

TITLE

HERBICIDAL CYCLIC AMIDES N-SUBSTITUTED WITH A
HALOALKYLSULFONYLANILIDE GROUP

FIELD OF THE DISCLOSURE

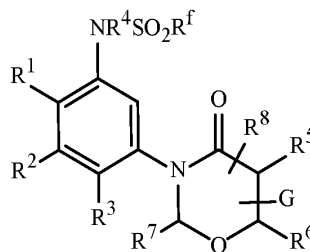
This invention relates to certain haloalkyl sulfonanilides, their *N*-oxides, salts and
5 compositions, and methods of their use for controlling undesirable vegetation.

BACKGROUND OF THE DISCLOSURE

The control of undesired vegetation is extremely important in achieving high crop
efficiency. Achievement of selective control of the growth of weeds especially in such useful
crops as rice, soybean, sugar beet, maize, potato, wheat, barley, tomato and plantation crops,
10 among others, is very desirable. Unchecked weed growth in such useful crops can cause
significant reduction in productivity and thereby result in increased costs to the consumer. The
control of undesired vegetation in noncrop areas is also important. Many products are
commercially available for these purposes, but the need continues for new compounds that are
more effective, less costly, less toxic, environmentally safer or have different sites of action.

SUMMARY OF THE DISCLOSURE

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

**1**

20 wherein

R¹ is H, C₁–C₇ alkyl, halogen, CN, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl,
C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₃–C₇ haloalkynyl,
C₂–C₇ alkoxyalkyl, C₁–C₇ alkoxy, C₁–C₅ alkylthio, C₂–C₃ alkoxy carbonyl or
25 C₂–C₇ haloalkoxyalkyl;

R² is H, C₁–C₇ alkyl, halogen, CN, C₁–C₇ haloalkyl, C₁–C₇ alkoxy or C₁–C₅
alkylthio;

R³ is H, C₁–C₇ alkyl, halogen, CN, C₂–C₆ alkenyl, C₂–C₇ alkynyl, C₃–C₇ cycloalkyl,
C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₃–C₇ haloalkynyl,

C₂–C₇ alkoxyalkyl, C₁–C₇ alkoxy, C₁–C₅ alkylthio, C₂–C₃ alkoxycarbonyl or C₂–C₇ haloalkoxyalkyl;

R⁴ is H, C(=O)R¹⁴, -C(=S)R¹⁴, -CO₂R¹⁴, -C(=O)SR¹⁴, -S(O)₂R¹⁴, C(=O)NR¹³R¹⁴, -S(O)₂NR¹³R¹⁴, CH₂OC(=O)OR¹⁴, CH₂OC(=O)NR¹³R¹⁴ or CH₂OC(=O)R¹⁴; or propargyl, allyl or benzyl.

R⁵ is H, C₂–C₆ alkenyl, C₂–C₇ haloalkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₄–C₇ cycloalkylalkyl, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₃–C₇ alkylthioalkyl, C₁–C₇ haloalkoxy, C₂–C₇ alkoxyalkyl or C₄–C₇ alkylcycloalkyl;

R⁶ is H, C₁–C₇ alkyl, halogen, CN, C₁–C₅ alkylthio, C₂–C₃ alkoxycarbonyl, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₄–C₇ cycloalkylalkyl, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₂–C₇ alkoxyalkyl, C₃–C₇ alkylthioalkyl, C₁–C₇ alkoxy, C₁–C₇ haloalkoxy, C₂–C₇ haloalkoxyalkyl or C₄–C₇ alkylcycloalkyl;

R⁷ is H, C₁–C₇ alkyl, halogen, CN, C₁–C₅ alkylthio, C₂–C₃ alkoxycarbonyl, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₄–C₇ cycloalkylalkyl, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₂–C₇ alkoxyalkyl, C₃–C₇ alkylthioalkyl, C₁–C₇ alkoxy, C₁–C₇ haloalkoxy, C₂–C₇ haloalkoxyalkyl or C₄–C₇ alkylcycloalkyl;

R⁸ is H, C₁–C₇ alkyl, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₄–C₇ cycloalkylalkyl, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₂–C₇ alkoxyalkyl, C₃–C₇ alkylthioalkyl, C₁–C₇ alkoxy, C₁–C₇ haloalkoxy, C₂–C₇ alkoxyalkyl or C₄–C₇ alkylcycloalkyl;

Q is CHR⁹, O or a direct bond;

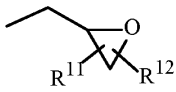
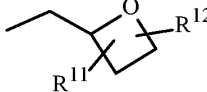
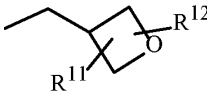
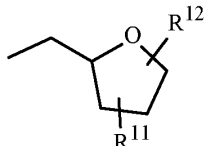
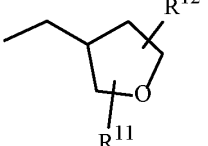
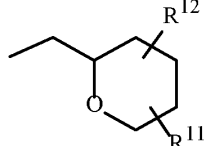
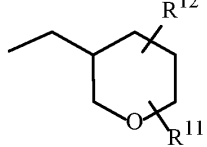
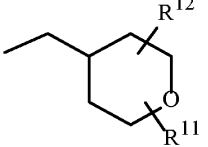
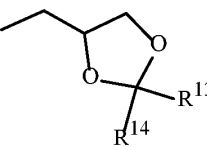
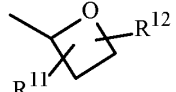
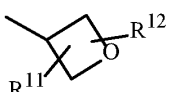
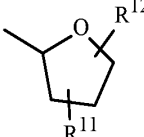
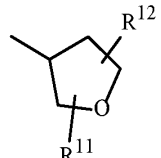
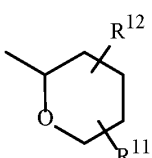
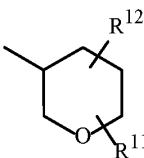
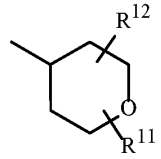
R⁹ is H, C₁–C₇ alkyl, halogen, CN, C₁–C₅ alkylthio, C₂–C₃ alkoxycarbonyl, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₄–C₇ cycloalkylalkyl, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₂–C₇ alkoxyalkyl, C₃–C₇ alkylthioalkyl, C₁–C₇ alkoxy, C₁–C₇ haloalkoxy, C₂–C₇ alkoxyalkyl, C₂–C₇ haloalkoxyalkyl or C₄–C₇ alkylcycloalkyl;

G is OR¹⁰, SR¹⁰, SOR¹⁰ or SO₂R¹⁰; or

G and R⁵ are taken together to form N-OR¹⁵;

R¹⁰ is H, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₃–C₇ halocycloalkyl, C₄–C₇ alkylcycloalkyl, C₄–C₇ cycloalkylalkyl, C₄–C₇ halocycloalkylalkyl, C₅–C₇ alkylcycloalkylalkyl, C₁–C₇ haloalkoxy, C₂–C₇ alkoxyalkyl, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₃–C₇ alkylthioalkyl, C₁–C₆ nitroalkyl, C₃–C₆ alkylcarboalkyl, C₃–C₆ alkoxycarboalkyl, C₂–C₇ haloalkoxyalkyl, benzyl or C₃–C₆ alkylcarboalkoxy; or

R¹⁰ is selected from the group consisting of

					
R ¹⁰ -1	,	R ¹⁰ -2	,	R ¹⁰ -3	,
					
R ¹⁰ -4		R ¹⁰ -5		R ¹⁰ -6	
					
R ¹⁰ -7		R ¹⁰ -8		R ¹⁰ -9	
					
R ¹⁰ -10		R ¹⁰ -11		R ¹⁰ -12	
					
R ¹⁰ -13		R ¹⁰ -14		R ¹⁰ -15	and
					
R ¹⁰ -16	.				

R¹¹ is H, C₁-C₇ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₇ cycloalkyl, C₄-C₇ cycloalkylalkyl, C₇ haloalkyl, C₂-C₇ haloalkenyl, C₂-C₇ alkoxyalkyl, C₃-C₇ alkylthioalkyl, C₁-C₇ alkoxy, C₁-C₇ haloalkoxy, C₂-C₇ alkoxyalkyl or C₄-C₇ alkylcycloalkyl;

5 R¹² is H, C₁-C₇ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₇ cycloalkyl, C₄-C₇ cycloalkylalkyl or C₇ haloalkyl;

each R¹³ and R¹⁴ is independently H, C₁-C₇ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₇ cycloalkyl, C₄-C₇ cycloalkylalkyl, C₂-C₃ cyanoalkyl, C₁-C₇ haloalkyl, C₂-C₇ haloalkenyl, C₂-C₇ alkylalkoxyalkyl, C₃-C₇ alkylthioalkyl, C₁-C₇ alkoxy; C₂-C₇ alkoxyalkyl, C₄-C₇ alkylcycloalkyl, Ph or benzyl;

5 R^f is C₁-C₇ haloalkyl;

G and R⁸ can be attached to any ring carbon(s) with available valency, said ring is the cyclic amide ring shown in Formula 1;

each R¹¹ or R¹² can be attached to any ring carbon(s) with available valency, said ring is illustrated in R¹⁰⁻¹ through R¹⁰⁻¹⁶ as above; and

10 R¹⁵ is H, C₁-C₆ alkyl, C₁-C₆ haloalkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl or C₄-C₇ cycloalkylalkyl.

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

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

DETAILS OF THE INVENTION

As used herein, the terms “comprises,” “comprising,” “includes,” “including,” “has,”
25 “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, method, article or apparatus 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, method, article or
30 apparatus.

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
35 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, method or apparatus 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”.

5 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.”

10 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).

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

As referred to herein, the term “seedling”, used either alone or in a combination of words means a young plant developing from the embryo of a seed.

20 As referred to herein, the term “broadleaf” used either alone or in words such as “broadleaf weed” means dicot or dicotyledon, a term used to describe a group of angiosperms characterized by embryos having two cotyledons.

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, 25 *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, 1-butenyl, 2-butenyl and the different butenyl, pentenyl and hexenyl isomers. “Alkenyl” also includes polyenes such as 1,2-propadienyl and 2,4-hexadienyl. “Alkenylalkyl” denotes alkenyl substitution on alkyl. Examples of “alkenylalkyl” include $\text{CH}_2=\text{CHCH}_2$, $\text{CH}_3\text{CH}=\text{CHCH}_2$, 30 $\text{CH}_2=\text{CHCH}_2\text{CH}_2$, $\text{CH}_2=\text{CHCH}(\text{CH}_3)\text{CH}_2$ and the different alkenylalkyl isomers. “Alkenylalkyl” is a subset of “alkenyl”. “Alkynyl” includes straight-chain or branched alkynes such as ethynyl, 1-propynyl, 2-propynyl, $\text{CH}\equiv\text{CCH}_2\text{CH}_2$, $\text{CH}_3\text{C}\equiv\text{CCH}_2$ and the different butynyl, pentynyl and hexynyl isomers. “Alkynyl” can also include moieties comprised of multiple triple bonds such as 2,5-hexadiynyl. “Alkynylalkyl” denotes alkynyl substitution on alkyl. Examples of “alkynylalkyl” include $\text{CH}\equiv\text{CCH}_2$, $\text{CH}_3\text{C}\equiv\text{CCH}_2$, 35 $\text{CH}\equiv\text{CCH}_2\text{CH}_2$, $\text{CH}\equiv\text{CCH}(\text{CH}_3)\text{CH}_2$ and the different alkynylalkyl isomers. “Alkynylalkyl” is a subset of “alkynyl”. “Alkylene” denotes a straight-chain or branched alkanediyl. Examples of “alkylene” include CH_2 , CH_2CH_2 , $\text{CH}(\text{CH}_3)$, $\text{CH}_2\text{CH}_2\text{CH}_2$, $\text{CH}_2\text{CH}(\text{CH}_3)$ and

the different butylene isomers. "Alkenylene" denotes a straight-chain or branched alkenediyl containing one olefinic bond. Examples of "alkenylene" include $\text{CH}=\text{CH}$, $\text{CH}_2\text{CH}=\text{CH}$, $\text{CH}=\text{C}(\text{CH}_3)$ and the different butenylene isomers. "Alkynylene" denotes a straight-chain or branched alkynediyl containing one triple bond. Examples of "alkynylene" include $\text{C}\equiv\text{C}$, $\text{CH}_2\text{C}\equiv\text{C}$, $\text{C}\equiv\text{CCH}_2$ and the different butynylene isomers.

"Alkoxy" includes, for example, methoxy, ethoxy, *n*-propyloxy, isopropyloxy and the different butoxy, pentoxy and hexyloxy isomers. "Alkoxyalkyl" denotes alkoxy substitution on alkyl. Examples of "alkoxyalkyl" include CH_3OCH_2 , $\text{CH}_3\text{OCH}_2\text{CH}_2$, $\text{CH}_3\text{CH}_2\text{OCH}_2$, $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OCH}_2$ and $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_2$. "Alkoxyalkoxy" denotes alkoxy substitution on alkoxy. "Alkenyloxy" includes straight-chain or branched alkenyloxy moieties. Examples of "alkenyloxy" include $\text{H}_2\text{C}=\text{CHCH}_2\text{O}$, $(\text{CH}_3)_2\text{C}=\text{CHCH}_2\text{O}$, $(\text{CH}_3)\text{CH}=\text{CHCH}_2\text{O}$, $(\text{CH}_3)\text{CH}=\text{C}(\text{CH}_3)\text{CH}_2\text{O}$ and $\text{CH}_2=\text{CHCH}_2\text{CH}_2\text{O}$. "Alkynyloxy" includes straight-chain or branched alkynyloxy moieties. Examples of "alkynyloxy" include $\text{HC}\equiv\text{CCH}_2\text{O}$, $\text{CH}_3\text{C}\equiv\text{CCH}_2\text{O}$ and $\text{CH}_3\text{C}\equiv\text{CCH}_2\text{CH}_2\text{O}$. "Alkylthio" includes branched or straight-chain alkylthio moieties such as methylthio, ethylthio, and the different propylthio, butylthio, pentylthio and hexylthio isomers. "Alkylsulfinyl" includes both enantiomers of an alkylsulfinyl group. Examples of "alkylsulfinyl" include $\text{CH}_3\text{S}(\text{O})-$, $\text{CH}_3\text{CH}_2\text{S}(\text{O})-$, $\text{CH}_3\text{CH}_2\text{CH}_2\text{S}(\text{O})-$, $(\text{CH}_3)_2\text{CHS}(\text{O})-$ and the different butylsulfinyl, pentylsulfinyl and hexylsulfinyl isomers. Examples of "alkylsulfonyl" include $\text{CH}_3\text{S}(\text{O})_2-$, $\text{CH}_3\text{CH}_2\text{S}(\text{O})_2-$, $\text{CH}_3\text{CH}_2\text{CH}_2\text{S}(\text{O})_2-$, $(\text{CH}_3)_2\text{CHS}(\text{O})_2-$, and the different butylsulfonyl, pentylsulfonyl and hexylsulfonyl isomers. "Alkylthioalkyl" denotes alkylthio substitution on alkyl. Examples of "alkylthioalkyl" include CH_3SCH_2 , $\text{CH}_3\text{SCH}_2\text{CH}_2$, $\text{CH}_3\text{CH}_2\text{SCH}_2$, $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{SCH}_2$ and $\text{CH}_3\text{CH}_2\text{SCH}_2\text{CH}_2$. "Alkylthioalkoxy" denotes alkylthio substitution on alkoxy. "Alkyldithio" denotes branched or straight-chain alkyldithio moieties. Examples of "alkyldithio" include $\text{CH}_3\text{SS}-$, $\text{CH}_3\text{CH}_2\text{SS}-$, $\text{CH}_3\text{CH}_2\text{CH}_2\text{SS}-$, $(\text{CH}_3)_2\text{CHSS}-$ and the different butyldithio and pentyldithio isomers. "Cyanoalkyl" denotes an alkyl group substituted with one cyano group. Examples of "cyanoalkyl" include NCCH_2 , NCCH_2CH_2 and $\text{CH}_3\text{CH}(\text{CN})\text{CH}_2$. "Alkylamino", "dialkylamino", "alkenylthio", "alkenylsulfinyl", "alkenylsulfonyl", "alkynylthio", "alkynylsulfinyl", "alkynylsulfonyl", and the like, are defined analogously to the above examples.

