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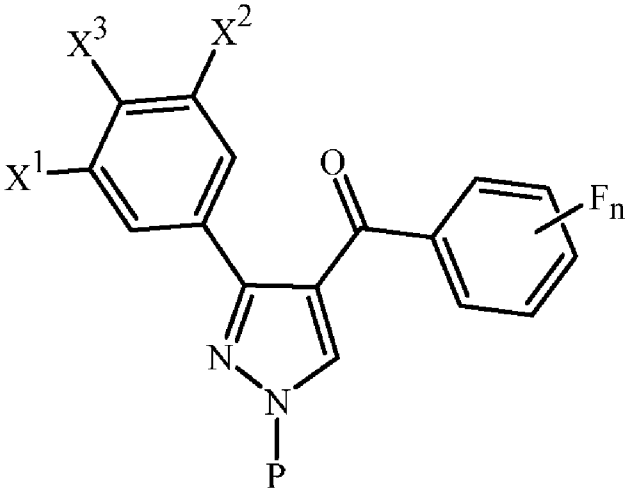

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(57) Abstract: Disclosed are compounds of Formula 1, including all stereoisomers, *N*-oxides, and salts thereof, wherein X^1, X^2, X^3, n and P are as defined in the disclosure. Also disclosed are compositions containing the compounds of Formula 1 and methods for controlling undesired vegetation comprising contacting the undesired vegetation or its environment with an effective amount of a compound or a composition of the invention.

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TITLE

HERBICIDAL SUBSTITUTED 3-PHENYL-4-FLUOROBENZOYL PYRAZOLES

FIELD OF THE INVENTION

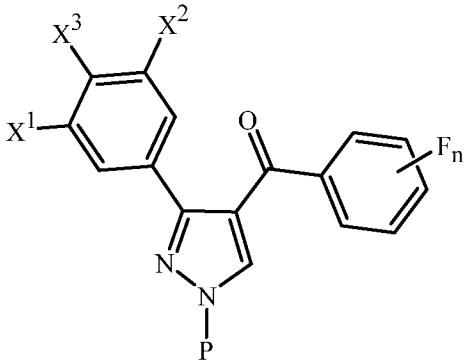
This invention relates to certain 3-phenyl-4-fluorobenzoyl pyrazoles, their *N*-oxides, salts and compositions, and methods of their use for controlling undesirable vegetation.

BACKGROUND OF THE INVENTION

The control of undesired vegetation is extremely important in achieving high crop efficiency. Achievement of selective control of the growth of weeds especially in such useful crops as rice, soybean, sugar beet, maize, potato, wheat, barley, tomato and plantation crops, among others, is very desirable. Unchecked weed growth in such useful crops can cause significant reduction in productivity and thereby result in increased costs to the consumer. The control of undesired vegetation in noncrop areas is also important. Many products are commercially available for these purposes, but the need continues for new compounds that are more effective, less costly, less toxic, environmentally safer or have different sites of action. U.S. Pat. Nos. 5,939,559 and 6,030,926 disclose certain herbicidal pyrazoles. The 3-phenyl-4-fluorobenzoyl pyrazoles of the present invention are not disclosed in this publication.

SUMMARY OF THE INVENTION

This invention is directed to a compound of Formula **1** including all stereoisomers, *N*-oxides, and salts thereof, agricultural compositions containing them and their use as herbicides



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wherein

X^1 is halogen, $-CF_3$, $-CF_2H$, $-OCF_3$, $-OCF_2H$, $-SCHF_2$ or $-C{\equiv}CH$;

X^2 is halogen, $-CF_3$, $-CF_2H$, $-OCF_3$, $-OCF_2H$, $-SCHF_2$ or $-C{\equiv}CH$;

X^3 is H or halogen;

n is 1, 2, 3, 4 or 5;

P is H, C_1-C_7 alkyl, C_3-C_7 alkenyl, C_3-C_7 alkynyl, C_3-C_7 cycloalkyl, C_1-C_7 haloalkyl, C_2-C_7 haloalkenyl, C_3-C_7 haloalkynyl, C_2-C_7 alkoxyalkyl, C_4-C_7 cycloalkylalkyl, C_1-C_7 alkoxy, C_3-C_7 alkoxyalkoxyalkyl, C_3-C_7 alkylcarbonylalkyl, C_3-C_7 alkoxycarbonylalkyl, C_4-C_7 halocycloalkylalkyl, C_2-C_7 haloalkoxyalkyl, C_2-C_7 alkylthioalkyl, C_2-C_7 alkylsulfonylalkyl, C_2-C_7 alkylsulfinylalkyl, C_2-C_7 haloalkylthioalkyl, C_2-C_7 haloalkylsulfonylalkyl, C_2-C_7 haloalkylsulfinylalkyl, C_3-C_7 haloalkoxycarbonylalkyl, C_3-C_7 haloalkylcarbonylalkyl, C_2-C_7 alkylaminoalkyl, C_3-C_7 dialkylaminoalkyl, C_2-C_7 cyanoalkyl, C_1-C_7 nitroalkyl, amino, hydroxy, CH_2OH, $C(=O)R^1$, SO_2R^2, $C(=O)NR^3R^4$, $SO_2NR^3R^4$, CO_2R^5, $CH(OR^6)_2$, $CH(CO_2CH_3)_2$ or $CH(CO_2C_2H_5)_2$;

R^1 is H, C_1-C_7 alkyl, C_2-C_7 alkenyl, C_2-C_7 alkynyl, C_3-C_7 cycloalkyl, C_1-C_7 haloalkyl, C_3-C_7 haloalkenyl, C_2-C_7 alkoxyalkyl or C_4-C_7 cycloalkylalkyl; or phenyl optionally substituted with R^7; or benzyl optionally substituted on ring members with R^7; or pyridyl optionally substituted with R^7;

R^2 is H, C_1-C_7 alkyl, C_2-C_7 alkenyl, C_2-C_7 alkynyl, C_3-C_7 cycloalkyl, C_1-C_7 haloalkyl, C_3-C_7 haloalkenyl, C_2-C_7 alkoxyalkyl or C_4-C_7 cycloalkylalkyl; or phenyl optionally substituted with R^7; or benzyl optionally substituted on ring members with R^7; or pyridyl optionally substituted with R^7;

R^3 is H, C_1-C_7 alkyl, C_2-C_7 alkenyl, C_2-C_7 alkynyl, C_3-C_7 cycloalkyl, C_1-C_7 haloalkyl, C_3-C_7 haloalkenyl, C_2-C_7 alkoxyalkyl or C_4-C_7 cycloalkylalkyl; or phenyl optionally substituted with R^7; or benzyl optionally substituted on ring members with R^7; or pyridyl optionally substituted with R^7;

R^4 is H or C_1-C_4 alkyl;

R^5 is C_1-C_7 alkyl, C_3-C_7 alkenyl, C_3-C_7 alkynyl, C_3-C_7 cycloalkyl, C_2-C_7 haloalkyl, C_3-C_7 haloalkenyl, C_2-C_7 alkoxyalkyl or C_4-C_7 cycloalkylalkyl; or phenyl optionally substituted with R^7; or benzyl optionally substituted on ring members with R^7; or pyridyl optionally substituted with R^7;

R^6 is C_1-C_3 alkyl; or

two R^6 are taken together as $-(CH_2)_2-$, $-(CH_2)_3-$ or $-CH_2CH(CH_3)-$ to form a ring; and

R^7 is halogen, cyano, C_1-C_2 alkyl, C_1-C_3 haloalkyl, C_1-C_3 haloalkoxy or C_1-C_3 alkoxy.

More particularly, this invention pertains to a compound of Formula **1** including all stereoisomers, an *N*-oxide or a salt thereof. This invention also relates to a herbicidal composition comprising a compound of the invention (i.e. in a herbicidally effective amount) and at least one component selected from the group consisting of surfactants, solid diluents and liquid diluents. This invention further relates to a method for controlling the growth of undesired vegetation comprising contacting the vegetation or its environment with a

herbicidally effective amount of a compound of the invention (e.g., as a composition described herein).

This invention also includes a herbicidal mixture comprising (a) a compound selected from Formula **1**, *N*-oxides, and salts thereof, and (b) at least one additional active ingredient selected from (b1) through (b16); and salts of compounds of (b1) through (b16).

DETAILS OF THE INVENTION

As used herein, the terms "comprises," "comprising," "includes," "including," "has," "having," "contains", "containing," "characterized by" or any other variation thereof, are intended to cover a non-exclusive inclusion, subject to any limitation explicitly indicated. For example, a composition, mixture, process or method that comprises a list of elements is not necessarily limited to only those elements but may include other elements not expressly listed or inherent to such composition, mixture, process or method.

The transitional phrase "consisting of" excludes any element, step, or ingredient not specified. If in the claim, such would close the claim to the inclusion of materials other than those recited except for impurities ordinarily associated therewith. When the phrase "consisting of" appears in a clause of the body of a claim, rather than immediately following the preamble, it limits only the element set forth in that clause; other elements are not excluded from the claim as a whole.

The transitional phrase "consisting essentially of" is used to define a composition, or method that includes materials, steps, features, components, or elements, in addition to those literally disclosed, provided that these additional materials, steps, features, components, or elements do not materially affect the basic and novel characteristic(s) of the claimed invention. The term "consisting essentially of" occupies a middle ground between "comprising" and "consisting of".

Where applicants have defined an invention or a portion thereof with an open-ended term such as "comprising," it should be readily understood that (unless otherwise stated) the description should be interpreted to also describe such an invention using the terms "consisting essentially of" or "consisting of."

Further, unless expressly stated to the contrary, "or" refers to an inclusive or and not to an exclusive or. For example, a condition A or B is satisfied by any one of the following: A is true (or present) and B is false (or not present), A is false (or not present) and B is true (or present), and both A and B are true (or present).

Also, the indefinite articles "a" and "an" preceding an element or component of the invention are intended to be nonrestrictive regarding the number of instances (i.e. occurrences) of the element or component. Therefore "a" or "an" should be read to include one or at least one, and the singular word form of the element or component also includes the plural unless the number is obviously meant to be singular.

As referred to herein, the term "seedling", used either alone or in a combination of words means a young plant developing from the embryo of a seed. As referred to herein, the term "broadleaf" used either alone or in words such as "broadleaf weed" means dicot or dicotyledon, a term used to describe a group of angiosperms characterized by embryos having two cotyledons. As used herein, the term "alkylating agent" refers to a chemical compound in which a carbon-containing radical is bound through a carbon atom to a leaving group such as halide or sulfonate, which is displaceable by bonding of a nucleophile to said carbon atom. Unless otherwise indicated, the term "alkylating" does not limit the carbon-containing radical to alkyl; the carbon-containing radicals in alkylating agents include the variety of carbon-bound substituent radicals specified for the fluorobenzoyl moiety on the pyrazole ring or nitrogen bound radicals specified for P.

In the above recitations, the term "alkyl", used either alone or in compound words such as "alkylthio" or "haloalkyl" includes straight-chain or branched alkyl, such as, methyl, ethyl, *n*-propyl, *i*-propyl, or the different butyl, pentyl or hexyl isomers. "Alkenyl" includes straight-chain or branched alkenes such as ethenyl, 1-propenyl, 2-propenyl, and the different butenyl, pentenyl and hexenyl isomers. "Alkenyl" also includes polyenes such as 1,2-propadienyl and 2,4-hexadienyl. "Alkynyl" includes straight-chain or branched alkynes such as ethynyl, 1-propynyl, 2-propynyl and the different butynyl, pentynyl and hexynyl isomers. "Alkynyl" can also include moieties comprised of multiple triple bonds such as 2,5-hexadiynyl.

"Alkoxy" includes, for example, methoxy, ethoxy, *n*-propyloxy, isopropyloxy and the different butoxy, pentoxy and hexyloxy isomers. "Alkoxyalkyl" denotes alkoxy substitution on alkyl. Examples of "alkoxyalkyl" include CH_3OCH_2, $CH_3OCH_2CH_2$, $CH_3CH_2OCH_2$, $CH_3CH_2CH_2CH_2OCH_2$ and $CH_3CH_2OCH_2CH_2$. "Alkoxyalkoxy" denotes alkoxy substitution on alkoxy. "Alkylthio" includes branched or straight-chain alkylthio moieties such as methylthio, ethylthio, and the different propylthio, butylthio, pentylthio and hexylthio isomers. "Alkylsulfinyl" includes both enantiomers of an alkylsulfinyl group. Examples of "alkylsulfinyl" include $CH_3S(O)$-, $CH_3CH_2S(O)$-, $CH_3CH_2CH_2S(O)$-, $(CH_3)_2CHS(O)$- and the different butylsulfinyl, pentylsulfinyl and hexylsulfinyl isomers. "Alkylthioalkyl" denotes alkylthio substitution on alkyl. Examples of "alkylthioalkyl" include CH_3SCH_2, $CH_3SCH_2CH_2$, $CH_3CH_2SCH_2$, $CH_3CH_2CH_2CH_2SCH_2$ and $CH_3CH_2SCH_2CH_2$. "Cyanoalkyl" denotes an alkyl group substituted with one cyano group. Examples of "cyanoalkyl" include $NCCH_2$, $NCCH_2CH_2$ and $CH_3CH(CN)CH_2$. "Alkylamino", "dialkylamino", "dialkylaminoalkyl", and the like, are defined analogously to the above examples.

"Cycloalkyl" includes, for example, cyclopropyl, cyclobutyl, cyclopentyl and cyclohexyl. The term "cycloalkylalkyl" denotes cycloalkyl substitution on an alkyl moiety.

Examples of "cycloalkylalkyl" include cyclopropylmethyl, cyclopentylethyl, and other cycloalkyl moieties bonded to straight-chain or branched alkyl groups.

The term "halogen", either alone or in compound words such as "haloalkyl", or when used in descriptions such as "alkyl substituted with halogen" includes fluorine, chlorine, bromine or iodine. Further, when used in compound words such as "haloalkyl", or when used in descriptions such as "alkyl substituted with halogen" said alkyl may be partially or fully substituted with halogen atoms which may be the same or different. Examples of "haloalkyl" or "alkyl substituted with halogen" include F_3C, $ClCH_2$, CF_3CH_2 and CF_3CCl_2. The terms "haloalkoxy", "haloalkylthio", "haloalkenyl", "haloalkynyl", and the like, areis defined analogously to the term "haloalkyl". Examples of "haloalkoxy" include CF_3O-, CCl_3CH_2O-, $HCF_2CH_2CH_2O$- and CF_3CH_2O-. Examples of "haloalkylthio" include CCl_3S-, CF_3S-, CCl_3CH_2S- and $ClCH_2CH_2CH_2S$-. Examples of "haloalkylsulfinyl" include $CF_3S(O)$-, $CCl_3S(O)$-, $CF_3CH_2S(O)$- and $CF_3CF_2S(O)$-. Examples of "haloalkylsulfonyl" include $CF_3S(O)_2$-, $CCl_3S(O)_2$-, $CF_3CH_2S(O)_2$- and $CF_3CF_2S(O)_2$-. Examples of "haloalkenyl" include $(Cl)_2C=CHCH_2$- and $CF_3CH_2CH=CHCH_2$-. Examples of "haloalkynyl" include $HC\equiv CCHCl$-, $CF_3C\equiv C$-, $CCl_3C\equiv C$- and $FCH_2C\equiv CCH_2$-. Examples of "haloalkoxyalkoxy" include CF_3OCH_2O-, $ClCH_2CH_2OCH_2CH_2O$-, $Cl_3CCH_2OCH_2O$- as well as branched alkyl derivatives. "Alkylcarbonyl" denotes a straight-chain or branched alkyl moieties bonded to a C(=O) moiety. Examples of "alkylcarbonyl" include $CH_3C(=O)$-, $CH_3CH_2CH_2C(=O)$- and $(CH_3)_2CHC(=O)$-. Examples of "alkoxycarbonyl" include $CH_3OC(=O)$-, $CH_3CH_2OC(=O)$-, $CH_3CH_2CH_2OC(=O)$-, $(CH_3)_2CHOC(=O)$- and the different butoxy- or pentoxycarbonyl isomers. When two variables are described as "taken together to form a ring" (e.g., two R^6 in the variable $CH(OR^6)_2$) the valencies of the two variables are connected by the listed radicals (e.g. $-(CH_2)_2$-, $-(CH_2)_3$- or $-CH_2CH(CH_3)$-) resulting in a ring comprising, in addition to the two oxygen atoms, the listed readicals as backbone members.

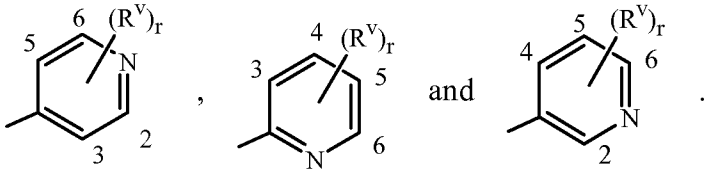
The total number of carbon atoms in a substituent group is indicated by the "C_i–C_j" prefix where i and j are numbers from 1 to 7. For example, C_1–C_4 alkylsulfonyl designates methylsulfonyl through butylsulfonyl; C_2 alkoxyalkyl designates CH_3OCH_2-; C_3 alkoxyalkyl designates, for example, $CH_3CH(OCH_3)$-, $CH_3OCH_2CH_2$- or $CH_3CH_2OCH_2$-; and C_4 alkoxyalkyl designates the various isomers of an alkyl group substituted with an alkoxy group containing a total of four carbon atoms, examples including $CH_3CH_2CH_2OCH_2$- and $CH_3CH_2OCH_2CH_2$-.

When a compound is substituted with a substituent bearing a subscript that indicates the number of said substituents can exceed 1, said substituents (when they exceed 1) are independently selected from the group of defined substituents (e.g., F_n, n is 1, 2, 3, 4 or 5). When a group contains a substituent which can be hydrogen, for example X^3, then when this substituent is taken as hydrogen, it is recognized that this is equivalent to said group being

unsubstituted. When a variable group is shown to be optionally attached to a position, for example R^7, then hydrogen may be at the position even if not recited in the variable group definition. When one or more positions on a group are said to be "unsubstituted", then hydrogen atoms are attached to take up any free valency.

Unless otherwise indicated, the term "benzyl ring" is phenyl bonded to the remainder of Formula **1** through a methyl group, and is either unsubstituted or substituted on ring a member with a substituent selected from R^7. The term "pyridyl" refers to a 6-memered ring containing ring members selected from carbon and 1 nitrogen atom. Examples of pyridyl include the following shown in Exhibit 1 where R^v refers to R^7 in the Summary of the Invention.

Exhibit 1



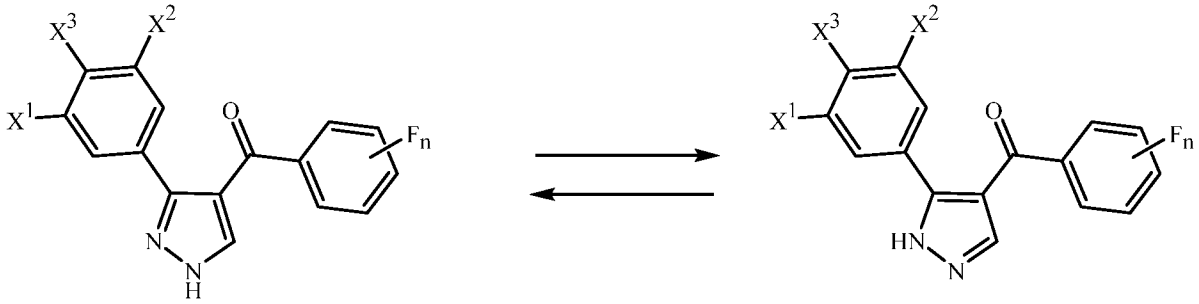
U-1 U-2 U-3

The term "optionally substituted" in connection with the term "benzyl" or "pyridyl" refers to groups which are unsubstituted or have at least one non-hydrogen substituent that does not extinguish the biological activity possessed by the unsubstituted analog. As used herein, the following definitions shall apply unless otherwise indicated. The term "optionally substituted" is used interchangeably with the phrase "substituted or unsubstituted" or with the term "(un)substituted." Unless otherwise indicated, an optionally substituted group may have a substituent at each substitutable position of the group, and each substitution is independent of the other. Although R^v groups are shown in the structures U-1 through U-3, it is noted that they do not need to be present since they are optional substituents. Note that the U groups are limited by the number of available valences on the ring and can only be substituted with up to 4 R^v groups.

A wide variety of synthetic methods are known in the art to enable preparation of aromatic and nonaromatic heterocyclic rings and ring systems; for extensive reviews see the eight volume set of *Comprehensive Heterocyclic Chemistry*, A. R. Katritzky and C. W. Rees editors-in-chief, Pergamon Press, Oxford, 1984 and the twelve volume set of *Comprehensive Heterocyclic Chemistry II*, A. R. Katritzky, C. W. Rees and E. F. V. Scriven editors-in-chief, Pergamon Press, Oxford, 1996.

Compounds of this invention can exist as one or more stereoisomers. The various stereoisomers include enantiomers, diastereomers, atropisomers and geometric isomers. Stereoisomers are isomers of identical constitution but differing in the arrangement of their atoms in space and include enantiomers, diastereomers, cis-trans isomers (also known as

geometric isomers) and atropisomers. Atropisomers result from restricted rotation about single bonds where the rotational barrier is high enough to permit isolation of the isomeric species. One skilled in the art will appreciate that one stereoisomer may be more active and/or may exhibit beneficial effects when enriched relative to the other stereoisomer(s) or when separated from the other stereoisomer(s). Additionally, the skilled artisan knows how to separate, enrich, and/or to selectively prepare said stereoisomers. The compounds of the invention may be present as a mixture of stereoisomers, individual stereoisomers or as an optically active form. Compounds of Formula **1** (when P is H) can also as be isolated as the tautomeric mixture of Formuala **1A** and **1A'** under certain reaction conditions.



1A **1A'**

The Summary of the Invention and any Embodiments herein refer to either tautomer so long as the presence of the tautomer **1A'** does not detract from the biological activity of the compound of the invention. When a compound of Formula **1A** or **1A'** are alkylated or capped with electrophiles, the predominant product is generally that from one or the other tautomer, however either "N-alkylated" tautomer isomer can be isolated using routing techniques known to one skilled in the art. In general, the tautomer represented by Formula **1A** is known to impart the most biological activity.

Compounds of Formula **1** can comprise additional chiral centers. For example, substituents and other molecular constituents (such as P) may contain chiral centers. This invention comprises racemic mixtures as well as enriched and essentially pure stereoconfigurations at these additional chiral centers. Compounds of this invention can exist as one or more conformational isomers due to restricted rotation about the amide bond (e.g., -C(=O)(2- and/or 6-fluorophenyl) in Formula **1**. This invention comprises mixtures of conformational isomers. In addition, this invention includes compounds that are enriched in one conformer relative to others.

Compounds of Formula **1** typically exist in more than one form, and thus a compound of Formula **1** includes all crystalline and non-crystalline forms of the compounds they represent. Non-crystalline forms include embodiments which are solids such as waxes and gums as well as embodiments which are liquids such as solutions and melts. Crystalline forms include embodiments which represent essentially a single crystal type and

embodiments which represent a mixture of polymorphs (i.e. different crystalline types). The term "polymorph" refers to a particular crystalline form of a chemical compound that can crystallize in different crystalline forms, these forms having different arrangements and/or conformations of the molecules in the crystal lattice. Although polymorphs can have the same chemical composition, they can also differ in composition due the presence or absence of co-crystallized water or other molecules, which can be weakly or strongly bound in the lattice. Polymorphs can differ in such chemical, physical and biological properties as crystal shape, density, hardness, color, chemical stability, melting point, hygroscopicity, suspensibility, dissolution rate and biological availability. One skilled in the art will appreciate that a polymorph of a compound of Formula **1** can exhibit beneficial effects (e.g., suitability for preparation of useful formulations, improved biological performance) relative to another polymorph or a mixture of polymorphs of the same compound of Formula **1**. Preparation and isolation of a particular polymorph of a compound of Formula **1** can be achieved by methods known to those skilled in the art including, for example, crystallization using selected solvents and temperatures. For a comprehensive discussion of polymorphism see R. Hilfiker, Ed., *Polymorphism in the Pharmaceutical Industry*, Wiley-VCH, Weinheim, 2006.

One skilled in the art will appreciate that not all nitrogen-containing heterocycles can form *N*-oxides since the nitrogen requires an available lone pair for oxidation to the oxide; one skilled in the art will recognize those nitrogen-containing heterocycles which can form *N*-oxides. One skilled in the art will also recognize that tertiary amines can form *N*-oxides. Synthetic methods for the preparation of *N*-oxides of heterocycles and tertiary amines are very well known by one skilled in the art including the oxidation of heterocycles and tertiary amines with peroxy acids such as peracetic and *m*-chloroperbenzoic acid (MCPBA), hydrogen peroxide, alkyl hydroperoxides such as *t*-butyl hydroperoxide, sodium perborate, and dioxiranes such as dimethyldioxirane. These methods for the preparation of *N*-oxides have been extensively described and reviewed in the literature, see for example: T. L. Gilchrist in *Comprehensive Organic Synthesis*, vol. 7, pp 748–750, S. V. Ley, Ed., Pergamon Press; M. Tisler and B. Stanovnik in *Comprehensive Heterocyclic Chemistry*, vol. 3, pp 18–20, A. J. Boulton and A. McKillop, Eds., Pergamon Press; M. R. Grimmett and B. R. T. Keene in *Advances in Heterocyclic Chemistry*, vol. 43, pp 149–161, A. R. Katritzky, Ed., Academic Press; M. Tisler and B. Stanovnik in *Advances in Heterocyclic Chemistry*, vol. 9, pp 285–291, A. R. Katritzky and A. J. Boulton, Eds., Academic Press; and G. W. H. Cheeseman and E. S. G. Werstiuk in *Advances in Heterocyclic Chemistry*, vol. 22, pp 390–392, A. R. Katritzky and A. J. Boulton, Eds., Academic Press.

One skilled in the art recognizes that because in the environment and under physiological conditions salts of chemical compounds are in equilibrium with their corresponding nonsalt forms, salts share the biological utility of the nonsalt forms. Thus a

wide variety of salts of a compound of Formula **1** are useful for control of undesired vegetation (i.e. are agriculturally suitable). The salts of a compound of Formula **1** include acid-addition salts with inorganic or organic acids such as hydrobromic, hydrochloric, nitric, phosphoric, sulfuric, acetic, butyric, fumaric, lactic, maleic, malonic, oxalic, propionic, salicylic, tartaric, 4-toluenesulfonic or valeric acids. When a compound of Formula **1** contains an acidic moiety such as a carboxylic acid or phenol, salts also include those formed with organic or inorganic bases such as pyridine, triethylamine or ammonia, or amides, hydrides, hydroxides or carbonates of sodium, potassium, lithium, calcium, magnesium or barium. Accordingly, the present invention comprises compounds selected from Formula **1**, *N*-oxides and agriculturally suitable salts thereof.

Embodiments of the present invention as described in the Summary of the Invention include (where Formula **1** as used in the following Embodiments includes *N*-oxides and salts thereof):

Embodiment 1. The compound of Formula **1** as described in the Summary of the Invention.

Embodiment 2. The compound of Embodiment 1 wherein X^1 is halogen, $-CF_3$, $-CF_2H$, $-OCF_3$, or $-OCF_2H$.

Embodiment 3. The compound of Embodiment 2 wherein X^1 is halogen or $-CF_3$.

Embodiment 4. The compound of Embodiment 3 wherein X^1 is halogen.

Embodiment 5. The compound of Embodiment 4 wherein X^1 is Cl or Br.

Embodiment 6. The compound of Embodiment 5 wherein X^1 is Cl.

Embodiment 7. The compound of any one of Embodiments 1 through 6 wherein X^2 is halogen, $-CF_3$, $-CF_2H$, $-OCF_3$, or $-OCF_2H$.

Embodiment 8. The compound of Embodiment 7 wherein X^2 is halogen or $-CF_3$.

Embodiment 9. The compound of Embodiment 8 wherein X^2 is halogen.

Embodiment 10. The compound of Embodiment 9 wherein X^2 is Cl or Br.

Embodiment 11. The compound of Embodiment 10 wherein X^2 is Cl.

Embodiment 12. The compound of any one of Embodiments 1 through 11 wherein X^3 is H, F, Cl or Br.

Embodiment 13. The compound of Embodiment 12 wherein X^3 is H, F or Cl.

Embodiment 14. The compound of Embodiment 13 wherein X^3 is H or Cl.

Embodiment 15. The compound of Embodiment 14 wherein X^3 is H.

Embodiment 16. The compound of Embodiment 14 wherein X^3 is Cl.

Embodiment 17. The compound of any one of Embodiments 1 through 16 wherein n is 1, 2 or 3.

Embodiment 18. The compound of Embodiment 17 wherein n is 2 or 3.

Embodiment 19. The compound of Embodiment 18 wherein n is 2.

Embodiment 20. The compound of Embodiment 18 wherein n is 3.

Embodiment 21. The compound of any one of Embodiments 1 through 20 wherein P is H, C_1-C_7 alkyl, C_3-C_7 alkenyl, C_3-C_7 alkynyl, C_3-C_7 cycloalkyl, C_1-C_7 haloalkyl, C_2-C_7 haloalkenyl, C_3-C_7 haloalkynyl, C_2-C_7 alkoxyalkyl, C_4-C_7 cycloalkylalkyl, C_1-C_7 alkoxy, C_3-C_7 alkoxyalkoxyalkyl, C_2-C_7 cyanoalkyl, C_1-C_7 nitroalkyl, amino, hydroxy, CH_2OH, $C(=O)R^1$, SO_2R^2, $C(=O)NR^3R^4$, $SO_2NR^3R^4$, CO_2R^5, $CH(OR^6)_2$, $CH(CO_2CH_3)_2$ or $CH(CO_2C_2H_5)_2$.

Embodiment 22. The compound of Embodiment 21 wherein P is H, C_1-C_7 alkyl, C_3-C_7 alkenyl, C_3-C_7 alkynyl, C_2-C_7 alkoxyalkyl, CH_2OH, $C(=O)R^1$ or SO_2R^2.

Embodiment 23. The compound of Embodiment 22 wherein P is H, C_1-C_4 alkyl, C_3-C_4 alkenyl, C_3-C_4 alkynyl, CH_2OCH_3, $CH_2OC_2H_5$, CH_2OH, $C(=O)CH_3$, $C(=O)C_2H_5$, $C(=O)CH_2OCH_3$, $C(=O)CH_2C{\equiv}CH$, SO_2CH_3, $SO_2C_2H_5$ or SO_2CF_3.

Embodiment 24. The compound of Embodiment 23 wherein P is H, C_1-C_4 alkyl, $CH_2C{\equiv}CH$, CH_2OH, $C(=O)CH_3$, $C(=O)C_2H_5$, $C(=O)CH_2C{\equiv}CH$, SO_2CH_3 or SO_2CF_3.

Embodiment 25. The compound of Embodiment 24 wherein P is H, CH_3, CH_2CH_3, $CH_2C{\equiv}CH$, CH_2OH, $C(=O)CH_3$ or $C(=O)C_2H_5$.

Embodiment 26. The compound of Embodiment 25 wherein P is H.

Embodiment 27. The compound of Embodiment 25 wherein P is CH_3.

Embodiment 28. The compound of Embodiment 25 wherein P is CH_2CH_3.

Embodiment 29. The compound of Embodiment 25 wherein P is $CH_2C{\equiv}CH$.

Embodiment 30. The compound of Embodiment 25 wherein P is CH_2OH.

Embodiment 31. The compound of Embodiment 25 wherein P is $C(=O)CH_3$.

Embodiment 32. The compound of Embodiment 25 wherein P is $C(=O)C_2H_5$.

Embodiment 33. The compound of any one of Embodiments 1 through 32 wherein R^1 is H, C_1-C_7 alkyl, C_2-C_7 alkenyl, C_2-C_7 alkynyl, C_1-C_7 haloalkyl or C_2-C_7 alkoxyalkyl; or benzyl optionally substituted on ring members with R^7.

Embodiment 34. The compound of Embodiment 33 wherein R^1 is H, C_1-C_4 alkyl, C_2-C_4 alkynyl, C_1-C_4 haloalkyl or C_2-C_4 alkoxyalkyl.

Embodiment 35. The compound of Embodiment 34 wherein R^1 is CH_3, CH_2CH_3, $CH_2C{\equiv}CH$, $-CF_3$ or CH_2OCH_3.

Embodiment 36. The compound of Embodiment 35 wherein R^1 is CH_3 or $-CF_3$.

Embodiment 37. The compound of any one of Embodiments 1 through 36 wherein R^2 is H, C_1-C_7 alkyl, C_2-C_7 alkenyl, C_2-C_7 alkynyl, C_1-C_7 haloalkyl or C_2-C_7 alkoxyalkyl; or benzyl optionally substituted on ring members with R^7.

Embodiment 38. The compound of Embodiment 37 wherein R^2 is H, C_1-C_4 alkyl, C_2-C_4 alkynyl, C_1-C_4 haloalkyl or C_2-C_4 alkoxyalkyl.

Embodiment 39. The compound of Embodiment 38 wherein R^2 is CH_3, CH_2CH_3, $CH_2C{\equiv}CH$, $-CF_3$ or CH_2OCH_3.

Embodiment 40. The compound of Embodiment 39 wherein R^2 is CH_3 or $-CF_3$.

Embodiment 41. The compound of any one of Embodiments 1 through 40 wherein R^3 is H, C_1-C_7 alkyl, C_2-C_7 alkenyl, C_2-C_7 alkynyl, C_1-C_7 haloalkyl or C_2-C_7 alkoxyalkyl; or benzyl optionally substituted on ring members with R^7.

