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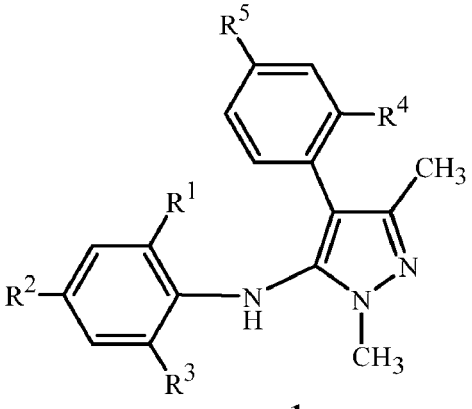

1

(57) Abstract: Disclosed is a fungicidal composition comprising (a) at least one compound selected from the compounds of Formula 1, *N*-oxides, and salts thereof, (1) wherein R^1 is H or halogen; R^2 is H or halogen; R^3 is halogen; R^4 is halogen or CH_3; and R^5 is halogen, cyano, CH_3 or C_1-C_2 alkoxy; and (b) at least one additional fungicidal compound selected from those disclosed herein. Also disclosed is a method for controlling plant diseases caused by fungal plant pathogens comprising applying to the plant or portion thereof, or to the plant seed, a fungicidally effective amount of the aforesaid composition.

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TITLE

FUNGICIDAL PYRAZOLE MIXTURES

FIELD OF THE INVENTION

This invention relates to certain pyrazole derivatives, their *N*-oxides and salts, and to mixtures and compositions comprising such pyrazole derivatives and methods for using such pyrazole derivatives and their mixtures and compositions as fungicides.

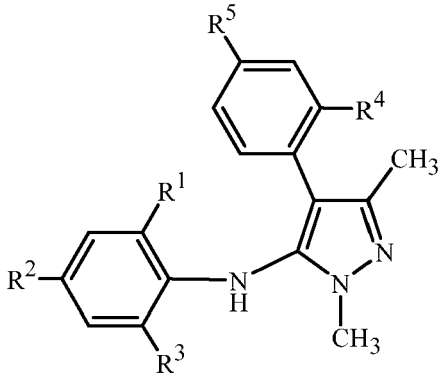
BACKGROUND OF THE INVENTION

The control of plant diseases caused by fungal plant pathogens is extremely important in achieving high crop efficiency. Plant disease damage to ornamental, vegetable, field, cereal and fruit crops can cause significant reduction in productivity and thereby result in increased costs to the consumer. In addition to often being highly destructive, plant diseases can be difficult to control and may develop resistance to commercial fungicides. Many products are commercially available for these purposes, but the need continues for new fungicidal compounds which are more effective, less costly, less toxic, environmentally safer or have different sites of action. Besides introduction of new fungicides, combinations of fungicides are often used to facilitate disease control, to broaden spectrum of control and to retard resistance development. Furthermore, certain rare combinations of fungicides demonstrate a greater-than-additive (i.e. synergistic) effect to provide commercially important levels of plant disease control. The advantages of particular fungicide combinations are recognized in the art to vary, depending on such factors as the particular plant species and plant disease to be treated, and whether the plants are treated before or after infection with the fungal plant pathogen. Accordingly new advantageous combinations are needed to provide a variety of options to best satisfy particular plant disease control needs. Such combinations have now been discovered.

SUMMARY OF THE INVENTION

This invention relates to a fungicidal composition (i.e. combination, mixture) comprising

(a) at least one compound selected from the compounds of Formula **1** (including all stereoisomers), *N*-oxides, and salts thereof:



1

wherein

R^1 is H or halogen;

R^2 is H or halogen;

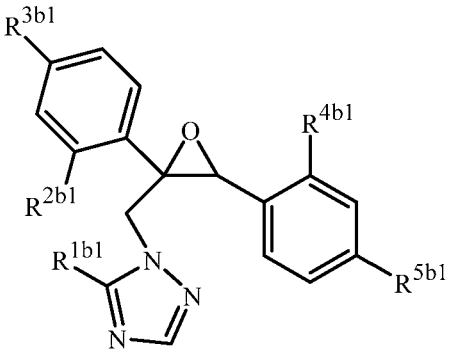
R^3 is halogen;

R^4 is halogen or CH_3; and

R^5 is halogen, cyano, CH_3 or C_1–C_2 alkoxy; and

(b) at least one fungicidal compound selected from

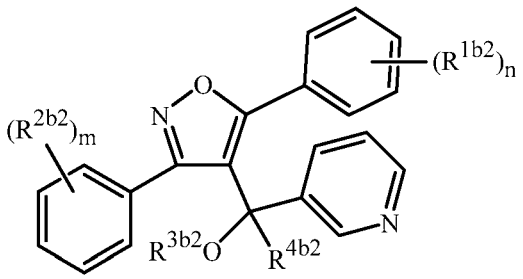
(b1)



B1

wherein R^{1b1} is H, -SH, -SCN, C_1–C_6 alkylthio, C_1–C_6 alkenylthio, C_1–C_6 alkynylthio or C_4-C_7 cycloalkylalkylthio; and R^{2b1}, R^{3b1}, R^{4b1} and R^{5b1} are each independently H or halogen; provided that (a) at least one of R^{2b1}, R^{3b1}, R^{4b1} and R^{5b1} is other than H and (b) the compound of Formula **B1** is other than 1-[3-(2-chlorophenyl)-2,3-epoxy-2-(4-fluorophenyl)propyl]-1*H*-1,2,4-triazole;

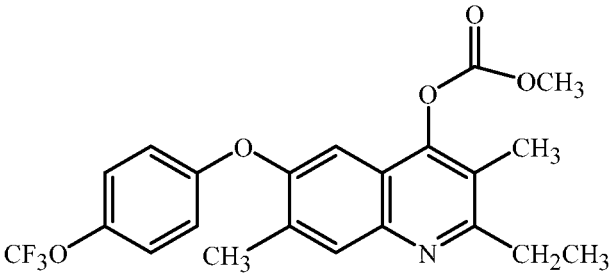
(b2)



B2

wherein each R^{1b2} and R^{2b2} is independently halogen; R^{3b2} is H, CH_3, CHO or $C(O)CH_3$; R^{4b2} is H; or R^{3b2} and R^{4b2} are taken together as CH_2; and n and m are each independently 1 or 2;

(b3)



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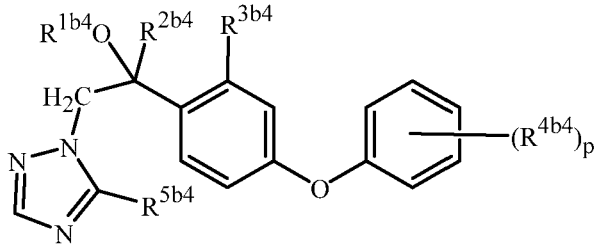
B3

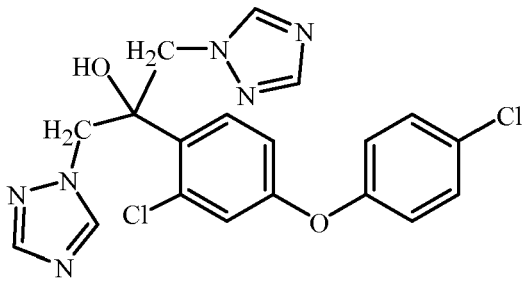
(b4)



B4

wherein R^{1b4} is H or CH_3; R^{2b4} is C_1–C_4 alkyl; R^{3b4} is H, halogen or CF_3; each R^{4b4} is independently F or Cl; R^{5b4} is H, -SH, -SCN, C_1–C_4 alkylthio or C_2–C_4 alkenylthio; and p is 1 or 2;

(b5)



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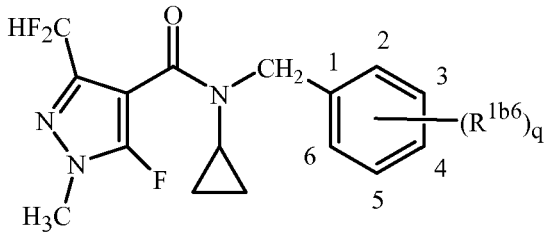
B5

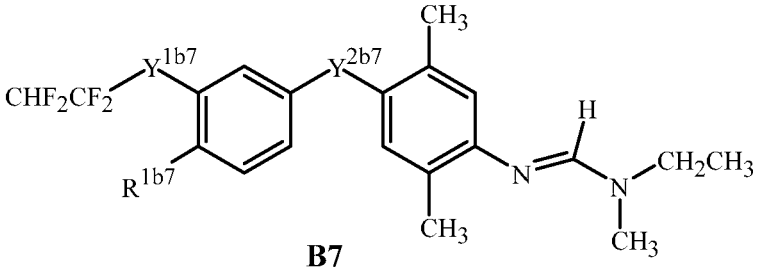
(b6)



B6

wherein each R^{1b6} is independently halogen, C_1–C_5 alkyl, C_1–C_5 haloalkyl, C_3–C_6 cycloalkyl or C_1–C_5 alkoxy; and q is 1, 2 or 3;

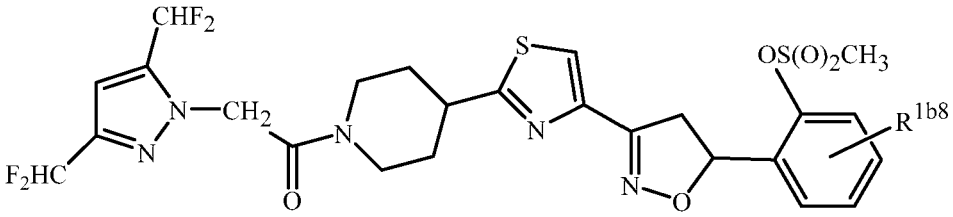
(b7)



B7

wherein R^{1b7} is H, F or Cl; and Y^{1b7} and Y^{2b7} are independently O or S;

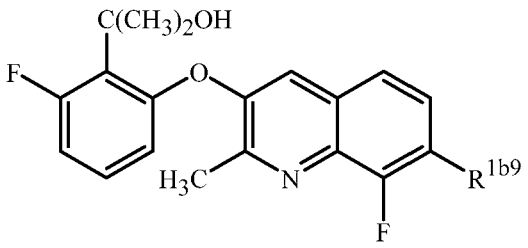
(b8)



B8

wherein R^{1b8} is H, F, Cl or CH_3;

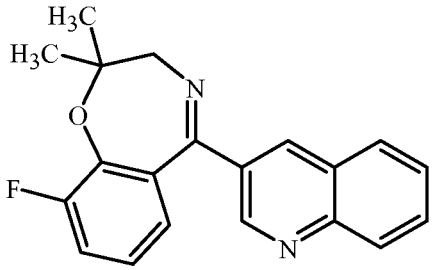
(b9)



B9

wherein R^{1b9} is H or F;

(b10)



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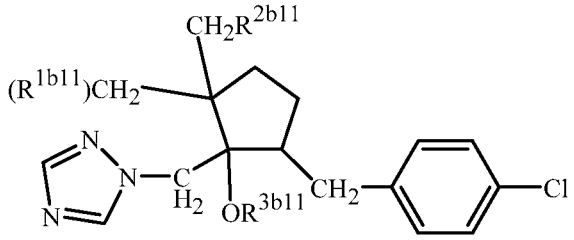
B10

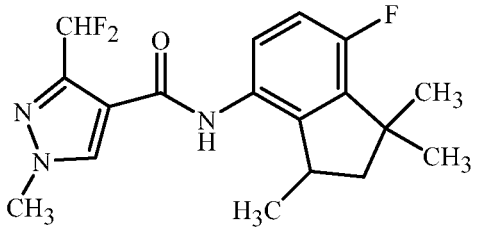
(b11)



B11

wherein R^{1b11} is H or -OH; R^{2b11} is Cl or -OH; and R^{3b11} is H; or R^{2b11} and R^{3b11} are taken together as a single bond;

(b12)



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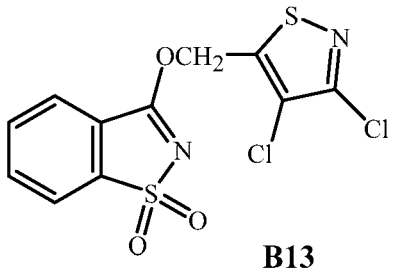
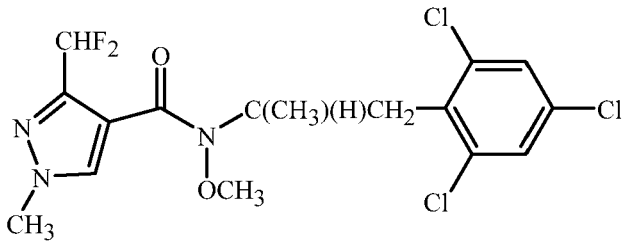
B12

(b13)



B13 ;

(b14)



B14 ;

and salts thereof.

This invention also relates to a fungicidal composition comprising: (a) at least one compound selected from the compounds of Formula **1**, (b) at least one fungicidal compound selected from Formulae **B1** through **B14** and salts thereof described above, and further comprising (c) at least one additional compound or agent that is biologically active.

This invention also relates to a composition comprising one of the aforesaid compositions comprising components (a) and (b) and at least one additional component selected from the group consisting of surfactants, solid diluents and liquid diluents.

This invention also relates to a method for controlling plant diseases caused by fungal plant pathogens comprising applying to the plant or portion thereof, or to the plant seed, a fungicidally effective amount of one of the aforesaid compositions.

The aforedescribed method can also be described as a method for protecting a plant or plant seed from diseases caused by fungal pathogens comprising applying a fungicidally effective amount of one of the aforesaid compositions to the plant (or portion thereof) or plant seed (directly or through the environment (e.g., growing medium) of the plant or plant seed).

This invention also relates to a compound of Formula **1** described above, or an *N*-oxide or salt thereof. This invention further relates to a fungicidal composition comprising a compound of Formula **1**, or an *N*-oxide or salt thereof, and at least one additional component selected from the group consisting of surfactants, solid diluents and liquid diluents. This invention also further relates to a method for protecting a plant or plant seed from diseases

caused by fungal pathogens comprising a fungicidally effective amount of a compound of Formula **1**, or an *N*-oxide or salt thereof, to the plant or plant seed.

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 in the present disclosure and claims, "plant" includes members of Kingdom Plantae, particularly seed plants (Spermatopsida), at all life stages, including young plants (e.g., germinating seeds developing into seedlings) and mature, reproductive

stages (e.g., plants producing flowers and seeds). Portions of plants include geotropic members typically growing beneath the surface of the growing medium (e.g., soil), such as roots, tubers, bulbs and corms, and also members growing above the growing medium, such as foliage (including stems and leaves), flowers, fruits and seeds.

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 in this disclosure, the terms "fungal pathogen" and "fungal plant pathogen" include pathogens in the Basidiomycete, Ascomycete, Oomycete and Deuteromycete classes that are the causal agents of a broad spectrum of plant diseases of economic importance, affecting ornamental, turf, vegetable, field, cereal and fruit crops. In the context of this disclosure, "protecting a plant from disease" or "control of a plant disease" includes preventative action (interruption of the fungal cycle of infection, colonization, symptom development and spore production) and/or curative action (inhibition of colonization of plant host tissues).

As referred to in this disclosure, the term mode of action (MOA) is as defined broadly by the Fungicide Resistance Action Committee (FRAC), and is used to distinguish fungicide groups according to their biochemical mode of action in the biosynthetic pathways of plant pathogens. These FRAC-defined MOAs are (A) nucleic acid synthesis, (B) mitosis and cell division, (C) respiration, (D) amino acid and protein synthesis, (E) signal transduction, (F) lipid synthesis and membrane integrity, (G) sterol biosynthesis in membranes, (H) cell wall biosynthesis in membranes, (I) melanin synthesis in cell wall, (P) host plant defense induction, multi-site contact activity and unknown mode of action. Each MOA class consists of one or more groups based either on individual validated target sites of action, or in cases where the precise target site is unknown, based on cross resistance profiles within a group or in relation to other groups. Each of these groupings within a FRAC-defined MOA, whether the target site is known or unknown, is designated by a FRAC code. Additional information on target sites and FRAC codes can be found on the following FRAC website: http://www.frac.info/ .

As referred to in this disclosure, the term "cross resistance" refers to a phenomenon wherein a pathogen evolves resistance to one fungicide and in addition acquires resistance to others. These additional fungicides are typically, but not always, in the same chemical class or have the same target site of action, or can be detoxified by the same mechanism.

The term "Registry Number" refers to Chemical Abstracts Registry Number.

A single bond drawn as a wavy line (e.g., in Formulae **17**) denote that either the *E* or *Z* isomer or a mixture of *E* and *Z* isomers may be present.

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" also includes moieties comprised of multiple triple bonds such as 2,5-hexadiynyl. "Alkoxy" includes methoxy (OCH_3 or OMe) and ethoxy (OCH_2CH_3 or OEt). "Alkylthio" includes branched or straight-chain alkylthio moieties such as methylthio, ethylthio, and the different propylthio, butylthio, pentylthio and hexylthio isomers. "Alkenylthio", and "alkynylthio" are defined analogously to the above examples.

Examples of "cycloalkylalkyl" include cyclopropylmethyl, cyclopentylethyl, and other cycloalkyl moieties bonded to straight-chain or branched alkyl groups. "Cycloalkylalkylthio" denotes cycloalkylalkyl linked through a sulfur atom attached to the alkyl chain. Examples of "cycloalkylalkylthio" include cyclopropylmethylthio, cyclopentylethylthio, and other cycloalkyl moieties bonded to straight-chain or branched alkylthio groups.

The term "halogen", either alone or in compound words such as "haloalkyl", includes fluorine, chlorine, bromine or iodine. The term "cyano" includes carbon triply bonded to nitrogen and can also be represented as C≡N or CN. The term "formyl" includes a carbon doubly bonded to an oxygen and singly bonded to a hydrogen and can be represented as C(O)H or CHO. The term "acetyl" includes a carbon doubly bonded to an oxygen and singly bonded to a methyl group and can be represented as $C(O)CH_3$ or COMe.

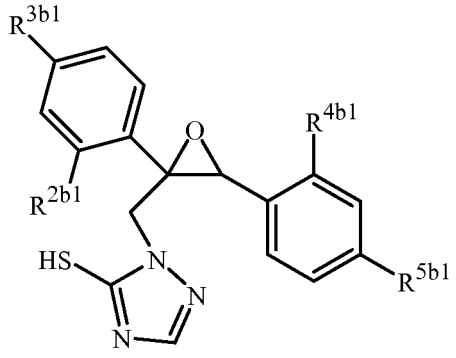
In Formula **B2**, an epoxide ring can be formed from the OR^{3b2} and R^{4b2} groups when taken together with the carbon to which they are attached. This is indicated as "R^{3b2} and R^{4b2} are taken together as CH_2".

Compounds relevant to the compositions and methods 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 in the compositions of this invention may be present as a mixture of stereoisomers, individual stereoisomers or as an optically active form. For a comprehensive discussion of all aspects of stereoisomerism, see Ernest L. Eliel and Samuel H. Wilen, *Stereochemistry of Organic Compounds*, John Wiley & Sons, 1994.

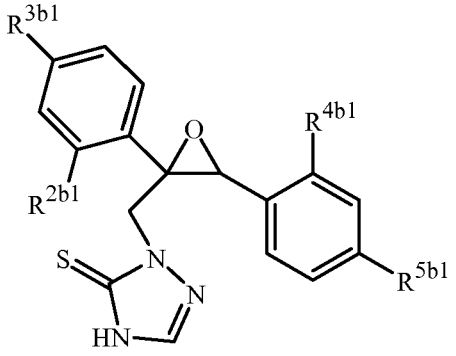
Molecular depictions drawn herein follow standard conventions for depicting stereochemistry. To indicate stereoconfiguration, bonds rising from the plane of the drawing and towards the viewer are denoted by solid wedges wherein the broad end of the wedge is attached to the atom rising from the plane of the drawing towards the viewer. Bonds going below the plane of the drawing and away from the viewer are denoted by dashed wedges wherein the narrow end of the wedge is attached to the atom further away from the viewer. Constant width lines indicate bonds with a direction opposite or neutral relative to bonds shown with solid or dashed wedges; constant width lines also depict bonds in molecules or parts of molecules in which no particular stereoconfiguration is intended to be specified.

Synthetic methods for the preparation of *N*-oxides of heterocycles such as pyrazoles are very well known by one skilled in the art including the oxidation of heterocycles 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 some of the compounds disclosed herein can exist in equilibrium with one or more of their respective tautomeric counterparts. Unless otherwise indicated, reference to a compound by one tautomer description is to be considered to include all tautomers. For example, reference to the tautomeric form depicted by Formula **B1-1** also includes the tautomeric form depicted by Formula **B1-2**,

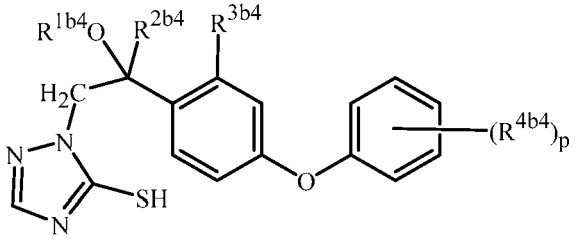


B1-1

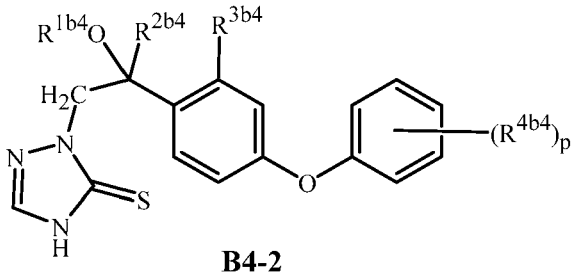


B1-2

and reference to the tautomeric form depicted by Formula **B4-1** also includes the tautomeric form depicted by Formula **B4-2**.



B4-1



B4-2

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 the compounds of Formula **1** alone and in mixtures are useful for control of plant diseases caused by fungal plant pathogens (i.e. are agriculturally suitable). The salts of the compounds 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. Accordingly, the present invention relates to mixtures of compounds selected from Formula **1**, *N*-oxides and agriculturally suitable salts thereof. Also, biologically similar salt forms can exist for many of the compounds of Formulae **B1** through **B14**.

Compounds selected from Formula **1**, stereoisomers, tautomers, *N*-oxides, and salts thereof, typically exist in more than one form, and Formula **1** thus includes all crystalline and non-crystalline forms of the compounds that Formula **1** represents. 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 represented by 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 represented by

Formula **1**. Preparation and isolation of a particular polymorph of a compound represented by Formula **1** can be achieved by methods known to those skilled in the art including, for example, crystallization using selected solvents and temperatures. Compounds of Formulae **B1** through **B14**, including salts thereof, can also typically exist in more than one form. For a comprehensive discussion of polymorphism see R. Hilfiker, Ed., *Polymorphism in the Pharmaceutical Industry*, Wiley-VCH, Weinheim, 2006.

In the embodiments of the present invention, including those described below, reference to Formula **1** includes *N*-oxides and salts thereof unless otherwise indicated, and reference to "a compound of Formula **1**" includes the definitions of substituents specified in the Summary of the Invention unless further defined in the Embodiments. Furthermore, reference to Formulae **B1** through **B14** includes salts thereof unless otherwise indicated.

Embodiment 1. A composition comprising components (a) and (b) described in the Summary of the Invention wherein in Formula **1**, R^1 is F, Cl or Br.

Embodiment 2. A composition comprising components (a) and (b) described in the Summary of the Invention or Embodiment 1 wherein in Formula **1**, R^2 is H or F, Cl or Br.

Embodiment 3. A composition of Embodiment 2 wherein in Formula **1**, R^2 is F, Cl or Br.

Embodiment 4. A composition comprising components (a) and (b) described in the Summary of the Invention or any one of Embodiments 1 through 3 wherein in Formula **1**, R^3 is F, Cl or Br.

Embodiment 5. A composition comprising components (a) and (b) described in the Summary of the Invention or any one of Embodiments 1 through 4 wherein in Formula **1**, R^4 is F, Cl or Br.

Embodiment 6. A composition comprising components (a) and (b) described in the Summary of the Invention or any one of Embodiments 1 through 5 wherein in Formula **1**, R^5 is F, Cl or Br.

Embodiment 7. A composition comprising components (a) and (b) described in the Summary of the Invention or any one of Embodiments 1 through 6 wherein component (a) does not comprise an *N*-oxide of a compound of Formula **1**.

Embodiment 8. A composition comprising components (a) and (b) described in the Summary of the Invention or Embodiment 7 wherein component (a) comprises a compound selected from the group consisting of
4-(2-chloro-4-fluorophenyl)-*N*-(2,6-difluorophenyl)-1,3-dimethyl-1*H*-pyrazol-5-amine (Compound 2),
4-(2-chloro-4-fluorophenyl)-*N*-(2-chloro-6-fluorophenyl)-1,3-dimethyl-1*H*-pyrazol-5-amine (Compound 3),

4-(2-bromo-4-fluorophenyl)-*N*-(2-chloro-6-fluorophenyl)-1,3-dimethyl-1*H*-pyrazol-5-amine (Compound 4),
N-(2-bromo-6-fluorophenyl)-4-(2-chloro-4-fluorophenyl)-1,3-dimethyl-1*H*-pyrazol-5-amine (Compound 5),
4-(2-bromo-4-fluorophenyl)-*N*-(2-bromo-6-fluorophenyl)-1,3-dimethyl-1*H*-pyrazol-5-amine (Compound 7),
4-(2-bromo-4-fluorophenyl)-*N*-(2-chlorophenyl)-1,3-dimethyl-1*H*-pyrazol-5-amine (Compound 8),
N-(2-bromophenyl)-4-(2-chloro-4-fluorophenyl)-1,3-dimethyl-1*H*-pyrazol-5-amine (Compound 9),
4-(2-bromo-4-fluorophenyl)-*N*-(2,6-difluorophenyl)-1,3-dimethyl-1*H*-pyrazol-5-amine (Compound 11),
N-(4-chloro-2,6-difluorophenyl)-4-(2-chloro-4-fluorophenyl)-1,3-dimethyl-1*H*-pyrazol-5-amine (Compound 15),
N-(2-chloro-4,6-difluorophenyl)-4-(2-chloro-4-fluorophenyl)-1,3-dimethyl-1*H*-pyrazol-5-amine (Compound 16),
4-(2-bromo-4-fluorophenyl)-*N*-(2-chloro-4,6-difluorophenyl)-1,3-dimethyl-1*H*-pyrazol-5-amine (Compound 17) and
N-(2-bromo-4,6-difluorophenyl)-4-(2-chloro-4-fluorophenyl)-1,3-dimethyl-1*H*-pyrazol-5-amine (Compound 34),
(wherein the compound numbers are identified in Index Table A).

Embodiment 9. A composition of Embodiment 8 wherein component (a) comprises Compound 2.

Embodiment 10. A composition of Embodiment 8 wherein component (a) comprises Compound 3.

Embodiment 11. A composition of Embodiment 8 wherein component (a) comprises Compound 4.

Embodiment 12. A composition of Embodiment 8 wherein component (a) comprises Compound 5.

Embodiment 13. A composition of Embodiment 8 wherein component (a) comprises Compound 7.

Embodiment 14. A composition of Embodiment 8 wherein component (a) comprises Compound 8.

Embodiment 15. A composition of Embodiment 8 wherein component (a) comprises Compound 9.

Embodiment 16. A composition of Embodiment 8 wherein component (a) comprises Compound 11.

Embodiment 17. A composition of Embodiment 8 wherein component (a) comprises Compound 15.

Embodiment 18. A composition of Embodiment 8 wherein component (a) comprises Compound 16.

Embodiment 19. A composition of Embodiment 8 wherein component (a) comprises Compound 17.

Embodiment 20. A composition of Embodiment 8 wherein component (a) comprises Compound 34.

Embodiment 21. A composition comprising components (a) and (b) described in the Summary of the Invention or any one of Embodiments 1 through 20 wherein in Formula **B1**, R^{1b1} is H, -SH, -SCN or $-SCH_2CH=CH_2$ (alternatively identified as $CH_2=CHCH_2S-$).

Embodiment 22. A composition comprising components (a) and (b) described in the Summary of the Invention or any one of Embodiments 1 through 21 wherein in Formula **B1**, R^{1b1} is H, -SH or $-SCH_2CH=CH_2$.

Embodiment 23. A composition comprising components (a) and (b) described in the Summary of the Invention or any one of Embodiments 1 through 22 wherein in Formula **B1**, R^{2b1}, R^{3b1} and R^{4b1} are halogen and R^{5b1} is H.

Embodiment 24. A composition comprising components (a) and (b) described in the Summary of the Invention or any one of Embodiments 1 through 23 wherein component (b) comprises a compound selected from the group consisting of *rel*-1-[[(2*R*,3*S*)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-2-oxiranyl]methyl]-1*H*-1,2,4-triazole,
rel-2-[[(2*R*,3*S*)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-2-oxiranyl]methyl]-1,2-dihydro-3*H*-1,2,4-triazole-3-thione,
rel-1-[[(2*R*,3*S*)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-2-oxiranyl]methyl]-5-(2-propen-1-ylthio)-1*H*-1,2,4-triazole and
rel-1-[[(2*R*,3*S*)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-2-oxiranyl]methyl]-1*H*-1,2,4-triazol-5-yl thiocyanate.

Embodiment 25. A composition of Embodiment 24 wherein component (b) comprises *rel*-1-[[(2*R*,3*S*)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-2-oxiranyl]methyl]-1*H*-1,2,4-triazole.

Embodiment 26. A composition of Embodiment 24 wherein component (b) comprises *rel*-2-[[(2*R*,3*S*)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-2-oxiranyl]methyl]-1,2-dihydro-3*H*-1,2,4-triazole-3-thione.

Embodiment 27. A composition of Embodiment 24 wherein component (b) comprises *rel*-1-[[(2*R*,3*S*)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-2-oxiranyl]methyl]-5-(2-propen-1-ylthio)-1*H*-1,2,4-triazole.

Embodiment 28. A composition of Embodiment 24 wherein component (b) comprises *rel*-1-[[(2*R*,3*S*)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-2-oxiranyl]methyl]-1*H*-1,2,4-triazol-5-yl thiocyanate.

Embodiment 29. The composition comprising components (a) and (b) described in the Summary of the Invention or any one of Embodiments 1 through 27 wherein in Formula **B1**, R^{1b1} is other than -SCN.

Embodiment 30. A composition comprising components (a) and (b) described in the Summary of the Invention or any one of Embodiments 1 through 29 wherein in Formula **B2**, R^{3b2} and R^{4b2} are each H.

Embodiment 31. A composition comprising components (a) and (b) described in the Summary of the Invention or any one of Embodiments 1 through 29 wherein in Formula **B2**, R^{3b2} and R^{4b2} are taken together as CH_2.

Embodiment 32. A composition comprising components (a) and (b) described in the Summary of the Invention or any one of Embodiments 1 through 31 wherein in Formula **B2**, n and m are each 2.

Embodiment 33. A composition comprising components (a) and (b) described in the Summary of the Invention or any one of Embodiments 1 through 32 wherein component (b) comprises a compound selected from the group consisting of
α-[3-(4-chloro-2-fluorophenyl)-5-(2,4-difluorophenyl)-4-isoxazolyl]-3-pyridinemethanol,
(α*S*)-[3-(4-chloro-2-fluorophenyl)-5-(2,4-difluorophenyl)-4-isoxazolyl]-3-pyridinemethanol,
(α*R*)-[3-(4-chloro-2-fluorophenyl)-5-(2,4-difluorophenyl)-4-isoxazolyl]-3-pyridinemethanol and
3-[2-[3-(4-chloro-2-fluorophenyl)-5-(2,4-difluorophenyl)-4-isoxazolyl]-2-oxiranyl]pyridine.

Embodiment 34. A composition of Embodiment 33 wherein component (b) comprises α-[3-(4-chloro-2-fluorophenyl)-5-(2,4-difluorophenyl)-4-isoxazolyl]-3-pyridinemethanol.

Embodiment 35. A composition of Embodiment 33 wherein component (b) comprises (α*S*)-[3-(4-chloro-2-fluorophenyl)-5-(2,4-difluorophenyl)-4-isoxazolyl]-3-pyridinemethanol.

Embodiment 36. A composition of Embodiment 33 wherein component (b) comprises (α*R*)-[3-(4-chloro-2-fluorophenyl)-5-(2,4-difluorophenyl)-4-isoxazolyl]-3-pyridinemethanol.

Embodiment 37. A composition of Embodiment 33 wherein component (b) comprises 3-[2-[3-(4-chloro-2-fluorophenyl)-5-(2,4-difluorophenyl)-4-isoxazolyl]-2-oxiranyl]pyridine.

Embodiment 38. A composition comprising components (a) and (b) described in the Summary of the Invention or any one of Embodiments 1 through 37 wherein component (b) comprises 2-ethyl-3,7-dimethyl-6-[4-(trifluoromethoxy)-phenoxy]-4-quinolinyl methyl carbonate.

Embodiment 39. A composition comprising components (a) and (b) described in the Summary of the Invention or any one of Embodiments 1 through 38 wherein in Formula **B4**, R^{1b4} is H, R^{3b4} is halogen or CF_3, and R^{5b4} is H.

Embodiment 40. A composition of Embodiment 39 wherein component (b) comprises α-[2-chloro-4-(4-chlorophenoxy)phenyl]-α-ethyl-1*H*-1,2,4-triazole-1-ethanol.

Embodiment 41. A composition comprising components (a) and (b) described in the Summary of the Invention or any one of Embodiments 1 through 40 wherein component (b) comprises α-[2-chloro-4-(4-chlorophenoxy)phenyl]-α-(1*H*-1,2,4-triazol-1-ylmethyl)-1*H*-1,2,4-triazole-1-ethanol.

Embodiment 42. A composition comprising components (a) and (b) described in the Summary of the Invention or any one of Embodiments 1 through 41 wherein component (b) comprises a compound selected from the group consisting of
N-cyclopropyl-3-(difluoromethyl)-5-fluoro-1-methyl-*N*-[[(2-(1-methylethyl)-phenyl]methyl]-1*H*-pyrazole-4-carboxamide,
N-[[5-chloro-2-(trifluoromethyl)phenyl]methyl]-*N*-cyclopropyl-3-(difluoro-methyl)-5-fluoro-1-methyl-1*H*-pyrazole-4-carboxamide,
N-[[2-chloro-6-(trifluoromethyl)phenyl]methyl]-*N*-cyclopropyl-3-(difluoro-methyl)-5-fluoro-1-methyl-1*H*-pyrazole-4-carboxamide,
N-[[3-chloro-2-fluoro-6-(trifluoromethyl)phenyl]methyl]-*N*-cyclopropyl-3-(difluoromethyl)-5-fluoro-1-methyl-1*H*-pyrazole-4-carboxamide,
N-cyclopropyl-3-(difluoromethyl)-5-fluoro-1-methyl-*N*-[[5-methyl-2-(trifluoro-methyl)phenyl]methyl]-1*H*-pyrazole-4-carboxamide,
N-[[5-chloro-2-(1-methylethyl)phenyl]methyl]-*N*-cyclopropyl-3-(difluoro-methyl)-5-fluoro-1-methyl-1*H*-pyrazole-4-carboxamide,
N-cyclopropyl-*N*-[(2-cyclopropylphenyl)methyl]-3-(difluoromethyl)-5-fluoro-1-methyl-1*H*-pyrazole-4-carboxamide,
N-cyclopropyl-3-(difluoromethyl)-*N*-[(2-ethyl-4,5-dimethylphenyl)methyl]-5-fluoro-1-methyl-1*H*-pyrazole-4-carboxamide,
N-cyclopropyl-3-(difluoromethyl)-5-fluoro-*N*-[[5-fluoro-2-(1-methylethyl)-phenyl]methyl-1-methyl-1*H*-pyrazole-4-carboxamide,
N-cyclopropyl-3-(difluoromethyl)-*N*-[[2-(1,1-dimethylethyl)phenyl]methyl]-5-fluoro-1-methyl-1*H*-pyrazole-4-carboxamide,
N-cyclopropyl-3-(difluoromethyl)-*N*-[(2-ethyl-5-fluorophenyl)methyl]-5-fluoro-1-methyl-1*H*-pyrazole-4-carboxamide,

N-cyclopropyl-*N*-[(2-cyclopropyl-5-fluorophenyl)methyl]-3-(difluoromethyl)-5-fluoro-1-methyl-1*H*-pyrazole-4-carboxamide,
N-[(5-chloro-2-ethylphenyl)methyl]-*N*-cyclopropyl-3-(difluoromethyl)-5-fluoro-1-methyl-1*H*-pyrazole-4-carboxamide,
N-cyclopropyl-3-(difluoromethyl)-5-fluoro-*N*-[[2-fluoro-6-(1-methylethyl)-phenyl]methyl]-1-methyl-1*H*-pyrazole-4-carboxamide,
N-cyclopropyl-3-(difluoromethyl)-5-fluoro-*N*-[[5-fluoro-2-(1-methylethyl)-phenyl]methyl]-1-methyl-1*H*-pyrazole-4-carboxamide,
N-[(5-chloro-2-ethylphenyl)methyl]-*N*-cyclopropyl-3-(difluoromethyl)-5-fluoro-1-methyl-1*H*-pyrazole-4-carboxamide,
N-cyclopropyl-3-(difluoromethyl)-5-fluoro-*N*-[[2-fluoro-6-(1-methylethyl)-phenyl]methyl]-1-methyl-1*H*-pyrazole-4-carboxamide,
N-cyclopropyl-3-(difluoromethyl)-5-fluoro-*N*-[[5-fluoro-2-(1-methylethyl)-phenyl]methyl]-1-methyl-1*H*-pyrazole-4-carboxamide, and
N-[(2-cyclopentyl-5-fluorophenyl)methyl]-*N*-cyclopropyl-3-(difluoromethyl)-5-fluoro-1-methyl-1*H*-pyrazole-4-carboxamide.

Embodiment 43. A composition of Embodiment 42 wherein component (b) comprises *N*-cyclopropyl-3-(difluoromethyl)-5-fluoro-1-methyl-*N*-[[(2-(1-methylethyl)-phenyl]methyl]-1*H*-pyrazole-4-carboxamide.

Embodiment 44. A composition comprising components (a) and (b) described in the Summary of the Invention or any one of Embodiments 1 through 43 wherein component (b) comprises a compound selected from the group consisting of *N*'-[2,5-dimethyl-4-[[3-(1,1,2,2-tetrafluoroethoxy)phenyl]thio]phenyl]-*N*-ethyl-*N*-methylmethanimidamide,
N'-[4-[[4-chloro-3-(1,1,2,2-tetrafluoroethoxy)phenyl]thio]-2,5-dimethylphenyl]-*N*-ethyl-*N*-methylmethanimidamide,
N-ethyl-*N*'-[4-[[4-fluoro-3-(1,1,2,2-tetrafluoroethoxy)phenyl]thio]-2,5-dimethylphenyl]-*N*-methylmethanimidamide,
N'-[2,5-dimethyl-4-[3-[(1,1,2,2-tetrafluoroethyl)thio]phenoxy]phenyl]-*N*-ethyl-*N*-methylmethanimidamide,
N'-[2,5-dimethyl-4-[4-chloro-3-[(1,1,2,2-tetrafluoroethyl)thio]phenoxy]phenyl]-*N*-ethyl-*N*-methylmethanimidamide,
N'-[2,5-dimethyl-4-[4-fluoro-3-[(1,1,2,2-tetrafluoroethyl)thio]phenoxy]phenyl]-*N*-ethyl-*N*-methylmethanimidamide, and
N'-[2,5-dimethyl-4-[[3-[(1,1,2,2-tetrafluoroethyl)thio]phenyl]thio]phenyl]-*N*-ethyl-*N*-methylmethanimidamide.

Embodiment 45. A composition comprising components (a) and (b) described in the Summary of the Invention or any one of Embodiments 1 through 44 wherein component (b) comprises a compound selected from the group consisting of 2-[3,5-bis(difluoromethyl)-1*H*-pyrazol-1-yl]-1-[4-[4-[4,5-dihydro-5-[2-[(methylsulfonyl)oxy]phenyl]-3-isoxazolyl]-2-thiazolyl]-1-piperidinyl]ethanone, 2-[3,5-bis(difluoromethyl)-1*H*-pyrazol-1-yl]-1-[4-[4-[5-[2-fluoro-6-[(methylsulfonyl)oxy]phenyl]-4,5-dihydro-3-isoxazolyl]-2-thiazolyl]-1-piperidinyl]ethanone, and 2-[3,5-bis(difluoromethyl)-1*H*-pyrazol-1-yl]-1-[4-[4-[5-[2-chloro-6-[(methylsulfonyl)oxy]phenyl]-4,5-dihydro-3-isoxazolyl]-2-thiazolyl]-1-piperidinyl]-ethanone.

Embodiment 46. A composition comprising components (a) and (b) described in the Summary of the Invention or any one of Embodiments 1 through 45 wherein component (b) comprises a compound selected from the group consisting of 2-fluoro-6-[(8-fluoro-2-methyl-3-quinolinyl)oxy]-α,α-dimethylbenzenemethanol, and 2-[(7,8-difluoro-2-methyl-3-quinolinyl)oxy]-6-fluoro-α,α-dimethylbenzene-methanol.

Embodiment 47. A composition comprising components (a) and (b) described in the Summary of the Invention or any one of Embodiments 1 through 46 wherein component (b) comprises 9-fluoro-2,3-dihydro-2,2-dimethyl-5-(3-quinolinyl)-1,4-benzoxazepine.

Embodiment 48. A composition comprising components (a) and (b) described in the Summary of the Invention or any one of Embodiments 1 through 47 wherein component (b) comprises a compound selected from the group consisting of (1*R*,2*S*,5*S*)-*rel*-2-(chloromethyl)-5-[(4-chlorophenyl)methyl]-2-methyl-1-(1*H*-1,2,4-triazol-1-ylmethyl)cyclopentanol, 1-[[4-[(4-chlorophenyl)methyl]-1-methyl-6-oxabicyclo[3.2.0]hept-5-yl]methyl]-1*H*-1,2,4-triazole, and 3-[(4-chlorophenyl)methyl]-2-hydroxy-2-(1*H*-1,2,4-triazol-1-ylmethyl)-1,1-cyclopentanedimethanol.

Embodiment 49. A composition comprising components (a) and (b) described in the Summary of the Invention or any one of Embodiments 1 through 48 wherein component (b) comprises 3-(difluoromethyl)-*N*-(7-fluoro-2,3-dihydro-1,1,3-trimethyl-1*H*-inden-4-yl)-1-methyl-1*H*-pyrazole-4-carboxamide.

Embodiment 50. A composition comprising components (a) and (b) described in the Summary of the Invention or any one of Embodiments 1 through 49 wherein component (b) comprises 3-[(3,4-dichloro-5-isothiazolyl)methoxy]-1,2-benzisothiazole, 1,1-dioxide.

Embodiment 51. A composition comprising components (a) and (b) described in the Summary of the Invention or any one of Embodiments 1 through 50 wherein component (b) comprises 3-(difluoromethyl)-*N*-methoxy-1-methyl-*N*-[1-methyl-2-(2,4,6-trichlorophenyl)ethyl]-1*H*-pyrazole-4-carboxamide.

Embodiment 52. A composition comprising components (a) and (b) described in the Summary of the Invention or any one of Embodiments 1 through 51 wherein component (b) comprises at least one fungicidal compound selected from (b1). (b2), (b3), (b4) and (b5).

Embodiment 53. A composition comprising components (a) and (b) described in the Summary of the Invention or any one of Embodiments 1 through 52 wherein component (b) comprises at least one fungicidal compound selected from (b1), (b2) and (b3).

Embodiment 54. A composition comprising components (a) and (b) described in the Summary of the Invention or any one of Embodiments 1 through 53 wherein component (b) comprises at least one fungicidal compound selected from (b1) and (b2).

Embodiment 55. A composition comprising components (a) and (b) described in the Summary of the Invention or any one of Embodiments 1 through 54 wherein component (b) comprises at least one fungicidal compound selected from (b1).

Embodiment 56. A composition comprising components (a) and (b) described in the Summary of the Invention or any one of Embodiments 1 through 55 wherein component (b) comprises at least one fungicidal compound selected from (b2).

Embodiment 57. A composition comprising components (a) and (b) described in the Summary of the Invention or any one of Embodiments 1 through 56 wherein component (b) comprises the fungicidal compound of (b3).

Embodiment 58. A composition comprising components (a) and (b) as described in the Summary of the Invention or any one of Embodiments 1 through 57 wherein component (b) comprises at least one fungicidal compound selected from (b4).