"Cycloalkyl" includes, for example, cyclopropyl, cyclobutyl, cyclopentyl and cyclohexyl. The term "alkylcycloalkyl" denotes alkyl substitution on a cycloalkyl moiety and includes, for example, ethylcyclopropyl, *i*-propylcyclobutyl, 3-methylcyclopentyl and 4-methylcyclohexyl. The term "cycloalkylalkyl" denotes cycloalkyl substitution on an alkyl moiety. Examples of "cycloalkylalkyl" include cyclopropylmethyl, cyclopentylethyl, and other cycloalkyl moieties bonded to straight-chain or branched alkyl groups. Examples of "alkylcycloalkylalkyl" include 2-methylcyclopropylmethyl, methylcyclopentylethyl, and other alkylcycloalkyl moieties bonded to straight-chain or branched alkyl groups. The term

“cycloalkoxy” denotes cycloalkyl linked through an oxygen atom such as cyclopentyloxy and cyclohexyloxy. “Cycloalkylalkoxy” denotes cycloalkylalkyl linked through an oxygen atom attached to the alkyl chain. Examples of “cycloalkylalkoxy” include cyclopropylmethoxy, cyclopentylethoxy, and other cycloalkyl moieties bonded to straight-chain or branched alkoxy groups. “Cyanocycloalkyl” denotes a cycloalkyl group substituted with one cyano group. Examples of “cyanocycloalkyl” include 4-cyanocyclohexyl and 3-cyanocyclopentyl. “Cycloalkenyl” includes groups such as cyclopentenyl and cyclohexenyl as well as groups with more than one double bond such as 1,3- and 1,4-cyclohexadienyl.

The term “halogen”, either alone or in compound words such as “haloalkyl” or when used in descriptions such as “alkyl substituted with halogen” includes fluorine, chlorine, bromine or iodine. Further, when used in compound words such as “haloalkyl” or when used in descriptions such as “alkyl substituted with halogen” said alkyl may be partially or fully substituted with halogen atoms which may be the same or different. Examples of “haloalkyl” or “alkyl substituted with halogen” include F_3C , $ClCH_2$, CF_3CH_2 and CF_3CCl_2 . The terms “halocycloalkyl”, “haloalkoxy”, “haloalkylthio”, “haloalkenyl”, “haloalkynyl”, and the like, are defined analogously to the term “haloalkyl”. Examples of “haloalkoxy” include CF_3O- , CCl_3CH_2O- , $HCF_2CH_2CH_2O-$ and CF_3CH_2O- . Examples of “haloalkylthio” include CCl_3S- , CF_3S- , CCl_3CH_2S- and $ClCH_2CH_2CH_2S-$. Examples of “haloalkylsulfinyl” include $CF_3S(O)-$, $CCl_3S(O)-$, $CF_3CH_2S(O)-$ and $CF_3CF_2S(O)-$. Examples of “haloalkylsulfonyl” include $CF_3S(O)_2-$, $CCl_3S(O)_2-$, $CF_3CH_2S(O)_2-$ and $CF_3CF_2S(O)_2-$. Examples of “haloalkenyl” include $(Cl)_2C=CHCH_2-$ and $CF_3CH_2CH=CHCH_2-$. Examples of “haloalkynyl” include $HC\equiv CCHCl-$, $CF_3C\equiv C-$, $CCl_3C\equiv C-$ and $FCH_2C\equiv CCH_2-$. Examples of “haloalkoxyalkoxy” include CF_3OCH_2O- , $ClCH_2CH_2OCH_2CH_2O-$, $Cl_3CCH_2OCH_2O-$ as well as branched alkyl derivatives. Examples of “haloalkoxyalkyl” include CF_3OCH_2- , $ClCH_2CH_2OCH_2CH_2-$, $Cl_3CCH_2OCH_2CH_2-$ as well as branched alkyl derivatives.

“Alkylcarbonyl” denotes a straight-chain or branched alkyl moieties bonded to a $C(=O)$ moiety. Examples of “alkylcarbonyl” include $CH_3C(=O)-$, $CH_3CH_2CH_2C(=O)-$ and $(CH_3)_2CHC(=O)-$. “Alkylcarboalkoxy” denotes a straight-chain or branched alkoxy substituted with alkylcarbonyl group. Examples of “Alkylcarboalkoxy” include $CH_3C(=O)CH_2O-$, $CH_3CH_2CH_2C(=O)CH_2O-$ and $(CH_3)_2CHC(=O)CH_2CH_2O-$. Examples of “alkoxycarbonyl” include $CH_3OC(=O)-$, $CH_3CH_2OC(=O)-$, $CH_3CH_2CH_2OC(=O)-$, $(CH_3)_2CHOC(=O)-$ and the different butoxy- or pentoxycarbonyl isomers. “Alkoxycarboalkyl” denotes a straight-chain or branched alkyl substituted with alkoxycarbonyl group. Examples of “alkoxycarboalkyl” include $CH_3OC(=O)CH_2-$, $CH_3CH_2OC(=O)CH_2CH_2-$, $CH_3CH_2CH_2OC(=O)CH_2-$, $(CH_3)_2CHOC(=O)CH(CH_3)CH_2-$ and the different butoxy- or pentoxycarbonylalkyl isomers.

The total number of carbon atoms in a substituent group is indicated by the “ C_i-C_j ” prefix where i and j are numbers from 1 to 7. In other words, i and j indicate the total number

of carbon atoms in this group, and i through j indicates the range of the possible total number of the carbon atoms in the group. For example, C₁–C₄ alkylsulfonyl designates methylsulfonyl through butylsulfonyl; C₂–C₆ alkenyl designates ethenyl through hexenyl, and the different propenyl, butenyl, pentenyl and hexenyl isomers. C₂ alkoxyalkyl designates
5 CH₃OCH₂-; C₃ alkoxyalkyl designates, for example, CH₃CH(OCH₃)-, CH₃OCH₂CH₂- or CH₃CH₂OCH₂-; and C₄ alkoxyalkyl designates the various isomers of an alkyl group substituted with an alkoxy group containing a total of four carbon atoms, examples including CH₃CH₂CH₂OCH₂- and CH₃CH₂OCH₂CH₂-.

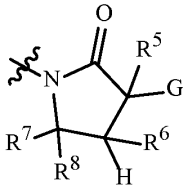
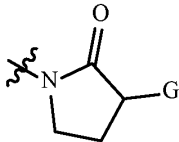
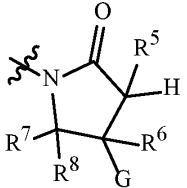
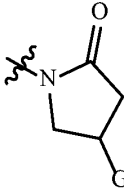
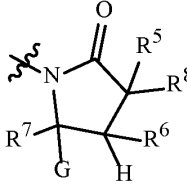
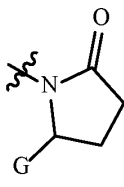
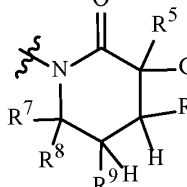
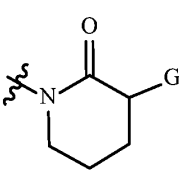
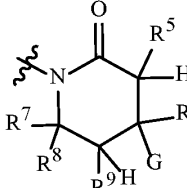
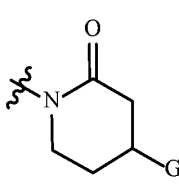
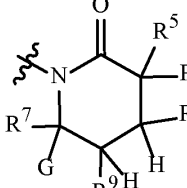
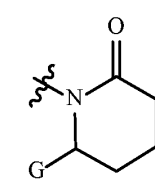
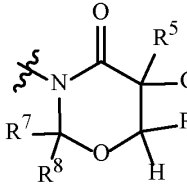
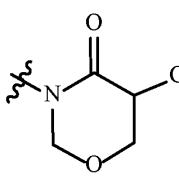
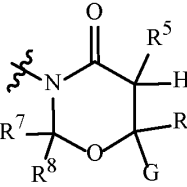
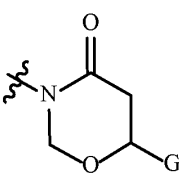
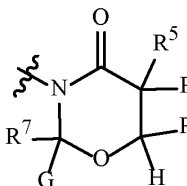
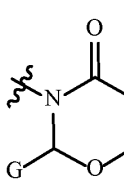
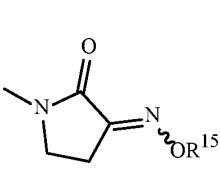
When a group contains a substituent which can be hydrogen, for example R², then when
10 this substituent is taken as hydrogen, it is recognized that this is equivalent to said group being unsubstituted at this position. When one or more positions on a group are said to be “not substituted” or “unsubstituted”, then hydrogen atoms are attached to take up any free valency.

For substituents G, R⁸, R¹¹ or R¹², the attachment point of these substituents is illustrated as floating, which means each of these substituents can be attached to any of the
15 available carbons on the ring, to which they are attached, by replacement of a hydrogen atom. For example, G or R⁸ can be attached to any ring carbon(s) with available valency by replacement of a hydrogen atom, said ring is the cyclic amide ring as shown in Formula 1. For example, when Q is CHR⁹, G can be attached to the said carbon by replacement of the H of CHR⁹ to form a moiety of C(G)R⁹. R¹¹ or R¹² can be attached to any ring carbon(s) with
20 available valency by replacement of a hydrogen atom, said ring is illustrated in R¹⁰-1 through R¹⁰-16 in the Summary of The Disclosure. In this disclosure, the cyclic amide ring always has the substituent G.

Unless otherwise indicated, a “ring” as a component of Formula 1 is carbocyclic or heterocyclic. For example, a cyclic amide ring is a ring containing a N-CO group, it can
25 optionally contain more heteroatom(s) as the ring member(s). The term “ring member” refers to an atom or other moiety (e.g., C(=O), C(=S), S(O) or S(O)₂) forming the backbone of a ring or ring system.

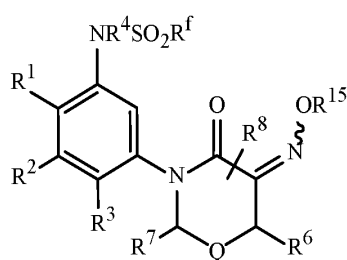
Some non-limiting examples of cyclic amide rings in this disclosure are illustrated in Exhibit 1 wherein each structure is associated with a L-# and the # is a number. When the
30 substituent on the cyclic amide ring is G, but not specified for other substituents on the same carbon to which G is bonded (e.g., L-2, L-4, L-6, L-8, L-10, L-12, L-14, L-16 and L-18) then H or R⁸ can take up the remaining valence on said carbon. G and R⁵ can also be taken together to form N-OR¹⁵, wherein the N is attached to the carbon ring member through a double bond to form an oxime moiety, such as in L-19.

Exhibit 1

			
L-1	L-2	L-3	L-4
			
L-5	L-6	L-7	L-8
			
L-9	L-10	L-11	L-12
			
L-13	L-14	L-15	L-16
			
L-17	L-18	L-19	

In one specific embodiment, G and R⁵ can be taken together to form N-OR¹⁵, wherein the N is attached to the carbon ring member through a double bond to form an oxime moiety, as shown below.

5

**1g**

The terms “heterocyclic ring”, “heterocycle” or “heterocyclic ring system” denote a ring or ring system in which at least one atom forming the ring backbone is not carbon, e.g., nitrogen, oxygen or sulfur. Typically, a heterocyclic ring contains no more than 4 nitrogens, no more than 2 oxygens and no more than 2 sulfurs. Unless otherwise indicated, a heterocyclic ring can be a saturated, partially unsaturated or fully unsaturated ring. When a fully unsaturated heterocyclic ring satisfies Hückel’s rule, then said ring is also called a “heteroaromatic ring” or “aromatic heterocyclic ring”. Unless otherwise indicated, heterocyclic rings and ring systems can be attached through any available carbon or nitrogen by replacement of a hydrogen on said carbon or nitrogen.

“Aromatic” indicates that each of the ring atoms is essentially in the same plane and has a *p*-orbital perpendicular to the ring plane, and that $(4n + 2) \pi$ electrons, where *n* is a positive integer, are associated with the ring to comply with Hückel’s rule. The term “aromatic ring system” denotes a carbocyclic or heterocyclic ring system in which at least one ring of the ring system is aromatic. The term “aromatic carbocyclic ring system” denotes a carbocyclic ring system in which at least one ring of the ring system is aromatic. The term “aromatic heterocyclic ring system” denotes a heterocyclic ring system in which at least one ring of the ring system is aromatic. The term “nonaromatic ring system” denotes a carbocyclic or heterocyclic ring system that may be fully saturated, as well as partially or fully unsaturated, provided that none of the rings in the ring system are aromatic. The term “nonaromatic carbocyclic ring system” in which no ring in the ring system is aromatic. The term “nonaromatic heterocyclic ring system” denotes a heterocyclic ring system in which no ring in the ring system is aromatic.

