienyl	methyl
	5-bromo-2-furyl	methyl
10	5-bromo-2-thienyl	methyl
	N-methyl-2-pyrrolyl	methyl
	N-methyl-3-pyrrolyl	methyl
	amino	methyl
15	methoxyamino	methyl
	ethoxyamino	methyl
	<u>n</u> -propyloxyamino	methyl
20	<u>i</u> -propyloxyamino	methyl
	<u>n</u> -butoxyamino	methyl
	<u>i</u> -butoxyamino	methyl
25	<u>sec</u> -butoxyamino	methyl
	<u>tert</u> -butoxyamino	methyl
	methyl(methoxy)amino	methyl
30	ethyl(methoxy)amino	methyl
	methyl(ethoxy)amino	methyl
	ethyl(ethoxy)amino	methyl
35	2-pyridyloxy	methyl
	4-pyridyloxy	methyl
	3-fluoro-2-pyridyloxy	methyl
	3-chloro-2-pyridyloxy	methyl
40	3-methyl-2-pyridyloxy	methyl
	3,5-dichloro-2-pyridyloxy	methyl
	3,5-difluoro-2-pyridyloxy	methyl
45	5-trifluoromethyl-2-pyridyloxy	methyl
	3-fluoro-5-trifluoromethyl-2-pyridyloxy	methyl
50	hydroxy	methyl

	<u>Y</u>	<u>Z</u>
	methyl	vinyl
5	methyl	1-propenyl
	methyl	allyl
	methyl	1-chlorovinyl
10	methyl	2-chlorovinyl
	methyl	ethynyl
	methyl	acetyl
	methyl	chloroacetyl
15	methyl	acetamido
	methyl	chloroacetamido
	methyl	N-methylacetamido
20	methyl	acetoxy
	methyl	chloroacetoxy
	methyl	methoxymethyl
25	methyl	methylthiomethyl
	methyl	methylaminomethyl
	methyl	dimethylaminomethyl
30	methyl	acetoxymethyl
	methyl	2-furyl
	methyl	2-thienyl
	methyl	amino
35	methyl	hydroxy
	methyl	methoxyamino
	methyl	3-fluoro-5-trifluoro-
40		methyl-2-pyridyloxy
	chloro	vinyl
	chloro	acetyl
45	chloro	ethynyl
	chloro	acetamido
	chloro	acetoxy
	chloro	methoxymethyl
50	chloro	acetoxymethyl
55		

	<u>Y</u>	<u>Z</u>
	chloro	2-furyl
5	chloro	2-thienyl
	chloro	amino
	chloro	hydroxy
10	chloro	methoxyamino
	vinyl	chloro
	1-propenyl	chloro
	isopropenyl	chloro
15	allyl	chloro
	1-chlorovinyl	chloro
	2-chlorovinyl	chloro
20	ethynyl	chloro
	acetyl	chloro
	chloroacetyl	chloro
25	acetamido	chloro
	chloroacetamido	chloro
	N-methylacetamido	chloro
	acetoxy	chloro
30	chloroacetoxy	chloro
	methoxymethyl	chloro
	methylthiomethyl	chloro
35	methylaminomethyl	chloro
	dimethylaminomethyl	chloro
	acetoxymethyl	chloro
40	2-furyl	chloro
	2-thienyl	chloro
	3-furyl	chloro
	3-thienyl	chloro
45	amino	chloro
	hydroxy	chloro
	methoxyamino	chloro
50	3-fluoro-5-trifluoromethyl-	chloro
	2-pyridyloxy	

55

	<u>Y</u>	<u>Z</u>
	vinyl	fluoro
5	1-propenyl	fluoro
	isopropenyl	fluoro
	allyl	fluoro
10	1-chlorovinyl	fluoro
	2-chlorovinyl	fluoro
	ethynyl	fluoro
	acetyl	fluoro
15	chloroacetyl	fluoro
	acetamido	fluoro
	chloroacetamido	fluoro
20	N-methylacetamido	fluoro
	acetoxymethyl	fluoro
	chloroacetoxymethyl	fluoro
25	methoxymethyl	fluoro
	methylthiomethyl	fluoro
	methylaminomethyl	fluoro
30	dimethylaminomethyl	fluoro
	acetoxymethyl	fluoro
	2-furyl	fluoro
	2-thienyl	fluoro
35	3-furyl	fluoro
	3-thienyl	fluoro
	amino	fluoro
40	hydroxy	fluoro
	methoxyamino	fluoro
	3-fluoro-5-trifluoromethyl- 2-pyridyloxy	fluoro
45		



Y	Z	R ₃
vinyl	hydrogen	methyl
ethynyl	hydrogen	ethyl
2-furyl	hydrogen	2-methoxyethyl
methylthiomethyl	hydrogen	furfuryl
acetoxymethyl	hydrogen	propargyl
hydrogen	methoxymethyl	methyl
hydrogen	N-methylacetamido	2-methoxyethyl
hydrogen	chloroacetoxy	allyl

The formula I compounds of this invention are effective herbicidal agents useful for the control of a variety of monocotyledonous and dicotyledonous plants. These compounds are herbicidally effective for controlling weeds indigenous to both dry land and wet land areas. They are also useful as aquatic herbicides and are effective for controlling the above-said plants when applied to the foliage thereof or to the soil or water containing seeds or other propagating organs of said plants such as tubers, rhizomes or stolons, at rates of from about 0.016 to 8.0 kg/ha.

The formula I and formula II compounds of this invention can be formulated as wettable powders, flowable concentrates or granular formulations.

Wettable powders can be prepared by grinding together about 20% to 45% by weight of a finely divided carrier such as kaolin, bentonite, diatomaceous earth or attapulgite 45% to 80% by weight of the active compound, 2% to 5% by weight of a dispersing agent such as sodium lignosulfonate, and 2% to 5% by weight of a nonionic surfactant, such as octylphenoxy polyethoxy ethanol or nonylphenoxy polyethoxy ethanol.

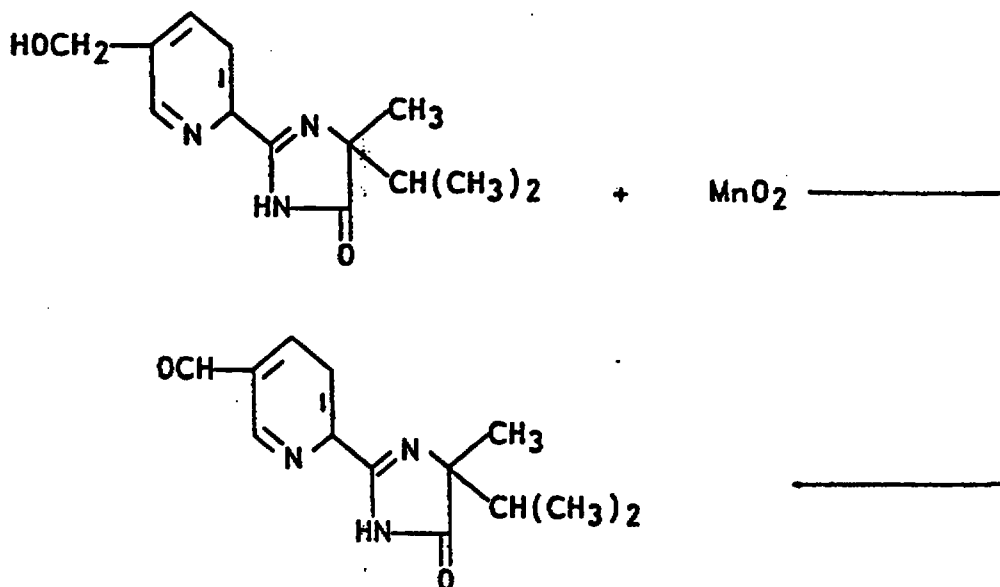
A typical flowable liquid can be prepared by admixing about 40% by weight of the active ingredient with about 2% by weight of a gelling agent such as bentonite, 3% by weight of a dispersing agent such as sodium lignosulfonate, 1% by weight of polyethylene glycol and 54% by weight of water.

A typical emulsifiable concentrate can be prepared by dissolving about 5% to 25% by weight of the active ingredient in about 65% to 90% by weight of N-methylpyrrolidone, isophorone, butyl cellosolve or methylacetate and dispersing therein about 5% to 10% by weight of a nonionic surfactant such as an alkylphenoxy polyethoxy alcohol. This concentrate is dispersed in water for application as a liquid spray.

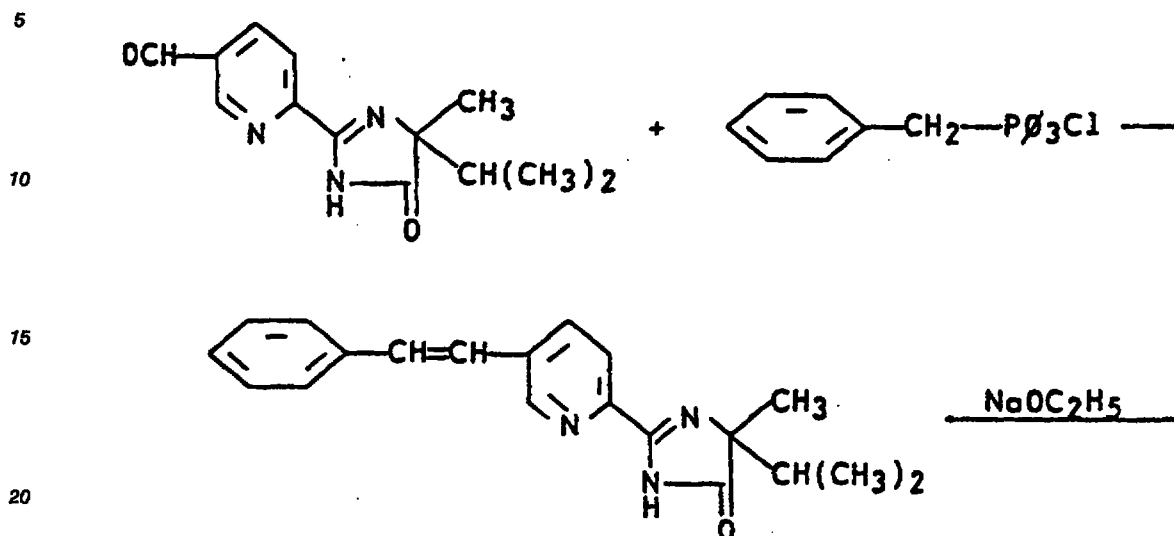
When the compounds of the invention are to be used as herbicides where soil treatments are involved, the compounds may be prepared and applied as granular products. Preparation of the granular product can be achieved by dissolving the active compound in a solvent such as methylene chloride or N-methylpyrrolidone and spraying the thus prepared solution on a granular carrier such as corncob grits, sand, attapulgite, kaolin or the like.

The granular product thus prepared generally comprises about 3% to 20% by weight of the active ingredient and about 97% to 80% by weight of the granular carrier.

In order to facilitate a further understanding of the invention, the following examples are presented primarily for the purpose of illustrating certain more specific details thereof.

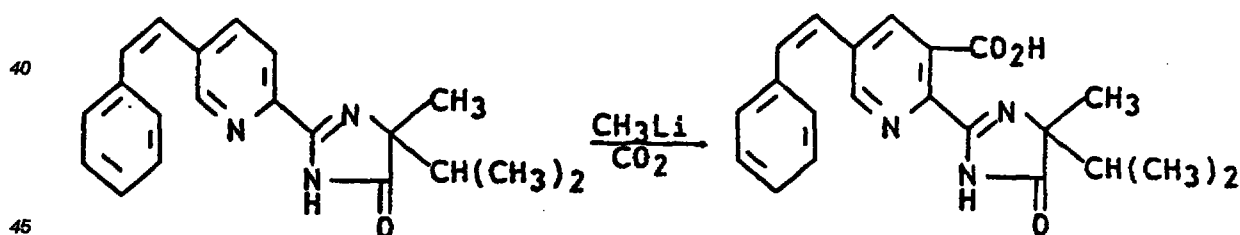
EXAMPLE 1**Preparation of 6-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)pyridine-3-carboxaldehyde**

To a stirred solution containing 18 g hydroxymethyl pyridine in 180 mL dry methylene chloride under nitrogen is added 44.3 g of activated manganese dioxide. The mixture is heated under reflux for four hours. The mixture is filtered and the filtrate concentrated. Trituration of the residue with ether-hexane gave a crystalline solid. This is recrystallized from ether-hexane to give analytically pure 6-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)pyridine-3-carboxaldehyde, mp 105.5-108°C.

EXAMPLE 2Preparation of 2-(5-Styryl-2-pyridyl)-4-isopropyl-4-methyl-2-imidazolin-5-one

25 To a solution of 2.72g of sodium ethoxide (.04 mol) in 100 mL absolute ethanol, stirred at room temperature under nitrogen, is added 7.9g (.02 mol) (benzyl) triphenylphosphonium chloride. After 5 minutes, 5.0g 6-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)pyridine-3-carboxaldehyde (.02 mol) is added all at once, and the mixture is stirred at room temperature for 24 hours. The mixture is concentrated in vacuo, and the residue is chromatographed on silica gel using ether-hexane as eluant to give 0.4g of the

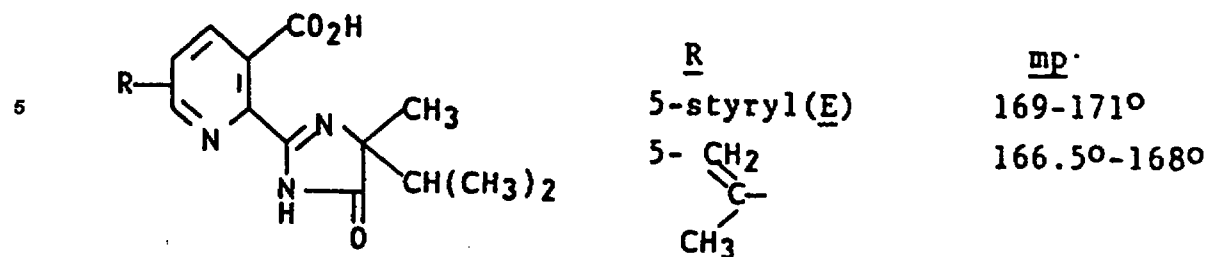
30 desired product as the pure cis isomer (oil), 4.5g product as an isomeric mixture, and 1.25g of the trans isomer, mp 128-133°C.

EXAMPLE 3Preparation of 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-styrylnicotinic acid, (Z)

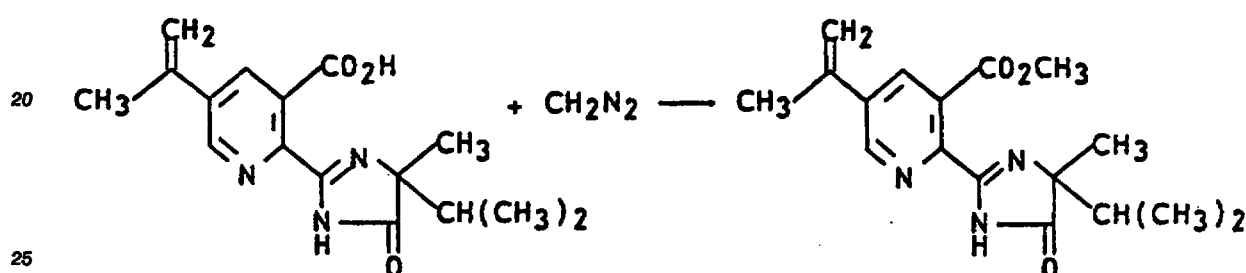
50 To a solution of 2.07g of 2-(5-styryl-2-pyridyl)-5-isopropyl-5-methyl-2-imidazolin-4-one in 100 mL dry tetrahydrofuran, stirred at -70° under nitrogen, is added slowly 9 mL of 1.6M methyllithium. After stirring the reaction mixture at -10° for 1 hour, it is slowly syringed into a saturated solution of carbon dioxide in tetrahydrofuran. After stirring the resulting mixture overnight, the solvent is removed in vacuo; the residue is dissolved in water, washed with methylene chloride, and the aqueous phase is acidified to pH 3 and extracted with methylene chloride. The combined extracts are dried and concentrated in vacuo to afford the

55 product. Recrystallization from methylene chloride-hexanes affords a solid, mp 122.5-126°.

Utilizing the above procedure and substituting the appropriate 2-pyridyl-5-isopropyl-5-methyl-2-imidazolin-4-one yields the compounds below:

**EXAMPLE 4**

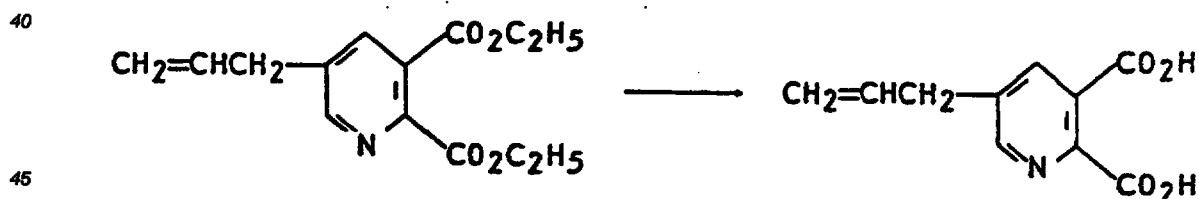
15 Preparation of methyl-5-isopropenyl-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)nicotinate



30 To a solution of 4.9g of 5-isopropenyl-2-(5-isopropyl-5-methyl-4-oxo-2-imidazolin-2-yl)nicotinic acid in 50 mL of methylene chloride, stirred at 0° is added 60 mL of .25M ethereal diazomethane. After stirring for 15 minutes, the reaction is concentrated on a steam bath. The residue is chromatographed on silica gel using 2:1 ether-hexanes as eluant to afford the desired product. Recrystallization from ether-hexanes affords a solid, mp 90.5-92.5°.

EXAMPLE 5

Preparation of 5-allylpyridine-2,3-dicarboxylic acid



50 To a solution of 6.07g of diethyl 5-allylpyridine-2,3-dicarboxylate in 20 mL methanol, stirred under nitrogen, is added slowly a solution of 3.3g of sodium hydroxide in 13 mL water. After diluting the reaction mixture with 10 mL each of water and methanol, it is heated at reflux for 1 3/4 hours. The reaction is cooled in an ice bath, acidified to pH 3 with concentrated hydrochloric acid, and concentrated in vacuo to a damp solid. This solid is reevaporated from pyridine to afford the product as a brown solid, mp >250°(dec).

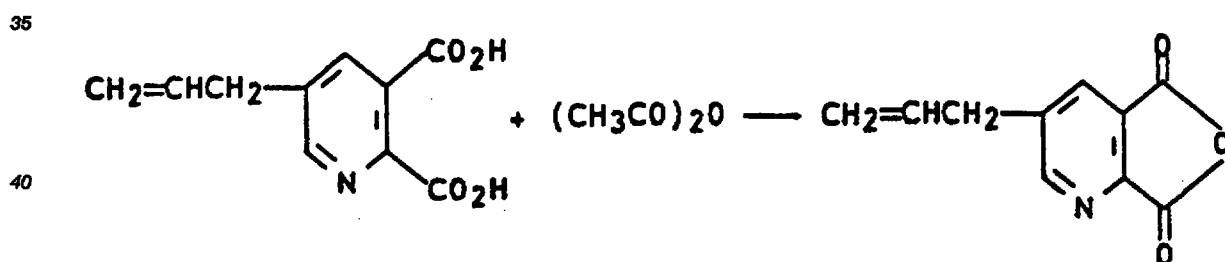
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The following were prepared in similar fashion:

5		<u>Y</u>	<u>Z</u>	<u>mp</u>
			CH ₃	solid
10		H		solid
15			H	solid
20		H		solid
25			H	solid

EXAMPLE 6

Preparation of 5-allylpyridine-2,3-dicarboxylic anhydride



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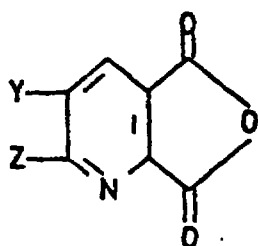
A mixture of 7 g of crude 5-allylpyridine-2,3-dicarboxylic acid, 9.8 mL acetic anhydride, and 3.3 mL pyridine in 100 mL dry 1,2-dimethoxyethane is stirred under nitrogen and heated at 65° for 1 hour. After adding an additional 1 mL of acetic anhydride, the reaction is heated for 2 hours at 65°, then at reflux overnight. The reaction mixture is filtered, and the solids are washed with ether and ethyl acetate. The

50 combined filtrates are concentrated in vacuo and reevaporated from xylenes to afford the product as a solid.

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Similarly were prepared the following:

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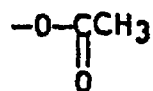
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55

YZmp

solid

H



solid

H



solid

YZmp

H

solid

H



solid

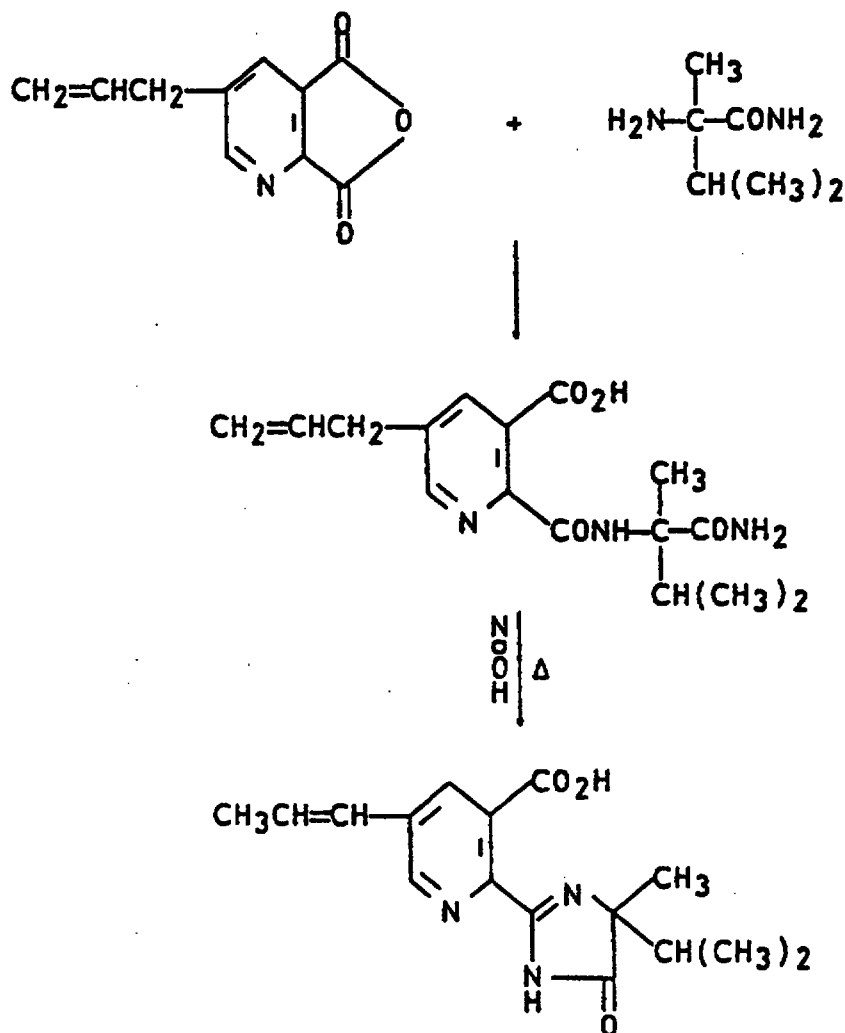


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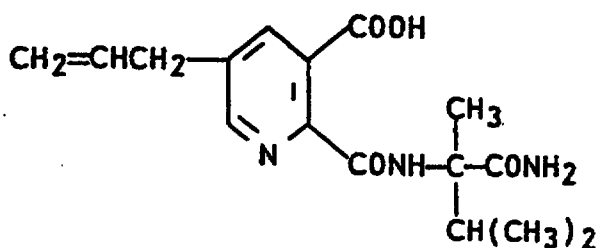
solid

EXAMPLE 7

Preparation of 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-propenylnicotinic acid and its picolinic acid isomer

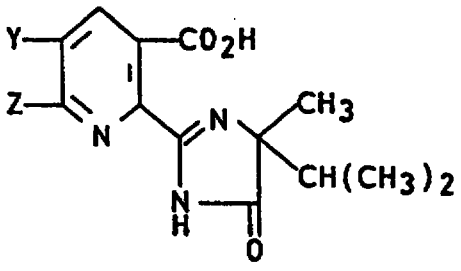
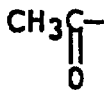
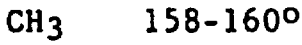


A mixture of 2.88g of 5-allylpyridine-2,3-dicarboxylic anhydride and 2.0g of 2-amino-2,3-dimethylbutyramide in 40 mL of dry tetrahydrofuran is stirred under nitrogen and heated at reflux for 2 hours. The reaction is cooled and concentrated in vacuo to afford a mixture of acid-diamides as a gum. The gum can be redigested in hot tetrahydrofuran, heated at reflux overnight, cooled, diluted with some ether, and filtered to afford the isomerically pure intermediate, 5-allyl-2-[(1-carbamoyl-1,2-dimethylpropyl)carbamoyl]nicotinic acid as a solid.



Using essentially the same procedure, but substituting 2-amino-2,3-dimethylthiobutyramide for 2-amino-2,3-dimethylbutyramide affords the corresponding 2-(4-isopropyl-4-methyl-5-thioxo-2-imidazolin-2-yl)-5-propenyl nicotinic acid as a solid. This material is digested in 15.2 mL of 5N sodium hydroxide and heated at 80° for 1 hour. The reaction is cooled, acidified to pH 3 with 4N hydrochloric acid and extracted with 5 methylene chloride and ethyl acetate. The combined extracts are dried and concentrated in vacuo to afford 2.68g crude product as a gummy isomeric mixture.

As above, followed by fractional crystallization, affords the following:

10	<u>Y</u>	<u>Z</u>	<u>mp</u>
15			
20			
25	<u>Y</u>	<u>Z</u>	<u>mp</u>
30	H		253-261°(dec)
35		H	211.5-213°
40	H		255-261°(dec)
45		H	172-174°
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EXAMPLE 8

Preparation of methyl 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-propenylpicotinate and its picolinate isomer

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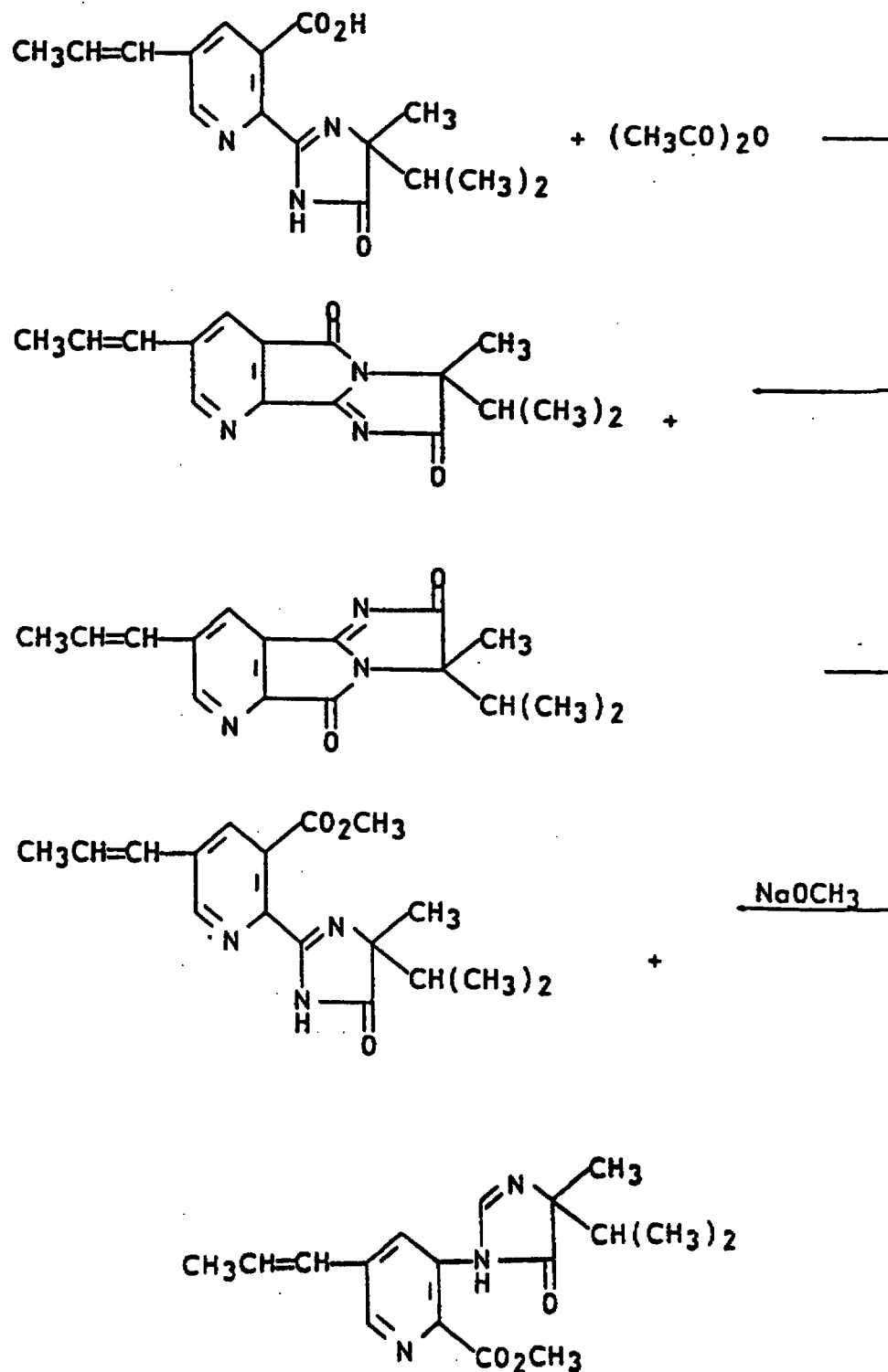
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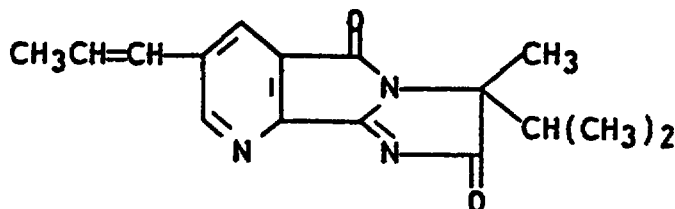
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A mixture of 2.68g of 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-propenylpicotinic acid and its picolinic acid isomer and 1.85 mL of acetic anhydride in 20 mL toluene is stirred under nitrogen and heated

at reflux for 2 1/2 hours. Solvent is removed in vacuo, and the residual gum is reevaporated from xylenes. The residue is dissolved in 20 mL methanol, .75g of sodium methoxide is added, and the mixture is stirred at room temperature for 3 hours. The reaction is then acidified with glacial acetic acid to pH 5, stirred overnight, and concentrated in vacuo. The residue is partitioned between methylene chloride and water, and the aqueous phase is further extracted with methylene chloride. The combined extracts are dried and concentrated in vacuo to an oil. Chromatography on silica gel using ether-hexane mixtures affords 1.85g of the nicotinate, and .56g of the picolinate. Using the same procedure on isomerically pure 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-propenyl nicotinic acid affords the isomerically pure intermediate, 3-isopropyl-3-methyl-7-propenyl-5H-imidazo[1:2:1,2]pyrrodo[3,4-b]pyridine-2(3H),5-dione, as a solid.