Embodiment 42. The compound of Embodiment 41 wherein R^3 is H, C_1-C_4 alkyl, C_2-C_4 alkynyl, C_1-C_4 haloalkyl or C_2-C_4 alkoxyalkyl.

Embodiment 43. The compound of Embodiment 42 wherein R^3 is CH_3, CH_2CH_3, $CH_2C{\equiv}CH$, $-CF_3$ or CH_2OCH_3.

Embodiment 44. The compound of Embodiment 43 wherein R^3 is CH_3 or $-CF_3$.

Embodiment 45. The compound of any one of Embodiments 1 through 44 wherein R^4 is H or CH_3.

Embodiment 46. The compound of Embodiment 45 wherein R^4 is CH_3.

Embodiment 47. The compound of any one of Embodiments 1 through 46 wherein R^5 is C_1-C_4 alkyl.

Embodiment 48. The compound of Embodiment 47 wherein R^5 is CH_3 or CH_2CH_3.

Embodiment 49. The compound of any one of Embodiments 1 through 48 wherein R^6 is CH_3 or CH_2CH_3.

Embodiment 50. The compound of Embodiment 49 wherein R^6 is CH_3.

Embodiment 51. The compound of any one of Embodiments 1 through 50 wherein two R^6 are taken together as $-(CH_2)_2-$ or $-(CH_2)_3-$ to form a ring.

Embodiment 52. The compound of Embodiment 51 wherein two R^6 are taken together as $-(CH_2)_2-$ to form a ring.

Embodiment 53. The compound of any one of Embodiments 1 through 52 wherein R^7 is halogen, cyano or C_1-C_2 alkyl.

Embodiment 54. The compound of Embodiment 53 wherein R^7 is Cl, Br, cyano or CH_3.

Embodiments of this invention, including Embodiments 1-54 above as well as any other embodiments described herein, can be combined in any manner, and the descriptions of variables in the embodiments pertain not only to the compounds of Formula **1** but also to the starting compounds and intermediate compounds useful for preparing the compounds of Formula **1**. In addition, embodiments of this invention, including Embodiments 1-54 above as well as any other embodiments described herein, and any combination thereof, pertain to the compositions and methods of the present invention.

Combinations of Embodiments 1-54 are illustrated by:

Embodiment A. The compound of the Summary of the Invention wherein

X^1 is halogen, $-CF_3$, $-CF_2H$, $-OCF_3$ or $-OCF_2H$;

X^2 is halogen, $-CF_3$, $-CF_2H$, $-OCF_3$ or $-OCF_2H$;

X^3 is H, F, Cl or Br;

P is H, C_1-C_7 alkyl, C_3-C_7 alkenyl, C_3-C_7 alkynyl, C_3-C_7 cycloalkyl, C_1-C_7 haloalkyl, C_2-C_7 haloalkenyl, C_3-C_7 haloalkynyl, C_2-C_7 alkoxyalkyl, C_4-C_7 cycloalkylalkyl, C_1-C_7 alkoxy, C_3-C_7 alkoxyalkoxyalkyl, C_2-C_7 cyanoalkyl, C_1-C_7 nitroalkyl, amino, hydroxy, CH_2OH, $C(=O)R^1$, SO_2R^2, $C(=O)NR^3R^4$, $SO_2NR^3R^4$, CO_2R^5, $CH(OR^6)_2$, $CH(CO_2CH_3)_2$ or $CH(CO_2C_2H_5)_2$;

R^1 is H, C_1-C_7 alkyl, C_2-C_7 alkenyl, C_2-C_7 alkynyl, C_1-C_7 haloalkyl or C_2-C_7 alkoxyalkyl; or benzyl optionally substituted on ring members with R^7;

R^2 is H, C_1-C_7 alkyl, C_2-C_7 alkenyl, C_2-C_7 alkynyl, C_1-C_7 haloalkyl or C_2-C_7 alkoxyalkyl; or benzyl optionally substituted on ring members with R^7;

R^3 is H, C_1-C_7 alkyl, C_2-C_7 alkenyl, C_2-C_7 alkynyl, C_1-C_7 haloalkyl or C_2-C_7 alkoxyalkyl; or benzyl optionally substituted on ring members with R^7;

R^4 is H or CH_3;

R^5 is C_1-C_4 alkyl;

R^6 is CH_3 or CH_2CH_3; or

two R^6 are taken together as $-(CH_2)_2-$ or $-(CH_2)_3-$ to form a ring; and

R^7 is Cl, Br, cyano or CH_3.

Embodiment B. A compound of Embodiment A wherein

X^1 is halogen;

X^2 is halogen;

X^3 is H, F, Cl or Br;

n is 1, 2 or 3; and

P is H, C_1-C_4 alkyl, C_3-C_4 alkenyl, C_3-C_4 alkynyl, CH_2OCH_3, $CH_2OC_2H_5$, CH_2OH, $C(=O)CH_3$, $C(=O)C_2H_5$, $C(=O)CH_2OCH_3$, $C(=O)CH_2C{\equiv}CH$, SO_2CH_3, $SO_2C_2H_5$ or SO_2CF_3.

Embodiment C. A compound of Embodiment B wherein

X^1 is Cl or Br;

X^2 is Cl or Br;

X^3 is H, F or Cl;

n is 2 or 3; and

P is H, C_1-C_4 alkyl, $CH_2C{\equiv}CH$, CH_2OH, $C(=O)CH_3$, $C(=O)C_2H_5$, $C(=O)CH_2C{\equiv}CH$, SO_2CH_3 or SO_2CF_3.

Embodiment D. A compound of Embodiment C wherein

X^1 is Cl;

X^2 is Cl;

X^3 is H or Cl; and

P is H, CH_3, CH_2CH_3, $CH_2C{\equiv}CH$, CH_2OH, $C(=O)CH_3$ or $C(=O)C_2H_5$.

Embodiment E. A compound of Embodiment D wherein

X^3 is H;

n is 2; and

P is H.

Specific Embodiments of the Invention include a compound of Formula **1** selected from [3-(3,5-dichlorophenyl)-1*H*-pyrazol-4-yl](2,5-difluorophenyl)methanone (Compound 1); [3-(3,5-dibromophenyl)-1*H*-pyrazol-4-yl](2,5-difluorophenyl)methanone (Compound 2); (2,5-difluorophenyl)[3-(3,5-difluorophenyl)-1*H*-pyrazol-4-yl]methanone (Compuond 3); [3-(3-chloro-5-fluorophenyl)-1*H*-pyrazol-4-yl](3-fluorophenyl)methanone (Compound 4); [3-(3,5-dichlorophenyl)-1*H*-pyrazol-4-yl](2,3,5-trifluorophenyl)methanone (Compound 5); [3-(3,5-dichlorophenyl)-1*H*-pyrazol-4-yl](3-fluorophenyl)methanone (Compound 6); [3-(3,5-dichlorophenyl)-1*H*-pyrazol-4-yl](3,5-difluorophenyl)methanone (Compound 7); 1-[3-(3,5-dichlorophenyl)-4-(2,5-difluorobenzoyl)-1*H*-pyrazol-1-yl]ethanone (Compound 8); and (3,5-difluorophenyl)[3-(3,5-difluorophenyl)-1*H*-pyrazol-4-yl]methanone (Compound 9).

This invention also relates to a method for controlling undesired vegetation comprising applying to the locus of the vegetation herbicidally effective amounts of the compounds of the invention (e.g., as a composition described herein). Of note as embodiments relating to methods of use are those involving the compounds of embodiments described above. Compounds of the invention are particularly useful for selective control of weeds in crops such as wheat, barley, maize, soybean, sunflower, cotton, oilseed rape and rice, and specialty crops such as sugarcane, citrus, fruit and nut crops. Compounds of the invention are more particularly useful for selective control of weeds in crops such as maize and soybean. Also noteworthy as embodiments are herbicidal compositions of the present invention comprising the compounds of embodiments described above.

This invention also includes a herbicidal mixture comprising (a) a compound selected from Formula **1**, *N*-oxides, and salts thereof, and (b) at least one additional active ingredient selected from (b1) photosystem II inhibitors, (b2) acetohydroxy acid synthase (AHAS) inhibitors, (b3) acetyl-CoA carboxylase (ACCase) inhibitors, (b4) auxin mimics and (b5) 5-enol-pyruvylshikimate-3-phosphate (EPSP) synthase inhibitors, (b6) photosystem I electron diverters, (b7) protoporphyrinogen oxidase (PPO) inhibitors, (b8) glutamine synthetase (GS) inhibitors, (b9) very long chain fatty acid (VLCFA) elongase inhibitors, (b10) auxin transport inhibitors, (b11) phytoene desaturase (PDS) inhibitors, (b12) 4-hydroxyphenyl-pyruvate dioxygenase (HPPD) inhibitors, (b13) homogentisate solenesyltransererase (HST) inhibitors, (b14) cellulose biosynthesis inhibitors, (b15) other herbicides including mitotic disruptors, organic arsenicals, asulam, bromobutide, cinmethylin, cumyluron, dazomet, difenzoquat, dymron, etobenzanid, flurenol, fosamine, fosamine-ammonium, metam, methyldymron, oleic acid, oxaziclomefone, pelargonic acid

and pyributicarb, and (b16) herbicide safeners; and salts of compounds of (b1) through (b16).

"Photosystem II inhibitors" (b1) are chemical compounds that bind to the D-1 protein at the Q_B-binding niche and thus block electron transport from Q_A to Q_B in the chloroplast thylakoid membranes. The electrons blocked from passing through photosystem II are transferred through a series of reactions to form toxic compounds that disrupt cell membranes and cause chloroplast swelling, membrane leakage, and ultimately cellular destruction. The Q_B-binding niche has three different binding sites: binding site A binds the triazines such as atrazine, triazinones such as hexazinone, and uracils such as bromacil, binding site B binds the phenylureas such as diuron, and binding site C binds benzothiadiazoles such as bentazon, nitriles such as bromoxynil and phenyl-pyridazines such as pyridate. Examples of photosystem II inhibitors include ametryn, amicarbazone, atrazine, bentazon, bromacil, bromofenoxim, bromoxynil, chlorbromuron, chloridazon, chlorotoluron, chloroxuron, cumyluron, cyanazine, daimuron, desmedipham, desmetryn, dimefuron, dimethametryn, diuron, ethidimuron, fenuron, fluometuron, hexazinone, ioxynil, isoproturon, isouron, lenacil, linuron, metamitron, methabenzthiazuron, metobromuron, metoxuron, metribuzin, monolinuron, neburon, pentanochlor, phenmedipham, prometon, prometryn, propanil, propazine, pyridafol, pyridate, siduron, simazine, simetryn, tebuthiuron, terbacil, terbumeton, terbuthylazine, terbutryn and trietazine.

"AHAS inhibitors" (b2) are chemical compounds that inhibit acetohydroxy acid synthase (AHAS), also known as acetolactate synthase (ALS), and thus kill plants by inhibiting the production of the branched-chain aliphatic amino acids such as valine, leucine and isoleucine, which are required for DNA synthesis and cell growth. Examples of AHAS inhibitors include amidosulfuron, azimsulfuron, bensulfuron-methyl, bispyribac-sodium, cloransulam-methyl, chlorimuron-ethyl, chlorsulfuron, cinosulfuron, cyclosulfamuron, diclosulam, ethametsulfuron-methyl, ethoxysulfuron, flazasulfuron, florasulam, flucarbazone-sodium, flumetsulam, flupyrsulfuron-methyl, flupyrsulfuron-sodium, foramsulfuron, halosulfuron-methyl, imazamethabenz-methyl, imazamox, imazapic, imazapyr, imazaquin, imazethapyr, imazosulfuron, iodosulfuron-methyl (including sodium salt), iofensulfuron (2-iodo-*N*-[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl]benzenesulfonamide), mesosulfuron-methyl, metazosulfuron (3-chloro-4-(5,6-dihydro-5-methyl-1,4,2-dioxazin-3-yl)-*N*-[[(4,6-dimethoxy-2-pyrimidinyl)amino]carbonyl]-1-methyl-1*H*-pyrazole-5-sulfonamide), metosulam, metsulfuron-methyl, nicosulfuron, oxasulfuron, penoxsulam, primisulfuron-methyl, propoxycarbazone-sodium, propyrisulfuron (2-chloro-*N*-[[(4,6-dimethoxy-2-pyrimidinyl)amino]carbonyl]-6-propylimidazo[1,2-*b*]pyridazine-3-sulfonamide), prosulfuron, pyrazosulfuron-ethyl, pyribenzoxim, pyriftalid, pyriminobac-methyl, pyrithiobac-sodium, rimsulfuron, sulfometuron-methyl, sulfosulfuron, thiencarbazone,

thifensulfuron-methyl, triafamone (*N*-[2-[(4,6-dimethoxy-1,3,5-triazin-2-yl)carbonyl]-6-fluorophenyl]-1,1-difluoro-*N*-methylmethanesulfonamide), triasulfuron, tribenuron-methyl, trifloxysulfuron (including sodium salt), triflusulfuron-methyl and tritosulfuron.

"ACCase inhibitors" (b3) are chemical compounds that inhibit the acetyl-CoA carboxylase enzyme, which is responsible for catalyzing an early step in lipid and fatty acid synthesis in plants. Lipids are essential components of cell membranes, and without them, new cells cannot be produced. The inhibition of acetyl CoA carboxylase and the subsequent lack of lipid production leads to losses in cell membrane integrity, especially in regions of active growth such as meristems. Eventually shoot and rhizome growth ceases, and shoot meristems and rhizome buds begin to die back. Examples of ACCase inhibitors include alloxydim, butroxydim, clethodim, clodinafop, cycloxydim, cyhalofop, diclofop, fenoxaprop, fluazifop, haloxyfop, pinoxaden, profoxydim, propaquizafop, quizalofop, sethoxydim, tepraloxydim and tralkoxydim, including resolved forms such as fenoxaprop-P, fluazifop-P, haloxyfop-P and quizalofop-P and ester forms such as clodinafop-propargyl, cyhalofop-butyl, diclofop-methyl and fenoxaprop-P-ethyl.

Auxin is a plant hormone that regulates growth in many plant tissues. "Auxin mimics" (b4) are chemical compounds mimicking the plant growth hormone auxin, thus causing uncontrolled and disorganized growth leading to plant death in susceptible species. Examples of auxin mimics include aminocyclopyrachlor (6-amino-5-chloro-2-cyclopropyl-4-pyrimidinecarboxylic acid) and its methyl and ethyl esters and its sodium and potassium salts, aminopyralid, benazolin-ethyl, chloramben, clacyfos, clomeprop, clopyralid, dicamba, 2,4-D, 2,4-DB, dichlorprop, fluroxypyr, halauxifen (4-amino-3-chloro-6-(4-chloro-2-fluoro-3-methoxyphenyl)-2-pyridinecarboxylic acid), halauxifen-methyl (methyl 4-amino-3-chloro-6-(4-chloro-2-fluoro-3-methoxyphenyl)-2-pyridinecarboxylate), MCPA, MCPB, mecoprop, picloram, quinclorac, quinmerac, 2,3,6-TBA, triclopyr, and methyl 4-amino-3-chloro-6-(4-chloro-2-fluoro-3-methoxyphenyl)-5-fluoro-2-pyridinecarboxylate.

"EPSP (5-enol-pyruvylshikimate-3-phosphate) synthase inhibitors" (b5) are chemical compounds that inhibit the enzyme, 5-enol-pyruvylshikimate-3-phosphate synthase, which is involved in the synthesis of aromatic amino acids such as tyrosine, tryptophan and phenylalanine. EPSP inhibitor herbicides are readily absorbed through plant foliage and translocated in the phloem to the growing points. Glyphosate is a relatively nonselective postemergence herbicide that belongs to this group. Glyphosate includes esters and salts such as ammonium, isopropylammonium, potassium, sodium (including sesquisodium) and trimesium (alternatively named sulfosate).

"Photosystem I electron diverters" (b6) are chemical compounds that accept electrons from Photosystem I, and after several cycles, generate hydroxyl radicals. These radicals are extremely reactive and readily destroy unsaturated lipids, including membrane fatty acids and chlorophyll. This destroys cell membrane integrity, so that cells and organelles "leak",

leading to rapid leaf wilting and desiccation, and eventually to plant death. Examples of this second type of photosynthesis inhibitor include diquat and paraquat.

"PPO inhibitors" (b7) are chemical compounds that inhibit the enzyme protoporphyrinogen oxidase, quickly resulting in formation of highly reactive compounds in plants that rupture cell membranes, causing cell fluids to leak out. Examples of PPO inhibitors include acifluorfen-sodium, azafenidin, benzfendizone, bifenox, butafenacil, carfentrazone, carfentrazone-ethyl, chlomethoxyfen, cinidon-ethyl, fluazolate, flufenpyr-ethyl, flumiclorac-pentyl, flumioxazin, fluoroglycofen-ethyl, fluthiacet-methyl, fomesafen, halosafen, lactofen, oxadiargyl, oxadiazon, oxyfluorfen, pentoxazone, profluazol, pyraclonil, pyraflufen-ethyl, saflufenacil, sulfentrazone, thidiazimin, tiafenacil (methyl *N*-[2-[[2-chloro-5-[3,6-dihydro-3-methyl-2,6-dioxo-4-(trifluoromethyl)-1(2*H*)-pyrimidinyl]-4-fluorophenyl]thio]-1-oxopropyl]-β-alaninate) and 3-[7-fluoro-3,4-dihydro-3-oxo-4-(2-propyn-1-yl)-2*H*-1,4-benzoxazin-6-yl]dihydro-1,5-dimethyl-6-thioxo-1,3,5-triazine-2,4(1*H*,3*H*)-dione.

"GS (glutamine synthase) inhibitors" (b8) are chemical compounds that inhibit the activity of the glutamine synthetase enzyme, which plants use to convert ammonia into glutamine. Consequently, ammonia accumulates and glutamine levels decrease. Plant damage probably occurs due to the combined effects of ammonia toxicity and deficiency of amino acids required for other metabolic processes. The GS inhibitors include glufosinate and its esters and salts such as glufosinate-ammonium and other phosphinothricin derivatives, glufosinate-P ((2*S*)-2-amino-4-(hydroxymethylphosphinyl)butanoic acid) and bilanaphos.

"VLCFA (very long chain fatty acid) elongase inhibitors" (b9) are herbicides having a wide variety of chemical structures, which inhibit the elongase. Elongase is one of the enzymes located in or near chloroplasts which are involved in biosynthesis of VLCFAs. In plants, very-long-chain fatty acids are the main constituents of hydrophobic polymers that prevent desiccation at the leaf surface and provide stability to pollen grains. Such herbicides include acetochlor, alachlor, anilofos, butachlor, cafenstrole, dimethachlor, dimethenamid, diphenamid, fenoxasulfone (3-[[(2,5-dichloro-4-ethoxyphenyl)methyl]sulfonyl]-4,5-dihydro-5,5-dimethylisoxazole), fentrazamide, flufenacet, indanofan, mefenacet, metazachlor, metolachlor, naproanilide, napropamide, napropamide-M ((2R)-*N*,*N*-diethyl-2-(1-naphthalenyloxy)propanamide), pethoxamid, piperophos, pretilachlor, propachlor, propisochlor, pyroxasulfone, and thenylchlor, including resolved forms such as S-metolachlor and chloroacetamides and oxyacetamides.

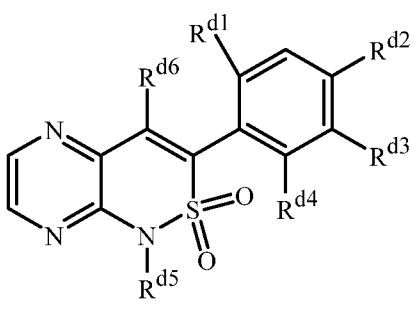
"Auxin transport inhibitors" (b10) are chemical substances that inhibit auxin transport in plants, such as by binding with an auxin-carrier protein. Examples of auxin transport inhibitors include diflufenzopyr, naptalam (also known as *N*-(1-naphthyl)phthalamic acid and 2-[(1-naphthalenylamino)carbonyl]benzoic acid).

"PDS (phytoene desaturase inhibitors) (b11) are chemical compounds that inhibit carotenoid biosynthesis pathway at the phytoene desaturase step. Examples of PDS inhibitors include beflubutamid, diflufenican, fluridone, flurochloridone, flurtamone norflurzon and picolinafen.

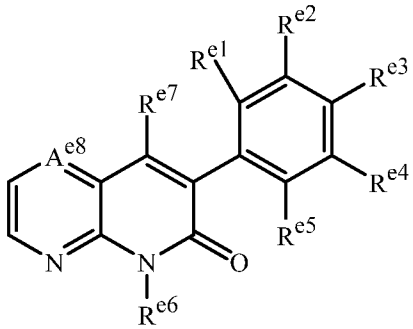
"HPPD (4-hydroxyphenyl-pyruvate dioxygenase) inhibitors" (b12) are chemical substances that inhibit the biosynthesis of synthesis of 4-hydroxyphenyl-pyruvate dioxygenase. Examples of HPPD inhibitors include benzobicyclon, benzofenap, bicyclopyrone (4-hydroxy-3-[[2-[(2-methoxyethoxy)methyl]-6-(trifluoromethyl)-3-pyridinyl]carbonyl]bicyclo[3.2.1]oct-3-en-2-one), fenquinotrione (2-[[8-chloro-3,4-dihydro-4-(4-methoxyphenyl)-3-oxo-2-quinoxalinyl]carbonyl]-1,3-cyclohexanedione), isoxachlortole, isoxaflutole, mesotrione, pyrasulfotole, pyrazolynate, pyrazoxyfen, sulcotrione, tefuryltrione, tembotrione, topramezone, 5-chloro-3-[(2-hydroxy-6-oxo-1-cyclohexen-1-yl)carbonyl]-1-(4-methoxyphenyl)-2(1*H*)-quinoxalinone, 4-(2,6-diethyl-4-methylphenyl)-5-hydroxy-2,6-dimethyl-3(2*H*)-pyridazinone, 4-(4-fluorophenyl)-6-[(2-hydroxy-6-oxo-1-cyclohexen-1-yl)carbonyl]-2-methyl-1,2,4-triazine-3,5(2*H*,4*H*)-dione, 5-[(2-hydroxy-6-oxo-1-cyclohexen-1-yl)carbonyl]-2-(3-methoxyphenyl)-3-(3-methoxypropyl)-4(3*H*)-pyrimidinone, 2-methyl-*N*-(4-methyl-1,2,5-oxadiazol-3-yl)-3-(methylsulfinyl)-4-(trifluoromethyl)benzamide and 2-methyl-3-(methylsulfonyl)-*N*-(1-methyl-1*H*-tetrazol-5-yl)-4-(trifluoromethyl)benzamide.

HST (homogentisate solenesyltranserase) inhibitors (b13) disrupt a plant's ability to convert homogentisate to 2-methyl-6-solanyl-1,4-benzoquinone, thereby disrupting carotenoid biosynthesis. Examples of HST inhibitors include haloxydine, pyriclor, 3-(2-chloro-3,6-difluorophenyl)-4-hydroxy-1-methyl-1,5-naphthyridin-2(1*H*)-one, 7-(3,5-dichloro-4-pyridinyl)-5-(2,2-difluoroethyl)-8-hydroxypyrido[2,3-*b*]pyrazin-6(5*H*)-one and 4-(2,6-diethyl-4-methylphenyl)-5-hydroxy-2,6-dimethyl-3(2*H*)-pyridazinone.

HST inhibitors also include compounds of Formulae **A** and **B**.



A



B

wherein R^{d1} is H, Cl or CF_3; R^{d2} is H, Cl or Br; R^{d3} is H or Cl; R^{d4} is H, Cl or CF_3; R^{d5} is CH_3, CH_2CH_3 or CH_2CHF_2; and R^{d6} is OH, or -OC(=O)-*i*-Pr; and R^{e1} is H, F, Cl, CH_3 or CH_2CH_3; R^{e2} is H or CF_3; R^{e3} is H, CH_3 or CH_2CH_3; R^{e4} is H, F or Br; R^{e5} is Cl,

CH_3, CF_3, OCF_3 or CH_2CH_3; R^{e6} is H, CH_3, CH_2CHF_2 or C≡CH; R^{e7} is OH, -OC(=O)Et, -OC(=O)-*i*-Pr or -OC(=O)-*t*-Bu; and A^{e8} is N or CH.

Cellulose biosynthesis inhibitors (b14) inhibit the biosynthesis of cellulose in certain plants. They are most effective when using a pre-aplication or early post-application on young or rapidly growing plants. Examples of cellulose biosynthesis inhibitors include chlorthiamid, dichlobenil, flupoxam, indaziflam (N^2-[(1*R*,2*S*)-2,3-dihydro-2,6-dimethyl-1*H*-inden-1-yl]-6-(1-fluoroethyl)-1,3,5-triazine-2,4-diamine), isoxaben and triaziflam.

Other herbicides (b15) include herbicides that act through a variety of different modes of action such as mitotic disruptors (e.g., flamprop-M-methyl and flamprop-M-isopropyl) organic arsenicals (e.g., DSMA, and MSMA), 7,8-dihydropteroate synthase inhibitors, chloroplast isoprenoid synthesis inhibitors and cell-wall biosynthesis inhibitors. Other herbicides include those herbicides having unknown modes of action or do not fall into a specific category listed in (b1) through (b14) or act through a combination of modes of action listed above. Examples of other herbicides include aclonifen, asulam, amitrole, bromobutide, cinmethylin, clomazone, cumyluron, cyclopyrimorate (6-chloro-3-(2-cyclopropyl-6-methylphenoxy)-4-pyridazinyl 4-morpholinecarboxylate), daimuron, difenzoquat, etobenzanid, fluometuron, flurenol, fosamine, fosamine-ammonium, dazomet, dymron, ipfencarbazone (1-(2,4-dichlorophenyl)-*N*-(2,4-difluorophenyl)-1,5-dihydro-*N*-(1-methylethyl)-5-oxo-4*H*-1,2,4-triazole-4-carboxamide), metam, methyldymron, oleic acid, oxaziclomefone, pelargonic acid, pyributicarb and 5-[[(2,6-difluorophenyl)methoxy]methyl]-4,5-dihydro-5-methyl-3-(3-methyl-2-thienyl)isoxazole.

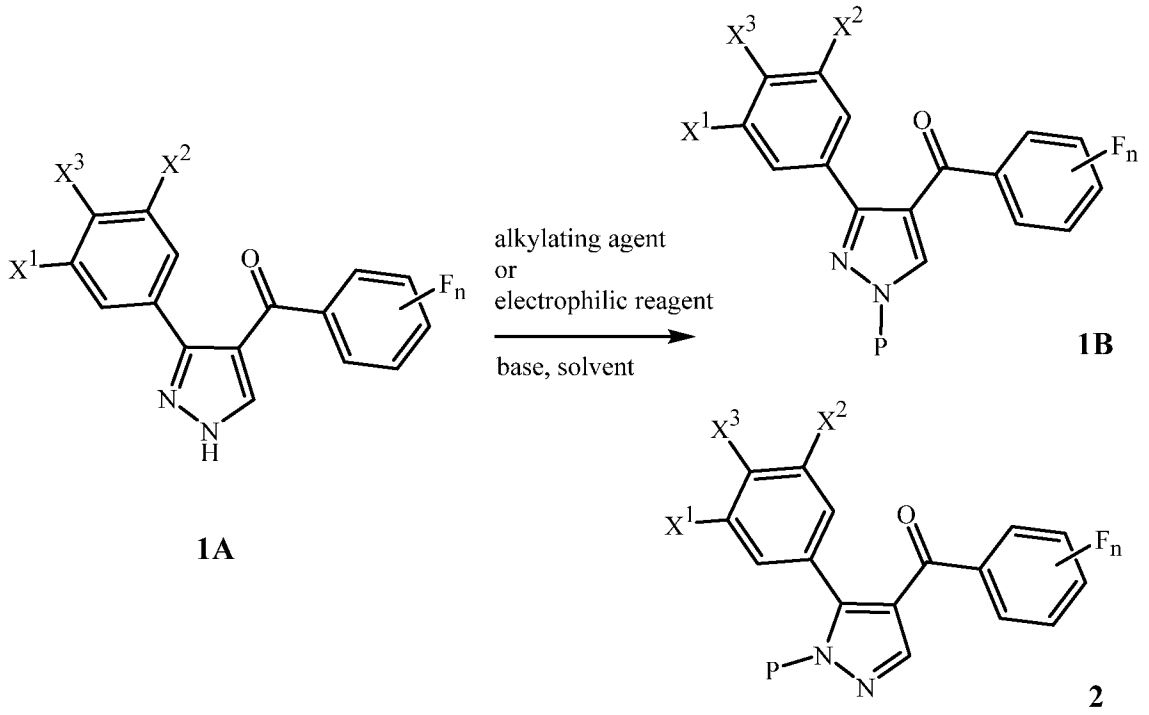
"Herbicide safeners" (b16) are substances added to a herbicide formulation to eliminate or reduce phytotoxic effects of the herbicide to certain crops. These compounds protect crops from injury by herbicides but typically do not prevent the herbicide from controlling undesired vegetation. Examples of herbicide safeners include but are not limited to benoxacor, cloquintocet-mexyl, cumyluron, cyometrinil, cyprosulfamide, daimuron, dichlormid, dicyclonon, dimepiperate, fenchlorazole-ethyl, fenclorim, flurazole, fluxofenim, furilazole, isoxadifen-ethyl, mefenpyr-diethyl, mephenate, methoxyphenone, naphthalic anhydride, oxabetrinil, *N*-(aminocarbonyl)-2-methylbenzenesulfonamide and *N*-(aminocarbonyl)-2-fluorobenzenesulfonamide, 1-bromo-4-[(chloromethyl)sulfonyl]benzene, 2-(dichloromethyl)-2-methyl-1,3-dioxolane (MG 191), 4-(dichloroacetyl)-1-oxa-4-azospiro[4.5]decane (MON 4660).

The compounds of Formula **1** can be prepared by general methods known in the art of synthetic organic chemistry. One or more of the following methods and variations as described in Schemes 1–10 can be used to prepare compounds of Formula **1**. The definitions of X^1, X^2, X^3, n and P in the compounds of Formulae **1**–**17** below are as defined above in the Summary of the Invention unless otherwise noted. A compound of Formulae **1A**, **1B**, and **1C** are subsets of Formula **1**, and all substituents for compounds of Formulae **1A**, **1B**

and **1C** are as defined above for a compound of Formula **1** unless otherwise noted. A compound of Formulae **10A** and **10B** are subsets of Formula **10**, and all substituents for compounds of Formulae **10A** and **10B** are as defined above for a compound of Formula **10** unless otherwise noted.

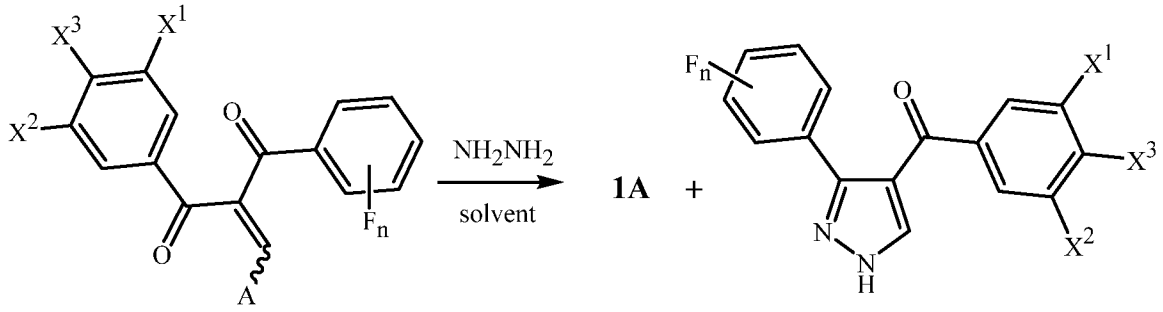
As shown in Scheme 1, pyrazoles of Formula **1A** (a subset of compounds of Formula **1** where P is hydrogen) can be alkylated or allowed to react with a suitable electrophilic reagent in the presence of base in an appropriate solvent to afford compounds of Formulae **1B** where P is other than H as defined for compounds of Formulae **1** in the Summary of the Invention. Although shown as only one tautomer where the exchangeable ring hydrogen resides on the nitrogen with no adjacent substituents, pyrazoles of Formula **1A** can exist in equilibrium with a tautomeric species where the ring hydrogen resides on the pyrazole nitrogen adjacent to the aryl substituent. Compounds of Formula **1B** are generally formed as the predominant product due to preferred alkylation at the less sterically hindered pyrazole ring nitrogen but some alkylation of the other pyrazole ring nitrogen adjacent to the aryl ring can take place through tautomerization to give the regioisomer pyrazole of Formula **2.** However, isomeric pyrazoles of Formula **2** are generally obtained as minor products relative to pyrazoles of Formula **1B**. The relative amounts of regioisomeric pyrazoles of Formulae **1B** and **2** formed can vary depending on substituents present on pyrazoles of Formula **1A** and the specific alkylation method used. Pyrazoles of Formula **1A** can be treated initially with base to form a carbanionic species that is then allowed to react with the alkylating agent or electrophilic reagent. Alternatively, base and electrophile can be added simultaneously in some cases to compounds of Formula **1A** previously dissolved in solvent. Examples of suitable bases for this reaction include but are not limited to potassium carbonate, sodium hydroxide, potassium hydroxide, sodium hydride, potassium *t*-butoxide and, depending on the specific base used, appropriate solvents can be protic or aprotic and used anhydrous or as an aqueous mixture. Some examples of solvents include acetonitrile, methanol, ethanol, tetrahydrofuran, diethyl ether, dioxane, dichloromethane or *N*,*N*-dimethylformamide. The reaction can be run at a range of temperatures, with temperatures typically ranging from 0 °C to the reflux temperature of the solvent.