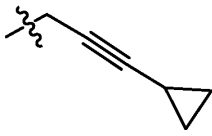
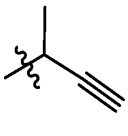
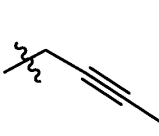
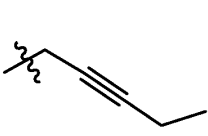
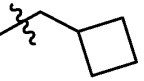
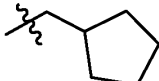
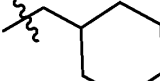
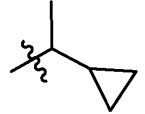
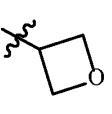
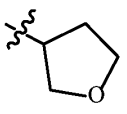
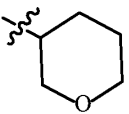
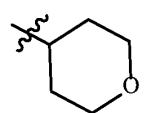
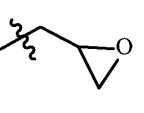
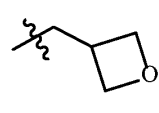
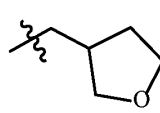
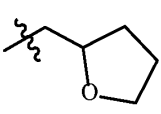
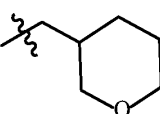
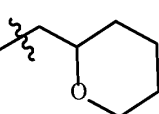
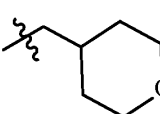
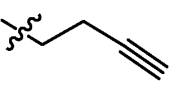
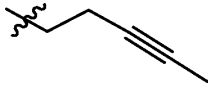
The term “optionally substituted” is used interchangeably with the phrase “substituted or unsubstituted” or with the term “(un)substituted.” Unless otherwise indicated, an optionally

substituted group may have a substituent at each substitutable position of the group, and each substitution is independent of the other.

In Formula 1, when G is OR¹⁰, SR¹⁰, SOR¹⁰ or SO₂R¹⁰, R¹⁰ can be (among others) J. Some non-limiting examples of J are illustrated in the table of Exhibit 2 wherein each structure is associated with a J-# and the # is a number.

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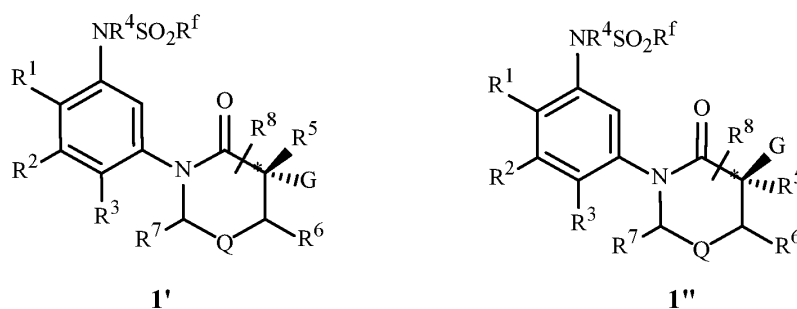
Exhibit 2

			
J-1	J-2	J-3	J-4
			
J-5	J-6	J-7	J-8
			
J-9	J-10	J-11	J-12
			
J-13	J-14	J-15	J-16
			
J-17	J-18	J-19	J-20
			
J-21	J-22		

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

Compounds of this invention can exist as one or more stereoisomers. The various stereoisomers include enantiomers, diastereomers, atropisomers and geometric isomers. Stereoisomers are isomers of identical constitution but differing in the arrangement of their atoms in space and include enantiomers, diastereomers, cis-trans isomers (also known as geometric isomers) and atropisomers. Atropisomers result from restricted rotation about single bonds where the rotational barrier is high enough to permit isolation of the isomeric species. One skilled in the art will appreciate that one stereoisomer may be more active and/or may exhibit beneficial effects when enriched relative to the other stereoisomer(s) or when separated from the other stereoisomer(s). Additionally, the skilled artisan knows how to separate, enrich, and/or to selectively prepare said stereoisomers. The compounds of the invention may be present as a mixture of stereoisomers, individual stereoisomers or as an optically active form.

For example, when G and R⁵ are different and attached to the same carbon, the compound of Formula 1 may have at least two stereoisomers. The two stereoisomers are depicted as Formula 1' and Formula 1'' with the chiral center identified with an asterisk (*). 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 broad 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.

5 This invention comprises racemic mixtures, for example, equal amounts of the enantiomers of Formulae **1'** and **1''**. In addition, this invention includes compounds that are enriched compared to the racemic mixture in an enantiomer of Formula **1**. Also included are the essentially pure enantiomers of compounds of Formula **1**, for example, Formula **1'** or Formula **1''**.

10 When enantiomerically enriched, one enantiomer is present in greater amounts than the other, and the extent of enrichment can be defined by an expression of enantiomeric excess ("ee"), which is defined as $(2x-1) \cdot 100\%$, where x is the mole fraction of the dominant enantiomer in the mixture (e.g., an ee of 20 % corresponds to a 60:40 ratio of enantiomers).

15 Preferably the compositions of this invention have at least a 50 % enantiomeric excess; more preferably at least a 75 % enantiomeric excess; still more preferably at least a 90 % enantiomeric excess; and the most preferably at least a 94 % enantiomeric excess of the more active isomer. Of particular note are enantiomerically pure embodiments of the more active isomer.

20 Compounds of Formula **1** may comprise additional chiral centers. For example, substituents and other molecular constituents, such as G and R⁵, may themselves contain chiral centers. This invention comprises racemic mixtures as well as enriched and essentially pure stereoconfigurations at these additional chiral centers.

25 Compounds of this invention can exist as one or more conformational isomers due to any restricted bond rotation in Formula **1**. This invention comprises mixtures of conformational isomers. In addition, this invention includes compounds that are enriched in one conformer relative to others.

30 Compounds of Formula **1** typically exist in more than one form, and Formula **1** thus include all crystalline and non-crystalline forms of the compounds they represent. Non-crystalline forms include embodiments which are solids such as waxes and gums as well as embodiments which are liquids such as solutions and melts. Crystalline forms include embodiments which represent essentially a single crystal type and embodiments which represent a mixture of polymorphs (i.e. different crystalline types). The term "polymorph" refers to a particular crystalline form of a chemical compound that can crystallize in different crystalline forms, these forms having different arrangements and/or conformations of the molecules in the crystal lattice. Although polymorphs can have the same chemical composition, they can also differ in composition due the presence or absence of co-crystallized water or other molecules, which can be weakly or strongly bound in the lattice. Polymorphs can differ in such chemical, physical and biological properties as crystal shape, density, hardness, color, chemical stability, melting point, hygroscopicity, suspensibility, dissolution

rate and biological availability. One skilled in the art will appreciate that a polymorph of a compound of Formula 1 can exhibit beneficial effects (e.g., suitability for preparation of useful formulations, improved biological performance) relative to another polymorph or a mixture of polymorphs of the same compound of Formula 1. Preparation and isolation of a particular polymorph of a compound of Formula 1 can be achieved by methods known to those skilled in the art including, for example, crystallization using selected solvents and temperatures. For a comprehensive discussion of polymorphism see R. Hilfiker, Ed., *Polymorphism in the Pharmaceutical Industry*, Wiley-VCH, Weinheim, 2006.

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

One skilled in the art recognizes that because in the environment and under physiological conditions salts of chemical compounds are in equilibrium with their corresponding nonsalt forms, salts share the biological utility of the nonsalt forms. Thus, a wide variety of salts of a compound of Formula 1 are useful for control of undesired vegetation (i.e. are agriculturally suitable). The salts of a compound of Formula 1 include acid-addition salts with inorganic or organic acids such as hydrobromic, hydrochloric, nitric, phosphoric, sulfuric, acetic, butyric, fumaric, lactic, maleic, malonic, oxalic, propionic, salicylic, tartaric, 4-toluenesulfonic or valeric acids. When a compound of Formula 1 contains an acidic moiety such as a carboxylic acid or phenol, salts also include those formed with organic or inorganic bases such as pyridine, triethylamine or ammonia or amides, hydrides, hydroxides or carbonates of sodium, potassium, lithium, calcium, magnesium or barium. Accordingly, the present invention

comprises compounds selected from Formula 1, *N*-oxides and agriculturally suitable salts thereof.

Embodiments of the present invention as described in the Summary of the Disclosure include those wherein a compound of Formula 1 is as described in any of the following

5 Embodiments:

- Embodiment 1. A compound of Formula 1, as described in the Summary of the Disclosure, all stereoisomers, *N*-oxides, and salts thereof, agricultural compositions containing them and their use as herbicides as described in the
- 10 Summary of the Disclosure.
- Embodiment 2. A compound of Formula 1 or Embodiment 1 wherein Q is CHR⁹, O or a direct bond.
- Embodiment 2a. A compound of Formula 1 or Embodiment 2 wherein Q is CHR⁹ or a direct bond.
- 15 Embodiment 2b. A compound of Formula 1 or Embodiment 2a wherein Q is CHR⁹.
- Embodiment 2c. A compound of Formula 1 or Embodiment 2a wherein Q is direct bond.
- Embodiment 2d. A compound of Formula 1 or Embodiment 2 wherein Q is O.
- Embodiment 3. A compound of Formula 1 or any one of the preceding Embodiments
- 20 wherein R¹ is H, C₁–C₇ alkyl, halogen, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₁–C₇ haloalkyl.
- Embodiment 3a. A compound of Embodiment 3 wherein R¹ is H, C₁–C₇ alkyl, halogen, C₃–C₇ cycloalkyl.
- Embodiment 3b. A compound of Embodiment 3a wherein R¹ is H, C₁–C₃ alkyl,
- 25 halogen or C₃–C₄ cycloalkyl.
- Embodiment 3c. A compound of Embodiment 3b wherein R¹ is H, Me, halogen or cyclopropyl.
- Embodiment 3d. A compound of Embodiment 3c wherein R¹ is H, Me, F, Cl, Br or cyclopropyl.
- 30 Embodiment 3e. A compound of Embodiment 3d wherein R¹ is Me or Cl.
- Embodiment 3f. A compound of Embodiment 3e wherein R¹ is Me.
- Embodiment 3g. A compound of Embodiment 3e wherein R¹ is Cl.
- Embodiment 3h. A compound of Embodiment 3d wherein R¹ is H.
- Embodiment 4. A compound of Formula 1 or any one of the preceding Embodiments
- 35 wherein R² is H, C₁–C₇ alkyl, halogen, CN, C₁–C₇ haloalkyl, C₁–C₇ alkoxy or C₁–C₅ alkylthio.
- Embodiment 4a. A compound of Embodiment 4 wherein R² is H, C₁–C₇ alkyl, halogen or CN.

- Embodiment 4b. A compound of Embodiment 4a wherein R² is H, Me, F, Cl or CN.
- Embodiment 4c. A compound of Embodiment 4b wherein R² is H or F.
- Embodiment 4d. A compound of Embodiment 4c wherein R² is H.
- Embodiment 4e. A compound of Embodiment 4c wherein R² is F.
- 5 Embodiment 5. A compound of Formula 1 or any one of the preceding Embodiments wherein R³ is H, C₁–C₇ alkyl, halogen, CN, C₂–C₆ alkenyl, C₃–C₇ alkynyl, C₃–C₇ cycloalkyl, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₃–C₇ haloalkynyl, C₂–C₇ alkoxyalkyl, C₁–C₇ alkoxy, C₁–C₅ alkylthio, C₂–C₃ alkoxy carbonyl or C₂–C₇ haloalkoxyalkyl.
- 10 Embodiment 5a. A compound of Embodiment 5 wherein R³ is H, C₁–C₇ alkyl, halogen, CN, C₁–C₇ alkoxy or C₁–C₇ haloalkyl.
- Embodiment 5b. A compound of Embodiment 5a wherein R³ is H, Me, F, Cl, CN, OMe or CF₃.
- Embodiment 5c. A compound of Embodiment 5b wherein R³ is Me or F.
- 15 Embodiment 5d. A compound of Embodiment 5c wherein R³ is Me.
- Embodiment 6. A compound of Formula 1 or any one of the preceding Embodiments wherein R⁴ is H, C(=O)R¹⁴, C(=S)R¹⁴, C(=O)OR¹⁴, C(=O)SR¹⁴, S(O)₂R¹⁴, C(=O)NR¹³R¹⁴, S(O)₂NR¹³R¹⁴, CH₂OC(=O)OR¹⁴, CH₂OC(=O)NR¹³R¹⁴ or CH₂OC(=O)R¹⁴; or propargyl, allyl or benzyl.
- 20 Embodiment 6a. A compound of Formula 1 or any one of the preceding Embodiments wherein R⁴ is H, C(=O)R¹⁴, C(=S)R¹⁴, C(=O)OR¹⁴, C(=O)SR¹⁴, S(O)₂R¹⁴, C(=O)NR¹³R¹⁴, S(O)₂NR¹³R¹⁴, CH₂OC(=O)OR¹⁴, CH₂OC(=O)NR¹³R¹⁴ or CH₂OC(=O)R¹⁴.
- Embodiment 6aa. A compound of Embodiment 6 wherein R⁴ is H, C(=O)R¹⁴, CO₂R¹⁴, C(=O)SR¹⁴, S(O)₂R¹⁴, CH₂OC(=O)OR¹⁴ or CH₂OCOR¹⁴.
- 25 Embodiment 6b. A compound of Embodiment 6aa wherein R⁴ is H, SO₂CF₃, SO₂CH₃, CO₂Me, COMe, CH₂OCO-*t*-Bu, CH₂OCO-*n*-Bu, CH₂OCO-*c*-hexyl, CH₂OCO-*c*-pentyl, CH₂OCOCH₂CH₃, COMe, CH₂OCOPh, CH₂OCO-*i*-Bu, CH₂OCOMe, CH₂OCO-*sec*-Bu, CH₂OCO-*n*-Pr, CH₂OCO-*i*-Pr or (C=O)SMe.
- 30 Embodiment 6c. A compound of Embodiment 6a wherein R⁴ is H, CH₂OCOR¹⁴ or -S(O)₂R¹⁴.
- Embodiment 6d. A compound of Embodiment 6c wherein R⁴ is H, CH₂OCO-*t*-Bu or S(O)₂CF₃.
- Embodiment 6e. A compound of Embodiment 6d wherein R⁴ is H.
- 35 Embodiment 6f. A compound of Embodiment 6d wherein R⁴ is S(O)₂CF₃.
- Embodiment 6g. A compound of Embodiment 6 wherein R⁴ is propargyl, allyl or benzyl.
- Embodiment 6h. A compound of Embodiment 6g wherein R⁴ is benzyl.

Embodiment 6g. A compound of Embodiment 6 wherein R⁴ is propargyl.

Embodiment 6g. A compound of Embodiment 6 wherein R⁴ is allyl.

Embodiment 7. A compound of Formula 1 or any one of the preceding Embodiments

5 wherein R⁵ is H, C₂-C₆ alkenyl, C₂-C₇ haloalkenyl, C₂-C₆ alkynyl, C₃-C₇ cycloalkyl, C₄-C₇ cycloalkylalkyl, C₂-C₇ alkoxyalkyl or C₄-C₇ alkylcycloalkyl.

Embodiment 7a. A compound of Embodiment 7 wherein R⁵ is H, C₄-C₇ cycloalkylalkyl or C₂-C₇ alkoxyalkyl;

Embodiment 7b. A compound of Embodiment 7a wherein R⁵ is H.