Embodiment 59. A composition comprising components (a) and (b) as described in the Summary of the Invention or any one of Embodiments 1 through 58 wherein component (b) comprises the fungicidal compound of (b5).

Embodiment 60. A composition comprising components (a) and (b) as described in the Summary of the Invention or any one of Embodiments 1 through 59 wherein component (b) comprises at least one fungicidal compound selected from (b6).

Embodiment 61. A composition comprising components (a) and (b) as described in the Summary of the Invention or any one of Embodiments 1 through 60 wherein component (b) comprises at least one fungicidal compound selected from (b7).

Embodiment 62. A composition comprising components (a) and (b) as described in the Summary of the Invention or any one of Embodiments 1 through 61 wherein component (b) comprises at least one fungicidal compound selected from (b8).

Embodiment 63. A composition comprising components (a) and (b) as described in the Summary of the Invention or any one of Embodiments 1 through 62 wherein component (b) comprises at least one fungicidal compound selected from (b9).

Embodiment 64. A composition comprising components (a) and (b) as described in the Summary of the Invention or any one of Embodiments 1 through 63 wherein component (b) comprises at least one fungicidal compound selected from (b10).

Embodiment 65. A composition comprising components (a) and (b) as described in the Summary of the Invention or any one of Embodiments 1 through 64 wherein component (b) comprises at least one fungicidal compound selected from (b11).

Embodiment 66. A composition comprising components (a) and (b) as described in the Summary of the Invention or any one of Embodiments 1 through 65 wherein component (b) comprises at least one fungicidal compound selected from (b12).

Embodiment 67. A composition comprising components (a) and (b) as described in the Summary of the Invention or any one of Embodiments 1 through 66 wherein component (b) comprises at least one fungicidal compound selected from (b13).

Embodiment 68. A composition comprising components (a) and (b) as described in the Summary of the Invention or any one of Embodiments 1 through 67 wherein component (b) comprises at least one fungicidal compound selected from (b14).

Embodiment 69. A composition comprising components (a) and (b) described in the Summary of the Invention or any one of Embodiments 1 through 68 further comprising (c) least one additional compound or agent that is biologically active.

Embodiment 70. A composition of Embodiment 69 wherein component (c) comprises at least one fungicidal compound selected from the group consisting of:

(c1) methyl benzimidazole carbamate (MBC) fungicides;

(c2) dicarboximide fungicides;

(c3) demethylation inhibitor (DMI) fungicides;

(c4) phenylamide fungicides;

(c5) amine/morpholine fungicides;

(c6) phospholipid biosynthesis inhibitor fungicides;

(c7) carboxamide fungicides;

(c8) hydroxy(2-amino-)pyrimidine fungicides;

(c9) anilinopyrimidine fungicides;

(c10) *N*-phenyl carbamate fungicides;

(c11) quinone outside inhibitor (QoI) fungicides;

(c12) phenylpyrrole fungicides;

(c13) quinoline fungicides;
(c14) lipid peroxidation inhibitor fungicides;
(c15) melanin biosynthesis inhibitor-reductase (MBI-R) fungicides;
(c16) melanin biosynthesis inhibitor-dehydratase (MBI-D) fungicides;
(c17) sterol biosynthesis inhibitor (SBI): class III fungicides (also known as hydroxyanilide fungicides);
(c18) squalene-epoxidase inhibitor fungicides;
(c19) polyoxin fungicides;
(c20) phenylurea fungicides;
(c21) quinone inside inhibitor (QiI) fungicides;
(c22) benzamide and thiazolecarboxamide fungicides (also known simply as benzamide fungicides);
(c23) enopyranuronic acid antibiotic fungicides;
(c24) hexopyranosyl antibiotic fungicides;
(c25) glucopyranosyl antibiotic: protein synthesis fungicides;
(c26) glucopyranosyl antibiotic: trehalase and inositol biosynthesis fungicides;
(c27) cyanoacetamideoxime fungicides;
(c28) carbamate fungicides;
(c29) oxidative phosphorylation uncoupling fungicides;
(c30) organo tin fungicides;
(c31) carboxylic acid fungicides;
(c32) heteroaromatic fungicides;
(c33) phosphonate fungicides;
(c34) phthalamic acid fungicides;
(c35) benzotriazine fungicides;
(c36) benzene-sulfonamide fungicides;
(c37) pyridazinone fungicides;
(c38) thiophene-carboxamide fungicides;
(c39) pyrimidinamide fungicides;
(c40) carboxylic acid amide (CAA) fungicides;
(c41) tetracycline antibiotic fungicides;
(c42) thiocarbamate fungicides;
(c43) benzamide fungicides;
(c44) host plant defense induction fungicides;
(c45) multi-site contact activity fungicides;
(c46) fungicides other than fungicides of component (a) and components (c1) through (c45); and
salts of compounds of (c1) through (c46).

Embodiment 71. A composition of Embodiment 69 wherein component (c) includes at least one compound selected from acibenzolar-*S*-methyl, aldimorph, ametoctradin, amisulbrom, anilazine, azaconazole, azoxystrobin, benalaxyl, benalaxyl-M, benodanil, benomyl, benthiavalicarb, benthiavalicarb-isopropyl, benzovindiflupyr, bethoxazin, binapacryl, biphenyl, bitertanol, bixafen, blasticidin-S, boscalid, bromuconazole, bupirimate, buthiobate, captafol, captan, carbendazim, carboxin, carpropamid, chloroneb, chlorothalonil, chlozolinate, clotrimazole, copper salts (such as Bordeaux mixture (tribasic copper sulfate), copper hydroxide and copper oxychloride), coumoxystrobin, cyazofamid, cyflufenamid, cymoxanil, cyproconazole, cyprodinil, dichlofluanid, diclocymet, diclomezine, dicloran, diethofencarb, difenoconazole, diflumetorim, dimethirimol, dimethomorph, dimoxystrobin, diniconazole, diniconazole-M, dinocap, dithianon, dodemorph, dodine, econazole, edifenphos, enoxastrobin, epoxiconazole, etaconazole, ethaboxam, ethirimol, etridiazole, famoxadone, fenamidone, fenarimol, fenaminstrobin, fenbuconazole, fenfuram, fenhexamid, fenoxanil, fenpiclonil, fenpropidin, fenpropimorph, fenpyrazamine, fentin acetate, fentin chloride, fentin hydroxide, ferbam, ferimzone, fluazinam, fludioxonil, flufenoxystrobin, flumetover, flumorph, fluopicolide (also known as picobenzamid), fluopyram, fluoroimide, fluoxastrobin, fluquinconazole, flusilazole, flusulfamide, flutianil (2-[[2-fluoro-5-(trifluoromethyl)phenyl]thio]-2-[3-(2-methoxyphenyl)-2-thiazolidinylidene]acetonitrile), flutolanil, flutriafol, fluxapyroxad, folpet, fuberidazole, furalaxyl, furametpyr, guazatine, hexaconazole, hymexazol, imazalil, imibenconazole, iminoctadine, iodocarb, ipconazole, iprobenfos, iprodione, iprovalicarb, isoconazole, isofetamid, isoprothiolane, isopyrazam, isotianil, kasugamycin, kresoxim-methyl, mancozeb, mandestrobin, mandipropamid, maneb, mepanipyrim, mepronil, meptyldinocap, metalaxyl, metalaxyl-M, metconazole, methasulfocarb, metiram, metominostrobin, metrafenone, miconazole, myclobutanil, naftifine, neo-asozin (ferric methanearsonate), nuarimol, octhilinone, ofurace, orysastrobin, oxadixyl, oxathiapiprolin, oxolinic acid, oxpoconazole, oxycarboxin, oxytetracycline, pefurazoate, penconazole, pencycuron, penflufen, penthiopyrad, phosphorous acid and salts thereof (e.g., fosetyl-aluminum), phthalide, picoxystrobin, piperalin, polyoxin, probenazole, prochloraz, procymidone, propamocarb, propamocarb-hydrochloride, propiconazole, propineb, proquinazid, prothiocarb, prothioconazole, pyraclostrobin, pyrametostrobin, pyraoxystrobin, pyrazophos, pyribencarb, pyributicarb, pyrifenox, pyrimethanil, pyriofenone, pyrisoxazole, pyroquilon, pyrrolnitrin, quinconazole, quinomethionate, quinoxyfen, quintozene, sedaxane, silthiofam, simeconazole, spiroxamine, streptomycin,

sulfur, tebuconazole, tebufloquin, tecloftalam, tecnazene, terbinafine, tetraconazole, thiabendazole, thifluzamide, thiophanate, thiophanate-methyl, thiram, tiadinil, tolclofos-methyl, tolnifanide, tolprocarb, tolylfluanid, triadimefon, triadimenol, triarimol, triazoxide, triclopyricarb, tricyclazole, tridemorph, trifloxystrobin, triflumizole, triforine, trimorphamide, triticonazole, uniconazole, validamycin, valifenalate (valiphenal), vinclozolin, zineb, ziram, zoxamide, *N'*-[4-[4-chloro-3-(trifluoromethyl)phenoxy]-2,5-dimethylphenyl]-*N*-ethyl-*N*-methylmethanimidamide, *N*-[2-[4-[[3-(4-chlorophenyl)-2-propyn-1-yl]oxy]-3-methoxyphenyl]ethyl]-3-methyl-2-[(methylsulfonyl)amino]-butanamide, *N*-[2-[4-[[3-(4-chlorophenyl)-2-propyn-1-yl]oxy]-3-methoxy-phenyl]ethyl]-3-methyl-2-[(ethylsulfonyl)amino]butanamide, 2-butoxy-6-iodo-3-propyl-4*H*-1-benzopyran-4-one, 3-[5-(4-chlorophenyl)-2,3-dimethyl-3-isoxazolidinyl]pyridine, 4-fluorophenyl *N*-[1-[[[1-(4-cyanophenyl)ethyl]-sulfonyl]methyl]propyl]carbamate, *N*-[[(cyclopropylmethoxy)amino][6-(difluoromethoxy)-2,3-difluorophenyl]methylene]benzeneacetamide, α-(methoxyimino)-*N*-methyl-2-[[[1-[3-(trifluoromethyl)phenyl]ethoxy]-imino]methyl]benzeneacetamide, pentyl *N*-[4-[[[[(1-methyl-1*H*-tetrazol-5-yl)-phenylmethylene]amino]oxy]methyl]-2-thiazolyl]carbamate, pentyl *N*-[6-[[[[(1-methyl-1*H*-tetrazol-5-yl)phenylmethylene]amino]oxy]methyl]-2-pyridinyl]-carbamate, 2-[(3-bromo-6-quinolinyl)oxy]-*N*-(1,1-dimethyl-2-butyn-1-yl)-2-(methylthio)acetamide, 2-[(3-ethynyl-6-quinolinyl)oxy]-*N*-[1-(hydroxymethyl)-1-methyl-2-propyn-1-yl]-2-(methylthio)acetamide, *N*-(1,1-dimethyl-2-butyn-1-yl)-2-[(3-ethynyl-6-quinolinyl)oxy]-2-(methylthio)acetamide, *N'*-[4-[[3-[(4-chlorophenyl)methyl]-1,2,4-thiadiazol-5-yl]oxy]-2,5-dimethylphenyl]-*N*-ethyl-*N*-methylmethanimidamide, 1-[4-[4-[5-[(2,6-difluorophenoxy)methyl]-4,5-dihydro-3-isoxazolyl]-2-thiazolyl]-1-piperdinyl-2-[5-methyl-3-(trifluoromethyl)-1*H*-pyrazol-1-yl]ethanone, (2-chloro-6-fluorophenyl)methyl 2-[1-[2-[3,5-bis(difluoromethyl)-1*H*-pyrazol-1-yl]acetyl]-4-piperidinyl]-4-thiazole-carboxylate, (1*R*)-1,2,3,4-tetrahydro-1-naphthalenyl 2-[1-[2-[3,5-bis(difluoromethyl)-1*H*-pyrazol-1-yl]acetyl]-4-piperidinyl]-4-thiazolecarboxylate, [[4-methoxy-2-[[[(3*S*,7*R*,8*R*,9*S*)-9-methyl-8-(2-methyl-1-oxopropoxy)-2,6-dioxo-7-(phenylmethyl)-1,5-dioxonan-3-yl]amino]carbonyl]-3-pyridinyl]oxy]methyl 2-methylpropanoate, (3*S*,6*S*,7*R*,8*R*)-3-[[[3-(acetyloxy)-4-methoxy-2-pyridinyl]carbonyl]amino]-6-methyl-4,9-dioxo-8-(phenylmethyl)-1,5-dioxonan-7-yl 2-methylpropanoate, (3*S*,6*S*,7*R*,8*R*)-3-[[[3-[(acetyloxy)methoxy]-4-methoxy-2-pyridinyl]carbonyl]amino]-6-methyl-4,9-dioxo-8-(phenylmethyl)-1,5-dioxonan-7-yl 2-methylpropanoate, (3*S*,6*S*,7*R*,8*R*)-3-[[[4-methoxy-3-[[(2-methylpropoxy)carbonyl]oxy]-2-

pyridinyl]carbonyl]amino]-6-methyl-4,9-dioxo-8-(phenylmethyl)-1,5-dioxonan-7-yl 2-methylpropanoate, *N*-[[3-(1,3-benzodioxol-5-ylmethoxy)-4-methoxy-2-pyridinyl]carbonyl]-*O*-[2,5-dideoxy-3-*O*-(2-methyl-1-oxopropyl)-2-(phenylmethyl)-L-arabinonoyl]-L-serine (1→4')-lactone, 5-fluoro-2-[(4-methylphenyl)methoxy]-4-pyrimidinamine, 5-fluoro-2-[(4-fluorophenyl)methoxy]-4-pyrimidinamine, 5,8-difluoro-*N*-[2-[3-methoxy-4-[[4-(trifluoromethyl)-2-pyridinyl]oxy]phenyl]ethyl]-4-quinazolinamine, pentyl [6-[[[(*Z*)-[(1-methyl-1*H*-tetrazol-5-yl)phenylmethylene]amino]oxy]methyl]-2-pyridinyl]carbamate, 1,1-dimethylethyl *N*-[6-[[[(*Z*)-[(1-methyl-1*H*-tetrazol-5-yl)-phenylmethylene]amino]oxy]methyl]-2-pyridinyl]carbamate, 3-butyn-1-yl *N*-[6-[[[(*Z*)-[(1-methyl-1*H*-tetrazol-5-yl)phenylmethylene]amino]oxy]methyl]-2-pyridinyl]carbamate, *N*-(3',4'-difluoro[1,1'-biphenyl]-2-yl)-3-(trifluoromethyl)-2-pyrazinecarboxamide, *N*-[2-(2,4-dichlorophenyl)-2-methoxy-1-methylethyl]-3-(difluoromethyl)-1-methyl-1*H*-pyrazole-4-carboxamide, 3-(difluoromethyl)-*N*-[4-fluoro-2-(1,1,2,3,3,3-hexafluoropropoxy)phenyl]-1-methyl-1*H*-pyrazole-4-carboxamide, 3-(difluoromethyl)-1-methyl-*N*-[2-(1,1,2,2-tetrafluoroethoxy)-phenyl]-1*H*-pyrazole-4-carboxamide, (α*R*)-2-[(2,5-dimethylphenoxy)methyl]-α-methoxy-*N*-methylbenzeneacetamide, 2,6-dimethyl-1*H*,5*H*-[1,4]dithiino[2,3-c:5,6-c']dipyrrole-1,3,5,7(2*H*,6*H*)-tetrone, 2-[(3-bromo-6-quinolinyl)oxy]-*N*-(1,1-dimethylethyl)butanamide, 2-[(3-bromo-8-methyl-6-quinolinyl)oxy]-*N*-[(1,1-dimethyl-2-propyn-1-yl)-2-(methylthio)acetamide, 2-[2-(1-chlorocyclopropyl)-4-(2,2-dichlorocyclopropyl)-2-hydroxybutyl]-1,2-dihydro-3*H*-1,2,4-triazole-3-thione, 3-(difluoromethyl)-*N*-(2,3-dihydro-1,1,3-trimethyl-1*H*-inden-4-yl)-1-methyl-1*H*-pyrazole-4-carboxamide, *N*-[2-(1*S*,2*R*)-[1,1'-bicyclopropyl]-2-ylphenyl]-3-(difluoromethyl)-1-methyl-1*H*-pyrazole-4-carboxamide, *N*-cyclopropyl-3-(difluoromethyl)-5-fluoro-1-methyl-*N*-[[2-(1-methylethyl)phenyl]methyl]-1*H*-pyrazole-4-carboxamide and α-(1-chlorocyclopropyl)-α-[2-(2,2-dichlorocyclopropyl)ethyl]-1*H*-1,2,4-triazole-1-ethanol.

Embodiment 72. A composition of Embodiment 71 wherein component (c) includes at least one compound selected from azoxystrobin, bixafen, boscalid (nicobifen), bromuconazole, carbendazim, chlorothalonil, cyflufenamid, cyproconazole, difenoconazole, dimoxystrobin, epoxiconazole, etaconazole, famoxadone, fenbuconazole, fenpropidin, fenpropimorph, fluopyram, flusilazole, fluxapyroxad, hexaconazole, ipconazole, isopyrazam, kresoxim-methyl, metconazole, metominostrobin/fenominostrobin, metrafenone, myclobutanil, penconazole, penthiopyrad, picoxystrobin, prochloraz, propiconazole, proquinazid, prothioconazole, pyraclostrobin, pyrametostrobin, pyraoxystrobin,

pyriofenone, quinoxyfen, sedaxane, tebuconazole, trifloxystrobin and triticonazole.

Embodiment 73. A composition of Embodiment 72 wherein component (c) includes at least one compound selected from azoxystrobin, bixafen, boscalid, cyflufenamid, cyproconazole, difenoconazole, epoxiconazole, fluopyram, isopyrazam, kresoxim-methyl, metconazole, metrafenone, myclobutanil, penthiopyrad, picoxystrobin, pyraclostrobin, pyrametostrobin, pyraoxystrobin, pyriofenone, proquinazid, prothioconazole, quinoxyfen, sedaxane, tebuconazole and trifloxystrobin.

Embodiment 74. A composition comprising components (a) and (b) described in the Summary of the Invention or any one of Embodiments 1 through 73 wherein the composition further comprises in component (c) at least one invertebrate pest control compound or agent.

Embodiments of this invention, including Embodiments 1–74 above as well as any other embodiments described herein, can be combined in any manner. In addition, embodiments of this invention, including Embodiments 1–74 above as well as any other embodiments described herein, and any combination thereof, pertain to the methods of the present invention. Furthermore, embodiments of the invention described herein and their combinations pertain to compounds of Formula **1** and intermediates for their preparation, such as compounds of Formulae **14**, **17**, **20** and **22**.

Of note is the composition of any one of the embodiments described herein, including Embodiments 1 through 74, wherein reference to Formula **1** includes salts thereof but not *N*-oxides thereof; therefore the phrase "a compound of Formula **1**" can be replaced by the phrase "a compound of Formula **1** or a salt thereof". In this composition of note, component (a) comprises a compound of Formula **1** or a salt thereof.

Also noteworthy as embodiments are fungicidal compositions of the present invention comprising a composition (e.g., in a fungicidally effective amount) of Embodiments 1 to 74, and at least one additional component selected from the group consisting of surfactants, solid diluents and liquid diluents.

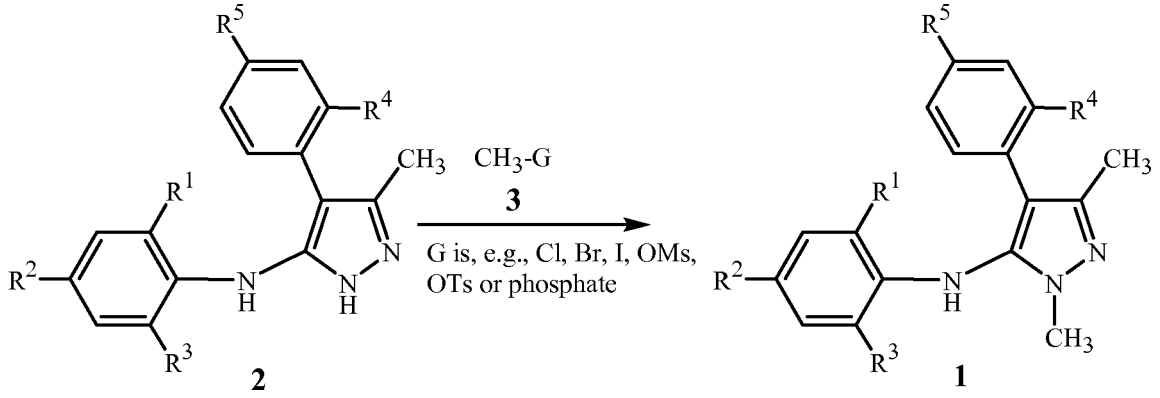
Embodiments of the invention further include methods for controlling plant diseases caused by fungal plant pathogens comprising applying to the plant or portion thereof, or to the plant seed or seedling, a fungicidally effective amount of a composition any one of Embodiments 1 through 74, (e.g., as a composition including formulation ingredients as described herein). Embodiments of the invention also include methods for protecting a plant or plant seed from diseases caused by fungal pathogens comprising applying a fungicidally effective amount of a composition of any one of Embodiments 1 through 74 to the plant or plant seed.

Some embodiments of the invention involve control of a plant disease or protection from a plant disease that primarily afflicts plant foliage and/or applying the composition of the invention to plant foliage (i.e. plants instead of seeds). The preferred methods of use include those involving the above preferred compositions; and the diseases controlled with particular effectiveness include plant diseases caused by fungal plant pathogens. Combinations of fungicides used in accordance with this invention can facilitate disease control and retard resistance development.

As described in the Summary of the Invention, an aspect of the present invention is directed at a composition comprising as component (a) at least one compound selected from Formula **1**, *N*-oxides, and salts thereof. One or more of the following methods and variations as described in Schemes 1–16 can be used to prepare the compounds of Formula **1**. The definitions of R^1, R^2, R^3, R^{32} and M in the compounds of Formulae **1**–**23** below are as defined above in the Summary of the Invention unless otherwise noted. Formulae **6a** and **6b** are various subsets of Formula **6**; Formula **10a** is a subset of Formula **10**; and Formula **17a** is a tautomeric subset of Formula **17**. Substituents for each subset formula are as defined for its parent formula unless otherwise noted.

As shown in Scheme 1, compounds of Formula **1** can be prepared by the reaction of 1*H*-pyrazole compounds of Formula **2** with various methylating agents (e.g., Formula **3**), such as iodomethane, methyl sulfonates (e.g., methyl mesylate (OMs) or tosylate (OTs)) or trimethyl phosphate, preferably in the presence of an organic or inorganic base such as 1,8-diazabicyclo[5.4.0]undec-7-ene, potassium carbonate or potassium hydroxide, and in a solvent such as *N*,*N*-dimethylformamide (DMF), tetrahydrofuran (THF), toluene or water.

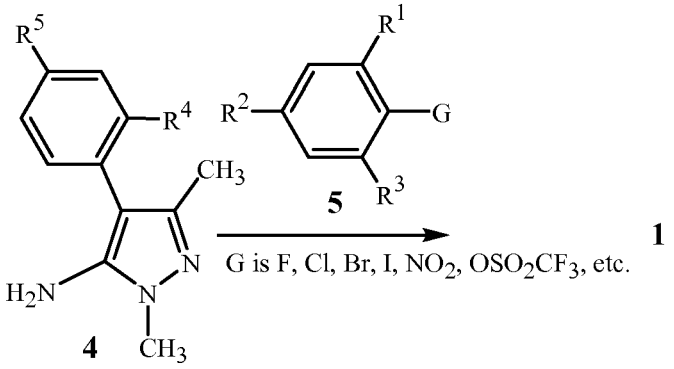
Scheme 1



As is shown in Scheme 2, compounds of Formula **1** can be prepared by the reaction of compounds of Formula **4** with aromatic compounds of Formula **5** containing a leaving group G (e.g., halogen or (halo)alkylsulfonate), optionally in the presence of a metal catalyst, and generally in the presence of a base and a polar aprotic solvent such as *N*,*N*-dimethylformamide or dimethyl sulfoxide. For example, compounds of Formula **5**

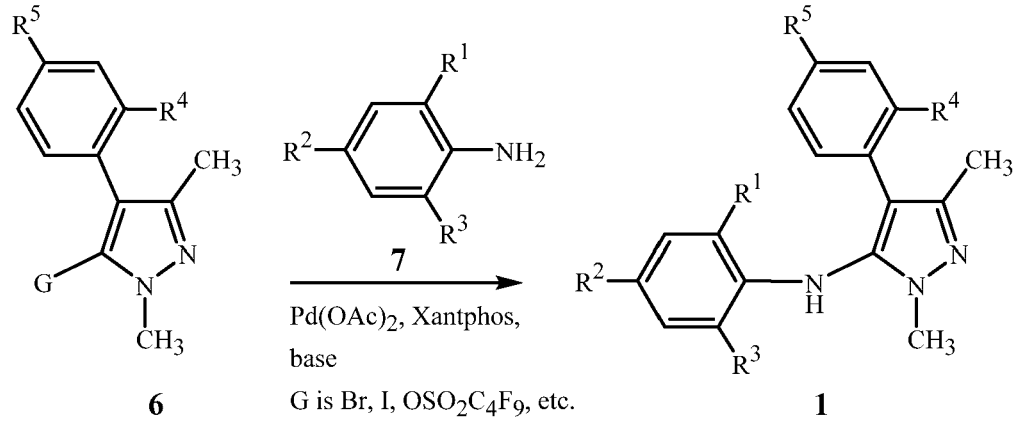
wherein the benzene ring contains electron-withdrawing substituents react by direct displacement of the leaving group G from the ring to provide compounds of Formula **1**. Compounds of Formula **5** are commercially available or their preparation is known in the art.

Scheme 2



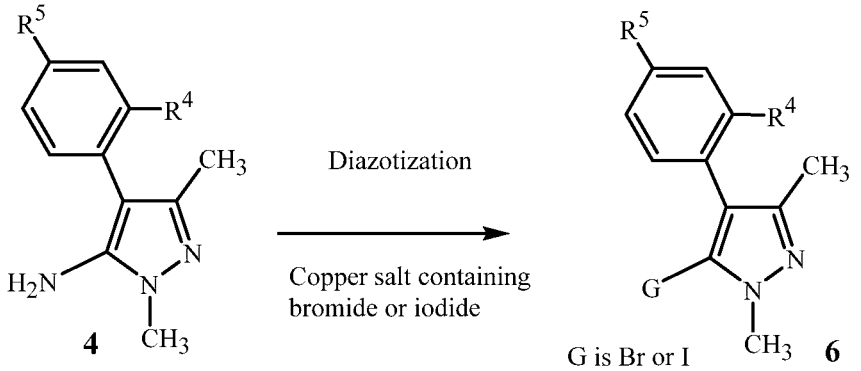
For reactions according to the method of Scheme 2 of a compound of Formula **4** with a compound of Formula **5** wherein the aromatic ring lacks sufficiently electron-withdrawing substituents, or to improve reaction rate, yield or product purity, the use of a metal catalyst (e.g., metal or metal salt) in amounts ranging from catalytic up to superstoichiometric can facilitate the desired reaction. Typically for these conditions, G is Br or I or a sulfonate such as $OS(O)_2CF_3$ or $OS(O)_2(CF_2)_3CF_3$. For example, copper salt complexes (e.g., CuI with *N,N'*-dimethylethylenediamine, proline or bipyridyl), palladium complexes (e.g., tris-(dibenzylideneacetone)dipalladium(0)) or palladium salts (e.g., palladium acetate) with ligands such as 4,5-bis(diphenylphosphino)-9,9-dimethylxanthene (i.e. "Xantphos"), 2-dicyclohexylphosphino-2',4',6'-triisopropylbiphenyl (i.e. "Xphos") or 2,2'-bis(diphenyl-phosphino)-1,1'-binaphthalene (i.e. "BINAP"), in the presence of a base such as potassium carbonate, cesium carbonate, sodium phenoxide or sodium *tert*-butoxide, in a solvent such as *N,N*-dimethylformamide, 1,2-dimethoxyethane, dimethyl sulfoxide, 1,4-dioxane or toluene, optionally mixed with alcohols such as ethanol, can be used. Alternatively as illustrated in Scheme 3, compounds of Formula **1** can be prepared by reaction of compounds of Formula **6** (i.e. 5-bromopyrazoles or other pyrazoles substituted at the 5-position with a leaving group) with compounds of Formula **7** under metal-catalyzed conditions similar to those described above for Scheme 2. Compounds of Formula **7** are commercially available or their preparation is known in the art.

Scheme 3



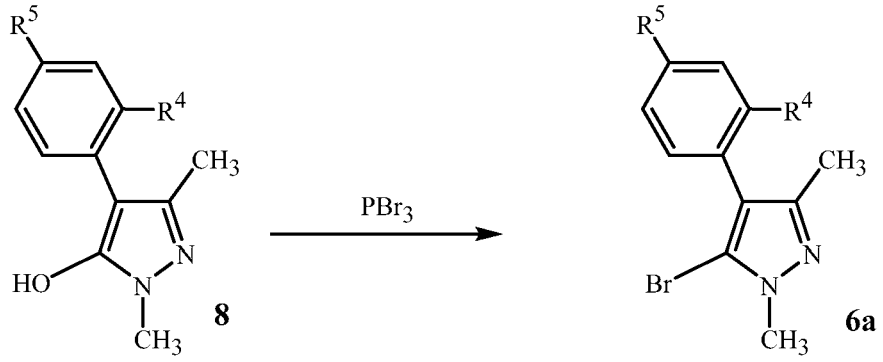
As shown in Scheme 4, compounds of Formula **6** wherein G is Br or I can be prepared by reaction of 5-aminopyrazoles of Formula **4** under diazotization conditions either in the presence of, or followed by combination with, copper salts containing bromide or iodide. For example, addition of *tert*-butyl nitrite to a solution of a 5-aminopyrazole of Formula **4** in the presence of $CuBr_2$ in a solvent such as acetonitrile provides the corresponding 5-bromopyrazole of Formula **6**. Likewise, a 5-aminopyrazole of Formula **4** can be converted to a diazonium salt and then to a corresponding 5-halopyrazole of Formula **6** by treatment with sodium nitrite in solvents such as water, acetic acid or trifluoroacetic acid, in the presence of a mineral acid typically containing the same halide atom (such as aqueous HI solution for G being I), followed by treatment with the corresponding copper(I) or copper(II) salt according to general procedures well known to those skilled in the art.

Scheme 4



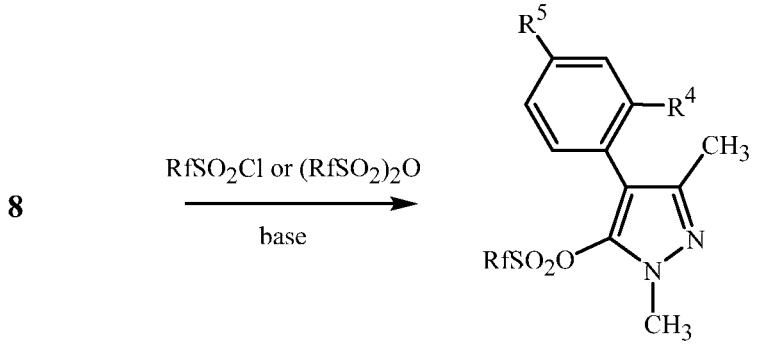
As shown in Scheme 5, 5-bromopyrazoles of Formula **6a** (i.e. Formula **6** wherein G is Br) can be prepared by reacting 5-hydroxypyrazoles of Formula **8** with phosphorus tribromide as described in *Tetrahedron Lett.* **2000**, *41*(24), 4713.

Scheme 5



As shown in Scheme 6, 5-hydroxypyrazoles of Formula **8** can also be used to prepare 5-fluoroalkylsulfonyl (e.g., 5-trifluoromethanesulfonyl, 5-nonafluorobutylsulfonyl) pyrazoles of Formula **6b** (i.e. Formula **6** wherein G is fluoroalkylsulfonyl) as described in *Synlett* **2004**, *5*, 795.

Scheme 6

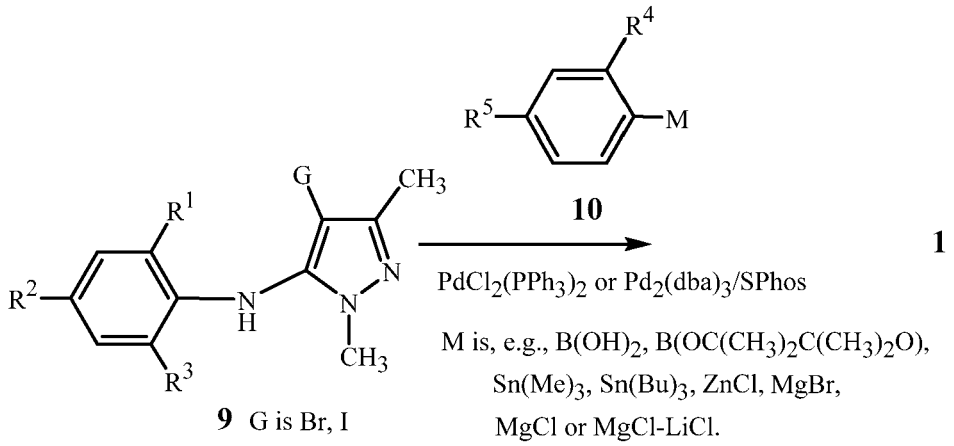


wherein Rf is fluoroalkyl such as CF_3 or $(CF_2)_2CF_3$

As shown in Scheme 7, compounds of Formula **1** can be prepared by reaction of 4-bromo or iodo pyrazoles of Formula **9** with organometallic compounds of Formula **10** under transition-metal-catalyzed cross-coupling reaction conditions. Reaction of a 4-bromo or iodo pyrazole of Formula **9** with a boronic acid, trialkyltin, zinc or organomagnesium reagent of Formula **10** in the presence of a palladium or nickel catalyst having appropriate ligands (e.g., triphenylphosphine (PPh_3), dibenzylideneacetone (dba), dicyclohexyl(2',6'-dimethoxy[1,1'-biphenyl]-2-yl)phosphine (SPhos)) and a base, if needed, affords the corresponding compound of Formula **1**. For example, a substituted aryl boronic acid or derivative e.g., Formula **10** wherein M is $B(OH)_2$, $B(OC(CH_3)_2C(CH_3)_2O)$ or $B(O\text{-}i\text{-}Pr)_3^{\ominus}Li^{\oplus}$, reacts with a 4-bromo- or 4-iodopyrazole of Formula **9** in the presence of dichlorobis(triphenylphosphine) palladium(II) and aqueous base such as sodium carbonate or potassium hydroxide, in solvents such as 1,4-dioxane, 1,2-dimethoxyethane, toluene or ethyl alcohol, or under anhydrous conditions with a ligand such as phosphine oxide or phosphite ligand (e.g., diphenylphosphine oxide) and potassium fluoride in a solvent such as

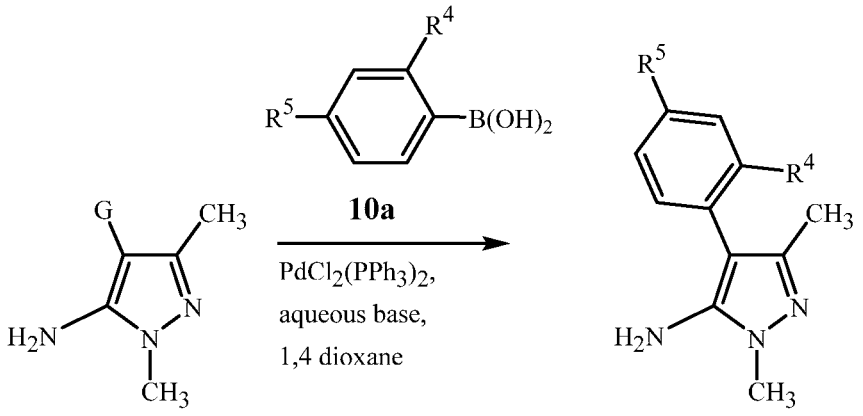
1,4-dioxane (see *Angewandte Chemie, International Edition* **2008**, *47*(25), 4695–4698) to provide the corresponding compound of Formula **1**.

Scheme 7



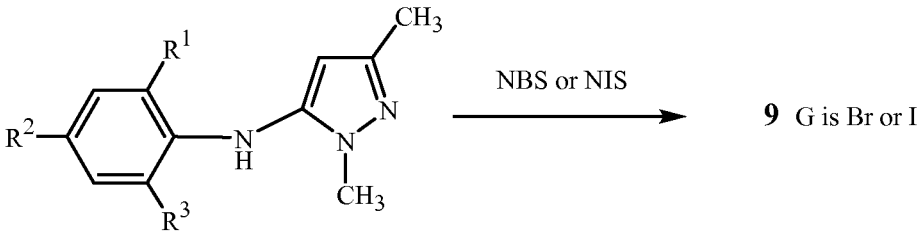
As illustrated in Scheme 8, compounds of Formula **4** can be prepared by reacting compounds of Formula **11** with compounds of Formula **10a** (e.g., compounds of Formula **10** wherein M is $B(OH)_2$) using transition-metal-catalyzed cross-coupling reaction conditions as described for the method of Scheme 7.

Scheme 8



As illustrated in Scheme 9, pyrazoles of Formula **9** wherein G is Br or I are readily prepared by the reaction of pyrazoles unsubstituted at the 4-position (Formula **12**) with halogenating reagents such as bromine, sodium bromite, *N*-bromosuccinimide (NBS) or *N*-iodosuccinimide (NIS), in solvents such as acetic acid, acetonitrile, *N*,*N*-dimethylformamide, *N*,*N*-dimethylacetamide or 1,4-dioxane, or a mixture of water with the aforementioned solvents, at temperatures ranging from ambient to the boiling point of the solvent.

Scheme 9



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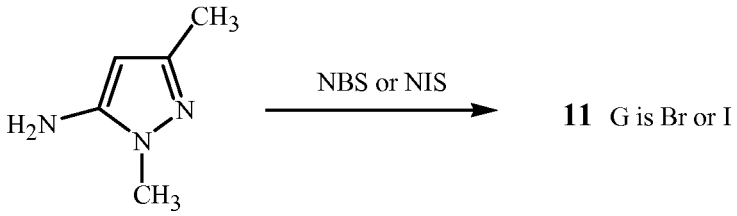
As illustrated in Scheme 10, using reaction conditions similar to those for the method of Scheme 9, the pyrazole of Formula **13** can be converted into intermediates of Formula **11** which are useful for preparing compounds of Formula **4** as depicted in Scheme 8. The compound of Formula **13** not only can be prepared by methods known in the art, but is also commercially available.

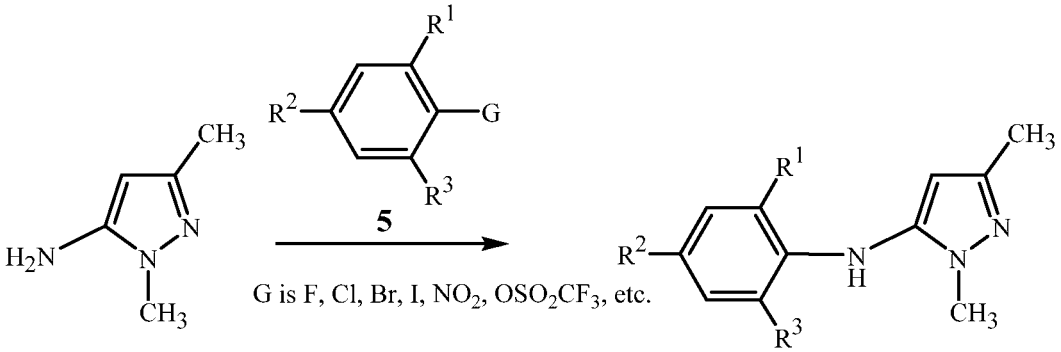
Scheme 10



13

As shown in Scheme 11, compounds of Formula **12** can be prepared from corresponding compounds of Formula **13** by procedures analogous to those used for the method of Scheme 2. Compounds of Formula **13** are commercially available or can be prepared by methods known in the art.

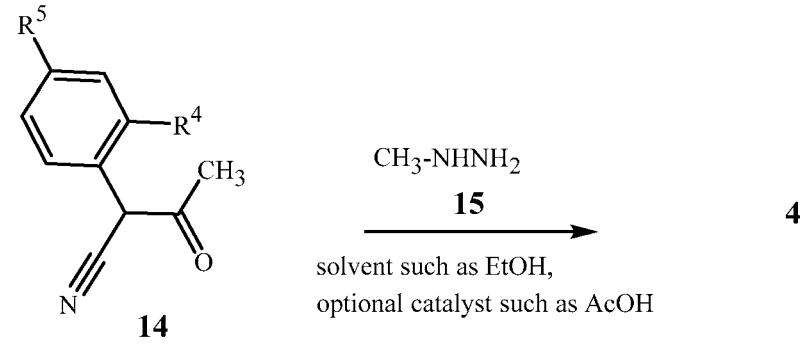
Scheme 11



13 12

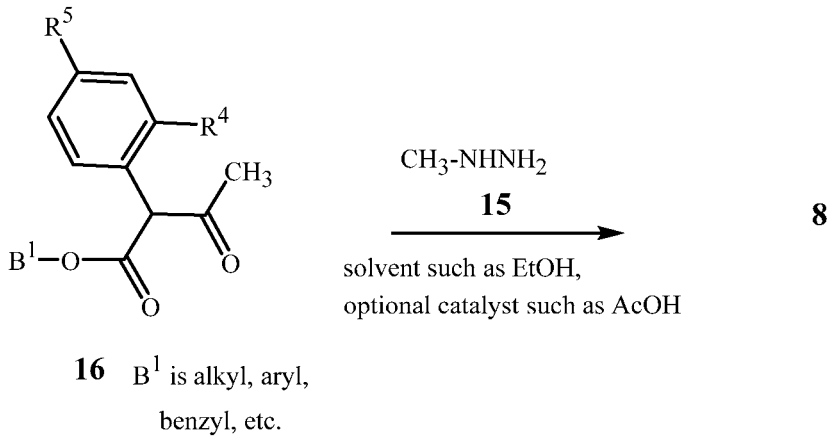
General methods useful for preparing 5-aminopyrazoles of Formula **4** are well known in the art; see, for example, *Journal für Praktische Chemie (Leipzig)* **1911**, *83*, 171 and *J. Am. Chem. Soc.* **1954**, *76*, 501. Such a method is illustrated in Scheme 12.

Scheme 12



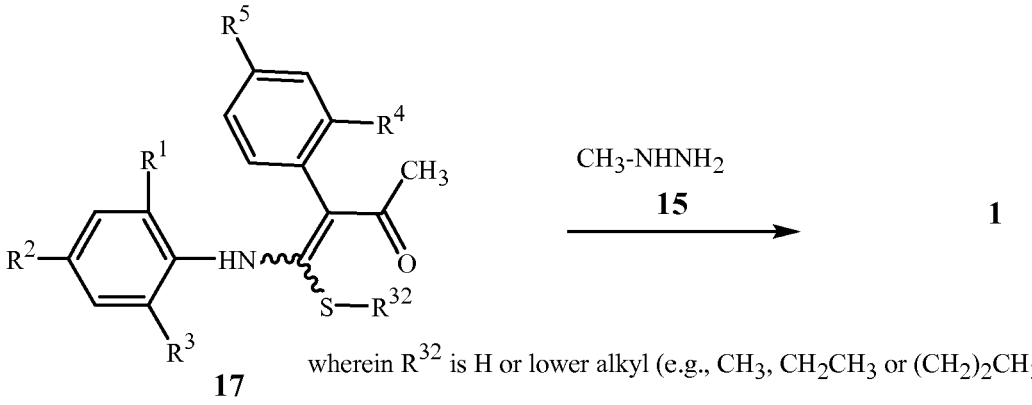
Similarly, general methods useful for preparing 5-hydroxypyrazoles of Formula **8** are well known in the art; see, for example, *Annalen der Chemie* **1924**, *436*, 88. Such a method is illustrated in Scheme 13.

Scheme 13



As shown in Scheme 14, compounds of Formula **1** can be prepared by condensing compounds of Formula **17** with methylhydrazine (Formula **15**) in a solvent such as ethanol or methanol and optionally in the presence of an acid or base catalyst such as acetic acid, piperidine or sodium methoxide, according to general procedures known in the art. The method of Scheme 14 is illustrated by Step C of Synthesis Example 1 and Step B of Synthesis Example 2.