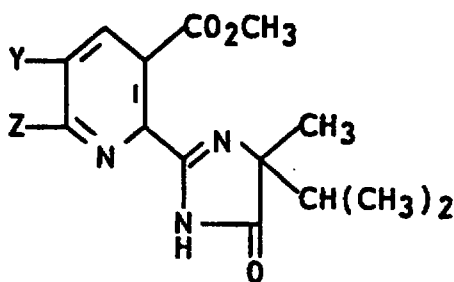
Recrystallization of the nicotinate from methylene chloride-hexanes gives 1.37g of a solid, mp 122.5-124.5.

By this method were also prepared:

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YZmp

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H



138-140.5°

40

H



168-173.5°

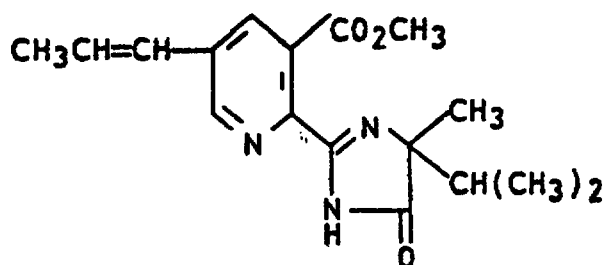
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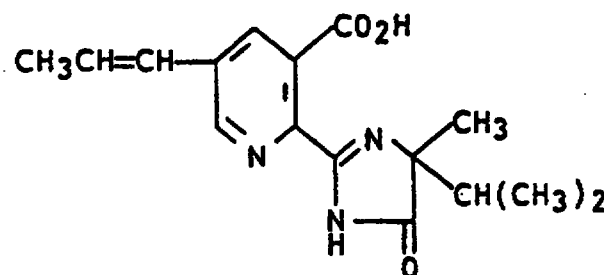
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EXAMPLE 9

Preparation of 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-propenylnicotinic acid

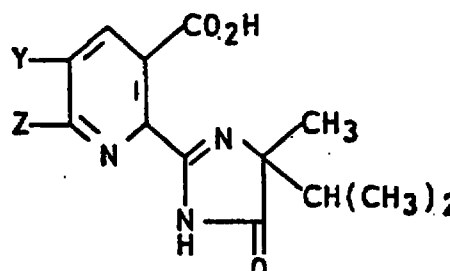


+ NaOH



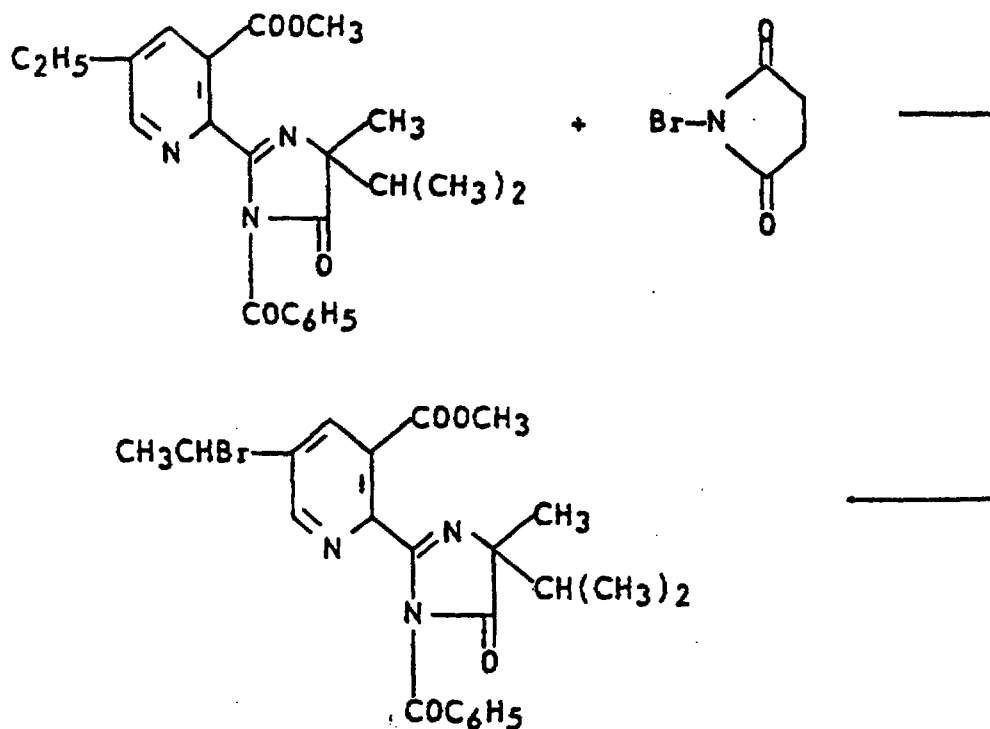
A mixture of 1.5g methyl 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-propenylnicotinate and 3.2 mL of 2N sodium hydroxide in 15 mL methanol is stirred under nitrogen and heated at 45° for 3 1/2 hours. The reaction is cooled to 10°, acidified to pH 3 with 2N hydrochloric acid, and concentrated in vacuo. The residue is partitioned between methylene chloride and water, and the aqueous phase is further extracted with methylene chloride. The combined organic phases are dried and concentrated in vacuo to a solid. Recrystallization from methylene chloride-hexanes gives a solid, mp 175-176°.

Using essentially the same conditions, and substituting the appropriate nicotinate precursor, the following are obtained:

	<u>Y</u>	<u>Z</u>	<u>mp</u>
	$\text{CH}_3\text{C}(=\text{O})-$	H	191.5-192.5°
	CH_3SCH_2-	H	162-165°
	H	CH_3SCH_2-	113-116°
	CH_3OCH_2	H	160-162°

EXAMPLE 10

Preparation of methyl 2-(1-benzoyl-4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-(1-bromoethyl)nicotinate



A mixture of 38.6g methyl 2-(1-benzoyl-4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-ethylnicotinate, 16.9g N-bromosuccinimide and 2.3g benzoyl peroxide in 740 mL carbon tetrachloride is stirred under nitrogen and heated at reflux using a sunlamp for 1 1/2 hours. The reaction mixture is cooled, filtered through celite, and the filtrate is concentrated in vacuo to an orange oil. This oil is partitioned between 400 mL each of water and methylene chloride. The aqueous layer is further extracted with methylene chloride, and the combined organic phases are dried over sodium sulfate and concentrated in vacuo to give 49.8g of a cloudy orange glass; NMR shows the desired product to be the major component.

Using essentially the same conditions described above on the 5-methylnicotinate gives the corresponding 5-bromomethyl compound.

EXAMPLE 11

Preparation of methyl 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-(1-bromoethyl)nicotinate

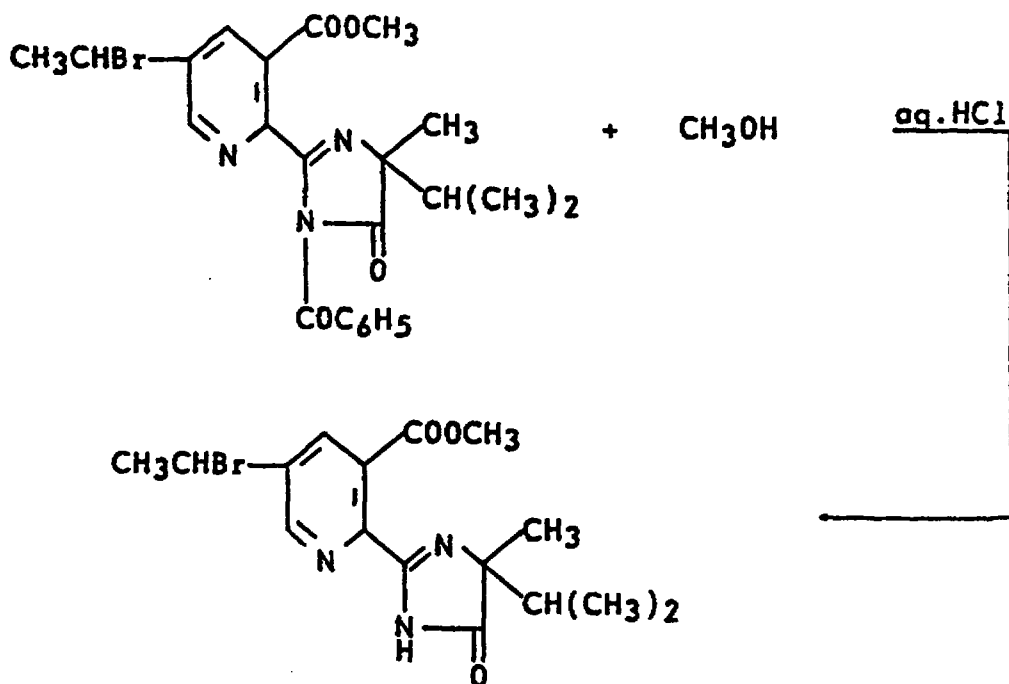
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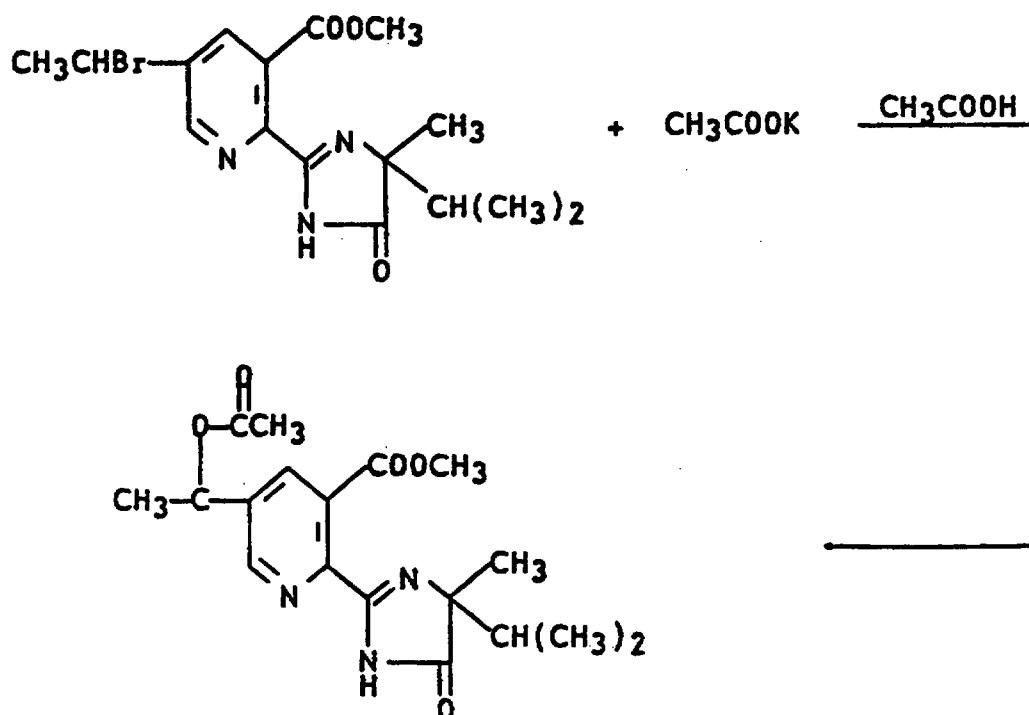
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A solution of 49.6g of crude methyl 2-(1-benzoyl-4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-(1-bromoethyl) nicotinate (See Exp. 10) in 300 mL of methanol is stirred at room temperature and 400 mL of 50% aqueous methanol (2N in hydrogen chloride) is added dropwise over 1 hour. After stirring the reaction for an additional 2 hours, it is concentrated in vacuo. The pH of the residue is adjusted to 6 with 2N aqueous sodium hydroxide, and the mixture is extracted with 4 x 200 mL methylene chloride. The combined extracts are dried and concentrated in vacuo to afford the crude desired product as a thick oil. A portion is chromatographed on silica gel using ether-hexane as eluant and recrystallized from methylene chloride-hexane to give the desired product as a light orange solid, mp 123-126°C.

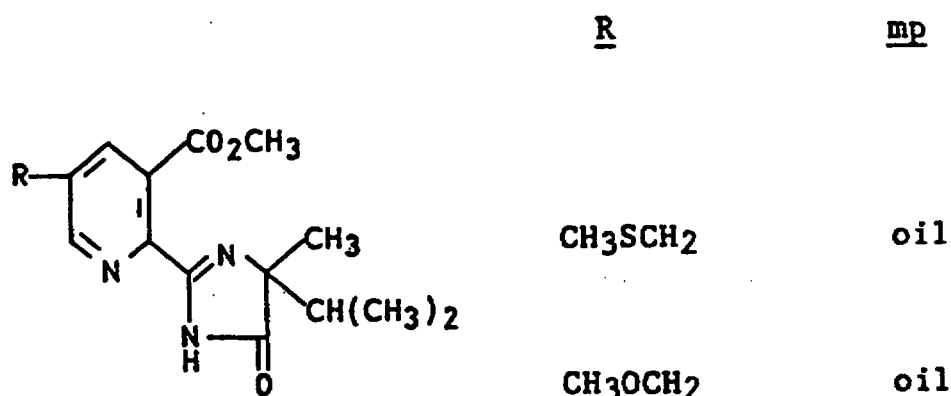
EXAMPLE 12

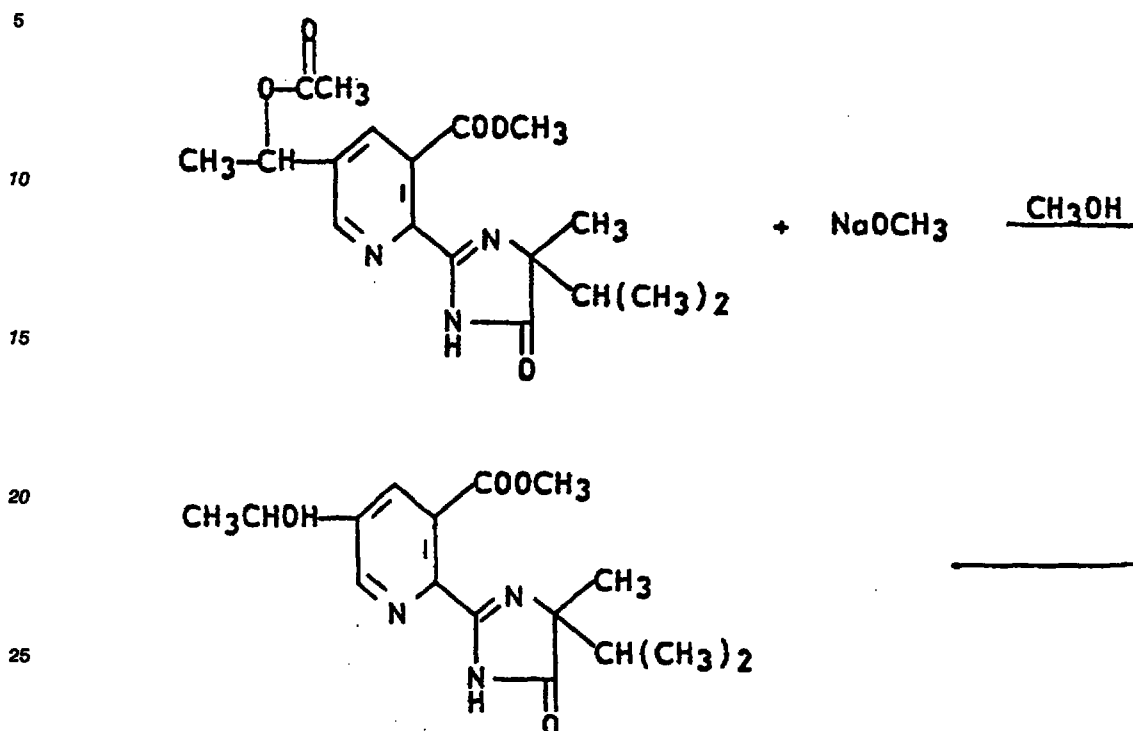
Preparation of methyl 5-(1-acetoxyethyl)-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)nicotinate



A mixture of 12g of methyl 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-(1-bromoethyl)nicotinate, 3.1g potassium acetate and 30 mL acetic acid is stirred under nitrogen and heated at reflux for 8 hours. The reaction mixture is filtered, and the filtrate is concentrated in vacuo. The residue is triturated with ether, filtered, and concentrated in vacuo to give the desired product as an amber glass.

Using essentially the same conditions as described above, and using the appropriate 5-(1-bromoalkyl)-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)nicotinate and appropriate nucleophile, the following are prepared: the 5-methylthiomethyl and the 5-methoxymethyl nicotinates.



EXAMPLE 13**Preparation of methyl 5-(1-hydroxyethyl)-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)nicotinate**

A solution of 16g of methyl 5-(1-acetoxyethyl)-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)nicotinate and 0.5g sodium methoxide in 150 mL methanol is stirred at room temperature under nitrogen for 5 days. The reaction is acidified to pH 5 with acetic acid and concentrated in vacuo. The residue is partitioned between methylene chloride and water, the aqueous layer is further extracted with methylene chloride, and the combined organic phases are dried over sodium sulfate and concentrated in vacuo to an orange oil. Column chromatography of this oil using ether-hexane as eluent affords the desired product as a white foam.

EXAMPLE 14**Preparation of methyl 5-acetyl-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)nicotinate**

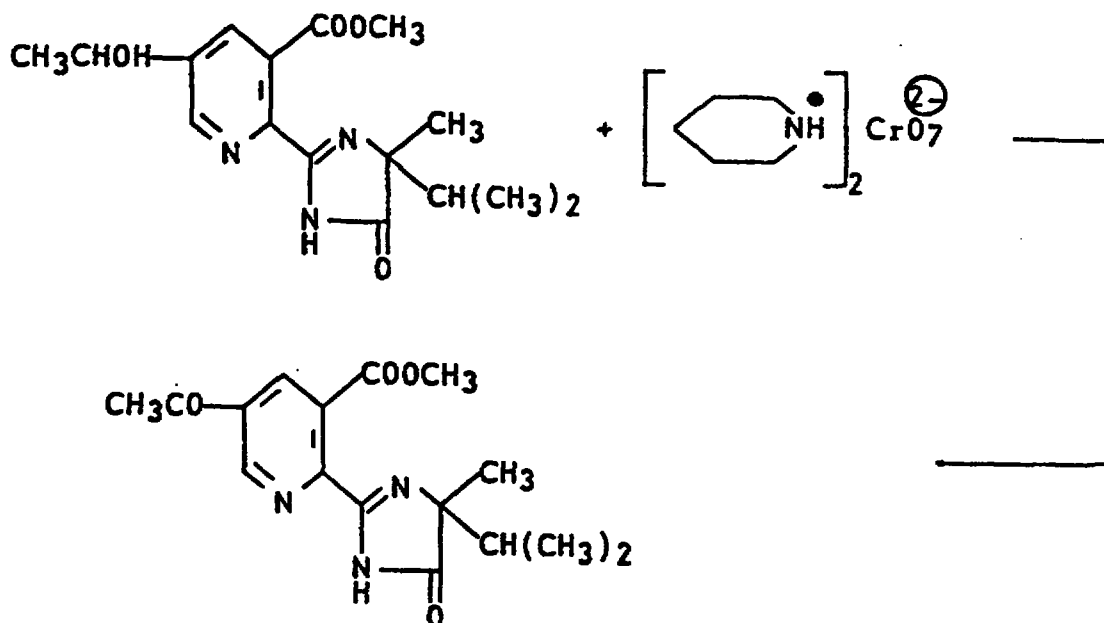
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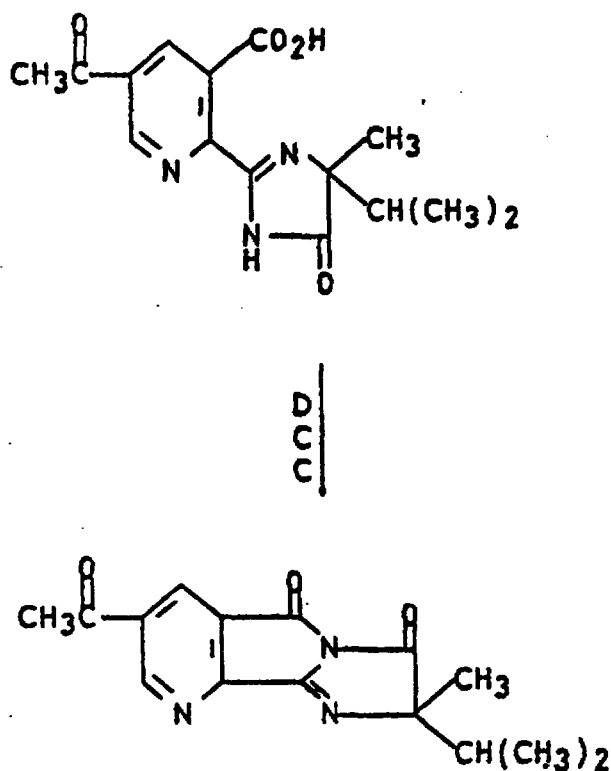
A mixture of 8.2g of methyl 5-(1-hydroxyethyl)-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-
 30 nicotinate, 14.5g of pyridinium dichromate and 1.99g of pyridinium trifluoroacetate in 30 mL of methylene
 chloride is stirred at room temperature under nitrogen for 3 days. The reaction mixture is flash-chromatog-
 raphed through florisil using methylene chloride as eluent, and the combined eluates are washed with water,
 dried, and concentrated in vacuo to a dark oil. Chromatography of this oil on silica gel using ether-hexane
 as eluant affords the desired product as a solid. Recrystallization of this solid from methylene chloride-
 35 hexane affords a white solid, mp 105-108°C.

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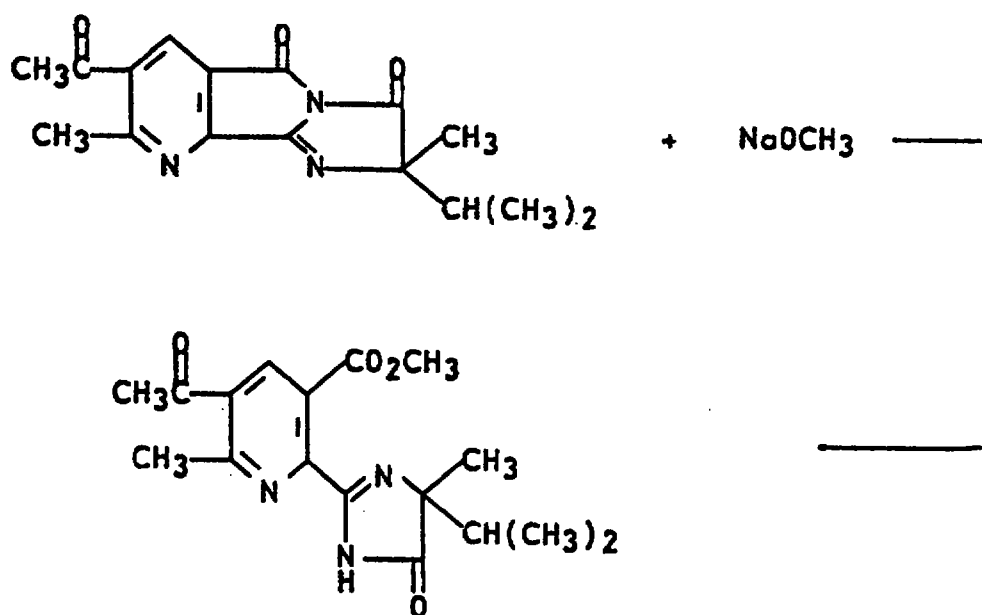
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EXAMPLE 15**Preparation of 5H-Imidazo[1',2':1,2]pyrrolo[3,4-b]pyridine-3(2H),5-dione, 7-acetyl-2,8-dimethyl-2-isopropyl**

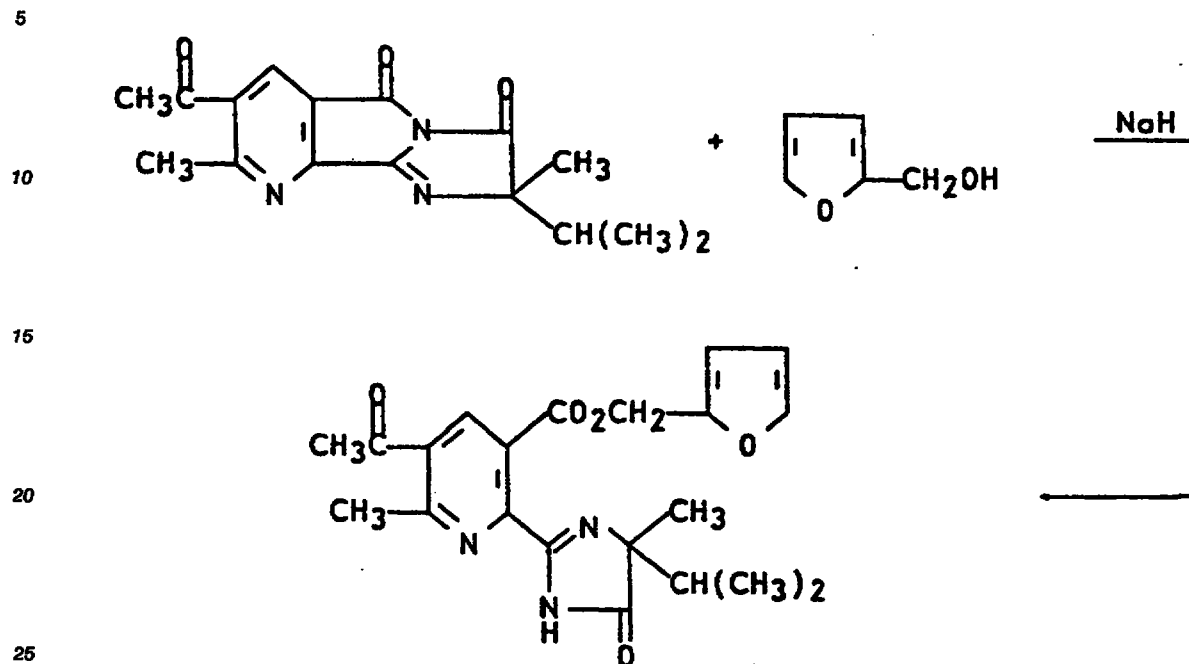
A solution of 2.6g 5-acetyl-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)nicotinic acid and 1.86g DCC in 100 mL methylene chloride is stirred at room temperature overnight. An additional 1.86g DCC is added and stirring continued over the weekend; a further 1.86g of DCC is added, and stirring continued for 1 more day. The reaction mixture is filtered, and the filtrate is stripped. Chromatography of the residue on silica gel using 5% ethyl acetate in methylene chloride affords 1.68g of the desired product, mp 158.160°.

EXAMPLE 16**Preparation of methyl 5-acetyl-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-6-methylnicotinate**

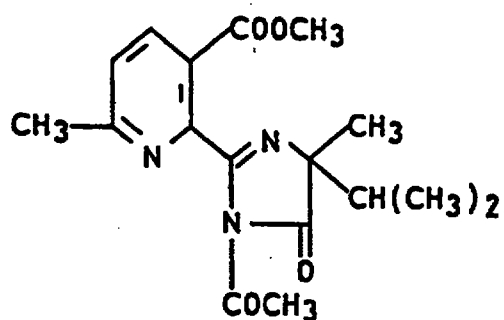
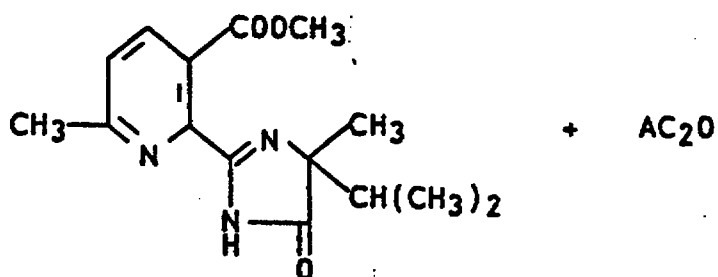
30 A solution of .68g of 7-acetyl-2,8-dimethyl-2-isopropyl-5H-imidazo[1',2':1,2]pyrrolo[3,4-b]pyridine-3(2H)-5-dione in 50 mL methanol is stirred at 5° and .06g of sodium methoxide is added. The reaction is stirred and allowed to warm to room temperature over 3 hours, at which point it is acidified with acetic acid and concentrated in vacuo. The residue is dissolved in methylene chloride, washed with water, dried and concentrated in vacuo to afford the desired product. Recrystallization from methylene chloride-hexanes gives a solid, mp 118-120°.

EXAMPLE 17

Preparation of furfuryl 5-acetyl-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-6-methylnicotinate



30 A solution of 1.0g of 7-acetyl-2,8-dimethyl-2-isopropyl-5H-imidazo[1',2':1,2]pyrrolo[3,4-b]pyridine-3(2H)-5-dione in 50 mL tetrahydrofuran is added dropwise to a preformed mixture of .03g sodium hydride and .35 mL furfuryl alcohol in 50 mL tetrahydrofuran. The reaction mixture is stirred at room temperature overnight, acidified with acetic acid, and concentrated in vacuo. The residue is chromatographed on silica gel using 5% ethyl acetate in methylene chloride as eluant to afford the desired product. Recrystallization from methylene chloride-hexanes gives a solid, mp 133-136°.

EXAMPLE 18**Preparation of methyl 2-(1-acetyl-4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-6-methylnicotinate**

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A solution of 33.2g of methyl 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-6-methylnicotinate in 350 mL of acetic anhydride is stirred and heated at reflux for 4 hours. The solution is concentrated in vacuo, and the residue is triturated with 2:1 hexane-ether to give the desired product as a white solid.