Embodiment 8. A compound of Formula 1 or any one of the preceding Embodiments

10 wherein R⁶ is H, C₁-C₇ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₇ cycloalkyl, C₄-C₇ cycloalkylalkyl, C₂-C₄ cyanoalkyl, C₁-C₇ haloalkyl, C₂-C₇ haloalkenyl, C₂-C₇ alkoxyalkyl, C₃-C₇ alkylthioalkyl, C₁-C₇ alkoxy, C₁-C₇ haloalkoxy or C₄-C₇ alkylcycloalkyl.

Embodiment 8a. A compound of Embodiment 8 wherein R⁶ is H, C₁-C₇ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₇ cycloalkyl, C₂-C₄ cyanoalkyl, C₁-C₇ haloalkyl, C₂-C₇ haloalkenyl, C₂-C₇ alkoxyalkyl, C₁-C₇ alkoxy or C₁-C₇ haloalkoxy.

Embodiment 8b. A compound of Embodiment 8a wherein R⁶ is H, C₁-C₇ alkyl, C₃-C₇ cycloalkyl, C₁-C₇ haloalkyl, C₂-C₇ alkoxyalkyl, C₁-C₇ alkoxy or C₁-C₇ haloalkoxy.

20 Embodiment 8c. A compound of Embodiment 8b wherein R⁶ is H, C₁-C₇ alkyl or C₁-C₇ alkoxy.

Embodiment 8d. A compound of Embodiment 8b wherein R⁶ is H, Me or OMe.

Embodiment 8e. A compound of Embodiment 8d wherein R⁶ is H.

Embodiment 8f. A compound of Embodiment 8d wherein R⁶ is Me.

25 Embodiment 8g. A compound of Embodiment 8d wherein R⁶ is OMe.

Embodiment 9. A compound of Formula 1 or any one of the preceding Embodiments

30 wherein R⁷ is H, C₁-C₇ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₇ cycloalkyl, C₄-C₇ cycloalkylalkyl, C₂-C₄ cyanoalkyl, C₁-C₇ haloalkyl, C₂-C₇ haloalkenyl, C₂-C₇ alkoxyalkyl, C₃-C₇ alkylthioalkyl, C₁-C₇ alkoxy, C₁-C₇ haloalkoxy or C₄-C₇ alkylcycloalkyl.

Embodiment 9a. A compound of Embodiment 9 wherein R⁷ is H, C₁-C₇ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₇ cycloalkyl, C₂-C₄ cyanoalkyl, C₁-C₇ haloalkyl, C₂-C₇ haloalkenyl, C₂-C₇ alkoxyalkyl, C₁-C₇ alkoxy or C₁-C₇ haloalkoxy.

35 Embodiment 9b. A compound of Embodiment 9a wherein R⁷ is H, C₁-C₇ alkyl, C₃-C₇ cycloalkyl, C₁-C₇ haloalkyl, C₂-C₇ alkoxyalkyl, C₁-C₇ alkoxy or C₁-C₇ haloalkoxy.

Embodiment 9c. A compound of Embodiment 9b wherein R⁷ is H, C₁-C₇ alkyl or C₁-C₇ alkoxy.

Embodiment 9d. A compound of Embodiment 9b wherein R⁷ is H, Me or OMe.

Embodiment 9e. A compound of Embodiment 9d wherein R⁷ is H.

Embodiment 9f. A compound of Embodiment 8d wherein R⁷ is Me.

Embodiment 9g. A compound of Embodiment 9d wherein R⁷ is OMe.

- 5 Embodiment 10. A compound of Formula 1 or any one of the preceding Embodiments wherein R⁸ is H, C₁–C₇ alkyl, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₄–C₇ cycloalkylalkyl, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₂–C₇ alkoxyalkyl, C₃–C₇ alkylthioalkyl, C₁–C₇ alkoxy, C₁–C₇ haloalkoxy, C₂–C₇ alkoxyalkyl or C₄–C₇ alkylcycloalkyl.
- 10 Embodiment 10a. A compound of Embodiment 10 wherein R⁸ is H, C₁–C₇ alkyl, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₂–C₇ alkoxyalkyl, C₁–C₇ alkoxy or C₁–C₇ haloalkoxy.
- Embodiment 10b. A compound of Embodiment 10a wherein R⁸ is H, C₁–C₇ alkyl, C₃–C₇ cycloalkyl, C₁–C₇ haloalkyl, C₂–C₇ alkoxyalkyl, C₁–C₇ alkoxy or C₁–C₇ haloalkoxy.
- 15 Embodiment 10c. A compound of Embodiment 10b wherein R⁸ is H, C₁–C₇ alkyl or C₁–C₇ alkoxy.
- Embodiment 10d. A compound of Embodiment 10b wherein R⁸ is H, Me or OMe.
- 20 Embodiment 10e. A compound of Embodiment 10d wherein R⁸ is H.
- Embodiment 10f. A compound of Embodiment 10d wherein R⁸ is Me.
- Embodiment 10g. A compound of Embodiment 10d wherein R⁸ is OMe.
- Embodiment 11. A compound of Formula 1 or any one of the preceding Embodiments wherein R⁹ is H, C₁–C₇ alkyl, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₄–C₇ cycloalkylalkyl, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₂–C₇ alkoxyalkyl, C₃–C₇ alkylthioalkyl, C₁–C₇ alkoxy, C₁–C₇ haloalkoxy or C₄–C₇ alkylcycloalkyl.
- 25 Embodiment 11a. A compound of Embodiment 11 wherein R⁹ is H, C₁–C₇ alkyl, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₂–C₇ alkoxyalkyl, C₁–C₇ alkoxy or C₁–C₇ haloalkoxy.
- 30 Embodiment 11b. A compound of Embodiment 11a wherein R⁹ is H, C₁–C₇ alkyl, C₃–C₇ cycloalkyl, C₁–C₇ haloalkyl, C₂–C₇ alkoxyalkyl, C₁–C₇ alkoxy or C₁–C₇ haloalkoxy.
- 35 Embodiment 11c. A compound of Embodiment 11b wherein R⁹ is H, C₁–C₇ alkyl or C₁–C₇ alkoxy.
- Embodiment 11d. A compound of Embodiment 11b wherein R⁹ is H, Me or OMe.
- Embodiment 11e. A compound of Embodiment 11d wherein R⁹ is H.

Embodiment 11f. A compound of Embodiment 11d wherein R^9 is Me.

Embodiment 11g. A compound of Embodiment 11d wherein R^9 is OMe.

Embodiment 12. A compound of Formula 1 or any one of the preceding Embodiments wherein G is OR^{10} , SR^{10} , SOR^{10} or SO_2R^{10} ; or G and R^5 are taken together to form N- OR^{15} where R^{15} is H, C_1-C_6 alkyl, C_1-C_6 haloalkyl, C_2-C_6 alkenyl, C_2-C_6 alkynyl or C_4-C_7 cycloalkylalkyl.

Embodiment 12a. A compound of Embodiment 12 wherein G is OR^{10} , SR^{10} , SOR^{10} or SO_2R^{10} .

Embodiment 12aa. A compound of Embodiment 12a wherein G is OR^{10} or SR^{10} .

Embodiment 12b. A compound of Embodiment 12aa wherein G is OR^{10} .

Embodiment 12c. A compound of Embodiment 12aa wherein G is SR^{10} .

Embodiment 12d. A compound of Embodiment 12 wherein G is SOR^{10} .

Embodiment 12e. A compound of Embodiment 12 wherein G is SO_2R^{10} .

Embodiment 12f. A compound of Embodiment 12 wherein G and R^5 are attached to the same carbon ring member.

Embodiment 12g. A compound of Embodiment 12 wherein G and R^5 are taken together to form N- OR^{15} .

Embodiment 12gg. A compound of Embodiment 12g wherein R^{15} is H, C_1-C_6 alkyl, C_1-C_6 haloalkyl, C_2-C_6 alkenyl, C_2-C_6 alkynyl or C_4-C_7 cycloalkylalkyl.

Embodiment 12h. A compound of Embodiment 12g wherein R^{15} is H.

Embodiment 12i. A compound of Embodiment 12g wherein R^{15} is C_1-C_6 alkyl.

Embodiment 12j. A compound of Embodiment 12g wherein R^{15} is H, Me, Et, $CH_2CH=CH_2$ or $CH_2C\equiv CH$.

Embodiment 12k. A compound of Embodiment 12j wherein R^{15} is Me, Et, $CH_2CH=CH_2$ or $CH_2C\equiv CH$.

Embodiment 12l. A compound of Embodiment 12a wherein G and R^5 are attached to the same carbon.

Embodiment 12m. A compound of Embodiment 12l wherein R^5 is H.

Embodiment 12n. A compound of Embodiment 12a wherein G and R^6 are attached to the same carbon.

Embodiment 12o. A compound of Embodiment 12n wherein R^6 is H.

Embodiment 12p. A compound of Embodiment 12a wherein G and R^7 are attached to the same carbon.

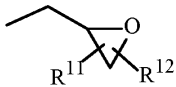
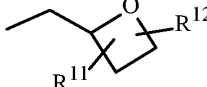
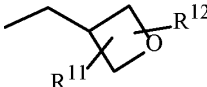
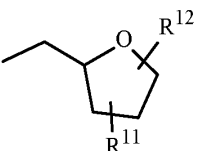
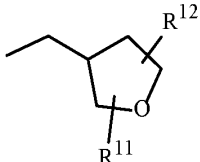
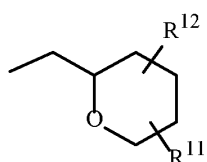
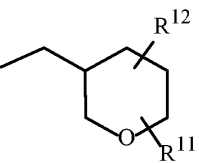
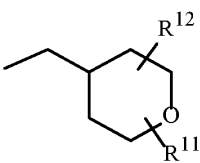
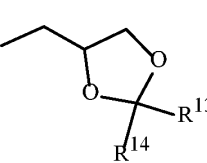
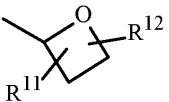
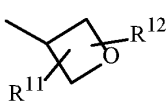
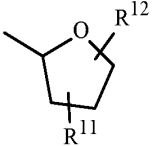
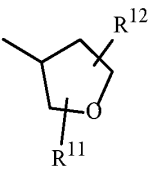
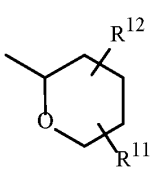
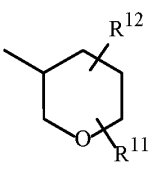
Embodiment 12q. A compound of Embodiment 12p wherein R^7 is H.

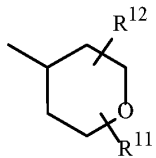
Embodiment 12r. A compound of Embodiment 12a wherein G and R^9 are attached to the same carbon.

Embodiment 12s. A compound of Embodiment 12r wherein R^9 is H.

Embodiment 13. A compound of Formula 1 or any one of the preceding Embodiments
 wherein R¹⁰ is H, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₃–C₇
 halocycloalkyl, C₄–C₇ alkylcycloalkyl, C₄–C₇ cycloalkylalkyl, C₄–C₇
 halocycloalkylalkyl, C₅–C₇ alkylcycloalkylalkyl, C₁–C₇ haloalkoxy, C₂–C₇
 alkoxyalkyl, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₃–C₇
 alkylthioalkyl, C₁–C₆ nitroalkyl, C₃–C₆ alkylcarboalkyl, C₃–C₆
 alkoxycarboalkyl, C₂–C₇ haloalkoxyalkyl, benzyl or C₃–C₆ alkylcarboalkoxy; or

R¹⁰ is selected from the group consisting of

					
R ¹⁰ -1	,	R ¹⁰ -2	,	R ¹⁰ -3	,
					
R ¹⁰ -4		R ¹⁰ -5		R ¹⁰ -6	
					
R ¹⁰ -7		R ¹⁰ -8		R ¹⁰ -9	
					
R ¹⁰ -10		R ¹⁰ -11		R ¹⁰ -12	
					
R ¹⁰ -13		R ¹⁰ -14		R ¹⁰ -15	and

					
R ¹⁰⁻¹⁶	.				

Embodiment 13a. A compound of Embodiment 13 wherein R¹⁰ is H, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₃–C₇ halocycloalkyl, C₄–C₇ alkylcycloalkyl, C₄–C₇ cycloalkylalkyl, C₄–C₇ halocycloalkylalkyl, C₅–C₇ alkylcycloalkylalkyl, C₁–C₇ haloalkoxy, C₂–C₇ alkoxyalkyl, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₃–C₇ alkylthioalkyl, C₂–C₇ haloalkoxyalkyl, benzyl or C₄–C₇ alkylcycloalkyl.

Embodiment 13aa. A compound of Embodiment 13a wherein R¹⁰ is H, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₃–C₇ halocycloalkyl, C₄–C₇ alkylcycloalkyl, C₄–C₇ cycloalkylalkyl, C₄–C₇ halocycloalkylalkyl, C₅–C₇ alkylcycloalkylalkyl, C₁–C₇ haloalkoxy, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₃–C₇ alkylthioalkyl, C₂–C₇ haloalkoxyalkyl, benzyl or C₄–C₇ alkylcycloalkyl.

Embodiment 13b. A compound of Embodiment 13aa wherein R¹⁰ is C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₃–C₇ halocycloalkyl, C₄–C₇ alkylcycloalkyl, C₄–C₇ cycloalkylalkyl, C₄–C₇ halocycloalkylalkyl, C₅–C₇ alkylcycloalkylalkyl, C₂–C₄ cyanoalkyl, C₃–C₇ alkylthioalkyl, benzyl or C₄–C₇ alkylcycloalkyl.

Embodiment 13c. A compound of Embodiment 13b wherein R¹⁰ is C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₄–C₇ cycloalkylalkyl, C₄–C₇ halocycloalkylalkyl or C₄–C₇ alkylcycloalkyl.

Embodiment 13d. A compound of Embodiment 13c wherein R¹⁰ is C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl or C₄–C₇ halocycloalkylalkyl.

Embodiment 13dd. A compound of Embodiment 13d wherein R¹⁰ is C₂–C₆ alkenyl, C₂–C₆ alkynyl or C₃–C₇ cycloalkyl.

Embodiment 13e. A compound of Embodiment 13d wherein R¹⁰ is cyclopropyl, cyclobutyl, cyclopentyl, allyl or propargyl.

Embodiment 13ee. A compound of Embodiment 13e wherein R¹⁰ is H.

Embodiment 13f. A compound of Embodiment 13e wherein R¹⁰ is cyclopropyl.

Embodiment 13g. A compound of Embodiment 13e wherein R¹⁰ is cyclobutyl.

Embodiment 13gg. A compound of Embodiment 13e wherein R¹⁰ is cyclopentyl.

Embodiment 13ggg. A compound of Embodiment 13e wherein R¹⁰ is cyclohexyl.

Embodiment 13h. A compound of Embodiment 13e wherein R¹⁰ is allyl.

Embodiment 13i. A compound of Embodiment 13e wherein R^{10} is propargyl.