Scheme 14

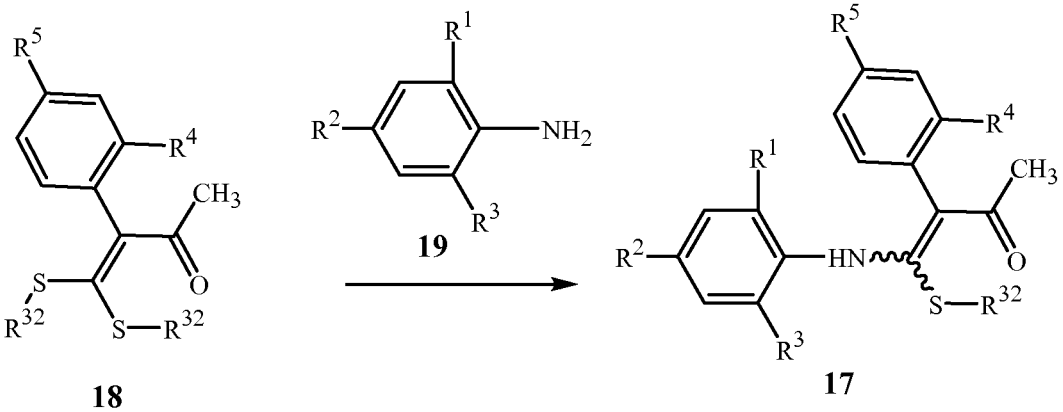


wherein R^{32} is H or lower alkyl (e.g., CH_3, CH_2CH_3 or $(CH_2)_2CH_3$)

In a manner analogous to the method of Scheme 14, compounds of Formula **2** can be similarly prepared by condensing compounds of Formula **17** with hydrazine. This method is described in *Chemistry of Heterocyclic Compounds* **2005**, *41*(1), 105–110.

As shown in Scheme 15, compounds of Formula **17** (wherein, R^{32} is H or lower alkyl such as CH_3, CH_2CH_3 or $(CH_2)_2CH_3$) can be prepared by reaction of corresponding ketene dithioacetal compounds of Formula **18** with compounds of Formula **19** optionally in the presence of a base, such as sodium hydride or ethylmagnesium chloride, in solvents such as toluene, tetrahydrofuran or dimethoxymethane, at temperatures ranging from –10 °C to the boiling point of the solvent. See, for example, *J. Heterocycl. Chem.* **1975**, *12*(1), 139. Methods useful for preparing compounds of Formula **18** are known in the art.

Scheme 15

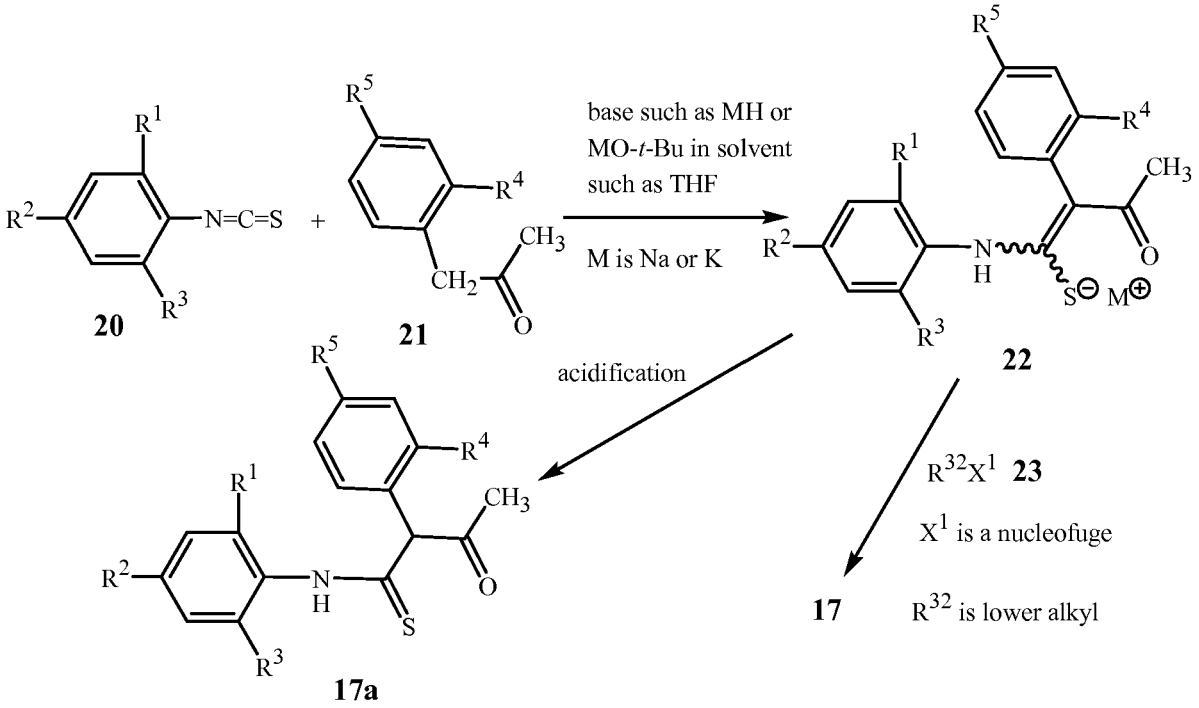


wherein R^{32} is H or lower alkyl (e.g., CH_3, CH_2CH_3 or $(CH_2)_2CH_3$)

As shown in Scheme 16, compounds of Formula **17** wherein R^{32} is lower alkyl (e.g., methyl, ethyl, *n*-propyl) and Formula **17a** (i.e. tautomer of Formula **17** wherein R^{32} is H) can be prepared starting by condensation reaction of corresponding isothiocyanate compounds of Formula **20** with arylacetone compounds of Formula **21** to give intermediate compounds of Formula **22**, which are salts of the thioamides of Formula **17a**. The intermediate compounds of Formula **22** can either be used in situ as is illustrated by Step C of Synthesis Example 1 or

isolated before further conversion as is illustrated by Steps A and B of Synthesis Example 2. Bases useful for preparing compounds of Formula **22** include hydrides, alkoxides, hydroxides or carbonates of sodium or potassium, such as sodium hydride, potassium *tert*-butoxide, sodium ethoxide, potassium hydroxide, sodium hydroxide or potassium carbonate. Amine bases (e.g., triethylamine or *N*,*N*-diisopropylethylamine) can also be used to effect the condensation of the compounds of Formulae **20** and **21**. A variety of solvents are useful, such as tetrahydrofuran, ether, toluene, *N*,*N*-dimethylformamide, alcohols (e.g., ethanol), esters (e.g., ethyl acetate or isopropyl acetate), or mixtures thereof. Solvents are chosen for compatibility with the base selected, as is well-known in the art. Reaction temperatures can range from –78 °C to the boiling point of the solvent. One useful mixture of base and solvent is potassium *tert*-butoxide in tetrahydrofuran, to which at –70 to 0 °C is added a solution of an isothiocyanate of Formula **20** and a carbonyl compound of Formula **21**, which are either combined into one solution, or added separately, preferably by addition of the carbonyl compound followed by addition of the isothiocyanate. The salt compound of Formula **22** can be acidified to form the ketothioamide compound of Formula **17a** or alkylated with $R^{32}X^1$ (Formula **23**) wherein R^{32} is lower alkyl (e.g., methyl, ethyl, *n*-propyl) and X^1 is a nucleofuge (i.e. a nucleophilic reaction leaving group such as Br, I, $OS(O)_2CH_3$) to form the corresponding compound of Formula **17**. This general method is known in the chemical literature; see, for example, *Zhurnal Organicheskoi Khimii* **1982**, *18*(12), 2501. The method of Scheme 16 to prepare a non-isolated intermediate compound of Formula **17** wherein R^{32} is methyl is illustrated by Step C of Synthesis Example 1. The method of Scheme 16 to prepare an isolated intermediate compound of Formula **22** is illustrated by Step A of Synthesis Example 2.

Scheme 16



Ketothioamides of Formula **17a** can also be prepared by allowing the corresponding ketoamides to react with sulfurizing agents such as Lawesson's reagent or P_2S_5; see, for example, *Helv. Chim. Act.* **1998**, *81*(7), 1207.

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 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 sequence, such as the preparation of 1*H* pyrazoles for use in the reaction in Scheme 2 by reactions illustrated later for the general preparation of substituted pyrazoles.

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 sequence 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 synthesis description can utilize the present invention to its fullest extent. The following Synthesis Examples are, therefore, to be construed as merely illustrative, and not limiting of the disclosure in any way whatsoever. Steps in the following Synthesis 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 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 $CDCl_3$ unless otherwise noted; "s" means singlet, "br s" means broad singlet, "d" means doublet, "dd" means doublet of doublets, "t" means triplet, "dt" means doublet of triplets, "m" means multiplet.

SYNTHESIS EXAMPLE 1

Preparation of 4-(2-Bromo-4-fluorophenyl)-*N*-(2-chloro-6-fluorophenyl)-1,3-dimethyl-1*H*-pyrazol-5-amine (Compound 4)

Step A: Preparation of 1-(2-Bromo-4-fluorophenyl)-2-propanone

A solution of sodium methoxide in methanol (25%, 34 mL, 157 mmol) was combined with toluene (200 mL). The methanol was then distilled off at 90 °C using a Dean-Stark trap. After the solution was cooled to 70 °C, 2-bromo-4-fluorobenzeneacetonitrile (21.4 g, 100 mmol) dissolved in ethyl acetate (40 mL) was added from a dropping funnel over 20 min with mechanical stirring. At this point additional toluene (150 mL) was added to facilitate stirring of a voluminous light pink precipitate. The reaction mixture was poured into water, and the organic phase was separated. The aqueous phase was acidified and extracted with ethyl acetate. The ethyl acetate phase was dried and concentrated under reduced pressure to provide the intermediate compound α-acetyl-2-bromo-4-fluorobenzene-acetonitrile as a crude oil.

The crude oil was stirred in sulfuric acid (60%, 170 mL), and the resulting mixture was refluxed for 6.5 h. The reaction mixture was then extracted with hexanes (2 × 100 mL), and the combined hexane extracts were washed with water and brine, dried ($MgSO_4$) and

concentrated under reduced pressure to yield the title compound as a yellow oil (14.7 g), which was used without further purification in Step C.

^{1}H NMR δ 7.33 (m, 1H), 7.18 (m, 1H), 7.01 (m, 1H), 3.85 (s, 2H), 2.23 (s, 3H).

Step B: Preparation of 1-Chloro-3-fluoro-2-isothiocyanatobenzene

To a solution of 2-chloro-6-fluorobenzenamine (5.0 g, 34 mmol) in chlorobenzene (52 mL) was added carbonothioic dichloride (thiophosgene) (5.1 g, 45 mmol) and DMF (0.27 mL). The reaction mixture was refluxed for 2 h and then concentrated to leave the title compound as a brown oil (6.15 g), which was used in Step C without further purification.

^{1}H NMR δ 7.18 (m, 2H), 7.07 (m, 1H).

Step C: Preparation of 4-(2-Bromo-4-fluorophenyl)-*N*-(2-chloro-6-fluorophenyl)-1,3-dimethyl-1*H*-pyrazol-5-amine

To a solution of potassium *tert*-butoxide (0.41 g, 3.3 mmol) in THF (20 mL) at 0 °C was added a solution of 1-(2-bromo-4-fluorophenyl)-2-propanone (i.e. the product of Step A) (0.70 g, 3.0 mmol) in THF (10 mL) over 5 minutes. Stirring was continued for 1 h and then the temperature was reduced to −10 °C. A solution of 1-chloro-3-fluoro-2-isothiocyanatobenzene (i.e. the product of Step B) (0.57 g, 3.0 mmol) in THF (10 mL) was added over 6 minutes, and stirring was continued for 15 minutes to provide a reaction mixture containing the intermediate compound 3-(2-bromo-4-fluorophenyl)-4-[(2-chloro-6-fluorophenyl)amino]-4-mercapto-3-buten-2-one potassium salt (1:1), which is the potassium salt of α-acetyl-2-bromo-*N*-(2-chloro-6-fluorophenyl)-4-fluorobenzeneethanethioamide. Iodomethane (0.54 g, 3.8 mmol) was added, and the cooling bath was removed to provide a reaction mixture containing the intermediate compound 3-(2-bromo-4-fluorophenyl)-4-[(2-chloro-6-fluorophenyl)amino]-4-(methylthio)-3-buten-2-one. After 5 min, water (0.2 mL, 11 mmol), glacial acetic acid (0.53 mL, 9.1 mmol) and methylhydrazine (0.81 mL, 15 mmol) were added in rapid succession, and the reaction mixture was heated to reflux for 6 h. The crude reaction mixture was then concentrated under reduced pressure and purified by MPLC (0 to 100% ethyl acetate in hexanes as eluent) to provide the title product as an off-white solid (0.55 g).

^{1}H NMR δ 7.24 (m, 1H), 7.04 (m, 1H), 6.95 (m, 1H), 6.87 (m, 1H), 6.78 (m, 1H), 6.68 (m, 1H), 5.45 (d, 1H), 3.80 (s, 3H), 2.10 (s, 3H).

EXAMPLE 2

Preparation of 4-(2-Bromo-4-fluorophenyl)-*N*-(2,6-difluorophenyl)-1,3-dimethyl-1*H*-pyrazol-5-amine (Compound 11)

Step A: Preparation of 3-(2-Bromo-4-fluorophenyl)-4-[(2,6-difluorophenyl)amino]-4-mercapto-3-buten-2-one potassium salt (1:1)

To a solution of 1-(2-bromo-4-fluorophenyl)-2-propanone (23.4 g, 101 mmol) in methyl *tert*-butyl ether (300 mL) cooled to 6 °C with aid of an ice bath was added a

tetrahydrofuran solution of potassium *tert*-butoxide (1.0 M, 100 mL, 100 mmol) over 30 min. During the addition of about 90 mL of potassium *tert*-butoxide solution the temperature of the reaction mixture was maintained at 6–8 °C, and then the ice bath was removed during the addition of the remaining potassium *tert*-butoxide solution.

At the completion of the potassium *tert*-butoxide solution addition, the reaction mixture was a light yellow solution at 12 °C. The reaction mixture was stirred for 30 min at 12–16 °C. The reaction mixture was then cooled to 3 °C, and a solution of 1,3-difluoro-2-isothiocyanatobenzene (17.4 g, 102 mmol) in methyl *tert*-butyl ether (50 mL) was added over 20 min while maintaining the temperature of the reaction mixture between 3 and 5 °C. The resulting yellow slurry was then slowly warmed to 12 °C over 90 min. The mixture was diluted with hexanes (100 mL) and cooled to 8 °C, and then the solid product was isolated by filtration. The product was dried in a vacuum oven at 70 °C overnight to provide the title product as a yellow solid (32.3 g).

^{1}H NMR (DMSO-d_6) δ 14.36 (s, 1H), 7.38 (dd, 1H), 7.22 (dd, 1H), 7.17 (m, 1H), 7.06 (dd, 1H), 6.99 (t, 2H), 1.50 (s, 3H).

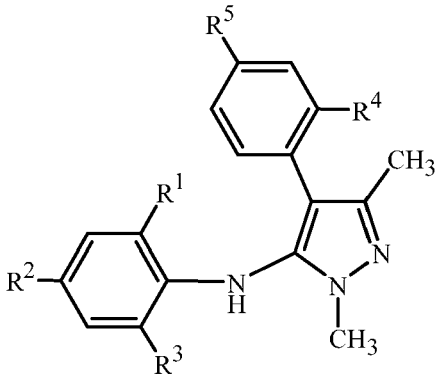
Step B: Preparation of 4-(2-Bromo-4-fluorophenyl)-*N*-(2,6-difluorophenyl)-1,3-dimethyl-1*H*-pyrazol-5-amine

A stirred mixture of 3-(2-bromo-4-fluorophenyl)-4-[(2,6-difluorophenyl)amino]-4-mercapto-3-buten-2-one potassium salt (1:1) (i.e. the product of Step A) (32.3 g, 73.4 mmol), acetic acid (44 g, 73 mmol) and methylhydrazine (109 mmol) in ethanol (200 mL) was heated at 65 °C for 3 h. Then the temperature was increased to 70 °C over 15 min. To the light yellow cloudy reaction mixture was added water (200 mL) over 30 min. The resulting yellow slurry was cooled to 8 °C over 2 h and then held at 8 °C for 30 min more. The solids were collected by filtration, rinsed with aqueous ethanol (1:4 EtOH–H_2O by volume) and dried in a vacuum oven at 70 °C to provide the title product as yellow solid (25 g).

^{1}H NMR δ 7.23 (dd, 1H), 7.06 (dd, 1H), 6.89 (dt, 1H), 6.68 (m, 3H), 5.15 (br s, 1H), 3.81 (s, 3H), 2.11 (s, 3H).

By the procedures described herein together with methods known in the art, the compounds disclosed in Tables 1–16 that follow can be prepared.

TABLE 1



R^4 is F and R^5 is F.

R^1	R^2	R^3	R^1	R^2	R^3
F	H	H	F	H	I
Cl	H	H	F	F	F
Br	H	H	F	F	Cl
I	H	H	F	F	Br
F	F	H	F	Cl	F
Cl	Cl	H	F	Br	F
Br	Br	H	F	Cl	H
F	H	F	F	Br	H
Cl	H	Cl	Cl	F	H
Br	H	Br	Br	F	H
F	H	Cl	Cl	Cl	Cl
F	H	Br			

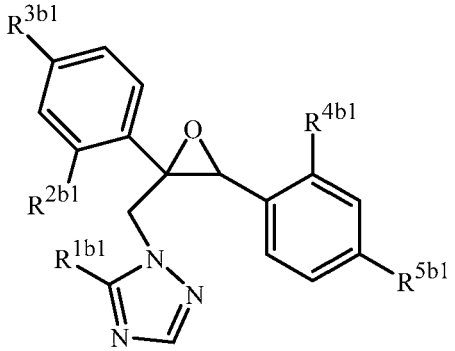
The present disclosure also includes Tables 2 through 16, each of which is constructed the same as Table 1 above, except that the row heading in Table 1 (i.e. "R^4 is F and R^5 is F") is replaced with the respective row heading shown below. For example, in Table 2 the row heading is "R^4 is Cl and R^5 is Cl" and R^1, R^2 and R^3 are as defined in Table 1 above. Thus, the first entry in Table 2 specifically discloses 4-(2,4-dichlorophenyl)-*N*-(2-fluorophenyl)-1,3-dimethyl-1*H*-pyrazol-5-amine. Tables 3 through 16 are constructed similarly.

Table	Row Heading	Table	Row Heading
2	R^4 is Cl and R^5 is Cl.	10	R^4 is F and R^5 is CN.
3	R^4 is Cl and R^5 is F.	11	R^4 is Cl and R^5 is CN.
4	R^4 is Br and R^5 is F.	12	R^4 is Br and R^5 is CN.
5	R^4 is F and R^5 is OMe.	13	R^4 is F and R^5 is OEt.
6	R^4 is Cl and R^5 is OMe.	14	R^4 is Cl and R^5 is OEt.
7	R^4 is Br and R^5 is OMe.	15	R^4 is Br and R^5 is OEt.

Table	Row Heading	Table	Row Heading
8	R^4 is Me and R^5 is F.	16	R^4 is Me and R^5 is OEt.
9	R^4 is Me and R^5 is OMe.		

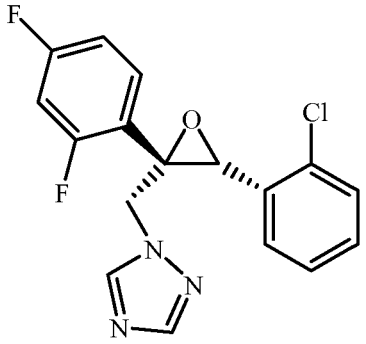
In a composition comprising (a) at least one compound selected from Formula **1**, *N*-oxides, and salts thereof, with (b) at least one fungicidal compound selected from component (b), component (b) is selected from components (b1) through (b14), i.e. Formulae **B1** through **B14**, respectively, including salts thereof.

Component (b1) relates to a compound of Formula **B1**



B1

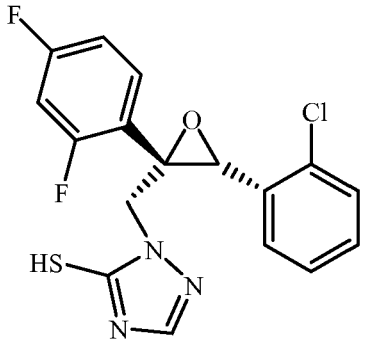
wherein R^{1b1} is H, -SH, -SCN, C_1–C_6 alkylthio, C_1–C_6 alkenylthio, C_1–C_6 alkynylthio or C_4–C_7 cycloalkylalkylthio; and R^{2b1}, R^{3b1}, R^{4b1} and R^{5b1} are each independently H or halogen; provided that (a) at least one of R^{2b1}, R^{3b1}, R^{4b1} and R^{5b1} is other than H and (b) the compound of Formula **B1** is other than 1-[3-(2-chlorophenyl)-2,3-epoxy-2-(4-fluorophenyl)propyl]-1*H*-1,2,4-triazole. Of note as an example of a compound of Formula **B1** wherein R^{1b1} and R^{5b1} are H, R^{2b1} and R^{3b1} are F, and R^{4b1} is Cl is (b1a) *rel*-1-[[(2*R*,3*S*)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-2-oxiranyl]methyl]-1*H*-1,2,4-triazole (Registry Number 1000181-79-2), the 2*R*,3*S* enantiomer of which is depicted as Formula **B1a**



B1a

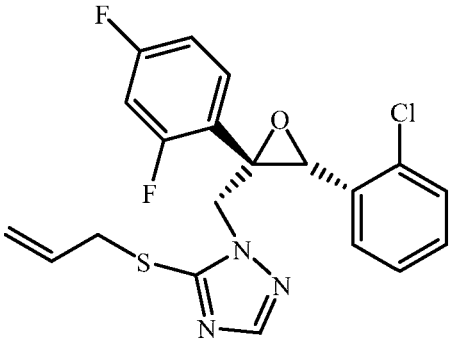
Of note as an example of a compound of Formula **B1** wherein R^{1b1} is -SH, R^{5b1} is H, R^{2b1} and R^{3b1} are F and R^{4b1} is Cl is (b1b) *rel*-2-[[(2*R*,3*S*)-3-(2-chlorophenyl)-2-(2,4-difluoro-

phenyl)-2-oxiranyl]methyl]-1,2-dihydro-3*H*-1,2,4-triazole-3-thione (Registry Number 1161442-71-2), the 2*R*,3*S* enantiomer of which is depicted as Formula **B1b**



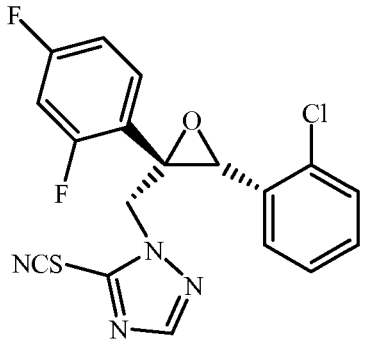
B1b

Of note as an example of a compound of Formula **B1** wherein R^{1b1} is $-SCH_2CH=CH_2$, R^{5b1} is H, R^{2b1} and R^{3b1} are F, and R^{4b1} is Cl is (b1c) *rel*-1-[[(2*R*,3*S*)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-2-oxiranyl]methyl]-5-(2-propen-1-ylthio)-1*H*-1,2,4-triazole (Registry Number 1310803-80-5), the 2*R*,3*S* enantiomer of which is depicted as Formula **B1c**



B1c

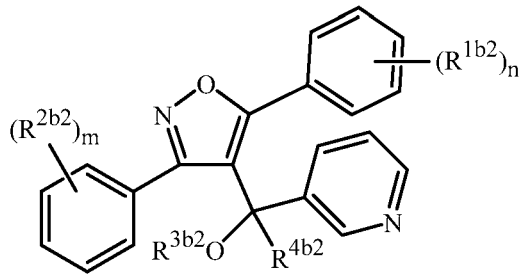
Of note as an example of a compound of Formula **B1d** wherein R^{1b1} is -SCN, R^{5b1} is H, R^{2b1} and R^{3b1} are F and R^{4b1} is Cl is (b1d) *rel*-1-[[(2*R*,3*S*)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-2-oxiranyl]methyl]-1*H*-1,2,4-triazol-5-yl thiocyanate (Registry Number 1161442-71-2), the 2*R*,3*S* enantiomer of which is depicted as Formula **B1d**



B1d

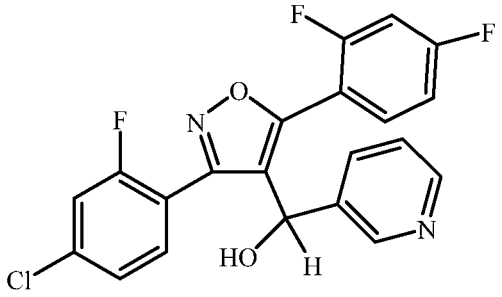
The "*rel*-" descriptor in the systematic chemical names of (b1a), (b1b), (b1c) and (b1d) means that the "2*R*,3*S*" stereochemistry is relative, and thus the chemical names include both the "*2R,3S*" and the "2*S*,3*R*" enantiomers separately or in admixture, including racemic mixture. Methods for preparing compounds of Formula **B1** are described in PCT Patent Publications WO 2007/147778, WO 2011/069912 and WO 2009/077443.

Component (b2) relates to a compound of Formula **B2**



B2

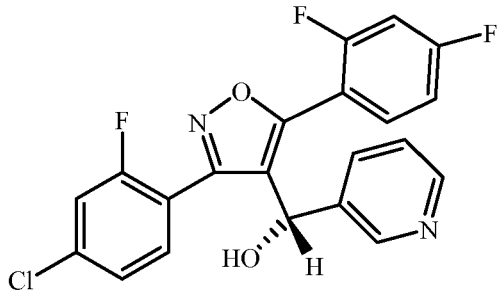
wherein each R^{1b2} and R^{2b2} is independently halogen; R^{3b2} is H, CH_3, CHO or $C(O)CH_3$; R^{4b2} is H; or R^{3b2} and R^{4b2} are taken together as CH_2; and n and m are each independently 1 or 2. Of note as an example of a compound of Formula **B2** wherein $(R^{1b2})_n$ is 2,4-diF, $(R^{2b2})_m$ is 2-F, 4-Cl, and R^{3b2} and R^{4b2} are each H is (b2a) the compound of Formula **B2a**



,

B2a

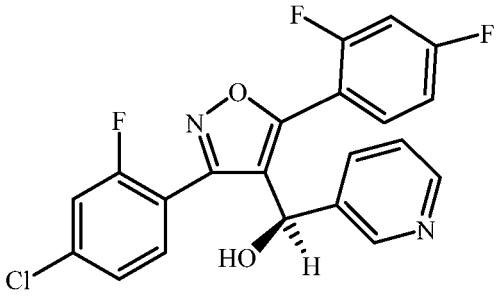
which is α-[3-(4-chloro-2-fluorophenyl)-5-(2,4-difluorophenyl)-4-isoxazolyl]-3-pyridine-methanol (Registry Number 1229605-96-2). Of note as an example of a compound of Formula **B2** wherein $(R^{1b2})_n$ is 2,4-diF, $(R^{2b2})_m$ is 2-F, 4-Cl, and R^{3b2} and R^{4b2} are each H (*S* enantiomer) is (b2b) the compound of Formula **B2b**



,

B2b

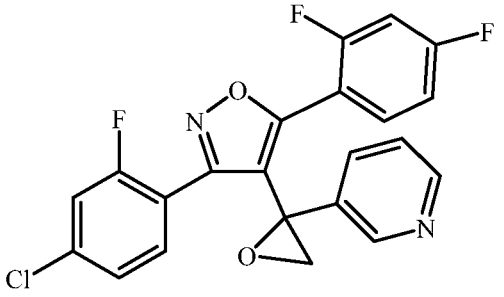
which is (α*S*)-[3-(4-chloro-2-fluorophenyl)-5-(2,4-difluorophenyl)-4-isoxazolyl]-3-pyridine-methanol (Registry Number 1229606-46-5). Of note as an example of a compound of Formula **B2** wherein $(R^{1b2})_n$ is 2,4-diF, $(R^{2b2})_m$ is 2-F, 4-Cl, and R^{3b2} and R^{4b2} are each H (*R* enantiomer) is (b2c) the compound of Formula **B2c**



,

B2c

which is (α*R*)-[3-(4-chloro-2-fluorophenyl)-5-(2,4-difluorophenyl)-4-isoxazolyl]-3-pyridine-methanol (Registry Number 1229606-02-3). Of note as an example of a compound of Formula **B2** wherein $(R^{1b2})_n$ is 2,4-diF, $(R^{2b2})_m$ is 2-F, 4-Cl, and R^{3b2} and R^{4b2} are taken together as CH_2 is (b2d) the compound of Formula **B2d**

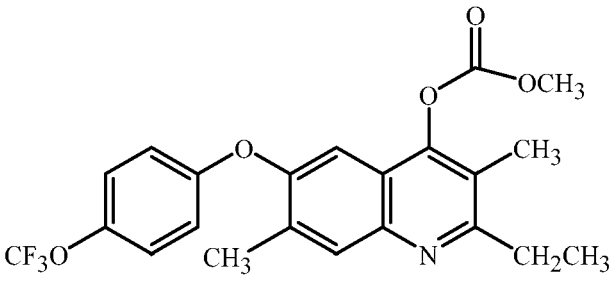


,

B2d

which is 3-[2-[3-(4-chloro-2-fluorophenyl)-5-(2,4-difluorophenyl)-4-isoxazolyl]-2-oxiranyl]-pyridine (Registry Number 1355373-06-6). Methods for preparing compounds of Formula **B2** are described in PCT Patent Publications WO 2010/069882 and WO 2012/010568.

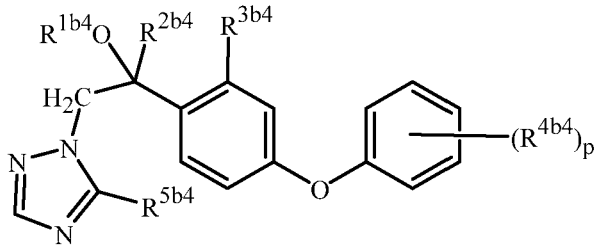
Component (b3) relates to a compound of Formula **B3**



B3

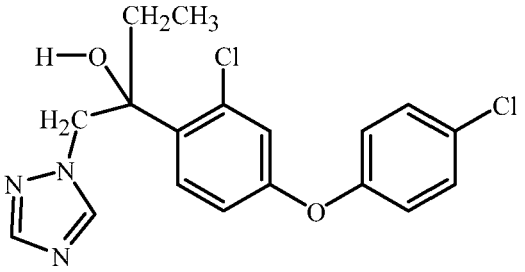
which is 2-ethyl-3,7-dimethyl-6-[4-(trifluoromethoxy)phenoxy]-4-quinolinyl methyl carbonate (flometoquin, Registry Number 875775-74-9). Methods for preparing the compound of Formula **B3** are described in PCT Patent Publication WO 2007/088978 A1 and U.S. Patent Publication 2011/0118468.

Component (b4) relates to a compound of Formula **B4**



B4

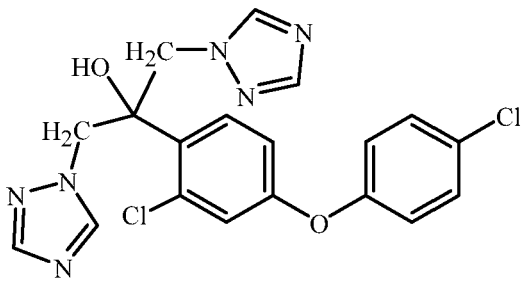
wherein R^{1b4} is H or CH_3; R^{2b4} is C_1–C_4 alkyl; R^{3b4} is H, halogen or CF_3; each R^{4b4} is independently F or Cl; R^{5b4} is H, -SH, -SCN, C_1–C_4 alkylthio or C_2–C_4 alkenylthio; and p is 1 or 2. Methods for preparing compounds of Formula **B4** are described in PCT Patent Publications WO 2013/010862, WO 2013/010885, WO 2013/024081 and WO 2013/007767, and US Patent 4,940,720. Of note as an example of a compound of Formula **B4** wherein R^{1b4} is H, R^{2b4} is CH_2CH_3, R^{3b4} is Cl, p is 1, R^{4b4} in the para position is Cl, and R^{5b4} is H is (b4a) the compound of Formula **B4a**



B4a

which is α-[2-chloro-4-(4-chlorophenoxy)phenyl]-α-ethyl-1*H*-1,2,4-triazole-1-ethanol (Registry Number 1419875-34-5).

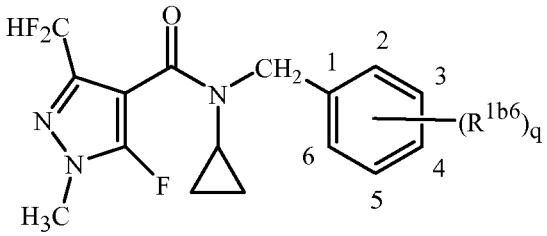
Component (b5) relates to a compound of Formula **B5**



B5

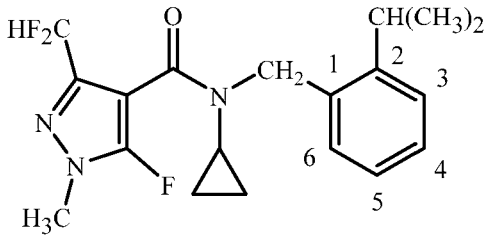
which is α-[2-chloro-4-(4-chlorophenoxy)phenyl]-α-(1*H*-1,2,4-triazol-1-ylmethyl)-1*H*-1,2,4-triazole-1-ethanol (difenodiconazole, Registry Number 930581-38-7). Methods for preparing the compound of Formula **B5** are described in Chinese Patent Publication CN 2006-10140836.

Component (b6) relates to a compound of Formula **B6**



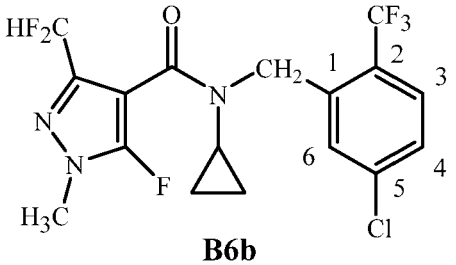
B6

wherein each R^{1b6} is independently halogen, C_1–C_5 alkyl, C_1–C_5 haloalkyl, C_3–C_6 cycloalkyl or C_1–C_5 alkoxy; and q is 1, 2 or 3. Methods for preparing a compound of Formula **B6** are described in PCT Patent Publication WO 2010/130767 A2. Of note as an example of a compound of Formula **B6** wherein q is 1, and R^{1b6} is methylethyl in the 2-position, is (b6a) *N*-cyclopropyl-3-(difluoromethyl)-5-fluoro-1-methyl-*N*-[[(2-(1-methylethyl)phenyl]methyl]-1*H*-pyrazole-4-carboxamide (Registry Number 1255733-83-5), which is depicted as Formula **B6a**



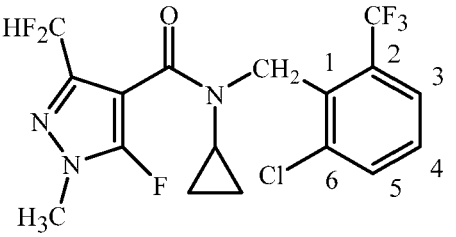
B6a

Of note as an example of a compound of Formula **B6** wherein q is 2, one R^{1b6} is trifluoromethyl in the 2-position, and the other R^{1b6} is chloro in the 5-position, is (b6b) *N*-[[5-chloro-2-(trifluoromethyl)phenyl]methyl]-*N*-cyclopropyl-3-(difluoromethyl)-5-fluoro-1-methyl-1*H*-pyrazole-4-carboxamide (Registry Number 1255733-73-3), which is depicted as Formula **B6b**



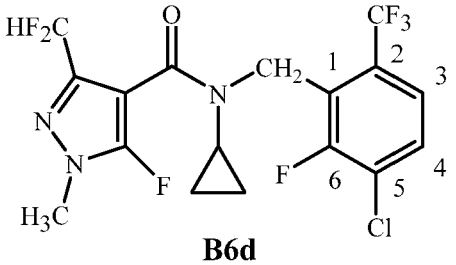
B6b

Of note as an example of a compound of Formula **B6** wherein q is 2, one R^{1b6} is trifluoromethyl in the 2-position, and the other R^{1b6} is chloro in the 6-position, is (b6c) *N*-[[2-chloro-6-(trifluoromethyl)phenyl]methyl]-*N*-cyclopropyl-3-(difluoromethyl)-5-fluoro-1-methyl-1*H*-pyrazole-4-carboxamide (Registry Number 1255733-75-5), which is depicted as Formula **B6c**



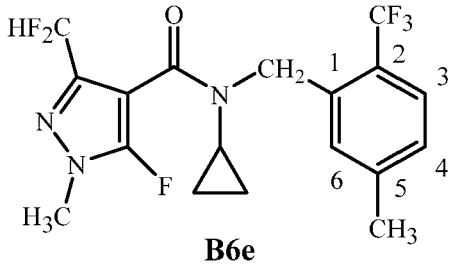
B6c

Of note as an example of a compound of Formula **B6** wherein q is 3, one R^{1b6} is trifluoromethyl in the 2-position, another R^{1b6} is chloro in the 5-position and the remaining R^{1b6} is fluoro in the 6-position, is (b6d) *N*-[[3-chloro-2-fluoro-6-(trifluoromethyl)-phenyl]methyl]-*N*-cyclopropyl-3-(difluoromethyl)-5-fluoro-1-methyl-1*H*-pyrazole-4-carboxamide (Registry Number 1255733-81-3), which is depicted as Formula **B6d**



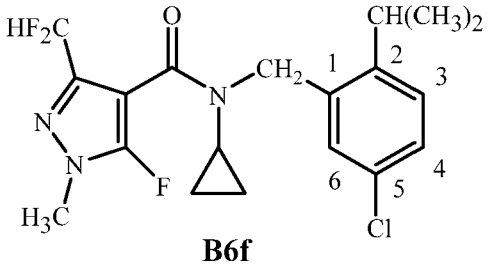
B6d

Of note as an example of a compound of Formula **B6** wherein q is 2, one R^{1b6} is trifluoromethyl in the 2-position and the other R^{1b6} is methyl in the 5-position, is (b6e) *N*-cyclopropyl-3-(difluoromethyl)-5-fluoro-1-methyl-*N*-[[5-methyl-2-(trifluoromethyl)-phenyl]methyl]-1*H*-pyrazole-4-carboxamide (Registry Number 1255733-95-9), which is depicted as Formula **B6e**



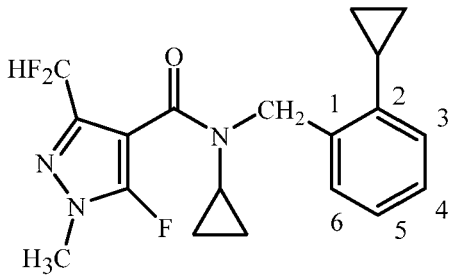
B6e

Of note as an example of a compound of Formula **B6** wherein q is 2, one R^{1b6} is methylethyl in the 2-position and the other R^{1b6} is chloro in the 5-position, is (b6f) *N*-[[5-chloro-2-(1-methylethyl)phenyl]methyl]-*N*-cyclopropyl-3-(difluoromethyl)-5-fluoro-1-methyl-1*H*-pyrazole-4-carboxamide (Registry Number 1255734-28-1), which is depicted as Formula **B6f**



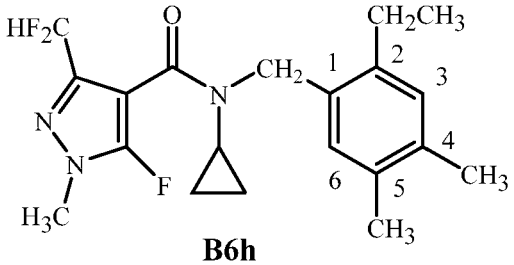
B6f

Of note as an example of a compound of Formula **B6** wherein q is 1, and R^{1b6} is cyclopropyl in the 2-position is (b6g) *N*-cyclopropyl-*N*-[(2-cyclopropylphenyl)methyl]-3-(difluoromethyl)-5-fluoro-1-methyl-1*H*-pyrazole-4-carboxamide (Registry Number 1255734-62-3), which is depicted as Formula **B6g**



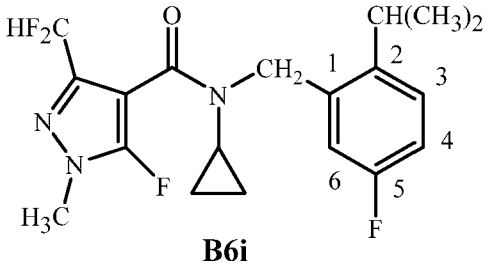
B6g

Of note as an example of a compound of Formula **B6** wherein q is 3, one R^{1b6} is ethyl in the 2-position, another R^{1b6} is methyl in the 4-position and the remaining R^{1b6} is methyl in the 6-position, is (b6h) *N*-cyclopropyl-3-(difluoromethyl)-*N*-[(2-ethyl-4,5-dimethylphenyl)-methyl]-5-fluoro-1-methyl-1*H*-pyrazole-4-carboxamide (Registry Number 1255734-74-7), which is depicted as Formula **B6h**



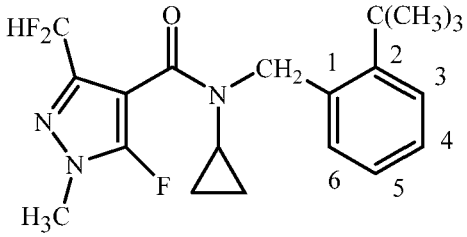
B6h

Of note as an example of a compound of Formula **B6** wherein q is 2, one R^{1b6} is methylethyl in the 2-position, and the other R^{1b6} is fluoro the 5-position, is (b6i) *N*-cyclopropyl-3-(difluoromethyl)-5-fluoro-*N*-[[5-fluoro-2-(1-methylethyl)phenyl]methyl-1-methyl-1*H*-pyrazole-4-carboxamide (Registry Number 1255947-20-6), which is depicted as Formula **B6i**



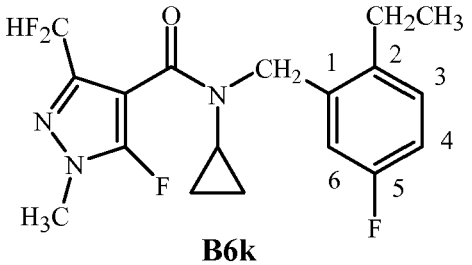
B6i

Of note as an example of a compound of Formula **B6** wherein q is 1, and R^{1b6} is a 1,1-dimethylethyl in the 2-position, is (b6j) *N*-cyclopropyl-3-(difluoromethyl)-*N*-[[2-(1,1-dimethylethyl)phenyl]methyl]-5-fluoro-1-methyl-1*H*-pyrazole-4-carboxamide (Registry Number 1255946-61-2), which is depicted as Formula **B6j**



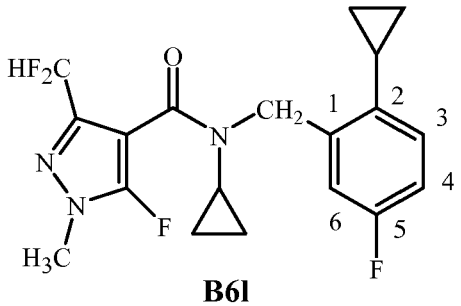
B6j

Of note as an example of a compound of Formula **B6** wherein q is 2, one R^{1b6} is ethyl in the 2-position, and the other R^{1b6} is fluoro in the 5-position, is (b6k) *N*-cyclopropyl-3-(difluoromethyl)-*N*-[(2-ethyl-5-fluorophenyl)methyl]-5-fluoro-1-methyl-1*H*-pyrazole-4-carboxamide (Registry Number 1255946-99-6), which is depicted as Formula **B6k**