Scheme 1



A non-regioselective method for making pyrazoles of Formula **1A** is outlined in Scheme 2. By the method taught in Example 2 of U.S. Pat. No. 5,939,559, or following the method described in *J. Heterocyclic Chem.* **1982**, *19*, 1355, hydrazine (anhydrous or the hydrate) can be cyclized with substituted 2-methylene-1,3-pentanediones of Formulae **3** (where A serves as a leaving group such as dimethylamino, ethoxy or methoxy) in a protic or aprotic solvent such as acetonitrile, methanol, ethanol or *N*,*N*-dimethylformamide to afford regioisomeric pyrazole mixtures of **1A** and **4** that are separated via chromatography and/or fractional crystallization. Temperatures for this reaction typically range from 0 °C to the reflux temperature of the solvent. Pyrazoles of Formulae **1A** and **4** can exist as tautomeric species via isomerization where the exchangeable hydrogen can reside on either ring nitrogen, although this hydrogen is shown in the compounds of Formulae **1A** and **4** to reside of the ring nitrogen furthest from the aryl group. The ratio of pyrazoles of Formulae **1A** and **4** formed in this reaction can vary depending on substitution on the substitution on the intermediate compound of Formula **3** and the reaction conditions employed.

Scheme 2

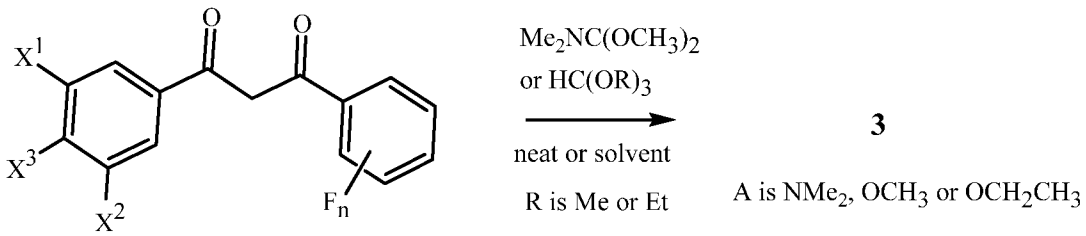


3 **4**

A is NMe_2, OCH_3 or OCH_2CH_3

Substituted 2-methylene-1,3-pentanediones of Formula **3**, where A is a leaving group such dimethylamino, ethoxy or methoxy, can be made by reacting substituted diaryl-1,3-pentanediones of Formula **5** with *N,N*-dimethylformamide dimethylacetal or a trialkyl orthoformate such as $HC(OMe)_3$ or $HC(OEt)_3$ neat or in a suitable solvent such as acetonitrile, methanol, ethanol, tetrahydrofuran, dioxane, toluene, dichloromethane or *N,N*-dimethylformamide. Temperatures for this reaction generally range from 25 °C to the reflux temperature of the neat mixture or solvent.

Scheme 3

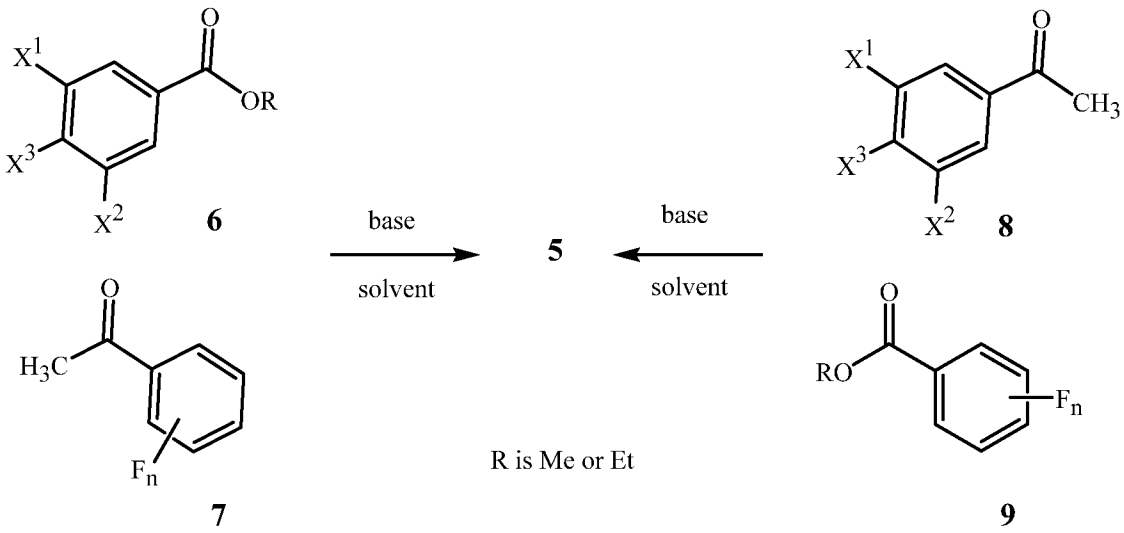


5

Methods to make substituted 1,3-diaryl-1,3-pentanediones of Formula **5** are well established with many procedures documented in the literature. For example, see *Synth. Comm.* **2007**, *37*(23), 4111-4115, *Org. Lett.* **2005**, *7*(3), 455-458, U.S. 20130137688, *Tetrahedron Lett.* **2003**, *44*(5) 1067-1069 and *Med. Chem. Res.* **2012**, *21*(5), 584-589. A particularly useful method for making diones of Formula **5** involves base-catalyzed coupling of an appropriately substituted acetophenone with a substituted benzoate by the procedure described in Example 1 of U.S. Pat. No. 5,939,559. As outlined in Scheme 4, benzoates of Formula **6** (generally where R is ethyl or methyl) are allowed to react with a fluoroacetophenone of Formula **7** in the presence of a suitable base, i.e. sodium hydride, a sodium alkoxide or potassium t-butoxide in a solvent such as tetrahydrofuran, dioxane, *N,N*-dimethylformamide or a protic alcohol solvent such as methanol or ethanol at temperatures ranging from 0 °C to the reflux temperature of the solvent. Alternatively, substituted acetophenones of Formula **8** can undergo base-catalyzed coupling with a

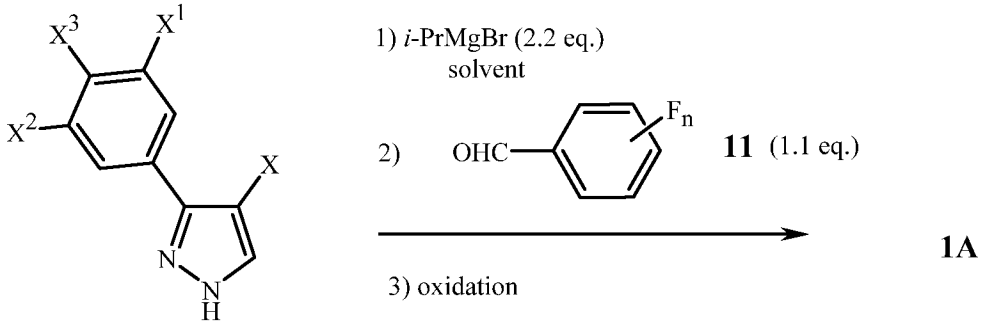
fluorobenzoate of Formula **9** under the same reaction conditions to provide diones of Formula **5**.

Scheme 4



A regioselective route for making pyrazoles of Formula **1A** entails a Grignard catalyzed coupling of an unprotected 3-phenyl-4-iodopyrazole of Formula **10A** with a fluorobenzaldehyde of Formula **11**. As shown in Scheme 5, this reaction can be performed in a suitable solvent such as tetrahydrofuran, dioxane or diethyl ether at temperatures ranging from 0 °C to the reflux temperature of the solvent. A preferred Grignard reagent used to generate the pyrazole Grignard compound of Formula **10A** for coupling with an appropriate fluorobenzaldehyde is isopropylmagnesium bromide where over 2 equivalents are added to the compound of Formula **10A** due to the exchangeable pyrazole ring proton present on the compound of Formula **10A**. The formed alcohol adduct is oxidized directly with an appropriate oxidizing reagent such as Jones Reagent, magnesium dioxide or pyridinium chlorochromate, TEMPO or Fehling's solution, to afford pyrazole ketones of Formula **1A**. The Grignard coupling described in Scheme 5 also works for 3-phenyl-4-bromopyrazoles but 3-phenyl-4-iodopyrazoles are generally preferred.

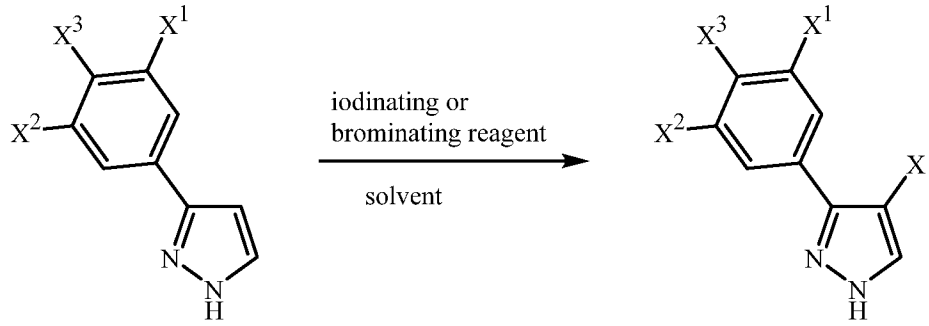
Scheme 5



10A (X=I)

As shown in Scheme 6, iodopyrazoles of Formula **10A** are readily made by iodination of pyrazoles of Formula **12** in the presence of an iodinating reagent such as *N*-iodosuccinimide or ICl in a solvent such as acetonitrile, tetrahydrofuran, dioxane or *N*,*N*-dimethylformamide and at temperatures ranging from 0 °C to the reflux temperature of the solvent. Bromination of pyrazoles of Formula **12** with a brominating agent such as bromine or *N*-bromosuccinimide gives the corresponding 3-phenyl-4-bromopyrazols of Formula **10B**.

Scheme 6



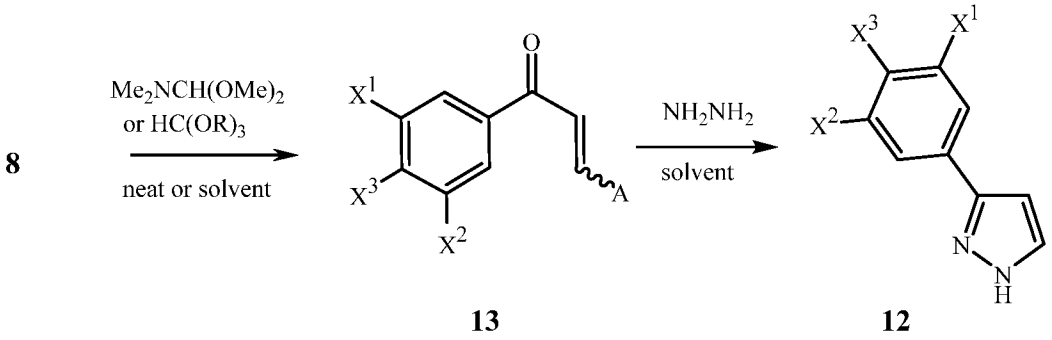
12

10A (X = I)
10B (X = Br)

Substituted 3-phenylpyrazoles of Formula **12** are readily made by the route outlined in Scheme 7. Stirrring substituted acetophenones of Formula **8** with *N*,*N*-dimethylformamide dimethylacetal or a trialkyl orthoformate such as $HC(OMe)_3$ or $HC(OEt)_3$ neat or in a solvent such as acetonitrile, methanol, ethanol, tetrahydrofuran, dioxane, toluene, dichloromethane or *N*,*N*-dimethylformamide, at a temperature ranging from 25 °C to the reflux temperature of the neat mixture or solvent, gives enone intermediates of Formula **13** (where A is a leaving group that is generally dimethylamino, ethoxy or methoxy). Cyclization of a compound of Formula **13** with hydrazine (anhydrous or the hydrate) in a protic or aprotic solvent, i.e. acetonitrile, methanol, ethanol or *N*,*N*-dimethylformamide gives phenylpyrazoles of Formula **12**. Temperatures for this reaction can range from 0 °C to the

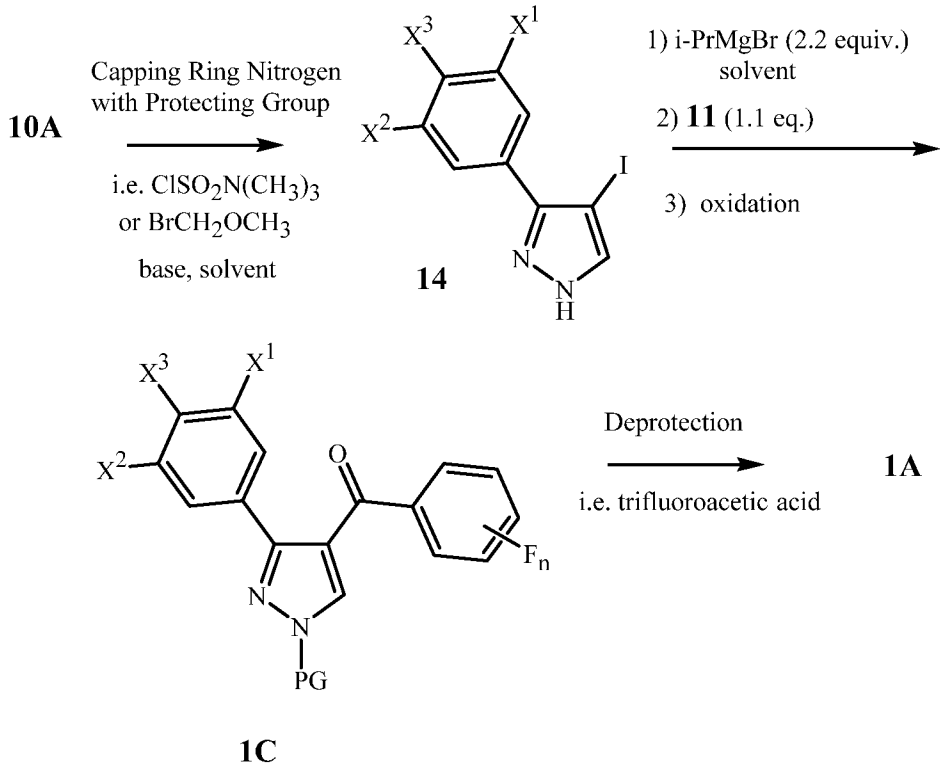
reflux temperature of the solvent. The chemistry methods described in Schemes 6 and 7 have literature precedence as illustrated in WO2013/062887 and *Tetrahedron* **2003**, *59*(4), 555-560.

Scheme 7



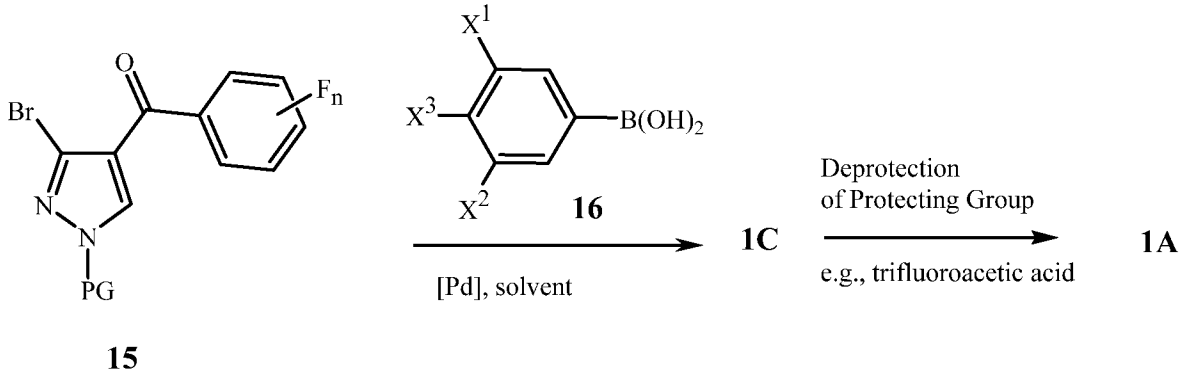
The ring nitrogen on 3-phenyl-4-iodopyrazoles of Formula **10A** can also be protected with an appropriate capping group (e.g., *N,N*-dimethylsulfonyl ($-SO_2N(CH_3)_2$), methoxymethyl ($-CH_2OCH_3$) or benzyl carbamate (cbz)) before generating the Grignard for addition to benzaldehydes of Formula **11** as shown in Scheme 8. For example, reaction of a compound of Formula **10A** with *N,N*-dimethyl chlorosulfonylamine or bromomethylether in the presence of base (i.e. potassium carbonate or sodium hydride) in a solvent (tetrahydrofuran, dioxane, acetonitrile, toluene or *N,N*-dimethylformamide) affords *N*-protected pyrazoles **14** where P is $SO_2N(CH_3)$ or CH_2OCH_3. Coupling of a compound of Formula **14** with isopropylmagnesium bromide gives the pyrazole Grignard that on reaction with fluorobenzaldehydes of Formula **11** in solvent, i.e. tetrahydrofuran, dioxane or diethyl ether, at temperatures ranging from 0 °C to the reflux temperature of the solvent gives alcohol intermediates that are oxidized to pyrazole ketones **1C** (i.e.a subset of Formula **1** where P is $SO_2N(CH_3)$ or CH_2OCH_3). The oxidation of alcohol to ketone is usually accomplished with Jones Reagent but other oxidants can be used. A preferred Grignard reagent for generating the *N*-protected pyrazole Grignard is isopropylmagnesium bromide where 1.1 to 1.2 equivalents are generally used. The *N*-protected 3-phenylpyrazole phenyl ketones of Formula **1C** are sometimes the intended synthetic target as a further subset of **1B** but can also be converted to pyrazoles of Formula **1A** by removal of the *N*-protecting group with an appropriate reagent such as an acid. Trifluoroacetic acid works well for de-protection when PG is $SO_2N(CH_3)_2$.

Scheme 8



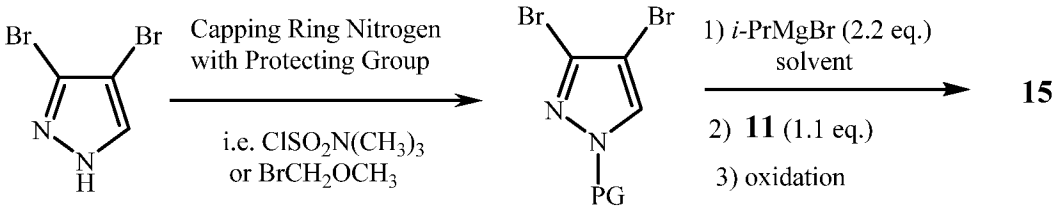
An alternative regioselective method for making 3-phenyl-4-flurobenzoyl pyrazoles of Formula **1A** is summarized in Scheme 9. Nitrogen-protected 3-bromo-4-fluorobenzoyl pyrazoles of Formula **15** can be cross-coupled with aryl boronic acids of Formula **16** in the presence of a palladium catalyst such as tetrakis(triphenylphosphine)palladium or dichloro-bis-(triphenylphosphine)palladium, optionally with a base such as a metal carbonate or tertiary amine, in solvents solvents such as dioxane, *N*,*N*-dimethylformamide, tetrahydrofuran or toluene at temperatures normally ranging from 25 °C to the reflux temperature of the solvent to give N-protected 3-phenyl-4-fluorobenzoyl pyrazoles of Formula **1C** that on de-protection provides compounds of Formula **1A**. Protecting groups PG and de-protection conditions are the same as that described for Scheme 8.

Scheme 9



Scheme 10 outlines the preparation of *N*-protected 3-bromopyrazole ketone intermediates of Formula **15** where a protecting group is first placed on the ring nitrogen of 3,4-dibromopyrazole to give *N*-protected-3,4-dibromopyrazoles **17**. Suitable protecting groups (PG) and reaction conditions are the same as that described in Scheme 8. Conditions for selective Grignard formation at the 4-pyrazole position, addition to fluorobenzaldehydes of Formula **11** to give alcohols that are oxidized to pyrazole ketones of Formual **16** is also the same as that in Scheme 8. Grignard formation at the 3-pyrazole position is generally not competitive with Grignard formation at the 4-positon which allows for limited side product formation. For literature methods to make *N,N*-dimethylsulfonyl pyrazoles of Formula **17** where PG is $SO_2N(CH_3)_2$, see WO2011/102399, WO2007/014290 and *Synthesis* **2006**, (5), 793-798.

Scheme 10



It is recognized by one skilled in the art that various functional groups can be converted into others to provide different compounds of Formula **1**. For a valuable resource that illustrates the interconversion of functional groups in a simple and straightforward fashion, see Larock, R. C., *Comprehensive Organic Transformations: A Guide to Functional Group Preparations, 2nd Ed.*, Wiley-VCH, New York, 1999. For example, intermediates for the preparation of compounds of Formula **1** may contain aromatic nitro groups, which can be reduced to amino groups, and then be converted via reactions well known in the art such as the Sandmeyer reaction, to various halides, providing compounds of Formula **1**. The above reactions can also in many cases be performed in alternate order

It is recognized that some reagents and reaction conditions described above for preparing compounds of Formula **1** may not be compatible with certain functionalities present in the intermediates. In these instances, the incorporation of protection/deprotection sequences or functional group interconversions into the synthesis will aid in obtaining the desired products. The use and choice of the protecting groups will be apparent to one skilled in chemical synthesis (see, for example, Greene, T. W.; Wuts, P. G. M. *Protective Groups in Organic Synthesis*, 2nd ed.; Wiley: New York, 1991). One skilled in the art will recognize that, in some cases, after the introduction of a given reagent as it is depicted in any individual scheme, it may be necessary to perform additional routine synthetic steps not described in detail to complete the synthesis of compounds of Formula **1**. One skilled in the

art will also recognize that it may be necessary to perform a combination of the steps illustrated in the above schemes in an order other than that implied by the particular presented to prepare the compounds of Formula **1**.

One skilled in the art will also recognize that compounds of Formula **1** and the intermediates described herein can be subjected to various electrophilic, nucleophilic, radical, organometallic, oxidation, and reduction reactions to add substituents or modify existing substituents.

Without further elaboration, it is believed that one skilled in the art using the preceding description can utilize the present invention to its fullest extent. The following Examples are, therefore, to be construed as merely illustrative, and not limiting of the disclosure in any way whatsoever. Steps in the following Examples illustrate a procedure for each step in an overall synthetic transformation, and the starting material for each step may not have necessarily been prepared by a particular preparative run whose procedure is described in other Examples or Steps. Percentages are by weight except for chromatographic solvent mixtures or where otherwise indicated. Parts and percentages for chromatographic solvent mixtures are by volume unless otherwise indicated. ^{1}H NMR spectra are reported in ppm downfield from tetramethylsilane in $CDCl_3$ at 500 MHz unless otherwise indicated; "s" means singlet, "d" means doublet, "t" means triplet, "td" means triplet of doublets, "m" means multiplet, "dd" means doublet of doublets, "ddd" means doublet of double doublets, and "br s" means broad singlet.

SYNTHESIS EXAMPLE 1

Preparation of [3-(3,5-dichlorophenyl)-1*H*-pyrazol-4-yl](3-fluorophenyl)methanone (Compound 6)

Step A: Preparation of 3,4-dibromo-*N*,*N*-dimethyl-1*H*-pyrazole-1-sulfonamide

Triethylamine (8.0 mL, 57 mmol) was slowly added to a mixture of 3,4-dibromo-1*H*-pyrazole (10 g, 44 mmol) and dimethylsulfamoyl chloride (5.3 mL, 49 mmol) in dichloromethane (30 mL) at ambient temperature. After stirring for 24 h, water was added, and the reaction mixture was extracted with dichloromethane. The organic extract was dried over $MgSO_4$, filtered and concentrated. The concentrated material was filtered through a short pad of silica gel eluting with diethyl ether to give 15 g of a clear yellow oil.

^{1}H NMR δ ppm 7.92 (s, 1H), 3.00 (s, 6H).

Step B: Preparation of 3-bromo-4-[(3-fluorophenyl)hydroxymethyl]-*N*,*N*-dimethyl-1*H*-pyrazole-1-sulfonamide

Isopropylmagnesium bromide (6.0 mL, 2.9 M in 2-methyltetrahydrofuran, 12 mmol) was added dropwise to a stirred solution of 3,4-dibromo-*N*,*N*-dimethyl-1*H*-pyrazole-1-sulfonamide (i.e. the product obtained in Step A above) (4.0 g, 12 mmol) in tetrahydrofuran (12 mL) at –5 °C. The reaction mixture was stirred at 0 °C for 1 h, then

3-fluorobenzaldehyde (3.8 mL, 36 mmol) was added, and the mixture was stirred for 16 h at ambient temperature. After cooling to 0 °C, the reaction was quenched with saturated aqueous ammonium chloride, and extracted with dichloromethane. The organic extract was dried over $MgSO_4$, filtered, concentrated and purified by silica gel column chromatography, eluting with a 0 to 70% gradient of ethyl acetate in hexanes to give a yellow oil (0.23 g).

^{1}H NMR δ ppm 7.72 (s, 1H), 7.35 (m, 1H), 7.15 (m, 2H), 7.00 (m, 1H), 5.78 (s, 1H), 2.98 (s, 6H).

Step C: Preparation of 3-bromo-4-(3-fluorobenzoyl)-*N*,*N*-dimethyl-1*H*-pyrazole-1-sulfonamide

To a solution of 3-bromo-4-[(3-fluorophenyl)hydroxymethyl]-*N*,*N*-dimethyl-1*H*-pyrazole-1-sulfonamide (i.e. the product obtained in Step B above) (0.23 g, 0.61 mmol) in acetone (5.0 mL) at 0 °C was added Jones Reagent (0.6 mL, 2.7 M CrO_3/H_2SO_4 in H_2O). The resulting solution was stirred at 0 °C for 1 h. Saturated aqueous $NaHCO_3$ was added and the mixture was then extracted with dichloromethane. The organic extract was dried over $MgSO_4$, filtered, and concentrated to give a yellow oil (0.22 g).

^{1}H NMR δ ppm 8.19 (s, 1H), 7.60 (d, 1H), 7.50 (m, 2H), 7.30 (t, 1H), 3.05 (s, 6H).

Step D: Preparation of 3-(3,5-dichlorophenyl)-4-(3-fluorobenzoyl)-*N*,*N*-dimethyl-1*H*-pyrazole-1-sulfonamide

A solution of 3-bromo-4-(3-fluorobenzoyl)-*N*,*N*-dimethyl-1*H*-pyrazole-1-sulfonamide (i.e. the product obtained in Step C above) (1.1 g, 2.8 mmol) in dioxane (30 mL) was purged with N_2 for 15 min. After adding tetrakis(triphenylphosphine)palladium (0.23 g, 0.20 mmol), followed by 3,5-dichlorobenzene boronic acid (0.64 g, 3.3 mmol), potassium phosphate (0.89 g, 4.2 mmol) and water (5.0 mL), the mixture was heated to 100 °C for 16 h. The reaction was cooled to ambient temperature, water was added, and the reaction was then extracted with dichloromethane. The extract was dried over $MgSO_4$ and filtered. The filtrate was concentrated onto Celite® diatomaceaous earth filter aid and purified by silica gel column chromatography, eluting with a 0 to 50% gradient of ethyl acetate in hexanes to yield a clear oil (0.60 g).

^{1}H NMR δ ppm 8.29 (s, 1H), 7.63 (d, *J*=1.89 Hz, 2H), 7.58 (m, 1H), 7.53 (dd, *J*=7.80, 1.18 Hz, 1H), 7.46 (m, 1H), 7.39 (m, 1H), 7.32 (m, 1 H), 3.08 (s, 6H).

Step E: Preparation of [3-(3,5-Dichlorophenyl)-1*H*-pyrazol-4-yl](3-fluorophenyl)methanone

Trifluoroacetic acid (3.0 mL) was added to 3-(3,5-dichlorophenyl)-4-(3-fluorobenzoyl)-*N*,*N*-dimethyl-1*H*-pyrazole-1-sulfonamide (i.e. the product obtained in Step D above) (0.60 g, 1.8 mmol) in dichloromethane (3.0 mL) and stirred at ambient temperature for 16 h. The reaction mixture was slowly poured into an ice-cooled aqueous solution of sodium bicarbonate and extracted with dichloromethane. The extract was dried

over $MgSO_4$ and filtered. The filtrate was concentrated onto Celite® diatomaceaous earth filter aid and purified by silica gel column chromatography, eluting with a 0 to 40% gradient of ethyl acetate in hexanes to yield a white solid (98 mg). M.P. = 158–160 °C.

^{1}H NMR δ ppm 10.5 (br s, 1H), 7.97 (s, 1H), 7.58 (m, 3H), 7.48 (m, 1H), 7.43 (m, 1H), 7.37 (s, 1H), 7.29 (m, 1H).

SYNTHESIS EXAMPLE 2

Preparation of (2-fluorophenyl)[3-(3,4,5-trichlorophenyl)-1*H*-pyrazol-4-yl]methanone (Compound 19)

Step A: Preparation of 4-amino-3,5-dichlorobenzoic acid methyl ester

A solution of 4-amino-3,5-dichlorobenzoic acid (8.6 g, 42 mmol) in methanol (140 mL) was cooled to 0 °C. While maintaining the temperature at 0 °C, thionyl chloride (6.4 mL, 88 mmol) was added dropwise to the reaction. The reaction was allowed to slowly warm to ambient temperature over 16 h. The reaction mixture was concentrated. Water was added, and the mixture was extracted with ethyl acetate. The organic extract was washed sequentially with aqueous saturated $NaHCO_3$, water, then saturated NaCl solution. The extract was dried over $MgSO_4$, filtered and the filtrate concentrated to give a brown solid (9.4 g).

^{1}H NMR δ ppm 7.88 (s, 2H), 4.90 (br s, 2H), 3.87 (s, 3H).

Step B: Preparation of 3,4,5-trichlorobenzoic acid methyl ester

Isopentyl nitrite (3.7 mL, 27 mmol) was slowly added to a mixture of 4-amino-3,5-dichlorobenzoic acid methyl ester (i.e. the product obtained in Step A above) (2.0 g, 9.1 mmol) in acetonitrile (90 mL), containing copper(I) chloride (1.8 g, 18 mmol) and copper (II) chloride (3.7 g, 27 mmol), at ambient temperature. The reaction was stirred for 1 h. Thin layer chromatography confirmed consumption of the starting material. The reaction mixture was slowly poured into ice-water cooled 1 N aqueous hydrochloric acid and extracted with diethyl ether. The organic extract was dried over $MgSO_4$, filtered and concentrated to give 2.3 g of a tan solid.

^{1}H NMR δ ppm 8.03 (s, 2H), 3.94 (s, 3H).

Step C: Preparation of 1-(2-fluorophenyl)-3-(3,4,5-trichlorophenyl)-1,3-propanedione

To a solution of tetrahydrofuran (20 mL) and sodium hydride (60% dispersion in mineral oil, 0.33 g, 8.3 mmol) was added 2'-fluoroacetophenone (0.56 mL, 4.6 mmol), followed by 3,4,5-trichlorobenzoic acid methyl ester (i.e. the product obtained in Step B above) (1.1 g, 4.6 mmol). The mixture was heated to reflux for 24 h. After cooling to ambient temperature, 1 N aqueous hydrochloric acid was added and the mixture was extracted three times with dichloromethane. The extracts were combined, dried over $MgSO_4$ and filtered. The filtrate was concentrated to give 1.7 g of a light brown solid, which was used without further purification.

Step D: Preparation of 2-[(dimethylamino)methylene]-1-(2-fluorophenyl)-3-(3,4,5-trichlorophenyl)-1,3-propanedione

To the product of Step C above (i.e. 1-(2-fluorophenyl)-3-(3,4,5-trichlorophenyl)-1,3-propanedione) (1.7 g) was added *N*,*N*-dimethylformamide dimethylacetal (20 mL). The solution was stirred for 3 d at ambient temperature. The reaction mixture was concentrated onto Celite® diatomaceaous earth filter aid and purified by silica gel column chromatography, eluting with a 0 to 100% gradient of ethyl acetate in hexanes to yield the desired product as a clear amber oil (0.24 g).

^{1}H NMR δ ppm 7.62 (m, 2H), 7.40 (m, 1H), 7.28 (m, 2H), 7.05 (t, 1H), 6.90 (t, 1H), 3.34 (br s, 3H), 2.80 (br s, 3H).

Step E: Preparation of (2-fluorophenyl)[3-(3,4,5-trichlorophenyl)-1*H*-pyrazol-4-yl]methanone

To 2-[(dimethylamino)methylene]-1-(2-fluorophenyl)-3-(3,4,5-trichlorophenyl)-1,3-propanedione (i.e. the product obtained in Step D above) (0.24 g, 0.60 mmol) in ethanol (20 mL) was added hydrazine hydrate (68 μL, 55% by weight in water, 1.2 mmol). The resulting mixture was stirred at ambient temperature for 24 h, then concentrated onto Celite and purified by silica gel column chromatography, eluting with a 0 to 40 % gradient of ethyl acetate in hexanes. After concentration, the product was crystallized from 1-chlorobutane to yield a light beige solid (0.18 g).M.P. = 187–189 °C.

^{1}H NMR δ ppm 10.5 (br s, 1H), 7.95 (m, 1H), 7.78 (m, 2H), 7.58 (m, 1H), 7.50 (m, 1H), 7.24 (m, 1H), 7.06 (m, 1H).