Embodiment 13j. A compound of Embodiment 13 wherein R^{10} is R^{10-1} , R^{10-2} , R^{10-3} , R^{10-4} , R^{10-5} , R^{10-6} , R^{10-7} , R^{10-8} , R^{10-9} , R^{10-10} , R^{10-11} , R^{10-12} , R^{10-13} , R^{10-14} , R^{10-15} or R^{10-16} .

5 Embodiment 13k. A compound of Embodiment 13j wherein R^{10} is R^{10-1} , R^{10-2} , R^{10-3} , R^{10-4} , R^{10-5} , R^{10-6} , R^{10-7} , R^{10-8} or R^{10-9} .

Embodiment 13l. A compound of Embodiment 13k wherein R^{10} is R^{10-3} or R^{10-4} .

10 Embodiment 13m. A compound of Embodiment 13a wherein R^{10} is C_2-C_6 alkenyl, C_2-C_6 alkynyl, C_3-C_7 cycloalkyl, C_4-C_7 halocycloalkylalkyl, C_4-C_7 cycloalkylalkyl or benzyl.

Embodiment 14. A compound of Formula 1 or any one of the preceding Embodiments wherein R^{11} is H or C_1-C_7 alkyl.

Embodiment 14a. A compound of Formula 1 or any one of the preceding Embodiments wherein R^{11} is H.

15 Embodiment 15. A compound of Formula 1 or any one of the preceding Embodiments wherein R^{12} is H or C_1-C_7 alkyl.

Embodiment 15a. A compound of Formula 1 or any one of the preceding Embodiments wherein R^{12} is H.

20 Embodiment 16. A compound of Formula 1 or any one of the preceding Embodiments wherein each R^{13} and R^{14} is independently H, C_1-C_7 haloalkyl or C_1-C_7 alkyl.

Embodiment 16a. A compound of Embodiment 16 wherein each R^{13} and R^{14} is independently C_1-C_4 alkyl.

Embodiment 16b. A compound of Embodiment 16a wherein each R^{13} and R^{14} is independently C_1-C_3 haloalkyl.

25 Embodiment 16c. A compound of Embodiment 16 wherein each R^{13} and R^{14} is independently CF_3 .

R^f

Embodiment 17. A compound of Formula 1 or any one of the preceding Embodiments wherein R^f is C_1-C_3 haloalkyl.

30 Embodiment 17a. A compound of Embodiment 28 wherein R^f is CF_3 .

Embodiments of this invention, including Embodiments 1–17a above as well as any other embodiments described herein, can be combined in any manner, and the descriptions of variables in the embodiments pertain not only to the compounds of Formula 1 but also to the starting compounds and intermediate compounds useful for preparing the compounds of Formula 1. In addition, embodiments of this invention, including Embodiments 1–17a above as well as any other embodiments described herein, and any combination thereof, pertain to the compositions and methods of the present invention.

Combinations of Embodiments 1–17a are illustrated by:

Embodiment A. A compound of Formula 1 as described in the Summary of the

Disclosure wherein

- 5 Q is direct bond;
- R¹ is H, C₁–C₇ alkyl, halogen, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₁–C₇ haloalkyl;
- R² is H, C₁–C₇ alkyl, halogen or -CN;
- R³ is H, C₁–C₇ alkyl, halogen, CN, C₁–C₇ alkoxy or C₁–C₇ haloalkyl;
- 10 R⁴ is H, -C(=O)R¹⁴, -C(=S)R¹⁴, -CO₂R¹⁴, -C(=O)SR¹⁴, -S(O)₂R¹⁴, -C(=O)NR¹³R¹⁴, -S(O)₂NR¹³R¹⁴, -CH₂OC(=O)OR¹⁴, -CH₂OC(=O)NR¹³R¹⁴ or -CH₂OC(=O)R¹⁴;
- R⁵ is H, C₂–C₆ alkenyl, C₂–C₇ haloalkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₄–C₇ cycloalkylalkyl, C₂–C₇ alkoxyalkyl or C₄–C₇ alkylcycloalkyl;
- 15 R⁶ is H, C₁–C₇ alkyl, C₃–C₇ cycloalkyl, C₁–C₇ haloalkyl, C₂–C₇ alkoxyalkyl, C₁–C₇ alkoxy or C₁–C₇ haloalkoxy;
- R⁷ is H, C₁–C₇ alkyl, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₂–C₇ alkoxyalkyl, C₁–C₇ alkoxy or C₁–C₇ haloalkoxy;
- 20 R⁸ is H, C₁–C₇ alkyl, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₂–C₇ alkoxyalkyl, C₁–C₇ alkoxy or C₁–C₇ haloalkoxy;
- G is OR¹⁰, SR¹⁰, SOR¹⁰ or SO₂R¹⁰;
- R¹⁰ is H, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₃–C₇ halocycloalkyl, C₄–C₇ alkylcycloalkyl, C₄–C₇ cycloalkylalkyl, C₄–C₇ halocycloalkylalkyl, C₅–C₇ alkylcycloalkylalkyl, C₁–C₇ haloalkoxy, C₂–C₇ alkoxyalkyl, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₃–C₇ alkylthioalkyl, C₂–C₇ haloalkoxyalkyl, benzyl or C₄–C₇ alkylcycloalkyl;
- 25 R¹¹ is H or C₁–C₇ alkyl;
- 30 R¹² is H or C₁–C₇ alkyl;
- each R¹³ and R¹⁴ is independently H, C₁–C₇ haloalkyl or C₁–C₇ alkyl; and
- R^f is C₁–C₃ haloalkyl.

Embodiment A1. A compound of Embodiment A wherein

- 35 R¹ is H, C₁–C₃ alkyl, halogen or C₃–C₄ cycloalkyl;
- R² is H, Me, F, Cl or CN;
- R³ is H, Me, F, Cl, CN, OMe or CF₃;

R⁴ is H, SO₂CF₃, SO₂CH₃, CO₂Me, COMe, CH₂OCO-*t*-Bu, CH₂OCO-*n*-Bu, CH₂OCO-*c*-hexyl, CH₂OCO-*c*-pentyl, CH₂OCOCH₂CH₃, COMe, CH₂OCOPh, CH₂OCO-*i*-Bu, CH₂OCOMe, CH₂OCO-*sec*-Bu, CH₂OCO-*n*-Pr and CH₂OCO-*i*-Pr or (C=O)SMe;

- 5 R⁵ is H, C₄-C₇ cycloalkylalkyl or C₂-C₇ alkoxyalkyl;
R⁶ is H, C₁-C₇ alkyl or C₁-C₇ alkoxy;
R⁷ is H, C₁-C₇ alkyl, C₃-C₇ cycloalkyl, C₁-C₇ haloalkyl, C₂-C₇ alkoxyalkyl, C₁-C₇ alkoxy or C₁-C₇ haloalkoxy;
R⁸ is H, C₁-C₇ alkyl or C₁-C₇ alkoxy;
10 G is OR¹⁰ or SR¹⁰; and
R¹⁰ is C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₇ cycloalkyl, C₃-C₇ halocycloalkyl, C₄-C₇ alkylcycloalkyl, C₄-C₇ cycloalkylalkyl, C₄-C₇ halocycloalkylalkyl, C₅-C₇ alkylcycloalkylalkyl, C₂-C₄ cyanoalkyl, C₃-C₇ alkylthioalkyl, benzyl or C₄-C₇ alkylcycloalkyl.

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Embodiment A2. A compound of Embodiment A1 wherein

- R¹ is H, Me, halogen or cyclopropyl;
R² is H or F;
R³ is Me or F;
20 R⁴ is H, CH₂OCOR¹⁴ or -S(O)₂R¹⁴;
R⁵ is H;
R⁶ is H, Me or OMe;
R⁷ is H, Me or OMe;
R⁸ is H, Me or OMe;
25 G is OR¹⁰; and
R¹⁰ is C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₇ cycloalkyl, C₄-C₇ cycloalkylalkyl, C₄-C₇ halocycloalkylalkyl or C₄-C₇ alkylcycloalkyl.

Embodiment A3. A compound of Embodiment A2 wherein

- 30 R¹ is H, Me, F, Cl, Br or cyclopropyl;
R⁴ is H, CH₂OCO-*t*-Bu or SO₂CF₃;
R⁸ is H; and
R¹⁰ is C₂-C₆ alkenyl, C₂-C₆ alkynyl or C₃-C₇ cycloalkyl.

Embodiment A4. A compound of Embodiment A3 wherein

- 35 R¹ is Me;
R³ is Me;
R⁴ is H;

R⁶ is H;

R⁷ is H; and

R¹⁰ is cyclopropyl, cyclobutyl, cyclopentyl, allyl or propargyl.

- 5 Embodiment B. A compound of Formula 1 as described in the Summary of the Disclosure wherein
- Q is CHR⁹;
- R¹ is H, C₁–C₇ alkyl, halogen, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₁–C₇ haloalkyl;
- 10 R² is H, C₁–C₇ alkyl, halogen or CN;
- R³ is H, C₁–C₇ alkyl, halogen, CN, C₁–C₇ alkoxy or C₁–C₇ haloalkyl;
- R⁴ is H, C(=O)R¹⁴, -C(=S)R¹⁴, -CO₂R¹⁴, -C(=O)SR¹⁴, -S(O)₂R¹⁴, C(=O)NR¹³R¹⁴, -S(O)₂NR¹³R¹⁴, CH₂OC(=O)OR¹⁴, CH₂OC(=O)NR¹³R¹⁴ or CH₂OC(=O)R¹⁴;
- 15 R⁵ is H, C₂–C₆ alkenyl, C₂–C₇ haloalkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₄–C₇ cycloalkylalkyl, C₂–C₇ alkoxyalkyl or C₄–C₇ alkylcycloalkyl;
- R⁶ is H, C₁–C₇ alkyl, C₃–C₇ cycloalkyl, C₁–C₇ haloalkyl, C₂–C₇ alkoxyalkyl, C₁–C₇ alkoxy or C₁–C₇ haloalkoxy;
- R⁷ is H, C₁–C₇ alkyl, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₂–C₇ alkoxyalkyl, C₁–C₇ alkoxy or C₁–C₇ haloalkoxy;
- 20 R⁸ is H, C₁–C₇ alkyl, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₂–C₇ alkoxyalkyl, C₁–C₇ alkoxy or C₁–C₇ haloalkoxy;
- 25 G is OR¹⁰, SR¹⁰, SOR¹⁰ or SO₂R¹⁰;
- R⁹ is H, C₁–C₇ alkyl, C₃–C₇ cycloalkyl, C₁–C₇ haloalkyl, C₂–C₇ alkoxyalkyl, C₁–C₇ alkoxy or C₁–C₇ haloalkoxy;
- R¹⁰ is H, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₃–C₇ halocycloalkyl, C₄–C₇ alkylcycloalkyl, C₄–C₇ cycloalkylalkyl, C₄–C₇ halocycloalkylalkyl, C₅–C₇ alkylcycloalkylalkyl, C₁–C₇ haloalkoxy, C₂–C₇ alkoxyalkyl, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₃–C₇ alkylthioalkyl, C₂–C₇ haloalkoxyalkyl, benzyl or C₄–C₇ alkylcycloalkyl;
- 30 R¹¹ is H or C₁–C₇ alkyl;
- R¹² is H or C₁–C₇ alkyl;
- 35 each R¹³ and R¹⁴ is independently H, C₁–C₇ haloalkyl or C₁–C₇ alkyl; and
- R^f is C₁–C₃ haloalkyl.

Embodiment B1. A compound of Embodiment B wherein

- R^1 is H, C_1 - C_3 alkyl, halogen or C_3 - C_4 cycloalkyl;
 R^2 is H, Me, F, Cl or CN;
 R^3 is H, Me, F, Cl, -CN, OMe or CF_3 ;
 R^4 is H, SO_2CF_3 , SO_2CH_3 , CO_2Me , COMe, $CH_2OCO-t-Bu$, $CH_2OCO-n-Bu$,
 5 $CH_2OCO-c-hexyl$, $CH_2OCO-c-pentyl$, $CH_2OCOCH_2CH_3$, COMe, CH_2OCOPh ,
 $CH_2OCO-i-Bu$, CH_2OCOMe , $CH_2OCO-sec-Bu$, $CH_2OCO-n-Pr$ and $CH_2OCO-i-Pr$ or $(C=O)SMe$;
 R^5 is H, C_4 - C_7 cycloalkylalkyl or C_2 - C_7 alkoxyalkyl;
 R^6 is H, C_1 - C_7 alkyl or C_1 - C_7 alkoxy;
 10 R^7 is H, C_1 - C_7 alkyl, C_3 - C_7 cycloalkyl, C_1 - C_7 haloalkyl, C_2 - C_7 alkoxyalkyl, C_1 - C_7
 alkoxy or C_1 - C_7 haloalkoxy;
 R^8 is H, C_1 - C_7 alkyl or C_1 - C_7 alkoxy;
 G is OR^{10} or SR^{10} ;
 R^9 is H, C_1 - C_7 alkyl or C_1 - C_7 alkoxy; and
 15 R^{10} is C_2 - C_6 alkenyl, C_2 - C_6 alkynyl, C_3 - C_7 cycloalkyl, C_3 - C_7 halocycloalkyl, C_4 -
 C_7 alkylcycloalkyl, C_4 - C_7 cycloalkylalkyl, C_4 - C_7 halocycloalkylalkyl, C_5 - C_7
 alkylcycloalkylalkyl, C_2 - C_4 cyanoalkyl, C_3 - C_7 alkylthioalkyl or C_4 - C_7
 alkylcycloalkyl.
- 20 Embodiment B2. A compound of Embodiment B1 wherein
 R^1 is H, Me, halogen or cyclopropyl;
 R^2 is H or F;
 R^3 is Me or F;
 R^4 is H, CH_2OCOR^{14} or $-S(O)_2R^{14}$;
 25 R^5 is H;
 R^6 is H, Me or OMe;
 R^7 is H, Me or OMe;
 R^8 is H, Me or OMe;
 G is OR^{10} ;
 30 R^9 is H, Me or OMe; and
 R^{10} is H, C_2 - C_6 alkenyl, C_2 - C_6 alkynyl, C_3 - C_7 cycloalkyl, C_4 - C_7 cycloalkylalkyl,
 C_4 - C_7 halocycloalkylalkyl or C_4 - C_7 alkylcycloalkyl.
- Embodiment B3. A compound of Embodiment B2 wherein
 35 R^1 is H, Me, F, Cl, Br or cyclopropyl;
 R^4 is H, $CH_2OCO-t-Bu$ or SO_2CF_3 ;
 R^8 is H;
 R^9 is H; and

R¹⁰ is C₂–C₆ alkenyl, C₂–C₆ alkynyl or C₃–C₇ cycloalkyl

Embodiment C. A compound of Formula 1 as described in the Summary of the Disclosure wherein