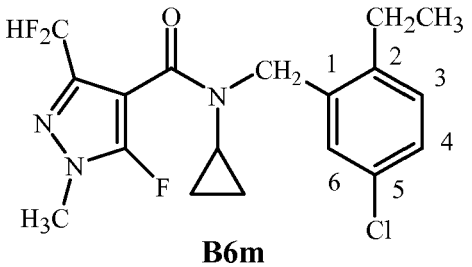
B6k

Of note as an example of a compound of Formula **B6** wherein q is 2, one R^{1b6} is cyclopropyl in the 2-position, and the other R^{1b6} is fluoro in the 5-position, is (b6l) *N*-cyclopropyl-*N*-[(2-cyclopropyl-5-fluorophenyl)methyl]-3-(difluoromethyl)-5-fluoro-1-methyl-1*H*-pyrazole-4-carboxamide (Registry Number 1255947-08-0), which is depicted as Formula **B6l**



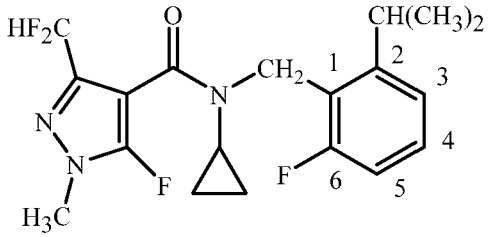
B6l

Of note as an example of a compound of Formula **B6** wherein q is 2, one R^{1b6} is ethyl in the 2-position, and the other R^{1b6} is chloro in the 5-position, is (b6m) *N*-[(5-chloro-2-ethylphenyl)methyl]-*N*-cyclopropyl-3-(difluoromethyl)-5-fluoro-1-methyl-1*H*-pyrazole-4-carboxamide (Registry Number 1255947-10-4), which is depicted as Formula **B6m**



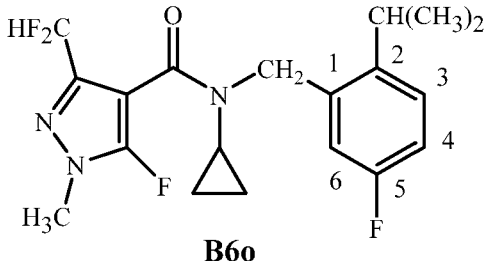
B6m

Of note as an example of a compound of Formula **B6** wherein q is 2, one R^{1b6} is a methylethyl in the 2-position, and the other R^{1b6} is fluoro in the 6-position, is (b6n) *N*-cyclopropyl-3-(difluoromethyl)-5-fluoro-*N*-[[2-fluoro-6-(1-methylethyl)phenyl]methyl]-1-methyl-1*H*-pyrazole-4-carboxamide (Registry Number 1255947-19-3), which is depicted as Formula **B6n**



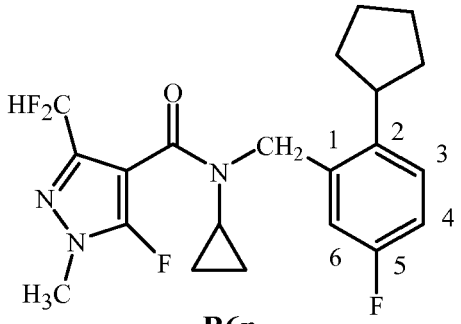
B6n

Of note as an example of a compound of Formula **B6** wherein q is 2, one R^{1b6} is methylethyl in the 2-position, and the other R^{1b6} is fluoro in the 5-position, is (b6o) *N*-cyclopropyl-3-(difluoromethyl)-5-fluoro-*N*-[[5-fluoro-2-(1-methylethyl)phenyl]methyl]-1-methyl-1*H*-pyrazole-4-carboxamide (Registry Number 1255947-20-6), which is depicted as Formula **B6o**



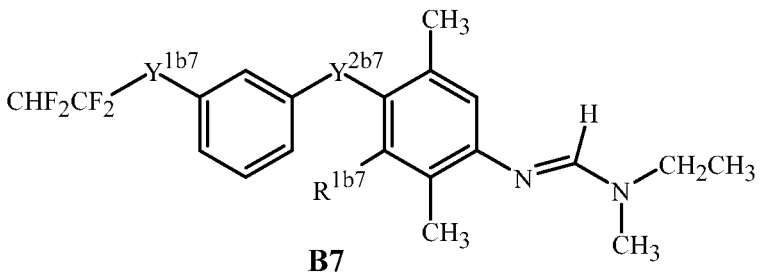
B6o

Of note as an example of a compound of Formula **B6** wherein q is 2, one R^{1b6} is cyclopentyl in the 2-position, and the other R^{1b6} is fluoro in the 5-position, is (b6p) *N*-[(2-cyclopentyl-5-fluorophenyl)methyl]-*N*-cyclopropyl-3-(difluoromethyl)-5-fluoro-1-methyl-1*H*-pyrazole-4-carboxamide (Registry Number 1255947-23-9), which is depicted as Formula **B6p**



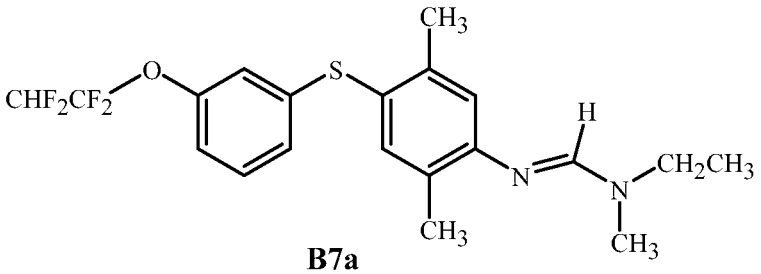
B6p

Component (b7) relates to a compound of Formula **B7**



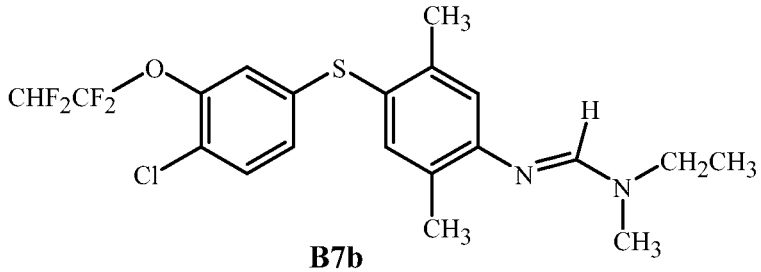
B7

wherein R^{1b7} is H, F or Cl; and Y^{1b7} and Y^{2b7} are independently O or S. Methods for preparing a compound of Formula **B7** are described in PCT Patent Publication WO 2012/025450. Of note as an example of a compound of Formula **B7** wherein R^{1b7} is H, Y^{1b7} is O, and Y^{2b7} is S is (b7a) *N*'-[2,5-dimethyl-4-[[3-(1,1,2,2-tetrafluoroethoxy)-phenyl]thio]phenyl]-*N*-ethyl-*N*-methylmethanimidamide (Registry Number 1361044-71-4), which is depicted as Formula **B7a**



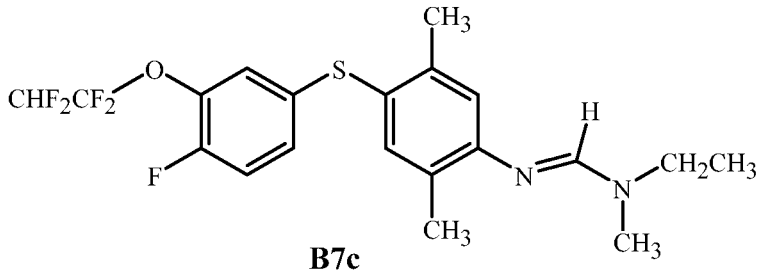
B7a

Of note as an example of a compound of Formula **B7** wherein R^{1b7} is Cl, Y^{1b7} is O, and Y^{2b7} is S is (b7b) *N*'-[4-[[4-chloro-3-(1,1,2,2-tetrafluoroethoxy)phenyl]thio]-2,5-dimethylphenyl]-*N*-ethyl-*N*-methylmethanimidamide (Registry Number 1361045-04-6), which is depicted as Formula **B7b**



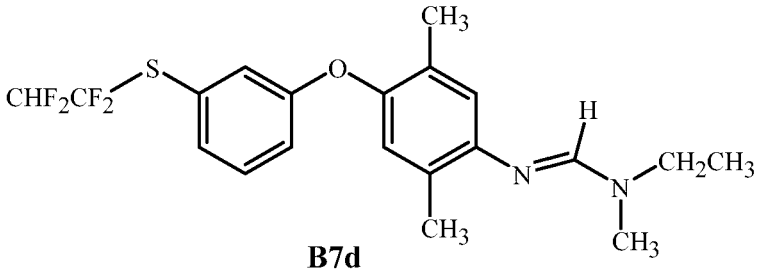
B7b

Of note as an example of a compound of Formula **B7** wherein R^{1b7} is F, Y^{1b7} is O, and Y^{2b7} is S is (b7c) *N*-ethyl-*N*'-[4-[[4-fluoro-3-(1,1,2,2-tetrafluoroethoxy)phenyl]thio]-2,5-dimethylphenyl]-*N*-methylmethanimidamide (Registry Number 1361045-14-8), which is depicted as Formula **B7c**



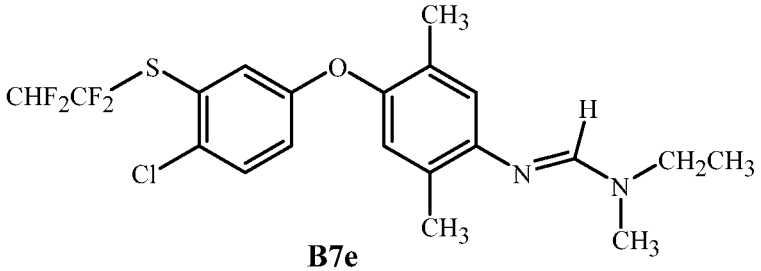
B7c

Of note as an example of a compound of Formula **B7** wherein R^{1b7} is H, Y^{1b7} is S, and Y^{2b7} is O is (b7d) *N*'-[2,5-dimethyl-4-[3-[(1,1,2,2-tetrafluoroethyl)thio]phenoxy]phenyl]-*N*-ethyl-*N*-methylmethanimidamide (Registry Number 1454910-74-7), which is depicted as Formula **B7d**



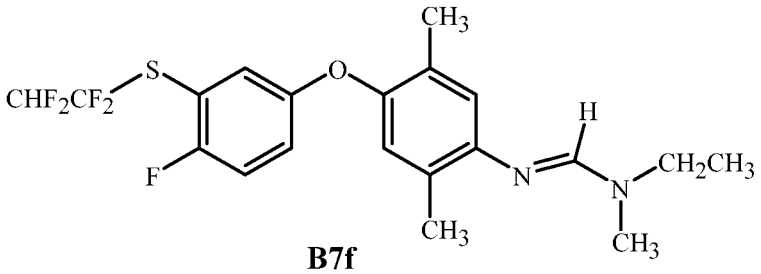
B7d

Of note as an example of a compound of Formula **B7** wherein R^{1b7} is Cl, Y^{1b7} is S, and Y^{2b7} is O is (b7e) *N*'-[2,5-dimethyl-4-[4-chloro-3-[(1,1,2,2-tetrafluoroethyl)thio]phenoxy]-phenyl]-*N*-ethyl-*N*-methylmethanimidamide, which is depicted as Formula **B7e**



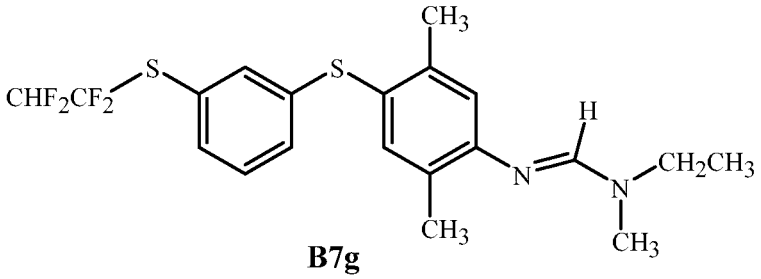
B7e

Of note as an example of a compound of Formula **B7** wherein R^{1b7} is F, Y^{1b7} is S, and Y^{2b7} is O is (b7f) *N*'-[2,5-dimethyl-4-[4-fluoro-3-[(1,1,2,2-tetrafluoroethyl)thio]phenoxy]phenyl]-*N*-ethyl-*N*-methylmethanimidamide, which is depicted as Formula **B7f**



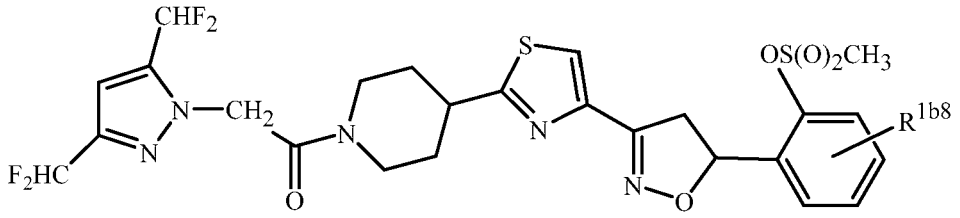
B7f

Of note as an example of a compound of Formula **B7** wherein R^{1b7} is H, Y^{1b7} is S, and Y^{2b7} is S is (b7g) *N*'-[2,5-dimethyl-4-[[3-[(1,1,2,2-tetrafluoroethyl)thio]phenyl]thio]phenyl]-*N*-ethyl-*N*-methylmethanimidamide (Registry Number 1361046-18-5), which is depicted as Formula **B7g**



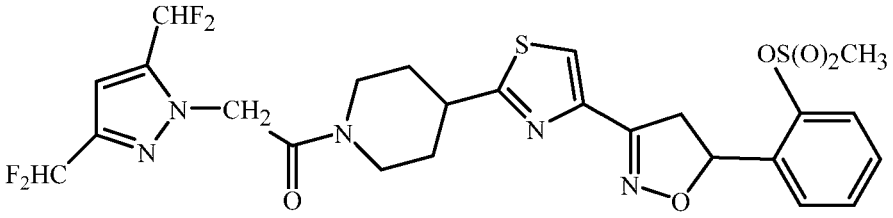
B7g

Component (b8) relates to a compound of Formula **B8**



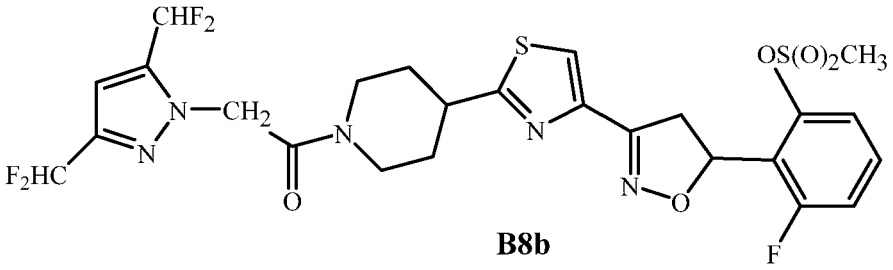
B8

wherein R^{1b8} is H, F, Cl or CH_3. Methods for preparing a compound of Formula **B8** are described in PCT Patent Publication WO 2012/025557 A1. Of note as an example of a compound of Formula **B8** wherein R^{1b8} is H is (b8a) 2-[3,5-bis(difluoromethyl)-1*H*-pyrazol-1-yl]-1-[4-[4-[4,5-dihydro-5-[2-[(methylsulfonyl)oxy]phenyl]-3-isoxazolyl]-2-thiazolyl]-1-piperidinyl]ethanone (Registry Number 1360819-33-5), which is depicted as Formula **B8a**



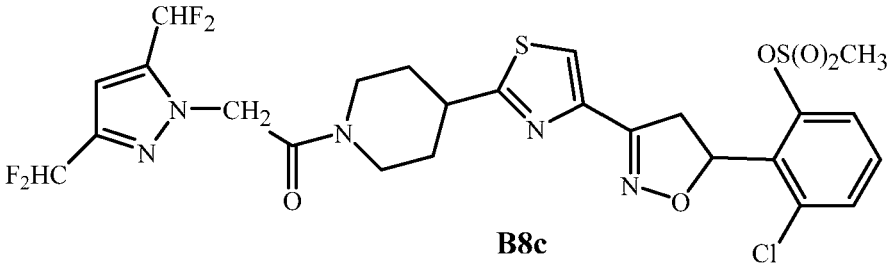
B8a

Of note as an example of a compound of Formula **B8** wherein R^{1b8} is F and at the 2-position is (b8b) 2-[3,5-bis(difluoromethyl)-1*H*-pyrazol-1-yl]-1-[4-[4-[5-[2-fluoro-6-[(methylsulfonyl)oxy]phenyl]-4,5-dihydro-3-isoxazolyl]-2-thiazolyl]-1-piperidinyl]ethanone, which is depicted as Formula **B8b**



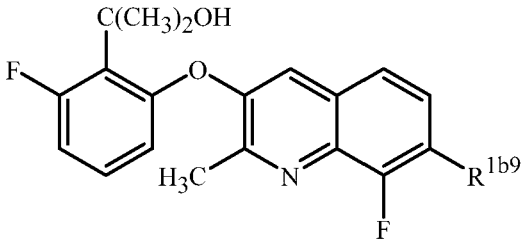
B8b

Of note as an example of a compound of Formula **B8** wherein R^{1b8} is Cl and at the 2-position is (b8c) 2-[3,5-bis(difluoromethyl)-1*H*-pyrazol-1-yl]-1-[4-[4-[5-[2-chloro-6-[(methylsulfonyl)oxy]phenyl]-4,5-dihydro-3-isoxazolyl]-2-thiazolyl]-1-piperidinyl]-ethanone (Registry Number 1360819-11-9), which is depicted as Formula **B8c**



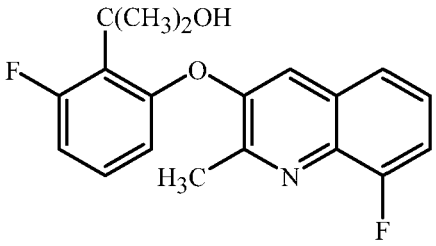
B8c

Component (b8) relates to a compound of Formula **B9**



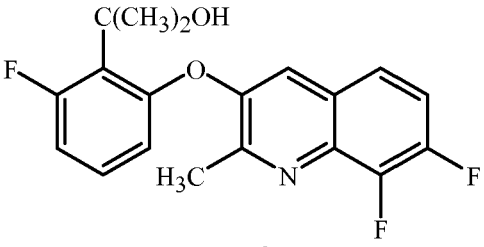
B9

wherein R^{1b9} is H or F. Methods for preparing a compound of Formula **B9** are described in PCT Patent Publication WO 2011/081174 A1. Of note as an example of a compound of Formula **B9** wherein R^{1b9} is H is (b9a) 2-fluoro-6-[(8-fluoro-2-methyl-3-quinolinyl)oxy]-α,α-dimethylbenzenemethanol (Registry Number 1314007-39-0), which is depicted as Formula **B9a**



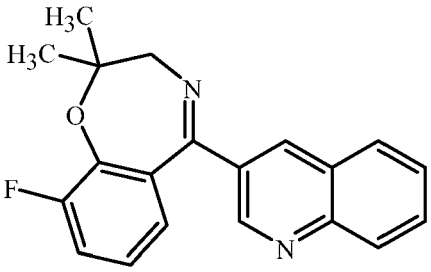
B9a

Of note as an example of a compound of Formula **B9** wherein R^{1b9} is F is (b9b) 2-[(7,8-difluoro-2-methyl-3-quinolinyl)oxy]-6-fluoro-α,α-dimethylbenzenemethanol (Registry Number 1314008-27-9), which is depicted as Formula **B9b**



B9b

Component (b10) relates to a compound of Formula **B10**



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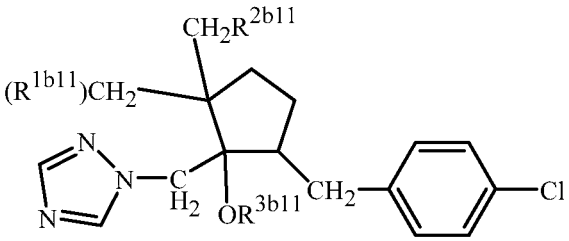
B10

which is 9-fluoro-2,3-dihydro-2,2-dimethyl-5-(3-quinolinyl)-1,4-benzoxazepine (Registry Number 1207749-50-5). Methods for preparing the compound of Formula **B10** are described in PCT Patent Publication WO 2010/018686 A1.

Component (b11) relates to a compound of Formula **B11**



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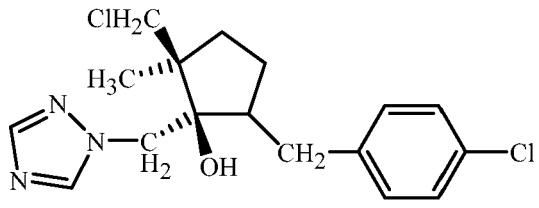
B11

wherein R^{1b11} is H or -OH; R^{2b11} is Cl or -OH; and R^{3b11} is H; or R^{2b11} and R^{3b11} are taken together as a single bond. Methods for preparing a compound of Formula **B11** are described in PCT Patent Publications WO 2011/070771 A1 and WO 2013/069615 A1. Of note as an example of a compound of Formula **B11** wherein R^{1b11} is H; R^{2b11} is Cl; R^{3b11} is H; and CH_2R^{2b11} and OR^{3b11} have relative cis orientation is (b11a) (1*R*,2*S*,5*S*)-*rel*-2-(chloromethyl)-5-[(4-chlorophenyl)methyl]-2-methyl-1-(1*H*-1,2,4-triazol-1-ylmethyl)-cyclopentanol (Registry Number 1311402-14-8), which is depicted as Formula **B11a**



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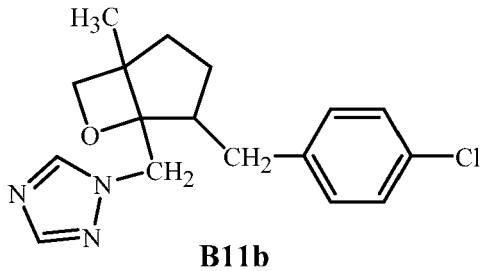
(relative stereochemistry)

B11a

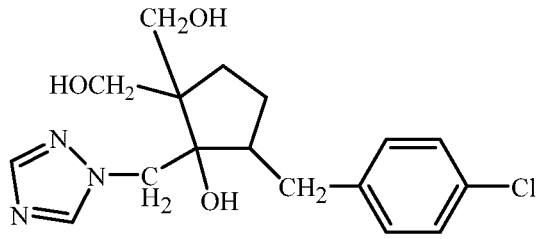
Of note as an example of a compound of Formula **B11** wherein R^{1b11} is H; and R^{2b11} and R^{3b11} are taken together as a single bond is (b11b) 1-[[4-[(4-chlorophenyl)methyl]-

1-methyl-6-oxabicyclo[3.2.0]hept-5-yl]methyl]-1*H*-1,2,4-triazole (Registry Number 1434827-96-9), which is depicted as Formula **B11b**



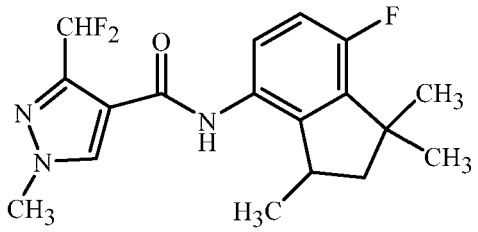
B11b

Of note as an example of a compound of Formula **B11** wherein R^{1b11} is -OH; R^{2b11} is -OH; and R^{3b11} is H is (b11c) 3-[(4-chlorophenyl)methyl]-2-hydroxy-2-(1*H*-1,2,4-triazol-1-ylmethyl)-1,1-cyclopentanedimethanol (Registry Number 1434828-09-7), which is depicted as Formula **B11c**



B11c

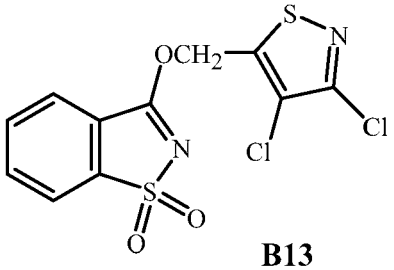
Component (b12) relates to a compound of Formula **B12**



B12

which is 3-(difluoromethyl)-*N*-(7-fluoro-2,3-dihydro-1,1,3-trimethyl-1*H*-inden-4-yl)-1-methyl-1*H*-pyrazole-4-carboxamide (Registry Number 1383809-87-7). Methods for preparing the compound of Formula **B12** are described in PCT Patent Publication WO 2012/084812 A1.

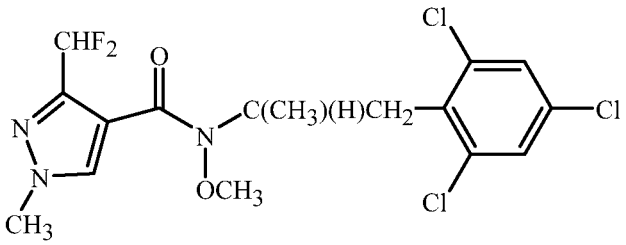
Component (b13) relates to a compound of Formula **B13**



B13

which is 3-[(3,4-dichloro-5-isothiazolyl)methoxy]-1,2-benzisothiazole, 1,1-dioxide (Registry Number 957144-77-3). Methods for preparing the compound of Formula **B13** are described in PCT Patent Publication WO 2007/129454 A1.

Component (b14) relates to a compound of Formula **B14**



B14

which is 3-(difluoromethyl)-*N*-methoxy-1-methyl-*N*-[1-methyl-2-(2,4,6-trichlorophenyl)-ethyl]-1*H*-pyrazole-4-carboxamide (Registry Number 1228284-64-7). Methods for preparing the compound of Formula **B14** are described in PCT Patent Publication WO 2010063700 A2.

Compositions comprising a combination of (a) at least one compound selected from the compounds of Formula **1**, including *N*-oxides and salts thereof, together with (b) at least one fungicidal component selected from Formulae **B1** through **B14**, including salts thereof, described above typically will provide improved control (i.e. prevention and/or cure) of plant disease from synergic contributions of components (a) and (b). The improved plant disease control may be manifest by a broader spectrum or longer duration of plant disease control, or retardation of resistance development. The contributions of components (a) and (b) may be complementarily additive or even greater than additive through synergistic interaction.

This invention also relates to a fungicidal composition comprising: (a) at least one compound selected from the compounds of Formula **1**, (b) at least one fungicidal compound selected from Formulae **B1** through **B14** described above, and (c) further comprising at least one additional compound or agent that is biologically active. Thus compositions of component (a) with component (b) can be further mixed with (c) one or more other biologically active compounds or agents including insecticides, nematocides, bactericides, acaricides, herbicides, herbicide safeners, 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. General references for these agricultural protectants include *The Pesticide Manual, 13th Edition*, C. D. S. Tomlin, Ed., British Crop Protection Council, Farnham, Surrey, U.K., 2003, *The Pesticide Manual, 16th Edition*, C. MacBean, Ed., British Crop Protection Council, Alton, Hampshire, U.K., 2012 and *The BioPesticide Manual*, *2nd Edition*, L. G. Copping, Ed., British Crop Protection Council, Farnham, Surrey, U.K., 2001.

A more particular aspect relates to said fungicidal composition wherein component (c) comprises at least one additional compound that is a fungicide (i.e. an additional fungicidal compound). In the present composition, additional fungicidal compounds in component (c) are typically selected from the group consisting of (c1) methyl benzimidazole carbamate (MBC) fungicides; (c2) dicarboximide fungicides; (c3) demethylation inhibitor (DMI) fungicides; (c4) phenylamide fungicides; (c5) amine/morpholine fungicides; (c6) phospholipid biosynthesis inhibitor fungicides; (c7) carboxamide fungicides; (c8) hydroxy(2-amino-)pyrimidine fungicides; (c9) anilinopyrimidine fungicides; (c10) *N*-phenyl carbamate fungicides; (c11) quinone outside inhibitor (QoI) fungicides; (c12) phenylpyrrole fungicides; (c13) quinoline fungicides; (c14) lipid peroxidation inhibitor fungicides; (c15) melanin biosynthesis inhibitor-reductase (MBI-R) fungicides; (c16) melanin biosynthesis inhibitor-dehydratase (MBI-D) fungicides; (c17) sterol biosynthesis inhibitor (SBI): class III fungicides (also known as hydroxyanilide fungicides); (c18) squalene-epoxidase inhibitor fungicides; (c19) polyoxin fungicides; (c20) phenylurea fungicides; (c21) quinone inside inhibitor (QiI) fungicides; (c22) benzamide fungicides; (c23) enopyranuronic acid antibiotic fungicides; (c24) hexopyranosyl antibiotic fungicides; (c25) glucopyranosyl antibiotic: protein synthesis fungicides; (c26) glucopyranosyl antibiotic: trehalase and inositol biosynthesis fungicides; (c27) cyanoacetamideoxime fungicides; (c28) carbamate fungicides; (c29) oxidative phosphorylation uncoupling fungicides; (c30) organo tin fungicides; (c31) carboxylic acid fungicides; (c32) heteroaromatic fungicides; (c33) phosphonate fungicides; (c34) phthalamic acid fungicides; (c35) benzotriazine fungicides; (c36) benzene-sulfonamide fungicides; (c37) pyridazinone fungicides; (c38) thiophene-carboxamide fungicides; (c39) pyrimidinamide fungicides; (c40) carboxylic acid amide (CAA) fungicides; (c41) tetracycline antibiotic fungicides; (c42) thiocarbamate fungicides; (c43) benzamide fungicides; (c44) host plant defense induction fungicides; (c45) multi-site contact activity fungicides; (c46) fungicides other than fungicides of component (a) and components (c1) through (c45); and salts of compounds of (c1) through (c46).

Of note are fungicide composition embodiments wherein component (c) comprises at least one fungicidal compound from each of two different groups selected from (c1) through (c46).

"Methyl benzimidazole carbamate (MBC) fungicides (c1)" (FRAC (Fungicide Resistance Action Committee) code 1) inhibit mitosis by binding to β-tubulin during microtubule assembly. Inhibition of microtubule assembly can disrupt cell division, transport within the cell and cell structure. Methyl benzimidazole carbamate fungicides include benzimidazole and thiophanate fungicides. The benzimidazoles include benomyl, carbendazim, fuberidazole and thiabendazole. The thiophanates include thiophanate and thiophanate-methyl.

"Dicarboximide fungicides (c2)" (FRAC code 2) inhibit a MAP/histidine kinase in osmotic signal transduction. Examples include chlozolinate, iprodione, procymidone and vinclozolin.

"Demethylation inhibitor (DMI) fungicides (c3)" (FRAC code 3) (Sterol Biosynthesis Inhibitors (SBI): Class I) inhibit C14-demethylase which plays a role in sterol production. Sterols, such as ergosterol, are needed for membrane structure and function, making them essential for the development of functional cell walls. Therefore, exposure to these fungicides result in abnormal growth and eventually death of sensitive fungi. DMI fungicides are divided between several chemical classes: azoles (including triazoles and imidazoles), pyrimidines, piperazines, pyridines and triazolinthiones. The triazoles include azaconazole, bitertanol, bromuconazole, cyproconazole, difenoconazole, diniconazole (including diniconazole-M), epoxiconazole, etaconazole, fenbuconazole, fluquinconazole, flusilazole, flutriafol, hexaconazole, imibenconazole, ipconazole, metconazole, myclobutanil, penconazole, propiconazole, quinconazole, simeconazole, tebuconazole, tetraconazole, triadimefon, triadimenol, triticonazole, uniconazole and α-(1-chlorocyclopropyl)-α-[2-(2,2-dichlorocyclopropyl)ethyl]-1*H*-1,2,4-triazole-1-ethanol. The imidazoles include clotrimazole, econazole, imazalil, isoconazole, miconazole, oxpoconazole, prochloraz, pefurazoate and triflumizole. The pyrimidines include fenarimol, nuarimol and triarimol. The piperazines include triforine. The pyridines include buthiobate, pyrifenox, pyrisoxazole (3-[(3*R*)-5-(4-chlorophenyl)-2,3-dimethyl-3-isoxazolidinyl]pyridine, mixture of 3*R*,5*R*- and 3*R*,5*S*-isomers) and (α*S*)-[3-(4-chloro-2-fluorophenyl)-5-(2,4-difluorophenyl)-4-isoxazolyl]-3-pyridinemethanol. The triazolinthiones include prothioconazole and 2-[2-(1-chlorocyclopropyl)-4-(2,2-dichlorocyclopropyl)-2-hydroxybutyl]-1,2-dihydro-3*H*-1,2,4-triazole-3-thione. Biochemical investigations have shown that all of the above mentioned fungicides are DMI fungicides as described by K. H. Kuck et al. in *Modern Selective Fungicides - Properties, Applications and Mechanisms of Action*, H. Lyr (Ed.), Gustav Fischer Verlag: New York, 1995, 205–258.

"Phenylamide fungicides (c4)" (FRAC code 4) are specific inhibitors of RNA polymerase in Oomycete fungi. Sensitive fungi exposed to these fungicides show a reduced capacity to incorporate uridine into rRNA. Growth and development in sensitive fungi is prevented by exposure to this class of fungicide. Phenylamide fungicides include acylalanine, oxazolidinone and butyrolactone fungicides. The acylalanines include benalaxyl, benalaxyl-M (also known as kiralaxyl), furalaxyl, metalaxyl, metalaxyl-M (also known as mefenoxam). The oxazolidinones include oxadixyl. The butyrolactones include ofurace.

"Amine/morpholine fungicides (c5)" (FRAC code 5) (SBI: Class II) inhibit two target sites within the sterol biosynthetic pathway, $\Delta^8 \rightarrow \Delta^7$ isomerase and Δ^{14} reductase. Sterols, such as ergosterol, are needed for membrane structure and function, making them essential for the development of functional cell walls. Therefore, exposure to these fungicides results in abnormal growth and eventually death of sensitive fungi. Amine/morpholine fungicides (also known as non-DMI sterol biosynthesis inhibitors) include morpholine, piperidine and spiroketal-amine fungicides. The morpholines include aldimorph, dodemorph, fenpropimorph, tridemorph and trimorphamide. The piperidines include fenpropidin and piperalin. The spiroketal-amines include spiroxamine.

"Phospholipid biosynthesis inhibitor fungicides (c6)" (FRAC code 6) inhibit growth of fungi by affecting phospholipid biosynthesis. Phospholipid biosynthesis fungicides include phosphorothiolate and dithiolane fungicides. The phosphorothiolates include edifenphos, iprobenfos and pyrazophos. The dithiolanes include isoprothiolane.

"Carboxamide fungicides (c7)", also known as "Succinate dehydrogenase inhibitor (SDHI) fungicides", (FRAC code 7) inhibit Complex II fungal respiration by disrupting a key enzyme in the Krebs Cycle (TCA cycle) named succinate dehydrogenase. Inhibiting respiration prevents the fungus from making ATP, and thus inhibits growth and reproduction. Carboxamide fungicides include phenylbenzamide, furan carboxamide, oxathiin carboxamide, thiazole carboxamide, pyrazole-4-carboxamide and pyridine carboxamide, phenyl oxoethyl thiophene amides and pyridinylethyl benzamides. The benzamides include benodanil, flutolanil and mepronil. The furan carboxamides include fenfuram. The oxathiin carboxamides include carboxin and oxycarboxin. The thiazole carboxamides include thifluzamide. The pyrazole-4-carboxamides include benzovindiflupyr (*N*-[9-(dichloromethylene)-1,2,3,4-tetrahydro-1,4-methanonaphthalen-5-yl]-3-(difluoromethyl)-1-methyl-1*H*-pyrazole-4-carboxamide), bixafen, furametpyr, isopyrazam (3-(difluoromethyl)-1-methyl-*N*-[1,2,3,4-tetrahydro-9-(1-methylethyl)-1,4-methanonaphthalen-5-yl]-1*H*-pyrazole-4-carboxamide), fluxapyroxad (3-(difluoromethyl)-1-methyl-*N*-(3′,4′,5′-trifluoro[1,1′-biphenyl]-2-yl)-1*H*-pyrazole-4-carboxamide), penthiopyrad, sedaxane (*N*-[2-[1,1′-bicyclopropyl]-2-ylphenyl]-3-(difluoromethyl)-1-methyl-1*H*-pyrazole-4-carboxamide), *N*-[2-(1*S*,2*R*)-[1,1'-bicyclopropyl]-2-ylphenyl]-3-(difluoromethyl)-1-methyl-1*H*-pyrazole-4-

carboxamide, 3-(difluoromethyl)-*N*-(2,3-dihydro-1,1,3-trimethyl-1*H*-inden-4-yl)-1-methyl-1*H*-pyrazole-4-carboxamide, *N*-[2-(2,4-dichlorophenyl)-2-methoxy-1-methylethyl]-3-(difluoromethyl)-1-methyl-1*H*-pyrazole-4-carboxamide, *N*-cyclopropyl-3-(difluoromethyl)-5-fluoro-1-methyl-*N*-[[2-(1-methylethyl)phenyl]methyl]-1*H*-pyrazole-4-carboxamide and penflufen (*N*-[2-(1,3-dimethylbutyl)phenyl]-5-fluoro-1,3-dimethyl-1*H*-pyrazole-4-carboxamide) (PCT Patent Publication WO 2003/010149). The pyridine carboxamides include boscalid. The phenyl oxoethyl thiophene amides include isofetamid (*N*-[1,1-dimethyl-2-[2-methyl-4-(1-methylethoxy)phenyl]-2-oxoethyl]-3-methyl-2-thiophene-carboxamide). The pyridinylethyl benzamides include fluopyram.

"Hydroxy(2-amino-)pyrimidine fungicides (c8)" (FRAC code 8) inhibit nucleic acid synthesis by interfering with adenosine deaminase. Examples include bupirimate, dimethirimol and ethirimol.

"Anilinopyrimidine fungicides (c9)" (FRAC code 9) are proposed to inhibit biosynthesis of the amino acid methionine and to disrupt the secretion of hydrolytic enzymes that lyse plant cells during infection. Examples include cyprodinil, mepanipyrim and pyrimethanil.

"*N*-Phenyl carbamate fungicides (c10)" (FRAC code 10) inhibit mitosis by binding to β-tubulin and disrupting microtubule assembly. Inhibition of microtubule assembly can disrupt cell division, transport within the cell and cell structure. Examples include diethofencarb.

"Quinone outside inhibitor (QoI) fungicides (c11)" (FRAC code 11) inhibit Complex III mitochondrial respiration in fungi by affecting ubiquinol oxidase. Oxidation of ubiquinol is blocked at the "quinone outside" (Q_o) site of the cytochrome bc_1 complex, which is located in the inner mitochondrial membrane of fungi. Inhibiting mitochondrial respiration prevents normal fungal growth and development. Quinone outside inhibitor fungicides include methoxyacrylate, methoxycarbamate, oximinoacetate, oximinoacetamide and dihydrodioxazine fungicides (collectively also known as strobilurin fungicides), and oxazolidinedione, imidazolinone and benzylcarbamate fungicides. The methoxyacrylates include azoxystrobin, coumoxystrobin (methyl (α*E*)-2-[[(3-butyl-4-methyl-2-oxo-2*H*-1-benzopyran-7-yl)oxy]methyl]-α-(methoxymethylene)benzeneacetate), enoxastrobin (methyl (α*E*)-2-[[[(*E*)-[(2*E*)-3-(4-chlorophenyl)-1-methyl-2-propen-1-ylidene]amino]oxy]methyl]-α-(methoxymethylene)benzeneaceate) (also known as enestroburin), flufenoxystrobin (methyl (α*E*)-2-[[2-chloro-4-(trifluoromethyl)phenoxy]methyl]-α-(methoxymethylene)benzene-acetate), picoxystrobin and pyraoxystrobin (methyl (α*E*)-2-[[[3-(4-chlorophenyl)-1-methyl-1*H*-pyrazol-5-yl]oxy]methyl]-α-(methoxymethylene)benzeneacetate). The methoxy-carbamates include pyraclostrobin, pyrametostrobin (methyl *N*-[2-[[(1,4-dimethyl-3-phenyl-1*H*-pyrazol-5-yl)oxy]methyl]phenyl]-*N*-methoxycarbamate) and triclopyricarb (methyl *N*-methoxy-*N*-[2-[[(3,5,6-trichloro-2-pyridinyl)oxy]methyl]phenyl]carbamate). The oximino-

acetates include kresoxim-methyl and trifloxystrobin. The oximinoacetamides include dimoxystrobin, fenaminstrobin ((αE)-2-[[[(E)-[(2E)-3-(2,6-dichlorophenyl)-1-methyl-2-propen-1-ylidene]amino]oxy]methyl]-α-(methoxyimino)-*N*-methylbenzeneacetamide, also known as 2-[[[(3-(2,6-dichlorophenyl)-1-methyl-2-propen-1-ylidene]amino]oxy]methyl]-α-(methoxyimino)-*N*-methylbenzeneacetamide), metominostrobin, orysastrobin and α-(methoxyimino)-*N*-methyl-2-[[[1-[3-(trifluoromethyl)phenyl]ethoxy]imino]-methyl]benzeneacetamide. The dihydrodioxazines include fluoxastrobin. The oxazolidinediones include famoxadone. The imidazolinones include fenamidone. The benzylcarbamates include pyribencarb. Class (c11) also includes mandestrobin (2-[(2,5-dimethylphenoxy)methyl]-α-methoxy-*N*-benzeneacetamide).

"Phenylpyrrole fungicides (c12)" (FRAC code 12) inhibit a MAP histidine kinase associated with osmotic signal transduction in fungi. Fenpiclonil and fludioxonil are examples of this fungicide class.

"Quinoline fungicides (c13)", also known as "azanaphthalene fungicides", (FRAC code 13) are proposed to inhibit signal transduction by a mechanism which is yet unknown. They have been shown to interfere with germination and/or appressorium formation in fungi that cause powdery mildew diseases. Quinoline fungicides include aryloxyquinolines and auinazolinones. The aryloxyquinolines include quinoxyfen. The quinazolinones include proquinazid.

"Lipid peroxidation inhibitor fungicides (c14)" (FRAC code 14) are proposed to inhibit lipid peroxidation which affects membrane synthesis in fungi. Members of this class, such as etridiazole, may also affect other biological processes such as respiration and melanin biosynthesis. Lipid peroxidation fungicides include aromatic hydrocarbon and 1,2,4-thiadiazole fungicides. The aromatic hydrocarbon fungicides include biphenyl, chloroneb, dicloran, quintozene, tecnazene and tolclofos-methyl. The 1,2,4-thiadiazoles include etridiazole.

"Melanin biosynthesis inhibitor-reductase (MBI-R) fungicides (c15)" (FRAC code 16.1) inhibit the naphthal reduction step in melanin biosynthesis. Melanin is required for host plant infection by some fungi. Melanin biosynthesis inhibitor-reductase fungicides include isobenzofuranone, pyrroloquinolinone and triazolobenzothiazole fungicides. The isobenzofuranones include phthalide (alternatively spelled fthalide). The pyrroloquinolinones include pyroquilon. The triazolobenzothiazoles include tricyclazole.

"Melanin biosynthesis inhibitor-dehydratase (MBI-D) fungicides (c16)" (FRAC code 16.2) inhibit scytalone dehydratase in melanin biosynthesis. Melanin in required for host plant infection by some fungi. Melanin biosynthesis inhibitor-dehydratase fungicides include cyclopropanecarboxamide, carboxamide and propionamide fungicides. The cyclopropanecarboxamides include carpropamid. The carboxamides include diclocymet. The propionamides include fenoxanil.

"Sterol Biosynthesis Inhibitor (SBI): Class III fungicides (c17)", (FRAC code 17) inhibit 3-ketoreductase during C4-demethylation in sterol production. SBI: Class III inhibitors include hydroxyanilide fungicides and aminopyrazolinone fungicides. Hydroxyanilides include fenhexamid. Aminopyrazolinones include fenpyrazamine (*S*-2-propen-1-yl 5-amino-2,3-dihydro-2-(1-methylethyl)-4-(2-methylphenyl)-3-oxo-1*H*-pyrazole-1-carbothioate, also known as 1-[(2-propenylthio)carbonyl]-2-(1-methylethyl)-4-(2-methyl-phenyl)-5-amino-1*H*-pyrazol-3-one,).

"Squalene-epoxidase inhibitor fungicides (c18)" (FRAC code 18) inhibit squalene-epoxidase in the sterol biosynthesis pathway. Sterols such as ergosterol are needed for membrane structure and function, making them essential for the development of functional cell walls. Therefore exposure to these fungicides result in abnormal growth and eventually death of sensitive fungi. Squalene-epoxidase inhibitor fungicides include thiocarbamate and allylamine fungicides. The thiocarbamates include pyributicarb. The allylamines include naftifine and terbinafine.

"Polyoxin fungicides (c19)" (FRAC code 19) inhibit chitin synthase. Examples include polyoxin.