SYNTHESIS EXAMPLE 3

Preparation of [3-(3,5-dichlorophenyl)-1*H*-pyrazol-4-yl](2-fluorophenyl)methanone (Compound 18)

Step A: Preparation of 1-(3,5-dichlorophenyl)-3-(2-fluorophenyl)-1,3-propanedione

To a solution of tetrahydrofuran (20 mL) and sodium hydride (60% dispersion in mineral oil, 0.35 g, 8.7 mmol) was added 2'-fluoroacetophenone (0.59 mL, 4.9 mmol), followed by 3,5-dichlorobenzoic acid methyl ester (1.0 g, 4.9 mmol). The mixture was heated at reflux for 24 h. After cooling to ambient temperature, 1 N aqueous hydrochloric acid was added, and the mixture was extracted three times with dichloromethane. The extracts were combined, dried with $MgSO_4$ and filtered. The filtrate was concentrated to give a tan solid (1.8 g), which was used without further purification.

Step B: Preparation of 1-(3,5-dichlorophenyl)-2-[(dimethylamino)methylene]-3-(2-fluorophenyl)-1,3-propanedione

To the crude sample obtained in Step A above (i.e. 1-(3,5-dichlorophenyl)-3-(2-fluorophenyl)-1,3-propanedione) (1.8 g) was added *N*,*N*-dimethylformamide dimethylacetal (20 mL). The solution was stirred for 3 d at ambient temperature. The reaction mixture was

concentrated onto Celite® diatomaceaous filter aid and purified by silica gel column chromatography, eluting with a 0 to 100 % gradient of ethyl acetate in hexanes to yield the desired product as a clear yellow oil (0.52 g).

^{1}H NMR δ ppm 7.65 (s, 1H), 7.47 (d, *J*=1.6 Hz, 2H), 7.40–7.34 (m, 1H), 7.31–7.21 (m, 2H), 7.05 (td, *J*=7.5, 1.0 Hz, 1H), 6.88 (ddd, *J*=9.9, 8.6, 0.8 Hz, 1H), 3.38–3.31 (m, 3H), 2.87–2.76 (m, 3H).

Step C: Preparation of [3-(3,5-dichlorophenyl)-1*H*-pyrazol-4-yl](2-fluorophenyl)methanone

To 1-(3,5-dichlorophenyl)-2-[(dimethylamino)methylene]-3-(2-fluorophenyl)-1,3-propanedione (i.e. the product obtained in Step B above) (0.52 g, 1.4 mmol) in ethanol (20 mL) was added hydrazine hydrate (55 % by weight in water, 0.16 mL, 2.8 mmol). The reaction was stirred at ambient temperature for 24 h. The reaction mixture was concentrated onto Celite and purified by silica gel column chromatography, eluting with a 0 to 40 % gradient of ethyl acetate in hexanes to yield a white solid (0.17 g). m.p. = 149–151 °C.

^{1}H NMR (CD_3OD) δ ppm 8.08 (s, 1H), 7.63 (d, *J*=1.9 Hz, 2H), 7.59–7.50 (m, 2H), 7.44 (t, *J*=1.7 Hz, 1H), 7.27 (t, *J*=7.8 Hz, 1H), 7.14 (t, *J*=9.3 Hz, 1H). A 3-bond NMR correlation was observed from the ortho proton (7.56 ppm) of the fluorinated phenyl ring to the carbonyl carbon (^{13}C δ ppm 188.34).

SYNTHESIS EXAMPLE 4

Preparation of [3-(3,5-dichlorophenyl)-1*H*-pyrazol-4-yl](2,3,5-trifluorophenyl)methanone (Compound 5)

Step A: Preparation of 3-(3,5-dichlorophenyl)-1*H*-pyrazole

To 3,5-dichloroacetophenone (9.90 g, 52.4 mmol, 1.0 eq.) was added *N*,*N*-dimethylformamide dimethylacetal (100 mL) and the resulting solution heated to 100 °C. After 18 h the reaction was cooled to ambient temperature and the solvent was removed under vacuum. The residue was dissolved in ethanol (100 mL) and hydrazine hydrate (3.81 mL, 78.6 mmol, 1.5 eq.) was added to the solution and the reaction mixture was stirred at ambient temperature for 18 h. The reaction mixture was concentrated under vacuum, and purified by chromatography on silica gel eluting with 0 to 100% ethyl acetate in hexanes to afford the title product (9.31 g).

^{1}H NMR δ ppm 7.69 (d, *J*=1.9 Hz, 2H), 7.64 (d, *J*=2.4 Hz, 1H), 7.31 (t, *J*=1.9 Hz, 1H), 7.26 (s, 1H), 6.63 (d, *J*=2.5 Hz, 1H).

Step B: Preparation of 3-(3,5-dichlorophenyl)-4-iodo-1*H*-pyrazole

To a solution of 3-(3,5-dichlorophenyl)-1*H*-pyrazole (i.e. the product obtained in Step A above) (9.31 g, 43.7 mmol, 1.0 eq.) in acetonitrile (200 mL) was added *N*-iodosuccinimide (10.8 g, 48.1 mmol, 1.1 eq.) and the reaction was heated to 60 °C for 18 h. The reaction mixture was cooled to ambient temperature and a saturated aqueous solution

of sodium thiosulfate was added, followed by ethyl acetate. The phases were separated and the organic phase was further washed with a saturated aqueous solution of sodium thiosulfate followed by saturated aqueous NaCl. The organic phases were dried over $MgSO_4$, concentrated under vacuum, and purified by chromatography on silica gel eluting with 0 to 100% ethyl acetate in hexanes to afford the desired product (12.5g).

^{1}H NMR δ ppm 7.75–7.69 (m, 3H), 7.39 (s, 1H).

Step C: Preparation of [3-(3,5-dichlorophenyl)-1*H*-pyrazol-4-yl](2,3,5-trifluorophenyl)methanone

To a solution of 3-(3,5-dichlorophenyl)-4-iodo-1*H*-pyrazole (300 mg, 0.885 mmol, 1.0 eq.) in tetrahydrofuran (5 mL) at 0 °C was added dropwise isopropylmagnesium bromide (2.9 M in 2-methyltetrahydrofuran, 0.67 mL, 2.2 eq.) and the reaction. After stirring for 30 min a solution of 2,3,5-trifluorobenzaldehyde (171 mg, 1.1 eq.) in tetrahydrofuran was added dropwise and the reaction was allowed to warm to ambient temperature over 18 h. The reaction was quenched by the addition of a saturated aqueous solution of ammonium chloride. The phases were separated and the aqueous phase was again washed with tetrahydrofuran. The organic phases were dried over $MgSO_4$, concentrated under vacuum, and purified by chromatography on silica gel eluting with 0 to 100% ethyl acetate in hexanes to afford the desired material which was then taken on to the next step as is. To a solution of this material in acetone (10 mL) at 0 °C was added Jones Reagent (1 mL, 2.7 M CrO_3/H_2SO_4 in H_2O) and the reaction was allowed to warm to ambient temperature over 5 h. The reaction was quenched by the addition of 2 drops of isopropyl alcohol and stirring for 5 min followed by the addition of a saturated solution of sodium bicarbonate and dichloromethane. The phases were separated and the organic layer was again washed with dichloromethane. The organic phases were dried over $MgSO_4$, concentrated under vacuum, and purified by chromatography on silica gel eluting with 0 to 100% ethyl acetate in hexanes to afford the desired product (123 mg).

^{1}H NMR δ ppm 12.10–11.84 (br s, 1H), 7.92 (d, *J*=1.6 Hz, 1H), 7.54 (d, *J*=1.9 Hz, 2H), 7.37 (t, *J*=1.9 Hz, 1H), 7.11–7.02 (m, 2H).

SYNTHESIS EXAMPLE 5

Preparation of [3-(3,5-dichlorophenyl)-1*H*-pyrazol-4-yl](3,5-difluorophenyl)methanone (Compound 7)

Step A: Preparation of 3-(3,5-dichlorophenyl)-α-(3,5-difluorophenyl)-1*H*-pyrazole-4-methanol

To a vial equipped with a septum was added 3-(3,5-dichlorophenyl)-4-iodo-1*H*-pyrazole (i.e. the product described in Example 4, Step A) (300 mg, 0.89 mmol) and anhydrous tetrahydrofuran (8 mL). The vial was purged under an N_2 atmosphere then cooled with an ice bath to 0 to 5 °C. Isopropylmagnesium bromide (2.9 M in

2-methyltetrahydrofuran, 0.71 mL, 2.04 mmol) was added dropwise via syringe. The reaction mixture was stirred at 0 °C for 30 min. A solution of 3,5-difluorobenzaldehyde (0.15 mL, 1.33 mmol) in anhydrous tetrahydrofuran (2 mL) was added dropwise. The stirring was continued at 0 °C for 30 min. The reaction was quenched by the addition of saturated aqueous ammonium chloride solution, extracted twice with ethyl acetate, washed with brine, dried over $MgSO_4$ and filtered. The reaction was concentrated onto silica gel and purified by column chromatography eluting with 5% to 30% ethyl acetate in hexanes to provide the title product as a white solid (241 mg).

^{1}H NMR (400 MHz) δ ppm 7.43 (s, 2H), 7.26 (m, 1H), 7.17 (s, 1H), 6.87 (m, 2H), 6.70 (m, 1H), 5.82 (s, 1H).

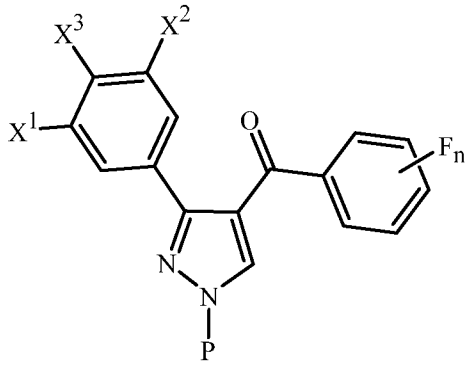
Step B: Preparation of [3-(3,5-dichlorophenyl)-1*H*-pyrazol-4-yl](3,5-difluorophenyl)methanone

To a vial containing 3-(3,5-dichlorophenyl)-α-(3,5-difluorophenyl)-1*H*-pyrazole-4-methanol (i.e. the product obtained in Step A above) (205 mg, 0.58 mmol) and acetone (4 mL) stirring at 0 – 5^0 C was added Jones Reagent (0.1 mL, 2.8 M CrO_3/H_2SO_4 in H_2O). The reaction was stirred at 0 to 5^0 C for 1 h. Analysis by thin-layer chromatography revealed that starting material remained so additional Jones Reagent (0.1 mL) was added. After 1 h of additional stirring, analysis by thin-layer chromatography showed complete consumption of starting material. The reaction was quenched by the addition of saturated aqueous sodium bicarbonate solution, extracted twice with ethyl acetate, washed with water, brine, dried over $MgSO_4$ and filtered. Excess solvent was evaporated to isolate the title compound as a white solid (169 mg).

^{1}H NMR (400 MHz, acetone-*d6*) δ ppm 12.99 (br s, 1H), 8.35 (s, 1H), 7.81–7.86 (m, 2H), 7.41–7.49 (m, 3H), 7.28 (m, 1H).

By the procedures described herein together with methods known in the art, the following compounds of Tables 1 to 192 can be prepared.

Table 1:



1

F_n is 2-F; P is H

X^1	X^2	X^3
F	F	H
F	Cl	H
F	Br	H
F	I	H
F	CF_3	H
F	CF_2H	H
F	OCF_3	H
F	OCF_2H	H
F	SCF_2H	H
F	C≡CH	H
Cl	Cl	H
Cl	Br	H
Cl	I	H
Cl	CF_3	H
Cl	CF_2H	H
Cl	OCF_3	H
Cl	OCF_2H	H
Cl	SCF_2H	H
Cl	C≡CH	H
Br	Br	H
Br	I	H
Br	CF_3	H
Br	CF_2H	H
Br	OCF_3	H
Br	OCF_2H	H
Br	SCF_2H	H
Br	C≡CH	H
I	I	H
I	CF_3	H
I	CF_2H	H
I	OCF_3	H
I	OCF_2H	H
I	SCF_2H	H
I	C≡CH	H
CF_3	CF_3	H
CF_3	CF_2H	H
CF_3	OCF_3	H
CF_3	OCF_2H	H
CF_3	SCF_2H	H
CF_3	C≡CH	H
CF_2H	CF_2H	H
CF_2H	OCF_3	H
CF_2H	OCF_2H	H
CF_2H	SCF_2H	H
CF_2H	C≡CH	H
OCF_3	OCF_3	H
OCF_3	OCF_2H	H
OCF_3	SCF_2H	H
OCF_3	C≡CH	H
OCF_2H	OCF_2H	H
OCF_2H	SCF_2H	H
OCF_2H	C≡CH	H
SCF_2H	SCF_2H	H
SCF_2H	C≡CH	H
C≡CH	C≡CH	H
F	F	F
F	Cl	F
F	Br	F
F	I	F
F	CF_3	F
F	CF_2H	F
F	OCF_3	F
F	OCF_2H	F
F	SCF_2H	F
F	C≡CH	F
Cl	Cl	F
Cl	Br	F
Cl	I	F
Cl	CF_3	F
Cl	OCF_2H	F

X^1	X^2	X^3
Cl	SCF_2H	F
Cl	C≡CH	F
Br	Br	F
Br	I	F
Br	CF_3	F
Br	CF_2H	F
Br	OCF_3	F
Br	OCF_2H	F
Br	SCF_2H	F
Br	C≡CH	F
I	I	F
I	CF_3	F
I	CF_2H	F
I	OCF_3	F
I	OCF_2H	F
I	SCF_2H	F
I	C≡CH	F
CF_3	CF_3	F
CF_3	CF_2H	F
CF_3	OCF_3	F
CF_3	OCF_2H	F
CF_3	SCF_2H	F
CF_3	C≡CH	F
CF_2H	CF_2H	F
CF_2H	OCF_3	F
CF_2H	OCF_2H	F
CF_2H	SCF_2H	F
CF_2H	C≡CH	F
OCF_3	OCF_3	F
OCF_3	OCF_2H	F
OCF_3	SCF_2H	F
OCF_3	C≡CH	F
OCF_2H	OCF_2H	F
OCF_2H	SCF_2H	F
OCF_2H	C≡CH	F
SCF_2H	SCF_2H	F

X^1	X^2	X^3
SCF_2H	C≡CH	F
C≡C≡H	C≡CH	F
F	Cl	Cl
F	Br	Cl
F	I	Cl
F	CF_3	Cl
F	CF_2H	Cl
F	OCF_3	Cl
F	OCF_2H	Cl
F	SCF_2H	Cl
F	C≡CH	Cl
Cl	Cl	Cl
Cl	Br	Cl
Cl	I	Cl
Cl	CF_3	Cl
Cl	CF_2H	Cl
Cl	OCF_3	Cl
Cl	OCF_2H	Cl
Cl	SCF_2H	Cl
Cl	C≡CH	Cl
Br	Br	Cl
Br	I	Cl
Br	CF_3	Cl
Br	CF_2H	Cl
Br	OCF_3	Cl
Br	OCF_2H	Cl
Br	SCF_2H	Cl
Br	C≡CH	Cl
I	I	Cl
I	CF_3	Cl
I	CF_2H	Cl
I	OCF_3	Cl
I	OCF_2H	Cl
I	SCF_2H	Cl
I	C≡CH	Cl
CF_3	CF_3	Cl
CF_3	CF_2H	Cl
CF_3	OCF_3	Cl
CF_3	OCF_2H	Cl
CF_3	SCF_2H	Cl
CF_3	C≡CH	Cl
CF_2H	CF_2H	Cl
CF_2H	OCF_3	Cl
CF_2H	OCF_2H	Cl
CF_2H	SCF_2H	Cl
CF_2H	C≡CH	Cl
OCF_3	OCF_3	Cl
OCF_3	OCF_2H	Cl
OCF_3	SCF_2H	Cl
OCF_3	C≡CH	Cl
OCF_2H	OCF_2H	Cl
OCF_2H	SCF_2H	Cl
OCF_2H	C≡CH	Cl
SCF_2H	SCF_2H	Cl
SCF_2H	C≡CH	Cl
C≡CH	C≡CH	Cl
F	Cl	Br
F	Br	Br
F	I	Br
F	CF_3	Br
F	CF_2H	Br
F	OCF_3	Br
F	OCF_2H	Br
F	SCF_2H	Br
F	C≡CH	Br
Cl	Cl	Br
Cl	Br	Br
Cl	I	Br
Cl	CF_3	Br
Cl	CF_2H	Br
Cl	OCF_3	Br
Cl	OCF_2H	Br
Cl	SCF_2H	Br
Cl	C≡CH	Br

X^1	X^2	X^3
Br	Br	Br
Br	I	Br
Br	CF_3	Br
Br	CF_2H	Br
Br	OCF_3	Br
Br	OCF_2H	Br
Br	SCF_2H	Br
Br	C≡CH	Br
I	I	Br
I	CF_3	Br
I	CF_2H	Br
I	OCF_3	Br
I	OCF_2H	Br
I	SCF_2H	Br
I	C≡CH	Br
CF_3	CF_3	Br
CF_3	CF_2H	Br
CF_3	OCF_3	Br
CF_3	OCF_2H	Br
CF_3	SCF_2H	Br
CF_3	C≡CH	Br
CF_2H	CF_2H	Br
CF_2H	OCF_3	Br
CF_2H	OCF_2H	Br
CF_2H	SCF_2H	Br
CF_2H	C≡CH	Br
OCF_3	OCF_3	Br
OCF_3	OCF_2H	Br
OCF_3	SCF_2H	Br
OCF_3	C≡CH	Br
OCF_2H	OCF_2H	Br
OCF_2H	SCF_2H	Br
OCF_2H	C≡CH	Br
SCF_2H	SCF_2H	Br
SCF_2H	C≡CH	Br
C≡CH	C≡CH	Br
F	Cl	I

X^1	X^2	X^3	X^1	X^2	X^3	X^1	X^2	X^3
F	Br	I	Br	I	I	CF_3	SCF_2H	I
F	I	I	Br	CF_3	I	CF_3	C≡CH	I
F	CF_3	I	Br	CF_2H	I	CF_2H	CF_2H	I
F	CF_2H	I	Br	OCF_3	I	CF_2H	OCF_3	I
F	OCF_3	I	Br	OCF_2H	I	CF_2H	OCF_2H	I
F	OCF_2H	I	Br	SCF_2H	I	CF_2H	SCF_2H	I
F	SCF_2H	I	Br	C≡CH	I	CF_2H	C≡CH	I
F	C≡CH	I	I	I	I	OCF_3	OCF_3	I
Cl	Cl	I	I	CF_3	I	OCF_3	OCF_2H	I
Cl	Br	I	I	CF_2H	I	OCF_3	SCF_2H	I
Cl	I	I	I	OCF_3	I	OCF_3	C≡CH	I
Cl	CF_3	I	I	OCF_2H	I	OCF_2H	OCF_2H	I
Cl	CF_2H	I	I	SCF_2H	I	OCF_2H	SCF_2H	I
Cl	OCF_3	I	I	C≡CH	I	OCF_2H	C≡CH	I
Cl	OCF_2H	I	CF_3	CF_3	I	SCF_2H	SCF_2H	I
Cl	SCF_2H	I	CF_3	CF_2H	I	SCF_2H	C≡CH	I
Cl	C≡CH	I	CF_3	OCF_3	I	C≡CH	C≡CH	I
Br	Br	I	CF_3	OCF_2H	I			

The present disclosure also includes Tables 2 through 192, each of which is constructed the same as Table 1 above, except that the row heading in Table 1 (i.e. "F_n is 2-F; P is H") is replaced with the respective row heading shown below. For Example, in Table 2 the row heading is "F_n is 3-F; P is H" and X^1, X^2, and X^3 are as defined in Table 1 above. Therefore, the first entry in Table A2 specifically discloses a comound of Formula **1** wherein X^1 is F, X^2 is F, X^3 is H, P is H and F_n is 3-F. The remaining table entries are constructed in the same fashion.

Table	Row Heading	Table	Row Heading
2	F_n is 3-F; P is H	13	F_n is 2,3,4,5-F; P is H
3	F_n is 4-F; P is H	14	F_n is 2,3,5,6-F; P is H
4	F_n is 2,3-F; P is H	15	F_n is 2,3,4,6-F; P is H
5	F_n is 2,4-F; P is H	16	F_n is 2,3,4,5,6-F; P is H
6	F_n is 2,5-F; P is H	17	F_n is 2-F; P is CH_3
7	F_n is 2,6-F; P is H	18	F_n is 3-F; P is CH_3
8	F_n is 2,3,4-F; P is H	19	F_n is 4-F; P is CH_3
9	F_n is 2,3,5-F; P is H	20	F_n is 2,3-F; P is CH_3
10	F_n is 2,3,6-F; P is H	21	F_n is 2,4-F; P is CH_3
11	F_n is 2,4,6-F; P is H	22	F_n is 2,5-F; P is CH_3
12	F_n is 2,4,5-F; P is H	23	F_n is 2,6-F; P is CH_3

Table	Row Heading
24	F_n is 2,3,4-F; P is CH_3
25	F_n is 2,3,5-F; P is CH_3
26	F_n is 2,3,6-F; P is CH_3
27	F_n is 2,4,6-F; P is CH_3
28	F_n is 2,4,5-F; P is CH_3
29	F_n is 2,3,4,5-F; P is CH_3
30	F_n is 2,3,5,6-F; P is CH_3
31	F_n is 2,3,4,6-F; P is CH_3
32	F_n is 2,3,4,5,6-F; P is CH_3
33	F_n is 2-F; P is CH_2CH_3
34	F_n is 3-F; P is CH_2CH_3
35	F_n is 4-F; P is CH_2CH_3
36	F_n is 2,3-F; P is CH_2CH_3
37	F_n is 2,4-F; P is CH_2CH_3
38	F_n is 2,5-F; P is CH_2CH_3
39	F_n is 2,6-F; P is CH_2CH_3
40	F_n is 2,3,4-F; P is CH_2CH_3
41	F_n is 2,3,5-F; P is CH_2CH_3
42	F_n is 2,3,6-F; P is CH_2CH_3
43	F_n is 2,4,6-F; P is CH_2CH_3
44	F_n is 2,4,5-F; P is CH_2CH_3
45	F_n is 2,3,4,5-F; P is CH_2CH_3
46	F_n is 2,3,5,6-F; P is CH_2CH_3
47	F_n is 2,3,4,6-F; P is CH_2CH_3
48	F_n is 2,3,4,5,6-F; P is CH_2CH_3
49	F_n is 2-F; P is $CH_2CH_2CH_3$
50	F_n is 3-F; P is $CH_2CH_2CH_3$
51	F_n is 4-F; P is $CH_2CH_2CH_3$
52	F_n is 2,3-F; P is $CH_2CH_2CH_3$
53	F_n is 2,4-F; P is $CH_2CH_2CH_3$
54	F_n is 2,5-F; P is $CH_2CH_2CH_3$
55	F_n is 2,6-F; P is $CH_2CH_2CH_3$
56	F_n is 2,3,4-F; P is $CH_2CH_2CH_3$
57	F_n is 2,3,5-F; P is $CH_2CH_2CH_3$
58	F_n is 2,3,6-F; P is $CH_2CH_2CH_3$
59	F_n is 2,4,6-F; P is $CH_2CH_2CH_3$
60	F_n is 2,4,5-F; P is $CH_2CH_2CH_3$
61	F_n is 2,3,4,5-F; P is $CH_2CH_2CH_3$
62	F_n is 2,3,5,6-F; P is $CH_2CH_2CH_3$
63	F_n is 2,3,4,6-F; P is $CH_2CH_2CH_3$
64	F_n is 2,3,4,5,6-F; P is $CH_2CH_2CH_3$
65	F_n is 2-F; P is $CH_2C\equiv CH$
66	F_n is 3-F; P is $CH_2C\equiv CH$
67	F_n is 4-F; P is $CH_2C\equiv CH$
68	F_n is 2,3-F; P is $CH_2C\equiv CH$
69	F_n is 2,4-F; P is $CH_2C\equiv CH$
70	F_n is 2,5-F; P is $CH_2C\equiv CH$
71	F_n is 2,6-F; P is $CH_2C\equiv CH$
72	F_n is 2,3,4-F; P is $CH_2C\equiv CH$
73	F_n is 2,3,5-F; P is $CH_2C\equiv CH$
74	F_n is 2,3,6-F; P is $CH_2C\equiv CH$
75	F_n is 2,4,6-F; P is $CH_2C\equiv CH$
76	F_n is 2,4,5-F; P is $CH_2C\equiv CH$
77	F_n is 2,3,4,5-F; P is $CH_2C\equiv CH$
78	F_n is 2,3,5,6-F; P is $CH_2C\equiv CH$
79	F_n is 2,3,4,6-F; P is $CH_2C\equiv CH$
80	F_n is 2,3,4,5,6-F; P is $CH_2C\equiv CH$
81	F_n is 2-F; P is $C(=O)CH_3$
82	F_n is 3-F; P is $C(=O)CH_3$
83	F_n is 4-F; P is $C(=O)CH_3$
84	F_n is 2,3-F; P is $C(=O)CH_3$
85	F_n is 2,4-F; P is $C(=O)CH_3$
86	F_n is 2,5-F; P is $C(=O)CH_3$
87	F_n is 2,6-F; P is $C(=O)CH_3$
88	F_n is 2,3,4-F; P is $C(=O)CH_3$
89	F_n is 2,3,5-F; P is $C(=O)CH_3$
90	F_n is 2,3,6-F; P is $C(=O)CH_3$
91	F_n is 2,4,6-F; P is $C(=O)CH_3$
92	F_n is 2,4,5-F; P is $C(=O)CH_3$
93	F_n is 2,3,4,5-F; P is $C(=O)CH_3$
94	F_n is 2,3,5,6-F; P is $C(=O)CH_3$
95	F_n is 2,3,4,6-F; P is $C(=O)CH_3$
96	F_n is 2,3,4,5,6-F; P is $C(=O)CH_3$
97	F_n is 2-F; P is $C(=O)CF_3$

Table	Row Heading
98	F_n is 3-F; P is $C(=O)CF_3$
99	F_n is 4-F; P is $C(=O)CF_3$
100	F_n is 2,3-F; P is $C(=O)CF_3$
101	F_n is 2,4-F; P is $C(=O)CF_3$
102	F_n is 2,5-F; P is $C(=O)CF_3$
103	F_n is 2,6-F; P is $C(=O)CF_3$
104	F_n is 2,3,4-F; P is $C(=O)CF_3$
105	F_n is 2,3,5-F; P is $C(=O)CF_3$
106	F_n is 2,3,6-F; P is $C(=O)CF_3$
107	F_n is 2,4,6-F; P is $C(=O)CF_3$
108	F_n is 2,4,5-F; P is $C(=O)CF_3$
109	F_n is 2,3,4,5-F; P is $C(=O)CF_3$
110	F_n is 2,3,5,6-F; P is $C(=O)CF_3$
111	F_n is 2,3,4,6-F; P is $C(=O)CF_3$
112	F_n is 2,3,4,5,6-F; P is $C(=O)CF_3$
113	F_n is 2-F; P is - CH_2OH
114	F_n is 3-F; P is CH_2OH
115	F_n is 4-F; P is CH_2OH
116	F_n is 2,3-F; P is CH_2OH
117	F_n is 2,4-F; P is CH_2OH
118	F_n is 2,5-F; P is CH_2OH
119	F_n is 2,6-F; P is CH_2OH
120	F_n is 2,3,4-F; P is CH_2OH
121	F_n is 2,3,5-F; P is CH_2OH
122	F_n is 2,3,6-F; P is CH_2OH
123	F_n is 2,4,6-F; P is CH_2OH
124	F_n is 2,4,5-F; P is CH_2OH
125	F_n is 2,3,4,5-F; P is CH_2OH
126	F_n is 2,3,5,6-F; P is CH_2OH
127	F_n is 2,3,4,6-F; P is CH_2OH
128	F_n is 2,3,4,5,6-F; P is CH_2OH
129	F_n is 2-F; P is SO_2CF_3
130	F_n is 3-F; P is SO_2CF_3
131	F_n is 4-F; P is SO_2CF_3
132	F_n is 2,3-F; P is SO_2CF_3
133	F_n is 2,4-F; P is SO_2CF_3
134	F_n is 2,5-F; P is SO_2CF_3
135	F_n is 2,6-F; P is SO_2CF_3
136	F_n is 2,3,4-F; P is SO_2CF_3
137	F_n is 2,3,5-F; P is SO_2CF_3
138	F_n is 2,3,6-F; P is SO_2CF_3
139	F_n is 2,4,6-F; P is SO_2CF_3
140	F_n is 2,4,5-F; P is SO_2CF_3
141	F_n is 2,3,4,5-F; P is SO_2CF_3
142	F_n is 2,3,5,6-F; P is SO_2CF_3
143	F_n is 2,3,4,6-F; P is SO_2CF_3
144	F_n is 2,3,4,5,6-F; P is SO_2CF_3
145	F_n is 2-F; P is $C(=O)CH_2OMe$
146	F_n is 3-F; P is $C(=O)CH_2OMe$
147	F_n is 4-F; P is $C(=O)CH_2OMe$
148	F_n is 2,3-F; P is $C(=O)CH_2OMe$
149	F_n is 2,4-F; P is $C(=O)CH_2OMe$
150	F_n is 2,5-F; P is $C(=O)CH_2OMe$
151	F_n is 2,6-F; P is $C(=O)CH_2OMe$
152	F_n is 2,3,4-F; P is $C(=O)CH_2OMe$
153	F_n is 2,3,5-F; P is $C(=O)CH_2OMe$
154	F_n is 2,3,6-F; P is $C(=O)CH_2OMe$
155	F_n is 2,4,6-F; P is $C(=O)CH_2OMe$
156	F_n is 2,4,5-F; P is $C(=O)CH_2OMe$
157	F_n is 2,3,4,5-F; P is $C(=O)CH_2OMe$
158	F_n is 2,3,5,6-F; P is $C(=O)CH_2OMe$
159	F_n is 2,3,4,6-F; P is $C(=O)CH_2OMe$
160	F_n is 2,3,4,5,6-F; P is $C(=O)CH_2OMe$
161	F_n is 2-F; P is SO_2NMe_2
162	F_n is 3-F; P is SO_2NMe_2
163	F_n is 4-F; P is SO_2NMe_2
164	F_n is 2,3-F; P is SO_2NMe_2
165	F_n is 2,4-F; P is SO_2NMe_2
166	F_n is 2,5-F; P is SO_2NMe_2
167	F_n is 2,6-F; P is SO_2NMe_2
168	F_n is 2,3,4-F; P is SO_2NMe_2
169	F_n is 2,3,5-F; P is SO_2NMe_2
170	F_n is 2,3,6-F; P is SO_2NMe_2
171	F_n is 2,4,6-F; P is SO_2NMe_2

Table	Row Heading
172	F_n is 2,4,5-F; P is SO_2NMe_2
173	F_n is 2,3,4,5-F; P is SO_2NMe_2
174	F_n is 2,3,5,6-F; P is SO_2NMe_2
175	F_n is 2,3,4,6-F; P is SO_2NMe_2
176	F_n is 2,3,4,5,6-F; P is SO_2NMe_2
177	F_n is 2-F; P is CF_2H
178	F_n is 3-F; P is CF_2H
179	F_n is 4-F; P is CF_2H
180	F_n is 2,3-F; P is CF_2H
181	F_n is 2,4-F; P is CF_2H
182	F_n is 2,5-F; P is CF_2H
183	F_n is 2,6-F; P is CF_2H
184	F_n is 2,3,4-F; P is CF_2H
185	F_n is 2,3,5-F; P is CF_2H
186	F_n is 2,3,6-F; P is CF_2H
187	F_n is 2,4,6-F; P is CF_2H
188	F_n is 2,4,5-F; P is CF_2H
189	F_n is 2,3,4,5-F; P is CF_2H
190	F_n is 2,3,5,6-F; P is CF_2H
191	F_n is 2,3,4,6-F; P is CF_2H
192	F_n is 2,3,4,5,6-F; P is CF_2H

A compound of this invention will generally be used as a herbicidal active ingredient in a composition, i.e. formulation, with at least one additional component selected from the group consisting of surfactants, solid diluents and liquid diluents, which serves as a carrier. The formulation or composition ingredients are selected to be consistent with the physical properties of the active ingredient, mode of application and environmental factors such as soil type, moisture and temperature.

Useful formulations include both liquid and solid compositions. Liquid compositions include solutions (including emulsifiable concentrates), suspensions, emulsions (including microemulsions, oil-in -water emulsions, flowable concentrates and/or suspoemulsions) and the like, which optionally can be thickened into gels. The general types of aqueous liquid compositions are soluble concentrate, suspension concentrate, capsule suspension, concentrated emulsion, microemulsion, oil-in-water emulsion, flowable concentrate and suspo-emulsion. The general types of nonaqueous liquid compositions are emulsifiable concentrate, microemulsifiable concentrate, dispersible concentrate and oil dispersion.

The general types of solid compositions are dusts, powders, granules, pellets, prills, pastilles, tablets, filled films (including seed coatings) and the like, which can be water-dispersible ("wettable") or water-soluble. Films and coatings formed from film-forming solutions or flowable suspensions are particularly useful for seed treatment. Active ingredient can be (micro)encapsulated and further formed into a suspension or solid formulation; alternatively the entire formulation of active ingredient can be encapsulated (or "overcoated"). Encapsulation can control or delay release of the active ingredient. An emulsifiable granule combines the advantages of both an emulsifiable concentrate formulation and a dry granular formulation. High-strength compositions are primarily used as intermediates for further formulation.