- 5 Q is O;
 R¹ is H, C₁–C₇ alkyl, halogen, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₁–C₇ haloalkyl;
 R² is H, C₁–C₇ alkyl, halogen or CN;
 R³ is H, C₁–C₇ alkyl, halogen, CN, C₁–C₇ alkoxy or C₁–C₇ haloalkyl;
 10 R⁴ is H, C(=O)R¹⁴, -C(=S)R¹⁴, -CO₂R¹⁴, -C(=O)SR¹⁴, -S(O)₂R¹⁴, C(=O)NR¹³R¹⁴, -S(O)₂NR¹³R¹⁴, CH₂OC(=O)OR¹⁴, CH₂OC(=O)NR¹³R¹⁴ or CH₂OC(=O)R¹⁴;
 R⁵ is H, C₂–C₆ alkenyl, C₂–C₇ haloalkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₄–C₇ cycloalkylalkyl, C₂–C₇ alkoxyalkyl or C₄–C₇ alkylcycloalkyl;
 15 R⁶ is H, C₁–C₇ alkyl, C₃–C₇ cycloalkyl, C₁–C₇ haloalkyl, C₂–C₇ alkoxyalkyl, C₁–C₇ alkoxy or C₁–C₇ haloalkoxy;
 R⁷ is H, C₁–C₇ alkyl, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₂–C₇ alkoxyalkyl, C₁–C₇ alkoxy or C₁–C₇ haloalkoxy;
 20 R⁸ is H, C₁–C₇ alkyl, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₂–C₇ alkoxyalkyl, C₁–C₇ alkoxy or C₁–C₇ haloalkoxy;
 G is OR¹⁰, SR¹⁰, SOR¹⁰ or SO₂R¹⁰;
 R¹⁰ is H, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₃–C₇ halocycloalkyl, C₄–C₇ alkylcycloalkyl, C₄–C₇ cycloalkylalkyl, C₄–C₇ halocycloalkylalkyl, C₅–C₇ alkylcycloalkylalkyl, C₁–C₇ haloalkoxy, C₂–C₇ alkoxyalkyl, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₃–C₇ alkylthioalkyl, C₂–C₇ haloalkoxyalkyl, benzyl or C₄–C₇ alkylcycloalkyl;
 R¹¹ is H or C₁–C₇ alkyl;
 30 R¹² is H or C₁–C₇ alkyl;
 each R¹³ and R¹⁴ is independently H, C₁–C₇ haloalkyl or C₁–C₇ alkyl; and
 R^f is C₁–C₃ haloalkyl.

Embodiment C1. A compound of Embodiment C wherein

- 35 R¹ is H, C₁–C₃ alkyl, halogen or C₃–C₄ cycloalkyl;
 R² is H, Me, F, Cl or CN;
 R³ is H, Me, F, Cl, -CN, OMe or CF₃;

R⁴ is H, SO₂CF₃, SO₂CH₃, CO₂Me, COMe, CH₂OCO-*t*-Bu, CH₂OCO-*n*-Bu, CH₂OCO-*c*-hexyl, CH₂OCO-*c*-pentyl, CH₂OCOCH₂CH₃, COMe, CH₂OCOPh, CH₂OCO-*i*-Bu, CH₂OCOMe, CH₂OCO-*sec*-Bu, CH₂OCO-*n*-Pr and CH₂OCO-*i*-Pr or (C=O)SMe;

- 5 R⁵ is H, C₄-C₇ cycloalkylalkyl or C₂-C₇ alkoxyalkyl;
R⁶ is H, C₁-C₇ alkyl or C₁-C₇ alkoxy;
R⁷ is H, C₁-C₇ alkyl, C₃-C₇ cycloalkyl, C₁-C₇ haloalkyl, C₂-C₇ alkoxyalkyl, C₁-C₇ alkoxy or C₁-C₇ haloalkoxy;
R⁸ is H, C₁-C₇ alkyl or C₁-C₇ alkoxy;
10 G is OR¹⁰ or SR¹⁰; and
R¹⁰ is C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₇ cycloalkyl, C₃-C₇ halocycloalkyl, C₄-C₇ alkylcycloalkyl, C₄-C₇ cycloalkylalkyl, C₄-C₇ halocycloalkylalkyl, C₅-C₇ alkylcycloalkylalkyl, C₂-C₄ cyanoalkyl, C₃-C₇ alkylthioalkyl, benzyl or C₄-C₇ alkylcycloalkyl.

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Embodiment C2. A compound of Embodiment C1 wherein

- R¹ is H, Me, halogen or cyclopropyl;
R² is H or F;
R³ is Me or F;
20 R⁴ is H, CH₂OCOR¹⁴ or -S(O)₂R¹⁴;
R⁵ is H;
R⁶ is H, Me or OMe;
R⁷ is H, Me or OMe;
R⁸ is H, Me or OMe;
25 G is OR¹⁰; and
R¹⁰ is C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₇ cycloalkyl, C₄-C₇ cycloalkylalkyl, C₄-C₇ halocycloalkylalkyl or C₄-C₇ alkylcycloalkyl.

Embodiment C3. A compound of Embodiment C2 wherein

- 30 R¹ is H, Me, F, Cl, Br or cyclopropyl;
R⁴ is H, CH₂OCO-*t*-Bu or S(O)₂CF₃;
R⁸ is H; and
R¹⁰ is C₂-C₆ alkenyl, C₂-C₆ alkynyl or C₃-C₇ cycloalkyl.

35 Embodiment C4. A compound of Embodiment C3 wherein

- R¹ is Me;
R³ is Me;
R⁴ is H;

R⁶ is H;

R⁷ is H; and

R¹⁰ is cyclopropyl, cyclobutyl, cyclopentyl, allyl or propargyl.

5 Embodiment D. A compound of Formula 1 as described in the Summary of the Disclosure wherein

R¹ is H, C₁–C₇ alkyl, halogen, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₁–C₇ haloalkyl;

R² is H, C₁–C₇ alkyl, halogen or CN;

10 R³ is H, C₁–C₇ alkyl, halogen, CN, C₁–C₇ alkoxy or C₁–C₇ haloalkyl;

R⁴ is H, C(=O)R¹⁴, -C(=S)R¹⁴, -CO₂R¹⁴, -C(=O)SR¹⁴, -S(O)₂R¹⁴, C(=O)NR¹³R¹⁴, -S(O)₂NR¹³R¹⁴, CH₂OC(=O)OR¹⁴, CH₂OC(=O)NR¹³R¹⁴ or CH₂OC(=O)R¹⁴;

15 R⁶ is H, C₁–C₇ alkyl, C₃–C₇ cycloalkyl, C₁–C₇ haloalkyl, C₂–C₇ alkoxyalkyl, C₁–C₇ alkoxy or C₁–C₇ haloalkoxy;

R⁷ is H, C₁–C₇ alkyl, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₃–C₇ alkenylalkyl, C₃–C₇ alkynylalkyl, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₂–C₇ alkoxyalkyl, C₁–C₇ alkoxy or C₁–C₇ haloalkoxy;

20 R⁸ is H, C₁–C₇ alkyl, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₂–C₇ alkoxyalkyl, C₁–C₇ alkoxy or C₁–C₇ haloalkoxy;

G and R⁵ are taken together to form N-OR¹⁵;

R¹¹ is H or C₁–C₇ alkyl;

R¹² is H or C₁–C₇ alkyl;

25 R¹³ and R¹⁴ are independently H, C₁–C₇ haloalkyl or C₁–C₇ alkyl;

R^f is C₁–C₃ haloalkyl; and

R¹⁵ is H, C₁–C₆ alkyl, C₁–C₆ haloalkyl, C₂–C₆ alkenyl, C₂–C₆ alkynyl or C₄–C₇ cycloalkylalkyl.

Embodiment D1. A compound of Embodiment D wherein

30 R¹ is H, C₁–C₃ alkyl, halogen or C₃–C₄ cycloalkyl;

R² is H, Me, F, Cl or CN;

R³ is H, Me, F, Cl, -CN, OMe or CF₃;

R⁴ is H, SO₂CF₃, SO₂CH₃, CO₂Me, COMe, CH₂OCO-*t*-Bu, CH₂OCO-*n*-Bu, CH₂OCO-*c*-hexyl, CH₂OCO-*c*-pentyl, CH₂OCOCH₂CH₃, COMe, CH₂OCOPh, CH₂OCO-*i*-Bu, CH₂OCOMe, CH₂OCO-*sec*-Bu, CH₂OCO-*n*-Pr and CH₂OCO-*i*-Pr or (C=O)SMe;

35

R⁶ is H, C₁–C₇ alkyl or C₁–C₇ alkoxy;

R^7 is H, C_1-C_7 alkyl, C_3-C_7 cycloalkyl, C_1-C_7 haloalkyl, C_2-C_7 alkoxyalkyl, C_1-C_7 alkoxy or C_1-C_7 haloalkoxy; and

R^8 is H, C_1-C_7 alkyl or C_1-C_7 alkoxy.

Embodiment D2. A compound of Embodiment D1 wherein

5 R^1 is H, Me, halogen or cyclopropyl;

R^2 is H or F;

R^3 is Me or F;

R^4 is H, CH_2OCOR^{14} or $-S(O)_2R^{14}$;

R^6 is H, Me or OMe;

10 R^7 is H, Me or OMe; and

R^8 is H, Me or OMe.

Embodiment D3. A compound of Embodiment D2 wherein

R^1 is H, Me, F, Cl, Br or cyclopropyl;

15 R^4 is H, $CH_2OCO-t-Bu$ or SO_2CF_3 ; and

R^8 is H.

Embodiment D4. A compound of Embodiment D3 wherein

R^1 is Me;

20 R^3 is Me;

R^4 is H;

R^6 is H;

R^7 is H; and

R^{15} is H, Me, Et, $CH_2CH=CH_2$ or $CH_2C\equiv CH$.

25

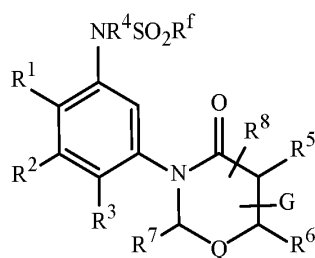
Embodiment D5. A compound of any one of Embodiments D to D4 wherein

Q is direct bond.

Embodiment P1. A compound selected from Formula 1, all stereoisomers, *N*-oxides, and

30

salts thereof,



1

wherein

- R^1 is H, C₁–C₇ alkyl, halogen, CN, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₃–C₇ haloalkynyl, C₂–C₇ alkoxyalkyl, C₁–C₇ alkoxy, C₁–C₅ alkylthio, C₂–C₃ alkoxycarbonyl or C₂–C₇ haloalkoxyalkyl;
- R^2 is H, C₁–C₇ alkyl, halogen, CN, C₁–C₇ haloalkyl, C₁–C₇ alkoxy or C₁–C₅ alkylthio;
- R^3 is H, C₁–C₇ alkyl, halogen, CN, C₂–C₆ alkenyl, C₂–C₇ alkynyl, C₃–C₇ cycloalkyl, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₃–C₇ haloalkynyl, C₂–C₇ alkoxyalkyl, C₁–C₇ alkoxy, C₁–C₅ alkylthio, C₂–C₃ alkoxycarbonyl or C₂–C₇ haloalkoxyalkyl;
- R^4 is H, C(=O)R¹⁴, -C(=S)R¹⁴, -CO₂R¹⁴, -C(=O)SR¹⁴, -S(O)₂R¹⁴, C(=O)NR¹³R¹⁴, -S(O)₂NR¹³R¹⁴, CH₂OC(=O)OR¹⁴, CH₂OC(=O)NR¹³R¹⁴ or CH₂OC(=O)R¹⁴; or propargyl, allyl or benzyl;
- R^5 is H, C₂–C₆ alkenyl, C₂–C₇ haloalkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₄–C₇ cycloalkylalkyl, C₃–C₇ alkenylalkyl, C₃–C₇ alkynylalkyl, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₃–C₇ alkylthioalkyl, C₁–C₇ haloalkoxy, C₂–C₇ alkoxyalkyl or C₄–C₇ alkylcycloalkyl;
- R^6 is H, C₁–C₇ alkyl, halogen, CN, C₁–C₅ alkylthio, C₂–C₃ alkoxycarbonyl, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₄–C₇ cycloalkylalkyl, C₃–C₇ alkenylalkyl, C₃–C₇ alkynylalkyl, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₂–C₇ alkoxyalkyl, C₃–C₇ alkylthioalkyl, C₁–C₇ alkoxy, C₁–C₇ haloalkoxy, C₂–C₇ haloalkoxyalkyl or C₄–C₇ alkylcycloalkyl;
- R^7 is H, C₁–C₇ alkyl, halogen, CN, C₁–C₅ alkylthio, C₂–C₃ alkoxycarbonyl, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₄–C₇ cycloalkylalkyl, C₃–C₇ alkenylalkyl, C₃–C₇ alkynylalkyl, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₂–C₇ alkoxyalkyl, C₃–C₇ alkylthioalkyl, C₁–C₇ alkoxy, C₁–C₇ haloalkoxy, C₂–C₇ haloalkoxyalkyl or C₄–C₇ alkylcycloalkyl;
- R^8 is H, C₁–C₇ alkyl, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₄–C₇ cycloalkylalkyl, C₃–C₇ alkenylalkyl, C₃–C₇ alkynylalkyl, C₂–C₄ cyanoalkyl,

C₁-C₇ haloalkyl, C₂-C₇ haloalkenyl, C₂-C₇ alkoxyalkyl, C₃-C₇ alkylthioalkyl, C₁-C₇ alkoxy, C₁-C₇ haloalkoxy, C₂-C₇ alkoxyalkyl or C₄-C₇ alkylcycloalkyl;

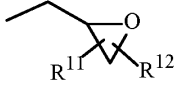
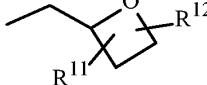
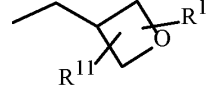
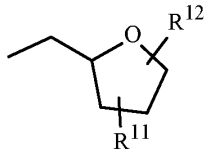
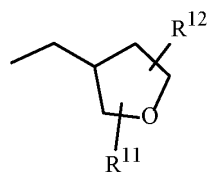
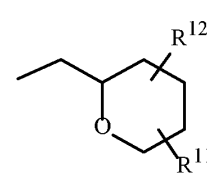
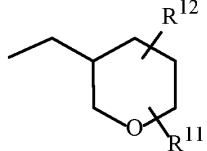
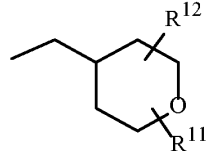
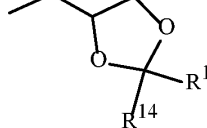
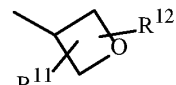
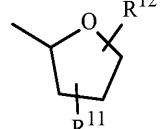
Q is CHR⁹, O or a direct bond;