EXAMPLE 19**Preparation of methyl 2-(1-acetyl-4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-6-methylnicotinate-1-oxide**

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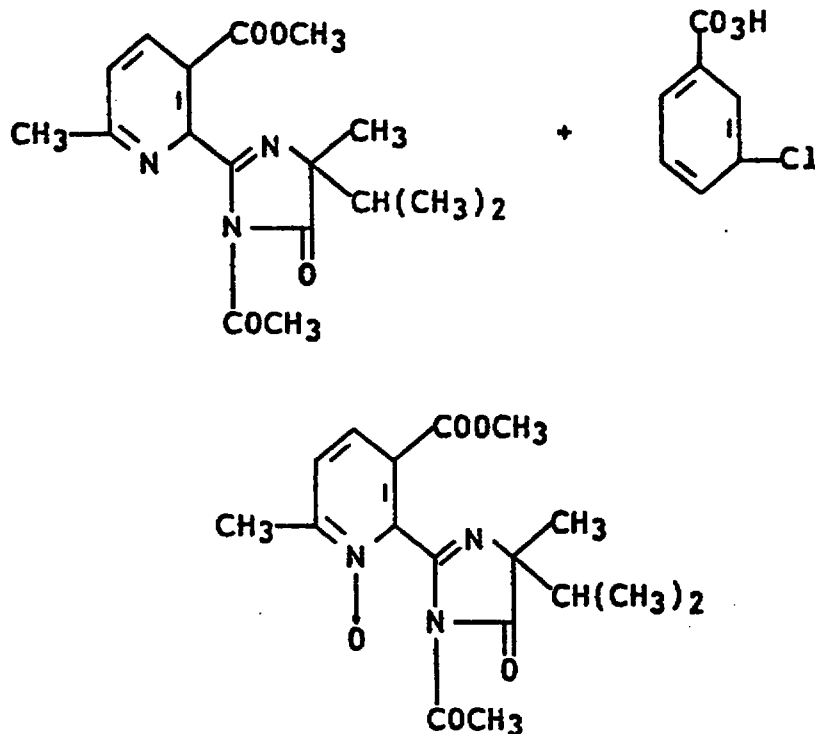
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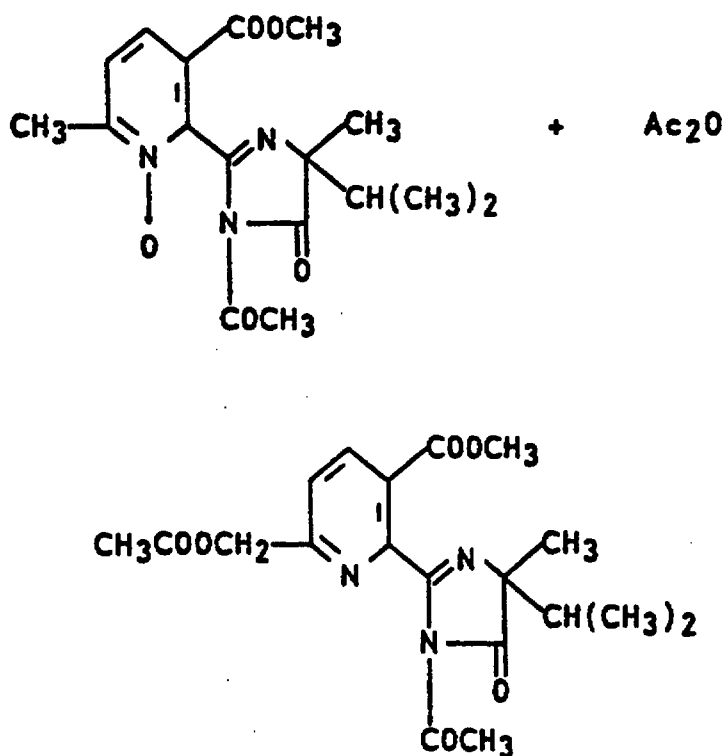
A solution of 29g of methyl 2-(1-acetyl-4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-6-methylnicotinate and 28.7g of 80% M-chloroperbenzoic acid in 250 mL of methylene chloride is stirred and heated at reflux for 3 1/2 hours. The reaction mixture is filtered, and the solid is thoroughly washed with methylene chloride. The combined filtrates are cooled and treated cautiously with saturated aqueous sodium bisulfite until a negative starch-iodide test is obtained. The mixture is again filtered, and the organic layer is washed with saturated sodium bicarbonate solution, dried, and concentrated in vacuo to give an oil. Trituration of this oil with ether affords the desired product as a pale yellow solid, mp 135-138.5°C.

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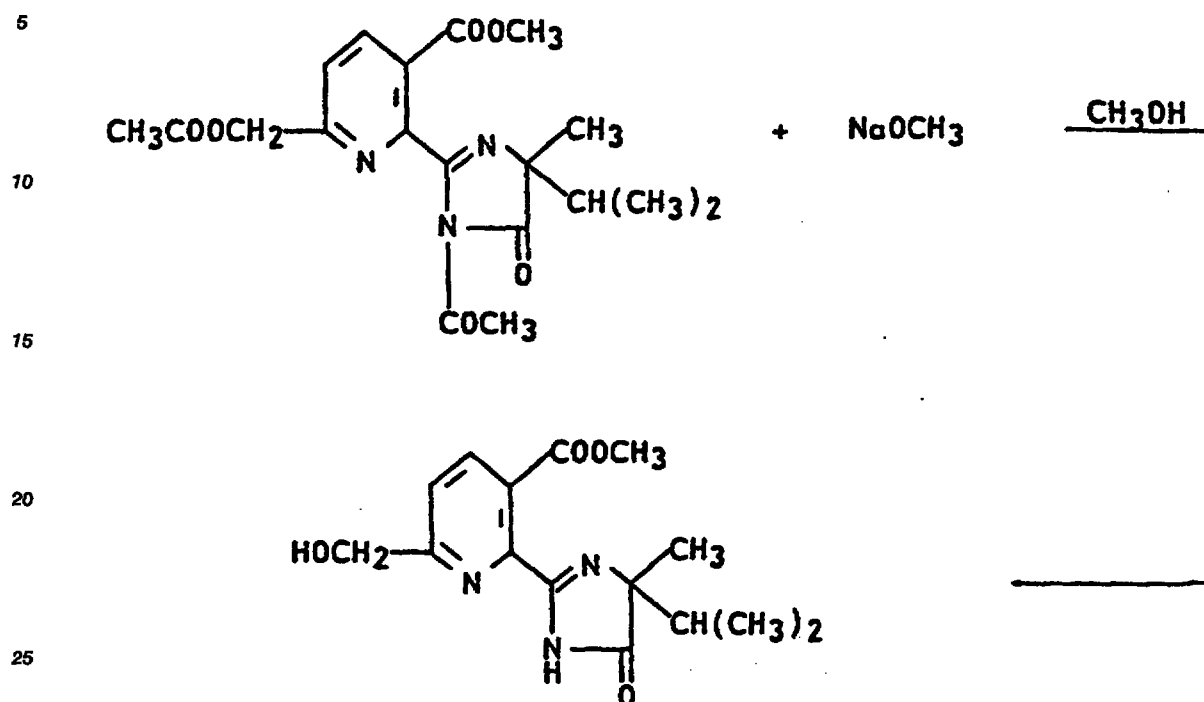
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EXAMPLE 20**Preparation of methyl 6-acetoxymethyl-2-(1-acetyl-4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)nicotinate**

A solution of 37.6g of methyl 2-(1-acetyl-4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-6-methyl-nicotinate-1-oxide in 350 mL of acetic anhydride is stirred and heated at reflux for 3 1/2 hours. The reaction is concentrated in vacuo, and the residue is chromatographed on silica gel using hexane-ethyl acetate as eluant to give the desired product as a solid. Recrystallization of the solid from methylene chloride-hexanes affords analytically pure material, mp 111-112°C.

EXAMPLE 21**Preparation of methyl 6-hydroxymethyl-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)nicotinate**

30 A solution of 16.7g of methyl 6-acetoxymethyl-2-(1-acetyl-4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl) nicotinate in 125 mL methanol containing 0.7g of sodium methoxide is stirred at room temperature for 16 hours. The solution is adjusted to pH 5 with acetic acid and concentrated in vacuo. The residue is chromatographed on silica gel using ether-methanol as eluant to give the desired product as a solid. Recrystallization from methylene chloride-hexane gives analytically pure material, mp 115-118°C.

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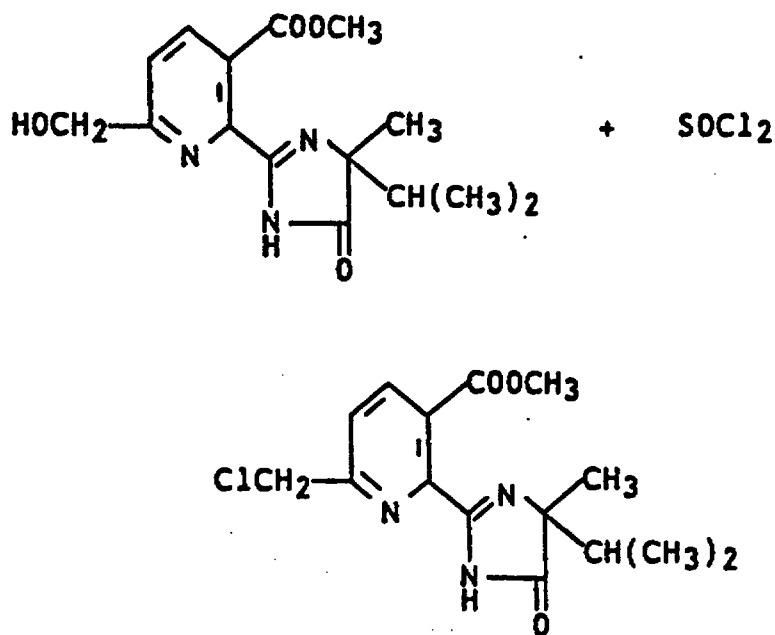
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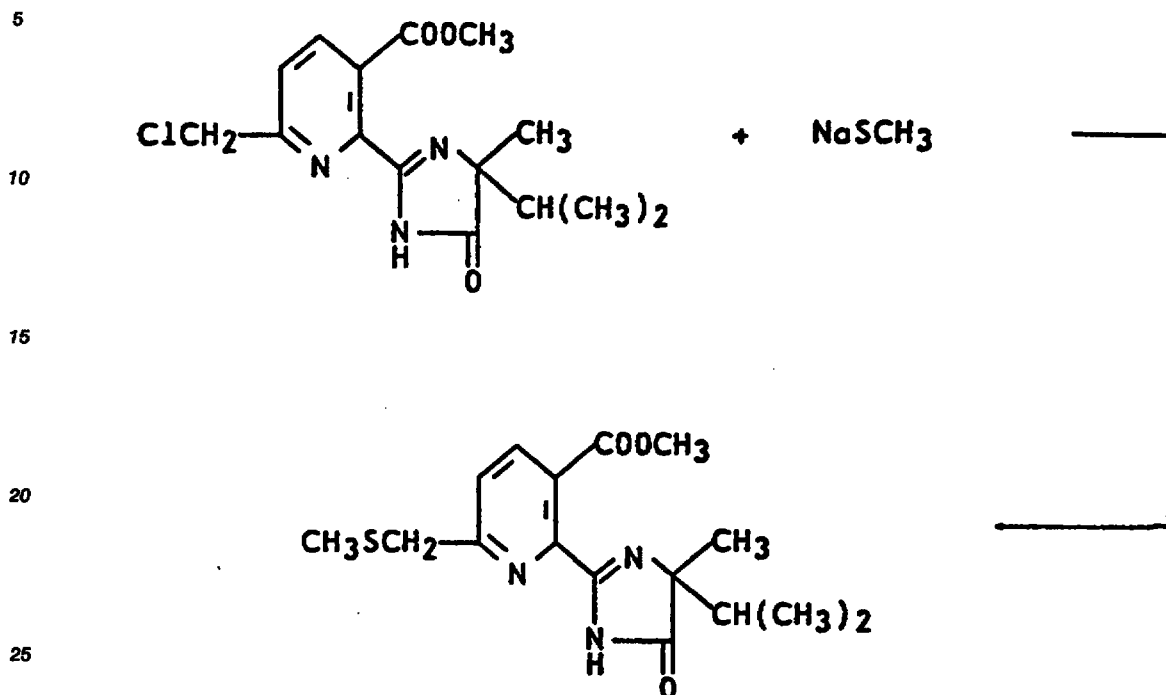
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EXAMPLE 22

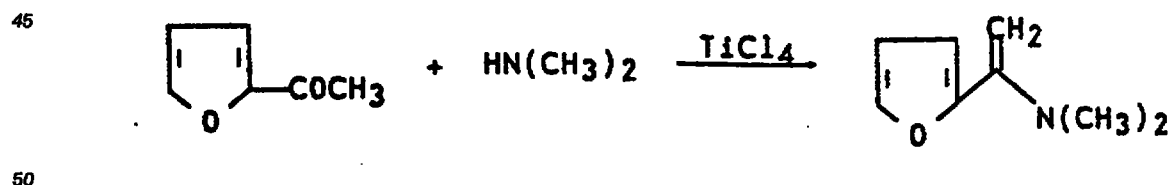
Preparation of methyl 6-chloromethyl-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)nicotinate

30 To a solution of 8.7g of methyl 6-hydroxymethyl-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-
 nicotinate in 90 mL chloroform, stirred at room temperature, is added dropwise 4.2 mL of thionyl chloride.
 When the addition is complete, the solution is heated at reflux for 1 hour. The reaction is concentrated in
vacuo, and the residue is dissolved in methylene chloride and washed with saturated sodium bicarbonate
 solution. The organic phase is dried and concentrated in vacuo to an oil. Trituration of this oil affords the
 35 desired product as a solid. Recrystallization from methylene chloride-hexane gives analytically pure
 material, mp 127-129°C.

EXAMPLE 23Preparation of methyl 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-6-methylthiomethylnicotinate

30 To 30 mL of absolute methanol, stirred at -10° under nitrogen, is added in portions 0.9g of 50% sodium hydride (oil dispersion). A stream of methyl mercaptan is then added to the solution until a pH of 10 is achieved. To this solution is added 3g of methyl 6-chloromethyl-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)nicotinate, and stirring is continued at -10° for 1 hour. The reaction is then allowed to warm to room temperature over 1 hour, and is then acidified with glacial acetic acid to pH 4. The mixture is concentrated

35 in vacuo, and the residue is dissolved in methylene chloride, washed with saturated aqueous sodium bicarbonate, dried, and concentrated in vacuo. The residue is dissolved in absolute methanol, washed with hexanes, and concentrated in vacuo to afford the desired product. Recrystallization from methylene chloride-hexane affords a solid, mp $113.5-115^{\circ}\text{C}$.

EXAMPLE 24Preparation of 1-dimethylamino-1-(2-furyl)ethylene

To a solution of 55g of 2-acetylfuran and 193g of dimethylamine in 1 liter of dry benzene, stirred at 3° under nitrogen, is added dropwise a solution of 31 mL of titanium tetrachloride in 100 mL benzene over 45

55 minutes. The mixture is stirred for a further 3 hours at 3° , then at ambient temperature overnight. The brown reaction mixture is filtered through a medium frit glass funnel under nitrogen, and the filtered solids are washed with dry benzene. The combined filtrates are concentrated in vacuo to give the desired enamine as an oil.

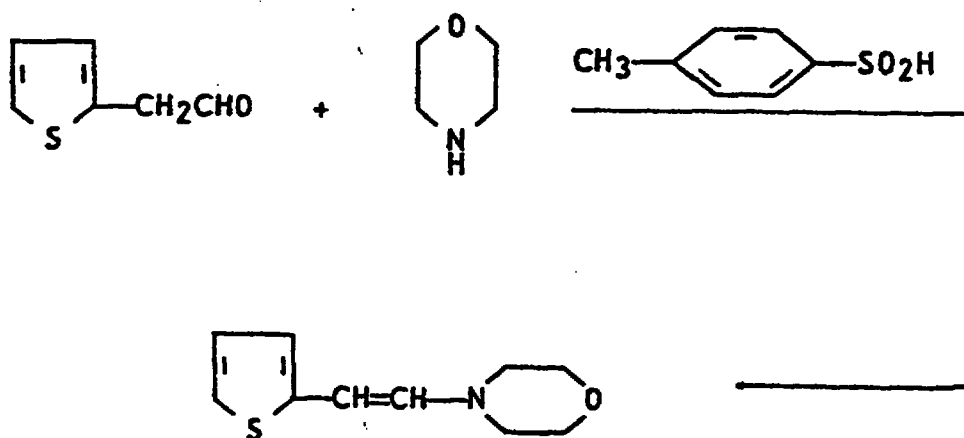
EXAMPLE 25**Preparation of 1-morpholino-2-(2-thienyl)ethylene**

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A mixture of 1.5g of 2-thienylacetaldehyde, 1.4 mL of morpholine, and .012g of *p*-toluenesulfonic acid hydrate in 7.5 mL of toluene is heated at reflux under a Dean-Stark Trap with azeotropic removal of water for 3 hours. The solution is cooled, neutralized by the addition of solid sodium methoxide, and concentrated in vacuo. The residue is taken up in toluene, filtered, and concentrated in vacuo to afford the desired enamine as an oil.

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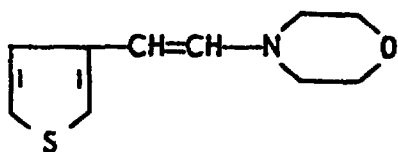
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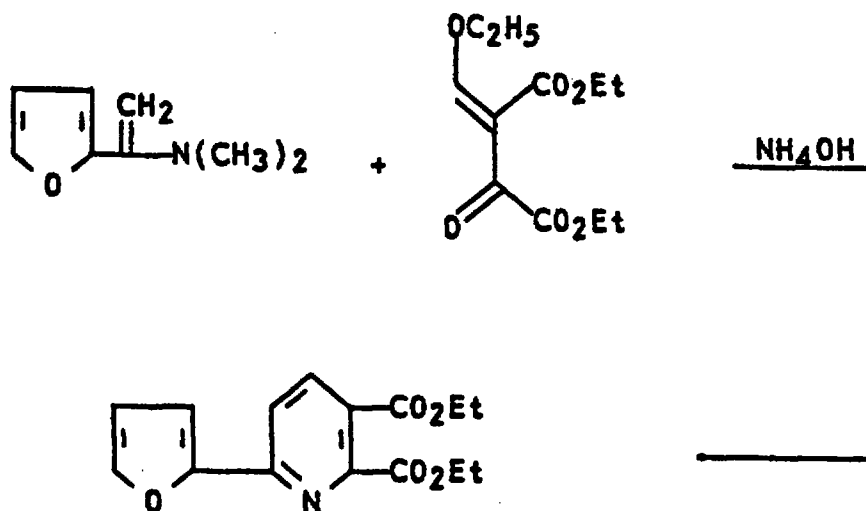
EXAMPLE 26**Preparation of diethyl 6-(2-furyl)pyridine-2,3-dicarboxylate**

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A solution of 147g of diethyl ethoxymethyleneoxalacetate in 600 mL of absolute ethanol is stirred at 5°C while a solution of 68.8g of 1-dimethylamino-1-(2-furyl)ethylene in 400 mL of absolute ethanol is added dropwise over 1 hour. After stirring for an additional 2 hours, the reaction mixture is treated with 250 mL of concentrated aqueous ammonium hydroxide. The resulting mixture is stirred at ambient temperature overnight and then concentrated in vacuo. Chromatography of the residue on silica gel using chloroform as eluant affords the desired product.

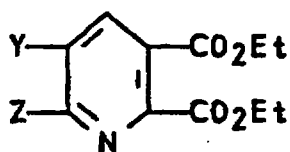
30

Using essentially the same procedure, and substituting the appropriate enamine, the following are prepared: the 5-(2-thienyl), the 6-(2-thienyl), and the 5-(3-thienyl) pyridine-2,3-dicarboxylates.

35

YZmp

40



H

Solid

45

H



97-99°

50



H

64-66°

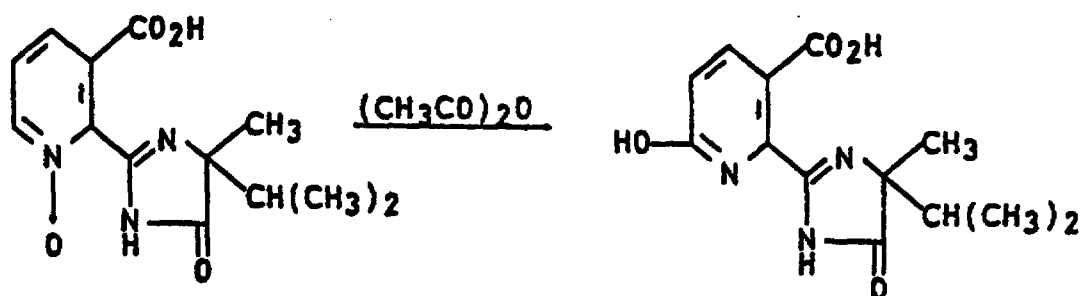
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EXAMPLE 27Preparation of 6-hydroxy-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)nicotinic acid

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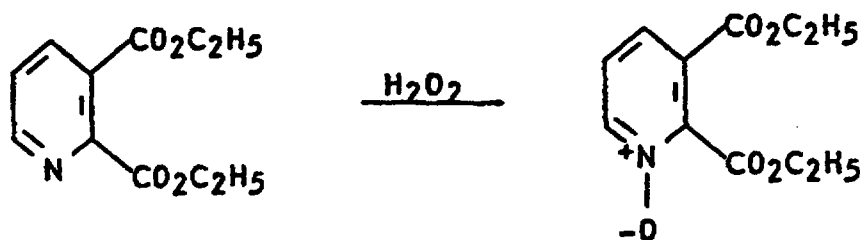
A mixture of 3g of 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)nicotinic acid -1-oxide, 2.24g of acetic anhydride, and 0.4g of pyridine in 80 mL of toluene is stirred and heated at reflux for 3 hours. The reaction mixture is cooled to 10°C and 75 mL of cold water is added with vigorous stirring. The resulting yellow solid is filtered, washed with toluene, and air dried. Recrystallization of this solid from methanol affords the desired product as a white solid, mp 201-203°C.

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EXAMPLE 28Preparation of diethyl pyridine-2,3-dicarboxylate-N-oxide

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A mixture of 99g of diethyl pyridine-2,3-dicarboxylate, 7.2 mL of concentrated sulfuric acid, 85 mL of 30% hydrogen peroxide and 256 mL acetic acid is stirred and heated at 85° for 4 hours. The reaction is concentrated in vacuo, and the residue is dissolved in methylene chloride, and washed with water, then saturated sodium bicarbonate. After drying, the organic phase is concentrated in vacuo to afford 79g of the desired product, mp 80-85°. A portion recrystallized from carbon tetrachloride/pentane has mp 87-88°.

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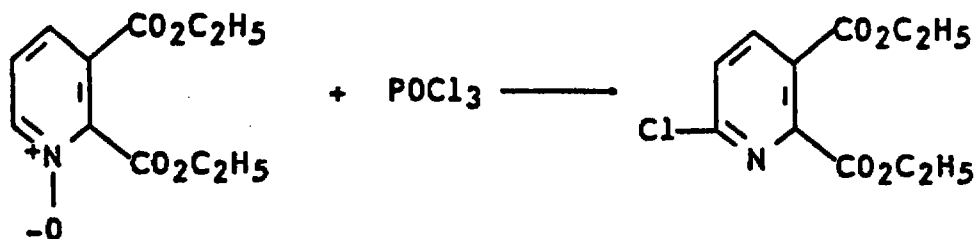
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EXAMPLE 29Preparation of diethyl 6-chloropyridine-2,3-dicarboxylate

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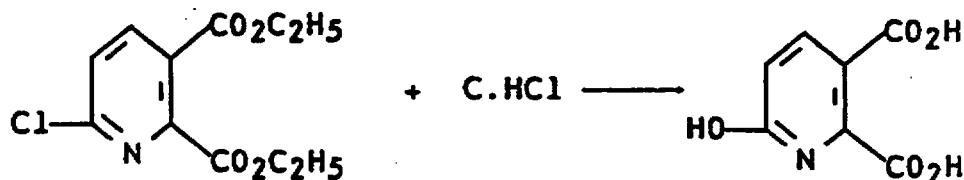
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A mixture of 75.6g of diethyl pyridine-2,3-dicarboxylate-N-oxide and 150 mL of phosphorous oxychloride is warmed slowly in a large reaction vessel equipped with a reflux condenser and gas scrubber. Caution: exothermic reaction! At about 70°, an exothermic reaction ensues with vigorous liberation of hydrogen chloride gas. The reaction is heated at reflux after the exotherm subsides for an additional hour. The reaction is cooled and concentrated in vacuo to a syrup. This material is dissolved in methylene chloride, washed cautiously with saturated sodium bicarbonate, dried and concentrated in vacuo to give the desired product as an oil. An analytical sample is obtained by chromatography on silica gel using 2:1 petroleum ether-ether as eluant to give the product as a colorless oil.

EXAMPLE 30Preparation of 6-hydroxypyridine-2,3-dicarboxylic acid

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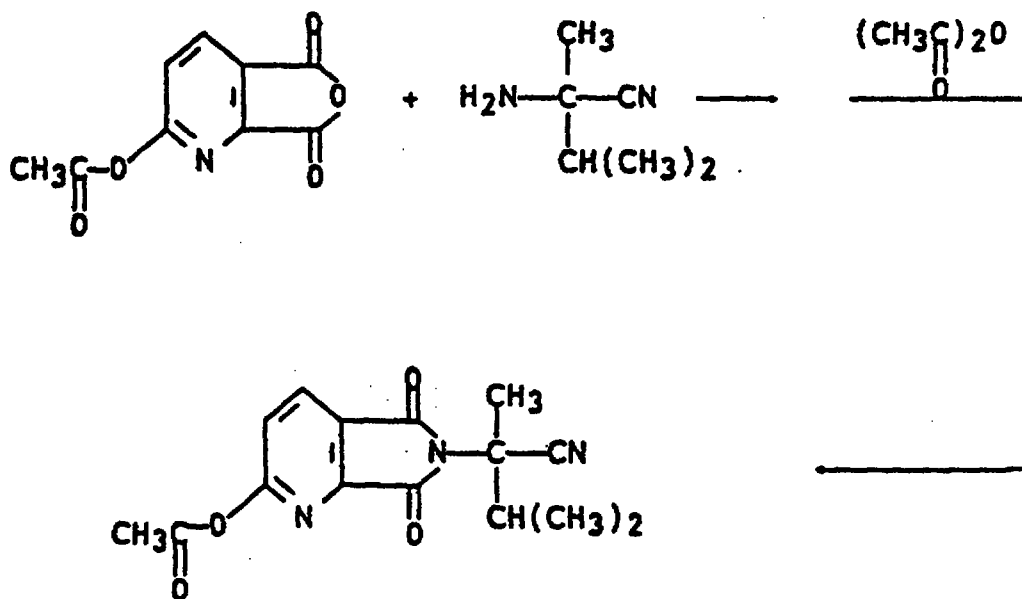
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A mixture of 72g of diethyl 6-chloropyridine-2,3-dicarboxylate and 420 mL of concentrated hydrochloric acid is stirred and heated at reflux overnight. The reaction mixture is cooled, and the solid is filtered and washed with hot water to give the desired product as a solid.

EXAMPLE 31

Preparation of 6-H-pyrrolo[3,4-b]pyridine-6-acetonitrile, 5,7-dihydro-2-hydroxy- α -isopropyl- α -methyl-5,7-dioxo-, acetate (ester)



A mixture of 30g of crude 6-acetoxypyrrolo[3,4-b]pyridine-2,3-dicarboxylic anhydride and 21g of 2-amino-2,3-dimethylbutyronitrile in 100 mL of methylene chloride is stirred at room temperature (exotherm) for 15 minutes, then at reflux for an additional 5 minutes. The solvent is removed in vacuo, and the residue is mixed with 15g sodium acetate and 300 mL of acetic anhydride and heated at reflux for 35 minutes. The reaction mixture is cooled and filter chromatographed through 200g of silica gel, using additional amounts of dilute methanol in ethyl acetate as eluant. The combined filtrates are concentrated in vacuo to give the desired product as an oil. A portion can be crystallized from carbon tetrachloride-pentane to give an analytically pure solid, mp 104.5-108°.

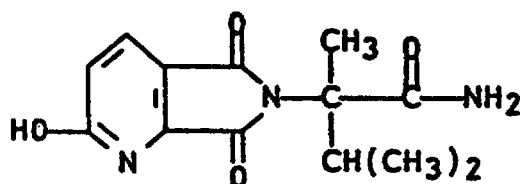
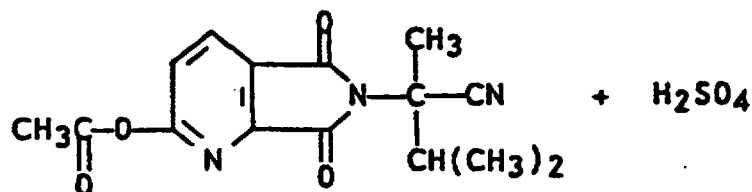
EXAMPLE 32**Preparation of 6H-pyrrolo[3,4-b]pyridine-6-acetamide, 5,7-dihydro-2-hydroxy- α -isopropyl- α -methyl-5,7-dioxo-**

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To a suspension of 34.5g of 5,7-dihydro-2-hydroxy- α -isopropyl- α -methyl-5,7-dioxo-6H-pyrrolo[3,4-b]-pyridine-6-acetonitrile, acetate(ester) in 150 mL ethylene dichloride, stirred in an ice bath, is added slowly 110g of concentrated sulfuric acid. The resulting mixture is heated at 60° for 3 hours, cooled to room temperature, mixed with 100g of sodium acetate, and poured onto ice-water with efficient stirring. Filtration and washing the filtered solid with water affords the desired product. A portion can be recrystallized from dimethylsulfoxide-water to give an analytically pure sample, mp 211-212°.