"Phenylurea fungicides (c20)" (FRAC code 20) are proposed to affect cell division. Examples include pencycuron.

"Quinone inside inhibitor (QiI) fungicides (c21)" (FRAC code 21) inhibit Complex III mitochondrial respiration in fungi by affecting ubiquinone reductase. Reduction of ubiquinol is blocked at the "quinone inside" (Q_i) site of the cytochrome bc_1 complex, which is located in the inner mitochondrial membrane of fungi. Inhibiting mitochondrial respiration prevents normal fungal growth and development. Quinone inside inhibitor fungicides include cyanoimidazole and sulfamoyltriazole fungicides. The cyanoimidazoles include cyazofamid. The sulfamoyltriazoles include amisulbrom.

"Benzamide and thiazolecarboxamide fungicides (c22)" (also known simply as "benzamide fungicides") (FRAC code 22) inhibit mitosis by binding to β-tubulin and disrupting microtubule assembly. Inhibition of microtubule assembly can disrupt cell division, transport within the cell and cell structure. The benzamides include zoxamide. The thiazolecarboxamides include ethaboxam.

"Enopyranuronic acid antibiotic fungicides (c23)" (FRAC code 23) inhibit growth of fungi by affecting protein biosynthesis. Examples include blasticidin-S.

"Hexopyranosyl antibiotic fungicides (c24)" (FRAC code 24) inhibit growth of fungi by affecting protein biosynthesis. Examples include kasugamycin.

"Glucopyranosyl antibiotic: protein synthesis fungicides (c25)" (FRAC code 25) inhibit growth of fungi by affecting protein biosynthesis. Examples include streptomycin.

"Glucopyranosyl antibiotic: trehalase and inositol biosynthesis fungicides (c26)" (FRAC code 26) inhibit trehalase and inositol biosynthesis. Examples include validamycin.

"Cyanoacetamideoxime fungicides (c27) (FRAC code 27) include cymoxanil.

"Carbamate fungicides (c28)" (FRAC code 28) are considered multi-site inhibitors of fungal growth. They are proposed to interfere with the synthesis of fatty acids in cell membranes, which then disrupts cell membrane permeability. Propamacarb, iodocarb, and prothiocarb are examples of this fungicide class.

"Oxidative phosphorylation uncoupling fungicides (c29)" (FRAC code 29) inhibit fungal respiration by uncoupling oxidative phosphorylation. Inhibiting respiration prevents normal fungal growth and development. This class includes 2,6-dinitroanilines such as fluazinam and dinitrophenyl crotonates such as dinocap, meptyldinocap and binapacryl.

"Organo tin fungicides (c30)" (FRAC code 30) inhibit adenosine triphosphate (ATP) synthase in oxidative phosphorylation pathway. Examples include fentin acetate, fentin chloride and fentin hydroxide.

"Carboxylic acid fungicides (c31)" (FRAC code 31) inhibit growth of fungi by affecting deoxyribonucleic acid (DNA) topoisomerase type II (gyrase). Examples include oxolinic acid.

"Heteroaromatic fungicides (c32)" (FRAC code 32) are proposed to affect DNA/ribonucleic acid (RNA) synthesis. Heteroaromatic fungicides include isoxazole and isothiazolone fungicides. The isoxazoles include hymexazole and the isothiazolones include octhilinone.

"Phosphonate fungicides (c33)" (FRAC code 33) include phosphorous acid and its various salts, including fosetyl-aluminum.

"Phthalamic acid fungicides (c34)" (FRAC code 34) include teclofthalam.

"Benzotriazine fungicides (c35)" (FRAC code 35) include triazoxide.

"Benzene-sulfonamide fungicides (c36)" (FRAC code 36) include flusulfamide.

"Pyridazinone fungicides (c37)" (FRAC code 37) include diclomezine.

"Thiophene-carboxamide fungicides (c38)" (FRAC code 38) are proposed to affect ATP production. Examples include silthiofam.

"Pyrimidinamide fungicides (c39)", also known as "Complex I NADH oxidoreductase inhibitor fungicides", (FRAC code 39) inhibit electron transport in mitochondria and include pyrimidinamines such as diflumetorim, and pyrazole-5-carboxamides such as tolfenpyrad.

"Carboxylic acid amide (CAA) fungicides (c40)" (FRAC code 40) inhibit cellulose synthase, which prevents growth and leads to death of the target fungus. Carboxylic acid amide fungicides include cinnamic acid amide, valinamide carbamate and mandelic acid amide fungicides. The cinnamic acid amides include dimethomorph, flumorph and pyrimorph (3-(2-chloro-4-pyridinyl)-3-[4-(1,1-dimethylethyl)phenyl]-1-(4-morpholinyl)-2-propene-1-one). The valinamide carbamates include benthiavalicarb, benthiavalicarb-isopropyl, iprovalicarb, tolprocarb (2,2,2-trifluoroethyl *N*-[(1*S*)-2-methyl-1-[[(4-methylbenzoyl)amino]methyl]propyl]carbamate) and valifenalate (methyl *N*-[(1-

methylethoxy)carbonyl]-L-valyl-3-(4-chlorophenyl)-β-alaninate) (also known as valiphenal). The mandelic acid amides include mandipropamid, *N*-[2-[4-[[3-(4-chlorophenyl)-2-propyn-1-yl]oxy]-3-methoxyphenyl]ethyl]-3-methyl-2-[(methylsulfonyl)amino]butanamide and *N*-[2-[4-[[3-(4-chlorophenyl)-2-propyn-1-yl]oxy]-3-methoxyphenyl]ethyl]-3-methyl-2-[(ethylsulfonyl)amino]butanamide.

"Tetracycline antibiotic fungicides (c41)" (FRAC code 41) inhibit growth of fungi by affecting protein synthesis. Examples include oxytetracycline.

"Thiocarbamate fungicides (c42)" (FRAC code 42) include methasulfocarb.

"Benzamide fungicides (c43)" (FRAC code 43) inhibit growth of fungi by delocalization of spectrin-like proteins. Examples include pyridinylmethyl benzamide fungicides such as fluopicolide.

"Host plant defense induction fungicides (c44)" (FRAC code P) induce host plant defense mechanisms. Host plant defense induction fungicides include benzothiadiazole-, benzisothiazole- and thiadiazole-carboxamide fungicides. The benzothiadiazoles include acibenzolar-*S*-methyl. The benzisothiazoles include probenazole. The thiadiazole-carboxamides include tiadinil and isotianil.

"Multi-site contact fungicides (c45)" inhibit fungal growth through multiple sites of action and have contact/preventive activity. This class of fungicides includes: "copper fungicides (c45.1) (FRAC code M1)", "sulfur fungicides (c45.2) (FRAC code M2)", "dithiocarbamate fungicides (c45.3) (FRAC code M3)", "phthalimide fungicides (c45.4) (FRAC code M4)", "chloronitrile fungicides (c45.5) (FRAC code M5)", "sulfamide fungicides (c45.6) (FRAC code M6)", "multi-site contact guanidine fungicides (c45.7) (FRAC code M7)" "triazine fungicides (c45.8) (FRAC code M8)", "quinone fungicides (c45.9) (FRAC code M9), "quinoxaline fungicides" (c45.10) (FRAC code M10) and "maleimide fungicides" (c45.11) (FRAC code M11). "Copper fungicides" are inorganic compounds containing copper, typically in the copper(II) oxidation state; examples include copper oxychloride, copper sulfate and copper hydroxide, including compositions such as Bordeaux mixture (tribasic copper sulfate). "Sulfur fungicides" are inorganic chemicals containing rings or chains of sulfur atoms; examples include elemental sulfur. "Dithiocarbamate fungicides" contain a dithiocarbamate molecular moiety; examples include mancozeb, metiram, propineb, ferbam, maneb, thiram, zineb and ziram. "Phthalimide fungicides" contain a phthalimide molecular moiety; examples include folpet, captan and captafol. "Chloronitrile fungicides" contain an aromatic ring substituted with chloro and cyano; examples include chlorothalonil. "Sulfamide fungicides" include dichlofluanid and tolylfluanid. "Multi-site contact guanidine fungicides" include guazatine, iminoctadine albesilate and iminoctadine triacetate. "Triazine fungicides" include anilazine. "Quinone fungicides" include dithianon. "Quinoxaline fungicides" include quinomethionate (also known as chinomethionate). "Maleimide fungicides" include fluoroimide.

"Fungicides other than fungicides of component (a) and components (c1) through (c45); (c46)" include certain fungicides whose mode of action may be unknown. These include: (c46.1) "phenyl-acetamide fungicides" (FRAC code U6), (c46.2) "aryl-phenyl-ketone fungicides" (also known as "benzophenone fungicides") (FRAC code U8), (c46.3) "guanidine fungicides" (FRAC code U12), (c46.4) "thiazolidine fungicides" (FRAC code U13), (c46.5) "pyrimidinone-hydrazone fungicides" (FRAC code U14) and (c46.6) "Q_XI fungicides" (also known as "triazolopyrimidylamine fungicides") (FRAC code 45). The phenyl-acetamides include cyflufenamid and *N*-[[(cyclopropylmethoxy)amino][6-(difluoromethoxy)-2,3-difluorophenyl]-methylene]benzeneacetamide. The aryl-phenyl ketones include benzophenones such as metrafenone and benzoylpyridines such as pyriofenone (5-chloro-2-methoxy-4-methyl-3-pyridinyl)(2,3,4-trimethoxy-6-methylphenyl)-methanone). The guanidines include dodine. The thiazolidines include flutianil ((2*Z*)-2-[[2-fluoro-5-(trifluoromethyl)phenyl]thio]-2-[3-(2-methoxyphenyl)-2-thiazolidinylidene]-acetonitrile). The pyrimidinone-hydrazones include ferimzone.

The Q_XI fungicides are now believed to inhibit Complex III mitochondrial respiration in fungi by affecting ubiquinone reductase at an unknown (Q_X) site of the cytochrome *bc1* complex. Inhibiting mitochondrial respiration prevents normal fungal growth and development. Q_XI fungicides include triazolopyrimidinylamines such as ametoctradin (5-ethyl-6-octyl[1,2,4]triazolo[1,5-*a*]pyrimidin-7-amine).

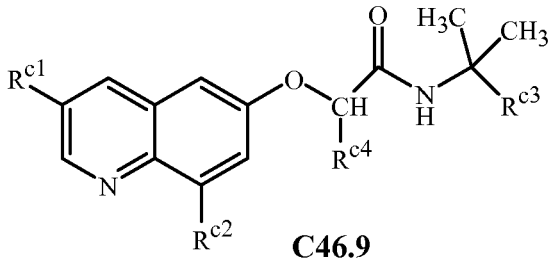
"Fungicides other than fungicides of component (a) and components (c1) through (c45); (c46)" also include (c46.7) *N'*-[4-[[3-[(4-chlorophenyl)methyl]-1,2,4-thiadiazol-5-yl]oxy]-2,5-dimethylphenyl]-*N*-ethyl-*N*-methylmethanimidamide, which is believed to inhibit C24-methyl transferase involved in biosynthesis of sterols. The (c46) class also includes (c46.8) compounds that bind to oxysterol-binding protein as described in PCT Patent Publication WO 2013/009971, such as oxathiapiprolin (1-[4-[4-[5-(2,6-difluorophenyl)-4,5-dihydro-3-isoxazolyl]-2-thiazolyl]-1-piperidinyl]-2-[5-methyl-3-(trifluoromethyl)-1*H*-pyrazol-1-yl]ethanone) and its R-enantiomer. The (c46) class further includes mitosis- and cell division-inhibiting fungicides besides those of the particular classes described above (e.g., (c1), (c10) and (c22)).

The (c46) class also includes bethoxazin, flumetover, neo-asozin (ferric methanearsonate), pyrrolnitrin, quinomethionate, tebufloquin (6-(1,1-dimethylethyl)-8-fluoro-2,3-dimethyl-4-quinolinyl acetate), 2-[[2-fluoro-5-(trifluoromethyl)phenyl]thio]-2-[3-(2-methoxyphenyl)-2-thiazolidinylidene]acetonitrile, 3-[5-(4-chlorophenyl)-2,3-dimethyl-3-isoxazolidinyl]pyridine, 4-fluorophenyl *N*-[1-[[[1-(4-cyanophenyl)ethyl]-sulfonyl]methyl]propyl]carbamate, tolnifanide (*N*-(4-chloro-2-nitrophenyl)-*N*-ethyl-4-methylbenzenesulfonamide), *N'*-[4-[4-chloro-3-(trifluoromethyl)phenoxy]-2,5-dimethyl-phenyl]-*N*-ethyl-*N*-methylmethanimidamide, 2-butoxy-6-iodo-3-propyl-4*H*-1-benzopyran-4-one, 3-butyn-1-yl *N*-[6-[[[[(1-methyl-1*H*-tetrazol-5-yl)phenylmethylene]amino]oxy]methyl]-

2-pyridinyl]carbamate, *N*'-[4-[[3-[(4-chlorophenyl)methyl]-1,2,4-thiadiazol-5-yl]oxy]-2,5-dimethylphenyl]-*N*-ethyl-*N*-methyl-methanimidamide, *N*-[[(cyclopropylmethoxy)amino][6-(difluoromethoxy)-2,3-difluorophenyl]methylene]benzeneacetamide, 1,1-dimethylethyl *N*-[6-[[[[(1-methyl-1*H*-tetrazol-5-yl)phenylmethylene]amino]oxy]methyl]-2-pyridinyl]-carbamate, 2,6-dimethyl-1*H*,5*H*-[1,4]dithiino[2,3-*c*:5,6-*c*']dipyrrole-1,3,5,7(2*H*,6*H*)-tetrone, 5-fluoro-2-[(4-methylphenyl)methoxy]-4-pyrimidinamine, 5-fluoro-2-[(4-fluorophenyl)methoxy]-4-pyrimidinamine, 4-fluorophenyl *N*-[1-[[[1-(4-cyanophenyl)ethyl]-sulfonyl]methyl]propyl]carbamate, pentyl *N*-[6-[[[[(1-methyl-1*H*-tetrazol-5-yl)phenylmethylene]amino]oxy]methyl]-2-pyridinyl]carbamate, pentyl *N*-[4-[[[[(1-methyl-1*H*-tetrazol-5-yl)phenylmethylene]amino]oxy]methyl]-2-thiazolyl]carbamate and pentyl *N*-[6-[[[[(Z)-(1-methyl-1*H*-tetrazol-5-yl)phenylmethylene]amino]oxy]methyl]-2-pyridinyl]-carbamate.

Additional "Fungicides other than fungicides of component (a) and components (c1) through (c45); (c46)" also include a fungicidal compound selected from components (c46.9) through (c46.13) as shown below.

Component (c46.9) relates to 6-quinolinyloxyacetamide compounds of Formula **C46.9** and salts thereof



C46.9

wherein

R^{c1} is halogen, C_1–C_4 alkoxy or C_1–C_4 alkynyl;

R^{c2} is H, halogen or C_1–C_4 alkyl;

R^{c3} is C_1–C_{12} alkyl, C_1–C_{12} haloalkyl, C_1–C_{12} alkoxy, C_2–C_{12} alkoxyalkyl, C_2–C_{12} alkenyl, C_2–C_{12} alkynyl, C_4–C_{12} alkoxyalkenyl, C_4–C_{12} alkoxyalkynyl, C_1–C_{12} alkylthio or C_2–C_{12} alkylthioalkyl;

R^{c4} is methyl or -Y^{a1}-R^{c5};

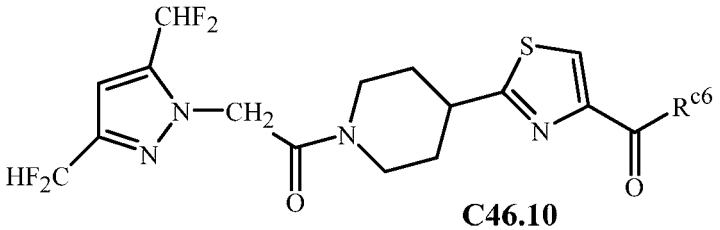
R^{c5} is C_1–C_2 alkyl; and

Y^{c1} is CH_2, O or S.

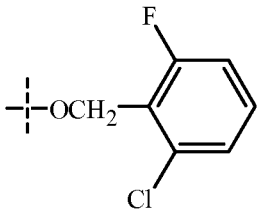
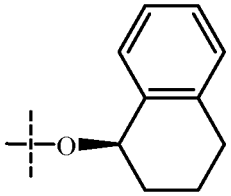
Compounds of Formula **C46.9**, their use as fungicides and methods of preparation are generally known; see, for example, PCT Patent Publications WO 2004/047538, WO 2004/108663, WO 2006/058699, WO 2006/058700, WO 2008/110355, WO 2009/030469, WO 2009/049716 and WO 2009/087098. Examples of compounds of Formula **C46.9** include: 2-[(3-bromo-6-quinolinyl)oxy]-*N*-(1,1-dimethyl-2-butyn-1-yl)-2-(methylthio)-

acetamide, 2-[(3-ethynyl-6-quinolinyl)oxy]-*N*-[1-(hydroxymethyl)-1-methyl-2-propyn-1-yl]-2-(methylthio)acetamide, *N*-(1,1-dimethyl-2-butyn-1-yl)-2-[(3-ethynyl-6-quinolinyl)oxy]-2-(methylthio)acetamide, 2-[(3-bromo-8-methyl-6-quinolinyl)oxy]-*N*-(1,1-dimethyl-2-propyn-1-yl)-2-(methylthio)acetamide and 2-[(3-bromo-6-quinolinyl)oxy]-*N*-(1,1-dimethylethyl)-butanamide.

Component (c46.10) relates to a compound of Formula **C46.10**

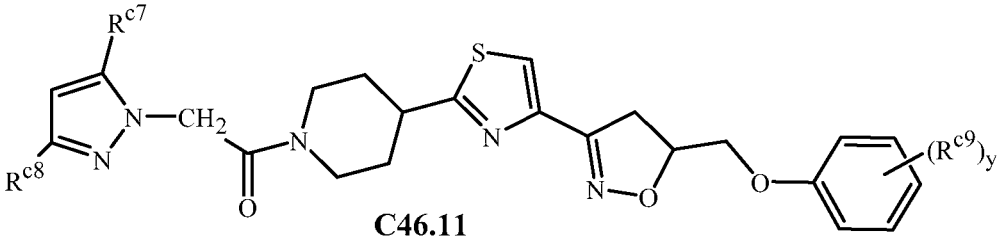


C46.10

wherein R^{c6} is  or  .

Examples of a compound of Formula **C46.10** include (c46.10a) (2-chloro-6-fluorophenyl)-methyl 2-[1-[2-[3,5-bis(difluoromethyl)-1*H*-pyrazol-1-yl]acetyl]-4-piperidinyl]-4-thiazolecarboxylate (Registry Number 1299409-40-7) and (c46.101b) (1*R*)-1,2,3,4-tetrahydro-1-naphthalenyl 2-[1-[2-[3,5-bis(difluoromethyl)-1*H*-pyrazol-1-yl]acetyl]-4-piperidinyl]-4-thiazolecarboxylate (Registry Number 1299409-42-9). Methods for preparing compounds of Formula **C46.10** are described in PCT Patent Publications WO 2009/132785 and WO 2011/051243.

Component (c46.11) relates to a compound of Formula **C46.11**

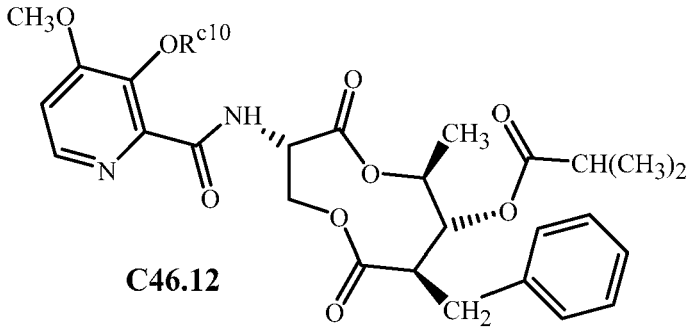


C46.11

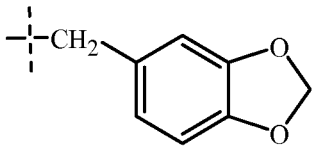
wherein R^{c7} is CH_3, CF_3 or CHF_2; R^{c8} is CH_3, CF_3 or CHF_2; each R^{c9} is independently halogen or cyano; and y is 0, 1, 2 or 3.

Examples of a compound of Formula **C46.11** include (c46.11a) 1-[4-[4-[5-[(2,6-difluorophenoxy)methyl]-4,5-dihydro-3-isoxazolyl]-2-thiazolyl]-1-piperdinyl]-2-[5-methyl-3-(trifluoromethyl)-1*H*-pyrazol-1-yl]ethanone. Methods for preparing compounds of Formula **C46.11** are described in PCT Patent Application PCT/US11/64324.

Component (c46.12) relates to a compound of Formula **C46.12**

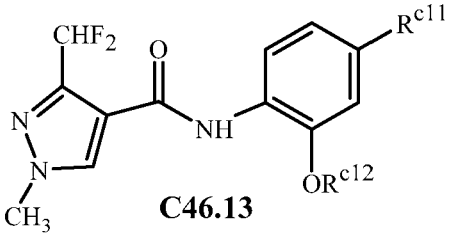


C46.12

wherein R^{c10} is $-CH_2OC(O)CH(CH_3)_2$, $-C(O)CH_3$, $-CH_2OC(O)CH_3$, $-C(O)OCH_2CH(CH_3)_2$ or  .

Examples of a compound of Formula **C46.12** include (c46.12a) [[4-methoxy-2-[[[(3*S*,7*R*,8*R*,9*S*)-9-methyl-8-(2-methyl-1-oxopropoxy)-2,6-dioxo-7-(phenylmethyl)-1,5-dioxonan-3-yl]amino]carbonyl]-3-pyridinyl]oxy]methyl 2-methylpropanoate (Registry Number 517875-34-2), (c46.12b) (3*S*,6*S*,7*R*,8*R*)-3-[[[3-(acetyloxy)-4-methoxy-2-pyridinyl]-carbonyl]amino]-6-methyl-4,9-dioxo-8-(phenylmethyl)-1,5-dioxonan-7-yl 2-methyl-propanoate (Registry Number 234112-93-7), (c46.12c) (3*S*,6*S*,7*R*,8*R*)-3-[[[3-[(acetyloxy)-methoxy]-4-methoxy-2-pyridinyl]carbonyl]amino]-6-methyl-4,9-dioxo-8-(phenylmethyl)-1,5-dioxonan-7-yl 2-methylpropanoate (Registry Number 517875-31-9), (c46.12d) (3*S*,6*S*,7*R*,8*R*)-3-[[[4-methoxy-3-[[(2-methylpropoxy)carbonyl]oxy]-2-pyridinyl]carbonyl]-amino]-6-methyl-4,9-dioxo-8-(phenylmethyl)-1,5-dioxonan-7-yl 2-methylpropanoate (Registry Number 328256-72-0), and (c46.12e) *N*-[[3-(1,3-benzodioxol-5-ylmethoxy)-4-methoxy-2-pyridinyl]carbonyl]-*O*-[2,5-dideoxy-3-*O*-(2-methyl-1-oxopropyl)-2-(phenyl-methyl)-L-arabinonoyl]-L-serine, (1→4')-lactone (Registry Number 1285706-70-8). Methods for preparing compounds of Formula **C46.12** are described in PCT Patent Publications WO 99/40081, WO 2001/014339, WO 2003/035617 and WO 2011044213.

Component (c46.13) relates to a compound of Formula **C46.13**



C46.13

wherein R^{c11} is H or F, and R^{c12} is $-CF_2CHFCF_3$ or $-CF_2CF_2H$. Examples of a compound of Formula **C46.13** are (c46.13a) 3-(difluoromethyl)-*N*-[4-fluoro-2-(1,1,2,3,3,3-hexafluoro-propoxy)phenyl]-1-methyl-1*H*-pyrazole-4-carboxamide (Registry Number 1172611-40-3)

and (c46.13b) 3-(difluoromethyl)-1-methyl-*N*-[2-(1,1,2,2-tetrafluoroethoxy)phenyl]-1*H*-pyrazole-4-carboxamide (Registry Number 923953-98-4). Compounds of Formula **C46.13** can be prepared by methods described in PCT Patent Publication WO 2007/017450.

Examples of component (c) fungicidal compounds include those listed in Embodiment 71, more particularly Embodiment 72, and even more particularly Embodiment 73.

Compositions comprising a combination of (a) at least one compound selected from the compounds of Formula **1**, including *N*-oxides and salts thereof, (b) at least one fungicidal component selected from Formulae **B1** through **B14**, including salts thereof and (c) at least one additional fungicidal compound (e.g., (c1) through (c46), including the corresponding fungicidal compounds described above) can provide improved control (i.e. prevention and/or cure) of plant disease from synergic contributions of components (a), (b) and (c). The improved plant disease control may be manifest by a broader spectrum or longer duration of plant disease control, or retardation of resistance development. The contributions of components (a), (b) and (c) may be complementarily additive or even greater than additive through synergistic interaction. Addition of component (c) may provide stronger synergy than resulting from combination of components (a) and (b).

In addition to or as an alternative to the fungicidal compounds disclosed as components (c1) through (c46), component (c) can comprise one or more "Microbial fungicides" (FRAC code 44). "Microbial fungicides" typically disrupt fungal pathogen cell membranes. Microbial fungicides include *Bacillus* species such as *Bacillus amyloliquefaciens* strains QST 713, FZB24, MB1600, D747 and the fungicidal lipopeptides which they produce.

Also of note is a composition which comprises component (a) (such as a compound specifically disclosed in Index Table A) in combination with at least one fungicidal compound or agent as described above for component (c). Said composition can be advantageously directly used as a combination fungicide, which may be synergistic, or can be further combined with component (b) to form a composition comprising component (a), component (b) and component (c) to provide additional synergic and possible synergistic benefits.

In a fungicidal composition comprising (a) at least one compound selected from the compounds of Formula **1**, including *N*-oxides and salts thereof, (b) at least one fungicidal compound selected from Formulae **B1** through **B14** including salts thereof, described above, and (c) further comprising at least one additional compound or agent that is biologically active, besides the fungicidal compounds (c1) through (c46) described above, component (c) can also be selected from compounds or agents having biological activity that is other than fungicidal. Examples of such biologically active compounds or agents with which compositions of component (a) with component (b), can be mixed (e.g., in an agricultural formulation) are: insecticides such as abamectin, acephate, acetamiprid, acetoprole,

acrinathrin, afidopyropen, aldicarb, amidoflumet, amitraz, avermectin, azadirachtin, azinphos-methyl, bensultap, bifenthrin, bifenazate, bistrifluron, buprofezin, cadusafos, carbofuran, carbaryl, carbofuran, cartap, chinomethionat, chlorantraniliprole, chlorfenapyr, chlorfluazuron, chlorpyrifos, chlorpyrifos-methyl, chlorobenzilate, chromafenozide, clothianidin, cyantraniliprole, cyclaniliprole, cyflumetofen, cyfluthrin, beta-cyfluthrin, cyhalothrin, gamma-cyhalothrin, lambda-cyhalothrin, cyhexatin, cypermethrin, alpha-cypermethrin, zeta-cypermethrin, cyromazine, deltamethrin, diafenthiuron, diazinon, dicofol, dieldrin, dienochlor, diflubenzuron, dimefluthrin, dimethoate, dinotefuran, diofenolan, emamectin, endosulfan, esfenvalerate, ethiprole, etofenprox, etoxazole, fenamiphos, fenazaquin, fenbutatin oxide, fenothiocarb, fenoxycarb, fenpropathrin, fenpyroximate, fenvalerate, fipronil, flonicamid, flubendiamide, flucythrinate, flufenerim, flufenoxuron, flufiprole, flupyradifurone, tau-fluvalinate, fonophos, formetanate, halofenozide, heptafluthrin, hexaflumuron, hexythiazox, hydramethylnon, imicyafos, imidacloprid, indoxacarb, isofenphos, lufenuron, malathion, meperfluthrin, metaflumizone, metaldehyde, methamidophos, methidathion, methiocarb, methomyl, methoprene, methoxychlor, methoxyfenozide, metofluthrin, milbemycin oxime, momfluorothrin, monocrotophos, nicotine, nitenpyram, nithiazine, novaluron, noviflumuron, oxamyl, parathion, parathion-methyl, permethrin, phorate, phosalone, phosmet, phosphamidon, pirimicarb, profenofos, profluthrin, propargite, prothiocarb, protrifenbute, pymetrozine, pyrafluprole, pyrethrin, pyridaben, pyridalyl, pyrifluquinazon, pyriprole, pyriproxyfen, rotenone, ryanodine, spinetoram, spinosad, spiridiclofen, spiromesifen, spirotetramat, sulfoxaflor, sulprofos, tebufenozide, tebufenpyrad, teflubenzuron, tefluthrin, terbufos, tetrachlorvinphos, tetramethrin, tetramethylfluthrin, thiacloprid, thiamethoxam, thiodicarb, thiosultap-sodium, tolfenpyrad, tralomethrin, triazamate, trichlorfon and triflumuron; nematocides such as aldicarb, fenamiphos, fluensulfone, fosthiazate, imicyafos and oxamyl; bactericides such as streptomycin; acaricides such as amitraz, chinomethionat, chlorobenzilate, cyenopyrafen, cyhexatin, dicofol, dienochlor, etoxazole, fenazaquin, fenbutatin oxide, fenpropathrin, fenpyroximate, flufenoxystrobin, hexythiazox, propargite, pyflubumide, pyridaben, pyriminostrobin and tebufenpyrad; and biological agents including entomopathogenic bacteria, such as *Bacillus thuringiensis* subsp. *aizawai*, *Bacillus thuringiensis* subsp. *kurstaki*, and the encapsulated delta-endotoxins of *Bacillus thuringiensis* (e.g., Cellcap, MPV, MPVII); entomopathogenic fungi, such as green muscardine fungus; and entomopathogenic virus including baculovirus, nucleopolyhedro virus (NPV) such as HzNPV, AfNPV; and granulosis virus (GV) such as CpGV.

Of note is a composition of the present invention which comprises, in addition to a components (a) and (b), at least one invertebrate pest control compound or agent selected from the group consisting of abamectin, acephate, acetamiprid, acetoprole, acrinathrin, afidopyropen, aldicarb, amidoflumet, amitraz, avermectin, azadirachtin, azinphos-methyl,

bensultap, bifenthrin, bifenazate, bistrifluron, buprofezin, cadusafos, carbofuran, carbaryl, carbofuran, cartap, chinomethionat, chlorantraniliprole, chlorfenapyr, chlorfluazuron, chlorpyrifos, chlorpyrifos-methyl, chlorobenzilate, chromafenozide, clothianidin, cyantraniliprole, cyclaniliprole, cyflumetofen, cyfluthrin, beta-cyfluthrin, cyhalothrin, gamma-cyhalothrin, lambda-cyhalothrin, cyhexatin, cypermethrin, alpha-cypermethrin, zeta-cypermethrin, cyromazine, deltamethrin, diafenthiuron, diazinon, dicofol, dieldrin, dienochlor, diflubenzuron, dimefluthrin, dimethoate, dinotefuran, diofenolan, emamectin, endosulfan, esfenvalerate, ethiprole, etofenprox, etoxazole, fenamiphos, fenazaquin, fenbutatin oxide, fenothiocarb, fenoxycarb, fenpropathrin, fenpyroximate, fenvalerate, fipronil, flonicamid, flubendiamide, flucythrinate, fluensulfone, flufenerim, flufenoxuron, flufenoxystrobin, flufiprole, flupyradifurone, tau-fluvalinate, fonophos, formetanate, fosthiazate, halofenozide, heptafluthrin, hexaflumuron, hexythiazox, hydramethylnon, imicyafos, imidacloprid, indoxacarb, isofenphos, lufenuron, malathion, meperfluthrin, metaflumizone, metaldehyde, methamidophos, methidathion, methiocarb, methomyl, methoprene, methoxychlor, methoxyfenozide, metofluthrin, milbemycin oxime, momfluorothrin, monocrotophos, nicotine, nitenpyram, nithiazine, novaluron, noviflumuron, oxamyl, parathion, parathion-methyl, permethrin, phorate, phosalone, phosmet, phosphamidon, pirimicarb, profenofos, profluthrin, propargite, protrifenbute, pyflubumide, pymetrozine, pyrafluprole, pyrethrin, pyridaben, pyridalyl, pyrifluquinazon, pyriminostrobin, pyriprole, pyriproxyfen, rotenone, ryanodine, spinetoram, spinosad, spiridiclofen, spiromesifen, spirotetramat, sulfoxaflor, sulprofos, tebufenozide, tebufenpyrad, teflubenzuron, tefluthrin, terbufos, tetrachlorvinphos, tetramethrin, tetramethylfluthrin, thiacloprid, thiamethoxam, thiodicarb, thiosultap-sodium, tolfenpyrad, tralomethrin, triazamate, trichlorfon, triflumuron, *Bacillus thuringiensis* subsp. *aizawai*, *Bacillus thuringiensis* subsp. *kurstaki*, nucleopolyhedro viruses, encapsulated delta-endotoxins of *Bacillus thuringiensis*, baculoviruses, entomopathogenic bacteria, entomopathogenic viruses and entomopathogenic fungi. Also of note is a composition which comprises component (a) (such as a compound specifically disclosed in Index Table A) in combination with at least one invertebrate pest control compound or agent selected from the above list. Said composition can be advantageously directly used as a combination fungicide and insecticide, which may be synergistic, or can be further combined with component (b) to form a composition comprising component (a), component (b) and at least one invertebrate pest control compound or agent as component (c) to provide additional synergic benefits.

In certain instances, combinations of a mixture of components (a) and (b) fungicidal compounds with invertebrate pest control compounds or agents (i.e. as component (c) biologically active ingredients) can result in a greater-than-additive (i.e. synergistic) effect. Reducing the quantity of active ingredients released in the environment while ensuring effective pest control is always desirable. When synergism of invertebrate pest control

active ingredients occurs at application rates giving agronomically satisfactory levels of invertebrate pest control, such combinations can be advantageous for reducing crop production cost and decreasing environmental load. Synergism can also result in increased plant disease control or protection, or increased invertebrate pest control.

In the fungicidal compositions of the present invention, component (a) (i.e. at least one compound selected from compounds of Formula **1**, *N*-oxides, and salts thereof) and component (b) are present in fungicidally effective amounts. The weight ratio of component (a) to component (b) (i.e. one or more additional fungicidal compounds) is generally between about 1:3000 to about 3000:1, more typically between about 1:500 and about 500:1. Of note are compositions where in the weight ratio of component (a) to component (b) is from about 125:1 to about 1:125. With many fungicidal compounds of component (b), these compositions are particularly effective for controlling plant diseases caused by fungal plant pathogens. Of particular note are compositions wherein the weight ratio of component (a) to component (b) is from about 25:1 to about 1:25, or from about 5:1 to about 1:5. One skilled in the art can easily determine through simple experimentation the weight ratios and application rates of fungicidal compounds necessary for the desired spectrum of fungicidal protection and control.

Table A1 lists specific combinations of a Component (b) compound with Compound 2 as Component (a) illustrative of the mixtures, compositions and methods of the present invention. (Compound numbers refer to compounds in Index Table A.) The second column of Table A1 lists the specific Component (b) compound (e.g., "1-[[(2*S*,3*R*)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-2-oxiranyl]methyl]-1*H*-1,2,4-triazole (b1a)" in the first line). The third, fourth and fifth columns of Table A1 list ranges of weight ratios for rates at which the Component (a) compound is typically applied to a field-grown crop relative to Component (b). Thus, for example, the first line of Table A1 specifically discloses the combination of Compound 2 with Component (b1a) is typically applied in a weight ratio of Compound 2 to Component (b1a) of between 36:1 and 1:30, more typically between 12:1 and 1:10, and most typically between 6:1 and 1:4. The remaining lines of Table A1 are to be construed similarly.

Table A1

Component (a)	Component (b)	Typical Weight Ratio	More Typical Weight Ratio	Most Typical Weight Ratio
Compound 2	1-[[(2*S*,3*R*)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-2-oxiranyl]methyl]-1*H*-1,2,4-triazole (b1a)	36:1 to 1:30	12:1 to 1:10	6:1 to 1:4

Component (a)	Component (b)	Typical Weight Ratio	More Typical Weight Ratio	Most Typical Weight Ratio
Compound 2	2-[[(2*S*,3*R*)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-2-oxiranyl]methyl]-1,2-dihydro-3*H*-1,2,4-triazole-3-thione (b1b)	36:1 to 1:30	12:1 to 1:10	6:1 to 1:4
Compound 2	1-[[(2*S*,3*R*)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-2-oxiranyl]methyl]-5-(2-propen-1-ylthio)-1*H*-1,2,4-triazole (b1c)	36:1 to 1:30	12:1 to 1:10	6:1 to 1:4
Compound 2	α-[3-(4-chloro-2-fluorophenyl)-5-(2,4-difluorophenyl)-4-isoxazolyl]-3-pyridine-methanol (b2a)	36:1 to 1:30	12:1 to 1:10	6:1 to 1:4
Compound 2	(α*S*)-[3-(4-chloro-2-fluorophenyl)-5-(2,4-difluorophenyl)-4-isoxazolyl]-3-pyridine-methanol (b2b)	36:1 to 1:30	12:1 to 1:10	6:1 to 1:4
Compound 2	(α*R*)-[3-(4-chloro-2-fluorophenyl)-5-(2,4-difluorophenyl)-4-isoxazolyl]-3-pyridine-methanol (b2c)	36:1 to 1:30	12:1 to 1:10	6:1 to 1:4
Compound 2	3-[2-[3-(4-chloro-2-fluorophenyl)-5-(2,4-difluorophenyl)-4-isoxazolyl]-2-oxiranyl]-pyridine (b2d)	36:1 to 1:30	12:1 to 1:10	6:1 to 1:4
Compound 2	2-ethyl-3,7-dimethyl-6-[4-(trifluoromethoxy)-phenoxy]-4-quinolinyl methyl carbonate (b3)	36:1 to 1:30	12:1 to 1:10	6:1 to 1:4
Compound 2	α-[2-chloro-4-(4-chlorophenoxy)phenyl]-α-ethyl-1*H*-1,2,4-triazole-1-ethanol (b4a)	36:1 to 1:30	12:1 to 1:10	6:1 to 1:4
Compound 2	α-[2-chloro-4-(4-chlorophenoxy)phenyl]-α-(1*H*-1,2,4-triazol-1-ylmethyl)-1*H*-1,2,4-triazole-1-ethanol (b5)	36:1 to 1:30	12:1 to 1:10	6:1 to 1:4
Compound 2	*N*-cyclopropyl-3-(difluoromethyl)-5-fluoro-1-methyl-*N*-[[(2-(1-methylethyl)phenyl]-methyl]-1*H*-pyrazole-4-carboxamide (b6a)	20:1 to 1:20	5:1 to 1:5	3:1 to 1:3
Compound 2	*N*-[[5-chloro-2-(trifluoromethyl)phenyl]-methyl]-*N*-cyclopropyl-3-(difluoromethyl)-5-fluoro-1-methyl-1*H*-pyrazole-4-carboxamide (b6b)	20:1 to 1:20	5:1 to 1:5	3:1 to 1:3
Compound 2	*N*-[[2-chloro-6-(trifluoromethyl)phenyl]-methyl]-*N*-cyclopropyl-3-(difluoromethyl)-5-fluoro-1-methyl-1*H*-pyrazole-4-carboxamide (b6c)	20:1 to 1:20	5:1 to 1:5	3:1 to 1:3

Component (a)	Component (b)	Typical Weight Ratio	More Typical Weight Ratio	Most Typical Weight Ratio
Compound 2	*N*-[[3-chloro-2-fluoro-6-(trifluoromethyl)-phenyl]methyl]-*N*-cyclopropyl-3-(difluoro-methyl)-5-fluoro-1-methyl-1*H*-pyrazole-4-carboxamide (b6d)	20:1 to 1:20	5:1 to 1:5	3:1 to 1:3
Compound 2	*N*-cyclopropyl-3-(difluoromethyl)-5-fluoro-1-methyl-*N*-[[5-methyl-2-(trifluoromethyl)-phenyl]methyl]-1*H*-pyrazole-4-carboxamide (b6e)	20:1 to 1:20	5:1 to 1:5	3:1 to 1:3
Compound 2	*N*-[[5-chloro-2-(1-methylethyl)phenyl]-methyl]-*N*-cyclopropyl-3-(difluoromethyl)-5-fluoro-1-methyl-1*H*-pyrazole-4-carboxamide (b6f)	20:1 to 1:20	5:1 to 1:5	3:1 to 1:3
Compound 2	*N*-cyclopropyl-*N*-[(2-cyclopropylphenyl)-methyl]-3-(difluoromethyl)-5-fluoro-1-methyl-1*H*-pyrazole-4-carboxamide (b6g)	20:1 to 1:20	5:1 to 1:5	3:1 to 1:3
Compound 2	*N*-cyclopropyl-3-(difluoromethyl)-*N*-[(2-ethyl-4,5-dimethylphenyl)methyl]-5-fluoro-1-methyl-1*H*-pyrazole-4-carboxamide (b6h)	20:1 to 1:20	5:1 to 1:5	3:1 to 1:3
Compound 2	*N*-cyclopropyl-3-(difluoromethyl)-5-fluoro-*N*-[[5-fluoro-2-(1-methylethyl)phenyl]methyl-1-methyl-1*H*-pyrazole-4-carboxamide (b6i)	20:1 to 1:20	5:1 to 1:5	3:1 to 1:3
Compound 2	1,1-dimethylethyl in the 2-position, is (b6j) *N*-cyclopropyl-3-(difluoromethyl)-*N*-[[2-(1,1-dimethylethyl)phenyl]methyl]-5-fluoro-1-methyl-1*H*-pyrazole-4-carboxamide (b6j)	20:1 to 1:20	5:1 to 1:5	3:1 to 1:3
Compound 2	*N*-cyclopropyl-3-(difluoromethyl)-*N*-[(2-ethyl-5-fluorophenyl)methyl]-5-fluoro-1-methyl-1*H*-pyrazole-4-carboxamide (b6k)	20:1 to 1:20	5:1 to 1:5	3:1 to 1:3
Compound 2	*N*-cyclopropyl-*N*-[(2-cyclopropyl-5-fluoro-phenyl)methyl]-3-(difluoromethyl)-5-fluoro-1-methyl-1*H*-pyrazole-4-carboxamide (b6l)	20:1 to 1:20	5:1 to 1:5	3:1 to 1:3
Compound 2	*N*-[(5-chloro-2-ethylphenyl)methyl]-*N*-cyclopropyl-3-(difluoromethyl)-5-fluoro-1-methyl-1*H*-pyrazole-4-carboxamide (b6m)	20:1 to 1:20	5:1 to 1:5	3:1 to 1:3
Compound 2	*N*-cyclopropyl-3-(difluoromethyl)-5-fluoro-*N*-[[2-fluoro-6-(1-methylethyl)phenyl]methyl]-1-methyl-1*H*-pyrazole-4-carboxamide (b6n)	20:1 to 1:20	5:1 to 1:5	3:1 to 1:3

Component (a)	Component (b)	Typical Weight Ratio	More Typical Weight Ratio	Most Typical Weight Ratio
Compound 2	*N*-cyclopropyl-3-(difluoromethyl)-5-fluoro-*N*-[[5-fluoro-2-(1-methylethyl)phenyl]methyl]-1-methyl-1*H*-pyrazole-4-carboxamide (b6o)	20:1 to 1:20	5:1 to 1:5	3:1 to 1:3
Compound 2	*N*-[(2-cyclopentyl-5-fluorophenyl)methyl]-*N*-cyclopropyl-3-(difluoromethyl)-5-fluoro-1-methyl-1*H*-pyrazole-4-carboxamide (b6p)	20:1 to 1:20	5:1 to 1:5	3:1 to 1:3
Compound 2	*N*'-[2,5-dimethyl-4-[[3-(1,1,2,2-tetrafluoro-ethoxy)phenyl]thio]phenyl]-*N*-ethyl-*N*-methylmethanimidamide (b7a)	20:1 to 1:20	5:1 to 1:5	3:1 to 1:3
Compound 2	*N*'-[4-[[4-chloro-3-(1,1,2,2-tetrafluoro-ethoxy)phenyl]thio]-2,5-dimethylphenyl]-*N*-ethyl-*N*-methylmethanimidamide (b7b)	20:1 to 1:20	5:1 to 1:5	3:1 to 1:3
Compound 2	*N*-ethyl-*N*'-[4-[[4-fluoro-3-(1,1,2,2-tetra-fluoroethoxy)phenyl]thio]-2,5-dimethyl-phenyl]-*N*-methylmethanimidamide (b7c)	20:1 to 1:20	5:1 to 1:5	3:1 to 1:3
Compound 2	*N*'-[2,5-dimethyl-4-[3-[(1,1,2,2-tetrafluoro-ethyl)thio]phenoxy]phenyl]-*N*-ethyl-*N*-methylmethanimidamide (b7d)	20:1 to 1:20	5:1 to 1:5	3:1 to 1:3
Compound 2	*N*'-[2,5-dimethyl-4-[4-chloro-3-[(1,1,2,2-tetrafluoroethyl)thio]phenoxy]phenyl]-*N*-ethyl-*N*-methylmethanimidamide (b7e)	20:1 to 1:20	5:1 to 1:5	3:1 to 1:3
Compound 2	*N*'-[2,5-dimethyl-4-[4-fluoro-3-[(1,1,2,2-tetrafluoroethyl)thio]phenoxy]phenyl]-*N*-ethyl-*N*-methylmethanimidamide (b7f)	20:1 to 1:20	5:1 to 1:5	3:1 to 1:3
Compound 2	*N*'-[2,5-dimethyl-4-[[3-[(1,1,2,2-tetrafluoroethyl)thio]phenyl]thio]phenyl]-*N*-ethyl-*N*-methylmethanimidamide (b7g)	20:1 to 1:20	5:1 to 1:5	3:1 to 1:3
Compound 2	2-[3,5-bis(difluoromethyl)-1*H*-pyrazol-1-yl]-1-[4-[4-[4,5-dihydro-5-[2-[(methylsulfonyl) oxy]phenyl]-3-isoxazolyl]-2-thiazolyl]-1-piperidinyl]ethanone (b8a)	400:1 to 1:1	100:1 to 4:1	50:1 to 8:1
Compound 2	2-[3,5-bis(difluoromethyl)-1*H*-pyrazol-1-yl]-1-[4-[4-[5-[2-fluoro-6-[(methylsulfonyl)-oxy]phenyl]-4,5-dihydro-3-isoxazolyl]-2-thiazolyl]-1-piperidinyl]ethanone (b8b)	400:1 to 1:1	100:1 to 4:1	50:1 to 8:1

Component (a)	Component (b)	Typical Weight Ratio	More Typical Weight Ratio	Most Typical Weight Ratio
Compound 2	2-[3,5-bis(difluoromethyl)-1*H*-pyrazol-1-yl]-1-[4-[4-[5-[2-chloro-6-[(methylsulfonyl)-oxy]phenyl]-4,5-dihydro-3-isoxazolyl]-2-thiazolyl]-1-piperidinyl]ethanone (b8c)	400:1 to 1:1	100:1 to 4:1	50:1 to 8:1
Compound 2	2-fluoro-6-[(8-fluoro-2-methyl-3-quinolinyl)-oxy]-α,α-dimethylbenzenemethanol (b9a)	40:1 to 1:10	10:1 to 1:3	5:1 to 1:2
Compound 2	2-[(7,8-difluoro-2-methyl-3-quinolinyl)oxy]-6-fluoro-α,α-dimethylbenzenemethanol (b9b)	40:1 to 1:10	10:1 to 1:3	5:1 to 1:2
Compound 2	9-fluoro-2,3-dihydro-2,2-dimethyl-5-(3-quinolinyl)-1,4-benzoxazepine (b10)	40:1 to 1:10	10:1 to 1:3	5:1 to 1:2
Compound 2	(1*R*,2*S*,5*S*)-*rel*-2-(chloromethyl)-5-[(4-chlorophenyl)methyl]-2-methyl-1-(1*H*-1,2,4-triazol-1-ylmethyl)cyclopentanol (b11a)	40:1 to 1:10	10:1 to 1:3	5:1 to 1:2
Compound 2	1-[[4-[(4-chlorophenyl)methyl]-1-methyl-6-oxabicyclo[3.2.0]hept-5-yl]methyl]-1*H*-1,2,4-triazole (b11b)	40:1 to 1:10	10:1 to 1:3	5:1 to 1:2
Compound 2	3-[(4-chlorophenyl)methyl]-2-hydroxy-2-(1*H*-1,2,4-triazol-1-ylmethyl)-1,1-cyclopentane-dimethanol (b11c)	40:1 to 1:10	10:1 to 1:3	5:1 to 1:2
Compound 2	3-(difluoromethyl)-*N*-(7-fluoro-2,3-dihydro-1,1,3-trimethyl-1*H*-inden-4-yl)-1-methyl-1*H*-pyrazole-4-carboxamide (b12)	20:1 to 1:20	5:1 to 1:5	3:1 to 1:3
Compound 2	3-[(3,4-dichloro-5-isothiazolyl)methoxy]-1,2-benzisothiazole, 1,1-dioxide (b13)	20:1 to 1:20	5:1 to 1:5	3:1 to 1:3
Compound 2	3-(difluoromethyl)-*N*-methoxy-1-methyl-*N*-[1-methyl-2-(2,4,6-trichlorophenyl)ethyl]-1*H*-pyrazole-4-carboxamide (b14)	20:1 to 1:20	5:1 to 1:5	3:1 to 1:3

Tables A2 through A12 are each 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. Thus, for example, in Table A2 the entries below the "Component (a)" column heading all recite "Compound 3", and the first line below the column headings in Table A2 specifically discloses combination of Compound 3 with 1-[[(2*S*,3*R*)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-2-oxiranyl]methyl]-1*H*-1,2,4-triazole (b1a). Tables A3 through A12 are constructed similarly.