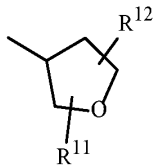
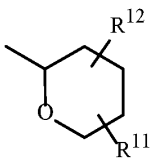
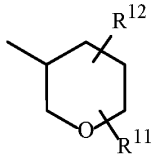
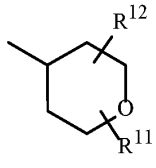
R⁹ is H, C₁-C₇ alkyl, halogen, CN, C₁-C₅ alkylthio, C₂-C₃ alkoxy carbonyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₇ cycloalkyl, C₄-C₇ cycloalkylalkyl, C₃-C₇ alkenylalkyl, C₃-C₇ alkynylalkyl, C₂-C₄ cyanoalkyl, C₁-C₇ haloalkyl, C₂-C₇ haloalkenyl, C₂-C₇ alkoxyalkyl, C₃-C₇ alkylthioalkyl, C₁-C₇ alkoxy, C₁-C₇ haloalkoxy, C₂-C₇ alkoxyalkyl, C₂-C₇ haloalkoxyalkyl or C₄-C₇ alkylcycloalkyl;

G is OR¹⁰, SR¹⁰, SOR¹⁰ or SO₂R¹⁰;

R¹⁰ is H, C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₇ cycloalkyl, C₃-C₇ halocycloalkyl, C₃-C₁₀ alkenylalkyl, C₃-C₁₀ alkynylalkyl, C₄-C₁₀ alkylalkenylalkyl, C₄-C₁₀ alkylalkynylalkyl, C₄-C₇ alkylcycloalkyl, C₄-C₇ cycloalkylalkyl, C₄-C₇ halocycloalkylalkyl, C₅-C₇ alkylcycloalkylalkyl, C₁-C₇ haloalkoxy, C₂-C₇ alkoxyalkyl, C₂-C₄ cyanoalkyl, C₁-C₇ haloalkyl, C₂-C₇ haloalkenyl, C₃-C₇ alkylthioalkyl, C₂-C₄ cyanoalkyl, C₄-C₇ alkylcycloalkyl, C₁-C₆ nitroalkyl, C₃-C₆ alkylcarboalkyl, C₃-C₆ alkoxy carboalkyl or C₃-C₆ alkylcarboalkoxy; or

R¹⁰ is selected from the group consisting of

					
R ¹⁰ -1	,	R ¹⁰ -2	,	R ¹⁰ -3	,
					
R ¹⁰ -4	,	R ¹⁰ -5	,	R ¹⁰ -6	,
					
R ¹⁰ -7	,	R ¹⁰ -8	,	R ¹⁰ -9	,
					

R ¹⁰⁻¹⁰	,	R ¹⁰⁻¹¹	,	R ¹⁰⁻¹²	,
					
R ¹⁰⁻¹³	,	R ¹⁰⁻¹⁴	,	R ¹⁰⁻¹⁵	and
					
R ¹⁰⁻¹⁶	;				

R¹¹ is H, C₁–C₇ alkyl, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₄–C₇ cycloalkylalkyl, C₇ haloalkyl, C₂–C₇ haloalkenyl, C₂–C₇ alkoxyalkyl, C₃–C₇ alkylthioalkyl, C₁–C₇ alkoxy, C₁–C₇ haloalkoxy, C₂–C₇ alkoxyalkyl or C₄–C₇ alkylcycloalkyl;

5 R¹² is H, C₁–C₇ alkyl, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₄–C₇ cycloalkylalkyl or C₇ haloalkyl;

each R¹³ and R¹⁴ are independently H, C₁–C₇ alkyl, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₄–C₇ cycloalkylalkyl, C₂–C₃ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₂–C₇ alkylalkoxyalkyl, C₃–C₇ alkylthioalkyl, C₁–C₇ alkoxy; C₂–C₇ alkoxyalkyl, C₄–C₇ alkylcycloalkyl, Ph or benzyl;

10

R^f is C₁–C₇ haloalkyl;

G and R⁸ can be attached to any ring carbon(s) with available valency, said ring is the cyclic amide ring shown in Formula 1; and

each R¹¹ or R¹² can be attached to any ring carbon(s) with available valency, said ring is illustrated in R¹⁰⁻¹ through R¹⁰⁻¹⁶ as above.

15

Embodiment P2. The compound of Embodiment P1 wherein

Q is direct bond;

R¹ is H, C₁–C₇ alkyl, halogen, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₁–C₇ haloalkyl;

20

R² is H, C₁–C₇ alkyl, halogen or CN;

R³ is H, C₁–C₇ alkyl, halogen, CN, C₁–C₇ alkoxy or C₁–C₇ haloalkyl;

R⁴ is H, C(=O)R¹⁴, -C(=S)R¹⁴, -CO₂R¹⁴, -C(=O)SR¹⁴, -S(O)₂R¹⁴, C(=O)NR¹³R¹⁴, -S(O)₂NR¹³R¹⁴, CH₂OC(=O)OR¹⁴, CH₂OC(=O)NR¹³R¹⁴ or CH₂OC(=O)R¹⁴;

25

- R⁵ is H, C₂-C₆ alkenyl, C₂-C₇ haloalkenyl, C₂-C₆ alkynyl, C₃-C₇ cycloalkyl, C₄-C₇ cycloalkylalkyl, C₃-C₇ alkenylalkyl, C₃-C₇ alkynylalkyl, C₂-C₇ alkoxyalkyl or C₄-C₇ alkylcycloalkyl;
- 5 R⁶ is H, C₁-C₇ alkyl, C₃-C₇ cycloalkyl, C₁-C₇ haloalkyl, C₂-C₇ alkoxyalkyl, C₁-C₇ alkoxy or C₁-C₇ haloalkoxy;
- R⁷ is H, C₁-C₇ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₇ cycloalkyl, C₃-C₇ alkenylalkyl, C₃-C₇ alkynylalkyl, C₂-C₄ cyanoalkyl, C₁-C₇ haloalkyl, C₂-C₇ haloalkenyl, C₂-C₇ alkoxyalkyl, C₁-C₇ alkoxy or C₁-C₇ haloalkoxy;
- 10 R⁸ is H, C₁-C₇ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₇ cycloalkyl, C₃-C₇ alkenylalkyl, C₃-C₇ alkynylalkyl, C₂-C₄ cyanoalkyl, C₁-C₇ haloalkyl, C₂-C₇ haloalkenyl, C₂-C₇ alkoxyalkyl, C₁-C₇ alkoxy or C₁-C₇ haloalkoxy;
- G is OR¹⁰, SR¹⁰, SOR¹⁰ or SO₂R¹⁰;
- R¹⁰ is H, C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₇ cycloalkyl, C₃-C₇ halocycloalkyl, C₃-C₁₀ alkenylalkyl, C₃-C₁₀ alkynylalkyl, C₄-C₁₀ alkylalkenylalkyl, C₄-C₁₀ alkylalkynylalkyl, C₄-C₇ alkylcycloalkyl, C₄-C₇ cycloalkylalkyl, C₄-C₇ halocycloalkylalkyl, C₅-C₇ alkylcycloalkylalkyl, C₁-C₇ haloalkoxy, C₂-C₇ alkoxyalkyl, C₂-C₄ cyanoalkyl, C₁-C₇ haloalkyl, C₂-C₇ haloalkenyl, C₃-C₇ alkylthioalkyl, C₂-C₇ alkoxyalkyl, C₂-C₄ cyanoalkyl or C₄-C₇ alkylcycloalkyl;
- 15 R¹¹ is H or C₁-C₇ alkyl;
- 20 R¹² is H or C₁-C₇ alkyl;
- R¹³ and R¹⁴ are independently H, C₁-C₇ haloalkyl or C₁-C₇ alkyl; and
- R^f is C₁-C₃ haloalkyl.

Embodiment P3. The compound of Embodiment P2 wherein

- 25 R¹ is H, C₁-C₃ alkyl, halogen or C₃-C₄ cycloalkyl;
- R² is H, Me, F, Cl or CN;
- R³ is H, Me, F, Cl, -CN, OMe or CF₃;
- R⁴ is H, SO₂CF₃, SO₂CH₃, CO₂Me, COMe, CH₂OCO-*t*-Bu, CH₂OCO-*n*-Bu, CH₂OCO-*c*-hexyl, CH₂OCO-*c*-pentyl, CH₂OCOCH₂CH₃, COMe, CH₂OCOPh, CH₂OCO-*i*-Bu, CH₂OCOME, CH₂OCO-*sec*-Bu, CH₂OCO-*n*-Pr and CH₂OCO-*i*-Pr or (C=O)SMe;
- 30 R⁵ is H, C₄-C₇ cycloalkylalkyl or C₂-C₇ alkoxyalkyl;
- R⁶ is H, C₁-C₇ alkyl or C₁-C₇ alkoxy;
- R⁷ is H, C₁-C₇ alkyl, C₃-C₇ cycloalkyl, C₁-C₇ haloalkyl, C₂-C₇ alkoxyalkyl, C₁-C₇ alkoxy or C₁-C₇ haloalkoxy;
- 35 R⁸ is H, C₁-C₇ alkyl or C₁-C₇ alkoxy;
- G is OR¹⁰ or SR¹⁰; and

R¹⁰ is C₃–C₇ cycloalkyl, C₃–C₇ halocycloalkyl, C₃–C₁₀ alkenylalkyl, C₃–C₁₀ alkynylalkyl, C₄–C₁₀ alkylalkenylalkyl, C₄–C₁₀ alkylalkynylalkyl, C₄–C₇ alkylcycloalkyl, C₄–C₇ cycloalkylalkyl, C₄–C₇ halocycloalkylalkyl, C₅–C₇ alkylcycloalkylalkyl, C₂–C₇ alkoxyalkyl, C₂–C₄ cyanoalkyl, C₃–C₇ alkylthioalkyl or C₄–C₇ alkylcycloalkyl.

Embodiment P4. The compound of Embodiment P3 wherein

R¹ is H, Me, halogen or cyclopropyl;

R² is H or F;

R³ is Me or F;

R⁴ is H, CH₂OCOR¹⁴ or -S(O)₂R¹⁴;

R⁵ is H;

R⁶ is H, Me or OMe;

R⁷ is H, Me or OMe;

R⁸ is H, Me or OMe;

G is OR¹⁰;

R¹⁰ is C₃–C₇ cycloalkyl, C₃–C₁₀ alkenylalkyl, C₃–C₁₀ alkynylalkyl, C₄–C₇ cycloalkylalkyl, C₂–C₇ alkoxyalkyl or C₄–C₇ alkylcycloalkyl.

Embodiment P5. The compound of Embodiment P4 wherein

R¹ is H, Me, F, Cl, Br or cyclopropyl;

R⁴ is H, CH₂OCO-*t*-Bu or SO₂CF₃;

R⁸ is H; and

R¹⁰ is C₃–C₇ cycloalkyl, C₃–C₁₀ alkenylalkyl or C₃–C₁₀ alkynylalkyl.

Embodiment P6. The compound of Embodiment P5 wherein

R¹ is Me;

R³ is Me;

R⁴ is H;

R⁶ is H;

R⁷ is H; and

R¹⁰ is cyclopropyl, cyclobutyl, cyclopentyl, allyl or propargyl.

Embodiment P7. The compound of Embodiment P6 wherein

Q is CHR⁹;

R¹ is H, C₁–C₇ alkyl, halogen, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₁–C₇ haloalkyl;

R² is H, C₁–C₇ alkyl, halogen or CN;

R³ is H, C₁–C₇ alkyl, halogen, CN, C₁–C₇ alkoxy or C₁–C₇ haloalkyl;

R⁴ is H, C(=O)R¹⁴, -C(=S)R¹⁴, -CO₂R¹⁴, -C(=O)SR¹⁴, -S(O)₂R¹⁴, C(=O)NR¹³R¹⁴, -S(O)₂NR¹³R¹⁴, CH₂OC(=O)OR¹⁴, CH₂OC(=O)NR¹³R¹⁴ or CH₂OC(=O)R¹⁴;

- R⁵ is H, C₂-C₆ alkenyl, C₂-C₇ haloalkenyl, C₂-C₆ alkynyl, C₃-C₇ cycloalkyl, C₄-C₇ cycloalkylalkyl, C₃-C₇ alkenylalkyl, C₃-C₇ alkynylalkyl, C₂-C₇ alkoxyalkyl or C₄-C₇ alkylcycloalkyl;
- 5 R⁶ is H, C₁-C₇ alkyl, C₃-C₇ cycloalkyl, C₁-C₇ haloalkyl, C₂-C₇ alkoxyalkyl, C₁-C₇ alkoxy or C₁-C₇ haloalkoxy;
- R⁷ is H, C₁-C₇ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₇ cycloalkyl, C₃-C₇ alkenylalkyl, C₃-C₇ alkynylalkyl, C₂-C₄ cyanoalkyl, C₁-C₇ haloalkyl, C₂-C₇ haloalkenyl, C₂-C₇ alkoxyalkyl, C₁-C₇ alkoxy or C₁-C₇ haloalkoxy;
- 10 R⁸ is H, C₁-C₇ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₇ cycloalkyl, C₃-C₇ alkenylalkyl, C₃-C₇ alkynylalkyl, C₂-C₄ cyanoalkyl, C₁-C₇ haloalkyl, C₂-C₇ haloalkenyl, C₂-C₇ alkoxyalkyl, C₁-C₇ alkoxy or C₁-C₇ haloalkoxy;
- G is OR¹⁰, SR¹⁰, SOR¹⁰ or SO₂R¹⁰;
- R⁹ is H, C₁-C₇ alkyl, C₃-C₇ cycloalkyl, C₁-C₇ haloalkyl, C₂-C₇ alkoxyalkyl, C₁-C₇ alkoxy or C₁-C₇ haloalkoxy;
- 15 R¹⁰ is alkynylalkyl, C₄-C₁₀ alkylalkenylalkyl, C₄-C₁₀ alkylalkynylalkyl, C₄-C₇ alkylcycloalkyl, C₄-C₇ cycloalkylalkyl, C₄-C₇ halocycloalkylalkyl, C₅-C₇ alkylcycloalkylalkyl, C₁-C₇ haloalkoxy, C₂-C₇ alkoxyalkyl, C₂-C₄ cyanoalkyl, C₁-C₇ haloalkyl, C₂-C₇ haloalkenyl, C₃-C₇ alkylthioalkyl, C₂-C₇ alkoxyalkyl, C₂-C₄ cyanoalkyl or C₄-C₇ alkylcycloalkyl;
- 20 R¹¹ is H or C₁-C₇ alkyl;
- R¹² is H or C₁-C₇ alkyl;
- R¹³ and R¹⁴ are independently H, C₁-C₇ haloalkyl or C₁-C₇ alkyl; and
- R^f is C₁-C₃ haloalkyl.
- Embodiment P8. The compound of Embodiment P7 wherein
- 25 R¹ is H, C₁-C₃ alkyl, halogen or C₃-C₄ cycloalkyl;
- R² is H, Me, F, Cl or CN;
- R³ is H, Me, F, Cl, -CN, OMe or CF₃;
- R⁴ is H, SO₂CF₃, SO₂CH₃, CO₂Me, COMe, CH₂OCO-*t*-Bu, CH₂OCO-*n*-Bu, CH₂OCO-*c*-hexyl, CH₂OCO-*c*-pentyl, CH₂OCOCH₂CH₃, COMe, CH₂OCOPh, CH₂OCO-*i*-Bu, CH₂OCOME, CH₂OCO-*sec*-Bu, CH₂OCO-*n*-Pr and CH₂OCO-*i*-Pr or (C=O)SMe;
- 30 R⁵ is H, C₄-C₇ cycloalkylalkyl or C₂-C₇ alkoxyalkyl;
- R⁶ is H, C₁-C₇ alkyl or C₁-C₇ alkoxy;
- R⁷ is H, C₁-C₇ alkyl, C₃-C₇ cycloalkyl, C₁-C₇ haloalkyl, C₂-C₇ alkoxyalkyl, C₁-C₇ alkoxy or C₁-C₇ haloalkoxy;
- 35 R⁸ is H, C₁-C₇ alkyl or C₁-C₇ alkoxy;
- G is OR¹⁰ or SR¹⁰;
- R⁹ is H, C₁-C₇ alkyl or C₁-C₇ alkoxy;