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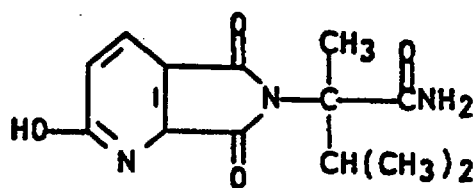
45

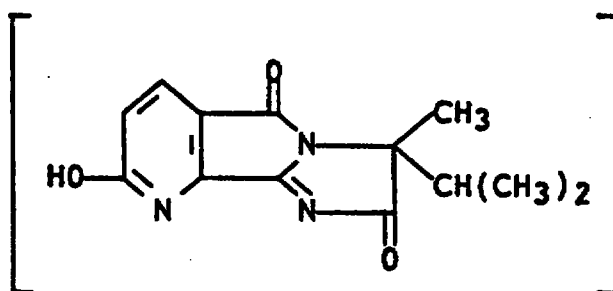
50

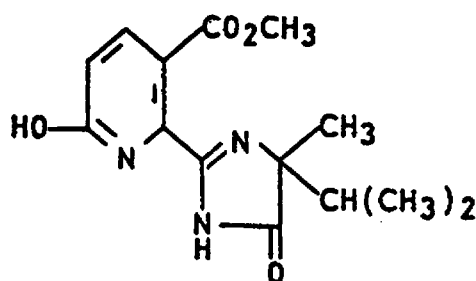
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EXAMPLE 33

Preparation of methyl 6-hydroxy-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)nicotinate



$$\begin{array}{c} \text{D} \\ \text{B} \\ \text{U} \end{array}$$


$$\text{NaOCH}_3$$


A mixture of 15g of 5,7-dihydro-2-hydroxy- α -isopropyl- α -methyl-5,7-dioxo-6H-pyrrolo[3,4-b]pyridine-6-acetamide and 600 mL xylene is heated at reflux under a water separator, and 2.46g of DBU is added in three portions over 20 minutes. After heating at reflux for an additional 45 minutes, the reaction is cooled to 100° and filtered through a sintered-glass funnel. The filtrate is treated with a solution of 6g sodium methoxide in 25 mL methanol and allowed to stand at room temperature overnight. The xylene layer is decanted off, and the residual yellow oil is dissolved in acetic acid and filtered through 50g of silica gel using additional 4:1 ethyl acetate-methanol as eluant. The combined filtrates are concentrated in vacuo and reevaporated from xylenes to give the desired product as a solid. A portion can be triturated with 50% aqueous methanol, filtered, washed with ether, and dried to give a solid, mp 186-191°.

EXAMPLE 34

Preparation of 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-6-(2-thienyl)nicotinic acid, isopropylamine salt

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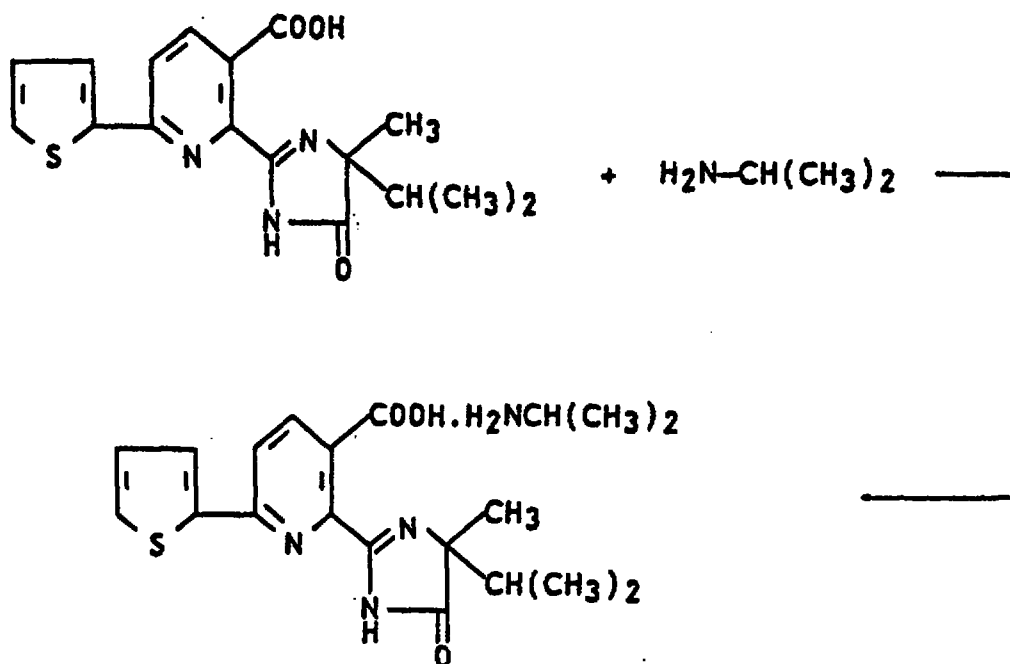
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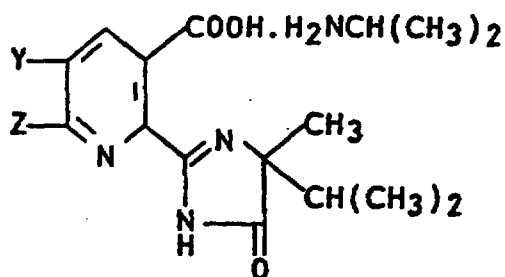
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A solution of 2g of 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-6-(2-thienyl)nicotinic acid and 0.34g isopropyl amine in 20 mL tetrahydrofuran is stirred at room temperature for 10 minutes. The reaction is diluted with 4 mL of hexane, filtered, and the filtrate is stirred overnight. The solid is filtered, washed with tetrahydrofuran, and dried in vacuo to give the desired product as a solid, mp 247-257°(dec).

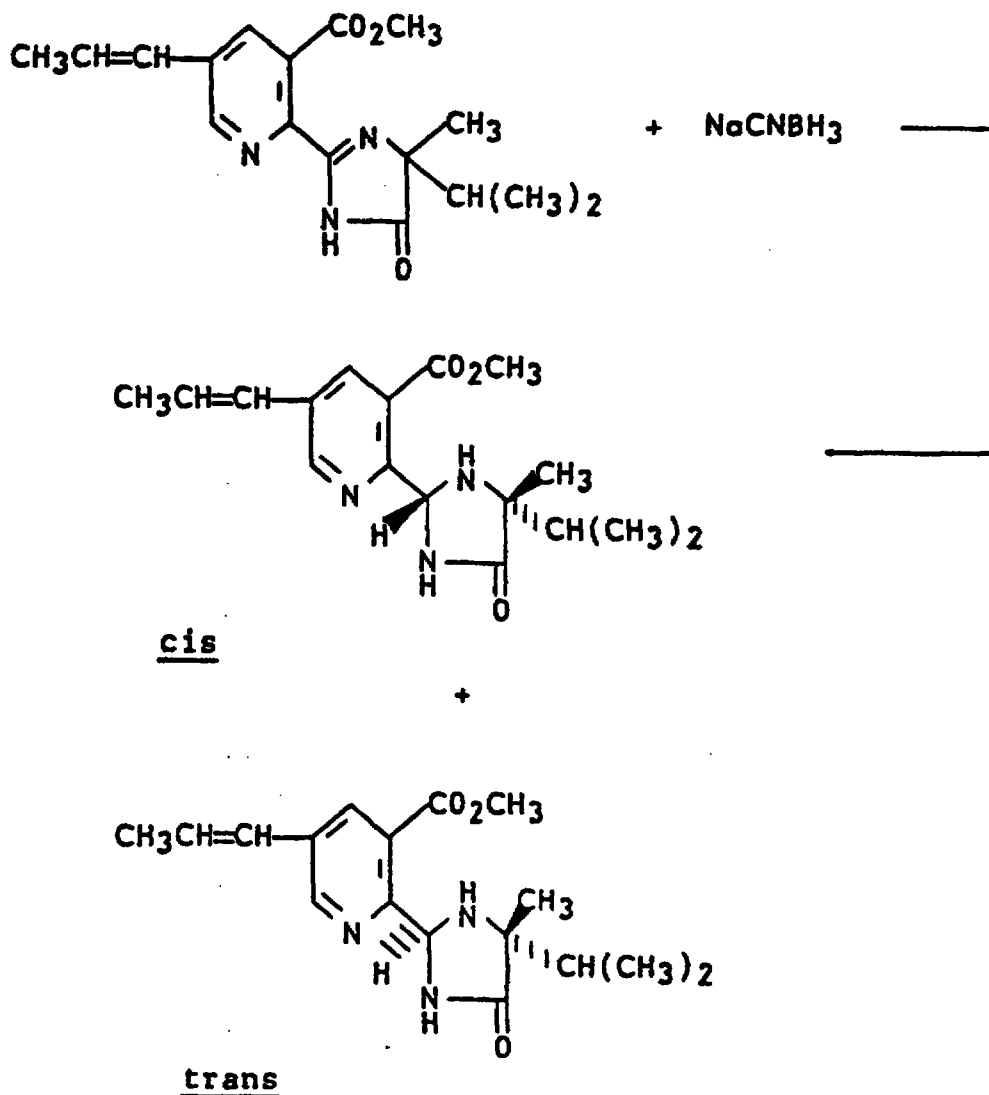
Also prepared by this method is the isopropylamine salt of the 6-(furyl)nicotinic acid.

YZmp

H



241-256°(dec)

EXAMPLE 35Preparation of methyl 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolidiny)-5-propenylnicotinate, cis and trans

45 A solution of 2.0g of methyl 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-propenylnicotinate in 50 mL of absolute methanol is cooled in an ice bath to 2° and the pH is adjusted to 3 with dilute methanolic hydrogen chloride. Sodium cyanoborohydride is added in small portions, with maintenance of the pH at 3 by concurrent addition of dilute methanolic hydrogen chloride, until the disappearance of the starting material is indicated by TLC. The reaction mixture is concentrated in vacuo, and the residue is chromatographed on silica gel using hexane-ethyl acetate mixtures as eluant to give the cis and trans products as solids.

50

EXAMPLE 36Preemergence herbicidal evaluation of test compounds

55 The preemergence herbicidal activity of the compounds of the present invention is exemplified by the following tests in which the seeds of a variety of monocotyledonous and dicotyledonous plants are separately mixed with potting soil and planted on top of approximately one inch of soil in separate pint

cups. After planting, the cups are sprayed with the selected aqueous acetone solution containing test compound in sufficient quantity to provide the equivalent of about 0.016 to 8.0 kg per hectare of test compound per cup. The treated cups are then placed on greenhouse benches, watered and cared for in accordance with conventional greenhouse procedures. From four to five weeks after treatment, the tests are terminated and each cup is examined and rated according to the rating system set forth below. Data obtained are reported in Table I below. Where more than one test is involved for a given compound, the data are averaged.

Plant species employed in these evaluations are reported by header abbreviation, common name and scientific name.

Compounds employed in this preemergence herbicidal evaluation and in the post-emergence evaluation in the following example are given a compound number and identified by name. Data in Table I are reported by compound number.

***Herbicide Rating Scale

Results of herbicide evaluation are expressed on a rating scale (0-9). The scale is based upon a visual observation of plant stand, vigor, malformation, size, chlorosis and overall plant appearance as compared with a control.

RATING	MEANING	% Control (COMPARED TO CHECK)
9	Complete Kill	100
8	Approaching Complete Kill	91-99
7	Good Herbicidal Effect	80-90
6	Herbicidal Effect	65-79
5	Definite Injury	45-64
4	Injury	30-44
3	Moderate Effect	16-29
2	Slight Effect	6-15
1	Trace Effect	1-5
0	No Effect	0
P	"PGR" Effect	---
X	Unable to Read Sample	---

PLANT SPECIES EMPLOYED IN HERBICIDAL EVALUATIONS		
HEADER ABB	COMMON NAME	SCIENTIFIC NAME
BARNYARDGR	BARNYARDGRASS	ECHINOCHLOA CRUS-GALLI, (L)BEAU
LARGE CRAB	CRABGRASS, (HAIRY) LARGE	DIGITARIA SANGUINALIS, (L)SCOP
GREEN FOX	FOXTAIL, GREEN	SETARIA VIRIDIS, (L)BEAUV
P NUTSEDGE	NUTSEDGE, PURPLE	CYPERUS ROTUNDUS, L.
WILD OATS	OAT, WILD	AVENA FATUA, L.
QUACKGRASS	QUACKGRASS	AGROPYRON REPENS, (L)BEAUV.
FLD BINDWD	BINDWEED, FIELD (RHIZOME)	CONVOLVULUS ARVENSIS, L.
MATRICARIA	MATRICARIA	MATRICARIA CHAMOMILLA, L.
MRNGLRY SP	MORNINGGLORY SPP.	IPOMOEAE SPP.
WILD MUSTD	MUSTARD, WILD	BRASSICA KABER, (DC)L.C. WHEELR
RAGWEED	RAGWEED, COMMON	AMBROSIA ARTEMISIIFOLIA, L.
PRIDY SIDA	SIDA, PRICKLY	SIDA SPINOSA, L.
VELVETLEAF	VELVETLEAF	ABUTILON THEOPHRASTI, MEDIC.
S BARLY LA	BARLEY, SPRING, LARKER	HORDEUM VULGARE, CV. LARKER
SUGARBEETS	SUGARBEETS	BETA VULGARIS, L.
CORN FIELD	CORN, FIELD	ZEAE MAYS, L.

COMPOUNDS EVALUATED AS HERBICIDAL AGENTS5 Compound No.

- 1 (E)-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-styryl-nicotinic acid
10
- 2 (Z)-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-styryl-nicotinic acid
15
- 3 methyl 5-isopropenyl-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)nicotinate
20
- 4 5-isopropenyl-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)nicotinic acid
25
- 5 1,6-dihydro-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-6-oxonicotinic acid
30
- 6 methyl 5-(1-hydroxyethyl)-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)nicotinate acetate(ester)
35
- 7 5-acetyl-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-6-methyl-nicotinic acid
40
- 8 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-6-(2-thienyl)nicotinic acid
45
- 9 methyl 5-acetyl-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-6-methylnicotinate
50
- 10 isopropylammonium 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-6-(2-thienyl)-nicotinate
55

Compound No.

5	11	furfuryl 5-acetyl-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-6-methylnicotinate
10	12	methyl 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-6-(2-thienyl)nicotinate
15	13	6-(2-furyl)-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)nicotinic acid
20	14	isopropylammonium 6-(2-furyl)-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)nicotinate
25	15	methyl 6-(2-furyl)-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)nicotinate
30	16	methyl 5-acetyl-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)nicotinate
35	17	5-acetyl-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)nicotinic acid
40	18	methyl 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-propenylnicotinate
45	19	(E)-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-propenylnicotinic acid
50	20	2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-(2-thienyl)nicotinic acid
55		

Compound No.

- 5
21 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-[(methylthio)methyl]nicotinic acid
- 10
22 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-(3-thienyl)nicotinic acid
- 15
23 methyl 1,6-dihydro-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-6-oxonicotinate
- 20
24 methyl 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-6-[(methylthio)methyl]-nicotinate
- 25
25 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-6-[(methylthio)methyl]nicotinic acid

TABLE I

Compound No.	RATE	PRE-EMERGENCE TESTS -- RATES IN KG/HA												SUGAR BEETS	CORN FIELD
		BARNY ANDGR	LARGE CRAB	GREEN FOX	P NUT SEDE	WILD OATS	QUACK GRASS	FLD B INOWD	WRNGL RY SP	WILD MUSTO	RACWE ED	PRIKY SIDA	VELVE TLEAF	MATRI CARIA	
1	4.000	2.0		0.0	0.0	0.0	0.0	9.0	3.0		0.0		3.0	3.0	7.0
	1.000	0.0		0.0	0.0	0.0	0.0	7.0	0.0		0.0		0.0	0.0	0.0
	.500	0.0		0.0	0.0	0.0	0.0	2.0	0.0		0.0		0.0	0.0	0.0
	.250	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0
	.125	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0
2	.063	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0
	4.000	2.0		3.0	4.0	4.0	9.0	6.0	5.0		2.0		6.0	9.0	2.0
	1.000	1.0		1.0	3.0	1.0	7.0	6.0	0.0		0.0		5.0	0.0	1.0
	.500	0.0		0.0	2.0	6.0	2.0	0.0	0.0		0.0		0.0	0.0	0.0
	.250	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0
3	.125	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0
	.063	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0
	.032	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0
	.016	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0
	8.000	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
4	.500	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0
	.250	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0
	.125	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0
	.063	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0
	.032	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0
	.016	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0

TABLE I (Cont.)

PRE-EMERGENCE TESTS -- RATES IN KG/HA

Compound No.	RATE	BARNY ARDCR	LARGE CRAB	GREEN FOX	P NUT SEGE	WILD OATS	QUACK GRASS	FLD B INOWD	WRNGL RY SP	WILD MUSTD	RAGWE ED	PRIKY SIDA	VELVE TLEAF	MATRI CARIA	S BAR LY LA	SUGAR BEETS	CORN FIELD
5	.750	6.0	0.0	7.0	9.0	9.0	9.0	9.0	7.0		0.0	7.0	7.0			9.0	7.0
	.500	3.0*	0.0	5.0	8.5	2.0	8.5	9.0	5.5		0.0	6.0	7.5	0.0			3.5
	.375	3.0	0.0	4.0	8.0		7.0	8.0	4.0		0.0	6.0	7.0				4.0
	.250	0.0	0.0	0.0	4.5	1.0	4.0	4.0*	0.0		0.0	4.0	3.5	0.0		8.0	0.5
	.188	0.0	0.0	0.0	6.0		3.0	8.0	0.0		0.0	0.0	0.0				0.0
	.125	0.0	0.0	0.0	3.0	0.0	1.5	4.0*	0.0		0.0	0.0	0.5	0.0		1.0	0.5
	.063	0.0			0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0
	.032	0.0			0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0
.016	0.0			0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
6	.500	0.0			8.0	0.0	4.0	8.0	8.0		0.0		3.0	0.0		8.0	4.0
	.250	0.0			3.0	0.0	2.0	7.0	7.0		0.0	3.0	0.0	0.0		7.0	0.0
	.125	0.0			0.0	0.0	0.0	7.0	1.0		0.0	0.0	0.0	0.0		7.0	0.0
	.063	0.0			0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		7.0	0.0
	.032	0.0			0.0	0.0	0.0	4.0	0.0		0.0	0.0	0.0	0.0		2.0	0.0
	.016	0.0			0.0	0.0	0.0	2.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0
	8.000	9.0	9.0	9.0	9.0	9.0	9.0	9.0	8.0	9.0	9.0	9.0	9.0	6.0		9.0	9.0
	.500	9.0			9.0	9.0	9.0	9.0	9.0		0.0		8.0				0.0
7	.250	8.0			9.0	9.0	9.0	9.0	9.0		8.0	7.0	8.0	2.0		9.0	9.0
	.125	7.0			9.0	9.0	9.0	9.0	9.0		8.0	8.0	8.0	2.0		9.0	9.0
	.063	2.0			9.0	9.0	9.0	9.0	8.0		6.0	7.0	7.0	0.0		9.0	7.0
	.032	0.0			9.0	9.0	9.0	3.0	6.0		2.0	5.0	5.0	0.0		9.0	4.0
	.016	0.0			7.0	5.0	4.0	3.0	4.0		0.0	2.0	2.0	0.0		9.0	3.0
	.500	3.0			4.0	0.0	4.5	5.0	5.5		4.0	6.0	6.0	6.0		9.0	0.0
	.250	2.5			3.0	0.0	2.0	1.0	3.0		2.0	6.0	6.0	4.5*		9.0	0.0
	.125	0.0			3.0	0.0	0.0	0.0	1.0		0.0	2.0	0.0	0.0		5.5*	0.0
8	.063	0.0			0.5	0.0	0.0	0.0	0.0		0.0	0.5	0.5	0.0		4.5*	0.0
	.032	0.0			0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		2.0	0.0
	.016	0.0			0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		1.0	0.0

TABLE I (Cont.)

Compound No.	RATE	PRE-EMERGENCE TESTS -- RATES IN KG/HA														SUGAR BEETS	CORN FIELD
		BARNY ARDGR	LARGE CRAB	GREEN FOX	P NUT SEDOE	WILD OATS	QUACK GRASS	FLD B INDWD	WRNCL RY SP	WILD MUSTD	RAGWE ED	PRIKY SIDA	VELVE TLEAF	MATRI CARIA	S BAR LY LA		
9	.500	7.0			9.0	9.0	9.0	9.0	6.0		0.0		7.0	0.0		9.0	8.0
	.250	2.0			9.0	4.0	4.0	4.0	0.0		0.0		4.0	0.0		7.0	6.0
	.125	0.0			7.0	2.0	2.0	2.0	0.0		0.0		1.0	0.0		5.0	3.0
	.063	0.0			2.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0		0.0	1.0
10	.032	0.0			0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0		0.0	0.0
	.500	9.0			0.0	0.0	9.0	9.0	6.0		4.0		7.0	4.0		9.0	4.0
	.250	2.0			4.0	0.0	5.0	4.0	4.0		2.0		6.0	2.0		6.0	2.0
	.125	0.0			4.0	0.0	3.0	4.0	2.0		0.0		5.0	1.0		0.0	2.0
11	.063	0.0			1.0	0.0	1.0	1.0	0.0		0.0		3.0	0.0		2.0	0.0
	.032	0.0			1.0	0.0	0.0	0.0	0.0		0.0		1.0	0.0		0.0	0.0
	.016	0.0			0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0		2.0	0.0
	.500	9.0			9.0	9.0	9.0	9.0	9.0		0.0		8.0	9.0		9.0	9.0
12	.250	9.0			9.0	9.0	9.0	9.0	9.0		7.0		8.0	9.0		9.0	9.0
	.125	2.0			9.0	9.0	9.0	9.0	6.0		3.0		7.0	4.0		9.0	9.0
	.063	1.0			9.0	9.0	9.0	9.0	7.0		1.0		3.0	1.0		9.0	8.0
	.032	0.0			7.0	7.0	3.0	3.0	3.0		0.0		3.0	0.0		9.0	7.0
12	.016	0.0			4.0	2.0	2.0	0.0	0.0		0.0		0.0	0.0		7.0	3.0
	.500	0.0			0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0		7.0	0.0
	.250	0.0			0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0		7.0	0.0
	.125	0.0			0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0		7.0	0.0
12	.063	0.0			0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0		7.0	0.0
	.032	0.0			0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0		7.0	0.0
	.016	0.0			0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0		7.0	0.0

TABLE I (Cont.)

Compound No.	RATE	PRE-EMERGENCE TESTS -- RATES IN KG/HA												SUGAR BEETS	CORN FIELD	
		BARNY ARDGR	LARGE CRAB	GREEN FOX	P NUT SEGE	WILD OATS	QUACK GRASS	FLD B INDWO	WRNGL RY SP	WILD MUSTD	RACWE ED	PRIKY SIDA	VELVE TLEAF			MATRI CARIA
13	.500	3.0			7.0	0.0	6.0	7.0	2.0	0.0	0.0	0.0	0.0	0.0	9.0	0.0
	.250	2.0			6.0	0.0	4.0	2.0	0.0	0.0	0.0	7.0	0.0	0.0	8.0	0.0
	.125	0.0			7.0	0.0	4.0	0.0	0.0	0.0	0.0	7.0	0.0	0.0	6.0	0.0
	.063	0.0			2.0	0.0	2.0	0.0	0.0	0.0	0.0	5.0	0.0	0.0	4.0	0.0
	.032	0.0			2.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	4.0	0.0
	.016	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
14	.500	2.0			7.0	0.0	9.0	4.0	8.0	6.0	6.0	7.0	8.0	8.0	9.0	4.0
	.250	1.0			7.0	0.0	9.0	2.0	7.0	4.0	4.0	6.0	6.0	9.0	9.0	1.0
	.125	0.0			6.0	0.0	1.0	0.0	1.0	0.0	0.0	4.0	0.0	9.0	9.0	1.0
	.063	0.0			1.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	7.0	7.0	0.0
	.032	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	5.0	0.0
	.016	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	5.0	0.0
15	.500	0.0			2.0	2.0	4.0	0.0	0.0	0.0	0.0	2.0	0.0	9.0	9.0	7.0
	.250	6.0			2.0	1.0	1.0	0.0	0.0	0.0	0.0	1.0	0.0	2.0	2.0	2.0
	.125	4.0			1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0
	.063	4.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	.032	1.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	.016	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	.500	1.0			9.0	0.0	8.0	8.0	2.0	0.0	0.0	6.0	0.0	9.0	9.0	2.0
	.250	0.0			6.0	0.0	9.0	4.0	1.0	0.0	0.0	4.0	0.0	9.0	9.0	1.0
	.125	0.0			2.0	0.0	1.0	4.0	1.0	0.0	0.0	1.0	0.0	9.0	9.0	0.0
	.063	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.0	7.0	0.0
	.032	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	4.0	0.0
	.016	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TABLE I (Cont.)

Compound No.	RATE	PRE-EMERGENCE TESTS -- RATES IN KG/HA												SUGAR BEETS	CORN FIELD
		BARNY AROG	LARGE CRAB	GREEN FOX	P NUT SEGE	WILD OATS	QUACK GRASS	FLD B INOW	WRNGL RY SP	WILD MUSTD	RAGWE ED	PRIKY SIDA	VELVE TLEAF		
17	.500	0.0			9.0	4.0	9.0	9.0	9.0	4.0		8.0		9.0	7.0
	.250	0.0			9.0	3.0	9.0	9.0	9.0	4.0		8.0		9.0	7.0
	.125	0.0			9.0	0.0	9.0	9.0	9.0	1.0		7.0		9.0	3.0
	.063	0.0			7.0	0.0	9.0	9.0	2.0	1.0	0.0	4.0	0.0	8.0	1.0
	.032	0.0			5.0	0.0	9.0	9.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
18	.016	0.0			2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0
	.500	9.0			9.0	9.0	9.0	9.0	5.0	8.0		9.0	8.0	9.0	9.0
	.250	4.0			4.0	9.0	9.0	7.0	2.0	7.0		9.0	4.0	9.0	8.0
	.125	1.0			3.0	9.0	9.0	2.0	2.0			8.0	4.0	8.0	6.0
	.063	0.0			2.0	5.0	7.0	0.0	0.0	0.0	0.0	6.0	0.0	6.0	3.0
19	.032	0.0			0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	3.0
	.016	0.0			0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0		2.0
	.500	8.0			9.0	9.0	9.0	9.0	8.0	7.0		9.0	5.0	9.0	9.0
	.250	8.0			8.0	9.0	9.0	9.0	8.0	7.0		9.0	5.0	9.0	9.0
	.125	8.0			8.0	9.0	9.0	9.0	6.0	6.0		8.0	3.0	9.0	9.0
20	.063	6.0			6.0	9.0	9.0	5.0	2.0	5.0		8.0	3.0	9.0	7.0
	.032	4.0			2.0	9.0	5.0	0.0	0.0	3.0		4.0	1.0	9.0	8.0
	.016	2.0			0.0	6.0	3.0	0.0	0.0	1.0		3.0	0.0	7.0	6.0
	.500	9.0			2.0	9.0	9.0	9.0	8.0	8.0		8.0	8.0	9.0	9.0
	.250	9.0			1.0	8.0	9.0	7.0	3.0	7.0		9.0	7.0	9.0	8.0
	.125	3.0			0.0	7.0	6.0	1.0	1.0	4.0		5.0	2.0	8.0	7.0
	.063	1.0			0.0	5.0	2.0	0.0	0.0	2.0		0.0	1.0	8.0	7.0
	.032	0.0			0.0	5.0	0.0	0.0	0.0	0.0		0.0	0.0	8.0	7.0
	.016	0.0			0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	8.0	3.0

TABLE I (Cont.)

PRE-EMERGENCE TESTS .. RATES IN KG/HA

Compound No.	RATE	BARNY ARDGR	LARGE CRAB	GREEN FOX	P NUT SEDE	WILD OATS	QUACK. GRASS	FLD B INDMO	WRNGL RY SP	WILD MUSTO	RACWE ED	PRIKY SIDA	VELVE TLEAF	MATRI CARIA	S BAR LY LA	SUGAR BEETS	CORN FIELD
21	.500	0.0			8.0	0.0	4.0	9.0	7.0		0.0		6.0	2.0		9.0	0.0
	.250	0.0			4.0	0.0	3.0	6.0	4.0		0.0		4.0	0.0		8.0	0.0
	.125	0.0			2.0	0.0	1.0	4.0	2.0		0.0		0.0	0.0		4.0	0.0
	.063	0.0			0.0	0.0	0.0	2.0	0.0		0.0		0.0	0.0		2.0	0.0
	.032	0.0			0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0		2.0	0.0
22	.016	0.0			0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0		2.0	0.0
	.500	9.0			4.0	9.0	9.0	9.0	8.0		7.0		8.0	9.0		9.0	8.0
	.250	9.0			1.0	9.0	9.0	9.0	7.0		6.0		8.0	7.0		9.0	7.0
	.125	6.0			1.0	7.0	9.0	4.0	7.0		4.0		6.0	7.0		8.0	6.0
	.063	2.0			0.0	4.0	8.0	4.0	2.0		0.0		4.0	2.0		7.0	3.0
23	.032	0.0			0.0	2.0	8.0	0.0	0.0		0.0		2.0	2.0		6.0	2.0
	.016	0.0			0.0	0.0	2.0	0.0	0.0		0.0		2.0	0.0		0.0	1.0
	8.000	8.0	8.0	9.0	7.0	9.0	9.0	9.0	8.0	9.0	5.0	8.0	8.0	0.0	0.0	0.0	0.0
	.500	0.0			0.0	0.0	0.0	0.0	0.0	9.0	0.0		0.0	0.0	0.0	0.0	0.0
	.250	0.0			0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0
23	.125	0.0			0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0
	.063	0.0			0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0
	.032	0.0			0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0
	.016	0.0			0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0
		0.0			0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0

EXAMPLE 37**Postemergence herbicidal evaluation of test compounds**

- 5 The postemergence herbicidal activity of the compounds of the present invention is determined by the following tests, wherein a variety of monocotyledonous and dicotyledonous plants are treated with test compounds dispersed in aqueous acetone mixtures. In the tests, seedling plants are grown in jiffy flats for about two weeks. The test compounds are dispersed in 50/50 acetone/water mixtures containing 0.5% TWEEN® 20, a polyoxyethylene sorbitan monolaurate surfactant of Atlas Chemical Industries, in sufficient
- 10 quantities to provide the equivalent of about 0.16 kg to 8.0 kg per hectare of active compound when applied to the plants through a spray nozzle operating at 40 psig for a predetermined time. After spraying, the plants are placed on greenhouse benches and are cared for in the usual manner, commensurate with conventional greenhouse practices. From four to five weeks after treatment, the seedling plants, are examined and rated according to the rating system provided in Example 36 above. The data obtained are
- 15 recorded in Table II below. The compounds evaluated are reported by compound number given in Example 36.