Table Number	Component (a) Column Entry	Table Number	Component (a) Column Entry
A2	Compound 3	A8	Compound 11
A3	Compound 4	A9	Compound 15
A4	Compound 5	A10	Compound 16
A5	Compound 7	A11	Compound 17
A6	Compound 8	A12	Compound 34
A7	Compound 9		

Specific mixtures are listed in Tables B1 through B12. (Compound numbers refer to compounds in Index Table A, and Component (b) is identified in Table A1.) In Table B1, each line below the column headings "Component (a)" and "Component (b)" specifically discloses a mixture of Component (a), which is Compound 2, with a Component (b) fungicidal compound. The entries under the heading "Illustrative Ratios" disclose seven specific weight ratios of Component (a) relative to Component (b) for the disclosed mixture. For example, the first line of Table B1 discloses a mixture of Compound 2 with 1-[[(2*S*,3*R*)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-2-oxiranyl]methyl]-1*H*-1,2,4-triazole (b1a) and lists weight ratios of Compound 2 relative to Component (b1a) of 1:15, 1:7, 1:3, 1:1, 4:1, 9:1 or 18:1. Table B1 thus supplements with specific ratios the general ranges of ratios for the combinations disclosed in Table A1.

Table B1

Component (a)	Component (b)	Illustrative Ratios						
Compound 2	b1a	1:15	1:7	1:3	1:1	4:1	9:1	18:1
Compound 2	b1b	1:15	1:7	1:3	1:1	4:1	9:1	18:1
Compound 2	b1c	1:15	1:7	1:3	1:1	4:1	9:1	18:1
Compound 2	b2a	1:15	1:7	1:3	1:1	4:1	9:1	18:1
Compound 2	b2b	1:15	1:7	1:3	1:1	4:1	9:1	18:1
Compound 2	b2c	1:15	1:7	1:3	1:1	4:1	9:1	18:1
Compound 2	b2d	1:15	1:7	1:3	1:1	4:1	9:1	18:1
Compound 2	b3	1:15	1:7	1:3	1:1	4:1	9:1	18:1
Compound 2	b4a	1:15	1:7	1:3	1:1	4:1	9:1	18:1
Compound 2	b5	1:15	1:7	1:3	1:1	4:1	9:1	18:1
Compound 2	b6a	1:10	1:5	1:3	1:1	3:1	5:1	10:1
Compound 2	b6b	1:10	1:5	1:3	1:1	3:1	5:1	10:1
Compound 2	b6c	1:10	1:5	1:3	1:1	3:1	5:1	10:1
Compound 2	b6d	1:10	1:5	1:3	1:1	3:1	5:1	10:1
Compound 2	b6e	1:10	1:5	1:3	1:1	3:1	5:1	10:1
Compound 2	b6f	1:10	1:5	1:3	1:1	3:1	5:1	10:1
Compound 2	b6g	1:10	1:5	1:3	1:1	3:1	5:1	10:1

Component (a)	Component (b)	Illustrative Ratios						
Compound 2	b6h	1:10	1:5	1:3	1:1	3:1	5:1	10:1
Compound 2	b6i	1:10	1:5	1:3	1:1	3:1	5:1	10:1
Compound 2	b6j	1:10	1:5	1:3	1:1	3:1	5:1	10:1
Compound 2	b6k	1:10	1:5	1:3	1:1	3:1	5:1	10:1
Compound 2	b6l	1:10	1:5	1:3	1:1	3:1	5:1	10:1
Compound 2	b6m	1:10	1:5	1:3	1:1	3:1	5:1	10:1
Compound 2	b6o	1:10	1:5	1:3	1:1	3:1	5:1	10:1
Compound 2	b6p	1:10	1:5	1:3	1:1	3:1	5:1	10:1
Compound 2	b7a	1:10	1:5	1:3	1:1	3:1	5:1	10:1
Compound 2	b7b	1:10	1:5	1:3	1:1	3:1	5:1	10:1
Compound 2	b7c	1:10	1:5	1:3	1:1	3:1	5:1	10:1
Compound 2	b7d	1:10	1:5	1:3	1:1	3:1	5:1	10:1
Compound 2	b7e	1:10	1:5	1:3	1:1	3:1	5:1	10:1
Compound 2	b7f	1:10	1:5	1:3	1:1	3:1	5:1	10:1
Compound 2	b7g	1:10	1:5	1:3	1:1	3:1	5:1	10:1
Compound 2	b8a	2:1	4:1	8:1	20:1	50:1	100:1	200:1
Compound 2	b8b	2:1	4:1	8:1	20:1	50:1	100:1	200:1
Compound 2	b8c	2:1	4:1	8:1	20:1	50:1	100:1	200:1
Compound 2	b9a	1:5	1:3	1:2	2:1	5:1	10:1	20:1
Compound 2	b9b	1:5	1:3	1:2	2:1	5:1	10:1	20:1
Compound 2	b10	1:5	1:3	1:2	2:1	5:1	10:1	20:1
Compound 2	b11a	1:5	1:3	1:2	2:1	5:1	10:1	20:1
Compound 2	b11b	1:5	1:3	1:2	2:1	5:1	10:1	20:1
Compound 2	b11c	1:5	1:3	1:2	2:1	5:1	10:1	20:1
Compound 2	b12	1:10	1:5	1:3	1:1	3:1	5:1	10:1
Compound 2	b13	1:10	1:5	1:3	1:1	3:1	5:1	10:1
Compound 2	b14	1:10	1:5	1:3	1:1	3:1	5:1	10:1

Tables B2 through B12 are each constructed the same as Table B1 above except that entries below the "Component (a)" column heading are replaced with the respective Component (a) Column Entry shown below. Thus, for example, in Table B2 the entries below the "Component (a)" column heading all recite "Compound 3", and the first line below the column headings in Table A2 specifically discloses a mixture of Compound 3 with 1-[[(2*S*,3*R*)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-2-oxiranyl]methyl]-1*H*-1,2,4-triazole (b1a). Tables B3 through B12 are constructed similarly. Tables B2 through B12 thus supplement with specific ratios the general ranges of ratios for the combinations disclosed in Tables A2 through A12, respectively.

Table Number	Component (a) Column Entry	Table Number	Component (a) Column Entry
B2	Compound 3	B8	Compound 11
B3	Compound 4	B9	Compound 15
B4	Compound 5	B10	Compound 16
B5	Compound 7	B11	Compound 17
B6	Compound 8	B12	Compound 34
B7	Compound 9		

As already noted, the present invention includes embodiments wherein the composition comprising components (a) and (b) further comprises as component (c) one or more biologically active compounds or agents. Therefore embodiments of the present composition include combinations of the mixtures disclosed in Tables A1 through A12 and B1 through B12 with additional biological compounds or agents. Of note as additional biological compounds or agents are fungicidal compounds selected from (c1) through (c46) already described. The weight ratio of component (c) to component (a) is generally between about 1:3000 and about 3000:1, more typically between about 1:500 and about 500:1, between about 125:1 and about 1:125, and between about 25:1 and 1:25 and most typically between about 5:1 and about 1:5. One skilled in the art can easily determine through simple experimentation the weight ratios and application rates of fungicidal compounds necessary for the desired spectrum of plant disease protection and control.

Table C lists typical, more typical, and most typical weight ratios for specific component (c) fungicides relative to component (a) in compositions comprising components (a) and (c) either before (i.e. without component (b)) or after inclusion of component (b).

Table C

Component (c)	Typical Weight Ratio	More Typical Weight Ratio	Most Typical Weight Ratio	Illustrative Weight Ratio
acibenzolar-*S*-methyl	2:1 to 1:180	1:1 to 1:60	1:1 to 1:18	1:4
aldimorph	30:1 to 1:3	10:1 to 1:1	7:1 to 1:1	3:1
ametoctradin	9:1 to 1:18	3:1 to 1:6	3:1 to 1:3	1:1
amisulbrom	6:1 to 1:18	2:1 to 1:6	1:1 to 1:6	1:2
anilazine	90:1 to 2:1	30:1 to 4:1	22:1 to 4:1	8:1
azaconazole	7:1 to 1:18	2:1 to 1:6	2:1 to 1:4	1:2
azoxystrobin	9:1 to 1:12	3:1 to 1:4	3:1 to 1:3	1:1
benalaxyl	4:1 to 1:18	1:1 to 1:6	1:1 to 1:6	1:2
benalaxyl-M	4:1 to 1:36	1:1 to 1:12	1:1 to 1:8	1:3
benodanil	18:1 to 1:6	6:1 to 1:2	4:1 to 1:2	2:1

Component (c)	Typical Weight Ratio	More Typical Weight Ratio	Most Typical Weight Ratio	Illustrative Weight Ratio
benomyl	45:1 to 1:4	15:1 to 1:1	11:1 to 1:1	4:1
benthiavalicarb or benthiavalicarb-isopropyl	2:1 to 1:36	1:1 to 1:12	1:1 to 1:12	1:4
bethoxazin	150:1 to 1:36	50:1 to 1:12	15:1 to 2:1	5:1
binapacryl	150:1 to 1:36	50:1 to 1:12	15:1 to 2:1	5:1
biphenyl	150:1 to 1:36	50:1 to 1:12	15:1 to 2:1	5:1
bitertanol	15:1 to 1:5	5:1 to 1:2	3:1 to 1:2	1:1
bixafen	12:1 to 1:9	4:1 to 1:3	2:1 to 1:3	1:1
blasticidin-S	3:1 to 1:90	1:1 to 1:30	1:4 to 1:30	1:12
boscalid	18:1 to 1:6	6:1 to 1:2	4:1 to 1:2	2:1
bromuconazole	15:1 to 1:9	5:1 to 1:3	3:1 to 1:3	1:1
bupirimate	3:1 to 1:90	1:1 to 1:30	1:3 to 1:30	1:10
captafol	90:1 to 1:4	30:1 to 1:2	15:1 to 2:1	5:1
captan	90:1 to 1:4	30:1 to 1:2	15:1 to 2:1	5:1
carbendazim	45:1 to 1:4	15:1 to 1:2	11:1 to 2:1	4:1
carboxin	18:1 to 1:6	6:1 to 1:2	4:1 to 1:2	2:1
carpropamid	15:1 to 1:9	5:1 to 1:3	3:1 to 1:3	1:1
chloroneb	300:1 to 2:1	100:1 to 4:1	100:1 to 14:1	35:1
chlorothalonil	90:1 to 1:4	30:1 to 1:2	15:1 to 2:1	5:1
chlozolinate	45:1 to 1:2	15:1 to 2:1	11:1 to 2:1	4:1
clotrimazole	15:1 to 1:9	5:1 to 1:3	3:1 to 1:3	1:1
copper salts such as Bordeaux mixture (tribasic copper sulfate), copper oxychloride, copper sulfate and copper hydroxide	450:1 to 1:1	150:1 to 4:1	45:1 to 5:1	15:1
cyazofamid	4:1 to 1:18	1:1 to 1:6	1:1 to 1:6	1:2
cyflufenamid	1:1 to 1:90	1:2 to 1:30	1:2 to 1:24	1:6
cymoxanil	6:1 to 1:18	2:1 to 1:6	1:1 to 1:5	1:2
cyproconazole	4:1 to 1:18	1:1 to 1:6	1:1 to 1:6	1:2
cyprodinil	22:1 to 1:9	7:1 to 1:3	4:1 to 1:2	2:1
dichlofluanid	150:1 to 1:36	50:1 to 1:12	15:1 to 2:1	5:1
diclocymet	150:1 to 1:36	50:1 to 1:12	15:1 to 2:1	5:1
diclomezine	15:1 to 1:9	5:1 to 1:3	3:1 to 1:3	1:1
dicloran	150:1 to 1:36	50:1 to 1:12	15:1 to 2:1	5:1

Component (c)	Typical Weight Ratio	More Typical Weight Ratio	Most Typical Weight Ratio	Illustrative Weight Ratio
diethofencarb	22:1 to 1:9	7:1 to 1:3	7:1 to 1:2	2:1
difenoconazole	4:1 to 1:36	1:1 to 1:12	1:1 to 1:12	1:3
diflumetorim	150:1 to 1:36	50:1 to 1:12	15:1 to 2:1	5:1
dimethirimol	3:1 to 1:90	1:1 to 1:30	1:3 to 1:30	1:8
dimethomorph	9:1 to 1:6	3:1 to 1:2	3:1 to 1:2	1:1
dimoxystrobin	9:1 to 1:18	3:1 to 1:6	2:1 to 1:4	1:1
diniconazole	3:1 to 1:36	1:1 to 1:12	1:1 to 1:8	1:3
diniconazole M	3:1 to 1:90	1:1 to 1:30	1:1 to 1:12	1:3
dinocap	7:1 to 1:9	2:1 to 1:3	2:1 to 1:3	1:1
dithianon	15:1 to 1:4	5:1 to 1:2	5:1 to 1:2	2:1
dodemorph	30:1 to 1:3	10:1 to 1:1	7:1 to 1:1	3:1
dodine	30:1 to 1:2	10:1 to 2:1	10:1 to 2:1	4:1
edifenphos	30:1 to 1:9	10:1 to 1:3	3:1 to 1:3	1:1
enoxastrobin	9:1 to 1:18	3:1 to 1:6	2:1 to 1:4	1:1
epoxiconazole	3:1 to 1:36	1:1 to 1:12	1:1 to 1:7	1:3
etaconazole	3:1 to 1:36	1:1 to 1:12	1:1 to 1:7	1:3
ethaboxam	7:1 to 1:9	2:1 to 1:3	2:1 to 1:3	1:1
ethirimol	30:1 to 1:3	10:1 to 1:1	7:1 to 1:1	3:1
etridiazole	30:1 to 1:9	10:1 to 1:3	7:1 to 1:2	2:1
famoxadone	9:1 to 1:18	3:1 to 1:6	2:1 to 1:4	1:1
fenamidone	6:1 to 1:18	2:1 to 1:6	2:1 to 1:4	1:1
fenarimol	3:1 to 1:90	1:1 to 1:30	1:2 to 1:24	1:7
fenbuconazole	3:1 to 1:30	1:1 to 1:10	1:1 to 1:10	1:3
fenfuram	18:1 to 1:6	6:1 to 1:2	4:1 to 1:2	1:1
fenhexamid	30:1 to 1:2	10:1 to 2:1	10:1 to 2:1	4:1
fenoxanil	150:1 to 1:36	50:1 to 1:12	15:1 to 1:1	4:1
fenpiclonil	75:1 to 1:9	25:1 to 1:3	15:1 to 2:1	5:1
fenpropidin	30:1 to 1:3	10:1 to 1:1	7:1 to 1:1	2:1
fenpropimorph	30:1 to 1:3	10:1 to 1:1	7:1 to 1:1	2:1
fenpyrazamine	100:1 to 1:100	10:1 to 1:10	3:1 to 1:3	1:1
fentin salt such as the acetate, chloride or hydroxide	15:1 to 1:9	5:1 to 1:3	3:1 to 1:3	1:1

Component (c)	Typical Weight Ratio	More Typical Weight Ratio	Most Typical Weight Ratio	Illustrative Weight Ratio
ferbam	300:1 to 1:2	100:1 to 2:1	30:1 to 4:1	10:1
ferimzone	30:1 to 1:5	10:1 to 1:2	7:1 to 1:2	2:1
fluazinam	22:1 to 1:5	7:1 to 1:2	3:1 to 1:2	1:1
fludioxonil	7:1 to 1:12	2:1 to 1:4	2:1 to 1:4	1:1
flumetover	9:1 to 1:6	3:1 to 1:2	3:1 to 1:2	1:1
flumorph	9:1 to 1:18	3:1 to 1:6	3:1 to 1:3	1:1
fluopicolide	3:1 to 1:18	1:1 to 1:6	1:1 to 1:6	1:2
fluopyram	15:1 to 1:9	5:1 to 1:3	3:1 to 1:3	1:1
fluoromide	150:1 to 2:1	50:1 to 4:1	37:1 to 5:1	14:1
fluoxastrobin	4:1 to 1:18	1:1 to 1:6	1:1 to 1:6	1:2
fluquinconazole	4:1 to 1:12	1:1 to 1:4	1:1 to 1:4	1:2
flusilazole	15:1 to 1:9	5:1 to 1:3	3:1 to 1:3	1:1
flusulfamide	90:1 to 1:2	30:1 to 2:1	15:1 to 2:1	5:1
flutianil	7:1 to 1:36	2:1 to 1:12	1:1 to 1:6	1:2
flutolanil	18:1 to 1:6	6:1 to 1:2	4:1 to 1:2	1:1
flutriafol	4:1 to 1:12	1:1 to 1:4	1:1 to 1:4	1:2
fluxapyroxad	12:1 to 1:9	4:1 to 1:3	2:1 to 1:3	1:1
folpet	90:1 to 1:4	30:1 to 1:2	15:1 to 2:1	5:1
fosetyl-aluminum	225:1 to 2:1	75:1 to 5:1	30:1 to 5:1	12:1
fuberidazole	45:1 to 1:4	15:1 to 1:2	11:1 to 2:1	4:1
furalaxyl	15:1 to 1:45	5:1 to 1:15	1:1 to 1:6	1:2
furametpyr	150:1 to 1:36	50:1 to 1:12	15:1 to 2:1	5:1
guazatine or iminoctadine	150:1 to 1:36	50:1 to 1:12	15:1 to 2:1	5:1
hexaconazole	15:1 to 1:36	5:1 to 1:12	1:1 to 1:5	1:2
hymexazol	225:1 to 2:1	75:1 to 4:1	75:1 to 9:1	25:1
imazalil	7:1 to 1:18	2:1 to 1:6	1:1 to 1:5	1:2
imibenconazole	15:1 to 1:36	5:1 to 1:12	1:1 to 1:5	1:2
iodocarb	150:1 to 1:36	50:1 to 1:12	15:1 to 2:1	4:1
ipconazole	15:1 to 1:36	5:1 to 1:12	1:1 to 1:5	1:2
iprobenfos	150:1 to 1:36	50:1 to 1:12	15:1 to 2:1	5:1
iprodione	120:1 to 1:2	40:1 to 2:1	15:1 to 2:1	5:1
iprovalicarb	9:1 to 1:9	3:1 to 1:3	2:1 to 1:3	1:1
isoprothiolane	150:1 to 2:1	50:1 to 4:1	45:1 to 5:1	15:1

Component (c)	Typical Weight Ratio	More Typical Weight Ratio	Most Typical Weight Ratio	Illustrative Weight Ratio
isopyrazam	12:1 to 1:9	4:1 to 1:3	2:1 to 1:3	1:1
isotianil	12:1 to 1:9	4:1 to 1:3	2:1 to 1:3	1:1
kasugamycin	7:1 to 1:90	2:1 to 1:30	1:2 to 1:24	1:7
kresoxim-methyl	7:1 to 1:18	2:1 to 1:6	2:1 to 1:4	1:1
mancozeb	180:1 to 1:3	60:1 to 2:1	22:1 to 3:1	7:1
mandipropamid	6:1 to 1:18	2:1 to 1:6	2:1 to 1:4	1:1
maneb	180:1 to 1:3	60:1 to 2:1	22:1 to 3:1	7:1
mepanipyrim	18:1 to 1:3	6:1 to 1:1	6:1 to 1:1	2:1
mepronil	7:1 to 1:36	2:1 to 1:12	1:1 to 1:6	1:2
meptyldinocap	7:1 to 1:9	2:1 to 1:3	2:1 to 1:3	1:1
metalaxyl	15:1 to 1:45	5:1 to 1:15	1:1 to 1:6	1:2
metalaxyl-M	7:1 to 1:90	2:1 to 1:30	1:1 to 1:12	1:4
metconazole	3:1 to 1:18	1:1 to 1:6	1:1 to 1:6	1:2
methasulfocarb	150:1 to 1:36	50:1 to 1:12	15:1 to 1:1	5:1
metiram	150:1 to 1:36	50:1 to 1:12	15:1 to 1:1	5:1
metominostrobin	9:1 to 1:12	3:1 to 1:4	3:1 to 1:3	1:1
metrafenone	6:1 to 1:12	2:1 to 1:4	2:1 to 1:4	1:1
myclobutanil	5:1 to 1:26	1:1 to 1:9	1:1 to 1:8	1:3
naftifine	150:1 to 1:36	50:1 to 1:12	15:1 to 2:1	5:1
neo-asozin (ferric methanearsonate)	150:1 to 1:36	50:1 to 1:12	15:1 to 2:1	5:1
nuarimol	15:1 to 1:9	5:1 to 1:3	3:1 to 1:3	1:1
octhilinone	150:1 to 1:36	50:1 to 1:12	15:1 to 1:1	4:1
ofurace	15:1 to 1:45	5:1 to 1:15	1:1 to 1:6	1:2
orysastrobin	9:1 to 1:12	3:1 to 1:4	3:1 to 1:3	1:1
oxadixyl	15:1 to 1:45	5:1 to 1:15	1:1 to 1:6	1:2
oxolinic acid	30:1 to 1:9	10:1 to 1:3	7:1 to 1:2	2:1
oxpoconazole	15:1 to 1:36	5:1 to 1:12	1:1 to 1:5	1:2
oxycarboxin	18:1 to 1:6	6:1 to 1:2	4:1 to 1:2	1:1
oxytetracycline	15:1 to 1:9	5:1 to 1:3	3:1 to 1:3	1:1
pefurazoate	150:1 to 1:36	50:1 to 1:12	15:1 to 2:1	5:1
penconazole	1:1 to 1:45	1:2 to 1:15	1:2 to 1:15	1:6
pencycuron	150:1 to 1:2	50:1 to 2:1	11:1 to 2:1	4:1
penflufen	12:1 to 1:9	4:1 to 1:3	2:1 to 1:3	1:1

Component (c)	Typical Weight Ratio	More Typical Weight Ratio	Most Typical Weight Ratio	Illustrative Weight Ratio
penthiopyrad	12:1 to 1:9	4:1 to 1:3	2:1 to 1:3	1:1
phosphorous acid and salts thereof	150:1 to 1:36	50:1 to 1:12	15:1 to 2:1	6:1
phthalide	150:1 to 1:36	50:1 to 1:12	15:1 to 2:1	6:1
picoxystrobin	7:1 to 1:18	2:1 to 1:6	1:1 to 1:5	1:2
piperalin	15:1 to 1:9	5:1 to 1:3	3:1 to 1:3	1:1
polyoxin	15:1 to 1:9	5:1 to 1:3	3:1 to 1:3	1:1
probenazole	15:1 to 1:9	5:1 to 1:3	3:1 to 1:3	1:1
prochloraz	22:1 to 1:4	7:1 to 1:1	7:1 to 1:2	2:1
procymidone	45:1 to 1:3	15:1 to 1:1	11:1 to 2:1	4:1
propamocarb or propamocarb-hydrochloride	30:1 to 1:2	10:1 to 2:1	10:1 to 2:1	4:1
propiconazole	4:1 to 1:18	1:1 to 1:6	1:1 to 1:5	1:2
propineb	45:1 to 1:2	15:1 to 2:1	11:1 to 2:1	4:1
proquinazid	3:1 to 1:36	1:1 to 1:12	1:1 to 1:12	1:3
prothiocarb	9:1 to 1:18	3:1 to 1:6	3:1 to 1:3	1:1
prothioconazole	6:1 to 1:18	2:1 to 1:6	1:1 to 1:5	1:2
pyraclostrobin	9:1 to 1:18	3:1 to 1:6	2:1 to 1:4	1:1
pyrametostrobin	9:1 to 1:18	3:1 to 1:6	2:1 to 1:4	1:1
pyraoxystrobin	9:1 to 1:18	3:1 to 1:6	2:1 to 1:4	1:1
pyrazophos	150:1 to 1:36	50:1 to 1:12	15:1 to 1:1	4:1
pyribencarb	15:1 to 1:6	5:1 to 1:2	4:1 to 1:2	1:1
pyrifenox	15:1 to 1:9	5:1 to 1:3	3:1 to 1:3	1:1
pyrimethanil	30:1 to 1:6	10:1 to 1:2	3:1 to 1:2	1:1
pyriofenone	6:1 to 1:12	2:1 to 1:4	2:1 to 1:4	1:1
pyroquilon	15:1 to 1:9	5:1 to 1:3	3:1 to 1:3	1:1
pyrrolnitrin	150:1 to 1:36	50:1 to 1:12	15:1 to 2:1	5:1
quinconazole	4:1 to 1:12	1:1 to 1:4	1:1 to 1:4	1:2
quinomethionate	150:1 to 1:36	50:1 to 1:12	15:1 to 2:1	5:1
quinoxyfen	4:1 to 1:18	1:1 to 1:6	1:1 to 1:6	1:2
quintozene	150:1 to 1:36	50:1 to 1:12	15:1 to 2:1	5:1
silthiofam	7:1 to 1:18	2:1 to 1:6	2:1 to 1:4	1:1
simeconazole	15:1 to 1:36	5:1 to 1:12	1:1 to 1:5	1:2
spiroxamine	22:1 to 1:4	7:1 to 1:2	5:1 to 1:2	2:1
streptomycin	15:1 to 1:9	5:1 to 1:3	3:1 to 1:3	1:1

Component (c)	Typical Weight Ratio	More Typical Weight Ratio	Most Typical Weight Ratio	Illustrative Weight Ratio
sulfur	300:1 to 3:1	100:1 to 9:1	75:1 to 9:1	25:1
tebuconazole	7:1 to 1:18	2:1 to 1:6	1:1 to 1:5	1:2
tebufloquin	100:1 to 1:100	10:1 to 1:10	3:1 to 1:3	1:1
tecloftalam	150:1 to 1:36	50:1 to 1:12	15:1 to 2:1	5:1
tecnazene	150:1 to 1:36	50:1 to 1:12	15:1 to 2:1	5:1
terbinafine	150:1 to 1:36	50:1 to 1:12	15:1 to 2:1	5:1
tetraconazole	15:1 to 1:36	5:1 to 1:12	1:1 to 1:5	1:2
thiabendazole	45:1 to 1:4	15:1 to 1:2	11:1 to 2:1	4:1
thifluzamide	15:1 to 1:9	5:1 to 1:3	3:1 to 1:3	1:1
thiophanate	45:1 to 1:3	15:1 to 2:1	11:1 to 2:1	4:1
thiophanate-methyl	45:1 to 1:3	15:1 to 2:1	11:1 to 2:1	4:1
thiram	150:1 to 1:2	50:1 to 2:1	37:1 to 5:1	14:1
tiadinil	12:1 to 1:9	4:1 to 1:3	2:1 to 1:3	1:1
tolclofos-methyl	150:1 to 1:2	50:1 to 2:1	37:1 to 5:1	14:1
tolylfluanid	150:1 to 1:36	50:1 to 1:12	15:1 to 2:1	5:1
triadimefon	15:1 to 1:36	5:1 to 1:12	1:1 to 1:5	1:2
triadimenol	15:1 to 1:36	5:1 to 1:12	1:1 to 1:5	1:2
triarimol	3:1 to 1:90	1:1 to 1:30	1:2 to 1:24	1:7
triazoxide	150:1 to 1:36	50:1 to 1:12	15:1 to 2:1	5:1
tricyclazole	15:1 to 1:9	5:1 to 1:3	3:1 to 1:3	1:1
tridemorph	30:1 to 1:3	10:1 to 1:1	7:1 to 1:1	2:1
trifloxystrobin	6:1 to 1:18	2:1 to 1:6	2:1 to 1:4	1:1
triflumizole	15:1 to 1:9	5:1 to 1:3	3:1 to 1:3	1:1
triforine	15:1 to 1:9	5:1 to 1:3	3:1 to 1:3	1:1
trimorphamide	45:1 to 1:9	15:1 to 1:3	7:1 to 1:2	2:1
triticonazole	15:1 to 1:36	5:1 to 1:12	1:1 to 1:5	1:2
uniconazole	15:1 to 1:36	5:1 to 1:12	1:1 to 1:5	1:2
validamycin	150:1 to 1:36	50:1 to 1:12	3:1 to 1:3	1:1
valifenalate	6:1 to 1:18	2:1 to 1:6	2:1 to 1:4	1:1
vinclozolin	120:1 to 1:2	40:1 to 2:1	15:1 to 2:1	6:1
zineb	150:1 to 1:2	50:1 to 2:1	37:1 to 5:1	14:1
ziram	150:1 to 1:2	50:1 to 2:1	37:1 to 5:1	14:1

Component (c)	Typical Weight Ratio	More Typical Weight Ratio	Most Typical Weight Ratio	Illustrative Weight Ratio
zoxamide	6:1 to 1:18	2:1 to 1:6	2:1 to 1:4	1:1
N-[2-[4-[[3-(4-chlorophenyl)-2-propyn-1-yl]oxy]-3-methoxyphenyl]ethyl]-3-methyl-2-[(methylsulfonyl)amino]butanamide	6:1 to 1:18	2:1 to 1:6	2:1 to 1:4	1:1
N-[2-[4-[[3-(4-chlorophenyl)-2-propyn-1-yl]oxy]-3-methoxyphenyl]ethyl]-3-methyl-2-[(ethylsulfonyl)amino]butanamide	6:1 to 1:18	2:1 to 1:6	2:1 to 1:4	1:1
2-butoxy-6-iodo-3-propyl-4*H*-1-benzopyran-4-one	3:1 to 1:36	1:1 to 1:12	1:1 to 1:12	1:3
3-[5-(4-chlorophenyl)-2,3-dimethyl-3-isoxazolidinyl]pyridine	15:1 to 1:9	5:1 to 1:3	3:1 to 1:3	1:1
N'-[4-[[3-[(4-chlorophenyl)methyl]-1,2,4-thiadiazol-5-yl]oxy]-2,5-dimethylphenyl]-*N*-ethyl-*N*-methylmethanimidamide	20:1 to 1:20	8:1 to 1:8	3:1 to 1:3	1:1
4-fluorophenyl *N*-[1-[[[1-(4-cyanophenyl)-ethyl]sulfonyl]methyl]propyl]carbamate	6:1 to 1:18	2:1 to 1:6	2:1 to 1:4	1:1
N-[[(cyclopropylmethoxy)amino][6-(difluoromethoxy)-2,3-difluorophenyl]-methylene]benzeneacetamide	1:1 to 1:90	1:2 to 1:30	1:2 to 1:24	1:7
α-(methoxyimino)-*N*-methyl-2-[[[1-[3-(trifluoromethyl)phenyl]ethoxy]imino]-methyl]benzeneacetamide	9:1 to 1:18	3:1 to 1:6	3:1 to 1:3	1:1
N'-[4-[4-chloro-3-(trifluoromethyl)phenoxy]-2,5-dimethylphenyl]-*N*-ethyl-*N*-methylmethanimidamide	15:1 to 1:18	5:1 to 1:6	3:1 to 1:3	1:1
N-(4-chloro-2-nitrophenyl)-*N*-ethyl-4-methylbenzenesulfonamide	15:1 to 1:18	5:1 to 1:6	3:1 to 1:3	1:1
fenaminstrobin (2-[[[3-(2,6-dichlorophenyl)-1-methyl-2-propen-1-ylidene]amino]-oxy]methyl]-α-(methoxyimino)-*N*-methylbenzeneacetamide)	9:1 to 1:18	3:1 to 1:6	3:1 to 1:3	1:1
pentyl *N*-[4-[[[[(1-methyl-1*H*-tetrazol-5-yl)-phenylmethylene]amino]oxy]methyl]-2-thiazolyl]carbamate	9:1 to 1:18	3:1 to 1:6	3:1 to 1:3	1:1

Component (c)	Typical Weight Ratio	More Typical Weight Ratio	Most Typical Weight Ratio	Illustrative Weight Ratio
2-[(3-bromo-6-quinolinyl)oxy]-*N*-(1,1-dimethyl-2-butyn-1-yl)-2-(methylthio)acetamide	5:1 to 1:22	2:1 to 1:8	2:1 to 1:4	1:1
2-[(3-ethynyl-6-quinolinyl)oxy]-*N*-[1-(hydroxymethyl)-1-methyl-2-propyn-1-yl]-2-(methylthio)acetamide	5:1 to 1:22	2:1 to 1:8	2:1 to 1:4	1:1
N-(1,1-dimethyl-2-butyn-1-yl)-2-[(3-ethynyl-6-quinolinyl)oxy]-2-(methylthio)acetamide	5:1 to 1:22	2:1 to 1:8	2:1 to 1:4	1:1
oxathiapiprolin (1-[4-[4-[5-(2,6-difluorophenyl)-4,5-dihydro-3-isoxazolyl]-2-thiazolyl]-1-piperidinyl]-2-[5-methyl-3-(trifluoromethyl)-1*H*-pyrazol-1-yl]ethanone)	1:1 to 1:90	1:2 to 1:30	1:2 to 1:18	1:6
1-[4-[4-[5*R*-(2,6-difluorophenyl)-4,5-dihydro-3-isoxazolyl]-2-thiazolyl]-1-piperidinyl]-2-[5-methyl-3-(trifluoromethyl)-1*H*-pyrazol-1-yl]-ethanone	1:1 to 1:90	1:2 to 1:30	1:2 to 1:18	1:6
1-[4-[4-[5-[(2,6-difluorophenoxy)methyl]-4,5-dihydro-3-isoxazolyl]-2-thiazolyl]-1-piperdinyl-2-[5-methyl-3-(trifluoromethyl)-1*H*-pyrazol-1-yl]ethanone	1:1 to 1:90	1:2 to 1:30	1:2 to 1:18	1:6
(2-chloro-6-fluorophenyl)methyl 2-[1-[2-[3,5-bis(difluoromethyl)-1*H*-pyrazol-1-yl]acetyl]-4-piperidinyl]-4-thiazolecarboxylate	1:1 to 1:90	1:2 to 1:30	1:2 to 1:18	1:6
(1*R*)-1,2,3,4-tetrahydro-1-naphthalenyl 2-[1-[2-[3,5-bis(difluoromethyl)-1*H*-pyrazol-1-yl]acetyl]-4-piperidinyl]-4-thiazolecarboxylate	1:1 to 1:90	1:2 to 1:30	1:2 to 1:18	1:6
[[4-methoxy-2-[[[(3*S*,7*R*,8*R*,9*S*)-9-methyl-8-(2-methyl-1-oxopropoxy)-2,6-dioxo-7-(phenylmethyl)-1,5-dioxonan-3-yl]amino]-carbonyl]-3-pyridinyl]oxy]methyl 2-methylpropanoate	90:1 to 1:4	30:1 to 1:2	15:1 to 3:1	7:1
(3*S*,6*S*,7*R*,8*R*)-3-[[[3-(acetyloxy)-4-methoxy-2-pyridinyl]carbonyl]amino]-6-methyl-4,9-dioxo-8-(phenylmethyl)-1,5-dioxonan-7-yl 2-methylpropanoate	90:1 to 1:4	30:1 to 1:2	15:1 to 3:1	7:1

Component (c)	Typical Weight Ratio	More Typical Weight Ratio	Most Typical Weight Ratio	Illustrative Weight Ratio
(3*S*,6*S*,7*R*,8*R*)-3-[[[3-[(acetyloxy)methoxy]-4-methoxy-2-pyridinyl]carbonyl]amino]-6-methyl-4,9-dioxo-8-(phenylmethyl)-1,5-dioxonan-7-yl 2-methylpropanoate	90:1 to 1:4	30:1 to 1:2	15:1 to 3:1	7:1
(3*S*,6*S*,7*R*,8*R*)-3-[[[4-methoxy-3-[[(2-methyl-propoxy)carbonyl]oxy]-2-pyridinyl]-carbonyl]amino]-6-methyl-4,9-dioxo-8-(phenylmethyl)-1,5-dioxonan-7-yl 2-methylpropanoate	90:1 to 1:4	30:1 to 1:2	15:1 to 3:1	7:1
N-[[3-(1,3-benzodioxol-5-ylmethoxy)-4-methoxy-2-pyridinyl]carbonyl]-*O*-[2,5-dideoxy-3-*O*-(2-methyl-1-oxopropyl)-2-(phenylmethyl)-L-arabinonoyl]-L-serine, (1→4')-lactone	90:1 to 1:4	30:1 to 1:2	15:1 to 3:1	7:1
5-fluoro-2-[(4-methylphenyl)methoxy]-4-pyrimidinamine	20:1 to 1:20	5:1 to 1:5	3:1 to 1:3	1:1
5-fluoro-2-[(4-fluorophenyl)methoxy]-4-pyrimidinamine	20:1 to 1:20	5:1 to 1:5	3:1 to 1:3	1:1
5,8-difluoro-*N*-[2-[3-methoxy-4-[[4-(trifluoromethyl)-2-pyridinyl]oxy]phenyl]-ethyl]-4-quinazolinamine	40:1 to 1:10	10:1 to 1:3	5:1 to 1:2	1:1
pentyl *N*-[6-[[[(*Z*)-[(1-methyl-1*H*-tetrazol-5-yl)phenylmethylene]amino]oxy]methyl]-2-pyridinyl]carbamate	40:1 to 1:10	10:1 to 1:3	5:1 to 1:2	1:1
1,1-dimethylethyl *N*-[6-[[[(*Z*)-[(1-methyl-1*H*-tetrazol-5-yl)phenylmethylene]amino]oxy]-methyl]-2-pyridinyl]carbamate	40:1 to 1:10	10:1 to 1:3	5:1 to 1:2	1:1
3-butyn-1-yl *N*-[6-[[[(*Z*)-[(1-methyl-1*H*-tetrazol-5-yl)phenylmethylene]amino]oxy]-methyl]-2-pyridinyl]carbamate	40:1 to 1:10	10:1 to 1:3	5:1 to 1:2	1:1
N-(3',4'-difluoro[1,1'-biphenyl]-2-yl)-3-(trifluoromethyl)-2-pyrazinecarboxamide	20:1 to 1:20	5:1 to 1:5	3:1 to 1:3	1:1
N-[2-(2,4-dichlorophenyl)-2-methoxy-1-methylethyl]-3-(difluoromethyl)-1-methyl-1*H*-pyrazole-4-carboxamide	20:1 to 1:20	5:1 to 1:5	3:1 to 1:3	1:1

Component (c)	Typical Weight Ratio	More Typical Weight Ratio	Most Typical Weight Ratio	Illustrative Weight Ratio
3-(difluoromethyl)-*N*-[4-fluoro-2-(1,1,2,3,3,3-hexafluoropropoxy)phenyl]-1-methyl-1*H*-pyrazole-4-carboxamide	20:1 to 1:20	5:1 to 1:5	3:1 to 1:3	1:1
3-(difluoromethyl)-1-methyl-*N*-[2-(1,1,2,2-tetrafluoroethoxy)phenyl]-1*H*-pyrazole-4-carboxamide	20:1 to 1:20	5:1 to 1:5	3:1 to 1:3	1:1
isofetamid	20:1 to 1:20	5:1 to 1:5	3:1 to 1:3	1:1
tolprocarb	20:1 to 1:20	5:1 to 1:5	3:1 to 1:3	1:1
(α*R*)-2-[(2,5-dimethylphenoxy)methyl]-α-methoxy-*N*-methylbenzeneacetamide	20:1 to 1:20	5:1 to 1:5	3:1 to 1:3	1:1
2,6-dimethyl-1*H*,5*H*-[1,4]dithiino[2,3-c:5,6-c']dipyrrole-1,3,5,7(2*H*,6*H*)-tetrone	1:1 to 1:400	1:4 to 1:100	1:8 to 1:50	1:1

The particular weight ratios defining the weight ratio ranges in Table C constitute disclosure of specific weight ratios. Table C also specifically discloses an additional illustrative weight ratio. Illustrative of specific combinations of components (a), (b) and (c) in the compositions of the present invention are specific combinations and weight ratios of components (a) and (b) listed in Tables B1 through B12 further combined with particular component (c) fungicidal compounds in the specific weight ratios disclosed in Table C. For example, the first row of Table B1 discloses weight ratios of Compound 2 as component (a) to (b1a) as component (b) as 1:15, 1:7, 1:3, 1:1, 4:1, 9:1 and 18:1. The first row of Table C discloses combinations of acibenzolar-*S*-methyl as component (c) with component (a) in weight ratios of acibenzolar-*S*-methyl relative to component (a) such as 2:1, 1:1, 1:4, 1:18, 1:60 and 1:180, including ranges. The corresponding ratios of component (a) relative to acibenzolar-*S*-methyl are 1:2, 1:1, 4:1, 18:1, 60:1 and 180:1. Therefore the combination of Table C with Table B1 discloses, for example, a 4:4:1 ternary mixture of Compound 2, (b1a) and acibenzolar-*S*-methyl, based on a 1:1 ratio of Compound 2 to (b1a) from Table B1, and a 4:1 ratio of Compound 2 to acibenzolar-*S*-methyl from Table C.