Sprayable formulations are typically extended in a suitable medium before spraying. Such liquid and solid formulations are formulated to be readily diluted in the spray medium,

usually water, but occasionally another suitable medium like an aromatic or paraffinic hydrocarbon or vegetable oil. Spray volumes can range from about from about one to several thousand liters per hectare, but more typically are in the range from about ten to several hundred liters per hectare. Sprayable formulations can be tank mixed with water or another suitable medium for foliar treatment by aerial or ground application, or for application to the growing medium of the plant. Liquid and dry formulations can be metered directly into drip irrigation systems or metered into the furrow during planting.

The formulations will typically contain effective amounts of active ingredient, diluent and surfactant within the following approximate ranges which add up to 100 percent by weight.

	Weight Percent		
	Active Ingredient	Diluent	Surfactant
Water-Dispersible and Water-soluble Granules, Tablets and Powders	0.001–90	0–99.999	0–15
Oil Dispersions, Suspensions, Emulsions, Solutions (including Emulsifiable Concentrates)	1–50	40–99	0–50
Dusts	1–25	70–99	0–5
Granules and Pellets	0.001–99	5–99.999	0–15
High Strength Compositions	90–99	0–10	0–2

Solid diluents include, for example, clays such as bentonite, montmorillonite, attapulgite and kaolin, gypsum, cellulose, titanium dioxide, zinc oxide, starch, dextrin, sugars (e.g., lactose, sucrose), silica, talc, mica, diatomaceous earth, urea, calcium carbonate, sodium carbonate and bicarbonate, and sodium sulfate. Typical solid diluents are described in Watkins et al., *Handbook of Insecticide Dust Diluents and Carriers*, 2nd Ed., Dorland Books, Caldwell, New Jersey.

Liquid diluents include, for example, water, *N*,*N*-dimethylalkanamides (e.g., *N*,*N*-dimethylformamide), limonene, dimethyl sulfoxide, *N*-alkylpyrrolidones (e.g., *N*-methylpyrrolidinone), alkyl phosphates (e.g., triethyl phosphate), ethylene glycol, triethylene glycol, propylene glycol, dipropylene glycol, polypropylene glycol, propylene carbonate, butylene carbonate, paraffins (e.g., white mineral oils, normal paraffins, isoparaffins), alkylbenzenes, alkylnaphthalenes, glycerine, glycerol triacetate, sorbitol, aromatic hydrocarbons, dearomatized aliphatics, alkylbenzenes, alkylnaphthalenes, ketones such as cyclohexanone, 2-heptanone, isophorone and 4-hydroxy-4-methyl-2-pentanone, acetates such as isoamyl acetate, hexyl acetate, heptyl acetate, octyl acetate, nonyl acetate, tridecyl acetate and isobornyl acetate, other esters such as alkylated lactate esters, dibasic esters, alkyl and aryl benzoates and γ-butyrolactone, and alcohols, which can be linear,

branched, saturated or unsaturated, such as methanol, ethanol, *n*-propanol, isopropyl alcohol, *n*-butanol, isobutyl alcohol, *n*-hexanol, 2-ethylhexanol, *n*-octanol, decanol, isodecyl alcohol, isooctadecanol, cetyl alcohol, lauryl alcohol, tridecyl alcohol, oleyl alcohol, cyclohexanol, tetrahydrofurfuryl alcohol, diacetone alcohol, cresol and benzyl alcohol. Liquid diluents also include glycerol esters of saturated and unsaturated fatty acids (typically C_6–C_{22}), such as plant seed and fruit oils (e.g., oils of olive, castor, linseed, sesame, corn (maize), peanut, sunflower, grapeseed, safflower, cottonseed, soybean, rapeseed, coconut and palm kernel), animal-sourced fats (e.g., beef tallow, pork tallow, lard, cod liver oil, fish oil), and mixtures thereof. Liquid diluents also include alkylated fatty acids (e.g., methylated, ethylated, butylated) wherein the fatty acids may be obtained by hydrolysis of glycerol esters from plant and animal sources, and can be purified by distillation. Typical liquid diluents are described in Marsden, *Solvents Guide*, 2nd Ed., Interscience, New York, 1950.

The solid and liquid compositions of the present invention often include one or more surfactants. When added to a liquid, surfactants (also known as "surface-active agents") generally modify, most often reduce, the surface tension of the liquid. Depending on the nature of the hydrophilic and lipophilic groups in a surfactant molecule, surfactants can be useful as wetting agents, dispersants, emulsifiers or defoaming agents.

Surfactants can be classified as nonionic, anionic or cationic. Nonionic surfactants useful for the present compositions include, but are not limited to: alcohol alkoxylates such as alcohol alkoxylates based on natural and synthetic alcohols (which may be branched or linear) and prepared from the alcohols and ethylene oxide, propylene oxide, butylene oxide or mixtures thereof; amine ethoxylates, alkanolamides and ethoxylated alkanolamides; alkoxylated triglycerides such as ethoxylated soybean, castor and rapeseed oils; alkylphenol alkoxylates such as octylphenol ethoxylates, nonylphenol ethoxylates, dinonyl phenol ethoxylates and dodecyl phenol ethoxylates (prepared from the phenols and ethylene oxide, propylene oxide, butylene oxide or mixtures thereof); block polymers prepared from ethylene oxide or propylene oxide and reverse block polymers where the terminal blocks are prepared from propylene oxide; ethoxylated fatty acids; ethoxylated fatty esters and oils; ethoxylated methyl esters; ethoxylated tristyrylphenol (including those prepared from ethylene oxide, propylene oxide, butylene oxide or mixtures thereof); fatty acid esters, glycerol esters, lanolin-based derivatives, polyethoxylate esters such as polyethoxylated sorbitan fatty acid esters, polyethoxylated sorbitol fatty acid esters and polyethoxylated glycerol fatty acid esters; other sorbitan derivatives such as sorbitan esters; polymeric surfactants such as random copolymers, block copolymers, alkyd peg (polyethylene glycol) resins, graft or comb polymers and star polymers; polyethylene glycols (pegs); polyethylene glycol fatty acid esters; silicone-based surfactants; and sugar-derivatives such as sucrose esters, alkyl polyglycosides and alkyl polysaccharides.

Useful anionic surfactants include, but are not limited to: alkylaryl sulfonic acids and their salts; carboxylated alcohol or alkylphenol ethoxylates; diphenyl sulfonate derivatives; lignin and lignin derivatives such as lignosulfonates; maleic or succinic acids or their anhydrides; olefin sulfonates; phosphate esters such as phosphate esters of alcohol alkoxylates, phosphate esters of alkylphenol alkoxylates and phosphate esters of styryl phenol ethoxylates; protein-based surfactants; sarcosine derivatives; styryl phenol ether sulfate; sulfates and sulfonates of oils and fatty acids; sulfates and sulfonates of ethoxylated alkylphenols; sulfates of alcohols; sulfates of ethoxylated alcohols; sulfonates of amines and amides such as *N*,*N*-alkyltaurates; sulfonates of benzene, cumene, toluene, xylene, and dodecyl and tridecylbenzenes; sulfonates of condensed naphthalenes; sulfonates of naphthalene and alkyl naphthalene; sulfonates of fractionated petroleum; sulfosuccinamates; and sulfosuccinates and their derivatives such as dialkyl sulfosuccinate salts.

Useful cationic surfactants include, but are not limited to: amides and ethoxylated amides; amines such as *N*-alkyl propanediamines, tripropylenetriamines and dipropylenetetramines, and ethoxylated amines, ethoxylated diamines and propoxylated amines (prepared from the amines and ethylene oxide, propylene oxide, butylene oxide or mixtures thereof); amine salts such as amine acetates and diamine salts; quaternary ammonium salts such as quaternary salts, ethoxylated quaternary salts and diquaternary salts; and amine oxides such as alkyldimethylamine oxides and bis-(2-hydroxyethyl)-alkylamine oxides.

Also useful for the present compositions are mixtures of nonionic and anionic surfactants or mixtures of nonionic and cationic surfactants. Nonionic, anionic and cationic surfactants and their recommended uses are disclosed in a variety of published references including *McCutcheon's Emulsifiers and Detergents*, annual American and International Editions published by McCutcheon's Division, The Manufacturing Confectioner Publishing Co.; Sisely and Wood, *Encyclopedia of Surface Active Agents*, Chemical Publ. Co., Inc., New York, 1964; and A. S. Davidson and B. Milwidsky, *Synthetic Detergents*, Seventh Edition, John Wiley and Sons, New York, 1987.

Compositions of this invention may also contain formulation auxiliaries and additives, known to those skilled in the art as formulation aids (some of which may be considered to also function as solid diluents, liquid diluents or surfactants). Such formulation auxiliaries and additives may control: pH (buffers), foaming during processing (antifoams such polyorganosiloxanes), sedimentation of active ingredients (suspending agents), viscosity (thixotropic thickeners), in-container microbial growth (antimicrobials), product freezing (antifreezes), color (dyes/pigment dispersions), wash-off (film formers or stickers), evaporation (evaporation retardants), and other formulation attributes. Film formers include, for example, polyvinyl acetates, polyvinyl acetate copolymers, polyvinylpyrrolidone-vinyl acetate copolymer, polyvinyl alcohols, polyvinyl alcohol copolymers and waxes. Examples

of formulation auxiliaries and additives include those listed in *McCutcheon's Volume 2: Functional Materials*, annual International and North American editions published by McCutcheon's Division, The Manufacturing Confectioner Publishing Co.; and PCT Publication WO 03/024222.

The compound of Formula **1** and any other active ingredients are typically incorporated into the present compositions by dissolving the active ingredient in a solvent or by grinding in a liquid or dry diluent. Solutions, including emulsifiable concentrates, can be prepared by simply mixing the ingredients. If the solvent of a liquid composition intended for use as an emulsifiable concentrate is water-immiscible, an emulsifier is typically added to emulsify the active-containing solvent upon dilution with water. Active ingredient slurries, with particle diameters of up to 2,000 μm can be wet milled using media mills to obtain particles with average diameters below 3 μm. Aqueous slurries can be made into finished suspension concentrates (see, for example, U.S. 3,060,084) or further processed by spray drying to form water-dispersible granules. Dry formulations usually require dry milling processes, which produce average particle diameters in the 2 to 10 μm range. Dusts and powders can be prepared by blending and usually grinding (such as with a hammer mill or fluid-energy mill). Granules and pellets can be prepared by spraying the active material upon preformed granular carriers or by agglomeration techniques. See Browning, "Agglomeration", *Chemical Engineering*, December 4, 1967, pp 147–48, *Perry's Chemical Engineer's Handbook*, 4th Ed., McGraw-Hill, New York, 1963, pages 8–57 and following, and WO 91/13546. Pellets can be prepared as described in U.S. 4,172,714. Water-dispersible and water-soluble granules can be prepared as taught in U.S. 4,144,050, U.S. 3,920,442 and DE 3,246,493. Tablets can be prepared as taught in U.S. 5,180,587, U.S. 5,232,701 and U.S. 5,208,030. Films can be prepared as taught in GB 2,095,558 and U.S. 3,299,566.

For further information regarding the art of formulation, see T. S. Woods, "The Formulator's Toolbox – Product Forms for Modern Agriculture" in *Pesticide Chemistry and Bioscience, The Food–Environment Challenge*, T. Brooks and T. R. Roberts, Eds., Proceedings of the 9th International Congress on Pesticide Chemistry, The Royal Society of Chemistry, Cambridge, 1999, pp. 120–133. See also U.S. 3,235,361, Col. 6, line 16 through Col. 7, line 19 and Examples 10–41; U.S. 3,309,192, Col. 5, line 43 through Col. 7, line 62 and Examples 8, 12, 15, 39, 41, 52, 53, 58, 132, 138–140, 162–164, 166, 167 and 169–182; U.S. 2,891,855, Col. 3, line 66 through Col. 5, line 17 and Examples 1–4; Klingman, *Weed Control as a Science*, John Wiley and Sons, Inc., New York, 1961, pp 81–96; Hance et al., *Weed Control Handbook*, 8th Ed., Blackwell Scientific Publications, Oxford, 1989; and *Developments in formulation technology*, PJB Publications, Richmond, UK, 2000.

In the following Examples, all percentages are by weight and all formulations are prepared in conventional ways. Compound numbers refer to compounds in Index Table A.

Without further elaboration, it is believed that one skilled in the art using the preceding description can utilize the present invention to its fullest extent. The following Examples are, therefore, to be construed as merely illustrative, and not limiting of the disclosure in any way whatsoever. Percentages are by weight except where otherwise indicated.

Example A

High Strength Concentrate

Compound 1	98.5%
silica aerogel	0.5%
synthetic amorphous fine silica	1.0%

Example B

Wettable Powder

Compound 2	65.0%
dodecylphenol polyethylene glycol ether	2.0%
sodium ligninsulfonate	4.0%
sodium silicoaluminate	6.0%
montmorillonite (calcined)	23.0%

Example C

Granule

Compound 3	10.0%
attapulgite granules (low volatile matter, 0.71/0.30 mm; U.S.S. No. 25–50 sieves)	90.0%

Example D

Extruded Pellet

Compound 4	25.0%
anhydrous sodium sulfate	10.0%
crude calcium ligninsulfonate	5.0%
sodium alkylnaphthalenesulfonate	1.0%
calcium/magnesium bentonite	59.0%

Example E

Emulsifiable Concentrate

Compound 5	10.0%
polyoxyethylene sorbitol hexoleate	20.0%
C_6–C_{10} fatty acid methyl ester	70.0%

Example F

Microemulsion

Compound 6	5.0%
polyvinylpyrrolidone-vinyl acetate copolymer	30.0%
alkylpolyglycoside	30.0%

glyceryl monooleate	15.0%
water	20.0%

Example G

Suspension Concentrate

Compound 7	35%
butyl polyoxyethylene/polypropylene block copolymer	4.0%
stearic acid/polyethylene glycol copolymer	1.0%
styrene acrylic polymer	1.0%
xanthan gum	0.1%
propylene glycol	5.0%
silicone based defoamer	0.1%
1,2-benzisothiazolin-3-one	0.1%
water	53.7%

Example H

Emulsion in Water

Compound 8	10.0%
butyl polyoxyethylene/polypropylene block copolymer	4.0%
stearic acid/polyethylene glycol copolymer	1.0%
styrene acrylic polymer	1.0%
xanthan gum	0.1%
propylene glycol	5.0%
silicone based defoamer	0.1%
1,2-benzisothiazolin-3-one	0.1%
aromatic petroleum based hydrocarbon	20.0
water	58.7%

Example I

Oil Dispersion

Compound 9	25%
polyoxyethylene sorbitol hexaoleate	15%
organically modified bentonite clay	2.5%
fatty acid methyl ester	57.5%

Test results indicate that the compounds of the present invention are highly active preemergent and/or postemergent herbicides and/or plant growth regulants. The compounds of the inention generally show highest activity for postemergence weed control (i.e. applied after weed seedlings emerge from the soil) and preemergence weed control (i.e. applied before weed seedlings emerge from the soil). Many of them have utility for broad-spectrum pre- and/or postemergence weed control in areas where complete control of all vegetation is

desired such as around fuel storage tanks, industrial storage areas, parking lots, drive-in theaters, air fields, river banks, irrigation and other waterways, around billboards and highway and railroad structures. Many of the compounds of this invention, by virtue of selective metabolism in crops versus weeds, or by selective activity at the locus of physiological inhibition in crops and weeds, or by selective placement on or within the environment of a mixture of crops and weeds, are useful for the selective control of grass and broadleaf weeds within a crop/weed mixture. One skilled in the art will recognize that the preferred combination of these selectivity factors within a compound or group of compounds can readily be determined by performing routine biological and/or biochemical assays. Compounds of this invention may show tolerance to important agronomic crops including, but is not limited to, alfalfa, barley, cotton, wheat, rape, sugar beets, corn (maize), sorghum, soybeans, rice, oats, peanuts, vegetables, tomato, potato, perennial plantation crops including coffee, cocoa, oil palm, rubber, sugarcane, citrus, grapes, fruit trees, nut trees, banana, plantain, pineapple, hops, tea and forests such as eucalyptus and conifers (e.g., loblolly pine), and turf species (e.g., Kentucky bluegrass, St. Augustine grass, Kentucky fescue and Bermuda grass). Compounds of this invention can be used in crops genetically transformed or bred to incorporate resistance to herbicides, express proteins toxic to invertebrate pests (such as *Bacillus thuringiensis* toxin), and/or express other useful traits. Those skilled in the art will appreciate that not all compounds are equally effective against all weeds. Alternatively, the subject compounds are useful to modify plant growth.

As the compounds of the invention have both preemergent and postemergent herbicidal activity, to control undesired vegetation by killing or injuring the vegetation or reducing its growth, the compounds can be usefully applied by a variety of methods involving contacting a herbicidally effective amount of a compound of the invention, or a composition comprising said compound and at least one of a surfactant, a solid diluent or a liquid diluent, to the foliage or other part of the undesired vegetation or to the environment of the undesired vegetation such as the soil or water in which the undesired vegetation is growing or which surrounds the seed or other propagule of the undesired vegetation.

As referred to herein Asteraceae is a plant family which includes the genera *Ambrosia* and *Bidens*; Brassicaceae is a plant family which includes the genera *Brassica*, *Raphanus* and *Sinapis*; Amaranthaceae is a plant family which includes the genera *Amaranthus*; Chenopodiaceae is a plant family which includes the genera *Chenopodium* and *Kochia*; Malvaceae is a plant family which includes the genera *Abutilon* and *Sida*; Papaveraceae is a plant family which includes the genera *Papaver*; Rubiaceae is a plant family which includes the genera *Galium*; Scrophulariaceae is a plant family which includes the genera *Veronica*; and Violaceae is a plant family which includes the genera *Viola*. As referred to herein, the term "pigweed" includes species of the genus *Amaranthus*. Species of pigweed for which control is often desired include *A. retroflexus* L. (redroot pigweed), *A. palmeri* (palmer

pigweed), and *A. rudis* (common waterhemp). As referred to herein "chickweed" includes species of the genus *Stellaria*. Species of chickweed for which control is often desired include *S. media* (L.) Vill. (common chickweed). As referred to herein "velvetleaf" includes species of the genus *Abutilon*. Species of velvetleaf for which control is often desired include *A. theophrasti* Medik. (velvetleaf). As referred to herein "lambsquarters" includes species of the genus *Chenopodium*. Species of lambsquarters for which control is often desired include *C. album* L. (common lambsquarters). Therefore, one aspect of this invention includes a method of applying a compound of Formula **1** to control the growth of *Amaranthus*, *Stellaria* and *Abutilon*.

A herbicidally effective amount of the compounds of this invention is determined by a number of factors. These factors include: formulation selected, method of application, amount and type of vegetation present, growing conditions, etc. In general, a herbicidally effective amount of compounds of this invention is about 0.001 to 20 kg/ha with a preferred range of about 0.004 to 1 kg/ha. One skilled in the art can easily determine the herbicidally effective amount necessary for the desired level of weed control.

Compounds of the invention are useful in treating all plants and plant parts. Plant varieties and cultivars can be obtained by conventional propagation and breeding methods or by genetic engineering methods. Genetically modified plants (transgenic plants) are those in which a heterologous gene (transgene) has been stably integrated into the plant's genome. A transgene that is defined by its particular location in the plant genome is called a transformation or transgenic event.

Genetically modified plant cultivars which can be treated according to the invention include those that are resistant against one or more biotic stresses (pests such as nematodes, insects, mites, fungi, etc.) or abiotic stresses (drought, cold temperature, soil salinity, etc.), or that contain other desirable characteristics. Plants can be genetically modified to exhibit traits of, for example, herbicide tolerance, insect-resistance, modified oil profiles or drought tolerance. Useful genetically modified plants containing single gene transformation events or combinations of transformation events are listed in Exhibit C. Additional information for the genetic modifications listed in Exhibit C can be obtained from publicly available databases maintained, for example, by the U.S. Department of Agriculture.

The following abbreviations, T1 through T37, are used in Exhibit C for traits. A "-" means the entry is not available.

Trait	Description	Trait	Description	Trait	Description
T1	Glyphosate tolerance	T15	Cold tolerance	T27	High tryptophan
T2	High lauric acid oil	T16	Imidazolinone herb. tol.	T28	Erect leaves semidwarf
T3	Glufosinate tolerance	T17	Modified alpha-amylase	T29	Semidwarf
T4	Phytate breakdown	T18	Pollination control	T30	Low iron tolerance
T5	Oxynil tolerance	T19	2,4-D tolerance	T31	Modified oil/fatty acid

T6	Disease resistance	T20	Increased lysine	T32	HPPD tolerance
T7	Insect resistance	T21	Drought tolerance	T33	High oil
T9	Modified flower color	T22	Delayed ripening/senescence	T34	Aryloxyalkanoate tol.
T11	ALS Herbicide Tol.	T23	Modified product quality	T35	Mesotrione tolerance
T12	Dicamba Tolerance	T24	High cellulose	T36	Reduced nicotine
T13	Anti-allergy	T25	Modified starch/carbohydrate	T37	Modified product
T14	Salt tolerance	T26	Insect & disease resist.		

Exhibit 2

Crop	Event Name	Event Code	Trait(s)	Gene(s)
Alfalfa	J101	MON-00101-8	T1	cp4 epsps (aroA:CP4)
Alfalfa	J163	MON-ØØ163-7	T1	cp4 epsps (aroA:CP4)
Canola*	23-18-17 (Event 18)	CGN-89465-2	T2	te
Canola*	23-198 (Event 23)	CGN-89465-2	T2	te
Canola*	61061	DP-Ø61Ø61-7	T1	gat4621
Canola*	73496	DP-Ø73496-4	T1	gat4621
Canola*	GT200 (RT200)	MON-89249-2	T1	cp4 epsps (aroA:CP4); goxv247
Canola*	GT73 (RT73)	MON-ØØØ73-7	T1	cp4 epsps (aroA:CP4); goxv247
Canola*	HCN10 (Topas 19/2)	-	T3	bar
Canola*	HCN28 (T45)	ACS-BNØØ8-2	T3	pat (syn)
Canola*	HCN92 (Topas 19/2)	ACS-BNØØ7-1	T3	bar
Canola*	MON88302	MON-883Ø2-9	T1	cp4 epsps (aroA:CP4)
Canola*	MPS961	-	T4	phyA
Canola*	MPS962	-	T4	phyA
Canola*	MPS963	-	T4	phyA
Canola*	MPS964	-	T4	phyA
Canola*	MPS965	-	T4	phyA
Canola*	MS1 (B91-4)	ACS-BNØØ4-7	T3	bar
Canola*	MS8	ACS-BNØØ5-8	T3	bar
Canola*	OXY-235	ACS-BNØ11-5	T5	bxn
Canola*	PHY14	-	T3	bar
Canola*	PHY23	-	T3	bar
Canola*	PHY35	-	T3	bar
Canola*	PHY36	-	T3	bar
Canola*	RF1 (B93-101)	ACS-BNØØ1-4	T3	bar
Canola*	RF2 (B94-2)	ACS-BNØØ2-5	T3	bar
Canola*	RF3	ACS-BNØØ3-6	T3	bar
Bean	EMBRAPA 5.1	EMB-PV051-1	T6	ac1 (sense and antisense)

Brinjal #	EE-1	-	T7	cry1Ac
Cotton	19-51a	DD-Ø1951A-7	T11	S4-HrA
Cotton	281-24-236	DAS-24236-5	T3,T7	pat (syn); cry1F
Cotton	3006-210-23	DAS-21Ø23-5	T3,T7	pat (syn); cry1Ac
Cotton	31707	-	T5,T7	bxn; cry1Ac
Cotton	31803	-	T5,T7	bxn; cry1Ac
Cotton	31807	-	T5,T7	bxn; cry1Ac
Cotton	31808	-	T5,T7	bxn; cry1Ac
Cotton	42317	-	T5,T7	bxn; cry1Ac
Cotton	BNLA-601	-	T7	cry1Ac
Cotton	BXN10211	BXN10211-9	T5	bxn; cry1Ac
Cotton	BXN10215	BXN10215-4	T5	bxn; cry1Ac
Cotton	BXN10222	BXN10222-2	T5	bxn; cry1Ac
Cotton	BXN10224	BXN10224-4	T5	bxn; cry1Ac
Cotton	COT102	SYN-IR102-7	T7	vip3A(a)
Cotton	COT67B	SYN-IR67B-1	T7	cry1Ab
Cotton	COT202	-	T7	vip3A
Cotton	Event 1	-	T7	cry1Ac
Cotton	GMF Cry1A	GTL-GMF311-7	T7	cry1Ab-Ac
Cotton	GHB119	BCS-GH005-8	T7	cry2Ae
Cotton	GHB614	BCS-GH002-5	T1	2mepsps
Cotton	GK12	-	T7	cry1Ab-Ac
Cotton	LLCotton25	ACS-GH001-3	T3	bar
Cotton	MLS 9124	-	T7	cry1C
Cotton	MON1076	MON-89924-2	T7	cry1Ac
Cotton	MON1445	MON-01445-2	T1	cp4 epsps (aroA:CP4)
Cotton	MON15985	MON-15985-7	T7	cry1Ac; cry2Ab2
Cotton	MON1698	MON-89383-1	T7	cp4 epsps (aroA:CP4)
Cotton	MON531	MON-00531-6	T7	cry1Ac
Cotton	MON757	MON-00757-7	T7	cry1Ac
Cotton	MON88913	MON-88913-8	T1	cp4 epsps (aroA:CP4)
Cotton	Nqwe Chi 6 Bt	-	T7	-
Cotton	SKG321	-	T7	cry1A; CpTI
Cotton	T303-3	BCS-GH003-6	T3,T7	cry1Ab; bar
Cotton	T304-40	BCS-GH004-7	T3,T7	cry1Ab; bar
Cotton	CE43-67B	-	T7	cry1Ab
Cotton	CE46-02A	-	T7	cry1Ab
Cotton	CE44-69D	-	T7	cry1Ab
Cotton	1143-14A	-	T7	cry1Ab
Cotton	1143-51B	-	T7	cry1Ab
Cotton	T342-142	-	T7	cry1Ab

Cotton	PV-GHGT07 (1445)	-	T1	cp4 epsps (aroA:CP4)
Cotton	EE-GH3	-	T1	mepsps
Cotton	EE-GH5	-	T7	cry1Ab
Cotton	MON88701	MON-88701-3	T3,T12	Modified dmo; bar
Cotton	OsCr11	-	T13	Modified Cry j
Flax	FP967	CDC-FL001-2	T11	als
Lentil	RH44	-	T16	als
Maize	3272	SYN-E3272-5	T17	amy797E
Maize	5307	SYN-05307-1	T7	ecry3.1Ab
Maize	59122	DAS-59122-7	T3,T7	cry34Ab1; cry35Ab1; pat
Maize	676	PH-000676-7	T3,T18	pat; dam
Maize	678	PH-000678-9	T3,T18	pat; dam
Maize	680	PH-000680-2	T3,T18	pat; dam
Maize	98140	DP-098140-6	T1,T11	gat4621; zm-hra
Maize	Bt10	-	T3,T7	cry1Ab; pat
Maize	Bt176 (176)	SYN-EV176-9	T3,T7	cry1Ab; bar
Maize	BVLA430101	-	T4	phyA2
Maize	CBH-351	ACS-ZM004-3	T3,T7	cry9C; bar
Maize	DAS40278-9	DAS40278-9	T19	aad-1
Maize	DBT418	DKB-89614-9	T3,T7	cry1Ac; pinII; bar
Maize	DLL25 (B16)	DKB-89790-5	T3	bar
Maize	GA21	MON-00021-9	T1	mepsps
Maize	GG25	-	T1	mepsps
Maize	GJ11	-	T1	mepsps
Maize	Fl117	-	T1	mepsps
Maize	GAT-ZM1	-	T3	pat
Maize	LY038	REN-00038-3	T20	cordapA
Maize	MIR162	SYN-IR162-4	T7	vip3Aa20
Maize	MIR604	SYN-IR604-5	T7	mcry3A
Maize	MON801 (MON80100)	MON801	T1,T7	cry1Ab; cp4 epsps (aroA:CP4); goxv247
Maize	MON802	MON-80200-7	T1,T7	cry1Ab; cp4 epsps (aroA:CP4); goxv247
Maize	MON809	PH-MON-809-2	T1,T7	cry1Ab; cp4 epsps (aroA:CP4); goxv247
Maize	MON810	MON-00810-6	T1,T7	cry1Ab; cp4 epsps (aroA:CP4); goxv247
Maize	MON832	-	T1	cp4 epsps (aroA:CP4); goxv247
Maize	MON863	MON-00863-5	T7	cry3Bb1
Maize	MON87427	MON-87427-7	T1	cp4 epsps (aroA:CP4)
Maize	MON87460	MON-87460-4	T21	cspB
Maize	MON88017	MON-88017-3	T1,T7	cry3Bb1; cp4 epsps (aroA:CP4)
Maize	MON89034	MON-89034-3	T7	cry2Ab2; cry1A.105
Maize	MS3	ACS-ZM001-9	T3,T18	bar; barnase

Maize	MS6	ACS-ZM005-4	T3,T18	bar; barnase
Maize	NK603	MON-00603-6	T1	cp4 epsps (aroA:CP4)
Maize	T14	ACS-ZM002-1	T3	pat (syn)
Maize	T25	ACS-ZM003-2	T3	pat (syn)
Maize	TC1507	DAS-01507-1	T3,T7	cry1Fa2; pat
Maize	TC6275	DAS-06275-8	T3,T7	mocry1F; bar
Maize	VIP1034	-	T3,T7	vip3A; pat
Maize	43A47	DP-043A47-3	T3,T7	cry1F; cry34Ab1; cry35Ab1; pat
Maize	40416	DP-040416-8	T3,T7	cry1F; cry34Ab1; cry35Ab1; pat
Maize	32316	DP-032316-8	T3,T7	cry1F; cry34Ab1; cry35Ab1; pat
Maize	4114	DP-004114-3	T3,T7	cry1F; cry34Ab1; cry35Ab1; pat
Melon	Melon A	-	T22	sam-k
Melon	Melon B	-	T22	sam-k
Papaya	55-1	CUH-CP551-8	T6	prsv cp
Papaya	63-1	CUH-CP631-7	T6	prsv cp
Papaya	Huanong No. 1	-	T6	prsv rep
Papaya	X17-2	UFL-X17CP-6	T6	prsv cp
Plum	C-5	ARS-PLMC5-6	T6	ppv cp
Canola**	ZSR500	-	T1	cp4 epsps (aroA:CP4); goxv247
Canola**	ZSR502	-	T1	cp4 epsps (aroA:CP4); goxv247
Canola**	ZSR503	-	T1	cp4 epsps (aroA:CP4); goxv247
Rice	7Crp#242-95-7	-	T13	7crp
Rice	7Crp#10	-	T13	7crp
Rice	GM Shanyou 63	-	T7	cry1Ab; cry1Ac
Rice	Huahui-1/TT51-1	-	T7	cry1Ab; cry1Ac
Rice	LLRICE06	ACS-OS001-4	T3	bar
Rice	LLRICE601	BCS-OS003-7	T3	bar
Rice	LLRICE62	ACS-OS002-5	T3	bar
Rice	Tarom molaii + cry1Ab	-	T7	cry1Ab (truncated)
Rice	GAT-OS2	-	T3	bar
Rice	GAT-OS3	-	T3	bar
Rice	PE-7	-	T7	Cry1Ac
Rice	7Crp#10	-	T13	7crp
Rice	KPD627-8	-	T27	OASA1D
Rice	KPD722-4	-	T27	OASA1D
Rice	KA317	-	T27	OASA1D
Rice	HW5	-	T27	OASA1D
Rice	HW1	-	T27	OASA1D
Rice	B-4-1-18	-	T28	Δ OsBRI1
Rice	G-3-3-22	-	T29	OSGA2ox1
Rice	AD77	-	T6	DEF

Rice	AD51	-	T6	DEF
Rice	AD48	-	T6	DEF
Rice	AD41	-	T6	DEF
Rice	13pNasNa800725atAprt1	-	T30	HvNAS1; HvNAAT-A; APRT
Rice	13pAprt1	-	T30	APRT
Rice	gHvNAS1-gHvNAAT-1	-	T30	HvNAS1; HvNAAT-A; HvNAAT-B
Rice	gHvIDS3-1	-	T30	HvIDS3
Rice	gHvNAAT1	-	T30	HvNAAT-A; HvNAAT-B
Rice	gHvNAS1-1	-	T30	HvNAS1
Rice	NIA-OS006-4	-	T6	WRKY45
Rice	NIA-OS005-3	-	T6	WRKY45
Rice	NIA-OS004-2	-	T6	WRKY45
Rice	NIA-OS003-1	-	T6	WRKY45
Rice	NIA-OS002-9	-	T6	WRKY45
Rice	NIA-OS001-8	-	T6	WRKY45
Rice	OsCr11	-	T13	Modified Cry j
Rice	17053	-	T1	cp4 epsps (aroA:CP4)
Rice	17314	-	T1	cp4 epsps (aroA:CP4)
Rose	WKS82 / 130-4-1	IFD-52401-4	T9	5AT; bp40 (f3'5'h)
Rose	WKS92 / 130-9-1	IFD-52901-9	T9	5AT; bp40 (f3'5'h)
Soybean	260-05 (G94-1, G94-19, G168)	-	T9	gm-fad2-1 (silencing locus)
Soybean	A2704-12	ACS-GM005-3	T3	pat
Soybean	A2704-21	ACS-GM004-2	T3	pat
Soybean	A5547-127	ACS-GM006-4	T3	pat
Soybean	A5547-35	ACS-GM008-6	T3	pat
Soybean	CV127	BPS-CV127-9	T16	csr1-2
Soybean	DAS68416-4	DAS68416-4	T3	pat
Soybean	DP305423	DP-305423-1	T11,T31	gm-fad2-1 (silencing locus); gm-hra
Soybean	DP356043	DP-356043-5	T1,T31	gm-fad2-1 (silencing locus); gat4601
Soybean	FG72	MST-FG072-3	T32,T1	2mepsps; hppdPF W336
Soybean	GTS 40-3-2 (40-3-2)	MON-04032-6	T1	cp4 epsps (aroA:CP4)
Soybean	GU262	ACS-GM003-1	T3	pat
Soybean	MON87701	MON-87701-2	T7	cry1Ac
Soybean	MON87705	MON-87705-6	T1,T31	fatb1-A (sense & antisense); fad2-1A (sense & antisense); cp4 epsps (aroA:CP4)
Soybean	MON87708	MON-87708-9	T1,T12	dmo; cp4 epsps (aroA:CP4)
Soybean	MON87769	MON-87769-7	T1,T31	Pj.D6D; Nc.Fad3; cp4 epsps (aroA:CP4)

Soybean	MON89788	MON-89788-1	T1	cp4 epsps (aroA:CP4)
Soybean	W62	ACS-GM002-9	T3	bar
Soybean	W98	ACS-GM001-8	T3	bar
Soybean	MON87754	MON-87754-1	T33	dgat2A
Soybean	DAS21606	DAS-21606	T34,T3	Modified aad-12; pat
Soybean	DAS44406	DAS-44406-6	T1,T3,T34	Modified aad-12; 2mepsps; pat
Soybean	SYHT04R	SYN-0004R-8	T35	Modified avhppd
Soybean	9582.814.19.1	-	T3,T7	cry1Ac; cry1F; pat
Squash	CZW3	SEM-ØCZW3-2	T6	cmv cp; zymv cp; wmv cp
Squash	ZW20	SEM-0ZW20-7	T6	zymv cp; wmv cp
Sugar Beet	GTSB77 (T9100152)	SY-GTSB77-8	T1	cp4 epsps (aroA:CP4); goxv247
Sugar Beet	H7-1	KM-000H71-4	T1	cp4 epsps (aroA:CP4)
Sugar Beet	T120-7	ACS-BV001-3	T3	pat
Sugar Beet	T227-1	-	T1	cp4 epsps (aroA:CP4)
Sugarcane	NXI-1T	-	T21	EcbetA
Sunflower	X81359	-	T16	als
Pepper	PK-SP01	-	T6	cmv cp
Tobacco	C/F/93/08-02	-	T5	bxn
Tobacco	Vector 21-41	-	T36	NtQPT1 (antisense)
Sunflower	X81359	-	T16	als
Wheat	MON71800	MON-718ØØ-3	T1	cp4 epsps (aroA:CP4)

* Argentine (*Brassica napus*), ** Polish (*B. rapa*), # Eggplant

Treatment of genetically modified plants with compounds of the invention may result in super-additive or synergistic effects. For example, reduction in application rates, broadening of the activity spectrum, increased tolerance to biotic/abiotic stresses or enhanced storage stability may be greater than expected from just simple additive effects of the application of compounds of the invention on genetically modified plants.