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TABLE II

Compound No.	RATE	POST-EMERGENCE TESTS -- RATES IN KG/HA																
		BARNY ARDGR	LARGE CRAB	GREEN FOX	P SEGE	NUT OATS	WILD OATS	QUACK GRASS	FLD B INDWO	WRNGL RY SP	WILD MUSTD	RAGWE ED	PRIKY SIDA	VELVE TLEAF	MATRI CARIA	S BAR LY LA	SUGAR BEETS	CORN FIELD
1	1.000	0.0		4.0	0.0	0.0	0.0	0.0	1.0				2.0	0.0			7.0	4.0
	.500	0.0		4.0	0.0	0.0	0.0	0.0	1.0		0.0		2.0	0.0			4.0	3.0
	.250	0.0		3.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0			4.0	3.0
	.125	0.0		4.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0			4.0	
3	1.000	4.0			3.0	7.0	7.0	7.0	5.0		6.0		3.0	9.0			8.0	4.0
	.500	3.0			2.0	6.0	7.0	4.0	2.0		5.0		1.0	9.0			3.0	3.0
	.250	2.0			2.0	4.0	3.0	2.0	0.0		0.0		0.0	0.0			1.0	2.0
	.125	0.0			0.0	2.0	1.0	0.0	0.0		0.0		0.0	0.0			0.0	0.0
4	.063	0.0			0.0	2.0	0.0	0.0	0.0		0.0		0.0	0.0			0.0	0.0
	.032	0.0			0.0	1.0	0.0	0.0	0.0		0.0		0.0	0.0			0.0	0.0
	0.000	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
	1.000	9.0			4.5	9.0	9.0	9.0	8.5		9.0	9.0	7.5	9.0			9.0	9.0
5	.500	9.0			3.5	9.0	9.0	9.0	5.5		7.5		6.5	9.0			9.0	9.0
	.250	9.0			1.5	9.0	9.0	9.0	5.0		5.5		5.5*	9.0			9.0	9.0
	.125	8.0			0.5	9.0	9.0	9.0	4.5		3.0		3.5	1.5			6.0*	9.0
	.063	5.0			0.0	7.5	3.5	4.0	3.5		1.0		2.5	1.5			6.0*	9.0
5	.032	3.5			0.0	3.0	2.0	1.0	3.0		0.5		1.5	0.5			9.0	7.5
	1.000	9.0	6.0	9.0	9.0	9.0	8.0	9.0	9.0		7.0		8.0	7.0			9.0	9.0
	.750	9.0		9.0	7.0	9.0	7.0	9.0	8.0		7.0	7.0	4.0				9.0	9.0
	.500	9.0	6.0	8.0	8.0	9.0	8.0	8.5	8.0		5.5	6.0	6.5	7.0			9.0	8.5
5	.375	7.0	5.0	8.0	6.0	8.0	6.0	8.0	7.0		5.0	5.0	4.0	5.0			9.0	8.5
	.250	8.0	4.0	8.0	5.5	9.0	7.5	8.0	8.0		5.0	4.0	5.5	5.0			9.0	8.5
	.188	6.0	4.0	8.0	3.0	8.0	5.0	5.0	4.0		4.0	3.0	3.0	3.0			9.0	7.0
	.125	7.5	4.0	8.0	3.5*	8.0	5.5	4.0*	5.0*		3.0	0.0	5.0	3.0			9.0	8.0
5	.063	8.0			5.0	8.0	7.0	7.0	8.0		3.0	0.0	6.0	3.0			3.0	8.0
	.032	7.0			2.0	6.0	4.0	6.0	5.0		3.0		2.0	0.0			8.0	5.0

TABLE II (Cont.)

Compound No.	RATE	POST-EMERGENCE TESTS -- RATES IN KG/HA													CORN FIELD		
		BARNY ARDCR	LARGE CRAB	GREEN FOX	P NUT SEEDGE	WILD OATS	QUACK GRASS	FLD B INDWO	MRNCL RY SP	WILD R--O	RAGWE ED	PRIKY SIDA	VELVE TLEAF	WATRI CARIA		S BAR LY LA	SUGAR BEETS
6	1.000	0.0			0.0	0.0	0.0	2.0		0.0		0.0	0.0	0.0		2.0	0.0
	.500	0.0			0.0	0.0	0.0	1.0		0.0		0.0	0.0	0.0		1.0	0.0
	.250	0.0			0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0		0.0	0.0
	.125	0.0			0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0		0.0	0.0
	.063	0.0			0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0		0.0	0.0
	.032	0.0			0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0		0.0	0.0
7	0.000	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0		9.0	9.0
	1.000	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	7.0	9.0	9.0	9.0	9.0		9.0	9.0
	.500	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	6.0	9.0	9.0	9.0	7.0		9.0	9.0
	.250	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	4.0	9.0	9.0	9.0	9.0		9.0	9.0
	.125	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	4.0	9.0	9.0	9.0	9.0		9.0	9.0
	.063	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	0.0	9.0	9.0	9.0	9.0		9.0	9.0
	.032	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	0.0	9.0	9.0	9.0	9.0		9.0	9.0
8	1.000	0.0			0.0	0.0	0.0	0.0		0.0		2.0	0.0	0.0		0.0	0.0
	.500	0.0			0.0	0.0	0.0	0.0		0.0		1.0	0.0	0.0		0.0	0.0
	.250	0.0			0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0		0.0	0.0
	.125	0.0			0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0		0.0	0.0
	.063	0.0			0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0		0.0	0.0
	.032	0.0			0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0		0.0	0.0
9	1.000	6.0	4.0	4.0	4.0	9.0	2.0	7.0	6.0	0.0	0.0	2.0	0.0	0.0		4.0	6.0
	.500	3.0	2.0	2.0	2.0	9.0	1.0	6.0	4.0	0.0	0.0	2.0	0.0	0.0		4.0	2.0
	.250	1.0	0.0	0.0	0.0	6.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0		4.0	1.0
	.125	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		2.0	1.0
	.063	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		1.0	1.0
	.032	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	

TABLE II (Cont.)

POST-EMERGENCE TESTS -- RATES IN KG/HA

Compound No.	RATE	BARNY ARDGR	LARGE CRAB	GREEN FOX	P NUT SEDGE	WILD OATS	QUACK GRASS	FLO B INWD	WRNGL RY SP	WILD MUSTD	RACWE ED	PRIKY SIDA	VELVE TLEAF	MATRI CARIA	S BAR LY LA	SUGAR BEETS	CORN FIELD
11	1.000	9.0			7.0	9.0	9.0	9.0	9.0	9.0	6.0		8.0	8.0		9.0	9.0
	.500	9.0			7.0	9.0	9.0	9.0	9.0		3.0		7.0	6.0		9.0	9.0
	.250	9.0			7.0	9.0	9.0	9.0	9.0		1.0		7.0	4.0		9.0	9.0
	.125	7.0			5.0	9.0	2.0	9.0	7.0		0.0		4.0	0.0		9.0	9.0
	.063	7.0			4.0	8.0	0.0	8.0	0.0		0.0		2.0	0.0		9.0	7.0
12	.032	4.0			4.0	2.0	0.0	4.0	0.0		0.0		2.0	0.0		4.0	4.0
	1.000	0.0			0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0		0.0	0.0
	.500	0.0			0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0		0.0	0.0
	.250	0.0			0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0		0.0	0.0
	.125	0.0			0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0		0.0	0.0
13	.063	0.0			0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0		0.0	0.0
	.032	0.0			0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0		0.0	0.0
	1.000	4.0			6.0	2.0	2.0	0.0	4.0		0.0		3.0			9.0	6.0
	.500	2.0			6.0	0.0	0.0	3.0	1.0		0.0		2.0			4.0	3.0
	.250	0.0			0.0	0.0	0.0	1.0	0.0		0.0		0.0			4.0	2.0
14	.125	0.0			0.0	0.0	0.0	0.0	0.0		0.0		0.0			2.0	2.0
	.063	0.0			0.0	0.0	0.0	0.0	0.0		0.0		0.0			2.0	0.0
	.032	0.0			0.0	0.0	0.0	0.0	0.0		0.0		0.0			0.0	0.0
	1.000	7.0			6.0	8.0	7.0	8.0	7.0		3.0		6.0	6.0		9.0	8.0
	.500	6.0			5.0	5.0	5.0	9.0	7.0		3.0		7.0	7.0		9.0	7.0
	.250	4.0			0.0	2.0	3.0	3.0	5.0		2.0		3.0	4.0		7.0	3.0
	.125	3.0			0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0		7.0	0.0
	.063	0.0			0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0		0.0	0.0
	.032	0.0			0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0		0.0	0.0

TABLE II (Cont.)

Compound No.	RATE	POST-EMERGENCE TESTS											RATES IN KG/HA				VELVE TLEAF	MATRI CARIA	S BAR LY LA	SUGAR BEETS	CORN FIELD
		BARNY ARCR	LARGE CRAB	GREEN FOX	P MUT SEGE	WILD DATS	QUACK GRASS	FLD B INDWD	WRNGL RY SP	WILD MUSTO	RAGWE ED	PRIKY SIDA	VELVE TLEAF	MATRI CARIA	S BAR LY LA	SUGAR BEETS					
15	1.000	5.0			0.0	0.0	0.0	3.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0				
	.500	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0				
	.250	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
	.125	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
	.063	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
16	.032	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
	1.000	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
	.500	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
	.250	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
	.125	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
17	.063	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
	.032	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
	1.000	9.0			9.0	8.0	7.0	9.0	8.0	3.0	3.0	9.0	4.0	4.0	9.0	7.0	7.0				
	.500	7.0			8.0	6.0	3.0	9.0	8.0	2.0	2.0	8.0	4.0	4.0	9.0	6.0	6.0				
	.250	6.0			8.0	3.0	0.0	8.0	7.0	0.0	0.0	8.0	4.0	4.0	9.0	5.0	5.0				
18	.125	3.0			6.0	0.0	0.0	7.0	8.0	0.0	0.0	7.0	3.0	3.0	8.0	5.0	5.0				
	.063	0.0			3.0	0.0	0.0	5.0	8.0	0.0	0.0	3.0	0.0	0.0	4.0	3.0	3.0				
	.032	0.0			0.0	0.0	0.0	5.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
18	1.000	2.0			5.0	4.0	7.0	6.0	0.0	2.0	7.0	7.0	7.0	9.0	0.0	0.0					

TABLE II (Cont.)

POST-EMERGENCE TESTS -- RATES IN KG/HA

Compound No.	RATE	BARNY ARDGR	LARGE CRAB	GREEN FOX	P NUT SEDE	WILD OATS	QUACK GRASS	FLD B INDWD	WRNGL RY SP	WILD MUSTD	RAGWE ED	PRIKY SIDA	VELVE TLEAF	MATRI CARIA	S BAR LY LA	SUGAR BEETS	CORN FIELD
18	.500	1.0			5.0	3.0	7.0	6.0	0.0	0.0	1.0		7.0	0.0		9.0	0.0
	.250	0.0			2.0	1.0	3.0	2.0	0.0	0.0	0.0		3.0	0.0		8.0	0.0
	.125	0.0			1.0	0.0	2.0	0.0	0.0	0.0	0.0		1.0	0.0		8.0	0.0
	.063	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0		6.0	0.0
19	.032	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0		5.0	0.0
	1.000	9.0			8.0	9.0	9.0	9.0	9.0	9.0	9.0		9.0	8.0		9.0	9.0
	.500	9.0			7.0	9.0	9.0	9.0	8.0	8.0	7.0		9.0	7.0		9.0	9.0
	.250	9.0			6.0	9.0	9.0	9.0	8.0	8.0	5.0		9.0	5.0		9.0	9.0
20	.125	9.0			5.0	9.0	8.0	9.0	6.0	6.0	1.0		6.0	3.0		9.0	9.0
	.063	9.0			2.0	9.0	8.0	9.0	2.0	2.0	1.0		2.0	3.0		9.0	9.0
	.032	5.0			0.0	9.0	7.0	9.0	0.0	0.0	0.0		0.0	1.0		9.0	9.0
	1.000	9.0			0.0	9.0	9.0	9.0	5.0	5.0	7.0		9.0	9.0		9.0	9.0
21	.500	9.0			0.0	9.0	9.0	5.0	4.0	4.0	3.0		9.0	6.0		9.0	9.0
	.250	9.0			0.0	9.0	9.0	0.0	1.0	1.0	1.0		8.0	6.0		8.0	9.0
	.125	8.0			0.0	8.0	7.0	0.0	0.0	0.0	1.0		3.0	5.0		8.0	9.0
	.063	2.0			0.0	7.0	7.0	0.0	0.0	0.0	0.0		0.0	1.0		7.0	9.0
21	.032	0.0			0.0	3.0	2.0	0.0	0.0	0.0	0.0		0.0	0.0		7.0	7.0
	1.000	9.0			9.0	9.0	7.0	9.0	9.0	9.0	7.0		9.0	6.0		9.0	8.0
	.500	9.0			7.0	9.0	6.0	8.0	9.0	9.0	7.0		9.0	3.0		9.0	6.0
	.250	9.0			2.0	8.0	7.0	7.0	7.0	7.0	6.0		7.0	1.0		8.0	3.0
21	.125	5.0			2.0	8.0	3.0	7.0	4.0	4.0	2.0		6.0	0.0		5.0	1.0
	.063	2.0			1.0	4.0	1.0	6.0	0.0	0.0	1.0		2.0	0.0		2.0	0.0
	.032	0.0			0.0	2.0	0.0	2.0	0.0	0.0	0.0		1.0	0.0		2.0	0.0
													1.0	0.0		2.0	0.0

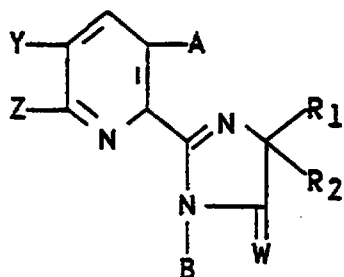
TABLE II (Cont.)

Compound No.	RATE	PUSI-EMERGENCE TESTS -- RATES IN KG/HA														WATRI CARIA	S BAR LY LA	SUGAR BEETS	CORN FIELD
		BARNY ARDR	LARGE CRAB	GREEN FOX	P NUT SEDR	WILD DAYS	QUACK GRASS	FLD B INDWD	WRNGL RY SP	WILD MUSTD	RAGWE ED	PRIKY SIDA	VELVE TLEAF						
23	0.000	0.0	0.0	2.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
	1.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
	.500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
	.250	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
	.125	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
24	.063	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
	.032	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
	1.000	0.0	0.0	0.0	0.0	0.0	0.0	7.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0		
	.500	0.0	0.0	0.0	0.0	0.0	0.0	6.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0		
	.250	0.0	0.0	0.0	0.0	0.0	0.0	2.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0		
25	.125	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0		
	.063	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0		
	.032	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
	1.000	4.0	7.0	9.0	9.0	9.0	9.0	2.0	2.0	2.0	7.0	7.0	2.0	2.0	6.0	6.0	8.0		
	.500	2.0	6.0	7.0	7.0	7.0	7.0	1.0	1.0	1.0	7.0	7.0	1.0	1.0	6.0	6.0	8.0		
	.250	0.0	4.0	3.0	4.0	3.0	3.0	0.0	0.0	0.0	0.0	3.0	3.0	0.0	4.0	4.0	4.0		
	.125	0.0	2.0	2.0	2.0	1.0	2.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	3.0		

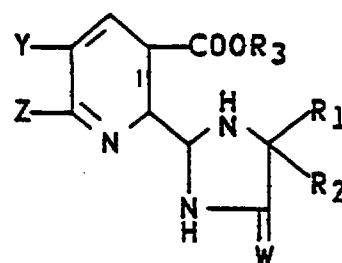
Claims

Claims for the following Contracting States : BE, CH, LI, DE, FR, GB, GR, IT, LU, NL, SE

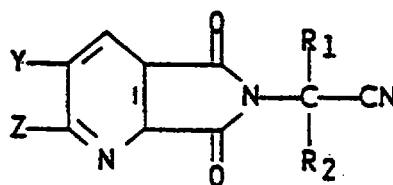
1. A compound having the structure:



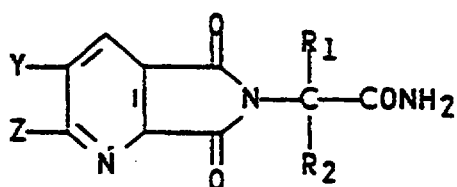
(I)



(II)

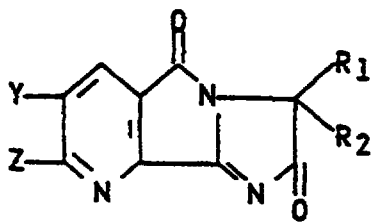


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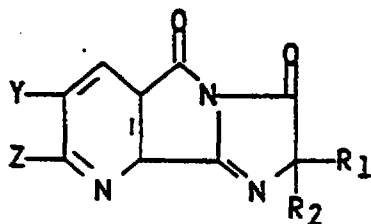


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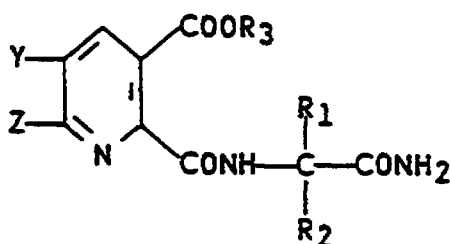




(V)



(VI)



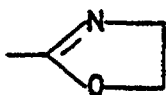
(VII)

wherein

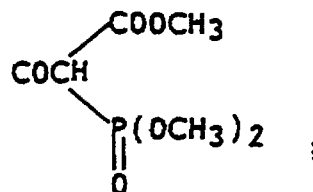
R₁ is C₁-C₄ alkyl;

R₂ is C₁-C₄ alkyl;

A is COOR₃, CONHR₆, CHO, CH₂OH, COCH₃, COC₆H₅, CN, CH₃, CH=NOH, CH₂COOH, CONHOH, CH₂CH₂COOH, CHR₈OH,

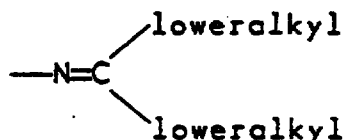


or



R₃ is hydrogen,





5

10

15

20

25

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35

40

45

50

55

C₁-C₁₂ alkyl optionally substituted with one of the following groups: C₁-C₃ alkoxy, C₁-C₃ alkylthio, halogen, hydroxyl, C₃-C₆ cycloalkyl, benzyloxy, fury], phenyl, halophenyl, loweralkylphenyl, loweralkoxyphenyl, nitrophenyl, carboxyl, loweralkoxycarbonyl, cyano or trloweralkylammonium halide;

C₃-C₁₂ alkenyl optionally substituted with one of the following groups: C₁-C₃ alkoxy, phenyl, halogen or loweralkoxycarbonyl or with two C₁-C₃ alkoxy groups or two halogen groups;

C₃-C₆ cycloalkyl optionally substituted with one or two C₁-C₃ alkyl groups;

C₃-C₁₆ alkynyl optionally substituted with one or two C₁-C₃ alkyl groups; or a cation;

R₆ is hydrogen, hydroxyl, C₃-alkenyl, C₃-alkynyl or C₁-C₄ alkyl optionally substituted with one hydroxyl or one chlorine group;

B is H, COR₄ or SO₂R₅, provided that when B is COR₄ or SO₂R₅; A is COOR₃ in which R₃ is other than H, or a cation, CH₃ or CN; W is O; and Y and Z are not alkylamino, hydroxyl, or hydroxyloweralkyl;

R₄ is C₁-C₁₁ alkyl, chloromethyl or phenyl optionally substituted with one chloro, one nitro or one methoxy group;

R₅ is C₁-C₄ alkyl or phenyl optionally substituted with one methyl group;

W is O;

R₈ is C₁-C₄ alkyl or phenyl;

Y and Z are each hydrogen, halogen, C₁-C₆ alkyl, C₁-C₄ hydroxyloweralkyl, C₁-C₆ alkoxy, C₁-C₄ alkylthio, phenoxy, C₁-C₄ haloalkyl, nitro, cyano, C₁-C₄ alkylamino, formyl, di-C₁-C₄ loweralkylamino, C₁-C₄ alkylsulfonyl, difluoromethoxy, trifluoromethoxy, 1,1,2,2-tetrafluoroethoxy, phenyl optionally substituted with one C₁-C₄ alkyl, C₁-C₄ alkoxy or halogen;

C₃-C₈ straight or branched alkenyloxy optionally substituted with one to three halogens;

C₃-C₈ straight or branched alkynyloxy optionally substituted with one to three halogens;

C₂-C₆ straight or branched alkenyl optionally substituted with phenyl, C₁-C₄ alkoxy or 1 to 3 halogens;

C₂-C₆ straight or branched alkynyl optionally substituted with phenyl, C₁-C₄ alkoxy or 1 to 3 halogens;

C₃-C₆ cycloalkyl optionally substituted with methyl, halogen or C₁-C₄ alkoxy;

C₁-C₄ alkylcarbonyl optionally substituted with C₁-C₄ alkoxy or 1 to 3 halogens;

C₁-C₄ alkylcarbonylamino optionally substituted on nitrogen with C₁-C₂ alkyl or C₁-C₄ alkoxy and on carbon with C₁-C₄ alkoxy or 1 to 3 halogens;

C₁-C₄ alkylcarbonyloxy optionally substituted with C₁-C₄ alkoxy or 1 to 3 halogens;

C₁-C₄ alkyl substituted with C₁-C₄ alkoxy, C₁-C₄ alkylthio, C₁-C₄ alkylamino, C₁-C₄ dialkylamino, C₁-C₄ trialkylammonium or C₁-C₄ alkylcarbonyloxy;

2(or 3)-fury] optionally substituted with halogen or C₁-C₃ alkyl;

2(or 3)-thienyl optionally substituted with halogen or C₁-C₃ alkyl;

N-methyl-2(or 3)-pyrrolyl;

hydroxy;

amino optionally substituted with C₁-C₄ alkoxy or C₁-C₂ alkyl and C₁-C₄ alkoxy;

2(or 4)-pyridyloxy optionally substituted with C₁-C₄ alkyl, trifluoromethyl or 1 or 2 halogens;

C₁-C₄ mono or dialkylaminocarbonylamino, optionally substituted on the nitrogen attached to the ring with C₁-C₂ alkyl or C₁-C₄ alkoxy;

C₁-C₄ alkoxy carbonylamino, optionally substituted on nitrogen with C₁-C₂ alkyl or C₁-C₄ alkoxy;

C₁-C₄ mono or dialkylaminocarbonyloxy;

Provided that at least one of Y and Z is:



C₂-C₆ straight or branched alkenyl optionally substituted with phenyl, C₁-C₄ alkoxy or 1 to 3 halogens;

C₂-C₆ straight or branched alkynyl optionally substituted with phenyl, C₁-C₄ alkoxy or 1 to 3 halogens;

5 C₃-C₆ cycloalkyl optionally substituted with methyl, halogen or C₁-C₄ alkoxy;

C₁-C₄ alkylcarbonyl optionally substituted with C₁-C₄ alkoxy or 1 to 3 halogens;

C₁-C₄ alkylcarbonylamino optionally substituted on nitrogen with C₁-C₂ alkyl or C₁-C₄ alkoxy and on carbon with C₁-C₄ alkoxy or 1 to 3 halogens;

10 C₁-C₄ alkyl substituted with C₁-C₄ alkoxy, C₁-C₄ alkylthio, C₁-C₄ alkylamino, C₁-C₄ dialkylamino, C₁-C₄ trialkylammonium or C₁-C₄ alkylcarbonyloxy;

2(or 3)-fury] optionally substituted with halogen or C₁-C₃ alkyl;

2(or 3)-thienyl optionally substituted with halogen or C₁-C₃ alkyl;

N-methy]-2-(or 3)-pyrrolyl;

hydroxy;

15 amino optionally substituted with C₁-C₄ alkoxy, or C₁-C₂ alkyl and C₁-C₄ alkoxy; or

2(or 4)-pyridyloxy optionally substituted by C₁-C₄ alkyl, trifluoromethyl or 1 to 2 halogens; and

C₁-C₄ mono or dialkylaminocarbonylamino, optionally substituted on the nitrogen attached to the ring with C₁-C₂ alkyl or C₁-C₄ alkoxy;

20 C₁-C₄ alkoxycarbonylamino, optionally substituted on nitrogen with C₁-C₂ alkyl or C₁-C₄ alkoxy;

C₁-C₄ mono or dialkylaminocarbonyloxy;

Provided also that when Y is hydroxy, Z cannot be hydrogen;

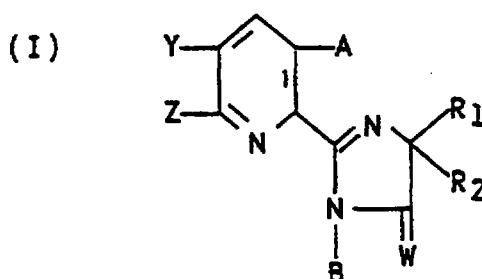
the N-oxides thereof, provided that R₃ cannot be unsaturated alkyl and Y and Z cannot be alkylthioalkyl, alkylaminoalkyl, dialkylaminoalkyl, trialkylammoniumalkyl, amino, 2(or 4)-pyridyloxy, alkoxyamino or unsaturated alkyl;

25 the optical isomers thereof when R₁ and R₂ are not the same;

the tautomers and geometric isomers thereof; and

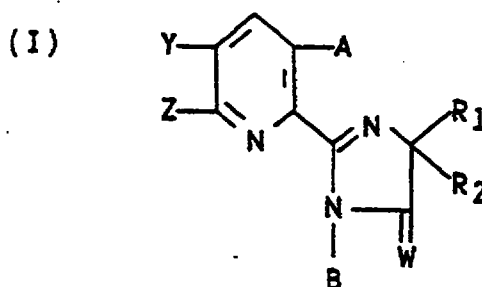
the acid addition salts thereof except when R₃ is a salt forming cation.

2. A compound according to claim 1 having the structure:



wherein A, B, W, R₁, R₂, Y and Z are as described in said claim 1.

3. A compound according to claim 2 having the structure:



wherein A, B, W, R₁ and R₂ are as described in said claim 1, one of Y and Z represents hydrogen or methyl and the other of Y and Z represents

C₂-C₆ straight or branched alkenyl optionally substituted with phenyl, C₁-C₄ alkoxy or 1 to 3 halogens;

C₂-C₆ straight or branched alkynyl optionally substituted with phenyl, C₁-C₄ alkoxy or 1 to 3 halogens;

C₃-C₆ cycloalkyl optionally substituted with methyl, halogen or C₁-C₄ alkoxy;

C₁-C₄ alkylcarbonyl optionally substituted with C₁-C₄ alkoxy or 1 to 3 halogens;

C₁-C₄ alkylcarbonylamino optionally substituted on nitrogen with C₁-C₂ alkyl or C₁-C₄ alkoxy and on carbon with C₁-C₄ alkoxy or 1 to 3 halogens;

C₁-C₄ alkyl substituted with C₁-C₄ alkoxy, C₁-C₄ alkylthio, C₁-C₄ alkylamino, C₁-C₄ dialkylamino, C₁-C₄ trialkylammonium or C₁-C₄ alkylcarbonyloxy;

2(or 3)-furyl optionally substituted with halogen or C₁-C₃ alkyl;

2(or 3)-thienyl optionally substituted with halogen or C₁-C₃ alkyl;

N-methyl-2(or 3)-pyrrolyl;

hydroxy;

amino optionally substituted with C₁-C₄ alkoxy or C₁-C₂ alkyl and C₁-C₄ alkoxy;

2(or 4)-pyridyloxy optionally substituted with C₁-C₄ alkyl, trifluoromethyl or 1 or 2 halogens;

C₁-C₄ mono or dialkylaminocarbonylamino, optionally substituted on the nitrogen attached to the ring with C₁-C₂ alkyl or C₁-C₄ alkoxy;

C₁-C₄ alkoxycarbonylamino, optionally substituted on nitrogen with C₁-C₂ alkyl or C₁-C₄ alkoxy;

C₁-C₄ mono or dialkylaminocarbonyloxy;

the N-oxides thereof, provided that R₃ cannot be unsaturated alkyl;

the optical isomers thereof when R₁ and R₂ are not the same;

the tautomers and geometric isomers thereof; and

the acid addition salts thereof except when R₃ is a salt forming cations.

4. A compound according to Claim 2, 5-isopropenyl-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl) nicotinic acid and the salts and esters thereof.

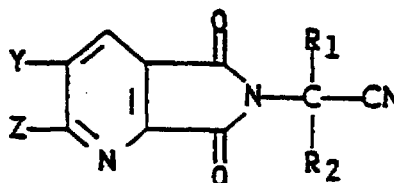
5. The compound according to Claim 2, namely 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-(methoxymethyl)nicotinic acid or the esters or salts thereof.

6. A compound according to Claim 2, 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-styrylnicotinic acid, 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-propenylnicotinic acid, 5-acetyl-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)nicotinic acid, 5-acetyl-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-6-methyl nicotinic acid, 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-[(methylthio)methyl]nicotinic acid, 6-(2-furyl)-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)nicotinic acid, 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-(2-thienyl)nicotinic acid, 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-6-(2-thienyl)nicotinic acid, 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-(3-thienyl)nicotinic acid, 1,6-dihydro-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-6-oxynicotinic acid and 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-6[(methylthio)methyl]nicotinic acid and the salts and esters thereof.

7. A compound according to Claim 2, methyl 2-(1-acetyl-4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-6-(hydroxymethyl)nicotinate acetate(ester), and isopropylammonium 6-(2-furyl)-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)nicotinate.

8. A compound according to Claim 1 having the structure:

(III)

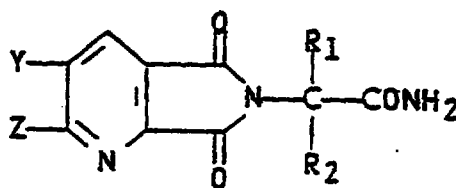


wherein R₁, R₂, Y and Z are as described in said Claim 1.



9. A compound according to Claim 1 having the structure:

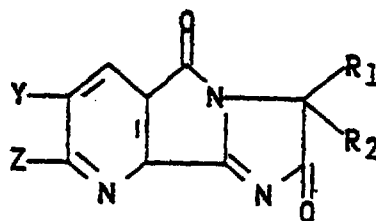
(IV)



wherein R_1 , R_2 , Y and Z are as described in said Claim 1.

10. A compound according to Claim 1 having the structure:

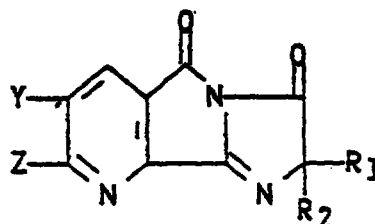
(V)



wherein R_1 , R_2 , Y and Z are as described in said Claim 1.

11. A compound according to Claim 1 having the structure:

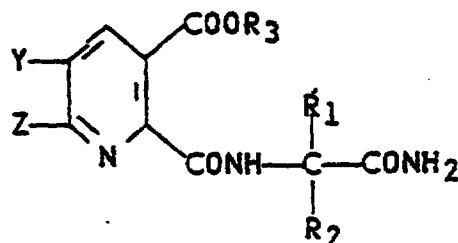
(VI)



wherein R_1 , R_2 , Y and Z are as described in said Claim 1.