Formulation/Utility

A compound selected from compounds of Formula **1**, *N*-oxides, and salts thereof, or a mixture (i.e. composition) comprising the compound with (b) at least one fungicidal compound selected from (b1) through (b14) and salts thereof as described in the Summary of the Invention, will generally be used to provide fungicidal active ingredients in further compositions, i.e. formulations, 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 ingredients, mode of application and environmental factors such as soil type, moisture and temperature.

The mixtures of component (a) (i.e. at least one compound of Formula **1**, *N*-oxides, or salts thereof) with component (b) (e.g., selected from (b1) to (b14) and salts thereof as described above) and/or one or more other biologically active compounds or agents (i.e. insecticides, other fungicides, nematocides, acaricides, herbicides and other biological agents) can be formulated in a number of ways, including:

(i) component (a), component (b) and optionally (c) one or more other biologically active compounds or agents can be formulated separately and applied separately or applied simultaneously in an appropriate weight ratio, e.g., as a tank mix; or

(ii) component (a), component (b) and optionally (c) one or more other biologically active compounds or agents can be formulated together in the proper weight ratio.

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.

Of note is a composition embodiment wherein granules of a solid composition comprising a compound of Formula **1** (or an *N*-oxide or salt thereof) is mixed with granules of a solid composition comprising component (b). These mixtures can be further mixed with granules comprising one or more additional biologically active compounds or agents, e.g., additional agricultural protectants. Alternatively, two or more agricultural protectants (e.g., a component (a) (Formula **1**) compound, a component (b) compound, (c) an agricultural protectant other than component (a) or (b)) can be combined in the solid composition of one

set of granules, which is then mixed with one or more sets of granules of solid compositions comprising one or more additional agricultural protectants. These granule mixtures can be in accordance with the general granule mixture disclosure of PCT Patent Publication WO 94/24861 or more preferably the homogeneous granule mixture teaching of U.S. Patent 6,022,552.

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. Liquid and solid formulations can be applied onto seeds of crops and other desirable vegetation as seed treatments before planting to protect developing roots and other subterranean plant parts and/or foliage through systemic uptake.

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, triacetin, 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 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 compounds of Formula **1** and 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.

Without further elaboration, it is believed that one skilled in the art using the preceding formulation description can utilize the present invention to its fullest extent. The following Examples of formulation are, therefore, to be construed as merely illustrative, and not limiting of the disclosure in any way whatsoever. Percentages are by weight, and all formulations are prepared in conventional ways. Compound numbers refer to compounds in Index Table A. The component designations refer to the corresponding compounds indicated in the Component (b) column of Table A1. For example, "Component (b1a)" refers to 1-[[(2*S*,3*R*)-3-(2-chlorophenyl)-2-(2,4-difluorophenyl)-2-oxiranyl]methyl]-1*H*-1,2,4-triazole.

Example A

High Strength Concentrate

Any one of Compounds 2, 3, 4, 5, 7, 8, 9, 11, 15, 16, 17 and 34	93.8%
Component (b1a)	4.7%
silica aerogel	0.5%
synthetic amorphous fine silica	1.0%

Example B

Wettable Powder

Any one of Compounds 2, 3, 4, 5, 7, 8, 9, 11, 15, 16, 17 and 34	59.1%
Component (b1b)	5.9%
dodecylphenol polyethylene glycol ether	2.0%
sodium ligninsulfonate	4.0%
sodium silicoaluminate	6.0%
montmorillonite (calcined)	23.0%

Example C

Granule

Any one of Compounds 2, 3, 4, 5, 7, 8, 9, 11, 15, 16, 17 and 34	5.0%
Component (b1c)	5.0%
attapulgite granules (low volatile matter, 0.71/0.30 mm; U.S.S. No. 25–50 sieves)	90.0%

Example D

Extruded Pellet

Any one of Compounds 2, 3, 4, 5, 7, 8, 9, 11, 15, 16, 17 and 34	16.7%
Component (b2a)	8.3%
anhydrous sodium sulfate	10.0%
crude calcium ligninsulfonate	5.0%
sodium alkylnaphthalenesulfonate	1.0%
calcium/magnesium bentonite	59.0%

Example E

Emulsifiable Concentrate

Any one of Compounds 2, 3, 4, 5, 7, 8, 9, 11, 15, 16, 17 and 34	6.7%
Component (b2b)	3.3%
polyoxyethylene sorbitol hexoleate	20.0%
C_6–C_{10} fatty acid methyl ester	70.0%

Example F

Microemulsion

Any one of Compounds 2, 3, 4, 5, 7, 8, 9, 11, 15, 16, 17 and 34	2.5%
Component (b2c)	2.5%
polyvinylpyrrolidone-vinyl acetate copolymer	30.0%
alkylpolyglycoside	30.0%
glyceryl monooleate	15.0%
water	20.0%

Example G

High Strength Concentrate

Any one of Compounds 2, 3, 4, 5, 7, 8, 9, 11, 15, 16, 17 and 34	49.3%
Component (b2d)	49.2%
silica aerogel	0.5%
synthetic amorphous fine silica	1.0%

Example H

Granule

Any one of Compounds 2, 3, 4, 5, 7, 8, 9, 11, 15, 16, 17 and 34	5.0%
Component (b1a)	5.0%
attapulgite granules (low volatile matter, 0.71/0.30 mm; U.S.S. No. 25–50 sieves)	90.0%

Example I

Extruded Pellet

Any one of Compounds 2, 3, 4, 5, 7, 8, 9, 11, 15, 16, 17 and 34	12.5%
Component (b1b)	12.5%
anhydrous sodium sulfate	10.0%
crude calcium ligninsulfonate	5.0%
sodium alkylnaphthalenesulfonate	1.0%
calcium/magnesium bentonite	59.0%

Example J

Emulsifiable Concentrate

Any one of Compounds 2, 3, 4, 5, 7, 8, 9, 11, 15, 16, 17 and 34	5.0%
Component (b1c)	5.0%
polyoxyethylene sorbitol hexoleate	20.0%
C_6–C_{10} fatty acid methyl ester	70.0%

Example K

Seed Treatment

Any one of Compounds 2, 3, 4, 5, 7, 8, 9, 11, 15, 16, 17 and 34	1.05%
Component (b2a)	18.95%
polyvinylpyrrolidone-vinyl acetate copolymer	5.00%
montan acid wax	5.00%
calcium ligninsulfonate	1.00%
polyoxyethylene/polyoxypropylene block copolymers	1.00%
stearyl alcohol (POE 20)	2.00%
polyorganosilane	0.20%
colorant red dye	0.05%
water	65.75%

Example L

Wettable Powder

Any one of Compounds 2, 3, 4, 5, 7, 8, 9, 11, 15, 16, 17 and 34	41.9%
Component (b2b)	2.1%
prothioconazole	21.0%
dodecylphenol polyethylene glycol ether	2.0%
sodium ligninsulfonate	4.0%
sodium silicoaluminate	6.0%
montmorillonite (calcined)	23.0%

Example M

Suspension Concentrate

Any one of Compounds 2, 3, 4, 5, 7, 8, 9, 11, 15, 16, 17 and 34	17.5%
Component (b3)	17.5%
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 N

Emulsifiable Concentrate

Any one of Compounds 2, 3, 4, 5, 7, 8, 9, 11, 15, 16, 17 and 34	6.7%
Component (b4a)	3.3%
polyoxyethylene sorbitol hexoleate	20.0%
C_6–C_{10} fatty acid methyl ester	70.0%

Example O

Extruded Pellet

Any one of Compounds 2, 3, 4, 5, 7, 8, 9, 11, 15, 16, 17 and 34	12.5%
Component (b5)	12.5%
anhydrous sodium sulfate	10.0%
crude calcium ligninsulfonate	5.0%
sodium alkylnaphthalenesulfonate	1.0%
calcium/magnesium bentonite	59.0%

Example P

Emulsifiable Concentrate

Any one of Compounds 2, 3, 4, 5, 7, 8, 9, 11, 15, 16, 17 and 34	5.0%
Component (b6a)	5.0%
polyoxyethylene sorbitol hexoleate	20.0%
C_6–C_{10} fatty acid methyl ester	70.0%

Example Q

Emulsifiable Concentrate

Any one of Compounds 2, 3, 4, 5, 7, 8, 9, 11, 15, 16, 17 and 34	5.0%
Component (b7a)	5.0%
polyoxyethylene sorbitol hexoleate	20.0%
C_6–C_{10} fatty acid methyl ester	70.0%

Example R

High Strength Concentrate

Any one of Compounds 2, 3, 4, 5, 7, 8, 9, 11, 15, 16, 17 and 34	93.8%
Component (b8a)	4.7%
silica aerogel	0.5%
synthetic amorphous fine silica	1.0%

Example S

Extruded Pellet

Any one of Compounds 2, 3, 4, 5, 7, 8, 9, 11, 15, 16, 17 and 34	16.7%
Component (b9a)	8.3%
anhydrous sodium sulfate	10.0%
crude calcium ligninsulfonate	5.0%
sodium alkylnaphthalenesulfonate	1.0%
calcium/magnesium bentonite	59.0%

Example T

Wettable Powder

Any one of Compounds 2, 3, 4, 5, 7, 8, 9, 11, 15, 16, 17 and 34	43.3%
Component (b10)	21.7%
dodecylphenol polyethylene glycol ether	2.0%
sodium ligninsulfonate	4.0%
sodium silicoaluminate	6.0%
montmorillonite (calcined)	23.0%

Example U

Emulsifiable Concentrate

Any one of Compounds 2, 3, 4, 5, 7, 8, 9, 11, 15, 16, 17 and 34	6.3%
Component (b11a)	3.7%
polyoxyethylene sorbitol hexoleate	20.0%
C_6–C_{10} fatty acid methyl ester	70.0%

Example V

Microemulsion

Any one of Compounds 2, 3, 4, 5, 7, 8, 9, 11, 15, 16, 17 and 34	2.5%
Component (b12)	2.5%
polyvinylpyrrolidone-vinyl acetate copolymer	30.0%
alkylpolyglycoside	30.0%
glyceryl monooleate	15.0%
water	20.0%

Example W

Wettable Powder

Any one of Compounds 2, 3, 4, 5, 7, 8, 9, 11, 15, 16, 17 and 34	32.5%
Component (b13)	32.5%
dodecylphenol polyethylene glycol ether	2.0%
sodium ligninsulfonate	4.0%
sodium silicoaluminate	6.0%
montmorillonite (calcined)	23.0%

Example X

Emulsifiable Concentrate

Any one of Compounds 2, 3, 4, 5, 7, 8, 9, 11, 15, 16, 17 and 34	5.0%
Component (b14)	5.0%
polyoxyethylene sorbitol hexoleate	20.0%
C_6–C_{10} fatty acid methyl ester	70.0%

As already mentioned, combinations of components (a), (b) and optionally (c) can be together or separately formulated with at least one of a surfactant, a solid diluent or a liquid diluent. Thus one, two or all three of components (a), (b) and (c) can be formulated together to form a premix composition, or they can be formulated separately and then the formulated compositions combined together before application (e.g., in a spray tank) or, alternatively, applied in succession. In the formulated compositions containing components (a), (b) or (c), the components (a), (b) or (c) are present in biologically effective amounts, or more

particularly, for example, fungicidally effective amounts if they are fungicidal or insecticidally effective amounts if they are insecticidal.

Formulations are often diluted with water to form aqueous compositions before application. Aqueous compositions for direct applications to the plant or portion thereof (e.g., spray tank compositions) typically comprise at least about 1 ppm or more (e.g., from 1 ppm to 100 ppm) of fungicidally active compounds according to the present invention.

The compositions of this invention are useful as plant disease control agents. The present invention therefore further comprises a method for controlling plant diseases caused by fungal plant pathogens comprising applying to the plant or portion thereof to be protected, or to the plant seed or vegetative propagation unit to be protected, an effective amount of a composition of the invention (e.g., a composition comprising component (a), or components (a) and (b), or components (a), (b) and (c)). This aspect of the present invention can also be described as a method for protecting a plant or plant seed from diseases caused by fungal pathogens comprising applying a fungicidally effective amount of a composition of the invention to the plant (or portion thereof) or plant seed (directly or through the environment (e.g., growing medium) of the plant or plant seed).

Component (a) compounds and/or combinations thereof with component (b) compounds and/or (c) one or more other biologically active compounds or agents can be applied to plants genetically transformed to express proteins toxic to invertebrate pests (such as *Bacillus thuringiensis* delta-endotoxins). The effect of the exogenously applied present component (a) alone or in combination with component (b) and optionally component (c) may be synergistic with the expressed toxin proteins.

Plant disease control is ordinarily accomplished by applying an effective amount of a composition of the invention (e.g., comprising component (a), or a mixture of components (a), (b) and optionally (c)), typically as a formulated composition, either pre- or post-infection, to the portion of the plant to be protected such as the roots, stems, foliage, fruit, seeds, tubers or bulbs, or to the media (soil or sand) in which the plants to be protected are growing. Component (a) or mixtures thereof can also be applied to seeds to protect the seeds and seedlings developing from the seeds. The mixtures can also be applied through irrigation water to treat plants. Control of postharvest pathogens which infect the produce before harvest is typically accomplished by field application of a composition of the invention, and in cases where infection occurs after harvest the compositions can be applied to the harvested crop as dips, sprays, fumigants, treated wraps or box liners.

Suitable rates of application (e.g., fungicidally effective amounts) of component (a) (i.e. at least one compound selected from compounds of Formula **1**, *N*-oxides and salts thereof) as well as suitable rates of application (e.g., biologically effective amounts, fungicidally effective amounts or insecticidally effective amounts) of components (b) and optionally (c) according to this invention can be influenced by many factors of the

environment and should be determined under actual use conditions. Foliage can normally be protected when treated at a rate of from less than about 1 g/ha to about 5,000 g/ha of active ingredients. Seed and seedlings can normally be protected when seed is treated at a rate of from about 0.1 to about 10 g per kilogram of seed; and vegetative propagation units (e.g., cuttings and tubers) can normally be protected when propagation unit is treated at a rate of from about 0.1 to about 10 g per kilogram of propagation unit. One skilled in the art can easily determine through simple experimentation the application rates of component (a), and mixtures and compositions thereof, containing particular combinations of active ingredients according to this invention needed to provide the desired spectrum of plant protection and control of plant diseases and optionally other plant pests.

The compounds of Formula **1**, *N*-oxides, and salts thereof, are particularly efficacious for controlling plant diseases caused by fungal pathogens, particularly in the Basidiomycete and Ascomycete classes. Combining these compounds with other fungicidal compounds can provide control of diseases caused by a broad spectrum of fungal plant pathogens in the Basidiomycete, Ascomycete, Oomycete and Deuteromycete classes. Accordingly, mixtures and compositions described herein can control a broad spectrum of plant diseases caused by fungal pathogens afflicting crops and other desired vegetation including: cereal grain crops such as wheat, barley, oats, rye, triticale, rice, maize, sorghum and millet; vine crops such as table and wine grapes; field crops such as oilseed rape (canola), sunflower, sugar beets, soybean, peanuts (groundnut) and tobacco; legume forage crops such as alfalfa, clover, lespedeza, trefoil and vetch; pome fruits such as apple, pear, crabapple, loquat, mayhaw and quince; stone fruits such as peaches, cherries, plums, apricots, nectarines and almonds; citrus fruits such as lemons, limes, oranges, grapefruit, mandarin (tangerines) and kumquat; root and tuber vegetables and field crops (and their foliage) such as artichoke, garden and sugar beet, carrot, cassava, ginger, ginseng, horseradish, parsnip, potato, radish, rutabaga, sweet potato, turnip and yam; bulb vegetables such as garlic, leek, onion and shallot; leafy vegetables such as arugula (roquette), celery, cress, endive (escarole), fennel, head and leaf lettuce, parsley, radicchio (red chicory), rhubarb, spinach and Swiss chard; brassica (cole) leafy vegetables such as broccoli, broccoli raab (rapini), Brussels sprouts, cabbage, bok choy, cauliflower, collards, kale, kohlrabi and mustard greens; legume vegetables (succulent or dried) such as lupin, bean (*Phaseolus* spp.) (including field bean, kidney bean, lima bean, navy bean, pinto bean, runner bean, snap bean, tepary bean and wax bean), bean (*Vigna* spp.) (including adzuki bean, asparagus bean, blackeyed pea, catjang, Chinese longbean, cowpea, crowder pea, moth bean, mung bean, rice bean, southern pea, urd bean and yardlong bean), broad bean (fava), chickpea (garbanzo), guar, jackbean, lablab bean, lentil and pea (*Pisum* spp.) (including dwarf pea, edible-podded pea, English pea, field pea, garden pea, green pea, snowpea, sugar snap pea, pigeon pea and soybean); fruiting vegetables such as eggplant, groundcherry (*Physalis* spp.), pepino and pepper (including bell pepper, chili pepper,

cooking pepper, pimento and sweet pepper); tomatillo and tomato; cucurbit vegetables such as Chayote (fruit), Chinese waxgourd (Chinese preserving melon), citron melon, cucumber, gherkin, edible gourd (including hyotan, cucuzza, hechima and Chinese okra), *Momordica* spp. (including balsam apple, balsam pear, bittermelon and Chinese cucumber), muskmelon (including cantaloupe), summer and winter squash (including butternut squash, calabaza, hubbard squash, acorn squash, spaghetti squash and pumpkin) and watermelon; berries such as blackberry (including bingleberry, boysenberry, dewberry, lowberry, marionberry, olallieberry and youngberry), blueberry, cranberry, currant, elderberry, gooseberry, huckleberry, loganberry, raspberry and strawberry; tree nuts such as almond, beech nut, Brazil nut, butternut, cashew, chestnut, chinquapin, filbert (hazelnut), hickory nut, macadamia nut, pecan and walnut; tropical fruits and other crops such as bananas, plantains, mangos, coconuts, papaya, guava, avocado, lichee, agave, coffee, cacao, sugar cane, oil palm, sesame, rubber and spices; fiber crops such as cotton, flax and hemp; turfgrasses (including warm- and cool-season turfgrasses) such as bentgrass, Kentucky bluegrass, St. Augustine grass, tall fescue and Bermuda grass.

Compounds of Formula **1**, *N*-oxides and salts thereof, or compositions comprising said compounds as present component (a) together with one or more additional biologically active compounds or agents, such as the fungicidal compounds of Formulae **B1**, **B2**, **B3**, **B4**, **B5**, **B6**, **B7**, **B8**, **B9**, **B10**, **B11**, **B12**, **B13** and **B14** of present component (b), are useful in treating all plants, plant parts and seeds. Plant and seed varieties and cultivars can be obtained by conventional propagation and breeding methods or by genetic engineering methods. Genetically modified plants or seeds (transgenic plants or seeds) are those in which a heterologous gene (transgene) has been stably integrated into the plant's or seed'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 and seed 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 and seeds can be genetically modified to exhibit traits of, for example, herbicide tolerance, insect-resistance, modified oil profiles or drought tolerance. Useful genetically modified plants and seeds containing single gene transformation events or combinations of transformation events are listed in Table I. Additional information for the genetic modifications listed in Table I can be obtained from the following databases: http://www2.oecd.org/biotech/byidentifier.aspx, http://www.aphis.usda.gov, and http://gmoinfo.jrc.ec.europa.eu .

The following abbreviations are used in Table I which follows: tol. is tolerance, res. is resistance, SU is sulfonylurea, ALS is acetolactate synthase, HPPD is 4-Hydroxyphenylpyruvate Dioxygenase, NA is Not Available.

Table I

Crop	Event Name	Event Code	Trait(s)	Gene(s)
Alfalfa	J101	MON-00101-8	Glyphosate tol.	cp4 epsps (aroA:CP4)
Alfalfa	J163	MON-ØØ163-7	Glyphosate tol.	cp4 epsps (aroA:CP4)
Canola*	23-18-17 (Event 18)	CGN-89465-2	High lauric acid oil	te
Canola*	23-198 (Event 23)	CGN-89465-2	High lauric acid oil	te
Canola*	61061	DP-Ø61Ø61-7	Glyphosate tol.	gat4621
Canola*	73496	DP-Ø73496-4	Glyphosate tol.	gat4621
Canola*	GT200 (RT200)	MON-89249-2	Glyphosate tol.	cp4 epsps (aroA:CP4); goxv247
Canola*	GT73 (RT73)	MON-ØØØ73-7	Glyphosate tol.	cp4 epsps (aroA:CP4); goxv247
Canola*	HCN10 (Topas 19/2)	NA	Glufosinate tol.	bar
Canola*	HCN28 (T45)	ACS-BNØØ8-2	Glufosinate tol.	pat (syn)
Canola*	HCN92 (Topas 19/2)	ACS-BNØØ7-1	Glufosinate tol.	bar
Canola*	MON88302	MON-883Ø2-9	Glyphosate tol.	cp4 epsps (aroA:CP4)
Canola*	MPS961	NA	Phytate breakdown	phyA
Canola*	MPS962	NA	Phytate breakdown	phyA
Canola*	MPS963	NA	Phytate breakdown	phyA
Canola*	MPS964	NA	Phytate breakdown	phyA
Canola*	MPS965	NA	Phytate breakdown	phyA
Canola*	MS1 (B91-4)	ACS-BNØØ4-7	Glufosinate tol.	bar
Canola*	MS8	ACS-BNØØ5-8	Glufosinate tol.	bar
Canola*	OXY-235	ACS-BNØ11-5	Oxynil tol.	bxn
Canola*	PHY14	NA	Glufosinate tol.	bar
Canola*	PHY23	NA	Glufosinate tol.	bar
Canola*	PHY35	NA	Glufosinate tol.	bar
Canola*	PHY36	NA	Glufosinate tol.	bar
Canola*	RF1 (B93-101)	ACS-BNØØ1-4	Glufosinate tol.	bar
Canola*	RF2 (B94-2)	ACS-BNØØ2-5	Glufosinate tol.	bar
Canola*	RF3	ACS-BNØØ3-6	Glufosinate tol.	bar
Bean	EMBRAPA 5.1	EMB-PV051-1	Disease res.	ac1 (sense and antisense)
Brinjal (Eggplant)	EE-1		Insect res.	cry1Ac
Carnation	11 (7442)	FLO-07442-4	SU tol..; modified flower color	surB; dfr; hfl (f3'5'h)
Carnation	11363 (1363A)	FLO-11363-1	SU tol.; modified flower color	surB; dfr; bp40 (f3'5'h)
Carnation	1226A (11226)	FLO-11226-8	SU tol.; modified flower color	surB; dfr; bp40 (f3'5'h)
Carnation	123.2.2 (40619)	FLO-4Ø619-7	SU tol.; modified flower color	surB; dfr; hfl (f3'5'h)
Carnation	123.2.38 (40644)	FLO-4Ø644-4	SU tol.; modified flower color	surB; dfr; hfl (f3'5'h)

Carnation	123.8.12	FLO-4Ø689-6	SU tol.; modified flower color	surB; dfr; bp40 (f3'5'h)
Carnation	123.8.8 (40685)	FLO-4Ø685-1	SU tol.; modified flower color	surB; dfr; bp40 (f3'5'h)
Carnation	1351A (11351)	FLO-11351-7	SU tol.; modified flower color	surB; dfr; bp40 (f3'5'h)
Carnation	1400A (11400)	FLO-114ØØ-2	SU tol.; modified flower color	surB; dfr; bp40 (f3'5'h)
Carnation	15	FLO-ØØØ15-2	SU tol.; modified flower color	surB; dfr; hfl (f3'5'h)
Carnation	16	FLO-ØØØ16-3	SU tol.; modified flower color	surB; dfr; hfl (f3'5'h)
Carnation	4	FLO-ØØØØ4-9	SU tol.; modified flower color	surB; dfr; hfl (f3'5'h)
Carnation	66	FLO-ØØØ66-8	SU tol.; delayed senescence	surB; acc
Carnation	959A (11959)	FLO-11959-3	SU tol.; modified flower color	surB; dfr; bp40 (f3'5'h)
Carnation	988A (11988)	FLO-11988-7	SU tol.; modified flower color	surB; dfr; bp40 (f3'5'h)
Carnation	26407	IFD-26497-2	SU tol.; modified flower color	surB; dfr; bp40 (f3'5'h)
Carnation	25958	IFD-25958-3	SU tol.; modified flower color	surB; dfr; bp40 (f3'5'h)
Chicory	RM3-3	NA	Glufosinate tol.	bar
Chicory	RM3-4	NA	Glufosinate tol.	bar
Chicory	RM3-6	NA	Glufosinate tol.	bar
Cotton	19-51a	DD-Ø1951A-7	ALS herbicide tol.	S4-HrA
Cotton	281-24-236	DAS-24236-5	Glufosinate tol.; insect res.	pat (syn); cry1F
Cotton	3006-210-23	DAS-21Ø23-5	Glufosinate tol.; insect res.	pat (syn); cry1Ac
Cotton	31707	NA	Oxynil tol.; insect res.	bxn; cry1Ac
Cotton	31803	NA	Oxynil tol.; insect res.	bxn; cry1Ac
Cotton	31807	NA	Oxynil tol.; insect res.	bxn; cry1Ac
Cotton	31808	NA	Oxynil tol.; insect res.	bxn; cry1Ac
Cotton	42317	NA	Oxynil tol.; insect res.	bxn; cry1Ac
Cotton	BNLA-601	NA	Insect res.	cry1Ac
Cotton	BXN10211	BXN10211-9	Oxynil tol.	bxn; cry1Ac
Cotton	BXN10215	BXN10215-4	Oxynil tol.	bxn; cry1Ac
Cotton	BXN10222	BXN10222-2	Oxynil tol.	bxn; cry1Ac
Cotton	BXN10224	BXN10224-4	Oxynil tol.	bxn; cry1Ac
Cotton	COT102	SYN-IR102-7	Insect res.	vip3A(a)
Cotton	COT67B	SYN-IR67B-1	Insect res.	cry1Ab
Cotton	COT202		Insect res.	vip3A
Cotton	Event 1	NA	Insect res.	cry1Ac
Cotton	GMF Cry1A	GTL-GMF311-7	Insect res.	cry1Ab-Ac
Cotton	GHB119	BCS-GH005-8	Insect res.	cry2Ae
Cotton	GHB614	BCS-GH002-5	Glyphosate tol.	2mepsps
Cotton	GK12	NA	Insect res.	cry1Ab-Ac

Cotton	LLCotton25	ACS-GH001-3	Glufosinate tol.	bar
Cotton	MLS 9124	NA	Insect res.	cry1C
Cotton	MON1076	MON-89924-2	Insect res.	cry1Ac
Cotton	MON1445	MON-01445-2	Glyphosate tol.	cp4 epsps (aroA:CP4)
Cotton	MON15985	MON-15985-7	Insect res.	cry1Ac; cry2Ab2
Cotton	MON1698	MON-89383-1	Glyphosate tol.	cp4 epsps (aroA:CP4)
Cotton	MON531	MON-00531-6	Insect res.	cry1Ac
Cotton	MON757	MON-00757-7	Insect res.	cry1Ac
Cotton	MON88913	MON-88913-8	Glyphosate tol.	cp4 epsps (aroA:CP4)
Cotton	Nqwe Chi 6 Bt	NA	Insect res.	NA?
Cotton	SKG321	NA	Insect res.	cry1A; CpTI
Cotton	T303-3	BCS-GH003-6	Insect res.; glufosinate tol.	cry1Ab; bar
Cotton	T304-40	BCS-GH004-7	Insect res.; glufosinate tol.	cry1Ab; bar
Cotton	CE43-67B		Insect res.	cry1Ab
Cotton	CE46-02A		Insect res.	cry1Ab
Cotton	CE44-69D		Insect res.	cry1Ab
Cotton	1143-14A		Insect res.	cry1Ab
Cotton	1143-51B		Insect res.	cry1Ab
Cotton	T342-142		Insect res.	cry1Ab
Cotton	PV-GHGT07 (1445)		Glyphosate tol.	cp4 epsps (aroA:CP4)
Cotton	EE-GH3		Glyphosate tol.	mepsps
Cotton	EE-GH5		Insect res.	cry1Ab
Cotton	MON88701	MON-88701-3	Dicamba & glufosinate tol.	Modified dmo; bar
Cotton	OsCr11		Anti-allergy	Modified Cry j
Creeping Bentgrass	ASR368	SMG-368ØØ-2	Glyphosate tol.	cp4 epsps (aroA:CP4)
Eucalyptus	20-C		Salt tol.	codA
Eucalyptus	12-5C		Salt tol.	codA
Eucalyptus	12-5B		Salt tol.	codA
Eucalyptus	107-1		Salt tol.	codA
Eucalyptus	1/9/2001		Salt tol.	codA
Eucalyptus	2/1/2001		Salt tol.	codA
Eucalyptus			Cold tol.	des9
Flax	FP967	CDC-FL001-2	ALS herbicide tol.	als
Lentil	RH44		Imidazolinone tol.	als
Maize	3272	SYN-E3272-5	Modified alpha-amylase	amy797E
Maize	5307	SYN-05307-1	Insect res.	ecry3.1Ab
Maize	59122	DAS-59122-7	Insect res.; glufosinate tol.	cry34Ab1; cry35Ab1; pat
Maize	676	PH-000676-7	Glufosinate tol.; pollination control	pat; dam
Maize	678	PH-000678-9	Glufosinate tol.; pollination control	pat; dam

Maize	680	PH-000680-2	Glufosinate tol.; pollination control	pat; dam
Maize	98140	DP-098140-6	Glyphosate toll; ALS herbicide tol.	gat4621; zm-hra
Maize	Bt10	NA	Insect res.; glufosinate tol.	cry1Ab; pat
Maize	Bt176 (176)	SYN-EV176-9	Insect res.; glufosinate tol.	cry1Ab; bar
Maize	BVLA430101	NA	Phytate breakdown	phyA2
Maize	CBH-351	ACS-ZM004-3	Insect res.; glufosinate tol.	cry9C; bar
Maize	DAS40278-9	DAS40278-9	2,4-D tol.	aad-1
Maize	DBT418	DKB-89614-9	Insect res.; glufosinate tol.	cry1Ac; pinII; bar
Maize	DLL25 (B16)	DKB-89790-5	Glufosinate tol.	bar
Maize	GA21	MON-00021-9	Glyphosate tol.	mepsps
Maize	GG25		Glyphosate tol.	mepsps
Maize	GJ11		Glyphosate tol.	mepsps
Maize	Fl117		Glyphosate tol.	mepsps
Maize	GAT-ZM1		Glufosinate tol.	pat
Maize	LY038	REN-00038-3	Increased lysine	cordapA
Maize	MIR162	SYN-IR162-4	Insect res.	vip3Aa20
Maize	MIR604	SYN-IR604-5	Insect res.	mcry3A
Maize	MON801 (MON80100)	MON801	Insect res.; glyphosate tol.	cry1Ab; cp4 epsps (aroA:CP4); goxv247
Maize	MON802	MON-80200-7	Insect res.; glyphosate tol.	cry1Ab; cp4 epsps (aroA:CP4); goxv247
Maize	MON809	PH-MON-809-2	Insect res.; glyphosate tol.	cry1Ab; cp4 epsps (aroA:CP4); goxv247
Maize	MON810	MON-00810-6	Insect res.; glyphosate tol.	cry1Ab; cp4 epsps (aroA:CP4); goxv247
Maize	MON832	NA	Glyphosate tol.	cp4 epsps (aroA:CP4); goxv247
Maize	MON863	MON-00863-5	Insect res.	cry3Bb1
Maize	MON87427	MON-87427-7	Glyphosate tol.	cp4 epsps (aroA:CP4)
Maize	MON87460	MON-87460-4	Drought tol.	cspB
Maize	MON88017	MON-88017-3	Insect res.; glyphosate tol.	cry3Bb1; cp4 epsps (aroA:CP4)
Maize	MON89034	MON-89034-3	Insect res.	cry2Ab2; cry1A.105
Maize	MS3	ACS-ZM001-9	Glufosinate tol.; pollination control	bar; barnase
Maize	MS6	ACS-ZM005-4	Glufosinate tol.; pollination control	bar; barnase
Maize	NK603	MON-00603-6	Glyphosate tol.	cp4 epsps (aroA:CP4)
Maize	T14	ACS-ZM002-1	Glufosinate tol.	pat (syn)
Maize	T25	ACS-ZM003-2	Glufosinate tol.	pat (syn)
Maize	TC1507	DAS-01507-1	Insect res.; glufosinate tol.	cry1Fa2; pat
Maize	TC6275	DAS-06275-8	Insect res.; glufosinate tol.	mocry1F; bar
Maize	VIP1034		Insect res.; glufosinate tol.	vip3A; pat
Maize	43A47	DP-043A47-3	Insect res.; glufosinate tol.	cry1F; cry34Ab1; cry35Ab1; pat
Maize	40416	DP-040416-8	Insect res.; glufosinate tol.	cry1F; cry34Ab1;

				cry35Ab1; pat
Maize	32316	DP-032316-8	Insect res.; glufosinate tol.	cry1F; cry34Ab1; cry35Ab1; pat
Maize	4114	DP-004114-3	Insect res.; glufosinate tol.	cry1F; cry34Ab1; cry35Ab1; pat
Melon	Melon A	NA	Delayed ripening/senescence	sam-k
Melon	Melon B	NA	Delayed ripening/senescence	sam-k
Papaya	55-1	CUH-CP551-8	Disease res.	prsv cp
Papaya	63-1	CUH-CP631-7	Disease res.	prsv cp
Papaya	Huanong No. 1	NA	Disease res.	prsv rep
Papaya	X17-2	UFL-X17CP-6	Disease res.	prsv cp
Petunia	Petunia-CHS	NA	Modified product quality	CHS suppres.sion
Plum	C-5	ARS-PLMC5-6	Disease res.	ppv cp
Canola**	ZSR500	NA	Glyphosate tol.	cp4 epsps (aroA:CP4); goxv247
Canola**	ZSR502	NA	Glyphosate tol.	cp4 epsps (aroA:CP4); goxv247
Canola**	ZSR503	NA	Glyphosate tol.	cp4 epsps (aroA:CP4); goxv247
Poplar	Bt poplar	NA	Insect res.	cry1Ac; API
Poplar	Hybrid poplar clone 741	NA	Insect res.	cry1Ac; API
Poplar	trg300-1		High cellulose	AaXEG2
Poplar	trg300-2		High cellulose	AaXEG2
Potato	1210 amk	NA	Insect res.	cry3A
Potato	2904/1 kgs	NA	Insect res.	cry3A
Canola**	ZSR500	NA	Glyphosate tol.	cp4 epsps (aroA:CP4); goxv247
Canola**	ZSR502	NA	Glyphosate tol.	cp4 epsps (aroA:CP4); goxv247
Potato	ATBT04-27	NMK-89367-8	Insect res.	cry3A
Potato	ATBT04-30	NMK-89613-2	Insect res.	cry3A
Potato	ATBT04-31	NMK-89170-9	Insect res.	cry3A
Potato	ATBT04-36	NMK-89279-1	Insect res.	cry3A
Potato	ATBT04-6	NMK-89761-6	Insect res.	cry3A
Potato	BT06	NMK-89812-3	Insect res.	cry3A
Potato	BT10	NMK-89175-5	Insect res.	cry3A
Potato	BT12	NMK-89601-8	Insect res.	cry3A
Potato	BT16	NMK-89167-6	Insect res.	cry3A
Potato	BT17	NMK-89593-9	Insect res.	cry3A
Potato	BT18	NMK-89906-7	Insect res.	cry3A
Potato	BT23	NMK-89675-1	Insect res.	cry3A
Potato	EH92-527-1	BPS-25271-9	Modified starch/carbohydrate	gbss (antisense)
Potato	HLMT15-15	NA	Insect & disease res.	cry3A; pvy cp
Potato	HLMT15-3	NA	Insect & disease res.	cry3A; pvy cp
Potato	HLMT15-46	NA	Insect & disease res.	cry3A; pvy cp

Potato	RBMT15-101	NMK-89653-6	Insect & disease res.	cry3A; pvy cp
Potato	RBMT21-129	NMK-89684-1	Insect & disease res.	cry3A; plrv orf1; plrv orf2
Potato	RBMT21-152	NA	Insect & disease res.	cry3A; plrv orf1; plrv orf2
Potato	RBMT21-350	NMK-89185-6	Insect & disease res.	cry3A; plrv orf1; plrv orf2
Potato	RBMT22-082	NMK-89896-6	Insect & disease res.; Glyphosate tol.	cry3A; plrv orf1; plrv orf2; cp4 epsps (aroA:CP4)
Potato	RBMT22-186	NA	Insect & disease res.; Glyphosate tol.	cry3A; plrv orf1; plrv orf2; cp4 epsps (aroA:CP4)
Potato	RBMT22-238	NA	Insect & disease res.; Glyphosate tol.	cry3A; plrv orf1; plrv orf2; cp4 epsps (aroA:CP4)
Potato	RBMT22-262	NA	Insect & disease res.; Glyphosate tol.	cry3A; plrv orf1; plrv orf2; cp4 epsps (aroA:CP4)
Potato	SEMT15-02	NMK-89935-9	Insect & disease res.	cry3A; pvy cp
Potato	SEMT15-07	NA	Insect & disease res.	cry3A; pvy cp
Potato	SEMT15-15	NMK-89930-4	Insect & disease res.	cry3A; pvy cp
Potato	SPBT02-5	NMK-89576-1	Insect res.	cry3A
Potato	SPBT02-7	NMK-89724-5	Insect res.	cry3A
Rice	7Crp#242-95-7		Anti-allergy	7crp
Rice	7Crp#10	NA	Anti-allergy	7crp
Rice	GM Shanyou 63	NA	Insect res.	cry1Ab; cry1Ac
Rice	Huahui-1/TT51-1	NA	Insect res.	cry1Ab; cry1Ac
Rice	LLRICE06	ACS-OS001-4	Glufosinate tol.	bar
Rice	LLRICE601	BCS-OS003-7	Glufosinate tol.	bar
Rice	LLRICE62	ACS-OS002-5	Glufosinate tol.	bar
Rice	Tarom molaii + cry1Ab	NA	Insect res.	cry1Ab (truncated)
Rice	GAT-OS2		Glufosinate tol.	bar
Rice	GAT-OS3		Glufosinate tol.	bar
Rice	PE-7		Insect res.	Cry1Ac
Rice	7Crp#10	NA	Anti-allergy	7crp
Rice	KPD627-8		High tryptophan	OASA1D
Rice	KPD722-4		High tryptophan	OASA1D
Rice	KA317		High tryptophan	OASA1D
Rice	HW5		High tryptophan	OASA1D
Rice	HW1		High tryptophan	OASA1D
Rice	B-4-1-18		Erect leaves semidwarf	Δ OsBRI1
Rice	G-3-3-22		Semidwarf	OSGA2ox1
Rice	AD77		Disease res.	DEF
Rice	AD51		Disease res.	DEF
Rice	AD48		Disease res.	DEF

Rice	AD41		Disease res.	DEF
Rice	13pNasNaatAprt1		Low iron tol.	HvNAS1; HvNAAT-A; APRT
Rice	13pAprt1		Low iron tol.	APRT
Rice	gHvNAS1-gHvNAAT-1		Low iron tol.	HvNAS1; HvNAAT-A; HvNAAT-B
Rice	gHvIDS3-1		Low iron tol.	HvIDS3
Rice	gHvNAAT1		Low iron tol.	HvNAAT-A; HvNAAT-B
Rice	gHvNAS1-1		Low iron tol.	HvNAS1
Rice	NIA-OS006-4		Disease res.	WRKY45
Rice	NIA-OS005-3		Disease res.	WRKY45
Rice	NIA-OS004-2		Disease res.	WRKY45
Rice	NIA-OS003-1		Disease res.	WRKY45
Rice	NIA-OS002-9		Disease res.	WRKY45
Rice	NIA-OS001-8		Disease res.	WRKY45
Rice	OsCr11		Anti-allergy	Modified Cry j
Rice	17053		Glyphosate tol.	cp4 epsps (aroA:CP4)
Rice	17314		Glyphosate tol.	cp4 epsps (aroA:CP4)
Rose	WKS82 / 130-4-1	IFD-52401-4	Modified flower color	5AT; bp40 (f3'5'h)
Rose	WKS92 / 130-9-1	IFD-52901-9	Modified flower color	5AT; bp40 (f3'5'h)
Soybean	260-05 (G94-1, G94-19, G168)	NA	Modified oil/fatty acid	gm-fad2-1 (silencing locus)
Soybean	A2704-12	ACS-GM005-3	Glufosinate tol.	pat
Soybean	A2704-21	ACS-GM004-2	Glufosinate tol.	pat
Soybean	A5547-127	ACS-GM006-4	Glufosinate tol.	pat
Soybean	A5547-35	ACS-GM008-6	Glufosinate tol.	pat
Soybean	CV127	BPS-CV127-9	Imidazolinone tol.	csr1-2
Soybean	DAS68416-4	DAS68416-4	Glufosinate tol.	pat
Soybean	DP305423	DP-305423-1	Modified oil/fatty acid; ALS herbicide tol.	gm-fad2-1 (silencing locus); gm-hra
Soybean	DP356043	DP-356043-5	Modified oil/fatty acid; glyphosate tol.	gm-fad2-1 (silencing locus); gat4601
Soybean	FG72	MST-FG072-3	Glyphosate & HPPD tol.	2mepsps; hppdPF W336
Soybean	GTS 40-3-2 (40-3-2)	MON-04032-6	Glyphosate tol.	cp4 epsps (aroA:CP4)
Soybean	GU262	ACS-GM003-1	Glufosinate tol.	pat
Soybean	MON87701	MON-87701-2	Insect res.	cry1Ac
Soybean	MON87705	MON-87705-6	Modified oil/fatty acid; glyphosate tol.	fatb1-A (sense & antisense); fad2-1A (sense & antisense); cp4 epsps (aroA:CP4)
Soybean	MON87708	MON-87708-9	Dicamba & glyphosate tol.	dmo; cp4 epsps (aroA:CP4)
Soybean	MON87769	MON-87769-7	Modified oil/fatty acid; glyphosate tol.	Pj.D6D; Nc.Fad3; cp4 epsps (aroA:CP4)
Soybean	MON89788	MON-89788-1	Glyphosate tol.	cp4 epsps (aroA:CP4)

Soybean	W62	ACS-GM002-9	Glufosinate tol.	bar
Soybean	W98	ACS-GM001-8	Glufosinate tol.	bar
Soybean	MON87754	MON-87754-1	High oil	dgat2A
Soybean	DAS21606	DAS-21606	Aryloxyalkanoate & glufosinate tol.	Modified aad-12; pat
Soybean	DAS44406	DAS-44406-6	Aryloxyalkanoate, glyphosate & glufosinate tol.	Modified aad-12; 2mepsps; pat
Soybean	SYHT04R	SYN-0004R-8	Mesotrione tol.	Modified avhppd
Soybean	9582.814.19.1		Insect res. & glufosinate tol.	cry1Ac, cry1F, PAT
Squash	CZW3	SEM-ØCZW3-2	Disease res.	cmv cp, zymv cp, wmv cp
Squash	ZW20	SEM-0ZW20-7	Disease res.	zymv cp, wmv cp
Sugar Beet	GTSB77 (T9100152)	SY-GTSB77-8	Glyphosate tol.	cp4 epsps (aroA:CP4); goxv247
Sugar Beet	H7-1	KM-000H71-4	Glyphosate tol.	cp4 epsps (aroA:CP4)
Sugar Beet	T120-7	ACS-BV001-3	Glufosinate tol.	pat
Sugar Beet	T227-1		Glyphosate tol.	cp4 epsps (aroA:CP4)
Sugarcane	NXI-1T		Drought tol.	EcbetA
Sunflower	X81359		Imidazolinone tol.	als
Sweet Pepper	PK-SP01	NA	Disease res.	cmv cp
Tobacco	C/F/93/08-02	NA	Oxynil tol.	bxn
Tobacco	Vector 21-41	NA	Reduced nicotine	NtQPT1 (antisense)
Tomato	1345-4	NA	Delayed ripening/senescense	acc (truncated)
Tomato	35-1-N	NA	Delayed ripening/senescense	sam-k
Tomato	5345	NA	Insect res.	cry1Ac
Tomato	8338	CGN-89322-3	Delayed ripening/senescense	accd
Tomato	B	SYN-0000B-6	Delayed ripening/senescense	pg (sense or antisense)
Tomato	Da	SYN-0000DA-9	Delayed ripening/senescense	pg (sense or antisense)
Sunflower	X81359		Imidazolinone tol.	als
Tomato	Da Dong No 9	NA	Modified product	NA
Tomato	F (1401F, h38F, 11013F,7913F)	SYN-0000F-1	Delayed ripening/senescense	pg (sense or antisense)
Tomato	FLAVR SAVR™	CGN-89564-2	Delayed ripening/senescense	pg (sense or antisense)
Tomato	Huafan No 1	NA	Delayed ripening/senescense	anti-efe
Tomato	PK-TM8805R (8805R)	NA	Disease res.	cmv cp
Wheat	MON71800	MON-718ØØ-3	Glyphosate tol.	cp4 epsps (aroA:CP4)

* Argentine (*Brassica napus*)

** Polish (*B. rapa*)

Treatment of genetically modified plants and seeds with compounds of Formula **1**, *N*-oxides and salts thereof, or compositions comprising said compounds as present component (a) together with one or more additional biologically active compounds or

agents, such as the fungicidal compounds of Formulae **B1**, **B2**, **B3**, **B4**, **B5**, **B6**, **B7**, **B8**, **B9**, **B10**, **B11**, **B12**, **B13** and **B14** of present component (b), 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 Formula **1** or their compositions with one or more additional biologically active compounds or agents on genetically modified plants and seeds.