Compounds of this invention can also be mixed with one or more other biologically active compounds or agents including herbicides, herbicide safeners, fungicides, insecticides, nematocides, bactericides, acaricides, growth regulators such as insect molting inhibitors and rooting stimulants, chemosterilants, semiochemicals, repellents, attractants, pheromones, feeding stimulants, plant nutrients, other biologically active compounds or entomopathogenic bacteria, virus or fungi to form a multi-component pesticide giving an even broader spectrum of agricultural protection. Mixtures of the compounds of the invention with other herbicides can broaden the spectrum of activity against additional weed species, and suppress the proliferation of any resistant biotypes. Thus the present invention also pertains to a composition comprising a compound of Formula **1** (in a herbicidally effective amount) and at least one additional biologically active compound or agent (in a

biologically effective amount) and can further comprise at least one of a surfactant, a solid diluent or a liquid diluent. The other biologically active compounds or agents can be formulated in compositions comprising at least one of a surfactant, solid or liquid diluent. For mixtures of the present invention, one or more other biologically active compounds or agents can be formulated together with a compound of Formula **1**, to form a premix, or one or more other biologically active compounds or agents can be formulated separately from the compound of Formula **1**, and the formulations combined together before application (e.g., in a spray tank) or, alternatively, applied in succession.

A mixture of one or more of the following herbicides with a compound of this invention may be particularly useful for weed control: acetochlor, acifluorfen and its sodium salt, aclonifen, acrolein (2-propenal), alachlor, alloxydim, ametryn, amicarbazone, amidosulfuron, aminocyclopyrachlor and its esters (e.g., methyl, ethyl) and salts (e.g., sodium, potassium), aminopyralid, amitrole, ammonium sulfamate, anilofos, asulam, atrazine, azimsulfuron, beflubutamid, benazolin, benazolin-ethyl, bencarbazone, benfluralin, benfuresate, bensulfuron-methyl, bensulide, bentazone, benzobicyclon, benzofenap, bicyclopyrone, bifenox, bilanafos, bispyribac and its sodium salt, bromacil, bromobutide, bromofenoxim, bromoxynil, bromoxynil octanoate, butachlor, butafenacil, butamifos, butralin, butroxydim, butylate, cafenstrole, carbetamide, carfentrazone-ethyl, catechin, chlomethoxyfen, chloramben, chlorbromuron, chlorflurenol-methyl, chloridazon, chlorimuron-ethyl, chlorotoluron, chlorpropham, chlorsulfuron, chlorthal-dimethyl, chlorthiamid, cinidon-ethyl, cinmethylin, cinosulfuron, clacyfos, clefoxydim, clethodim, clodinafop-propargyl, clomazone, clomeprop, clopyralid, clopyralid-olamine, cloransulam-methyl, cumyluron, cyanazine, cycloate, cyclopyrimorate, cyclosulfamuron, cycloxydim, cyhalofop-butyl, 2,4-D and its butotyl, butyl, isoctyl and isopropyl esters and its dimethylammonium, diolamine and trolamine salts, daimuron, dalapon, dalapon-sodium, dazomet, 2,4-DB and its dimethylammonium, potassium and sodium salts, desmedipham, desmetryn, dicamba and its diglycolammonium, dimethylammonium, potassium and sodium salts, dichlobenil, dichlorprop, diclofop-methyl, diclosulam, difenzoquat metilsulfate, diflufenican, diflufenzopyr, dimefuron, dimepiperate, dimethachlor, dimethametryn, dimethenamid, dimethenamid-P, dimethipin, dimethylarsinic acid and its sodium salt, dinitramine, dinoterb, diphenamid, diquat dibromide, dithiopyr, diuron, DNOC, endothal, EPTC, esprocarb, ethalfluralin, ethametsulfuron-methyl, ethiozin, ethofumesate, ethoxyfen, ethoxysulfuron, etobenzanid, fenoxaprop-ethyl, fenoxaprop-P-ethyl, fenoxasulfone, fenquinotrione, fentrazamide, fenuron, fenuron-TCA, flamprop-methyl, flamprop-M-isopropyl, flamprop-M-methyl, flazasulfuron, florasulam, fluazifop-butyl, fluazifop-P-butyl, fluazolate, flucarbazone, flucetosulfuron, fluchloralin, flufenacet, flufenpyr, flufenpyr-ethyl, flumetsulam, flumiclorac-pentyl, flumioxazin, fluometuron, fluoroglycofen-ethyl, flupoxam, flupyrsulfuron-methyl and its sodium salt, flurenol,

flurenol-butyl, fluridone, flurochloridone, fluroxypyr, flurtamone, fluthiacet-methyl, fomesafen, foramsulfuron, fosamine-ammonium, glufosinate, glufosinate-ammonium, glufosinate-P, glyphosate and its salts such as ammonium, isopropylammonium, potassium, sodium (including sesquisodium) and trimesium (alternatively named sulfosate), halauxifen, halauxifen-methyl, halosulfuron-methyl, haloxyfop-etotyl, haloxyfop-methyl, hexazinone, imazamethabenz-methyl, imazamox, imazapic, imazapyr, imazaquin, imazaquin-ammonium, imazethapyr, imazethapyr-ammonium, imazosulfuron, indanofan, indaziflam, iofensulfuron, iodosulfuron-methyl, ioxynil, ioxynil octanoate, ioxynil-sodium, ipfencarbazone, isoproturon, isouron, isoxaben, isoxaflutole, isoxachlortole, lactofen, lenacil, linuron, maleic hydrazide, MCPA and its salts (e.g., MCPA-dimethylammonium, MCPA-potassium and MCPA-sodium, esters (e.g., MCPA-2-ethylhexyl, MCPA-butotyl) and thioesters (e.g., MCPA-thioethyl), MCPB and its salts (e.g., MCPB-sodium) and esters (e.g., MCPB-ethyl), mecoprop, mecoprop-P, mefenacet, mefluidide, mesosulfuron-methyl, mesotrione, metam-sodium, metamifop, metamitron, metazachlor, metazosulfuron, methabenzthiazuron, methylarsonic acid and its calcium, monoammonium, monosodium and disodium salts, methyldymron, metobenzuron, metobromuron, metolachlor, S-metolachlor, metosulam, metoxuron, metribuzin, metsulfuron-methyl, molinate, monolinuron, naproanilide, napropamide, napropamide-M, naptalam, neburon, nicosulfuron, norflurazon, orbencarb, orthosulfamuron, oryzalin, oxadiargyl, oxadiazon, oxasulfuron, oxaziclomefone, oxyfluorfen, paraquat dichloride, pebulate, pelargonic acid, pendimethalin, penoxsulam, pentanochlor, pentoxazone, perfluidone, pethoxamid, pethoxyamid, phenmedipham, picloram, picloram-potassium, picolinafen, pinoxaden, piperophos, pretilachlor, primisulfuron-methyl, prodiamine, profoxydim, prometon, prometryn, propachlor, propanil, propaquizafop, propazine, propham, propisochlor, propoxycarbazone, propyrisulfuron, propyzamide, prosulfocarb, prosulfuron, pyraclonil, pyraflufen-ethyl, pyrasulfotole, pyrazogyl, pyrazolynate, pyrazoxyfen, pyrazosulfuron-ethyl, pyribenzoxim, pyributicarb, pyridate, pyriftalid, pyriminobac-methyl, pyrimisulfan, pyrithiobac, pyrithiobac-sodium, pyroxasulfone, pyroxsulam, quinclorac, quinmerac, quinoclamine, quizalofop-ethyl, quizalofop-P-ethyl, quizalofop-P-tefuryl, rimsulfuron, saflufenacil, sethoxydim, siduron, simazine, simetryn, sulcotrione, sulfentrazone, sulfometuron-methyl, sulfosulfuron, 2,3,6-TBA, TCA, TCA-sodium, tebutam, tebuthiuron, tefuryltrione, tembotrione, tepraloxydim, terbacil, terbumeton, terbuthylazine, terbutryn, thenylchlor, thiazopyr, thiencarbazone, thifensulfuron-methyl, thiobencarb, tiafenacil, tiocarbazil, topramezone, tralkoxydim, tri-allate, triafamone, triasulfuron, triaziflam, tribenuron-methyl, triclopyr, triclopyr-butotyl, triclopyr-triethylammonium, tridiphane, trietazine, trifloxysulfuron, trifluralin, triflusulfuron-methyl, tritosulfuron, vernolate, 3-(2-chloro-3,6-difluorophenyl)-4-hydroxy-1-methyl-1,5-naphthyridin-2(1*H*)-one, 5-chloro-3-[(2-hydroxy-6-oxo-1-cyclohexen-1-yl)carbonyl]-1-(4-methoxyphenyl)-2(1*H*)-quinoxalinone, 2-chloro-*N*-(1-methyl-1*H*-tetrazol-

5-yl)-6-(trifluoromethyl)-3-pyridinecarboxamide, 7-(3,5-dichloro-4-pyridinyl)-5-(2,2-difluoroethyl)-8-hydroxypyrido[2,3-*b*]pyrazin-6(5*H*)-one), 4-(2,6-diethyl-4-methylphenyl)-5-hydroxy-2,6-dimethyl-3(2*H*)-pyridazinone), 5-[[(2,6-difluorophenyl)methoxy]methyl]-4,5-dihydro-5-methyl-3-(3-methyl-2-thienyl)isoxazole (previously methioxolin), 3-[7-fluoro-3,4-dihydro-3-oxo-4-(2-propyn-1-yl)-2*H*-1,4-benzoxazin-6-yl]dihydro-1,5-dimethyl-6-thioxo-1,3,5-triazine-2,4(1*H*,3*H*)-dione, 4-(4-fluorophenyl)-6-[(2-hydroxy-6-oxo-1-cyclohexen-1-yl)carbonyl]-2-methyl-1,2,4-triazine-3,5(2*H*,4*H*)-dione, methyl 4-amino-3-chloro-6-(4-chloro-2-fluoro-3-methoxyphenyl)-5-fluoro-2-pyridinecarboxylate, 2-methyl-3-(methylsulfonyl)-*N*-(1-methyl-1*H*-tetrazol-5-yl)-4-(trifluoromethyl)benzamide and 2-methyl-*N*-(4-methyl-1,2,5-oxadiazol-3-yl)-3-(methylsulfinyl)-4-(trifluoromethyl)benzamide. Other herbicides also include bioherbicides such as *Alternaria destruens* Simmons, *Colletotrichum gloeosporiodes* (Penz.) Penz. & Sacc., *Drechsiera monoceras* (MTB-951), *Myrothecium verrucaria* (Albertini & Schweinitz) Ditmar: Fries, *Phytophthora palmivora* (Butl.) Butl. and *Puccinia thlaspeos* Schub.

Compounds of this invention can also be used in combination with plant growth regulators such as aviglycine, *N*-(phenylmethyl)-1*H*-purin-6-amine, epocholeone, gibberellic acid, gibberellin A_4 and A_7, harpin protein, mepiquat chloride, prohexadione calcium, prohydrojasmon, sodium nitrophenolate and trinexapac-methyl, and plant growth modifying organisms such as *Bacillus cereus* strain BP01.

General references for agricultural protectants (i.e. herbicides, herbicide safeners, insecticides, fungicides, nematocides, acaricides and biological agents) include *The Pesticide Manual, 13th Edition*, C. D. S. Tomlin, Ed., British Crop Protection Council, Farnham, Surrey, U.K., 2003 and *The BioPesticide Manual, 2nd Edition*, L. G. Copping, Ed., British Crop Protection Council, Farnham, Surrey, U.K., 2001.

For embodiments where one or more of these various mixing partners are used, the weight ratio of these various mixing partners (in total) to the compound of Formula **1** is typically between about 1:3000 and about 3000:1. Of note are weight ratios between about 1:300 and about 300:1 (for example ratios between about 1:30 and about 30:1). One skilled in the art can easily determine through simple experimentation the biologically effective amounts of active ingredients necessary for the desired spectrum of biological activity. It will be evident that including these additional components may expand the spectrum of weeds controlled beyond the spectrum controlled by the compound of Formula **1** alone.

In certain instances, combinations of a compound of this invention with other biologically active (particularly herbicidal) compounds or agents (i.e. active ingredients) can result in a greater-than-additive (i.e. synergistic) effect on weeds and/or a less-than-additive effect (i.e. safening) on crops or other desirable plants. Reducing the quantity of active ingredients released in the environment while ensuring effective pest control is always desirable. Ability to use greater amounts of active ingredients to provide more effective

weed control without excessive crop injury is also desirable. When synergism of herbicidal active ingredients occurs on weeds at application rates giving agronomically satisfactory levels of weed control, such combinations can be advantageous for reducing crop production cost and decreasing environmental load. When safening of herbicidal active ingredients occurs on crops, such combinations can be advantageous for increasing crop protection by reducing weed competition.

Of note is a combination of a compound of the invention with at least one other herbicidal active ingredient. Of particular note is such a combination where the other herbicidal active ingredient has different site of action from the compound of the invention. In certain instances, a combination with at least one other herbicidal active ingredient having a similar spectrum of control but a different site of action will be particularly advantageous for resistance management. Thus, a composition of the present invention can further comprise (in a herbicidally effective amount) at least one additional herbicidal active ingredient having a similar spectrum of control but a different site of action.

Compounds of this invention can also be used in combination with herbicide safeners such as allidochlor, benoxacor, cloquintocet-mexyl, cumyluron, cyometrinil, cyprosulfonamide, daimuron, dichlormid, dicyclonon, dietholate, dimepiperate, fenchlorazole-ethyl, fenclorim, flurazole, fluxofenim, furilazole, isoxadifen-ethyl, mefenpyr-diethyl, mephenate, methoxyphenone naphthalic anhydride (1,8-naphthalic anhydride), oxabetrinil, *N*-(aminocarbonyl)-2-methylbenzenesulfonamide, *N*-(aminocarbonyl)-2-fluorobenzenesulfonamide, 1-bromo-4-[(chloromethyl)sulfonyl]benzene (BCS), 4-(dichloroacetyl)-1-oxa-4-azospiro[4.5]decane (MON 4660), 2-(dichloromethyl)-2-methyl-1,3-dioxolane (MG 191), ethyl 1,6-dihydro-1-(2-methoxyphenyl)-6-oxo-2-phenyl-5-pyrimidinecarboxylate, 2-hydroxy-*N*,*N*-dimethyl-6-(trifluoromethyl)pyridine-3-carboxamide, and 3-oxo-1-cyclohexen-l-yl 1-(3,4-dimethylphenyl)-l,6-dihydro-6-oxo-2-phenyl-5-pyrimidinecarboxylate to increase safety to certain crops. Antidotally effective amounts of the herbicide safeners can be applied at the same time as the compounds of this invention, or applied as seed treatments. Therefore an aspect of the present invention relates to a herbicidal mixture comprising a compound of this invention and an antidotally effective amount of a herbicide safener. Seed treatment is particularly useful for selective weed control, because it physically restricts antidoting to the crop plants. Therefore a particularly useful embodiment of the present invention is a method for selectively controlling the growth of undesired vegetation in a crop comprising contacting the locus of the crop with a herbicidally effective amount of a compound of this invention wherein seed from which the crop is grown is treated with an antidotally effective amount of safener. Antidotally effective amounts of safeners can be easily determined by one skilled in the art through simple experimentation.

Of note is a composition comprising a compound of the invention (in a herbicidally effective amount), at least one additional active ingredient selected from the group consisting of other herbicides and herbicide safeners (in an effective amount), and at least one component selected from the group consisting of surfactants, solid diluents and liquid diluents.

Table A1 lists specific combinations of a Component (a) with Component (b) illustrative of the mixtures, compositions and methods of the present invention. Compound 1 in the Component (a) column is identified in Index Table A. The second column of Table A1 lists the specific Component (b) compound (e.g., "2,4-D" in the first line). The third, fourth and fifth columns of Table A1 lists ranges of weight ratios for rates at which the Component (a) compound is typically applied to a field-grown crop relative to Component (b) (i.e. (a):(b)). Thus, for example, the first line of Table A1 specifically discloses the combination of Component (a) (i.e. Compound 1 in Index Table A) with 2,4-D is typically applied in a weight ratio between 1:192 – 6:1. The remaining lines of Table A1 are to be construed similarly.

TABLE A1

Component (a) (Compound)	Component (b)	Typical Weight Ratio	More Typical Weight Ratio	Most Typical Weight Ratio
1	2,4-D	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Acetochlor	1:768 – 2:1	1:256 – 1:2	1:96 – 1:11
1	Acifluorfen	1:96 – 12:1	1:32 – 4:1	1:12 – 1:2
1	Aclonifen	1:857 – 2:1	1:285 – 1:3	1:107 – 1:12
1	Alachlor	1:768 – 2:1	1:256 – 1:2	1:96 – 1:11
1	Ametryn	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Amicarbazone	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Amidosulfuron	1:6 – 168:1	1:2 – 56:1	1:1 – 11:1
1	Aminocyclopyrachlor	1:48 – 24:1	1:16 – 8:1	1:6 – 2:1
1	Aminopyralid	1:20 – 56:1	1:6 – 19:1	1:2 – 4:1
1	Amitrole	1:768 – 2:1	1:256 – 1:2	1:96 – 1:11
1	Anilofos	1:96 – 12:1	1:32 – 4:1	1:12 – 1:2
1	Asulam	1:960 – 2:1	1:320 – 1:3	1:120 – 1:14
1	Atrazine	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Azimsulfuron	1:6 – 168:1	1:2 – 56:1	1:1 – 11:1
1	Beflubutamid	1:342 – 4:1	1:114 – 2:1	1:42 – 1:5
1	Benfuresate	1:617 – 2:1	1:205 – 1:2	1:77 – 1:9
1	Bensulfuron-methyl	1:25 – 45:1	1:8 – 15:1	1:3 – 3:1
1	Bentazone	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3

Component (a) (Compound)	Component (b)	Typical Weight Ratio	More Typical Weight Ratio	Most Typical Weight Ratio
1	Benzobicyclon	1:85 – 14:1	1:28 – 5:1	1:10 – 1:2
1	Benzofenap	1:257 – 5:1	1:85 – 2:1	1:32 – 1:4
1	Bicyclopyrone	1:42 – 27:1	1:14 – 9:1	1:5 – 2:1
1	Bifenox	1:257 – 5:1	1:85 – 2:1	1:32 – 1:4
1	Bispyribac-sodium	1:10 – 112:1	1:3 – 38:1	1:1 – 7:1
1	Bromacil	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Bromobutide	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Bromoxynil	1:96 – 12:1	1:32 – 4:1	1:12 – 1:2
1	Butachlor	1:768 – 2:1	1:256 – 1:2	1:96 – 1:11
1	Butafenacil	1:42 – 27:1	1:14 – 9:1	1:5 – 2:1
1	Butylate	1:1542 – 1:2	1:514 – 1:5	1:192 – 1:22
1	Carfenstrole	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Carfentrazone-ethyl	1:128 – 9:1	1:42 – 3:1	1:16 – 1:2
1	Chlorimuron-ethyl	1:8 – 135:1	1:2 – 45:1	1:1 – 9:1
1	Chlorotoluron	1:768 – 2:1	1:256 – 1:2	1:96 – 1:11
1	Chlorsulfuron	1:6 – 168:1	1:2 – 56:1	1:1 – 11:1
1	Cincosulfuron	1:17 – 68:1	1:5 – 23:1	1:2 – 5:1
1	Cinidon-ethyl	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Cinmethylin	1:34 – 34:1	1:11 – 12:1	1:4 – 3:1
1	Clacyfos	1:34 – 34:1	1:11 – 12:1	1:4 – 3:1
1	Clethodim	1:48 – 24:1	1:16 – 8:1	1:6 – 2:1
1	Clodinafop-propargyl	1:20 – 56:1	1:6 – 19:1	1:2 – 4:1
1	Clomazone	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Clomeprop	1:171 – 7:1	1:57 – 3:1	1:21 – 1:3
1	Clopyralid	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Cloransulam-methyl	1:12 – 96:1	1:4 – 32:1	1:1 – 6:1
1	Cumyluron	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Cyanazine	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Cyclopyrimorate	1:17 – 68:1	1:5 – 23:1	1:2 – 5:1
1	Cyclosulfamuron	1:17 – 68:1	1:5 – 23:1	1:2 – 5:1
1	Cycloxydim	1:96 – 12:1	1:32 – 4:1	1:12 – 1:2
1	Cyhalofop	1:25 – 45:1	1:8 – 15:1	1:3 – 3:1
1	Daimuron	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Desmedipham	1:322 – 4:1	1:107 – 2:1	1:40 – 1:5
1	Dicamba	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3

Component (a) (Compound)	Component (b)	Typical Weight Ratio	More Typical Weight Ratio	Most Typical Weight Ratio
1	Dichlobenil	1:1371 – 1:2	1:457 – 1:4	1:171 – 1:20
1	Dichlorprop	1:925 – 2:1	1:308 – 1:3	1:115 – 1:13
1	Diclofop-methyl	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Diclosulam	1:10 – 112:1	1:3 – 38:1	1:1 – 7:1
1	Difenzoquat	1:288 – 4:1	1:96 – 2:1	1:36 – 1:4
1	Diflufenican	1:857 – 2:1	1:285 – 1:3	1:107 – 1:12
1	Diflufenzopyr	1:12 – 96:1	1:4 – 32:1	1:1 – 6:1
1	Dimethachlor	1:768 – 2:1	1:256 – 1:2	1:96 – 1:11
1	Dimethametryn	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Dimethenamid-P	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Dithiopyr	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Diuron	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	EPTC	1:768 – 2:1	1:256 – 1:2	1:96 – 1:11
1	Esprocarb	1:1371 – 1:2	1:457 – 1:4	1:171 – 1:20
1	Ethalfluralin	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Ethametsulfuron-methyl	1:17 – 68:1	1:5 – 23:1	1:2 – 5:1
1	Ethoxyfen	1:8 – 135:1	1:2 – 45:1	1:1 – 9:1
1	Ethoxysulfuron	1:20 – 56:1	1:6 – 19:1	1:2 – 4:1
1	Etobenzanid	1:257 – 5:1	1:85 – 2:1	1:32 – 1:4
1	Fenoxaprop-ethyl	1:120 – 10:1	1:40 – 4:1	1:15 – 1:2
1	Fenoxasulfone	1:85 – 14:1	1:28 – 5:1	1:10 – 1:2
1	Fenquinotrione	1:17 – 68:1	1:5 – 23:1	1:2 – 5:1
1	Fentrazamide	1:17 – 68:1	1:5 – 23:1	1:2 – 5:1
1	Flazasulfuron	1:17 – 68:1	1:5 – 23:1	1:2 – 5:1
1	Florasulam	1:2 – 420:1	1:1 – 140:1	2:1 – 27:1
1	Fluazifop-butyl	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Flucarbazone	1:8 – 135:1	1:2 – 45:1	1:1 – 9:1
1	Flucetosulfuron	1:8 – 135:1	1:2 – 45:1	1:1 – 9:1
1	Flufenacet	1:257 – 5:1	1:85 – 2:1	1:32 – 1:4
1	Flumetsulam	1:24 – 48:1	1:8 – 16:1	1:3 – 3:1
1	Flumiclorac-pentyl	1:10 – 112:1	1:3 – 38:1	1:1 – 7:1
1	Flumioxazin	1:25 – 45:1	1:8 – 15:1	1:3 – 3:1
1	Fluometuron	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Flupyrsulfuron-methyl	1:3 – 336:1	1:1 – 112:1	2:1 – 21:1
1	Fluridone	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6

Component (a) (Compound)	Component (b)	Typical Weight Ratio	More Typical Weight Ratio	Most Typical Weight Ratio
1	Fluroxypyr	1:96 – 12:1	1:32 – 4:1	1:12 – 1:2
1	Flurtamone	1:857 – 2:1	1:285 – 1:3	1:107 – 1:12
1	Fluthiacet-methyl	1:48 – 42:1	1:16 – 14:1	1:3 – 3:1
1	Fomesafen	1:96 – 12:1	1:32 – 4:1	1:12 – 1:2
1	Foramsulfuron	1:13 – 84:1	1:4 – 28:1	1:1 – 6:1
1	Glufosinate	1:288 – 4:1	1:96 – 2:1	1:36 – 1:4
1	Glyphosate	1:288 – 4:1	1:96 – 2:1	1:36 – 1:4
1	Halosulfuron-methyl	1:17 – 68:1	1:5 – 23:1	1:2 – 5:1
1	Halauxifen	1:20 – 56:1	1:6 – 19:1	1:2 – 4:1
1	Halauxifen methyl	1:20 – 56:1	1:6 – 19:1	1:2 – 4:1
1	Haloxyfop-methyl	1:34 – 34:1	1:11 – 12:1	1:4 – 3:1
1	Hexazinone	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Imazamox	1:13 – 84:1	1:4 – 28:1	1:1 – 6:1
1	Imazapic	1:20 – 56:1	1:6 – 19:1	1:2 – 4:1
1	Imazapyr	1:85 – 14:1	1:28 – 5:1	1:10 – 1:2
1	Imazaquin	1:34 – 34:1	1:11 – 12:1	1:4 – 3:1
1	Imazethabenz-methyl	1:171 – 7:1	1:57 – 3:1	1:21 – 1:3
1	Imazethapyr	1:24 – 48:1	1:8 – 16:1	1:3 – 3:1
1	Imazosulfuron	1:27 – 42:1	1:9 – 14:1	1:3 – 3:1
1	Indanofan	1:342 – 4:1	1:114 – 2:1	1:42 – 1:5
1	Indaziflam	1:25 – 45:1	1:8 – 15:1	1:3 – 3:1
1	Iodosulfuron-methyl	1:3 – 336:1	1:1 – 112:1	2:1 – 21:1
1	Ioxynil	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Ipfencarbazone	1:85 – 14:1	1:28 – 5:1	1:10 – 1:2
1	Isoproturon	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Isoxaben	1:288 – 4:1	1:96 – 2:1	1:36 – 1:4
1	Isoxaflutole	1:60 – 20:1	1:20 – 7:1	1:7 – 2:1
1	Lactofen	1:42 – 27:1	1:14 – 9:1	1:5 – 2:1
1	Lenacil	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Linuron	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	MCPA	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	MCPB	1:288 – 4:1	1:96 – 2:1	1:36 – 1:4
1	Mecoprop	1:768 – 2:1	1:256 – 1:2	1:96 – 1:11
1	Mefenacet	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Mefluidide	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3

Component (a) (Compound)	Component (b)	Typical Weight Ratio	More Typical Weight Ratio	Most Typical Weight Ratio
1	Mesosulfuron-methyl	1:5 – 224:1	1:1 – 75:1	1:1 – 14:1
1	Mesotrione	1:42 – 27:1	1:14 – 9:1	1:5 – 2:1
1	Metamifop	1:42 – 27:1	1:14 – 9:1	1:5 – 2:1
1	Metazachlor	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Metazosulfuron	1:25 – 45:1	1:8 – 15:1	1:3 – 3:1
1	Methabenzthiazuron	1:768 – 2:1	1:256 – 1:2	1:96 – 1:11
1	Metolachlor	1:768 – 2:1	1:256 – 1:2	1:96 – 1:11
1	Metosulam	1:8 – 135:1	1:2 – 45:1	1:1 – 9:1
1	Metribuzin	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Metsulfuron-methyl	1:2 – 560:1	1:1 – 187:1	3:1 – 35:1
1	Molinate	1:1028 – 2:1	1:342 – 1:3	1:128 – 1:15
1	Napropamide	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Napropamide-M	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Naptalam	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Nicosulfuron	1:12 – 96:1	1:4 – 32:1	1:1 – 6:1
1	Norflurazon	1:1152 – 1:1	1:384 – 1:3	1:144 – 1:16
1	Orbencarb	1:1371 – 1:2	1:457 – 1:4	1:171 – 1:20
1	Orthosulfamuron	1:20 – 56:1	1:6 – 19:1	1:2 – 4:1
1	Oryzalin	1:514 – 3:1	1:171 – 1:2	1:64 – 1:8
1	Oxadiargyl	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Oxadiazon	1:548 – 3:1	1:182 – 1:2	1:68 – 1:8
1	Oxasulfuron	1:27 – 42:1	1:9 – 14:1	1:3 – 3:1
1	Oxaziclomefone	1:42 – 27:1	1:14 – 9:1	1:5 – 2:1
1	Oxyfluorfen	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Paraquat	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Pendimethalin	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Penoxsulam	1:10 – 112:1	1:3 – 38:1	1:1 – 7:1
1	Penthoxamid	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Pentoxazone	1:102 – 12:1	1:34 – 4:1	1:12 – 1:2
1	Phenmedipham	1:102 – 12:1	1:34 – 4:1	1:12 – 1:2
1	Picloram	1:96 – 12:1	1:32 – 4:1	1:12 – 1:2
1	Picolinafen	1:34 – 34:1	1:11 – 12:1	1:4 – 3:1
1	Pinoxaden	1:25 – 45:1	1:8 – 15:1	1:3 – 3:1
1	Pretilachlor	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Primisulfuron-methyl	1:8 – 135:1	1:2 – 45:1	1:1 – 9:1

Component (a) (Compound)	Component (b)	Typical Weight Ratio	More Typical Weight Ratio	Most Typical Weight Ratio
1	Prodiamine	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Profoxydim	1:42 – 27:1	1:14 – 9:1	1:5 – 2:1
1	Prometryn	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Propachlor	1:1152 – 1:1	1:384 – 1:3	1:144 – 1:16
1	Propanil	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Propaquizafop	1:48 – 24:1	1:16 – 8:1	1:6 – 2:1
1	Propoxycarbazone	1:17 – 68:1	1:5 – 23:1	1:2 – 5:1
1	Propyrisulfuron	1:17 – 68:1	1:5 – 23:1	1:2 – 5:1
1	Propyzamide	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Prosulfocarb	1:1200 – 1:2	1:400 – 1:4	1:150 – 1:17
1	Prosulfuron	1:6 – 168:1	1:2 – 56:1	1:1 – 11:1
1	Pyraclonil	1:42 – 27:1	1:14 – 9:1	1:5 – 2:1
1	Pyraflufen-ethyl	1:5 – 224:1	1:1 – 75:1	1:1 – 14:1
1	Pyrasulfotole	1:13 – 84:1	1:4 – 28:1	1:1 – 6:1
1	Pyrazolynate	1:857 – 2:1	1:285 – 1:3	1:107 – 1:12
1	Pyrazosulfuron-ethyl	1:10 – 112:1	1:3 – 38:1	1:1 – 7:1
1	Pyrazoxyfen	1:5 – 224:1	1:1 – 75:1	1:1 – 14:1
1	Pyribenzoxim	1:10 – 112:1	1:3 – 38:1	1:1 – 7:1
1	Pyributicarb	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Pyridate	1:288 – 4:1	1:96 – 2:1	1:36 – 1:4
1	Pyriftalid	1:10 – 112:1	1:3 – 38:1	1:1 – 7:1
1	Pyriminobac-methyl	1:20 – 56:1	1:6 – 19:1	1:2 – 4:1
1	Pyrimisulfan	1:17 – 68:1	1:5 – 23:1	1:2 – 5:1
1	Pyrithiobac	1:24 – 48:1	1:8 – 16:1	1:3 – 3:1
1	Pyroxasulfone	1:85 – 14:1	1:28 – 5:1	1:10 – 1:2
1	Pyroxsulam	1:5 – 224:1	1:1 – 75:1	1:1 – 14:1
1	Quinclorac	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Quizalofop-ethyl	1:42 – 27:1	1:14 – 9:1	1:5 – 2:1
1	Rimsulfuron	1:13 – 84:1	1:4 – 28:1	1:1 – 6:1
1	Saflufenacil	1:25 – 45:1	1:8 – 15:1	1:3 – 3:1
1	Sethoxydim	1:96 – 12:1	1:32 – 4:1	1:12 – 1:2
1	Simazine	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Sulcotrione	1:120 – 10:1	1:40 – 4:1	1:15 – 1:2
1	Sulfentrazone	1:147 – 8:1	1:49 – 3:1	1:18 – 1:3
1	Sulfometuron-methyl	1:34 – 34:1	1:11 – 12:1	1:4 – 3:1

Component (a) (Compound)	Component (b)	Typical Weight Ratio	More Typical Weight Ratio	Most Typical Weight Ratio
1	Sulfosulfuron	1:8 – 135:1	1:2 – 45:1	1:1 – 9:1
1	Tebuthiuron	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Tefuryltrione	1:42 – 27:1	1:14 – 9:1	1:5 – 2:1
1	Tembotrione	1:31 – 37:1	1:10 – 13:1	1:3 – 3:1
1	Tepraloxydim	1:25 – 45:1	1:8 – 15:1	1:3 – 3:1
1	Terbacil	1:288 – 4:1	1:96 – 2:1	1:36 – 1:4
1	Terbuthylazine	1:857 – 2:1	1:285 – 1:3	1:107 – 1:12
1	Terbutryn	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Thenylchlor	1:85 – 14:1	1:28 – 5:1	1:10 – 1:2
1	Thiazopyr	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Thiencarbazone	1:3 – 336:1	1:1 – 112:1	2:1 – 21:1
1	Thifensulfuron-methyl	1:5 – 224:1	1:1 – 75:1	1:1 – 14:1
1	Tiafenacil	1:17 – 68:1	1:5 – 23:1	1:2 – 5:1
1	Thiobencarb	1:768 – 2:1	1:256 – 1:2	1:96 – 1:11
1	Topramzone	1:6 – 168:1	1:2 – 56:1	1:1 – 11:1
1	Tralkoxydim	1:68 – 17:1	1:22 – 6:1	1:8 – 2:1
1	Triallate	1:768 – 2:1	1:256 – 1:2	1:96 – 1:11
1	Triasulfuron	1:5 – 224:1	1:1 – 75:1	1:1 – 14:1
1	Triaziflam	1:171 – 7:1	1:57 – 3:1	1:21 – 1:3
1	Tribenuron-methyl	1:3 – 336:1	1:1 – 112:1	2:1 – 21:1
1	Triclopyr	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Trifloxysulfuron	1:2 – 420:1	1:1 – 140:1	2:1 – 27:1
1	Trifluralin	1:288 – 4:1	1:96 – 2:1	1:36 – 1:4
1	Triflusulfuron-methyl	1:17 – 68:1	1:5 – 23:1	1:2 – 5:1
1	Tritosulfuron	1:13 – 84:1	1:4 – 28:1	1:1 – 6:1

Table A2 is constructed the same as Table A1 above except that entries below the "Component (a)" column heading are replaced with the respective Component (a) Column Entry shown below. Compound 1 in the Component (a) column is identified in Index Table A. Thus, for example, in Table A2 the entries below the "Component (a)" column heading all recite "Compound 2" (i.e. Compound 2 identified in Index Table A), and the first line below the column headings in Table A2 specifically discloses a mixture of Compound 2 with 2,4-D. Tables A3 through A7 are constructed similarly.