12. A compound according to Claim 1 having the structure:

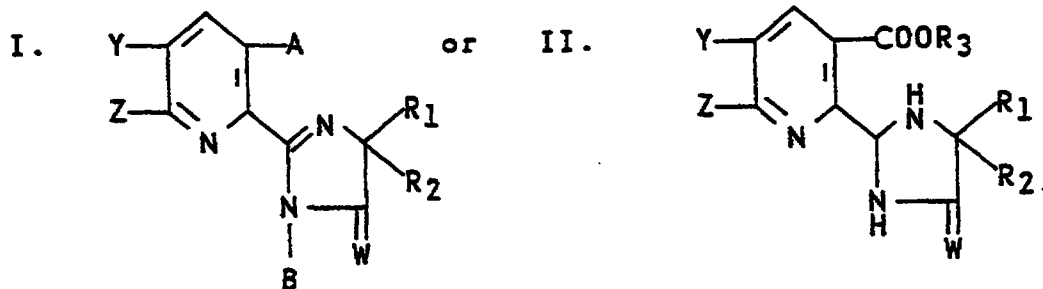
(VII)



wherein R_1 , R_2 , R_3 , Y and Z are as described in said Claim 1.

13. A method for the control of undesirable plant species comprising: applying to the foliage of said plants or to soil or water containing seeds or other propagating organs thereof, a herbicidally effective amount of a compound having the structure:



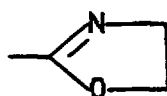


wherein

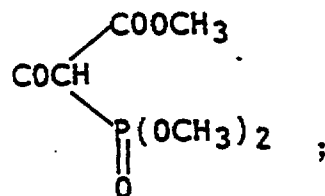
R₁ is C₁-C₄ alkyl;

R₂ is C₁-C₄ alkyl;

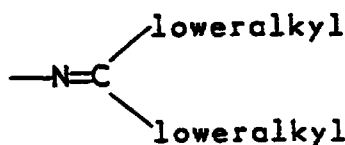
A is COOR₃, CONHR₆, CHO, CH₂OH, COCH₃, COC₆H₅, CN, CH₃, CH=NOH, CH₂COOH, CONHOH, CH₂CH₂COOH, CHR₈OH,



or



R₃ is hydrogen,



C₁-C₁₂ alkyl optionally substituted with one of the following groups: C₁-C₃ alkoxy, C₁-C₃ alkylthio, halogen, hydroxyl, C₃-C₆ cycloalkyl, benzyloxy, furyl, phenyl, halophenyl, loweralkylphenyl, loweralkoxyphenyl, nitrophenyl, carboxyl, loweralkoxycarbonyl, cyano or triloweralkylammonium halide;

C₃-C₁₂ alkenyl optionally substituted with one of the following groups: C₁-C₃ alkoxy, phenyl, halogen or loweralkoxycarbonyl or with two C₁-C₃ alkoxy groups or two halogen groups;

C₃-C₆ cycloalkyl optionally substituted with one or two C₁-C₃ alkyl groups;

C₃-C₁₆ alkynyl optionally substituted with one or two C₁-C₃ alkyl groups; or a cation;

R₆ is hydrogen, hydroxyl, C₃-alkenyl, C₃-alkynyl or C₁-C₄ alkyl optionally substituted with one hydroxyl or one chlorine group;

B is H, COR₄ or SO₂R₅, provided that when B is COR₄ or SO₂R₅; A is COOR₃ in which R₃ is other than H, or a cation, CH₃ or CN; W is O; and Y and Z are not alkylamino, hydroxyl, or hydroxyloweralkyl;

R₄ is C₁-C₁₁ alkyl, chloromethyl or phenyl optionally substituted with one chloro, one nitro or one methoxy group;

R₅ is C₁-C₄ alkyl or phenyl optionally substituted with one methyl group;

W is O;

R₈ is C₁-C₄-alkyl or phenyl;

Y and Z are each hydrogen, halogen, C₁-C₆ alkyl, C₁-C₄ hydroxyloweralkyl, C₁-C₆ alkoxy, C₁-C₄ alkylthio, formyl, phenoxy, C₁-C₄ haloalkyl, nitro, cyano, C₁-C₄ alkylamino, di-C₁-C₄-



loweralkylamino, C₁-C₄ alkylsulfonyl, difluoromethoxy, trifluoromethoxy, 1,1,2,2-tetrafluoroethoxy, phenyl optionally substituted with one C₁-C₄ alkyl, C₁-C₄ alkoxy or halogen;

C₃-C₈ straight or branched alkenyloxy optionally substituted with one to three halogens;

C₃-C₈ straight or branched alkynyloxy optionally substituted with one to three halogens;

C₂-C₆ straight or branched alkenyl optionally substituted with phenyl, C₁-C₄ alkoxy or 1 to 3 halogens;

C₂-C₆ straight or branched alkynyl optionally substituted with phenyl, C₁-C₄ alkoxy or 1 to 3 halogens;

C₃-C₆ cycloalkyl optionally substituted with methyl, halogen or C₁-C₄ alkoxy;

C₁-C₄ alkylcarbonyl optionally substituted with C₁-C₄ alkoxy or 1 to 3 halogens;

C₁-C₄ alkylcarbonylamino optionally substituted on nitrogen with C₁-C₂ alkyl or C₁-C₄ alkoxy and on carbon with C₁-C₄ alkoxy or 1 to 3 halogens;

C₁-C₄ alkylcarbonyloxy optionally substituted with C₁-C₄ alkoxy or 1 to 3 halogens;

C₁-C₄ alkyl substituted with C₁-C₄ alkoxy, C₁-C₄ alkylthio, C₁-C₄ alkylamino, C₁-C₄ dialkylamino, C₁-C₄ trialkylammonium or C₁-C₄ alkylcarbonyloxy;

2(or 3)-furyl optionally substituted with halogen or C₁-C₃ alkyl;

2(or 3)-thienyl optionally substituted with halogen or C₁-C₃ alkyl;

N-methyl-2(or 3)-pyrrolyl;

hydroxy;

amino optionally substituted with C₁-C₄ alkoxy or C₁-C₂ alkyl and C₁-C₄ alkoxy;

2(or 4)-pyridyloxy optionally substituted with C₁-C₄ alkyl, trifluoromethyl or 1 or 2 halogens;

C₁-C₄ mono or dialkylaminocarbonylamino, optionally substituted on the nitrogen attached to the ring with C₁-C₂ alkyl or C₁-C₄ alkoxy;

C₁-C₄ alkoxycarbonylamino, optionally substituted on nitrogen with C₁-C₂ alkyl or C₁-C₄ alkoxy;

C₁-C₄ mono or dialkylaminocarbonyloxy;

Provided that at least one of Y and Z is:

C₂-C₆ straight or branched alkenyl optionally substituted with phenyl, C₁-C₄ alkoxy or 1 to 3 halogens;

C₁-C₆ straight or branched alkynyl optionally substituted with phenyl, C₁-C₄ alkoxy or 1 to 3 halogens;

C₃-C₆ cycloalkyl optionally substituted with methyl, halogen or C₁-C₄ alkoxy;

C₁-C₄ alkylcarbonyl optionally substituted with C₁-C₄ alkoxy or 1 to 3 halogens;

C₁-C₄ alkylcarbonylamino optionally substituted on nitrogen with C₁-C₂ alkyl or C₁-C₄ alkoxy and on carbon with C₁-C₄ alkoxy or 1 to 3 halogens;

C₁-C₄ alkyl substituted with C₁-C₄ alkoxy, C₁-C₄ alkylthio, C₁-C₄ alkylamino, C₁-C₄ dialkylamino, C₁-C₄ trialkylammonium or C₁-C₄ alkylcarbonyloxy;

2(or 3)-furyl optionally substituted with halogen or C₁-C₃ alkyl;

2(or 3)-thienyl optionally substituted with halogen or C₁-C₃ alkyl;

N-methyl-2(or 3)-pyrrolyl;

hydroxy;

amino optionally substituted with C₁-C₄ alkoxy, or C₁-C₂ alkyl and C₁-C₄ alkoxy; or

2(or 4)-pyridyloxy optionally substituted by C₁-C₄ alkyl, trifluoromethyl or 1 to 2 halogens; and

C₁-C₄ mono or dialkylaminocarbonylamino, optionally substituted on the nitrogen attached to the ring with C₁-C₂ alkyl or C₁-C₄ alkoxy;

C₁-C₄ alkoxycarbonylamino, optionally substituted on nitrogen with C₁-C₂ alkyl or C₁-C₄ alkoxy;

C₁-C₄ mono or dialkylaminocarbonyloxy;

Provided also that when Y is hydroxy, Z cannot be hydrogen;

the N-oxides thereof, provided that R₃ cannot be unsaturated alkyl and Y and Z cannot be alkylthioalkyl, alkylaminoalkyl, dialkylaminoalkyl, trialkylammoniumalkyl, amino, 2(or 4)-pyridyloxy, alkoxylamino or unsaturated alkyl;

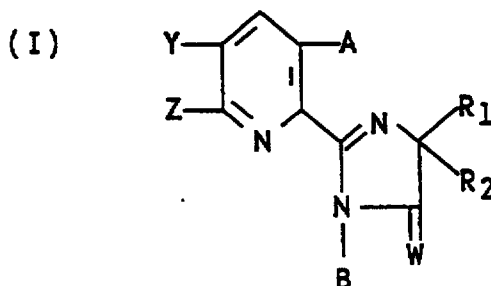
the optical isomers thereof when R₁ and R₂ are not the same;

the tautomers and geometric isomers thereof; and

the acid addition salts thereof except when R₃ is a salt forming cation.



14. A method according to Claim 13 for controlling undesirable plant species comprising: applying to the foliage of said plants or to soil or water containing seeds or other propagating organs thereof, a herbicidally effective amount of a compound having the structure:



wherein A, B, W, R₁ and R₂ are as described in said claim 1, one of Y and Z represents hydrogen or methyl and the other of Y and Z represents;

C₂-C₆ straight or branched alkenyl optionally substituted with phenyl, C₁-C₄ alkoxy or 1 to 3 halogens;

C₂-C₆ straight or branched alkynyl optionally substituted with phenyl, C₁-C₄ alkoxy or 1 to 3 halogens;

C₃-C₆ cycloalkyl optionally substituted with methyl, halogen or C₁-C₄ alkoxy;

C₁-C₄ alkylcarbonyl optionally substituted with C₁-C₄ alkoxy or 1 to 3 halogens;

C₁-C₄ alkylcarbonylamino optionally substituted on nitrogen with C₁-C₂ alkyl or C₁-C₄ alkoxy and on carbon with C₁-C₄ alkoxy or 1 to 3 halogens;

C₁-C₄ alkyl substituted with C₁-C₄ alkoxy, C₁-C₄ alkylthio, C₁-C₄ alkylamino, C₁-C₄ dialkylamino, C₁-C₄ trialkylammonium or C₁-C₄ alkylcarbonyloxy;

2(or 3)-furyl optionally substituted with halogen or C₁-C₃ alkyl;

2(or 3)-thienyl optionally substituted with halogen or C₁-C₃ alkyl;

N-methyl-2(or 3)-pyrrolyl;

hydroxy;

amino optionally substituted with C₁-C₄ alkoxy or C₁-C₂ alkyl and C₁-C₄ alkoxy;

2(or 4)-pyridyloxy optionally substituted with C₁-C₄ alkyl, trifluoromethyl or 1 or 2 halogens;

C₁-C₄ mono or dialkylaminocarbonylamino, optionally substituted on the nitrogen attached to the ring with C₁-C₂ alkyl or C₁-C₄ alkoxy;

C₁-C₄ alkoxycarbonylamino, optionally substituted on nitrogen with C₁-C₂ alkyl or C₁-C₄ alkoxy;

C₁-C₄ mono or dialkylaminocarbonyloxy;

the N-oxides thereof, provided that R₃ cannot be unsaturated alkyl;

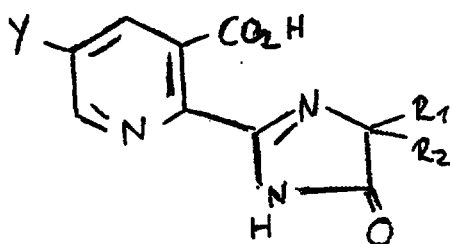
the optical isomers thereof when R₁ and R₂ are not the same;

the tautomers thereof, and

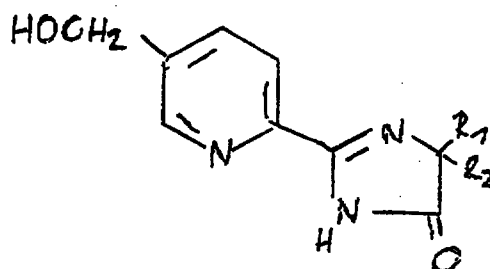
the acid addition salts thereof except when R₃ is a cation.

Claims for the following Contracting States : AT, ES

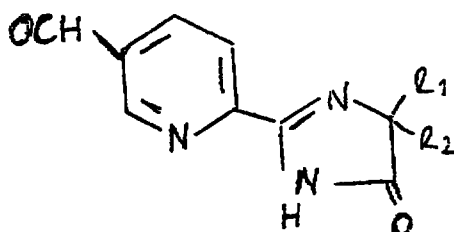
1. A process for the preparation of a compound having the structural formula



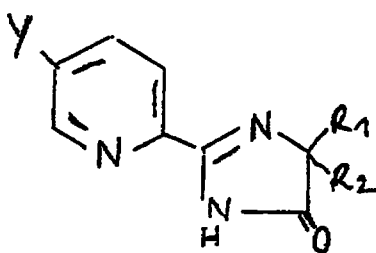
wherein R_1 and R_2 are each independently C_1 - C_4 alkyl; and Y is C_2 - C_6 straight or branched alkenyl optionally substituted with phenyl, C_1 - C_4 alkoxy or 1 to 3 halogens, which comprises oxidizing a hydroxymethyl compound having the structural formula



wherein R_1 and R_2 are as described above with manganese dioxide at an elevated temperature in the presence of an inert organic solvent to form a carboxaldehyde compound having the structural formula



wherein R_1 and R_2 are as described above, reacting the carboxaldehyde compound with an appropriate alkyl triphenylphosphonium halide compound in the presence of an alkali metal hydride, mineral oil and dimethylsulfoxide to form a 5-alkenyl compound having the structural formula



wherein Y is as described above, and reacting the 5-alkenyl compound with methyl lithium and carbon dioxide in the presence of tetrahydrofuran.

2. A process for the preparation of 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-(methoxymethyl)-nicotinic acid which comprises reacting methyl 5-(bromomethyl)-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)nicotinate with potassium methoxide to form methyl 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-(methoxymethyl)nicotinate, reacting the 5-(methoxymethyl)nicotinate with sodium hydroxide in the presence of methanol to form a 5-(methoxymethyl) nicotinic acid salt, and reacting the acid salt with hydrochloric acid.



Patentansprüche

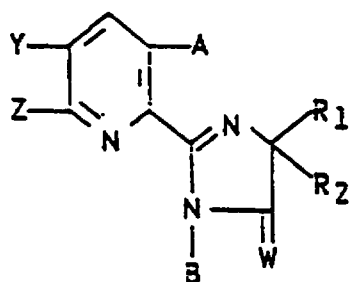
Patentansprüche für folgende Vertragsstaaten : BE, CH, LI, DE, FR, GB, GR, IT, LU, NL, SE

1. Verbindung der Struktur

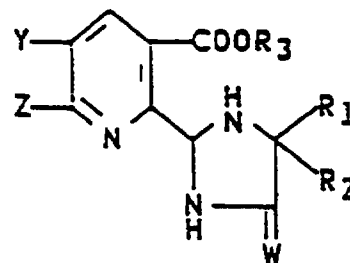
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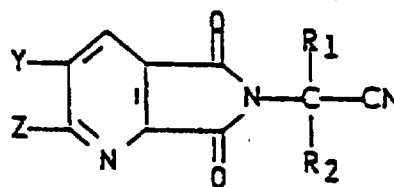
(I)



(II)

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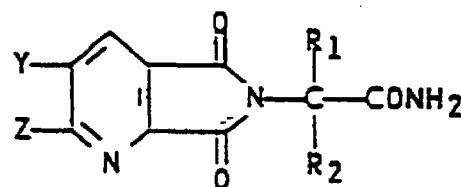


(III)

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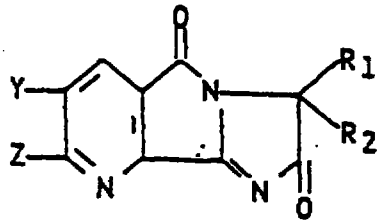
(IV)

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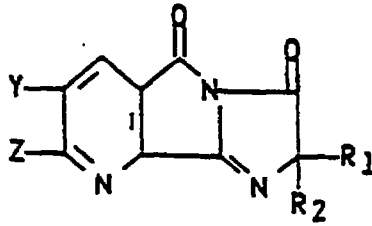
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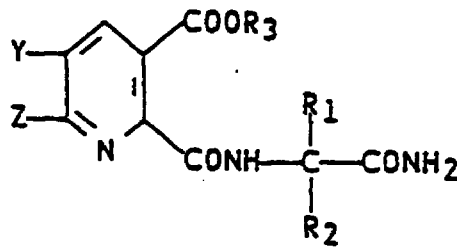




(V)



(VI)



(VII)

worin

R₁

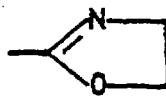
R₂

A

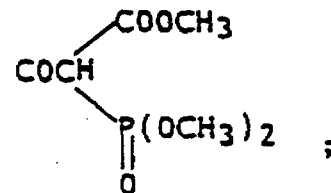
C₁-C₄-Alkyl bedeutet,

C₁-C₄-Alkyl bedeutet,

COOR₃, CONHR₆, CHO, CH₂OH, COCH₃, COC₆H₅, CN, CH₃, CH=NOH, CH₂COOH, CONHOH, CH₂CH₂COOH, CHR₈OH,



oder

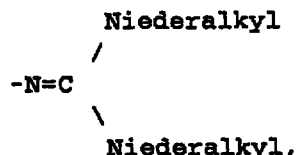


bedeutet,

Wasserstoff,

R₃





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 R_6

B

 R_4 R_5

W

 R_8

Y und Z

C_1 - C_{12} -Alkyl, gegebenenfalls substituiert mit einer der nachstehenden Gruppen: C_1 - C_3 -Alkoxy, C_1 - C_3 -Alkylthio, Halogen, Hydroxyl, C_3 - C_6 -Cycloalkyl, Benzyloxy, Furyl, Phenyl, Halogenphenyl, Niederalkylphenyl, Niederalkoxyphenyl, Nitrophenyl, Carboxyl, Niederalkoxycarbonyl, Cyano oder Triniederalkylammoniumhalogenid;

C_3 - C_{12} -Alkenyl, gegebenenfalls substituiert mit einer der nachstehenden Gruppen: C_1 - C_3 -Alkoxy, Phenyl, Halogen oder Niederalkoxycarbonyl oder mit zwei C_1 - C_3 -Alkoxygruppen oder zwei Halogengruppen,

C_3 - C_6 -Cycloalkyl, gegebenenfalls substituiert mit einer oder zwei C_1 - C_3 -Alkylgruppen;

C_3 - C_{16} -Alkynyl, gegebenenfalls substituiert mit einer oder zwei C_1 - C_3 -Alkylgruppen oder ein Kation bedeutet;

Wasserstoff, Hydroxyl, C_3 -Alkenyl, C_3 -Alkynyl oder C_1 - C_4 -Alkyl, gegebenenfalls substituiert mit einer Hydroxyl- oder einer Chlorgruppe bedeutet;

H, COR_4 oder SO_2R_5 bedeutet, mit der Maßgabe, daß, wenn B COR_4 oder SO_2R_5 ist; A COOR_3 bedeutet, wobei R_3 nicht H ist oder ein Kation, CH_3 oder CN; W O ist; und Y und Z nicht Alkylamino, Hydroxyl oder Hydroxyniederalkyl bedeuten;

C_1 - C_{11} -Alkyl, Chlormethyl oder Phenyl, gegebenenfalls substituiert mit einer Chlor-, einer Nitro- oder einer Methoxygruppe, bedeutet;

C_1 - C_4 -Alkyl oder Phenyl, gegebenenfalls substituiert mit einer Methylgruppe, darstellt, O ist,

C_1 - C_4 -Alkyl oder Phenyl bedeutet,

jeweils Wasserstoff, Halogen, C_1 - C_6 -Alkyl, C_1 - C_4 -Hydroxyniederalkyl, C_1 - C_6 -Alkoxy, C_1 - C_4 -Alkylthio, Phenoxy, C_1 - C_4 -Halogenalkyl, Nitro, Cyano, C_1 - C_4 -Alkylamino, Formyl, Di- C_1 - C_4 -niederalkylamino, C_1 - C_4 -Alkylsulfonyl, Difluormethoxy, Trifluormethoxy, 1,1,2,2-Tetrafluorethoxy, Phenyl, gegebenenfalls substituiert mit einer C_1 - C_4 -Alkyl-, C_1 - C_4 -Alkoxy- oder Halogengruppe;

C_3 - C_8 gerad- oder verzweigt-kettige Alkenyloxygruppe, gegebenenfalls substituiert mit ein bis drei Halogenatomen;

C_3 - C_8 gerad- oder verzweigt-kettige Alkinyloxygruppe, gegebenenfalls substituiert mit ein bis drei Halogenatomen;

C_2 - C_6 gerad- oder verzweigt-kettige Alkenylgruppe, gegebenenfalls substituiert mit Phenyl, C_1 - C_4 -Alkoxy oder 1 bis 3 Halogenatomen;

C_2 - C_6 gerad- oder verzweigt-kettige Alkynylgruppe, gegebenenfalls substituiert mit Phenyl, C_1 - C_4 -Alkoxy mit 1 bis 3 Halogenatomen;

C_3 - C_6 -Cycloalkyl, gegebenenfalls substituiert mit Methyl, Halogen oder C_1 - C_4 -Alkoxy;

C_1 - C_4 -Alkylcarbonyl, gegebenenfalls substituiert mit C_1 - C_4 -Alkoxy oder 1 bis 3 Halogenatomen;

C_1 - C_4 -Alkylcarbonylamino, gegebenenfalls substituiert am Stickstoffatom mit C_1 - C_2 -Alkyl oder C_1 - C_4 -Alkoxy und am Kohlenstoffatom mit C_1 - C_4 -Alkoxy oder 1 bis 3 Halogenatomen;

C_1 - C_4 -Alkylcarbonyloxy, gegebenenfalls substituiert mit C_1 - C_4 -Alkoxy oder 1 bis 3 Halogenatomen;

C_1 - C_4 -Alkyl, substituiert mit C_1 - C_4 -Alkoxy, C_1 - C_4 -Alkylthio, C_1 - C_4 -Alkylamino, C_1 - C_4 -Di-alkylamino, C_1 - C_4 -Trialkylammonium oder C_1 - C_4 -Alkylcarbonyloxy, 2(oder 3)-Furyl, gegebenenfalls substituiert mit Halogen oder C_1 - C_3 -Alkyl, 2(oder 3)-Thienyl, gegebenenfalls substituiert mit Halogen oder C_1 - C_3 -Alkyl, N-Methyl-2(oder 3)-pyrrolyl;

Hydroxy;

Amino, gegebenenfalls substituiert mit C_1 - C_4 -Alkoxy oder C_1 - C_2 -Alkyl und C_1 - C_4 -Alkoxy;

2(oder 4)-Pyridyloxy, gegebenenfalls substituiert mit C_1 - C_4 -Alkyl, Trifluormethyl

oder 1 oder 2 Halogenatomen;

C₁-C₄ -Mono- oder Dialkylaminocarbonylamino, gegebenenfalls substituiert am Stickstoffatom, das an den Ring gebunden ist mit C₁-C₂-Alkyl oder C₁-C₄-Alkoxy;

C₁-C₄ -Alkoxy-carbonylamino, gegebenenfalls substituiert am Stickstoffatom mit C₁-C₂-Alkyl oder C₁-C₄-Alkoxy;

C₁-C₄ -Mono- oder Dialkylaminocarbonyloxy; sind,

mit der Maßgabe, daß mindestens einer der Reste Y und Z ist:

C₂-C₆ gerad- oder verzweigt-kettige Alkenylgruppe, gegebenenfalls substituiert mit Phenyl, C₁-C₄-Alkoxy oder 1 bis 3 Halogenatomen;

C₂-C₆ gerad- oder verzweigt-kettige Alkylgruppe, gegebenenfalls substituiert mit Phenyl, C₁-C₄-Alkoxy, oder mit 1 bis 3 Halogenatomen;

C₃-C₆ -Cycloalkyl, gegebenenfalls substituiert mit Methyl, Halogen oder C₁-C₄-Alkoxy,

C₁-C₄ -Alkylcarbonyl, gegebenenfalls substituiert mit C₁-C₄-Alkoxy oder 1 bis 3 Halogenatomen;

C₁-C₄ -Alkylcarbonylamino, gegebenenfalls substituiert am Stickstoffatom mit C₁-C₂-Alkyl oder C₁-C₄-Alkoxy und am Kohlenstoffatom mit C₁-C₄-Alkoxy oder 1 bis 3 Halogenatomen;

C₁-C₄ -Alkyl, substituiert mit C₁-C₄-Alkoxy, C₁-C₄-Alkylthio, C₁-C₄-Alkylamino, C₁-C₄-Dialkylamino, C₁-C₄-Trialkylammonium oder C₁-C₄-Alkylcarbonyloxy, 2(oder 3)-Furyl, gegebenenfalls substituiert mit Halogen oder C₁-C₃-Alkyl, 2(oder 3)-Thienyl, gegebenenfalls substituiert mit Halogen oder C₁-C₃-Alkyl, N-Methyl-2(oder 3)-pyrrolyl;

Hydroxy;

Amino, gegebenenfalls substituiert mit C₁-C₄-Alkoxy oder C₁-C₂-Alkyl und C₁-C₄-Alkoxy; oder

2(oder 4)-Pyridyloxy, gegebenenfalls substituiert mit C₁-C₄-Alkyl, Trifluormethyl oder 1 bis 2 Halogenatomen; und

C₁-C₄ -Mono- oder Dialkylaminocarbonylamino, gegebenenfalls substituiert am Stickstoffatom, das an dem Ring gebunden ist mit C₁-C₂-Alkyl oder C₁-C₄-Alkoxy;

C₁-C₄ -Alkoxy-carbonylamino, gegebenenfalls substituiert am Stickstoffatom, mit C₁-C₂-Alkyl oder C₁-C₄-Alkoxy;

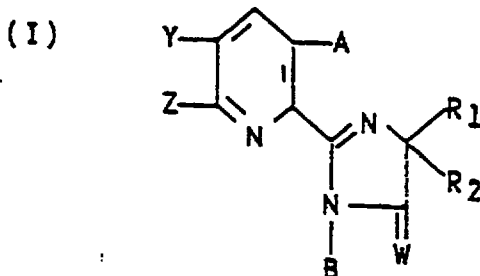
C₁-C₄ -Mono- oder Dialkylaminocarbonyloxy;

mit der weiteren Maßgabe, daß wenn Y Hydroxy ist Z nicht Wasserstoff sein kann;

die N-Oxide davon, mit der Maßgabe, daß R₃ nicht ungesättigtes Alkyl bedeutet und Y und Z nicht Alkylthioalkyl, Alkylaminoalkyl, Dialkylaminoalkyl, Trialkylammoniumalkyl, Amino, 2(oder 4)-Pyridyloxy, Alkoxyamino oder eine ungesättigte Alkylgruppe bedeuten können und die optischen Isomeren davon, wenn R₁ und R₂ nicht gleich sind;

die tautomeren und geometrischen Isomeren davon und die Säureadditionssalze davon, mit der Ausnahme, wenn R₃ ein salzbildendes Kation ist.

2. Verbindung nach Anspruch 1 der Struktur:

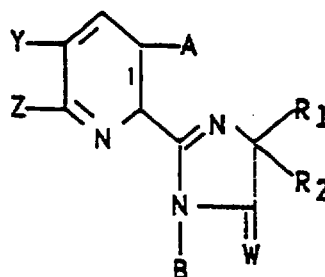


worin A, B, W, R₁, R₂, Y und Z wie in Anspruch 1 beschrieben sind.



3. Verbindung nach Anspruch 2 der Struktur:

(I)



15 worin A, B, W, R₁ und R₂ wie in Anspruch 1 beschrieben sind, einer der Reste Y und Z Wasserstoff oder Methyl bedeutet und die anderen Reste Y und Z wiedergeben:

C₂-C₆ gerad- oder verzweigte Alkenylgruppe, gegebenenfalls substituiert mit Phenyl, C₁-C₄-Alkoxy oder 1 bis 3 Halogenatomen;

C₂-C₆ gerad- oder verzweigte Alkylgruppe, gegebenenfalls substituiert mit Phenyl, C₁-C₄-Alkoxy oder 1 bis 3 Halogenatomen;

20 C₃-C₆ -Cycloalkyl, gegebenenfalls substituiert mit Methyl, Halogen oder C₁-C₄-Alkoxy,

C₁-C₄ -Alkylcarbonyl, gegebenenfalls substituiert mit C₁-C₄-Alkoxy oder 1 bis 3 Halogenatomen;

C₁-C₄-Alkylcarbonylamino, gegebenenfalls substituiert am Stickstoffatom mit C₁-C₂-Alkyl oder C₁-C₄-Alkoxy und am Kohlenstoffatom mit C₁-C₄-Alkoxy oder 1 bis 3 Halogenatomen;

25 C₁-C₄ -Alkyl, substituiert mit C₁-C₄-Alkoxy, C₁-C₄-Alkylthio, C₁-C₄-Alkylamino, C₁-C₄-Dialkylamino, C₁-C₄-Trialkylammonium oder C₁-C₄-Alkylcarbonyloxy, 2(oder 3)-Furyl, gegebenenfalls substituiert mit Halogen oder C₁-C₃-Alkyl, 2(oder 3)-Thienyl, gegebenenfalls substituiert mit Halogen oder C₁-C₃-Alkyl, N-Methyl-2(oder 3)-pyrrolyl;

Hydroxy;

Amino, gegebenenfalls substituiert mit C₁-C₄-Alkoxy oder C₁-C₂-Alkyl und C₁-C₄-Alkoxy;

30 2(oder 4)-Pyridyloxy, gegebenenfalls substituiert mit C₁-C₄-Alkyl, Trifluormethyl oder 1 oder 2 Halogenatomen;

C₁-C₄ -Mono- oder Dialkylaminocarbonylamino, gegebenenfalls substituiert am Stickstoffatom, das an den Ring gebunden ist mit C₁-C₂-Alkyl oder C₁-C₄-Alkoxy;

35 C₁-C₄ -Alkoxy, gegebenenfalls substituiert am Stickstoffatom mit C₁-C₂-Aryl oder C₁-C₄ -Alkoxy;

C₁-C₄ -Mono- oder Dialkylaminocarbonyloxy;

die N-Oxide davon, mit der Maßgabe, daß R_3 keine ungesättigte Alkylgruppe bedeutet, die optischen Isomeren davon, wenn R_1 und R_2 nicht dieselben sind;

40 die tautomeren und geometrischen Isomeren davon und die Säureadditionssalze davon, mit der Ausnahme, wenn R_3 ein salzbildendes Kation ist.