Pathogens controlled by compositions of the present invention include: Oomycetes, including *Phytophthora* pathogens such as *Phytophthora infestans*, *Phytophthora megasperma*, *Phytophthora parasitica*, *Phytophthora cinnamomi* and *Phytophthora capsici*, *Pythium* pathogens such as *Pythium aphanidermatum*, and pathogens in the Peronosporaceae family such as *Plasmopara viticola*, *Peronospora* spp. (including *Peronospora tabacina* and *Peronospora parasitica*), *Pseudoperonospora* spp. (including *Pseudoperonospora cubensis)* and *Bremia lactucae*; Ascomycetes, including *Alternaria* pathogens such as *Alternaria solani* and *Alternaria brassicae*, *Guignardia* pathogens such as *Guignardia bidwelli*, *Venturia* pathogens such as *Venturia inaequalis*, *Septoria* pathogens such as *Septoria nodorum* and *Septoria tritici*, powdery mildew disease pathogens such as *Blumeria* spp. (including *Blumeria graminis*) and *Erysiphe* spp. (including *Erysiphe polygoni*), *Uncinula necatur*, *Sphaerotheca fuligena* and *Podosphaera leucotricha*, *Pseudocercosporella herpotrichoides*, *Botrytis* pathogens such as *Botrytis cinerea*, *Monilinia fructicola*, *Sclerotinia* pathogens such as *Sclerotinia sclerotiorum* and *Sclerotinia. minor*, *Magnaporthe grisea*, *Phomopsis viticola*, *Helminthosporium* pathogens such as *Helminthosporium tritici repentis*, *Pyrenophora teres*, anthracnose disease pathogens such as *Glomerella* or *Colletotrichum* spp. (such as *Colletotrichum graminicola* and *Colletotrichum orbiculare*), and *Gaeumannomyces graminis*; Basidiomycetes, including *Puccinia* spp. causing rust diseases (such as *Puccinia recondita*, *Puccinia striiformis*, *Puccinia hordei*, *Puccinia graminis* and *Puccinia arachidis)*, *Hemileia vastatrix* and *Phakopsora pachyrhizi*; other pathogens including Rhizoctonia spp. (such as *Rhizoctonia solani and Rhizoctonia oryzae)*; *Fusarium* pathogens such as *Fusarium roseum*, *Fusarium graminearum* and *Fusarium oxysporum*; *Verticillium dahliae*; *Sclerotium rolfsii*; *Rynchosporium secalis*; *Cercosporidium personatum*, *Cercospora arachidicola* and *Cercospora beticola; Rutstroemia floccosum* (also known as *Sclerontina homoeocarpa*); *Rhizopus* spp. (such as *Rhizopus stolonifer*); *Aspergillus* spp. (such as *Aspergillus flavus* and *Aspergillus parasiticus*); and other genera and species closely related to these pathogens. Commonly, pathogens are referred to as diseases, and thus in the preceding sentence the word "pathogen" also refers to the plant disease caused by the pathogen. More precisely, plant diseases are caused by pathogens. Therefore, for example, powdery mildew diseases are plant diseases caused by powdery mildew pathogens, Septoria diseases are plant diseases caused by *Septoria* pathogens, and

rust diseases are plant diseases caused by rust disease pathogens. Certain fungicidal compounds are also bactericidal, and therefore in addition to their fungicidal activity, the compositions or combinations can also have activity against bacteria such as *Erwinia amylovora*, *Xanthomonas campestris*, *Pseudomonas syringae*, and other related species. Furthermore, compounds of Formula **1** and their mixtures and compositions according to this invention are useful in treating postharvest diseases of fruits and vegetables caused by fungi and bacteria. These infections can occur before, during and after harvest. For example, infections can occur before harvest and then remain dormant until some point during ripening (e.g., host begins tissue changes in such a way that infection can progress); also infections can arise from surface wounds created by mechanical or insect injury. In this respect, application of compounds, mixtures and compositions according to this invention can reduce losses (i.e. losses resulting from quantity and quality) due to postharvest diseases which may occur at any time from harvest to consumption. Treatment of postharvest diseases with compounds of the invention can increase the period of time during which perishable edible plant parts (e.g., fruits, seeds, foliage, stems, bulbs, tubers) can be stored refrigerated or unrefrigerated after harvest, and remain edible and free from noticeable or harmful degradation or contamination by fungi or other microorganisms. Treatment of edible plant parts before or after harvest with compounds, mixtures or compositions according to this invention can also decrease the formation of toxic metabolites of fungi or other microorganisms, for example, mycotoxins such as aflatoxins.

In the present fungicidal compositions, the Formula **1** compounds of component (a) can work synergically with the additional fungicidal compounds of component (b) to provide such beneficial results as broadening the spectrum of plant diseases controlled, extending duration of preventative and curative protection, and suppressing proliferation of resistant fungal pathogens. In particular embodiments, compositions are provided in accordance with this invention that comprise proportions of component (a) and component (b) that are especially useful for controlling particular fungal diseases (such as *Alternaria solani*, *Blumeria graminis* f. sp. *tritici*, *Botrytis cinerea*, *Puccinia recondita* f. sp. *tritici*, *Rhizoctonia solani*, *Septoria nodorum* and *Septoria tritici*).

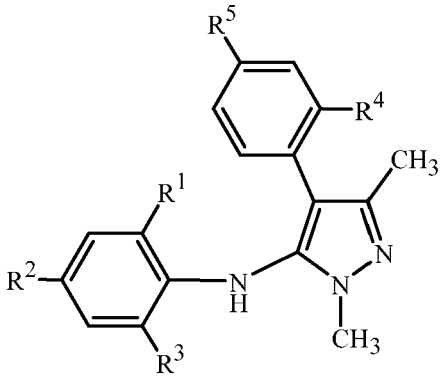
Mixtures of fungicides may also provide significantly better disease control than could be predicted based on the activity of the individual components. This synergism has been described as "the cooperative action of two components of a mixture, such that the total effect is greater or more prolonged than the sum of the effects of the two (or more) taken independently" (see P. M. L. Tames, *Neth. J. Plant Pathology* **1964**, *70*, 73–80). In methods providing plant disease control in which synergy is exhibited from a combination of active ingredients (e.g., fungicidal compounds) applied to the plant or seed, the active ingredients are applied in a synergistic weight ratio and synergistic (i.e. synergistically effective) amounts. Measures of disease control, inhibition and prevention cannot exceed 100%.

Therefore expression of substantial synergism typically requires use of application rates of active ingredients wherein the active ingredients separately provide much less than 100% effect, so that their additive effect is substantially less than 100% to allow the possibility of an increase in effect as result of synergism. On the other hand, application rates of active ingredients that are too low may show not show much activity in mixtures even with the benefit of synergism. One skilled in the art can easily identify and optimize through simple experimentation the weight ratios and application rates (i.e. amounts) of fungicidal compounds providing synergy.

The following Tests include tests demonstrating the efficacy of compounds of Formula **1** for controlling specific pathogens; this efficacy is thus provided to fungicidal mixtures comprising these compounds. The disease control afforded by the present compounds alone or in mixtures is not limited, however, to the pathogenic fungi species exemplified.

See Index Table A for compound descriptions. The abbreviation "Cmpd." stands for "Compound", and the abbreviation "Ex." stands for "Example" and is followed by a number indicating in which Synthesis Example the compound is prepared. Mass spectra (M.S.) are reported as the molecular weight of the highest isotopic abundance parent ion (M+1) formed by addition of H^+ (molecular weight of 1) to the molecule, observed by mass spectrometry using atmospheric pressure chemical ionization (AP^+). The presence of molecular ions containing one or more higher atomic weight isotopes of lower abundance (e.g., ^{37}Cl, ^{81}Br) is not reported.

INDEX TABLE A



Cmpd.	R1	R2	R3	R4	R5	m.p. (°C)	AP+ (M+1)
1	F	H	H	Cl	F		334
2	F	H	F	Cl	F		352
3	Cl	H	F	Cl	F	166–168	
4 (Ex. 1)	Cl	H	F	Br	F		414
5	Br	H	F	Cl	F		414
6	Br	H	H	Br	F		440

Cmpd.	R^1	R^2	R^3	R^4	R^5	m.p. (°C)	AP^+ (M+1)
7	Br	H	F	Br	F	154–156	
8	Cl	H	H	Br	F		396
9	Br	H	H	Cl	F		396
10	Cl	H	H	Cl	F		350
11 (Ex. 2)	F	H	F	Br	F	134–136	
12	F	F	F	Cl	F		370
13	F	F	F	F	F		354
14	F	H	F	Cl	OMe		364
15	F	Cl	F	Cl	F		386
16	Cl	F	F	Cl	F		386
17	Cl	F	F	Br	F		431
18	Cl	F	Cl	Br	F		448
19	F	H	F	Cl	CN		359
20	F	Cl	F	Cl	CN		393
21	Cl	F	F	F	F		369
22	Br	F	Cl	F	F		432
23	F	Br	F	Cl	F		432
24	Cl	Cl	F	Cl	F		402
25	Cl	F	Cl	Cl	F		404
26	Cl	Br	Cl	F	F		448
27	Cl	Cl	F	F	F		386
28	F	Br	F	Br	F		474
29	Cl	Br	Cl	Cl	F		464
30	Cl	Cl	Cl	F	F		404
31	Br	F	F	F	F		416
32	Cl	Br	Cl	Br	F		508
33	Cl	Cl	Cl	Cl	F		420
34	Br	F	F	Cl	F		432

BIOLOGICAL EXAMPLES OF THE INVENTION

General protocol for preparing test suspensions for Tests A–I: the test compounds were first dissolved in acetone in an amount equal to 3% of the final volume and then suspended at the desired concentration (in ppm) in acetone and purified water (50/50 mix by volume) containing 250 ppm of the surfactant Trem® 014 (polyhydric alcohol esters). The resulting test suspensions were then used in Tests A–I. Each test was conducted in triplicate, and the results were averaged. Spraying a 200 ppm test suspension to the point of run-off on

the test plants was the equivalent of a rate of about 800 g/ha. Unless otherwise indicated, the rating values indicate a 200 ppm test suspension was used. (An asterisk "*" next to the rating value indicates a 40 ppm test suspension was used.)

TEST A

The test suspension was sprayed to the point of run-off on tomato seedlings. The following day the seedlings were inoculated with a spore suspension of *Botrytis cinerea* (the causal agent of tomato Botrytis) and incubated in saturated atmosphere at 20 °C for 48 h, and then moved to a growth chamber at 24 °C for 3 additional days, after which time visual disease ratings were made.

TEST B

The test suspension was sprayed to the point of run-off on tomato seedlings. The following day the seedlings were inoculated with a spore suspension of *Alternaria solani* (the causal agent of tomato early blight) and incubated in a saturated atmosphere at 27 °C for 48 h, and then moved to a growth chamber at 20 °C for 5 days, after which time visual disease ratings were made.

TEST C

The test suspension was sprayed to the point of run-off on tomato seedlings. The following day the seedlings were inoculated with a spore suspension of *Phytophthora infestans* (the causal agent of tomato late blight) and incubated in a saturated atmosphere at 20 °C for 24 h, and then moved to a growth chamber at 20 °C for 5 days, after which time visual disease ratings were made.

TEST D

The test suspension was sprayed to the point of run-off on creeping bent grass (*Agrostis* sp.) seedlings. The following day the seedlings were inoculated with a bran and mycelial slurry of *Rhizoctonia solani* (the causal agent of turf brown patch) and incubated in a saturated atmosphere at 27 °C for 48 h, and then moved to a growth chamber at 27 °C for 3 days, after which time disease ratings were made.

TEST E

The test suspension was sprayed to the point of run-off on wheat seedlings. The following day the seedlings were inoculated with a spore suspension of *Septoria nodorum* (the causal agent of Septoria glume blotch) and incubated in a saturated atmosphere at 24 °C for 48 h, and then moved to a growth chamber at 20 °C for 9 days, after which time visual disease ratings were made.

TEST F

The test suspension was sprayed to the point of run-off on wheat seedlings. The following day the seedlings were inoculated with a spore suspension of *Septoria tritici* (the

causal agent of wheat leaf blotch) and incubated in saturated atmosphere at 24 °C for 48 h, and then the seedlings were moved to a growth chamber at 20 °C for 19 additional days, after which time visual disease ratings were made.

TEST G

Wheat seedlings were inoculated with a spore suspension of *Puccinia recondita* f. sp. *tritici* (the causal agent of wheat leaf rust) and incubated in a saturated atmosphere at 20 °C for 24 h, and then moved to a growth chamber at 20 °C for 2 days. At the end of this time the test suspension was sprayed to the point of run-off, and then the seedlings were moved to a growth chamber at 20 °C for 4 days after which time visual disease ratings were made.

TEST H

The test suspension was sprayed to the point of run-off on wheat seedlings. The following day the seedlings were inoculated with a spore suspension of *Puccinia recondita* f. sp. *tritici* (the causal agent of wheat leaf rust) and incubated in a saturated atmosphere at 20 °C for 24 h, and then moved to a growth chamber at 20 °C for 6 days, after which time visual disease ratings were made.

TEST I

The test suspension was sprayed to the point of run-off on wheat seedlings. The following day the seedlings were inoculated with a spore dust of *Blumeria graminis* f. sp. *tritici* (also known as *Erysiphe graminis* f. sp. *tritici*, the causal agent of wheat powdery mildew) and incubated in a growth chamber at 20 °C for 8 days, after which time visual disease ratings were made.

Results for Tests A–I are given in Table A. In the Table, a rating of 100 indicates 100% disease control and a rating of 0 indicates no disease control (relative to the controls). A hyphen (-) indicates no test results.

TABLE A

Cmpd.	Test A	Test B	Test C	Test D	Test E	Test F	Test G	Test H	Test I
1	99	93	0	99	0	100	-	99	100
2	100	100	-	-	87	100	0	99	100
3	100	100	-	-	99	100	100	100	99
4	100	-	-	-	-	100	-	100	100
5	100	-	-	-	-	100	-	96	99
6	99*	-	-	-	-	100*	-	96*	99*
7	100	-	-	-	-	100	-	100	100
8	100	-	-	-	-	100	-	99	100
9	99*	-	-	-	0*	100*	-	93*	100*
10	100*	-	-	-	0*	100*	-	98*	100*

Cmpd.	Test A	Test B	Test C	Test D	Test E	Test F	Test G	Test H	Test I
11	100*	-	-	-	60*	100*	-	98	99
12	99	100	-	-	99	95	99	100	100
13	100	99	-	-	90	94	0	100	99
14	98	100	-	-	0	100	95	100	98
15	100	99	-	-	90	100	99	100	100
16	98	100	-	-	100	100	97	100	100
17	100	99	-	-	96	100	92	100	100
18	99	0	-	-	0	99	9	99	96
19	-	-	-	-	-	-	-	-	-
20	100	97	-	-	95	100	94	100	99
21	100	100	-	-	97	100	91	100	100
22	100	80	-	-	94	100	19	100	100
23	100	99	-	-	64	100	74	100	100
24	100	100	-	-	100	100	100	100	100
25	100	66	-	-	0	100	17	100	99
26	100	0	-	-	0	100	94	97	99
27	100	99	-	-	99	100	100	100	100
28	100*	77*	-	-	60*	100*	91*	100*	100*
29	99	0	-	-	0	100	99	100	99
30	100	0	-	-	0	100	67	99	99
31	100	100	-	-	100	100	100	100	100
32	0	.0	-	-	0	100	91	97	48
33	65	0	-	-	0	100	79	98	79
34	100	99	-	-	100	100	100	100	100

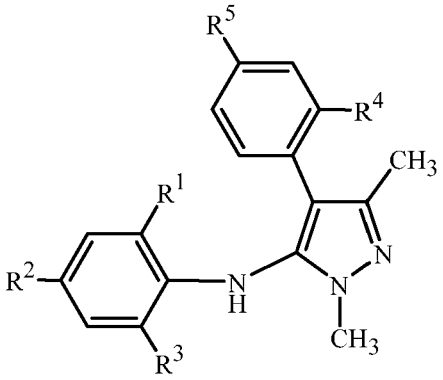
The test results presented in Table A for compounds of Formula **1** illustrate the fungicidal activity of component (a) contributing to the plant disease control utility of compositions comprising component (a) in combination with component (b) and optionally component (c) according to the present invention.

CLAIMS

What is claimed is:

1. A fungicidal composition comprising:

(a) at least one compound selected from the compounds of Formula **1**, *N*-oxides, and salts thereof:



1

wherein

R^1 is H or halogen;

R^2 is H or halogen;

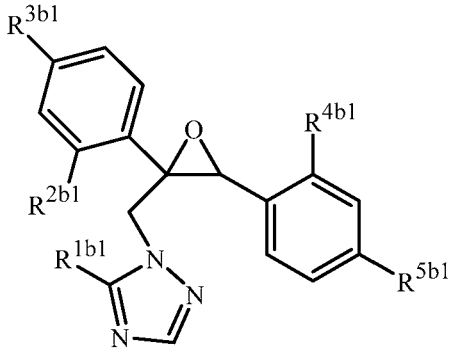
R^3 is halogen;

R^4 is halogen or CH_3; and

R^5 is halogen, cyano, CH_3 or C_1–C_2 alkoxy; and

(b) at least one fungicidal compound selected from

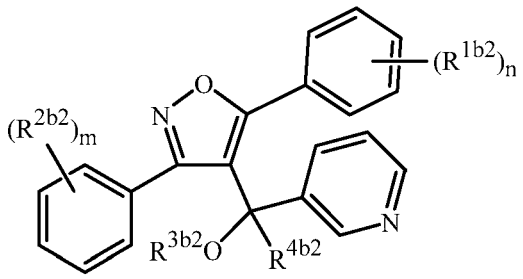
(b1)



B1

wherein R^{1b1} is H, -SH, -SCN, C_1–C_6 alkylthio, C_1–C_6 alkenylthio, C_1–C_6 alkynylthio or C_4-C_7 cycloalkylalkylthio; and R^{2b1}, R^{3b1}, R^{4b1} and R^{5b1} are each independently H or halogen; provided that (a) at least one of R^{2b1}, R^{3b1}, R^{4b1} and R^{5b1} is other than H and (b) the compound of Formula **B1** is other than 1-[3-(2-chlorophenyl)-2,3-epoxy-2-(4-fluorophenyl)propyl]-1*H*-1,2,4-triazole;

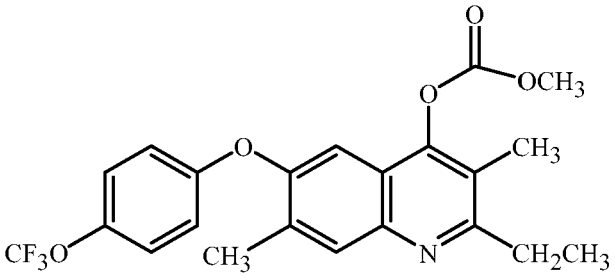
(b2)



B2

wherein each R^{1b2} and R^{2b2} is independently halogen; R^{3b2} is H, CH_3, CHO or $C(O)CH_3$; R^{4b2} is H; or R^{3b2} and R^{4b2} are taken together as CH_2; and n and m are each independently 1 or 2;

(b3)



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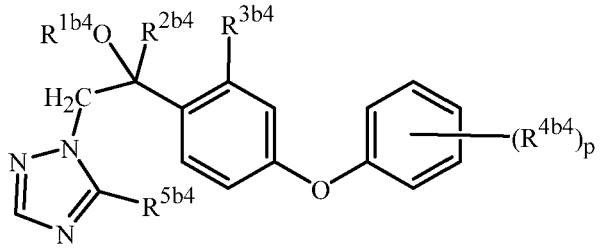
B3

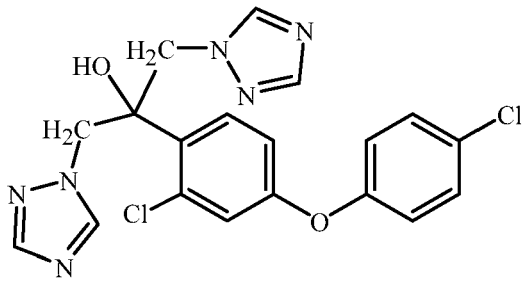
(b4)



B4

wherein R^{1b4} is H or CH_3; R^{2b4} is C_1–C_4 alkyl; R^{3b4} is H, halogen or CF_3; each R^{4b4} is independently F or Cl; R^{5b4} is H, -SH, -SCN, C_1–C_4 alkylthio or C_2–C_4 alkenylthio; and p is 1 or 2;

(b5)



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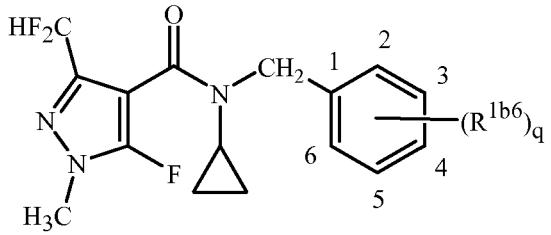
B5

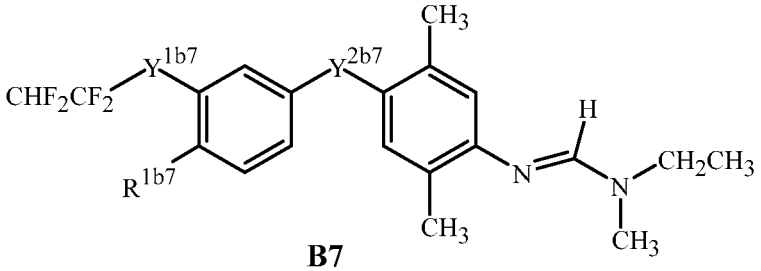
(b6)



B6

wherein each R^{1b6} is independently halogen, C_1–C_5 alkyl, C_1–C_5 haloalkyl, C_3–C_6 cycloalkyl or C_1–C_5 alkoxy; and q is 1, 2 or 3;

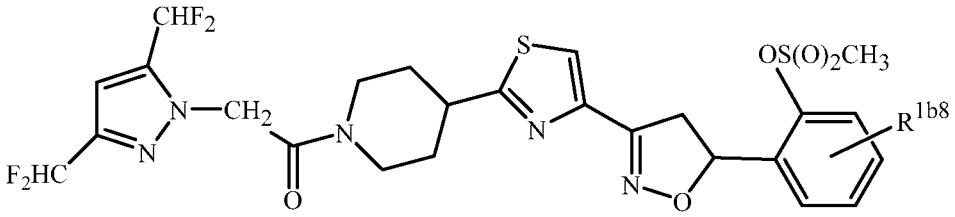
(b7)



B7

wherein R^{1b7} is H, F or Cl; and Y^{1b7} and Y^{2b7} are independently O or S;

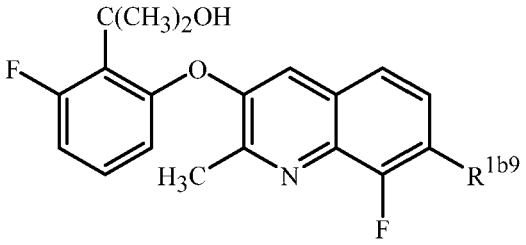
(b8)



B8

wherein R^{1b8} is H, F, Cl or CH_3;

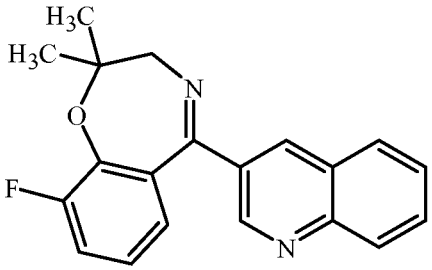
(b9)



B9

wherein R^{1b9} is H or F;

(b10)



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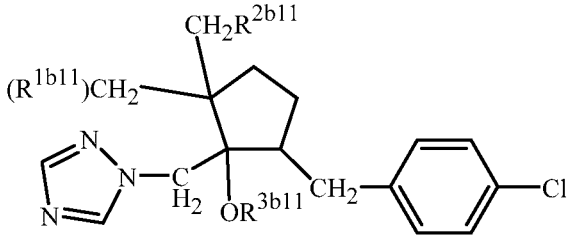
B10

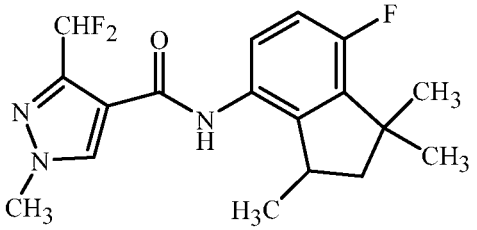
(b11)



B11

wherein R^{1b11} is H or -OH; R^{2b11} is Cl or -OH; and R^{3b11} is H; or R^{2b11} and R^{3b11} are taken together as a single bond;

(b12)



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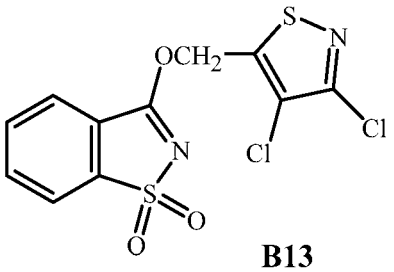
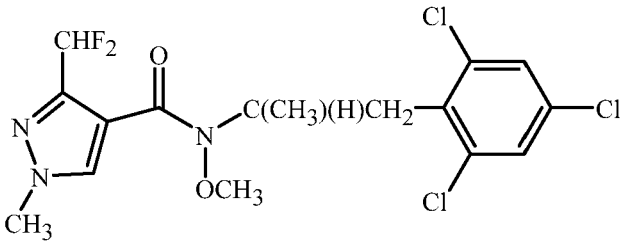
B12

(b13)



B13 ;

(b14)



B14 ;

and salts thereof.

2. The composition of Claim 1 wherein component (a) comprises a compound selected from the group consisting of

4-(2-chloro-4-fluorophenyl)-*N*-(2,6-difluorophenyl)-1,3-dimethyl-1*H*-pyrazol-5-amine,

4-(2-chloro-4-fluorophenyl)-*N*-(2-chloro-6-fluorophenyl)-1,3-dimethyl-1*H*-pyrazol-5-amine,

4-(2-bromo-4-fluorophenyl)-*N*-(2-chloro-6-fluorophenyl)-1,3-dimethyl-1*H*-pyrazol-5-amine,

N-(2-bromo-6-fluorophenyl)-4-(2-chloro-4-fluorophenyl)-1,3-dimethyl-1*H*-pyrazol-5-amine,

4-(2-bromo-4-fluorophenyl)-*N*-(2-bromo-6-fluorophenyl)-1,3-dimethyl-1*H*-pyrazol-5-amine,

4-(2-bromo-4-fluorophenyl)-*N*-(2-chlorophenyl)-1,3-dimethyl-1*H*-pyrazol-5-amine,

N-(2-bromophenyl)-4-(2-chloro-4-fluorophenyl)-1,3-dimethyl-1*H*-pyrazol-5-amine,

4-(2-bromo-4-fluorophenyl)-*N*-(2,6-difluorophenyl)-1,3-dimethyl-1*H*-pyrazol-5-amine,

N-(4-chloro-2,6-difluorophenyl)-4-(2-chloro-4-fluorophenyl)-1,3-dimethyl-1*H*-pyrazol-5-amine,

N-(2-chloro-4,6-difluorophenyl)-4-(2-chloro-4-fluorophenyl)-1,3-dimethyl-1*H*-pyrazol-5-amine,

4-(2-bromo-4-fluorophenyl)-*N*-(2-chloro-4,6-difluorophenyl)-1,3-dimethyl-1*H*-pyrazol-5-amine and

N-(2-bromo-4,6-difluorophenyl)-4-(2-chloro-4-fluorophenyl)-1,3-dimethyl-1*H*-pyrazol-5-amine.

3. The composition of any one of Claims 1 through 2 further comprising (c) at least one additional compound or agent that is biologically active.

4. The composition of Claim 3 wherein component (c) comprises at least one fungicidal compound selected from the group consisting of:

(c1) methyl benzimidazole carbamate fungicides;
(c2) dicarboximide fungicides;
(c3) demethylation inhibitor fungicides;
(c4) phenylamide fungicides;
(c5) amine/morpholine fungicides;
(c6) phospholipid biosynthesis inhibitor fungicides;
(c7) carboxamide fungicides;
(c8) hydroxy(2-amino-)pyrimidine fungicides;
(c9) anilinopyrimidine fungicides;
(c10) *N*-phenyl carbamate fungicides;
(c11) quinone outside inhibitor fungicides;
(c12) phenylpyrrole fungicides;
(c13) quinoline fungicides;
(c14) lipid peroxidation inhibitor fungicides;
(c15) melanin biosynthesis inhibitor-reductase fungicides;
(c16) melanin biosynthesis inhibitor-dehydratase fungicides;
(c17) sterol biosynthesis inhibitor: class III fungicides;
(c18) squalene-epoxidase inhibitor fungicides;
(c19) polyoxin fungicides;
(c20) phenylurea fungicides;
(c21) quinone inside inhibitor fungicides;
(c22) benzamide and thiazolecarboxamide fungicides;
(c23) enopyranuronic acid antibiotic fungicides;
(c24) hexopyranosyl antibiotic fungicides;
(c25) glucopyranosyl antibiotic: protein synthesis fungicides;
(c26) glucopyranosyl antibiotic: trehalase and inositol biosynthesis fungicides;
(c27) cyanoacetamideoxime fungicides;
(c28) carbamate fungicides;
(c29) oxidative phosphorylation uncoupling fungicides;
(c30) organo tin fungicides;
(c31) carboxylic acid fungicides;

(c32) heteroaromatic fungicides;
(c33) phosphonate fungicides;
(c34) phthalamic acid fungicides;
(c35) benzotriazine fungicides;
(c36) benzene-sulfonamide fungicides;
(c37) pyridazinone fungicides;
(c38) thiophene-carboxamide fungicides;
(c39) pyrimidinamide fungicides;
(c40) carboxylic acid amide fungicides;
(c41) tetracycline antibiotic fungicides;
(c42) thiocarbamate fungicides;
(c43) benzamide fungicides;
(c44) host plant defense induction fungicides;
(c45) multi-site contact activity fungicides;
(c46) fungicides other than fungicides of component (a) and components (c1) through (c45); and
salts of compounds of (c1) through (c46).

5. The composition of Claim 3 wherein component (c) includes at least one compound selected from acibenzolar-*S*-methyl, aldimorph, ametoctradin, amisulbrom, anilazine, azaconazole, azoxystrobin, benalaxyl, benalaxyl-M, benodanil, benomyl, benthiavalicarb, benthiavalicarb-isopropyl, benzovindiflupyr, bethoxazin, binapacryl, biphenyl, bitertanol, bixafen, blasticidin-S, boscalid, bromuconazole, bupirimate, buthiobate, captafol, captan, carbendazim, carboxin, carpropamid, chloroneb, chlorothalonil, chlozolinate, clotrimazole, copper salts, coumoxystrobin, cyazofamid, cyflufenamid, cymoxanil, cyproconazole, cyprodinil, dichlofluanid, diclocymet, diclomezine, dicloran, diethofencarb, difenoconazole, diflumetorim, dimethirimol, dimethomorph, dimoxystrobin, diniconazole, diniconazole-M, dinocap, dithianon, dodemorph, dodine, econazole, edifenphos, enoxastrobin, epoxiconazole, etaconazole, ethaboxam, ethirimol, etridiazole, famoxadone, fenamidone, fenaminstrobin, fenarimol, fenbuconazole, fenfuram, fenhexamid, fenoxanil, fenpiclonil, fenpropidin, fenpropimorph, fenpyrazamine, fentin acetate, fentin chloride, fentin hydroxide, ferbam, ferimzone, fluazinam, fludioxonil, flufenoxystrobin, flumetover, flumorph, fluopicolide, fluopyram, fluoroimide, fluoxastrobin, fluquinconazole, flusilazole, flusulfamide, flutianil, flutolanil, flutriafol, fluxapyroxad, folpet, fuberidazole, furalaxyl, furametpyr, guazatine, hexaconazole, hymexazol, imazalil, imibenconazole, iminoctadine, iodocarb, ipconazole, iprobenfos, iprodione, iprovalicarb, isoconazole, isofetamid, isoprothiolane, isopyrazam, isotianil, kasugamycin, kresoxim-methyl, mancozeb, mandestrobin, mandipropamid, maneb, mepanipyrim, mepronil, meptyldinocap, metalaxyl,

metalaxyl-M, metconazole, methasulfocarb, metiram, metominostrobin, metrafenone, miconazole, myclobutanil, naftifine, neo-asozin, nuarimol, octhilinone, ofurace, orysastrobin, oxadixyl, oxathiapiprolin, oxolinic acid, oxpoconazole, oxycarboxin, oxytetracycline, pefurazoate, penconazole, pencycuron, penflufen, penthiopyrad, phosphorous acid and salts thereof, phthalide, picoxystrobin, piperalin, polyoxin, probenazole, prochloraz, procymidone, propamocarb, propamocarb-hydrochloride, propiconazole, propineb, proquinazid, prothiocarb, prothioconazole, pyraclostrobin, pyrametostrobin, pyraoxystrobin, pyrazophos, pyribencarb, pyributicarb, pyrifenox, pyrimethanil, pyriofenone, pyrisoxazole, pyroquilon, pyrrolnitrin, quinconazole, quinomethionate, quinoxyfen, quintozene, sedaxane, silthiofam, simeconazole, spiroxamine, streptomycin, sulfur, tebuconazole, tebufloquin, tecloftalam, tecnazene, terbinafine, tetraconazole, thiabendazole, thifluzamide, thiophanate, thiophanate-methyl, thiram, tiadinil, tolclofos-methyl, tolnifanide, tolprocarb, tolylfluanid, triadimefon, triadimenol, triarimol, triazoxide, triclopyricarb, tricyclazole, tridemorph, trifloxystrobin, triflumizole, triforine, trimorphamide, triticonazole, uniconazole, validamycin, valifenalate, vinclozolin, zineb, ziram, zoxamide, *N*'-[4-[4-chloro-3-(trifluoromethyl)phenoxy]-2,5-dimethylphenyl]-*N*-ethyl-*N*-methylmethanimidamide, *N*-[2-[4-[[3-(4-chlorophenyl)-2-propyn-1-yl]oxy]-3-methoxyphenyl]ethyl]-3-methyl-2-[(methylsulfonyl)amino]butanamide, *N*-[2-[4-[[3-(4-chlorophenyl)-2-propyn-1-yl]oxy]-3-methoxyphenyl]ethyl]-3-methyl-2-[(ethylsulfonyl)amino]-butanamide, 2-butoxy-6-iodo-3-propyl-4*H*-1-benzopyran-4-one, 3-[5-(4-chlorophenyl)-2,3-dimethyl-3-isoxazolidinyl]pyridine, 4-fluorophenyl *N*-[1-[[[1-(4-cyanophenyl)ethyl]-sulfonyl]methyl]propyl]carbamate, *N*-[[(cyclopropylmethoxy)amino][6-(difluoromethoxy)-2,3-difluorophenyl]methylene]benzeneacetamide, α-(methoxyimino)-*N*-methyl-2-[[[1-[3-(trifluoromethyl)phenyl]ethoxy]imino]methyl]benzeneacetamide, pentyl *N*-[4-[[[[(1-methyl-1*H*-tetrazol-5-yl)phenylmethylene]amino]oxy]methyl]-2-thiazolyl]carbamate, pentyl *N*-[6-[[[[(1-methyl-1*H*-tetrazol-5-yl)phenylmethylene]amino]oxy]methyl]-2-pyridinyl]carbamate, 2-[(3-bromo-6-quinolinyl)oxy]-*N*-(1,1-dimethyl-2-butyn-1-yl)-2-(methylthio)acetamide, 2-[(3-ethynyl-6-quinolinyl)oxy]-*N*-[1-(hydroxymethyl)-1-methyl-2-propyn-1-yl]-2-(methyl-thio)acetamide, *N*-(1,1-dimethyl-2-butyn-1-yl)-2-[(3-ethynyl-6-quinolinyl)oxy]-2-(methylthio)acetamide, *N*'-[4-[[3-[(4-chlorophenyl)methyl]-1,2,4-thiadiazol-5-yl]oxy]-2,5-dimethylphenyl]-*N*-ethyl-*N*-methylmethanimidamide, 1-[4-[4-[5-[(2,6-difluorophenoxy)methyl]-4,5-dihydro-3-isoxazolyl]-2-thiazolyl]-1-piperdinyl-2-[5-methyl-3-(trifluoromethyl)-1*H*-pyrazol-1-yl]ethanone, (2-chloro-6-fluorophenyl)methyl 2-[1-[2-[3,5-bis(difluoromethyl)-1*H*-pyrazol-1-yl]acetyl]-4-piperidinyl]-4-thiazolecarboxylate, (1*R*)-1,2,3,4-tetrahydro-1-naphthalenyl 2-[1-[2-[3,5-bis(difluoromethyl)-1*H*-pyrazol-1-yl]acetyl]-4-piperidinyl]-4-thiazolecarboxylate, [[4-methoxy-2-[[[(3*S*,7*R*,8*R*,9*S*)-9-methyl-8-(2-methyl-1-oxopropoxy)-2,6-dioxo-7-(phenylmethyl)-1,5-dioxonan-3-yl]amino]carbonyl]-3-pyridinyl]oxy]methyl 2-methylpropanoate, (3*S*,6*S*,7*R*,8*R*)-3-[[[3-(acetyloxy)-4-methoxy-2-

pyridinyl]carbonyl]amino]-6-methyl-4,9-dioxo-8-(phenylmethyl)-1,5-dioxonan-7-yl 2-methylpropanoate, (3*S*,6*S*,7*R*,8*R*)-3-[[[3-[(acetyloxy)methoxy]-4-methoxy-2-pyridinyl]carbonyl]amino]-6-methyl-4,9-dioxo-8-(phenylmethyl)-1,5-dioxonan-7-yl 2-methylpropanoate, (3*S*,6*S*,7*R*,8*R*)-3-[[[4-methoxy-3-[[(2-methylpropoxy)carbonyl]oxy]-2-pyridinyl]carbonyl]amino]-6-methyl-4,9-dioxo-8-(phenylmethyl)-1,5-dioxonan-7-yl 2-methylpropanoate, *N*-[[3-(1,3-benzodioxol-5-ylmethoxy)-4-methoxy-2-pyridinyl]carbonyl]-*O*-[2,5-dideoxy-3-*O*-(2-methyl-1-oxopropyl)-2-(phenylmethyl)-L-arabinonoyl]-L-serine (1→4')-lactone, 5-fluoro-2-[(4-methylphenyl)methoxy]-4-pyrimidinamine, 5-fluoro-2-[(4-fluorophenyl)methoxy]-4-pyrimidinamine, 5,8-difluoro-*N*-[2-[3-methoxy-4-[[4-(trifluoromethyl)-2-pyridinyl]oxy]phenyl]ethyl]-4-quinazolinamine, pentyl [6-[[[(*Z*)-[(1-methyl-1*H*-tetrazol-5-yl)phenylmethylene]amino]oxy]methyl]-2-pyridinyl]carbamate, 1,1-dimethylethyl *N*-[6-[[[(*Z*)-[(1-methyl-1*H*-tetrazol-5-yl)phenylmethylene]amino]oxy]methyl]-2-pyridinyl]carbamate, 3-butyn-1-yl *N*-[6-[[[(*Z*)-[(1-methyl-1*H*-tetrazol-5-yl)phenylmethylene]amino]oxy]methyl]-2-pyridinyl]carbamate, *N*-(3',4'-difluoro[1,1'-biphenyl]-2-yl)-3-(trifluoromethyl)-2-pyrazinecarboxamide, *N*-[2-(2,4-dichlorophenyl)-2-methoxy-1-methylethyl]-3-(difluoromethyl)-1-methyl-1*H*-pyrazole-4-carboxamide, 3-(difluoromethyl)-*N*-[4-fluoro-2-(1,1,2,3,3,3-hexafluoropropoxy)phenyl]-1-methyl-1*H*-pyrazole-4-carboxamide, 3-(difluoromethyl)-1-methyl-*N*-[2-(1,1,2,2-tetrafluoroethoxy)-phenyl]-1*H*-pyrazole-4-carboxamide, (α*R*)-2-[(2,5-dimethylphenoxy)methyl]-α-methoxy-*N*-methylbenzeneacetamide, 2,6-dimethyl-1*H*,5*H*-[1,4]dithiino[2,3-c:5,6-c']dipyrrole-1,3,5,7(2*H*,6*H*)-tetrone, 2-[(3-bromo-6-quinolinyl)oxy]-*N*-(1,1-dimethylethyl)butanamide, 2-[(3-bromo-8-methyl-6-quinolinyl)oxy]-*N*-[(1,1-dimethyl-2-propyn-1-yl)-2-(methylthio)acetamide, 2-[2-(1-chlorocyclopropyl)-4-(2,2-dichlorocyclopropyl)-2-hydroxybutyl]-1,2-dihydro-3*H*-1,2,4-triazole-3-thione, 3-(difluoromethyl)-*N*-(2,3-dihydro-1,1,3-trimethyl-1*H*-inden-4-yl)-1-methyl-1*H*-pyrazole-4-carboxamide, *N*-[2-(1*S*,2*R*)-[1,1'-bicyclopropyl]-2-ylphenyl]-3-(difluoromethyl)-1-methyl-1*H*-pyrazole-4-carboxamide, *N*-cyclopropyl-3-(difluoromethyl)-5-fluoro-1-methyl-*N*-[[2-(1-methylethyl)phenyl]methyl]-1*H*-pyrazole-4-carboxamide and α-(1-chlorocyclopropyl)-α-[2-(2,2-dichlorocyclopropyl)ethyl]-1*H*-1,2,4-triazole-1-ethanol.

6. A composition comprising the composition of any one of Claims 1 through 5 and at least one additional component selected from the group consisting of surfactants, solid diluents and liquid diluents.

7. A method for protecting a plant or plant seed from diseases caused by fungal pathogens comprising applying a fungicidally effective amount of the composition of any one of Claims 1 through 6 to the plant or plant seed.