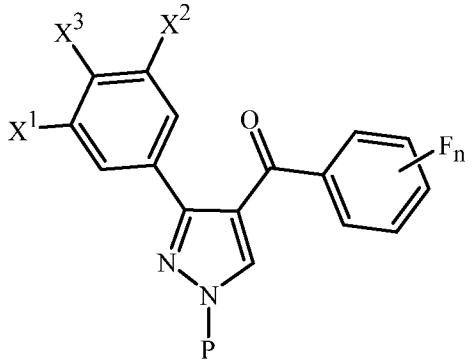
Table Number	Component (a) Column Entries	Table Number	Component (a) Column Entries
A2	Compound 2	A3	Compound 3

Table Number	Component (a) Column Entries	Table Number	Component (a) Column Entries
A4	Compound 4	A7	Compound 7
A5	Compound 5	A8	Compound 8
A6	Compound 6	A9	Compound 9

Preferred for better control of undesired vegetation (e.g., lower use rate such as from synergism, broader spectrum of weeds controlled, or enhanced crop safety) or for preventing the development of resistant weeds are mixtures of a compound of this invention with a herbicide selected from the group consisting of chlorimuron-ethyl, nicosulfuron, mesotrione, thifensulfuron-methyl, flupyrsulfuron-methyl, tribenuron, pyroxasulfone, pinoxaden, tembotrione, pyroxsulam, metolachlor and *S*-metolachlor. More prererred are mixtures of a compound of this invention with a herbicide selected from the group consisting of indaziflam and isoxaben.

The following Tests demonstrate the control efficacy of the compounds of this invention against specific weeds. The weed control afforded by the compounds is not limited, however, to these species. See Index Tables A for compound descriptions. The following abbreviations are used in the Index Table which follow: "Ex." stands for "Example" and is followed by a number indicating in which example the compound is prepared, "Cmpd. No." means compound number. M.S. is reported as M+H unless otherwise indicated.

INDEX TABLE A



1

Cmpd. No.	X^1	X^2	X^3	F_n	P	m.p. (°C)	M.S.
1	Cl	Cl	H	2,5-di-F	H		355
2	Br	Br	H	2,5-di-F	H		441
3	F	F	H	2,5-di-F	H		321
4	F	Cl	H	3-F	H		319
5 (Ex. 4)	Cl	Cl	H	2,3,5-tri-F	H	**	371
6 (Ex. 1)	Cl	Cl	H	3-F	H	158–160 **	

7 (Ex. 5)	Cl	Cl	H	3,5-di-F	H	**	353
8	Cl	Cl	H	2,5-di-F	$C(=O)CH_3$		394*
9	F	F	H	3,5-di-F	H		321
10	Cl	Cl	H	2,3,6-tri-F	H		371
11	Cl	Cl	H	3,4-di-F	H		353
12	Cl	Cl	H	2,3-di-F	H		353
13	Cl	Cl	H	4-F	H	158–163	
14	F	F	H	2,3-di-F	H		321
15	Br	Br	F	3-F	H		457*
16	Br	Br	H	3-F	H		425
17	Br	Br	H	3,5-di-F	H		443
18 (Ex. 3)	Cl	Cl	H	2-F	H	149–151 **	
19 (Ex. 2)	Cl	Cl	Cl	2-F	H	187–189 **	
20	Cl	CF_3	H	3-F	H		369
21	CF_3	CF_3	H	3-F	H		403
22	Br	$OCHF_2$	H	3-F	H	***	
23	Cl	Cl	F	2,5-di-F	H	60–88	
24	Cl	Cl	H	2,6-di-F	H		353
25	Cl	Cl	H	2,3,5,6-tetra-F	H		387
26	Cl	Cl	Cl	2,5-di-F	H	168–171	

* AP^-

** See Index Table B for ^1H NMR data.

*** See Synthesis Example for ^1H NMR data.

INDEX TABLE B

Cmpd. No.	^1H NMR Data ($CDCl_3$ solution unless indicated otherwise)[a]
22	^1H NMR (500MHz) δ ppm 8.04–7.92 (br s, 1H), 7.73–7.67 (m, 1H), 7.59–7.54 (m, 1H), 7.52–7.46 (m, 1H), 7.46–7.38 (m, 2H), 7.33–7.23 (m, 3H), 6.50 (t, J = 22.5 Hz, 1H)

[a] ^1H NMR data are in ppm downfield from tetramethylsilane. Couplings are designated by (t)-triplet, (m)-multiplet, (br s)-broad singlet.

BIOLOGICAL EXAMPLES OF THE INVENTION

TEST A

Seeds of plant species selected from barnyardgrass (*Echinochloa crus-galli*), kochia (*Kochia scoparia*), ragweed (common ragweed, *Ambrosia elatior*), Italian ryegrass (*Lolium multiflorum*), foxtail, giant (giant foxtail Setaria faberii), pigweed (*Amaranthus retroflexus*), crabgrass, large (large crabgrass, *Digitaria sanguinalis*), morningglory (*Ipomoea* spp.), velvetleaf (*Abutilon theophrasti*), wheat (*Triticum aestivum*), and corn (*Zea mays*) were planted into a blend of loam soil and sand and treated preemergence with a directed soil

spray using test chemicals formulated in a non-phytotoxic solvent mixture which included a surfactant.

At the same time, plants selected from these crop and weed species and also blackgrass (*Alopecurus myosuroides*), and galium (catchweed bedstraw, *Galium aparine*) were planted in pots containing the same blend of loam soil and sand and treated with postemergence applications of test chemicals formulated in the same manner. Plants ranged in height from 2 to 10 cm and were in the one- to two-leaf stage for the postemergence treatment. Treated plants and untreated controls were maintained in a greenhouse for approximately 10 days, after which time all treated plants were compared to untreated controls and visually evaluated for injury. Plant response ratings, summarized in Table A, are based on a 0 to 100 scale where 0 is no effect and 100 is complete control. A dash (–) response means no test result.

Table A	Compounds													
1000 g ai/ha	1	6	7	8	9	11	12	13	14	15	16	17	18	19
Postemergence														
Barnyardgrass	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corn	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crabgrass, Large	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Foxtail, Giant	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Morningglory	0	0	0	0	0	30	30	10	0	0	0	0	10	10
Pigweed	100	100	100	90	70	60	80	80	80	80	100	90	90	80
Velvetleaf	100	100	90	90	90	70	90	80	80	80	90	90	80	80
Wheat	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table A	Compounds			Table A	Compounds		
1000 g ai/ha	20	21	22	1000 g ai/ha	20	21	22
Postemergence				Postemergence			
Barnyardgrass	0	0	0	Morningglory	0	0	0
Corn	0	0	0	Pigweed	80	0	70
Crabgrass, Large	0	0	0	Velvetleaf	70	0	70
Foxtail, Giant	0	0	0	Wheat	0	0	0

Table A	Compounds								
500 g ai/ha	2	3	4	5	10	23	24	25	26
Postemergence									
Barnyardgrass	0	0	0	10	0	0	0	0	0
Blackgrass	-	-	-	-	-	0	-	-	-
Corn	0	0	0	0	0	0	0	0	0
Crabgrass, Large	0	0	0	0	0	-	0	0	0
Foxtail, Giant	0	0	0	0	0	0	0	0	0

Galium	-	-	-	-	-	60	-	-	-
Kochia	-	-	-	-	-	90	-	-	-
Morningglory	0	0	0	0	0	-	0	0	0
Pigweed	90	70	90	100	100	90	90	100	90
Ragweed	-	-	-	-	-	80	-	-	-
Ryegrass, Italian	-	-	-	-	-	0	-	-	-
Velvetleaf	90	80	90	90	80	-	80	90	90
Wheat	0	0	0	0	0	0	0	0	0

Table A	Compounds								
125 g ai/ha	2	3	4	5	10	23	24	25	26
Postemergence									
Barnyardgrass	0	0	0	0	0	0	0	0	0
Blackgrass	-	-	-	-	-	0	-	-	-
Corn	0	0	0	0	0	0	0	0	0
Crabgrass, Large	0	0	0	0	0	-	0	0	0
Foxtail, Giant	0	0	0	0	0	0	0	0	0
Galium	-	-	-	-	-	10	-	-	-
Kochia	-	-	-	-	-	50	-	-	-
Morningglory	0	0	0	0	0	-	0	0	0
Pigweed	80	60	80	80	70	80	50	70	80
Ragweed	-	-	-	-	-	20	-	-	-
Ryegrass, Italian	-	-	-	-	-	0	-	-	-
Velvetleaf	80	70	90	60	60	-	50	80	50
Wheat	0	0	0	0	0	0	0	0	0

Table A	Compounds													
1000 g ai/ha	1	6	7	8	9	11	12	13	14	15	16	17	18	19
Preemergence														
Barnyardgrass	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corn	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crabgrass, Large	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Foxtail, Giant	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Morningglory	0	0	0	0	0	0	0	0	0	0	0	0	10	0
Pigweed	100	100	90	80	100	80	70	70	100	70	70	70	80	80
Velvetleaf	50	80	60	80	90	0	70	70	80	60	70	60	60	30
Wheat	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table A	Compounds			Table A	Compounds		
1000 g ai/ha	20	21	22	1000 g ai/ha	20	21	22
Preemergence				Preemergence			

Table A	Compounds		
1000 g ai/ha	20	21	22
Preemergence			
Barnyardgrass	0	0	0
Corn	0	0	0
Crabgrass, Large	0	0	0
Foxtail, Giant	0	0	0

Table A	Compounds		
1000 g ai/ha	20	21	22
Preemergence			
Morningglory	0	0	0
Pigweed	60	0	40
Velvetleaf	20	0	40
Wheat	0	0	0

Table A	Compounds								
500 g ai/ha	2	3	4	5	10	23	24	25	26
Preemergence									
Barnyardgrass	0	0	0	0	0	0	0	0	0
Corn	0	0	0	0	0	-	0	0	0
Crabgrass, Large	0	0	0	0	0	-	0	0	0
Foxtail, Giant	0	0	0	0	0	0	0	0	0
Kochia	-	-	-	-	-	70	-	-	-
Morningglory	0	0	0	0	0	-	0	0	0
Pigweed	100	100	100	100	90	100	80	70	90
Ragweed	-	-	-	-	-	90	-	-	-
Ryegrass, Italian	-	-	-	-	-	0	-	-	-
Velvetleaf	50	90	80	70	30	-	20	70	20
Wheat	0	0	0	0	0	-	0	0	0

Table A	Compounds								
125 g ai/ha	2	3	4	5	10	23	24	25	26
Preemergence									
Barnyardgrass	0	0	0	0	0	0	0	0	0
Corn	0	0	0	0	0	-	0	0	0
Crabgrass, Large	0	0	0	0	0	-	0	0	0
Foxtail, Giant	0	0	0	0	0	0	0	0	0
Kochia	-	-	-	-	-	20	-	-	-
Morningglory	0	0	0	0	0	-	0	0	0
Pigweed	60	100	40	80	10	30	30	50	30
Ragweed	-	-	-	-	-	20	-	-	-
Ryegrass, Italian	-	-	-	-	-	0	-	-	-
Velvetleaf	0	60	60	30	0	-	0	0	0
Wheat	0	0	0	0	0	-	0	0	0

TEST B

Plant species in the flooded paddy test selected from rice (*Oryza sativa*), sedge, umbrella (small-flower umbrella sedge, *Cyperus difformis*), ducksalad (*Heteranthera limosa*), and barnyardgrass (*Echinochloa crus-galli*) were grown to the 2-leaf stage for testing. At time of treatment, test pots were flooded to 3 cm above the soil surface, treated by application of test compounds directly to the paddy water, and then maintained at that water depth for the duration of the test. Treated plants and controls were maintained in a greenhouse for 13 to 15 days, after which time all species were compared to controls and visually evaluated. Plant response ratings, summarized in Table B, are based on a scale of 0 to 100 where 0 is no effect and 100 is complete control. A dash (–) response means no test result.

Table B

	Compounds										
250 g ai/ha	1	2	3	4	5	8	10	23	24	25	26
Flood											
Barnyardgrass	0	0	0	0	0	0	0	0	0	0	0
Ducksalad	0	0	0	0	0	0	0	0	0	0	0
Rice	0	0	0	0	0	0	0	0	30	0	0
Sedge, Umbrella	65	0	0	0	0	0	0	0	40	0	0

TEST C

Seeds of plant species selected from blackgrass (*Alopecurus myosuroides*), ryegrass, Italian (Italian ryegrass, *Lolium multiflorum*), wheat (winter wheat, *Triticum aestivum*), *Galium* (catchweed bedstraw, *Galium aparine*), corn (*Zea mays*), crabgrass, large (large crabgrass, *Digitaria sanguinalis*), foxtail, giant (giant foxtail, *Setaria faberii*), lambsquarters (*Chenopodium album*), morningglory (*Ipomoea coccinea*), nutsedge, yellow (yellow nutsedge, *Cyperus esculentus*), pigweed (*Amaranthus retroflexus*), johnsongrass (Sorghum halepense), ragweed (common ragweed, *Ambrosia elatior*), soybean (*Glycine max*), barnyardgrass (*Echinochloa crus-galli*), oilseed rape (*Brassica napus*), waterhemp (common waterhemp, *Amaranthus rudis*), and velvetleaf (*Abutilon theophrasti*) were planted into a blend of loam soil and sand and treated preemergence with test chemicals formulated in a non-phytotoxic solvent mixture which included a surfactant.

At the same time, plants selected from these crop and weed species and barley (winter barley, *Hordeum vulgare*), canarygrass (*Phalaris minor*), chickweed (common chickweed, *Stellaria media*), windgrass (*Apera spica-venti*), bromegrass, downy (downy bromegrass, *Bromus tectorum*), foxtail, green (green foxtail, *Setaria viridis*), oat, wild (wild oat, *Avena*

fatua), bermudagrass (*Cynodon dactylon*), surinam grass (*Brachiaria decumbens*), cocklebur (common cocklebur, *Xanthium strumarium*), cupgrass, woolly (woolly cupgrass, *Eriochloa villosa*), goosegrass (*Eleusine indica*), johnsongrass (*Sorghum halepense*), *Kochia* (*Kochia scoparia*), and deadnettle (henbit deadnettle, *Lamium amplexicaule*) were planted in pots containing Redi-Earth® planting medium (Scotts Company, 14111 Scottslawn Road, Marysville, Ohio 43041) comprising spaghnum peat moss, vermiculite, wetting agent and starter nutrients and treated with postemergence applications of test chemicals formulated in the same manner. Plants ranged in height from 2 to 18 cm (1- to 4-leaf stage) for postemergence treatments. Treated plants and controls were maintained in a greenhouse for 13 to 15 days, after which time all species were compared to controls and visually evaluated. Plant response ratings, summarized in Table C, are based on a scale of 0 to 100 where 0 is no effect and 100 is complete control. A dash (–) response means no test result.

Table C	Compounds				Table C	Compounds			
500 g ai/ha	1	2	3	4	500 g ai/ha	1	2	3	4
Postemergence					Postemergence				
Barnyardgrass	0	5	0	5	Nutsedge, Yellow	0	0	0	0
Blackgrass	0	0	0	5	Oat, Wild	0	0	0	0
Chickweed	100	98	100	100	Oilseed Rape	85	60	90	95
Corn	0	0	0	0	Pigweed	100	98	90	80
Crabgrass, Large	0	0	0	0	Ragweed	70	80	85	90
Foxtail, Giant	0	0	10	0	Ryegrass, Italian	5	0	0	0
Galium	30	30	20	40	Soybean	0	0	0	0
Johnsongrass	0	0	0	0	Velvetleaf	85	65	70	90
Kochia	90	85	85	95	Waterhemp	98	100	90	85
Lambsquarters	90	100	85	98	Wheat	0	0	0	0
Morningglory	0	0	0	0					

Table C	Compounds						
250 g ai/ha	1	2	3	4	6	7	10
Postemergence							
Barley	-	-	-	-	0	-	-
Barnyardgrass	0	0	0	0	-	0	0
Bermudagrass	-	-	-	-	0	-	-
Blackgrass	0	0	0	0	0	10	0
Bromegrass, Downy	-	-	-	-	0	-	-
Canarygrass	-	-	-	-	0	-	-
Chickweed	100	98	100	100	100	100	70
Cocklebur	-	-	-	-	85	-	-

Corn	0	0	0	0	0	0	0
Crabgrass, Large	0	0	0	0	0	10	0
Cupgrass, Woolly	-	-	-	-	0	-	-
Deadnettle	-	-	-	-	0	-	-
Foxtail, Giant	0	0	0	0	0	0	0
Foxtail, Green	-	-	-	-	0	-	-
Galium	45	10	5	45	5	55	15
Goosegrass	-	-	-	-	0	-	-
Johnsongrass	0	0	0	0	0	0	0
Kochia	90	90	80	85	65	85	80
Lambsquarters	98	98	85	95	98	85	95
Morningglory	0	10	10	0	0	0	0
Nutsedge, Yellow	0	0	0	0	0	5	0
Oat, Wild	0	0	0	0	0	0	0
Oilseed Rape	70	65	90	70	-	70	60
Pigweed	100	85	85	80	80	95	98
Ragweed	85	40	90	85	60	80	50
Ryegrass, Italian	5	0	0	0	0	0	0
Soybean	0	0	0	0	-	0	0
Surinam Grass	-	-	-	-	0	-	-
Velvetleaf	80	65	60	85	85	85	55
Waterhemp	90	95	80	75	-	98	100
Wheat	5	0	0	0	0	0	0
Windgrass	-	-	-	-	0	-	-
Table C			Compounds				
125 g ai/ha	1	2	3	4	6	7	10
Postemergence							
Barley	-	-	-	-	0	-	-
Barnyardgrass	0	0	0	0	-	0	0
Bermudagrass	-	-	-	-	0	-	-
Blackgrass	0	0	0	0	0	0	0
Bromegrass, Downy	-	-	-	-	0	-	-
Canarygrass	-	-	-	-	0	-	-
Chickweed	95	100	100	100	98	100	85
Cocklebur	-	-	-	-	75	-	-
Corn	0	0	0	0	0	0	0
Crabgrass, Large	0	0	0	0	0	0	0
Cupgrass, Woolly	-	-	-	-	0	-	-

Deadnettle	-	-	-	-	0	-	-
Foxtail, Giant	0	0	0	0	0	0	0
Foxtail, Green	-	-	-	-	0	-	-
Galium	40	0	0	10	0	50	5
Goosegrass	-	-	-	-	0	-	-
Johnsongrass	0	0	0	0	0	0	0
Kochia	90	85	80	85	65	85	75
Lambsquarters	98	70	45	75	95	98	75
Morningglory	0	0	15	0	0	0	0
Nutsedge, Yellow	0	0	0	0	0	0	10
Oat, Wild	0	0	0	0	0	0	0
Oilseed Rape	70	30	0	70	-	85	60
Pigweed	100	90	70	80	60	95	80
Ragweed	60	60	80	70	50	75	50
Ryegrass, Italian	0	0	0	0	0	0	0
Soybean	0	0	0	0	-	0	0
Surinam Grass	-	-	-	-	0	-	-
Velvetleaf	75	55	55	70	80	75	40
Waterhemp	100	90	60	75	-	98	90
Wheat	0	0	0	0	0	0	0
Windgrass	-	-	-	-	0	-	-

Table C	Compounds						
62 g ai/ha	1	2	3	4	6	7	10
Postemergence							
Barley	-	-	-	-	0	-	-
Barnyardgrass	0	0	0	0	-	5	0
Bermudagrass	-	-	-	-	0	-	-
Blackgrass	0	0	0	0	0	0	0
Bromegrass, Downy	-	-	-	-	0	-	-
Canarygrass	-	-	-	-	0	-	-
Chickweed	95	85	100	98	80	100	85
Cocklebur	-	-	-	-	20	-	-
Corn	0	0	0	0	0	0	0
Crabgrass, Large	0	0	0	0	0	0	0
Cupgrass, Woolly	-	-	-	-	0	-	-
Deadnettle	-	-	-	-	0	-	-
Foxtail, Giant	0	10	0	0	0	0	0
Foxtail, Green	-	-	-	-	0	-	-

Galium	35	0	0	5	0	30	0
Goosegrass	-	-	-	-	0	-	-
Johnsongrass	0	0	0	0	0	0	0
Kochia	85	75	75	80	60	80	50
Lambsquarters	95	30	50	40	60	75	75
Morningglory	0	0	0	0	0	0	5
Nutsedge, Yellow	0	0	10	0	0	0	10
Oat, Wild	0	0	0	0	0	0	0
Oilseed Rape	45	55	0	80	-	30	0
Pigweed	98	85	65	60	60	90	75
Ragweed	75	60	55	70	45	60	30
Ryegrass, Italian	0	0	0	0	0	0	0
Soybean	0	0	0	0	0	0	0
Surinam Grass	-	-	-	-	0	-	-
Velvetleaf	70	45	25	70	70	60	20
Waterhemp	90	90	55	60	-	95	95
Wheat	0	0	0	0	0	0	0
Windgrass	-	-	-	-	0	-	-

Table C	Compounds		
31 g ai/ha	6	7	10
Postemergence			
Barley	0	-	-
Barnyardgrass	-	0	0
Bermudagrass	0	-	-
Blackgrass	0	0	0
Bromegrass, Downy	0	-	-
Canarygrass	0	-	-
Chickweed	70	98	60
Cocklebur	10	-	-
Corn	0	0	0
Crabgrass, Large	0	0	0
Cupgrass, Woolly	0	-	-
Deadnettle	0	-	-
Foxtail, Giant	0	0	0
Foxtail, Green	0	-	-

Table C	Compounds		
31 g ai/ha	6	7	10
Postemergence			
Johnsongrass	0	0	0
Kochia	35	70	10
Lambsquarters	0	45	55
Morningglory	0	0	0
Nutsedge, Yellow	0	10	0
Oat, Wild	0	0	0
Oilseed Rape	-	15	0
Pigweed	25	80	70
Ragweed	25	15	0
Ryegrass, Italian	0	0	0
Soybean	0	0	0
Surinam Grass	0	-	-
Velvetleaf	70	45	20
Waterhemp	-	80	70

Table C	Compounds		
31 g ai/ha	6	7	10
Postemergence			
Galium	0	0	0
Goosegrass	0	-	-

Table C	Compounds		
31 g ai/ha	6	7	10
Postemergence			
Wheat	0	0	0
Windgrass	0	-	-

Table C	Compounds			
500 g ai/ha	1	2	3	4
Preemergence				
Barnyardgrass	0	0	0	0
Blackgrass	0	0	60	30
Corn	0	0	0	0
Crabgrass, Large	0	0	0	0
Foxtail, Giant	0	0	0	0
Galium	80	35	98	100
Johnsongrass	10	0	0	0
Lambsquarters	100	100	-	100
Morningglory	0	0	10	0

Table C	Compounds			
500 g ai/ha	1	2	3	4
Preemergence				
Nutsedge, Yellow	80	0	0	0
Oilseed Rape	90	50	100	98
Pigweed	100	100	100	100
Ragweed	98	80	100	100
Ryegrass, Italian	0	0	0	0
Soybean	0	0	0	0
Velvetleaf	55	80	100	100
Waterhemp	100	100	100	100

Table C	Compounds					
250 g ai/ha	1	2	3	4	7	10
Preemergence						
Barnyardgrass	0	0	0	0	0	0
Blackgrass	10	0	0	0	30	0
Corn	0	0	0	0	5	0
Crabgrass, Large	0	0	0	0	0	0
Foxtail, Giant	0	0	0	0	0	0
Galium	60	30	98	85	90	0
Johnsongrass	0	0	0	0	0	0
Lambsquarters	100	100	-	100	100	-
Morningglory	0	15	10	0	20	0
Nutsedge, Yellow	30	0	0	0	0	0
Oilseed Rape	60	80	30	100	90	10
Pigweed	100	90	100	100	100	100
Ragweed	100	40	100	90	95	50
Ryegrass, Italian	0	0	0	0	10	0
Soybean	0	0	0	0	0	0
Velvetleaf	75	50	100	95	75	20
Waterhemp	100	98	100	100	100	100

Wheat	0	0	0	0	0	0
Table C		Compounds				
125 g ai/ha	1	2	3	4	7	10
Preemergence						
Barnyardgrass	0	0	0	0	0	0
Blackgrass	50	0	0	45	10	0
Corn	0	0	0	10	5	0
Crabgrass, Large	0	0	20	0	0	0
Foxtail, Giant	0	0	0	0	0	0
Galium	0	0	0	90	90	10
Johnsongrass	10	0	0	0	0	0
Lambsquarters	100	85	-	100	100	-
Morningglory	0	0	0	0	0	0
Nutsedge, Yellow	0	0	0	20	0	0
Oilseed Rape	40	0	80	98	40	0
Pigweed	100	85	100	100	100	100
Ragweed	100	30	100	90	100	60
Ryegrass, Italian	0	0	0	0	0	0
Soybean	0	0	0	0	0	0
Velvetleaf	75	60	90	85	80	10
Waterhemp	100	90	100	100	100	100
Wheat	0	0	0	0	0	0
Table C		Compounds				
62 g ai/ha	1	2	3	4	7	10
Preemergence						
Barnyardgrass	0	0	0	0	0	0
Blackgrass	10	0	0	0	10	0
Corn	0	0	0	0	0	0
Crabgrass, Large	0	0	0	0	0	15
Foxtail, Giant	0	0	0	0	0	0
Galium	80	0	50	100	0	80
Johnsongrass	0	0	0	0	0	0
Lambsquarters	98	100	-	100	80	-
Morningglory	0	0	0	0	0	0
Nutsedge, Yellow	0	0	0	0	0	0
Oilseed Rape	10	0	0	0	0	0
Pigweed	85	50	100	55	65	55
Ragweed	55	40	100	35	100	50

Ryegrass, Italian	0	0	0	35	30	0
Soybean	0	0	0	0	10	5
Velvetleaf	55	15	40	50	20	0
Waterhemp	100	85	100	100	80	65
Wheat	0	0	0	0	10	0

Table C	Compounds	
31 g ai/ha	7	10
Preemergence		
Barnyardgrass	0	0
Blackgrass	0	0
Corn	5	0
Crabgrass, Large	0	0
Foxtail, Giant	0	0
Galium	0	0
Johnsongrass	0	0
Lambsquarters	0	-
Morningglory	0	0

Table C	Compounds	
31 g ai/ha	7	10
Preemergence		
Nutsedge, Yellow	0	0
Oilseed Rape	0	0
Pigweed	20	10
Ragweed	45	0
Ryegrass, Italian	0	0
Soybean	0	0
Velvetleaf	15	20
Waterhemp	75	40
Wheat	0	0

TEST D

Seeds of plant species selected from bluegrass (annual bluegrass, *Poa annua*), blackgrass (*Alopecurus myosuroides*), canarygrass (*Phalaris minor*), chickweed (common chickweed, *Stellaria media*), *Galium* (catchweed bedstraw, *Galium aparine*), bromegrass, downy (downy bromegrass, *Bromus tectorum*), field poppy (*Papaver rhoeas*), field violet (*Viola arvensis*), foxtail, green (green foxtail, *Setaria viridis*), deadnettle (henbit deadnettle, *Lamium amplexicaule*), ryegrass, Italian (Italian ryegrass, *Lolium multiflorum*), *Kochia* (*Kochia scoparia*), lambsquarters (*Chenopodium album*), oilseed rape (*Brassica napus*), pigweed (*Amaranthus retroflexus*), chamomile (scentless chamomile, *Matricaria inodora*), speedwell (bird's-eye speedwell, *Veronica persica*), barley, spring (spring barley, *Hordeum vulgare*), wheat, spring (spring wheat, *Triticum aestivum*), buckwheat, wild (wild buckwheat, *Polygonum convolvulus*), mustard, wild (wild mustard, *Sinapis arvensis*), oat, wild (wild oat, *Avena fatua*), radish, wild (wild radish, *Raphanus raphanistrum*), windgrass (*Apera spica-venti*), barley, winter (winter barley, *Hordeum vulgare*), and wheat, winter (winter wheat, *Triticum aestivum*) were planted into a silt loam soil and treated preemergence with test chemicals formulated in a non-phytotoxic solvent mixture which included a surfactant. At the same time, these species were planted in pots containing Redi-Earth® planting medium (Scotts Company, 14111 Scottslawn Road, Marysville, Ohio 43041) comprising spaghnum peat moss, vermiculite, wetting agent and starter nutrients and treated with postemergence applications of the test chemicals formulated in the same manner.

Plants ranged in height from 2 to 18 cm (1- to 4-leaf stage). Treated plants and controls were maintained in a controlled growth environment for 14 to 21 days after which time all species were compared to controls and visually evaluated. Plant response ratings, summarized in Table D, are based on a scale of 0 to 100 where 0 is no effect and 100 is complete control. A dash (–) response means no test result.