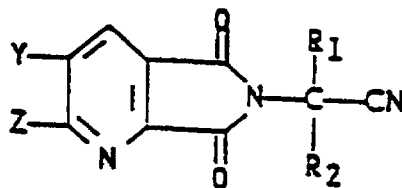
4. Verbindung nach Anspruch 2, nämlich 5-Isopropenyl-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-nicotinsäure und die Salze und Ester davon.
- 45 5. Verbindung nach Anspruch 2, nämlich 2-(4-Isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-(methoxymethyl)-nicotinsäure oder die Ester oder Salze davon.
6. Verbindung nach Anspruch 2, nämlich 2-(4-Isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-styrylnicotinsäure, 2-(4-Isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-propenylnicotinsäure, 5-Acetyl-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)nicotinsäure, 5-Acetyl-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-6-methylnicotinsäure, 2-(4-Isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-[(methylthio)methyl]nicotinsäure, 6-(2-Furyl)-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)nicotinsäure, 2-(4-Isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-(2-thienyl)nicotinsäure, 2-(4-Isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-6-(2-thienyl)-nicotinsäure, 2-(4-Isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-(3-thienyl)nicotinsäure, 1,6-Dihydro-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-6-oxynicotinsäure und 2-(4-Isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-6-[(methylthio)methyl]nicotinsäure und die Salze und Ester davon.
- 55



7. Verbindung nach Anspruch 2, nämlich 2-(1-Acetyl-4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-6-(hydroxymethyl)nicotinsäureessigmethylester und Isopropylammonium-6-(2-furyl)-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)nicotinat.

8. Verbindung nach Anspruch 1 der Struktur:

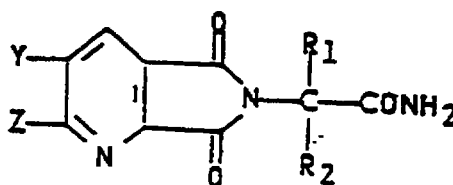
(III)



worin R_1 , R_2 , Y und Z wie in Anspruch 1 beschrieben sind.

9. Verbindung nach Anspruch 1 der Struktur:

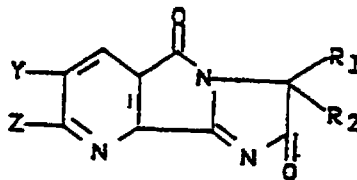
(IV)



worin R_1 , R_2 , Y und Z wie in Anspruch 1 beschrieben sind.

10. Verbindung nach Anspruch 1 der Struktur:

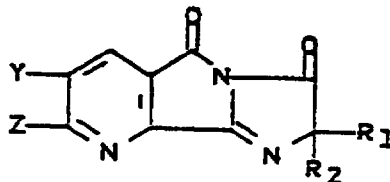
(V)



worin R_1 , R_2 , Y und Z wie in Anspruch 1 beschrieben sind.

11. Verbindung nach Anspruch 1 der Struktur:

(VI)



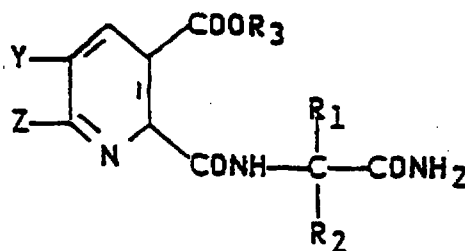
worin R_1 , R_2 , Y und Z wie in Anspruch 1 beschrieben sind.





12. Verbindung nach Anspruch 1 der Struktur:

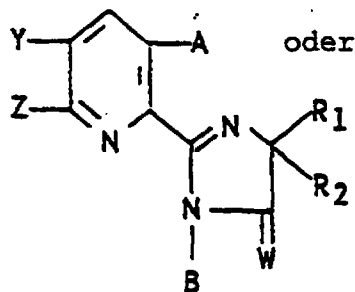
(VII)



worin R_1 , R_2 , R_3 , Y und Z wie in Anspruch 1 beschrieben sind.

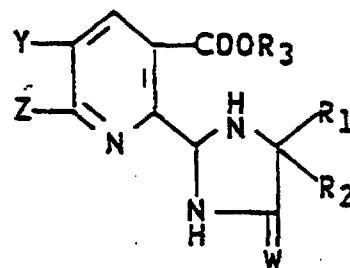
13. Verfahren zur Bekämpfung unerwünschter Pflanzenarten, umfassend: Anwenden auf das Blattwerk der Pflanzen oder auf den Boden oder das Wasser, enthaltend Samen oder andere Fortpflanzungsorgane davon, einer herbizid wirksamen Menge einer Verbindung der Struktur:

I.



oder

II.



worin

R_1

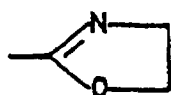
C_1 - C_4 -Alkyl bedeutet,

R_2

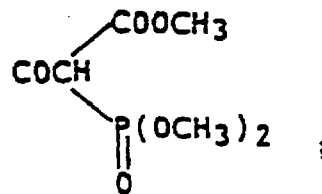
C_1 - C_4 -Alkyl bedeutet,

A

$COOR_3$, $CONHR_6$, CHO , CH_2OH , $COCH_3$, COC_6H_5 , CN , CH_3 , $CH=NOH$, CH_2COOH , $CONHOH$, CH_2CH_2COOH , CH_2R_8OH ,

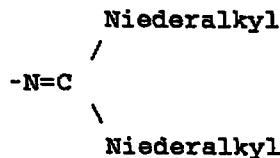


oder



R_3

bedeutet,
Wasserstoff,



C_1 - C_{12} -Alkyl, gegebenenfalls substituiert mit einer der nachstehenden Gruppen:
 C_1 - C_3 -Alkoxy, C_1 - C_3 -Alkylthio, Halogen, Hydroxyl, C_3 - C_6 -Cycloalkyl, Benzyloxy, Furyl,
Phenyl, Halogenphenyl, Niederalkylphenyl, Niederalkoxyphenyl, Nitrophenyl, Carboxyl,



Niederalkoxycarbonyl, Cyano oder Triniederalkylammoniumhalogenid;

C₃-C₁₂ -Alkenyl, gegebenenfalls substituiert mit einer der nachstehenden Gruppen: C₁-C₃-Alkoxy, Phenyl, Halogen oder Niederalkoxycarbonyl oder mit zwei C₁-C₃-Alkoxygruppen oder zwei Halogengruppen,

C₃-C₆ -Cycloalkyl, gegebenenfalls substituiert mit einer oder zwei C₁-C₃-Alkylgruppen;

C₃-C₁₆ -Alkynyl, gegebenenfalls substituiert mit einer oder zwei C₁-C₃-Alkylgruppen oder ein Kation bedeutet;

R₆ Wasserstoff, Hydroxyl, C₃-Alkenyl, C₃-Alkynyl oder C₁-C₄-Alkyl, gegebenenfalls substituiert mit einer Hydroxyl- oder einer Chlorgruppe, bedeutet;

B H, COR₄ oder SO₂R₅ bedeutet, mit der Maßgabe, daß, wenn B COR₄ oder SO₂R₅ ist; A COOR₃ bedeutet, wobei R₃ nicht H ist oder ein Kation, CH₃ oder CN; W O ist; und Y und Z nicht Alkylamino, Hydroxyl oder Hydroxyniederalkyl bedeuten;

R₄ C₁-C₁₁-Alkyl, Chlormethyl oder Phenyl, gegebenenfalls substituiert mit einer Chlor-, einer Nitro- oder einer Methoxygruppe bedeutet;

R₅ C₁-C₄-Alkyl oder Phenyl, gegebenenfalls substituiert mit einer Methylgruppe darstellt, O ist,

R₈ C₁-C₄-Alkyl oder Phenyl bedeutet,

Y und Z jeweils Wasserstoff, Halogen, C₁-C₆-Alkyl, C₁-C₄-Hydroxyniederalkyl, C₁-C₆-Alkoxy, C₁-C₄-Alkylthio, Formyl, Phenoxy, C₁-C₄-Halogenalkyl, Nitro, Cyano, C₁-C₄-Alkylamino, Di-C₁-C₄-niederalkylamino, C₁-C₄-Alkylsulfonyl, Difluormethoxy, Trifluormethoxy, 1,1,2,2-Tetrafluorethoxy, Phenyl, gegebenenfalls substituiert mit einer C₁-C₄-Alkyl-, C₁-C₄-Alkoxy- oder Halogengruppe;

C₃-C₈ gerad- oder verzweigt-kettige Alkenyloxygruppe, gegebenenfalls substituiert mit ein bis drei Halogenatomen;

C₃-C₈ gerad- oder verzweigt-kettige Alkinyloxygruppe, gegebenenfalls substituiert mit ein bis drei Halogenatomen;

C₂-C₆ gerad- oder verzweigt-kettige Alkenylgruppe, gegebenenfalls substituiert mit Phenyl, C₁-C₄-Alkoxy oder 1 bis 3 Halogenatomen;

C₂-C₆ gerad- oder verzweigt-kettige Alkynylgruppe, gegebenenfalls substituiert mit Phenyl, C₁-C₄-Alkoxy oder 1 bis 3 Halogenatomen;

C₃-C₆ -Cycloalkyl, gegebenenfalls substituiert mit Methyl, Halogen oder C₁-C₄-Alkoxy,

C₁-C₄ -Alkylcarbonyl, gegebenenfalls substituiert mit C₁-C₄-Alkoxy oder 1 bis 3 Halogenatomen;

C₁-C₄ -Alkylcarbonylamino, gegebenenfalls substituiert am Stickstoffatom mit C₁-C₂-Alkyl oder C₁-C₄-Alkoxy und am Kohlenstoffatom mit C₁-C₄-Alkoxy oder 1 bis 3 Halogenatomen;

C₁-C₄ -Alkylcarbonyloxy, gegebenenfalls substituiert mit C₁-C₄-Alkoxy oder 1 bis 3 Halogenatomen;

C₁-C₄ -Alkyl, substituiert mit C₁-C₄-Alkoxy, C₁-C₄-Alkylthio, C₁-C₄-Alkylamino, C₁-C₄-Dialkylamino, C₁-C₄-Trialkylammonium oder C₁-C₄-Alkylcarbonyloxy, 2(oder 3)-Furyl, gegebenenfalls substituiert mit Halogen oder C₁-C₃-Alkyl, 2(oder 3)-Thienyl, gegebenenfalls substituiert mit Halogen oder C₁-C₃-Alkyl, N-Methyl-2(oder 3)-pyrrolyl;

Hydroxy;

Amino, gegebenenfalls substituiert mit C₁-C₄-Alkoxy oder C₁-C₂-Alkyl und C₁-C₄-Alkoxy;

2(oder 4)-Pyridyloxy, gegebenenfalls substituiert mit C₁-C₄-Alkyl, Trifluormethyl oder 1 oder 2 Halogenatomen;

C₁-C₄ -Mono- oder Dialkylaminocarbonylamino, gegebenenfalls substituiert am Stickstoffatom, das an den Ring gebunden ist mit C₁-C₂-Alkyl oder C₁-C₄-Alkoxy;

C₁-C₄ -Alkoxycarbonylamino, gegebenenfalls substituiert am Stickstoffatom mit C₁-C₂-Alkyl oder C₁-C₄-Alkoxy;

C₁-C₄ -Mono- oder Dialkylaminocarbonyloxy; sind,

mit der Maßgabe, daß mindestens einer der Reste Y und Z ist:

C₂-C₆ gerad- oder verzweigt-kettige Alkenylgruppe, gegebenenfalls substituiert mit Phenyl, C₁-C₄-Alkoxy oder 1 bis 3 Halogenatomen;

C₁-C₆ gerad- oder verzweigt-kettige Alkynylgruppe, gegebenenfalls substituiert mit Phenyl, C₁-C₄-



Alkoxy mit 1 bis 3 Halogenatomen;

C₃-C₆ -Cycloalkyl, gegebenenfalls substituiert mit Methyl, Halogen oder C₁-C₄-Alkoxy,

C₁-C₄ -Alkylcarbonyl, gegebenenfalls substituiert mit C₁-C₄-Alkoxy oder 1 bis 3 Halogenatomen;

C₁-C₄ -Alkylcarbonylamino, gegebenenfalls substituiert am Stickstoffatom mit C₁-C₂-Alkyl oder C₁-C₄-Alkoxy und am Kohlenstoffatom mit C₁-C₄-Alkoxy oder 1 bis 3 Halogenatomen;

C₁-C₄ -Alkyl, substituiert mit C₁-C₄-Alkoxy, C₁-C₄-Alkylthio, C₁-C₄-Alkylamino, C₁-C₄-Dialkylamino, C₁-C₄-Trialkylammonium oder C₁-C₄-Alkylcarbonyloxy, 2(oder 3)-Furyl, gegebenenfalls substituiert mit Halogen oder C₁-C₃-Alkyl, 2(oder 3)-Thienyl, gegebenenfalls substituiert mit Halogen oder C₁-C₃-Alkyl, N-Methyl-2(oder 3)-pyrrolyl;

Hydroxy;

Amino, gegebenenfalls substituiert mit C₁-C₄-Alkoxy oder C₁-C₂-Alkyl und C₁-C₄-Alkoxy; oder

2(oder 4)-Pyridyloxy, gegebenenfalls substituiert mit C₁-C₄-Alkyl, Trifluormethyl oder 1 bis 2 Halogenatomen; und

C₁-C₄ -Mono- oder Dialkylaminocarbonylamino, gegebenenfalls substituiert am Stickstoffatom, das an den Ring gebunden ist mit C₁-C₂-Alkyl oder C₁-C₄-Alkoxy;

C₁-C₄ -Alkoxy carbonylamino, gegebenenfalls substituiert am Stickstoffatom, mit C₁-C₂-Alkyl oder C₁-C₄-Alkoxy;

C₁-C₄ -Mono- oder Dialkylaminocarbonyloxy;

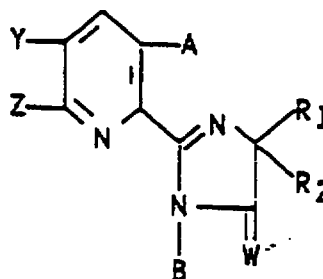
mit der weiteren Maßgabe, daß wenn Y Hydroxy ist, Z nicht Wasserstoff sein kann;

die N-Oxide davon, mit der Maßgabe, daß R₃ nicht ungesättigtes Alkyl bedeutet und Y und Z nicht Alkylthioalkyl, Alkylaminoalkyl, Dialkylaminoalkyl, Trialkylammoniumalkyl, Amino, 2(oder 4)-Pyridyloxy, Alkoxyamino oder ungesättigtes Alkyl bedeuten können und die optischen Isomeren davon, wenn R₁ und R₂ nicht gleich sind;

die tautomeren und geometrischen Isomeren davon und die Säureadditionssalze davon, mit der Ausnahme, wenn R₃ ein salzbildendes Kation ist.

14. Verfahren zur Bekämpfung unerwünschter Pflanzenarten, umfassend: Anwenden auf das Blattwerk der Pflanzen oder auf den Boden oder das Wasser, enthaltend Samen oder andere Fortpflanzungsorgane davon, einer herbizid wirksamen Menge einer Verbindung der Struktur:

(I)



worin A, B, W, R₁ und R₂ wie in Anspruch 1 beschrieben sind, einer der Reste Y und Z Wasserstoff oder Methyl bedeutet und die anderen Reste Y und Z wiedergeben:

C₂-C₆ gerad- oder verzweigt-kettige Alkenylgruppe, gegebenenfalls substituiert mit Phenyl, C₁-C₄-Alkoxy oder 1 bis 3 Halogenatomen;

C₂-C₆ gerad- oder verzweigt-kettige Alkynylgruppe, gegebenenfalls substituiert mit Phenyl, C₁-C₄-Alkoxy oder 1 bis 3 Halogenatomen;

C₃-C₆ -Cycloalkyl, gegebenenfalls substituiert mit Methyl, Halogen oder C₁-C₄-Alkoxy,

C₁-C₄ -Alkylcarbonyl, gegebenenfalls substituiert mit C₁-C₄-Alkoxy oder 1 bis 3 Halogenatomen;

C₁-C₄ -Alkylcarbonylamino, gegebenenfalls substituiert am Stickstoffatom mit C₁-C₂-Alkyl oder C₁-C₄-Alkoxy und am Kohlenstoffatom mit C₁-C₄-Alkoxy oder 1 bis 3 Halogenatomen;

C₁-C₄ -Alkyl, substituiert mit C₁-C₄-Alkoxy, C₁-C₄-Alkylthio, C₁-C₄-Alkylamino, C₁-C₄-Dialkylamino, C₁-C₄-Trialkylammonium oder C₁-C₄-Alkylcarbonyloxy, 2(oder 3)-Furyl, gegebenenfalls substituiert mit Halogen oder C₁-C₃-Alkyl, 2(oder 3)-Thienyl, gegebenenfalls substituiert mit Halogen oder C₁-C₃-Alkyl, N-Methyl-2(oder 3)-pyrrolyl;

Hydroxy;

Amino, gegebenenfalls substituiert mit C₁-C₄-Alkoxy oder C₁-C₂-Alkyl und C₁-C₄-Alkoxy;

2(oder 4)-Pyridyloxy, gegebenenfalls substituiert mit C₁-C₄-Alkyl, Trifluormethyl oder 1 oder 2



Halogenatomen;

C₁-C₄ -Mono- oder Dialkylaminocarbonylamino, gegebenenfalls substituiert am Stickstoffatom, das an den Ring gebunden ist, mit C₁-C₂-Alkyl oder C₁-C₄-Alkoxy;

C₁-C₄ -Alkoxy-carbonylamino, gegebenenfalls substituiert am Stickstoffatom mit C₁-C₂-Alkyl oder C₁-C₄-Alkoxy;

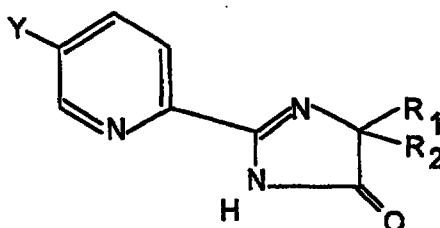
C₁-C₄ -Mono- oder Dialkylaminocarbonyloxy;

die N-Oxide davon, mit der Maßgabe, daß R₃ keine ungesättigte Alkylgruppe bedeutet, die optischen Isomeren davon, wenn R₁ und R₂ nicht dieselben sind;

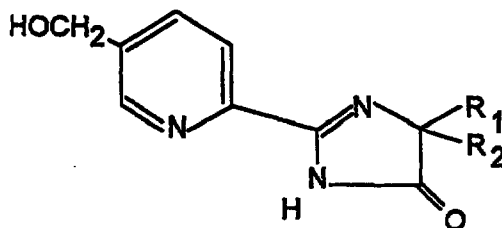
die Tautomeren davon und die Säureadditionssalze davon, mit der Ausnahme, wenn R₃ ein salzbildendes Kation ist.

Patentansprüche für folgende Vertragsstaaten : AT, ES

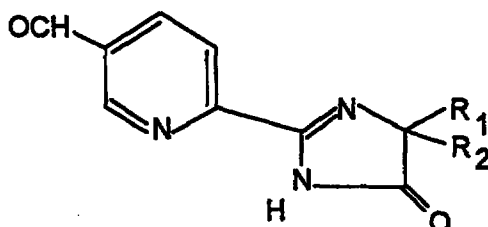
1. Verfahren zur Herstellung einer Verbindung der Strukturformel



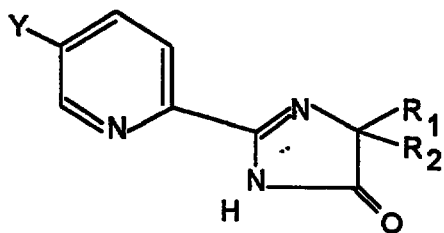
worin R₁ und R₂ jeweils unabhängig voneinander C₁-C₄-Alkyl darstellen; und Y eine C₂-C₆ gerad- oder verzweigte Alkenylgruppe, gegebenenfalls substituiert mit Phenyl, C₁-C₄-Alkoxy oder 1 bis 3 Halogenatomen, bedeutet; umfassend Oxidieren einer Hydroxymethylverbindung der Strukturformel



worin R₁ und R₂ wie vorstehend beschrieben sind, mit Mangandioxid bei erhöhter Temperatur in Gegenwart eines inerten organischen Lösungsmittels zu einer Carboxaldehydverbindung der Strukturformel



worin R₁ und R₂ wie vorstehend beschrieben sind, Umsetzen der Carboxaldehydverbindung mit einer geeigneten Alkyltriphenylphosphoniumhalogenidverbindung in Gegenwart eines Alkalimetallhydrids, Mineralöls und Dimethylsulfoxid zu einer 5-Alkenylverbindung der Strukturformel



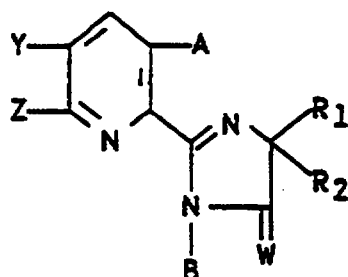
15 worin Y wie vorstehend beschrieben ist und Umsetzen der 5-Alkenylverbindung mit Methyllithium und Kohlendioxid in Gegenwart von Tetrahydrofuran.

2. Verfahren zur Herstellung von 2-(4-Isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-(methoxymethyl)-nicotinsäure, umfassend Umsetzung von 5-(Brommethyl)-2-(4-Isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-nicotinsäuremethylester mit Kaliummethoxid zu 2-(4-Isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-(methoxymethyl)nicotinsäuremethylester, Umsetzen des 5-(Methoxymethyl)nicotinsäureesters mit Natriumhydroxid in Gegenwart von Methanol zu einem 5-(Methoxymethyl)nicotinsäuresalz und Umsetzen des sauren Salzes mit Salzsäure.
- 20
- 25
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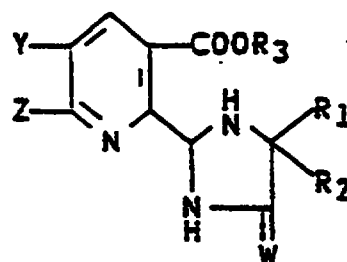
Revendications

Revendications pour les Etats contractants suivants : BE, CH, LI, DE, FR, GB, GR, IT, LU, NL, SE

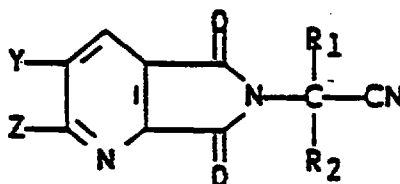
1. Composés de structure :



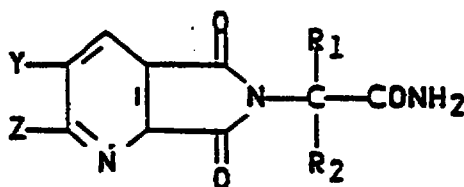
(I)



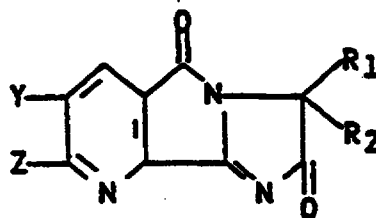
(II)



(III)

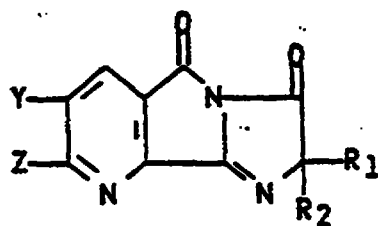


(IV)

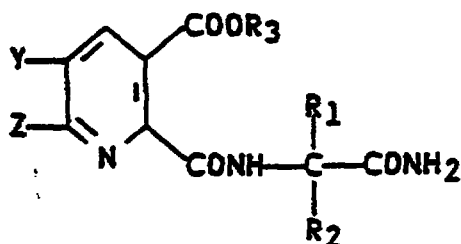


(V)





(VI)

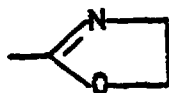


(VII)

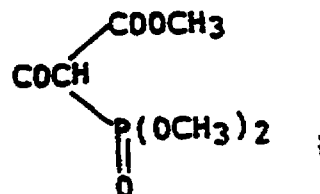
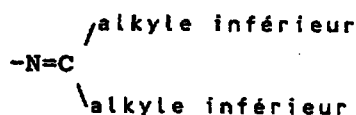
où

R₁est un groupe alkyle en C₁-C₄ ;R₂est un groupe alkyle en C₁-C₄ ;

A

est COOR₃, CONHR₆, CHO, CH₂OH, COCH₃, COC₆H₅, CN, CH₃, CH=NOH, CH₂COOH, CONHOH, CH₂CH₂COOH, CHR₈OH,

ou

R₃est un atome d'hydrogène,
un groupe

un groupe alkyle en C₁-C₁₂ facultativement substitué avec un des groupes suivants :
alcoxy en C₁-C₃, alkylthio en C₁-C₃, halogéno, hydroxyle, cycloalkyle en C₃-C₆, benzyloxy, furyle, phényle, halogénophényle, (alkyl inférieur)phényle, (alcoxy inférieur)phényle, nitrophényle, carboxyle, (alcoxy inférieur) carbonyle, cyano ou halogénure de tri(alkyl inférieur) ammonium ;

un groupe alcényle en C₃-C₁₂ facultativement substitué avec un des groupes suivants :
alcoxy en C₁-C₃, phényle, halogéno ou (alcoxy inférieur)carbonyle ou avec deux groupes alcoxy en C₁-C₃ ou deux groupes halogéno ;

un groupe cycloalkyle en C₃-C₆ facultativement substitué avec un ou deux groupes alkyle en C₁-C₃ ;



un groupe alcynyle en C₃-C₁₆ facultativement substitué avec un ou deux groupes alkyle en C₁-C₃ ; ou
un cation ;

- 5 R₆ est un atome d'hydrogène, un groupe hydroxyle, alcényle en C₃, alcynyle en C₃ ou alkyle en C₁-C₄ facultativement substitué avec un groupe hydroxyle ou un groupe chloro ;
- B est H, COR₄ ou SO₂R₅, sous réserve que, lorsque B est COR₄ ou SO₂R₅, A soit COOR₃ où R₃ est autre que H ou un cation, CH₃ ou CN ; W soit O ; et Y et Z ne soient pas un groupe alkylamino, hydroxyle ou hydroxyalkyle inférieur ;
- 10 R₄ est un groupe alkyle en C₁-C₁₁, chlorométhyle ou phényle facultativement substitué avec un groupe chloro, un groupe nitro ou un groupe méthoxy ;
- R₅ est un groupe alkyle en C₁-C₄ ou phényle facultativement substitué avec un groupe méthyle ;
- W est O ;
- 15 R₈ est un groupe alkyle en C₁-C₄ ou phényle ;
- Y et Z sont chacun un atome d'hydrogène ou un groupe halogéno, alkyle en C₁-C₆, hydroxyalkyle inférieur en C₁-C₄, alcoxy en C₁-C₆, alkylthio en C₁-C₄, phénoxy, halogénoalkyle en C₁-C₄, nitro, cyano, alkylamino en C₁-C₄, formyle, di(alkyl inférieur en C₁-C₄) amino, alkylsulfonyl en C₁-C₄, difluorométhoxy, trifluorométhoxy, 1,1,2,2-tétrafluoroéthoxy ou phényle facultativement substitué avec un groupe alkyle en C₁-C₄, alcoxy en C₁-C₄ ou halogéno ;
- 20 un groupe alcényloxy en C₃-C₈ droit ou ramifié facultativement substitué avec un à trois groupes halogéno ;
- un groupe alcynyloxy en C₃-C₈ droit ou ramifié facultativement substitué avec un à trois groupes halogéno ;
- 25 un groupe alcényle en C₂-C₆ droit ou ramifié facultativement substitué avec un groupe phényle ou alcoxy en C₁-C₄ ou un à trois groupes halogéno ;
- un groupe alcynyle en C₂-C₆ droit ou ramifié facultativement substitué avec un groupe phényle ou alcoxy en C₁-C₄ ou un à trois groupes halogéno ;
- 30 un groupe cycloalkyle en C₃-C₆ facultativement substitué avec un groupe méthyle, halogéno ou alcoxy en C₁-C₄ ;
- un groupe (alkyl en C₁-C₄)carbonyl facultativement substitué avec un groupe alcoxy en C₁-C₄ ou un à trois groupes halogéno ;
- un groupe (alkyl en C₁-C₄)carbonylamino facultativement substitué sur l'azote avec un groupe alkyle en C₁-C₂ ou alcoxy en C₁-C₄ et sur le carbone avec un groupe alcoxy en C₁-C₄ ou un à trois groupes halogéno ;
- 35 un groupe (alkyl en C₁-C₄)carbonyloxy facultativement substitué avec un groupe alcoxy en C₁-C₄ ou un à trois groupes halogéno ;
- un groupe alkyle en C₁-C₄ substitué avec un groupe alcoxy en C₁-C₄, alkylthio en C₁-C₄, alkylamino en C₁-C₄, di(alkyl en C₁-C₄)amino, tri(alkyl en C₁-C₄)ammonium ou (alkyl en C₁-C₄) carbonyloxy ;
- 40 un groupe 2(ou 3)-furyl facultativement substitué avec un groupe halogéno ou alkyle en C₁-C₃ ;
- un groupe 2(ou 3)-thiényle facultativement substitué avec un groupe halogéno ou alkyle en C₁-C₃ ;
- 45 un groupe N-méthyl-2(ou 3)-pyrrolyl ;
- un groupe hydroxy ;
- un groupe amino facultativement substitué avec un groupe alcoxy en C₁-C₄, alkyle en C₁-C₂ ou alcoxy en C₁-C₄ ;
- 50 un groupe 2(ou 4)-pyridyloxy facultativement substitué avec un groupe alkyle en C₁-C₄ ou trifluorométhyle ou un ou deux groupes halogéno ;
- un groupe mono- ou di(alkyl en C₁-C₄)aminocarbonylamino facultativement substitué sur l'azote fixé au cycle avec un groupe alkyle en C₁-C₂ ou alcoxy en C₁-C₄ ;
- un groupe (alcoxy en C₁-C₄)carbonylamino facultativement substitué sur l'azote avec un groupe alkyle en C₁-C₂ ou alcoxy en C₁-C₄ ;
- 55 un groupe mono- ou di(alkyl en C₁-C₄)aminocarbonyloxy ;
- sous réserve qu'au moins un de Y et de Z soit :
- un groupe alcényle en C₂-C₆ droit ou ramifié facultativement substitué avec un groupe phényle ou alcoxy en C₁-C₄ ou un à trois groupes halogéno ;



un groupe alcynyle en C₂-C₆ droit ou ramifié facultativement substitué avec un groupe phényle ou alcoxy en C₁-C₄ ou un à trois groupes halogéno ;

un groupe cycloalkyle en C₃-C₆ facultativement substitué avec un groupe méthyle, halogéno ou alcoxy en C₁-C₄ ;

un groupe (alkyl en C₁-C₄)carbonyle facultativement substitué avec un groupe alcoxy en C₁-C₄ ou un à trois groupes halogéno ;

un groupe (alkyl en C₁-C₄)carbonylamino facultativement substitué sur l'azote avec un groupe alkyle en C₁-C₂ ou alcoxy en C₁-C₄ et sur le carbone avec un groupe alcoxy en C₁-C₄ ou un à trois groupes halogéno ;

un groupe alkyle en C₁-C₄ substitué avec un groupe alcoxy en C₁-C₄, alkylthio en C₁-C₄, alkylamino en C₁-C₄, di(alkyl en C₁-C₄) amino, tri(alkyl en C₁-C₄)ammonium ou (alkyl en C₁-C₄) carbonyloxy ;

un groupe 2(ou 3)-furyle facultativement substitué avec un groupe halogéno ou alkyle en C₁-C₃ ;

un groupe 2(ou 3)-thiényle facultativement substitué avec un groupe halogéno ou alkyle en C₁-C₃ ;

un groupe N-méthyl-2(ou 3)-pyrrolyle ;

un groupe hydroxy ;

un groupe amino facultativement substitué avec un groupe alcoxy en C₁-C₄, alkyle en C₁-C₂ ou alcoxy en C₁-C₄ ;

un groupe 2(ou 4)-pyridyloxy facultativement substitué avec un groupe alkyle en C₁-C₄ ou trifluorométhyle ou un ou deux groupes halogéno ;

un groupe mono- ou di(alkyl en C₁-C₄)aminocarbonylamino facultativement substitué sur l'azote fixé au cycle avec un groupe alkyle en C₁-C₂ ou alcoxy en C₁-C₄ ;

un groupe (alcoxy en C₁-C₄)carbonylamino facultativement substitué sur l'azote avec un groupe alkyle en C₁-C₂ ou alcoxy en C₁-C₄ ;

un groupe mono- ou di(alkyl en C₁-C₄)aminocarbonyloxy ;

sous réserve également que, lorsque Y est un groupe hydroxy, Z ne soit pas un atome d'hydrogène ;

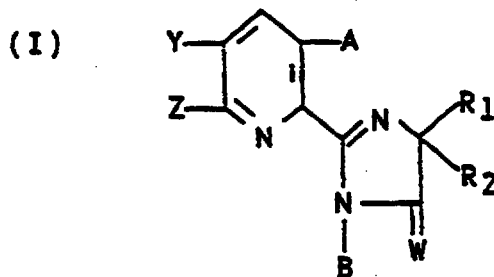
leurs N-oxydes, sous réserve que R₃ ne soit pas un groupe alkyle insaturé et Y et Z ne soient pas un groupe alkylthioalkyle, alkylaminoalkyle, dialkylaminoalkyle, trialkylammoniumalkyle, amino, 2(ou 4)-pyridyloxy, alcoxyamino ou alkyle insaturé ;

leurs isomères optiques lorsque R₁ et R₂ ne sont pas identiques ;

leurs tautomères et leurs isomères géométriques ; et

leurs sels d'addition d'acides, sauf lorsque R₃ est un cation formant un sel.