Table D	Compounds	
500 g ai/ha	1	7
Postemergence		
Barley, Spring	0	0
Barley, Winter	0	0
Blackgrass	0	0
Bluegrass	0	0
Bromegrass, Downy	0	0
Buckwheat, Wild	60	60
Canarygrass	0	0
Chamomile	65	60
Chickweed	100	80
Deadnettle	10	20
Field Poppy	80	50
Field Violet	90	90
Foxtail, Green	0	0
Galium	20	40
Kochia	75	70
Lambsquarters	90	85
Mustard, Wild	95	100
Oat, Wild	0	0
Oilseed Rape	75	60
Pigweed	100	100
Radish, Wild	75	70
Ryegrass, Italian	0	0
Speedwell	25	20
Wheat, Spring	0	0
Wheat, Winter	0	0
Windgrass	0	0

Table D	Compounds	
250 g ai/ha	1	7
Postemergence		
Barley, Spring	0	0
Barley, Winter	0	0
Blackgrass	0	0
Bluegrass	0	0
Bromegrass, Downy	0	0
Buckwheat, Wild	70	50
Canarygrass	0	0
Chamomile	60	50
Chickweed	75	100
Deadnettle	5	10
Field Poppy	70	50
Field Violet	90	75
Foxtail, Green	0	0
Galium	20	50
Kochia	70	60
Lambsquarters	85	75
Mustard, Wild	85	90
Oat, Wild	0	0
Oilseed Rape	75	70
Pigweed	100	95
Radish, Wild	75	80
Ryegrass, Italian	0	0
Speedwell	20	45
Wheat, Spring	0	0
Wheat, Winter	0	0
Windgrass	0	0

Table D	Compounds	
250 g ai/ha	1	7
Postemergence		

Table D	Compounds	
125 g ai/ha	1	7
Postemergence		

Table D	Compounds	
250 g ai/ha	1	7
Postemergence		
Barley, Spring	0	0
Barley, Winter	0	0
Blackgrass	0	0
Bluegrass	0	0
Bromegrass, Downy	0	0
Buckwheat, Wild	70	50
Canarygrass	0	0
Chamomile	60	50
Chickweed	75	100
Deadnettle	5	10
Field Poppy	70	50
Field Violet	90	75
Foxtail, Green	0	0
Galium	20	50
Kochia	70	60
Lambsquarters	85	75
Mustard, Wild	85	90
Oat, Wild	0	0
Oilseed Rape	75	70
Pigweed	100	95
Radish, Wild	75	80
Ryegrass, Italian	0	0
Speedwell	20	45
Wheat, Spring	0	0
Wheat, Winter	0	0
Windgrass	0	0

Table D	Compounds	
125 g ai/ha	1	7
Postemergence		
Barley, Spring	0	0
Barley, Winter	0	0
Blackgrass	0	0
Bluegrass	0	0
Bromegrass, Downy	0	0
Buckwheat, Wild	60	30
Canarygrass	0	0
Chamomile	55	30
Chickweed	85	75
Deadnettle	0	10
Field Poppy	50	30
Field Violet	80	75
Foxtail, Green	0	0
Galium	10	35
Kochia	60	55
Lambsquarters	75	70
Mustard, Wild	80	80
Oat, Wild	0	0
Oilseed Rape	65	55
Pigweed	85	75
Radish, Wild	70	65
Ryegrass, Italian	0	0
Speedwell	15	10
Wheat, Spring	0	0
Wheat, Winter	0	0
Windgrass	0	0

Table D	Compounds	
62 g ai/ha	1	7
Postemergence		
Barley, Spring	0	0
Barley, Winter	0	0
Blackgrass	0	0
Bluegrass	0	0
Bromegrass, Downy	0	0

Table D	Compounds	
500 g ai/ha	1	7
Preemergence		
Barley, Spring	0	0
Barley, Winter	0	0
Blackgrass	0	0
Bluegrass	0	0
Bromegrass, Downy	0	0

Table D	Compounds	
62 g ai/ha	1	7
Postemergence		
Buckwheat, Wild	15	20
Canarygrass	0	0
Chamomile	30	15
Chickweed	75	75
Deadnettle	0	10
Field Poppy	35	20
Field Violet	90	60
Foxtail, Green	0	0
Galium	5	25
Kochia	55	50
Lambsquarters	70	55
Mustard, Wild	80	80
Oat, Wild	0	0
Oilseed Rape	60	40
Pigweed	75	70
Radish, Wild	70	60
Ryegrass, Italian	0	0
Speedwell	10	5
Wheat, Spring	0	0
Wheat, Winter	0	0
Windgrass	0	0

Table D	Compounds	
500 g ai/ha	1	7
Preemergence		
Buckwheat, Wild	50	10
Canarygrass	0	0
Chamomile	-	55
Chickweed	100	100
Deadnettle	5	0
Field Poppy	-	100
Field Violet	0	100
Foxtail, Green	0	0
Galium	0	5
Kochia	70	60
Lambsquarters	100	100
Mustard, Wild	100	55
Oat, Wild	0	0
Oilseed Rape	65	10
Pigweed	100	80
Radish, Wild	65	0
Ryegrass, Italian	0	0
Speedwell	-	20
Wheat, Spring	0	0
Wheat, Winter	0	0
Windgrass	0	0

Table D	Compounds	
250 g ai/ha	1	7
Preemergence		
Barley, Spring	0	0
Barley, Winter	0	0
Blackgrass	0	0
Bluegrass	0	0
Bromegrass, Downy	0	0
Buckwheat, Wild	0	10
Canarygrass	0	0
Chamomile	65	-
Chickweed	100	100
Deadnettle	0	0

Table D	Compounds	
125 g ai/ha	1	7
Preemergence		
Barley, Spring	0	0
Barley, Winter	0	0
Blackgrass	0	0
Bluegrass	0	0
Bromegrass, Downy	0	0
Buckwheat, Wild	5	5
Canarygrass	0	0
Chickweed	100	100
Deadnettle	0	0
Field Poppy	-	100

Table D	Compounds	
250 g ai/ha	1	7
Preemergence		
Field Poppy	-	100
Field Violet	0	60
Foxtail, Green	0	0
Galium	0	5
Kochia	60	25
Lambsquarters	100	80
Mustard, Wild	85	10
Oat, Wild	0	0
Oilseed Rape	20	5
Pigweed	100	60
Radish, Wild	75	0
Ryegrass, Italian	0	0
Speedwell	-	0
Wheat, Spring	0	0
Wheat, Winter	0	0
Windgrass	0	0

Table D	Compounds	
125 g ai/ha	1	7
Preemergence		
Field Violet	0	35
Foxtail, Green	0	0
Galium	0	0
Kochia	50	10
Lambsquarters	100	25
Mustard, Wild	60	0
Oat, Wild	0	0
Oilseed Rape	10	0
Pigweed	95	40
Radish, Wild	0	0
Ryegrass, Italian	0	0
Speedwell	-	0
Wheat, Spring	0	0
Wheat, Winter	0	0
Windgrass	0	0

Table D	Compounds	
62 g ai/ha	1	7
Preemergence		
Barley, Spring	0	0
Barley, Winter	0	0
Blackgrass	0	0
Bluegrass	0	0
Bromegrass, Downy	0	0
Buckwheat, Wild	0	5
Canarygrass	0	0
Chamomile	0	0
Chickweed	100	100
Deadnettle	0	0
Field Poppy	-	0
Field Violet	0	-
Foxtail, Green	0	0

Table D	Compounds	
62 g ai/ha	1	7
Preemergence		
Galium	0	0
Kochia	55	10
Lambsquarters	60	25
Mustard, Wild	40	0
Oat, Wild	0	0
Oilseed Rape	10	0
Pigweed	80	35
Radish, Wild	0	0
Ryegrass, Italian	0	0
Speedwell	-	0
Wheat, Spring	0	0
Wheat, Winter	0	0
Windgrass	0	0

TEST E

Seeds of plant species selected from corn (*Zea mays*), soybean (*Glycine max*), velvetleaf (*Abutilon theophrasti*), lambsquarters (*Chenopodium album*), poinsettia, wild (wild poinsettia, *Euphorbia heterophylla*), pigweed, palmer (palmer pigweed, *Amaranthus palmeri*), waterhemp (common waterhemp, *Amaranthus rudis*), surinam grass (*Brachiaria decumbens*), crabgrass, large (large crabgrass, *Digitaria sanguinalis*), crabgrass, Brazil (Brazilian crabgrass, *Digitaria horizontalis*), panicum, fall (fall panicum, *Panicum dichotomiflorum*), foxtail, giant (giant foxtail Setaria faberii), foxtail, green (green foxtail, *Setaria viridis*), goosegrass (*Eleusine indica*), johnsongrass (*Sorghum halepense*), ragweed (common ragweed, *Ambrosia elatior*), barnyardgrass (*Echinochloa crus-galli*), sandbur (southern sandbur, *Cenchrus echinatus*), arrowleaf sida (*Sida rhombifolia*), ryegrass, Italian (Italian ryegrass, *Lolium multiflorum*), dayflower, VA (Virginia dayflower, *Commelina virginica*), field bindweed (*Convolvulus arvensis*), cocklebur (common cocklebur, *Xanthium strumarium*), morningglory (*Ipomoea coccinea*), nightshade (eastern black nightshade, *Solanum ptycanthum*), *Kochia* (*Kochia scoparia*), nutsedge, yellow (yellow nutsedge, *Cyperus esculentus*), smartweed (ladysthumb smartweed, *Polygonum persicaria*), and beggarticks (hairy beggarticks, *Bidens pilosa*), were planted into a silt loam soil and treated preemergence with test chemicals formulated in a non-phytotoxic solvent mixture which included a surfactant. At the same time, plants from these crop and weed species and also waterhemp_RES1, (ALS & Triazine resistant common waterhemp, *Amaranthus rudis*), and waterhemp_RES2, (ALS & HPPD resistant common waterhemp, *Amaranthus rudis*) were treated with postemergence applications of test chemicals formulated in the same manner. Plants ranged in height from 2 to 18 cm for postemergence treatments (1- to 4-leaf stage). Treated plants and controls were maintained in a greenhouse for 14 to 21 days, after which time all species were compared to controls and visually evaluated. Plant response ratings, summarized in Table E, are based on a scale of 0 to 100 where 0 is no effect and 100 is complete control. A dash (–) response means no test result.

Table E	Compounds				
500 g ai/ha	2	3	4	7	10
Postemergence					
Arrowleaf Sida	80	90	90	65	60
Barnyardgrass	0	0	0	0	0
Beggarticks	80	95	100	90	70
Corn	0	0	0	0	0
Crabgrass, Brazil	0	20	0	10	0
Dayflower, VA	0	0	0	0	0
Field Bindweed	0	0	0	0	0
Panicum, Fall	0	0	0	0	0

Pigweed, Palmer	95	70	85	95	75	
Poinsettia, Wild	0	20	15	30	0	
Ryegrass, Italian	0	0	0	0	0	
Sandbur	0	0	0	0	0	
Soybean	0	0	0	0	0	
Waterhemp	100	90	90	100	95	
Waterhemp_RES1	100	95	95	98	100	
Waterhemp_RES2	100	75	90	100	95	

Table E	Compounds					
250 g ai/ha	1	2	3	4	7	10
Postemergence						
Arrowleaf Sida	80	70	80	90	60	40
Barnyardgrass	10	0	0	0	0	0
Beggarticks	80	80	90	100	75	60
Corn	0	0	0	0	0	0
Crabgrass, Brazil	0	0	0	0	10	0
Dayflower, VA	0	0	0	0	0	0
Field Bindweed	0	0	0	0	0	0
Panicum, Fall	-	0	0	0	0	0
Pigweed, Palmer	95	95	30	70	100	60
Poinsettia, Wild	30	0	0	0	0	0
Ryegrass, Italian	0	0	0	0	0	0
Sandbur	0	0	0	0	0	0
Smartweed	30	-	-	-	-	-
Soybean	0	0	0	0	0	0
Waterhemp	95	100	75	95	95	85
Waterhemp_RES1	100	100	75	85	90	100
Waterhemp_RES2	90	100	60	85	100	80

Table E	Compounds					
125 g ai/ha	1	2	3	4	7	10
Postemergence						
Arrowleaf Sida	75	65	50	85	75	60
Barnyardgrass	20	0	0	0	0	0
Beggarticks	60	70	80	95	80	50
Corn	0	0	0	0	0	0
Crabgrass, Brazil	0	0	0	0	0	0
Dayflower, VA	0	0	0	0	0	0
Field Bindweed	0	0	0	0	0	0

Panicum, Fall	-	0	0	0	0	0
Pigweed, Palmer	90	100	20	50	70	50
Poinsettia, Wild	20	0	0	0	0	0
Ryegrass, Italian	10	0	0	0	0	0
Sandbur	0	0	0	0	0	0
Smartweed	20	-	-	-	-	-
Soybean	0	0	0	0	0	0
Waterhemp	95	100	60	80	98	80
Waterhemp_RES1	100	100	70	80	100	90
Waterhemp_RES2	80	98	50	80	90	65

Table E	Compounds					
62 g ai/ha	1	2	3	4	7	10
Postemergence						
Arrowleaf Sida	60	50	50	75	50	50
Barnyardgrass	10	0	0	0	0	0
Beggarticks	60	50	50	85	70	60
Corn	0	0	0	0	0	0
Crabgrass, Brazil	0	0	0	0	0	0
Dayflower, VA	0	0	0	0	0	0
Field Bindweed	0	0	0	0	0	0
Panicum, Fall	-	0	0	0	0	0
Pigweed, Palmer	60	80	20	40	60	40
Poinsettia, Wild	30	0	0	0	0	0
Ryegrass, Italian	10	0	0	0	0	0
Sandbur	10	0	0	0	0	0
Smartweed	0	-	-	-	-	-
Soybean	0	0	0	0	0	0
Waterhemp	85	95	40	50	90	75
Waterhemp_RES1	95	95	50	70	90	85
Waterhemp_RES2	85	75	70	40	90	40

Table E	Compounds					
31 g ai/ha	1	2	3	4	7	10
Postemergence						
Arrowleaf Sida	60	65	60	70	40	40
Barnyardgrass	0	0	0	0	0	0
Beggarticks	40	25	40	80	60	40
Corn	0	0	0	0	0	0
Crabgrass, Brazil	0	0	0	0	0	0

Dayflower, VA	0	0	0	0	0	0
Field Bindweed	0	0	0	0	0	0
Panicum, Fall	-	0	0	0	0	0
Pigweed, Palmer	40	85	10	30	70	40
Poinsettia, Wild	0	0	0	0	0	0
Ryegrass, Italian	0	0	0	0	0	0
Sandbur	0	0	0	0	0	0
Smartweed	0	-	-	-	-	-
Soybean	0	0	0	0	0	0
Waterhemp	90	80	30	60	75	70
Waterhemp_RES1	80	80	50	70	90	80
Waterhemp_RES2	0	65	50	40	95	60

Table E	Compound	Table E	Compound
16 g ai/ha	1	16 g ai/ha	1
Postemergence		Postemergence	
Arrowleaf Sida	50	Poinsettia, Wild	0
Barnyardgrass	0	Ryegrass, Italian	0
Beggarticks	40	Sandbur	0
Corn	20	Smartweed	0
Crabgrass, Brazil	0	Soybean	0
Dayflower, VA	0	Waterhemp	80
Field Bindweed	0	Waterhemp_RES1	70
Pigweed, Palmer	50	Waterhemp_RES2	0

Table E	Compounds				
500 g ai/ha	2	3	4	7	10
Preemergence					
Arrowleaf Sida	35	100	100	90	40
Barnyardgrass	0	0	0	0	0
Beggarticks	15	35	60	40	0
Cocklebur	-	-	-	0	-
Corn	35	0	20	0	0
Crabgrass, Brazil	35	0	35	0	-
Crabgrass, Large	0	0	0	0	0
Dayflower, VA	0	0	25	0	0
Field Bindweed	0	0	35	0	30
Foxtail, Giant	0	0	15	0	10
Foxtail, Green	20	0	0	0	0
Goosegrass	0	0	35	0	35

Johnsongrass	20	0	0	0	0	
Kochia	0	60	75	60	30	
Lambsquarters	98	100	100	98	80	
Morningglory	50	0	0	0	0	
Nightshade	0	0	25	0	20	
Nutsedge, Yellow	0	0	0	0	0	
Panicum, Fall	0	0	0	0	0	
Pigweed, Palmer	35	-	65	35	-	
Poinsettia, Wild	20	0	35	0	0	
Ragweed	35	100	98	90	65	
Ryegrass, Italian	0	0	35	0	0	
Sandbur	0	0	20	0	0	
Soybean	25	0	50	0	0	
Surinam Grass	0	0	0	0	0	
Velvetleaf	35	100	100	50	25	
Waterhemp	90	100	90	100	75	

Table E	Compounds					
250 g ai/ha	1	2	3	4	7	10
Preemergence						
Arrowleaf Sida	90	0	100	95	90	40
Barnyardgrass	0	0	0	0	0	0
Beggarticks	20	15	20	60	30	0
Cocklebur	0	-	-	-	-	-
Corn	0	35	0	20	0	0
Crabgrass, Brazil	0	0	0	50	0	-
Crabgrass, Large	0	0	0	0	0	0
Dayflower, VA	0	0	0	0	0	0
Field Bindweed	0	0	25	10	0	0
Foxtail, Giant	0	0	0	0	0	10
Foxtail, Green	0	0	0	0	0	0
Goosegrass	0	0	0	65	0	20
Johnsongrass	65	0	0	0	0	-
Kochia	30	0	25	75	75	15
Lambsquarters	98	0	100	100	95	70
Morningglory	0	20	0	0	0	0
Nightshade	0	0	0	65	0	20
Nutsedge, Yellow	0	0	0	0	0	0
Panicum, Fall	0	0	0	0	0	0

Pigweed, Palmer	100	30	-	0	0	-
Poinsettia, Wild	20	20	25	15	0	0
Ragweed	20	20	100	65	65	40
Ryegrass, Italian	0	0	0	20	0	0
Sandbur	0	0	0	20	0	0
Smartweed	0	-	-	-	-	-
Soybean	35	0	0	0	0	0
Surinam Grass	0	0	0	20	0	0
Velvetleaf	98	25	35	95	35	0
Waterhemp	100	90	90	60	80	60

Table E	Compounds					
125 g ai/ha	1	2	3	4	7	10
Preemergence						
Arrowleaf Sida	50	0	100	70	50	10
Barnyardgrass	0	0	0	0	0	0
Beggarticks	20	0	15	35	0	0
Cocklebur	0	-	0	0	-	-
Corn	0	0	0	0	0	0
Crabgrass, Brazil	0	0	0	-	0	0
Crabgrass, Large	0	0	0	0	0	0
Dayflower, VA	0	0	0	0	0	0
Field Bindweed	0	0	30	0	0	30
Foxtail, Giant	0	0	0	0	0	0
Foxtail, Green	0	0	0	0	0	0
Goosegrass	0	0	0	0	0	0
Johnsongrass	0	0	0	0	0	0
Kochia	20	0	20	0	40	0
Lambsquarters	85	-	80	100	90	0
Morningglory	0	0	0	0	0	0
Nightshade	0	0	0	25	0	0
Nutsedge, Yellow	0	0	0	0	0	0
Panicum, Fall	0	0	0	0	0	0
Pigweed, Palmer	0	30	-	0	20	-
Poinsettia, Wild	20	0	10	0	0	0
Ragweed	15	0	60	75	40	35
Ryegrass, Italian	0	0	10	20	0	0
Sandbur	0	0	0	0	0	0
Soybean	0	0	0	0	0	0

Surinam Grass	0	0	0	0	0	0
Velvetleaf	35	15	20	75	20	0
Waterhemp	80	65	50	0	40	20
Table E			Compounds			
62 g ai/ha	1	2	3	4	7	10
Preemergence						
Arrowleaf Sida	10	0	0	50	20	0
Barnyardgrass	0	0	0	0	0	0
Beggarticks	20	0	0	35	0	0
Cocklebur	-	-	-	-	0	-
Corn	0	0	0	0	0	0
Crabgrass, Brazil	0	0	-	-	0	-
Crabgrass, Large	0	0	0	0	0	0
Dayflower, VA	0	0	0	0	0	0
Field Bindweed	0	0	0	0	0	35
Foxtail, Giant	0	0	0	0	-	0
Foxtail, Green	0	0	0	0	0	0
Goosegrass	0	0	0	0	0	0
Johnsongrass	0	0	0	0	0	0
Kochia	20	0	0	0	0	0
Lambsquarters	30	-	100	98	65	-
Morningglory	0	0	0	0	0	0
Nightshade	0	0	0	0	0	0
Nutsedge, Yellow	0	0	0	0	0	0
Panicum, Fall	0	0	0	0	0	0
Pigweed, Palmer	-	20	-	0	20	-
Poinsettia, Wild	0	0	0	0	0	0
Ragweed	0	0	0	0	65	0
Ryegrass, Italian	0	0	0	0	0	0
Sandbur	0	0	0	0	0	0
Soybean	0	0	0	0	0	0
Surinam Grass	0	0	0	0	0	0
Velvetleaf	0	20	20	0	0	0
Waterhemp	35	40	0	0	30	15
Table E			Compounds			
31 g ai/ha	1	2	3	4	7	10
Preemergence						
Arrowleaf Sida	10	0	0	65	20	30

Barnyardgrass	0	0	0	0	0	0
Beggarticks	0	0	0	0	0	0
Cocklebur	0	-	0	0	-	0
Corn	0	0	0	0	0	0
Crabgrass, Brazil	0	0	-	0	0	0
Crabgrass, Large	0	0	0	0	0	0
Dayflower, VA	0	0	0	0	0	0
Field Bindweed	0	0	0	0	0	0
Foxtail, Giant	0	0	0	0	0	0
Foxtail, Green	0	0	0	0	0	0
Goosegrass	0	0	0	0	0	0
Johnsongrass	0	0	0	0	0	0
Kochia	35	0	0	0	0	0
Lambsquarters	40	0	95	0	0	0
Morningglory	0	0	0	0	0	0
Nightshade	0	0	0	0	0	0
Nutsedge, Yellow	0	0	0	0	0	0
Panicum, Fall	0	0	0	0	0	0
Pigweed, Palmer	30	0	-	0	0	-
Poinsettia, Wild	20	0	15	0	0	0
Ragweed	0	0	0	0	35	0
Ryegrass, Italian	0	0	0	0	0	0
Sandbur	0	0	0	0	0	0
Soybean	0	0	0	0	0	0
Surinam Grass	0	0	0	0	0	0
Velvetleaf	0	0	0	0	0	0
Waterhemp	65	0	0	0	0	0

Table E	Compound
16 g ai/ha	1
Preemergence	
Arrowleaf Sida	0
Barnyardgrass	0
Beggarticks	0
Waterhemp	0
Corn	0
Crabgrass, Brazil	0
Crabgrass, Large	0
Dayflower, VA	0

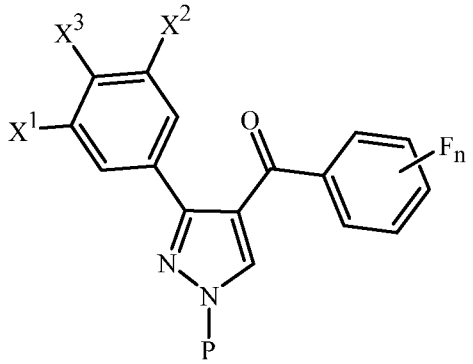
Table E	Compound
16 g ai/ha	1
Preemergence	
Lambsquarters	70
Morningglory	0
Nightshade	0
Nutsedge, Yellow	0
Panicum, Fall	0
Pigweed, Palmer	0
Poinsettia, Wild	0
Ragweed	0

Field Bindweed	0	Ryegrass, Italian	0
Foxtail, Giant	0	Sandbur	0
Foxtail, Green	0	Smartweed	0
Goosegrass	0	Soybean	0
Johnsongrass	0	Surinam Grass	0
Kochia	0	Velvetleaf	0
		Waterhemp	0

CLAIMS

What is claimed is:

1. A compound selected from Formula **1**, *N*-oxides and salts thereof,



1

wherein

X^1 is halogen, $-CF_3$, $-CF_2H$, $-OCF_3$, $-OCF_2H$, $-SCHF_2$ or $-C\equiv CH$;

X^2 is halogen, $-CF_3$, $-CF_2H$, $-OCF_3$, $-OCF_2H$, $-SCHF_2$ or $-C\equiv CH$;

X^3 is H or halogen;

n is 1, 2, 3, 4 or 5;

P is H, C_1-C_7 alkyl, C_3-C_7 alkenyl, C_3-C_7 alkynyl, C_3-C_7 cycloalkyl, C_1-C_7 haloalkyl, C_2-C_7 haloalkenyl, C_3-C_7 haloalkynyl, C_2-C_7 alkoxyalkyl, C_4-C_7 cycloalkylalkyl, C_1-C_7 alkoxy, C_3-C_7 alkoxyalkoxyalkyl, C_3-C_7 alkylcarbonylalkyl, C_3-C_7 alkoxycarbonylalkyl, C_4-C_7 halocycloalkylalkyl, C_2-C_7 haloalkoxyalkyl, C_2-C_7 alkylthioalkyl, C_2-C_7 alkylsulfonylalkyl, C_2-C_7 alkylsulfinylalkyl, C_2-C_7 haloalkylthioalkyl, C_2-C_7 haloalkylsulfonylalkyl, C_2-C_7 haloalkylsulfinylalkyl, C_3-C_7 haloalkoxycarbonylalkyl, C_3-C_7 haloalkylcarbonylalkyl, C_2-C_7 alkylaminoalkyl, C_3-C_7 dialkylaminoalkyl, C_2-C_7 cyanoalkyl, C_1-C_7 nitroalkyl, amino, hydroxy, CH_2OH, $C(=O)R^1$, SO_2R^2, $C(=O)NR^3R^4$, $SO_2NR^3R^4$, CO_2R^5, $CH(OR^6)_2$, $CH(CO_2CH_3)_2$ or $CH(CO_2C_2H_5)_2$;

R^1 is H, C_1-C_7 alkyl, C_2-C_7 alkenyl, C_2-C_7 alkynyl, C_3-C_7 cycloalkyl, C_1-C_7 haloalkyl, C_3-C_7 haloalkenyl, C_2-C_7 alkoxyalkyl or C_4-C_7 cycloalkylalkyl; or phenyl optionally substituted with R^7; or benzyl optionally substituted on ring members with R^7; or pyridyl optionally substituted with R^7;

R^2 is H, C_1-C_7 alkyl, C_2-C_7 alkenyl, C_2-C_7 alkynyl, C_3-C_7 cycloalkyl, C_1-C_7 haloalkyl, C_3-C_7 haloalkenyl, C_2-C_7 alkoxyalkyl or C_4-C_7 cycloalkylalkyl; or phenyl optionally substituted with R^7; or benzyl optionally substituted on ring members with R^7; or pyridyl optionally substituted with R^7;

R^3 is H, C_1-C_7 alkyl, C_2-C_7 alkenyl, C_2-C_7 alkynyl, C_3-C_7 cycloalkyl, C_1-C_7 haloalkyl, C_3-C_7 haloalkenyl, C_2-C_7 alkoxyalkyl or C_4-C_7 cycloalkylalkyl; or phenyl optionally substituted with R^7; or benzyl optionally substituted on ring members with R^7; or pyridyl optionally substituted with R^7;

R^4 is H or C_1-C_4 alkyl;

R^5 is C_1-C_7 alkyl, C_3-C_7 alkenyl, C_3-C_7 alkynyl, C_3-C_7 cycloalkyl, C_2-C_7 haloalkyl, C_3-C_7 haloalkenyl, C_2-C_7 alkoxyalkyl or C_4-C_7 cycloalkylalkyl; or phenyl optionally substituted with R^7; or benzyl optionally substituted on ring members with R^7; or pyridyl optionally substituted with R^7;

R^6 is C_1-C_3 alkyl; or

two R^6 are taken together as -$(CH_2)_2$-, -$(CH_2)_3$- or -$CH_2CH(CH_3)$- to form a ring; and

R^7 is halogen, cyano, C_1-C_2 alkyl, C_1-C_3 haloalkyl, C_1-C_3 haloalkoxy or C_1-C_3 alkoxy.

2. The compound of Claim 1 wherein

X^1 is halogen, -CF_3, -CF_2H, -OCF_3 or -OCF_2H;

X^2 is halogen, -CF_3, -CF_2H, -OCF_3 or -OCF_2H ;

X^3 is H, F, Cl or Br;

P is H, C_1-C_7 alkyl, C_3-C_7 alkenyl, C_3-C_7 alkynyl, C_3-C_7 cycloalkyl, C_1-C_7 haloalkyl, C_2-C_7 haloalkenyl, C_3-C_7 haloalkynyl, C_2-C_7 alkoxyalkyl, C_4-C_7 cycloalkylalkyl, C_1-C_7 alkoxy, C_3-C_7 alkoxyalkoxyalkyl, C_2-C_7 cyanoalkyl, C_1-C_7 nitroalkyl, amino, hydroxy, CH_2OH, $C(=O)R^1$, SO_2R^2, $C(=O)NR^3R^4$, $SO_2NR^3R^4$, CO_2R^5, $CH(OR^6)_2$, $CH(CO_2CH_3)_2$ or $CH(CO_2C_2H_5)_2$;

R^1 is H, C_1-C_7 alkyl, C_2-C_7 alkenyl, C_2-C_7 alkynyl, C_1-C_7 haloalkyl or C_2-C_7 alkoxyalkyl; or benzyl optionally substituted on ring members with R^7;

R^2 is H, C_1-C_7 alkyl, C_2-C_7 alkenyl, C_2-C_7 alkynyl, C_1-C_7 haloalkyl or C_2-C_7 alkoxyalkyl; or benzyl optionally substituted on ring members with R^7;

R^3 is H, C_1-C_7 alkyl, C_2-C_7 alkenyl, C_2-C_7 alkynyl, C_1-C_7 haloalkyl or C_2-C_7 alkoxyalkyl; or benzyl optionally substituted on ring members with R^7;

R^4 is H or CH_3;

R^5 is C_1-C_4 alkyl;

R^6 is CH_3 or CH_2CH_3; or

two R^6 are taken together as -$(CH_2)_2$- or -$(CH_2)_3$- to form a ring; and

R^7 is Cl, Br, cyano or CH_3.

3. The compound of Claim 2 wherein

X^1 is halogen;

X^2 is halogen;

X^3 is H, F, Cl or Br;

n is 1, 2 or 3; and

P is H, C_1-C_4 alkyl, C_3-C_4 alkenyl, C_3-C_4 alkynyl, CH_2OCH_3, $CH_2OC_2H_5$, CH_2OH, $C(=O)CH_3$, $C(=O)C_2H_5$, $C(=O)CH_2OCH_3$, $C(=O)CH_2C{\equiv}CH$, SO_2CH_3, $SO_2C_2H_5$ or SO_2CF_3.

4. The compound of Claim 3 wherein

X^1 is Cl or Br;

X^2 is Cl or Br;

X^3 is H, F or Cl;

n is 2 or 3; and

P is H, C_1-C_4 alkyl, $CH_2C{\equiv}CH$, CH_2OH, $C(=O)CH_3$, $C(=O)C_2H_5$, $C(=O)CH_2C{\equiv}CH$, SO_2CH_3 or SO_2CF_3 or.

5. The compound of Claim 4 wherein

X^1 is Cl;

X^2 is Cl;

X^3 is H or Cl; and

P is H, CH_3, CH_2CH_3, $CH_2C{\equiv}CH$, CH_2OH, $C(=O)CH_3$ or $C(=O)C_2H_5$.

6. The compound of Claim 1 wherein

X^3 is H;

n is 2; and

P is H.

7. The compound of Claim 1 selected from

[3-(3,5-dichlorophenyl)-1*H*-pyrazol-4-yl](2,5-difluorophenyl)methanone;

[3-(3,5-dibromophenyl)-1*H*-pyrazol-4-yl](2,5-difluorophenyl)methanone;

(2,5-difluorophenyl)[3-(3,5-difluorophenyl)-1*H*-pyrazol-4-yl]methanone;

[3-(3-chloro-5-fluorophenyl)-1*H*-pyrazol-4-yl](3-fluorophenyl)methanone;

[3-(3,5-dichlorophenyl)-1*H*-pyrazol-4-yl](2,3,5-trifluorophenyl)methanone;

[3-(3,5-dichlorophenyl)-1*H*-pyrazol-4-yl](3-fluorophenyl)methanone;

[3-(3,5-dichlorophenyl)-1*H*-pyrazol-4-yl](3,5-difluorophenyl)methanone;

1-[3-(3,5-dichlorophenyl)-4-(2,5-difluorobenzoyl)-1*H*-pyrazol-1-yl]ethanone; and

(3,5-difluorophenyl)[3-(3,5-difluorophenyl)-1*H*-pyrazol-4-yl]methanone.

8. A herbicidal composition comprising a compound of Claim 1 and at least one component selected from the group consisting of surfactants, solid diluents and liquid diluents.

9. A herbicidal composition comprising a compound of Claim 1, at least one additional active ingredient selected from the group consisting of other herbicides and herbicide safeners, and at least one component selected from the group consisting of surfactants, solid diluents and liquid diluents.

10. A herbicidal mixture comprising (a) a compound of Claim 1, and (b) at least one additional active ingredient selected from (b1) through (b16) and salts of compounds of (b1) through (b16).

11. A method for controlling the growth of undesired vegetation comprising contacting the vegetation or its environment with a herbicidally effective amount of a compound of Claim 1.

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2015/025731

A. CLASSIFICATION OF SUBJECT MATTER
INV. C07D231/36 A01N43/56
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
C07D A01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 030 926 A (MORIMOTO KATSUSHI [JP] ET AL) 29 February 2000 (2000-02-29) cited in the application the whole document	1-11
A	WO 2013/192126 A1 (DU PONT [US]) 27 December 2013 (2013-12-27) the whole document	1-11

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
15 June 2015	26/06/2015

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2015/025731

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6030926 A	29-02-2000	AU 4632696 A	27-08-1996
		EP 0822187 A1	04-02-1998
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WO 2013192126 A1	27-12-2013	AU 2013277368 A1	15-01-2015
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		KR 20150027107 A	11-03-2015
		WO 2013192126 A1	27-12-2013