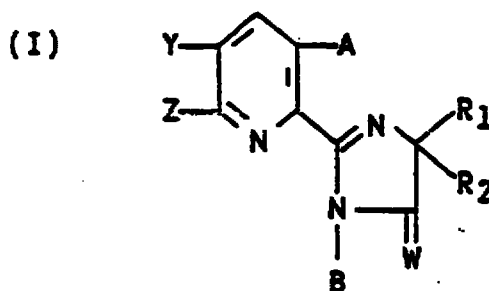
2. Composés selon la revendication 1 ayant la structure :



dans laquelle A, B, W, R₁, R₂, Y et Z sont comme décrit dans la revendication 1.



3. Composés selon la revendication 2 de structure :



dans laquelle A, B, W, R₁ et R₂ sont comme décrit dans la revendication 1, un de Y et Z représente un atome d'hydrogène ou un groupe méthyle et l'autre de Y et Z représente

un groupe alcényle en C₂-C₆ droit ou ramifié facultativement substitué avec un groupe phényle ou alcoxy en C₁-C₄ ou un à trois groupes halogéno ;

un groupe alcynyle en C₂-C₆ droit ou ramifié facultativement substitué avec un groupe phényle ou alcoxy en C₁-C₄ ou un à trois groupes halogéno ;

un groupe cycloalkyle en C₃-C₆ facultativement substitué avec un groupe méthyle, halogéno ou alcoxy en C₁-C₄ ;

un groupe (alkyl en C₁-C₄)carbonyle facultativement substitué avec un groupe alcoxy en C₁-C₄ ou un à trois groupes halogéno ;

un groupe (alkyl en C₁-C₄)carbonylamino facultativement substitué sur l'azote avec un groupe alkyle en C₁-C₂ ou alcoxy en C₁-C₄ et sur le carbone avec un groupe alcoxy en C₁-C₄ ou un à trois groupes halogéno ;

un groupe alkyle en C₁-C₄ substitué avec un groupe alcoxy en C₁-C₄, alkylthio en C₁-C₄, alkylamino en C₁-C₄, di(alkyl en C₁-C₄)amino, tri(alkyl en C₁-C₄)ammonium ou (alkyl en C₁-C₄)carbonyloxy ;

un groupe 2(ou 3)-furyle facultativement substitué avec un groupe halogéno ou alkyle en C₁-C₃ ;

un groupe 2(ou 3)-thiényle facultativement substitué avec un groupe halogéno ou alkyle en C₁-C₃ ;

un groupe N-méthyl-2(ou 3)-pyrrolyle ;

un groupe hydroxy ;

un groupe amino facultativement substitué avec un groupe alcoxy en C₁-C₄, alkyle en C₁-C₂ ou alcoxy en C₁-C₄ ;

un groupe 2(ou 4)-pyridyloxy facultativement substitué avec un groupe alkyle en C₁-C₄ ou trifluorométhyle ou un ou deux groupes halogéno ;

un groupe mono- ou di(alkyl en C₁-C₄)aminocarbonylamino facultativement substitué sur l'azote fixé au cycle avec un groupe alkyle en C₁-C₂ ou alcoxy en C₁-C₄ ;

un groupe (alcoxy en C₁-C₄)carbonylamino facultativement substitué sur l'azote avec un groupe alkyle en C₁-C₂ ou alcoxy en C₁-C₄ ;

un groupe mono- ou di(alkyl en C₁-C₄)aminocarbonyloxy ;

leurs N-oxydes, sous réserve que R₃ ne soit pas un groupe alkyle insaturé ;

leurs isomères optiques lorsque R₁ et R₂ ne sont pas identiques ;

leurs tautomères et leurs isomères géométriques ; et

leurs sels d'addition d'acides sauf lorsque R₃ est un cation formant un sel.

4. Composés selon la revendication 2, qui sont l'acide 5-isopropényl-2-(4-isopropyl-4-méthyl-5-oxo-2-imidazoline-2-yl)nicotinique et ses sels et esters.

5. Composés selon la revendication 2, qui sont l'acide 2-(4-isopropyl-4-méthyl-5-oxo-2-imidazoline-2-yl)-5-(méthoxyméthyl) nicotinique ou ses esters ou ses sels.

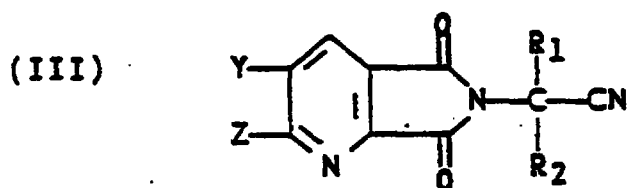
6. Composés selon la revendication 2, qui sont l'acide 2-(4-isopropyl-4-méthyl-5-oxo-2-imidazoline-2-yl)-5-styrylnicotinique, l'acide 2-(4-isopropyl-4-méthyl-5-oxo-2-imidazoline-2-yl)-5-propénylnicotinique, l'acide 5-acétyl-2-(4-isopropyl-4-méthyl-5-oxo-2-imidazoline-2-yl)nicotinique, l'acide 5-acétyl-2-(4-isopropyl-4-méthyl-5-oxo-2-imidazoline-2-yl)-6-méthylnicotinique, l'acide 2-(4-isopropyl-4-méthyl-5-oxo-2-imidazoline-2-yl)-5-[(méthylthio)méthyl]nicotinique, l'acide 6-(2-furyl)-2-(4-isopropyl-4-méthyl-5-oxo-2-imidazoline-



2-yl)nicotinique, l'acide 2-(4-isopropyl-4-méthyl-5-oxo-2-imidazoline-2-yl)-5-(2-thiényle) nicotinique, l'acide 2-(4-isopropyl-4-méthyl-5-oxo-2-imidazoline-2-yl)-6-(2-thiényle)nicotinique, l'acide 2-(4-isopropyl-4-méthyl-5-oxo-2-imidazoline-2-yl)-5-(3-thiényle)nicotinique, l'acide 1,6-dihydro-2-(4-isopropyl-4-méthyl-5-oxo-2-imidazoline-2-yl)-6-oxynicotinique et l'acide 2-(4-isopropyl-4-méthyl-5-oxo-2-imidazoline-2-yl)-6-[(méthylthio)méthyle]nicotinique et leurs sels et leurs esters.

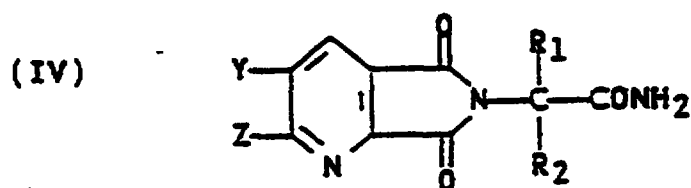
7. Composés selon la revendication 2, qui sont l'ester acétate du 2-(1-acétyl-4-isopropyl-4-méthyl-5-oxo-2-imidazoline-2-yl)-6-(hydroxyméthyle)nicotinate de méthyle et le 6-(2-furyl)-2-(4-isopropyl-4-méthyl-5-oxo-2-imidazoline-2-yl)nicotinate d'isopropylammonium.

8. Composés selon la revendication 1 ayant la structure :



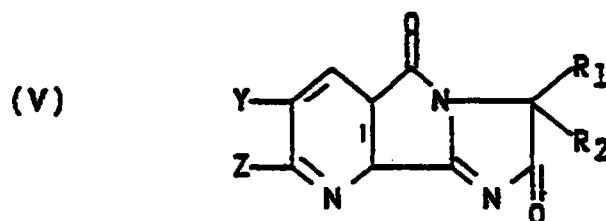
dans laquelle R_1 , R_2 , Y et Z sont comme décrit dans la revendication 1.

9. Composés selon la revendication 1 ayant la structure :



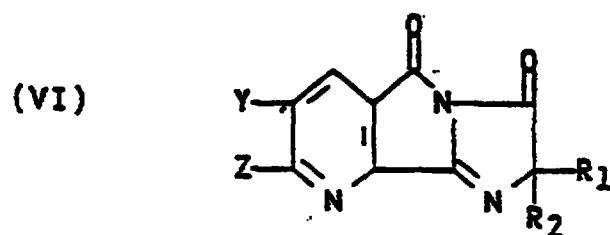
dans laquelle R_1 , R_2 , Y et Z sont comme décrit dans la revendication 1.

10. Composés selon la revendication 1 ayant la structure :



dans laquelle R_1 , R_2 , Y et Z sont comme décrit dans la revendication 1.

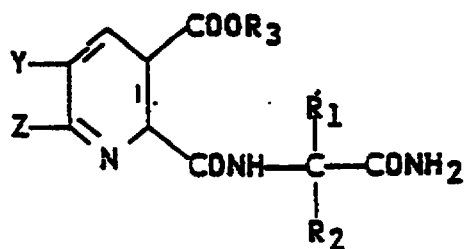
11. Composés selon la revendication 1 ayant la structure :



dans laquelle R_1 , R_2 , Y et Z sont comme décrit dans la revendication 1.

12. Composé selon la revendication 1 ayant la structure :

(VII)



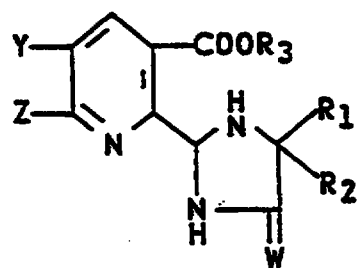
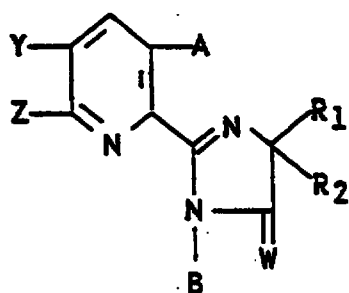
dans laquelle R_1 , R_2 , R_3 , Y et Z sont comme décrit dans la revendication 1.

13. Procédé de maîtrise des espèces de plantes indésirables comprenant : l'application, au feuillage desdites plantes ou au sol ou à l'eau contenant des graines ou d'autres organes de leur propagation, d'une quantité herbicide efficace d'un composé de structure :

I

ou

II,

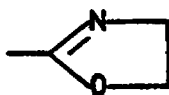


où

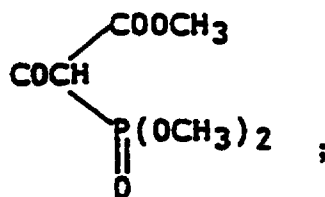
R_1 est un groupe alkyle en C_1 - C_4 ;

R_2 est un groupe alkyle en C_1 - C_4 ;

A est $COOR_3$, $CONHR_6$, CHO , CH_2OH , $COCH_3$, COC_6H_5 , CN , CH_3 , $CH=NOH$, CH_2COOH , $CONHOH$, CH_2CH_2COOH , CH_2CH_2OH ,



ou



R_3 est un atome d'hydrogène,
un groupe



un groupe alkyle en C₁-C₁₂ facultativement substitué avec un des groupes suivants : alcoxy en C₁-C₃, alkylthio en C₁-C₃, halogéno, hydroxyle, cycloalkyle en C₃-C₆, benzyloxy, furyle, phényle, halogénophényle, (alkyl inférieur)phényle, (alcoxy inférieur)phényle, nitrophényle, carboxyle, (alcoxy inférieur) carbonyle, cyano ou halogénure de tri(alkyl inférieur) ammonium ;

un groupe alcényle en C₃-C₁₂ facultativement substitué avec un des groupes suivants : alcoxy en C₁-C₃, phényle, halogéno ou (alcoxy inférieur)carbonyle ou avec deux groupes alcoxy en C₁-C₃ ou deux groupes halogéno ;

un groupe cycloalkyle en C₃-C₆ facultativement substitué avec un ou deux groupes alkyle en C₁-C₃ ;

un groupe alcynyle en C₃-C₁₆ facultativement substitué avec un ou deux groupes alkyle en C₁-C₃ ; ou un cation ;

R₆ est un atome d'hydrogène, un groupe hydroxyle, alcényle en C₃, alcynyle en C₃ ou alkyle en C₁-C₄ facultativement substitué avec un groupe hydroxyle ou un groupe chloro ;

B est H, COR₄ ou SO₂R₅, sous réserve que, lorsque B est COR₄ ou SO₂R₅, A soit COOR₃ où R₃ est autre que H ou un cation, CH₃ ou CN ; W soit O ; et Y et Z ne soient pas un groupe alkylamino, hydroxyle ou hydroxyalkyle inférieur ;

R₄ est un groupe alkyle en C₁-C₁₁, chlorométhyle ou phényle facultativement substitué avec un groupe chloro, un groupe nitro ou un groupe méthoxy ;

R₅ est un groupe alkyle en C₁-C₄ ou phényle facultativement substitué avec un groupe méthyle ; W est O ;

R₈ est un groupe alkyle en C₁-C₄ ou phényle ; Y et Z sont chacun un atome d'hydrogène ou un groupe halogéno, alkyle en C₁-C₆, hydroxyalkyle inférieur en C₁-C₄, alcoxy en C₁-C₆, alkylthio en C₁-C₄, formyle, phénoxy, halogénoalkyle en C₁-C₄, nitro, cyano, alkylamino en C₁-C₄, di(alkyl inférieur en C₁-C₄) amino, alkylsulfonyl en C₁-C₄, difluorométhoxy, trifluorométhoxy, 1,1,2,2-tétrafluorométhoxy ou phényle facultativement substitué avec un groupe alkyle en C₁-C₄, alcoxy en C₁-C₄ ou halogéno ;

un groupe alcényloxy en C₃-C₈ droit ou ramifié facultativement substitué avec un à trois groupes halogéno ;

un groupe alcynyloxy en C₃-C₈ droit ou ramifié facultativement substitué avec un à trois groupes halogéno ;

un groupe alcényle en C₂-C₆ droit ou ramifié facultativement substitué avec un groupe phényle ou alcoxy en C₁-C₄ ou un à trois groupes halogéno ;

un groupe alcynyle en C₂-C₆ droit ou ramifié facultativement substitué avec un groupe phényle ou alcoxy en C₁-C₄ ou un à trois groupes halogéno ;

un groupe cycloalkyle en C₃-C₆ facultativement substitué avec un groupe méthyle, halogéno ou alcoxy en C₁-C₄ ;

un groupe (alkyl en C₁-C₄)carbonyle facultativement substitué avec un groupe alcoxy en C₁-C₄ ou un à trois groupes halogéno ;

un groupe (alkyl en C₁-C₄)carbonylamino facultativement substitué sur l'azote avec un groupe alkyle en C₁-C₂ ou alcoxy en C₁-C₄ et sur le carbone avec un groupe alcoxy en C₁-C₄ ou un à trois groupes halogéno ;

un groupe (alkyl en C₁-C₄)carbonyloxy facultativement substitué avec un groupe alcoxy en C₁-C₄ ou un à trois groupes halogéno ;

un groupe alkyle en C₁-C₄ substitué avec un groupe alcoxy en C₁-C₄, alkylthio en C₁-C₄, alkylamino en C₁-C₄, di(alkyl en C₁-C₄) amino, tri(alkyl en C₁-C₄)ammonium ou (alkyl en C₁-C₄) carbonyloxy ;

un groupe 2(ou 3)-furyle facultativement substitué avec un groupe halogéno ou alkyle en C₁-C₃ ;

un groupe 2(ou 3)-thiényle facultativement substitué avec un groupe halogéno ou alkyle en C₁-C₃ ;

un groupe N-méthyl-2(ou 3)-pyrrolyle ;

un groupe hydroxy ;

un groupe amino facultativement substitué avec un groupe alcoxy en C₁-C₄, alkyle en C₁-C₂ ou alcoxy en C₁-C₄ ;

un groupe 2(ou 4)-pyridyloxy facultativement substitué avec un groupe alkyle en C₁-C₄



ou trifluorométhyle ou un ou deux groupes halogéno ;

un groupe mono- ou di(alkyl en C₁-C₄)aminocarbonylamino facultativement substitué sur l'azote fixé au cycle avec un groupe alkyle en C₁-C₂ ou alcoxy en C₁-C₄ ;

un groupe (alcoxy en C₁-C₄)carbonylamino facultativement substitué sur l'azote avec un groupe alkyle en C₁-C₂ ou alcoxy en C₁-C₄ ;

un groupe mono- ou di(alkyl en C₁-C₄)aminocarbonyloxy ;

sous réserve qu'au moins un de Y et de Z soit :

un groupe alcényle en C₂-C₆ droit ou ramifié facultativement substitué avec un groupe phényle ou alcoxy en C₁-C₄ ou un à trois groupes halogéno ;

un groupe alcynyle en C₂-C₆ droit ou ramifié facultativement substitué avec un groupe phényle ou alcoxy en C₁-C₄ ou un à trois groupes halogéno ;

un groupe cycloalkyle en C₃-C₆ facultativement substitué avec un groupe méthyle, halogéno ou alcoxy en C₁-C₄ ;

un groupe (alkyl en C₁-C₄)carbonyle facultativement substitué avec un groupe alcoxy en C₁-C₄ ou un à trois groupes halogéno ;

un groupe (alkyl en C₁-C₄)carbonylamino facultativement substitué sur l'azote avec un groupe alkyle en C₁-C₂ ou alcoxy en C₁-C₄ et sur le carbone avec un groupe alcoxy en C₁-C₄ ou un à trois groupes halogéno ;

un groupe alkyle en C₁-C₄ substitué avec un groupe alcoxy en C₁-C₄, alkylthio en C₁-C₄, alkylamino en C₁-C₄, di(alkyl en C₁-C₄) amino, tri(alkyl en C₁-C₄) ammonium ou (alkyl en C₁-C₄) carbonyloxy ;

un groupe 2(ou 3)-furyle facultativement substitué avec un groupe halogéno ou alkyle en C₁-C₃ ;

un groupe 2(ou 3)-thiényle facultativement substitué avec un groupe halogéno ou alkyle en C₁-C₃ ;

un groupe N-méthyl-2(ou 3)-pyrrolyle ;

un groupe hydroxy ;

un groupe amino facultativement substitué avec un groupe alcoxy en C₁-C₄, alkyle en C₁-C₂ ou alcoxy en C₁-C₄ ;

un groupe 2(ou 4)-pyridyloxy facultativement substitué avec un groupe alkyle en C₁-C₄ ou trifluorométhyle ou un ou deux groupes halogéno ;

un groupe mono- ou di(alkyl en C₁-C₄)aminocarbonylamino facultativement substitué sur l'azote fixé au cycle avec un groupe alkyle en C₁-C₂ ou alcoxy en C₁-C₄ ;

un groupe (alcoxy en C₁-C₄)carbonylamino facultativement substitué sur l'azote avec un groupe alkyle en C₁-C₂ ou alcoxy en C₁-C₄ ;

un groupe mono- ou di(alkyl en C₁-C₄)aminocarbonyloxy ;

sous réserve également que, lorsque Y est un groupe hydroxy, Z ne soit pas un atome d'hydrogène ;

ses N-oxydes, sous réserve que R₃ ne soit pas un groupe alkyle insaturé et Y et Z ne soient pas un groupe alkylthioalkyle, alkylaminoalkyle, dialkylaminoalkyle, trialkylammonium-alkyle, amino, 2(ou 4)-pyridyloxy, alcoxyamino ou alkyle insaturé ;

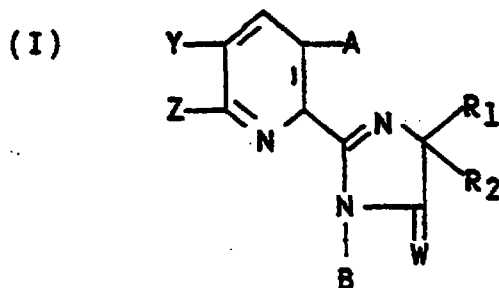
ses isomères optiques lorsque R₁ et R₂ ne sont pas identiques ;

ses tautomères et ses isomères géométriques ; et

ses sels d'addition d'acides, sauf lorsque R₃ est un cation formant un sel.

14. Procédé selon la revendication 13 pour maîtriser des espèces de plantes indésirables comprenant : l'application, au feuillage desdites plantes ou au sol ou à l'eau contenant des graines ou d'autres organes de leur propagation, d'une quantité herbicide efficace d'un composé de structure :





dans laquelle A, B, W, R₁ et R₂ sont comme décrit dans la revendication 1, un de Y et Z représente un atome d'hydrogène ou un groupe méthyle et l'autre de Y et Z représente

un groupe alcényle en C₂-C₆ droit ou ramifié facultativement substitué avec un groupe phényle ou alcoxy en C₁-C₄ ou un à trois groupes halogéno ;

un groupe alcynyle en C₂-C₆ droit ou ramifié facultativement substitué avec un groupe phényle ou alcoxy en C₁-C₄ ou un à trois groupes halogéno ;

un groupe cycloalkyle en C₃-C₆ facultativement substitué avec un groupe méthyle, halogéno ou alcoxy en C₁-C₄ ;

un groupe (alkyl en C₁-C₄)carbonyle facultativement substitué avec un groupe alcoxy en C₁-C₄ ou un à trois groupes halogéno ;

un groupe (alkyl en C₁-C₄)carbonylamino facultativement substitué sur l'azote avec un groupe alkyle en C₁-C₂ ou alcoxy en C₁-C₄ et sur le carbone avec un groupe alcoxy en C₁-C₄ ou un à trois groupes halogéno ;

un groupe alkyle en C₁-C₄ substitué avec un groupe alcoxy en C₁-C₄, alkylthio en C₁-C₄, alkylamino en C₁-C₄, di(alkyl en C₁-C₄)amino, tri(alkyl en C₁-C₄)ammonium ou (alkyl en C₁-C₄)carbonyloxy ;

un groupe 2(ou 3)-furyle facultativement substitué avec un groupe halogéno ou alkyle en C₁-C₃ ;

un groupe 2(ou 3)-thiényle facultativement substitué avec un groupe halogéno ou alkyle en C₁-C₃ ;

un groupe N-méthyl-2(ou 3)-pyrrolyle ;

un groupe hydroxy ;

un groupe amino facultativement substitué avec un groupe alcoxy en C₁-C₄, alkyle en C₁-C₂ ou alcoxy en C₁-C₄ ;

un groupe 2(ou 4)-pyridyloxy facultativement substitué avec un groupe alkyle en C₁-C₄ ou trifluorométhyle ou un ou deux groupes halogéno ;

un groupe mono- ou di(alkyl en C₁-C₄)aminocarbonylamino facultativement substitué sur l'azote fixé au cycle avec un groupe alkyle en C₁-C₂ ou alcoxy en C₁-C₄ ;

un groupe (alcoxy en C₁-C₄)carbonylamino facultativement substitué sur l'azote avec un groupe alkyle en C₁-C₂ ou alcoxy en C₁-C₄ ;

un groupe mono- ou di(alkyl en C₁-C₄)aminocarbonyloxy ; ses N-oxydes, sous réserve que R₃ ne soit pas un groupe alkyle insaturé ;

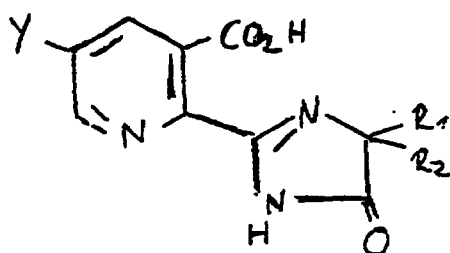
ses isomères optiques lorsque R₁ et R₂ ne sont pas identiques ;

ses tautomères ; et

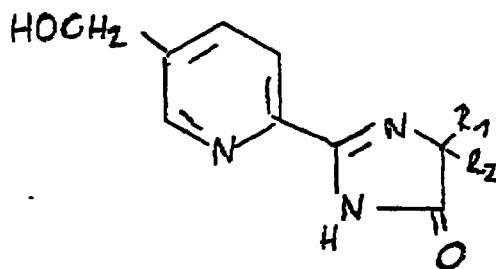
ses sels d'addition d'acides sauf lorsque R₃ est un cation.

Revendications pour les Etats contractants suivants : AT, ES

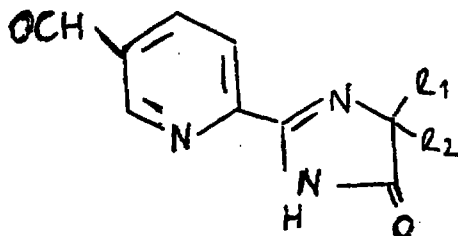
1. Procédé pour la préparation d'un composé de formule développée :



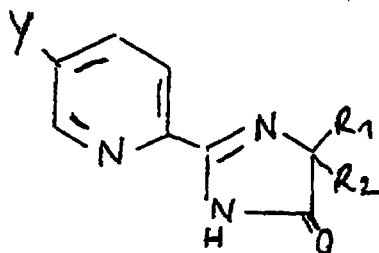
dans laquelle R_1 et R_2 représentent indépendamment un groupe alkyle en C_1 - C_4 , et Y représente un groupe alcényle en C_2 - C_6 linéaire ou ramifié éventuellement substitué par phényle, alcoxy en C_1 - C_4 ou 1 à 3 atomes d'halogène, comprenant les étapes consistant à oxyder un composé hydroxyméthylé de formule développée :



dans laquelle R_1 et R_2 sont tels que définis ci-dessus avec du dioxyde de manganèse, à température élevée, en présence d'un solvant organique inerte de façon à former un dérivé carboxaldéhyde de formule développée :



dans laquelle R_1 et R_2 sont tels que définis ci-dessus, faire réagir le dérivé carboxaldéhyde avec un dérivé halogénure d'alkyl-triphénylphosphonium approprié en présence d'un hydrure de métal alcalin, d'une huile minérale et de diméthylsulfoxyde de façon à former un dérivé 5-alcényle de formule développée :



dans laquelle Y est tel que défini ci-dessus, et faire réagir le dérivé 5-alcényle avec du méthyl-lithium et du dioxyde de carbone en présence de tétrahydrofurane.

2. Procédé pour la préparation d'acide de 2-(4-isopropyl-4-méthyl-5-oxo-2-imidazolin-2-yl)-5-(méthoxyméthyl)nicotinique comprenant les étapes consistant à faire réagir le 5-(bromométhyl)-2-(4-isopropyl-4-méthyl-5-oxo-2-imidazolin-2-yl)nicotinate de méthyle avec du méthylate de potassium de façon à conduire à du 2-(4-isopropyl-4-méthyl-5-oxo-2-imidazolin-2-yl)-5-(méthoxyméthyl)nicotinate de méthyle, faire réagir le 5-(méthoxyméthyle)nicotinate avec de l'hydroxyde de sodium en présence de méthanol de façon à conduire à un sel de l'acide 5-(méthoxyméthyl)nicotinique, et faire réagir le sel de l'acide avec de l'acide chlorhydrique..