R¹⁰ is C₃–C₇ cycloalkyl, C₃–C₇ halocycloalkyl, C₃–C₁₀ alkenylalkyl, C₃–C₁₀ alkynylalkyl, C₄–C₁₀ alkylalkenylalkyl, C₄–C₁₀ alkylalkynylalkyl, C₄–C₇ alkylcycloalkyl, C₄–C₇ cycloalkylalkyl, C₄–C₇ halocycloalkylalkyl, C₅–C₇ alkylcycloalkylalkyl, C₂–C₇ alkoxyalkyl, C₂–C₄ cyanoalkyl, C₃–C₇ alkylthioalkyl or C₄–C₇ alkylcycloalkyl;

Embodiment P9. The compound of Embodiment P8 wherein

R¹ is H, Me, halogen or cyclopropyl;

R² is H or F;

R³ is Me or F;

R⁴ is H, CH₂OCOR¹⁴ or -S(O)₂R¹⁴;

R⁵ is H;

R⁶ is H, Me or OMe;

R⁷ is H, Me or OMe;

R⁸ is H, Me or OMe;

G is OR¹⁰;

R⁹ is H, Me or OMe;

R¹⁰ is C₃–C₇ cycloalkyl, C₃–C₁₀ alkenylalkyl, C₃–C₁₀ alkynylalkyl, C₄–C₇ cycloalkylalkyl, C₂–C₇ alkoxyalkyl or C₄–C₇ alkylcycloalkyl.

Embodiment P10. The compound of Embodiment P9 wherein

R¹ is H, Me, F, Cl, Br or cyclopropyl;

R⁴ is H, CH₂OCO-*t*-Bu or SO₂CF₃;

R⁸ is H;

R⁹ is H; and

R¹⁰ is C₃–C₇ cycloalkyl, C₃–C₁₀ alkenylalkyl or C₃–C₁₀ alkynylalkyl.

Embodiment P11. The compound of Embodiment P1 wherein

Q is O;

R¹ is H, C₁–C₇ alkyl, halogen, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₁–C₇ haloalkyl;

R² is H, C₁–C₇ alkyl, halogen or CN;

R³ is H, C₁–C₇ alkyl, halogen, CN, C₁–C₇ alkoxy or C₁–C₇ haloalkyl;

R⁴ is H, C(=O)R¹⁴, -C(=S)R¹⁴, -CO₂R¹⁴, -C(=O)SR¹⁴, -S(O)₂R¹⁴, C(=O)NR¹³R¹⁴, -S(O)₂NR¹³R¹⁴, CH₂OC(=O)OR¹⁴, CH₂OC(=O)NR¹³R¹⁴ or CH₂OC(=O)R¹⁴;

R⁵ is H, C₂–C₆ alkenyl, C₂–C₇ haloalkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₄–C₇ cycloalkylalkyl, C₃–C₇ alkenylalkyl, C₃–C₇ alkynylalkyl, C₂–C₇ alkoxyalkyl or C₄–C₇ alkylcycloalkyl;

R⁶ is H, C₁–C₇ alkyl, C₃–C₇ cycloalkyl, C₁–C₇ haloalkyl, C₂–C₇ alkoxyalkyl, C₁–C₇ alkoxy or C₁–C₇ haloalkoxy;

R⁷ is H, C₁-C₇ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₇ cycloalkyl, C₃-C₇ alkenylalkyl, C₃-C₇ alkynylalkyl, C₂-C₄ cyanoalkyl, C₁-C₇ haloalkyl, C₂-C₇ haloalkenyl, C₂-C₇ alkoxyalkyl, C₁-C₇ alkoxy or C₁-C₇ haloalkoxy;

R⁸ is H, C₁-C₇ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₇ cycloalkyl, C₃-C₇ alkenylalkyl, C₃-C₇ alkynylalkyl, C₂-C₄ cyanoalkyl, C₁-C₇ haloalkyl, C₂-C₇ haloalkenyl, C₂-C₇ alkoxyalkyl, C₁-C₇ alkoxy or C₁-C₇ haloalkoxy;

G is OR¹⁰, SR¹⁰, SOR¹⁰ or SO₂R¹⁰;

R¹⁰ is alkynylalkyl, C₄-C₁₀ alkylalkenylalkyl, C₄-C₁₀ alkylalkynylalkyl, C₄-C₇ alkylcycloalkyl, C₄-C₇ cycloalkylalkyl, C₄-C₇ halocycloalkylalkyl, C₄-C₇ alkylcycloalkylalkyl, C₁-C₇ haloalkoxy, C₂-C₇ alkoxyalkyl, C₂-C₄ cyanoalkyl, C₁-C₇ haloalkyl, C₂-C₇ haloalkenyl, C₃-C₇ alkylthioalkyl, C₂-C₇ alkoxyalkyl, C₂-C₄ cyanoalkyl or C₄-C₇ alkylcycloalkyl;

R¹¹ is H or C₁-C₇ alkyl;

R¹² is H or C₁-C₇ alkyl;

R¹³ and R¹⁴ are independently H, C₁-C₇ haloalkyl or C₁-C₇ alkyl; and

R^f is C₁-C₃ haloalkyl.

Embodiment P12. The compound of Embodiment P11 wherein

R¹ is H, C₁-C₃ alkyl, halogen or C₃-C₄ cycloalkyl;

R² is H, Me, F, Cl or CN;

R³ is H, Me, F, Cl, -CN, OMe or CF₃;

R⁴ is H, SO₂CF₃, SO₂CH₃, CO₂Me, COMe, CH₂OCO-*t*-Bu, CH₂OCO-*n*-Bu, CH₂OCO-*c*-hexyl, CH₂OCO-*c*-pentyl, CH₂OCOCH₂CH₃, COMe, CH₂OCOPh, CH₂OCO-*i*-Bu, CH₂OCOME, CH₂OCO-*sec*-Bu, CH₂OCO-*n*-Pr and CH₂OCO-*i*-Pr or (C=O)SMe;

R⁵ is H, C₄-C₇ cycloalkylalkyl or C₂-C₇ alkoxyalkyl;

R⁶ is H, C₁-C₇ alkyl or C₁-C₇ alkoxy;

R⁷ is H, C₁-C₇ alkyl, C₃-C₇ cycloalkyl, C₁-C₇ haloalkyl, C₂-C₇ alkoxyalkyl, C₁-C₇ alkoxy or C₁-C₇ haloalkoxy;

R⁸ is H, C₁-C₇ alkyl or C₁-C₇ alkoxy;

G is OR¹⁰ or SR¹⁰;

R¹⁰ is C₃-C₇ cycloalkyl, C₃-C₇ halocycloalkyl, C₃-C₁₀ alkenylalkyl, C₃-C₁₀ alkynylalkyl, C₄-C₁₀ alkylalkenylalkyl, C₄-C₁₀ alkylalkynylalkyl, C₄-C₇ alkylcycloalkyl, C₄-C₇ cycloalkylalkyl, C₄-C₇ halocycloalkylalkyl, C₅-C₇ alkylcycloalkylalkyl, C₂-C₇ alkoxyalkyl, C₂-C₄ cyanoalkyl, C₃-C₇ alkylthioalkyl or C₄-C₇ alkylcycloalkyl.

Embodiment P13. The compound of Embodiment P12 wherein

R¹ is H, Me, halogen or cyclopropyl;

R² is H or F;

- R^3 is Me or F;
 R^4 is H, $\text{CH}_2\text{OCOR}^{14}$ or $-\text{S}(\text{O})_2\text{R}^{14}$;
 R^5 is H;
 R^6 is H, Me or OMe;
5 R^7 is H, Me or OMe;
 R^8 is H, Me or OMe;
G is OR^{10} ;
 R^{10} is $\text{C}_3\text{--C}_7$ cycloalkyl, $\text{C}_3\text{--C}_{10}$ alkenylalkyl, $\text{C}_3\text{--C}_{10}$ alkynylalkyl, $\text{C}_4\text{--C}_7$ cycloalkylalkyl, $\text{C}_2\text{--C}_7$ alkoxyalkyl or $\text{C}_4\text{--C}_7$ alkylcycloalkyl.
- 10 Embodiment P14. The compound of Embodiment P13 wherein
 R^1 is H, Me, F, Cl, Br or cyclopropyl;
 R^4 is H, $\text{CH}_2\text{OCO-}t\text{-Bu}$ or SO_2CF_3 ;
 R^8 is H; and
 R^{10} is $\text{C}_3\text{--C}_7$ cycloalkyl, $\text{C}_3\text{--C}_{10}$ alkenylalkyl or $\text{C}_3\text{--C}_{10}$ alkynylalkyl.
- 15 Embodiment P15. The compound of Embodiment P14 wherein
 R^1 is Me;
 R^3 is Me;
 R^4 is H;
 R^6 is H;
20 R^7 is H; and
 R^{10} is cyclopropyl, cyclobutyl, cyclopentyl, allyl or propargyl.

Specific embodiments include compounds of Formula 1 selected from the group consisting of:

N -[5-[3-(cyclopentyloxy)-2-oxo-1-pyrrolidinyl]-2,4-dimethylphenyl]-1,1,1-trifluoromethanesulfonamide (Compound 6); [[5-[3-(cyclopentyloxy)-2-oxo-1-pyrrolidinyl]-2,4-dimethylphenyl][(trifluoromethyl)sulfonyl]amino]methyl 2,2-dimethylpropanoate (Compound 5)
N -[2,4-dimethyl-5-[2-oxo-3-(2-propyn-1-yloxy)-1-pyrrolidinyl]phenyl]-1,1,1-trifluoromethanesulfonamide (Compound 1); N -[5-[3-(cyclopropyloxy)-2-oxo-1-pyrrolidinyl]-2,4-dimethylphenyl]-1,1,1-trifluoromethanesulfonamide (Compound 3); [[5-[3-(cyclopropyloxy)-2-oxo-1-pyrrolidinyl]-2,4-dimethylphenyl][(trifluoromethyl)sulfonyl]amino]methyl 2,2-dimethylpropanoate (Compound 7);

[[5-[3-(cyclobutyloxy)-2-oxo-1-pyrrolidinyl]-2,4-dimethylphenyl][(trifluoromethyl)sulfonyl]amino]methyl 2,2-dimethylpropanoate (Compound 8);
<i>N</i> -[2,4-dimethyl-5-[2-oxo-3-(2-propen-1-yloxy)-1-pyrrolidinyl]phenyl]-1,1,1-trifluoromethanesulfonamide (Compound 2); and <i>N</i> -[5-[3-(cyclobutyloxy)-2-oxo-1-pyrrolidinyl]-2,4-dimethylphenyl]-1,1,1-trifluoromethanesulfonamide (Compound 4).
<i>N</i> -[5-[3-(ethoxyimino)-2-oxo-1-pyrrolidinyl]-2,4-dimethylphenyl]-1,1,1-trifluoromethanesulfonamide (Compound 12)
<i>N</i> -[2,4-dimethyl-5-[2-oxo-3-[(2-propyn-1-yloxy)imino]-1-pyrrolidinyl]phenyl]-1,1,1-trifluoromethanesulfonamide (Compound 13)
1,1,1-trifluoro- <i>N</i> -[5-[3-(methoxyimino)-2-oxo-1-pyrrolidinyl]-2,4-dimethylphenyl]methanesulfonamide (Compound 9)

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

Also noteworthy as embodiments are herbicidal compositions of the present invention comprising the compounds of embodiments described above.

This invention also includes a herbicidal mixture comprising (a) a compound selected from Formula 1, *N*-oxides, and salts thereof, and (b) at least one additional active ingredient selected from (b1) photosystem II inhibitors, (b2) acetohydroxy acid synthase (AHAS) inhibitors, (b3) acetyl-CoA carboxylase (ACCase) inhibitors, (b4) auxin mimics, (b5) 5-enol-pyruvylshikimate-3-phosphate (EPSP) synthase inhibitors, (b6) photosystem I electron diverters, (b7) protoporphyrinogen oxidase (PPO) inhibitors, (b8) glutamine synthetase (GS) inhibitors, (b9) very long chain fatty acid (VLCFA) elongase inhibitors, (b10) auxin transport inhibitors, (b11) phytoene desaturase (PDS) inhibitors, (b12) 4-hydroxyphenyl-pyruvate dioxygenase (HPPD) inhibitors, (b13) homogentisate solanesyltransferase (HST) inhibitors, (b14) cellulose biosynthesis inhibitors, (b15) other herbicides including mitotic disruptors organic arsenicals, asulam, bromobutide, cinmethylin, cumyluron, dazomet, difenzoquat, dymron, etobenzanid, flurenol, fosamine, fosamine-ammonium, hydantocidin, metam, methyl dymron, oleic acid, oxaziclomefone, pelargonic acid and pyributicarb, (b16) herbicide safeners, and salts of compounds of (b1) through (b16).

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

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

fluorophenyl]-1,1-difluoro-*N*-methylmethanesulfonamide), triasulfuron, tribenuron-methyl, trifloxysulfuron (including sodium salt), triflusulfuron-methyl and tritosulfuron.

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

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

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

“Photosystem I electron diverters” (b6) are chemical compounds that accept electrons from Photosystem I, and after several cycles, generate hydroxyl radicals. These radicals are extremely reactive and readily destroy unsaturated lipids, including membrane fatty acids and chlorophyll. This destroys cell membrane integrity, so that cells and organelles “leak”, leading to rapid leaf wilting and desiccation, and eventually to plant death. Examples of this second type of photosynthesis inhibitor include diquat and paraquat.

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

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

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

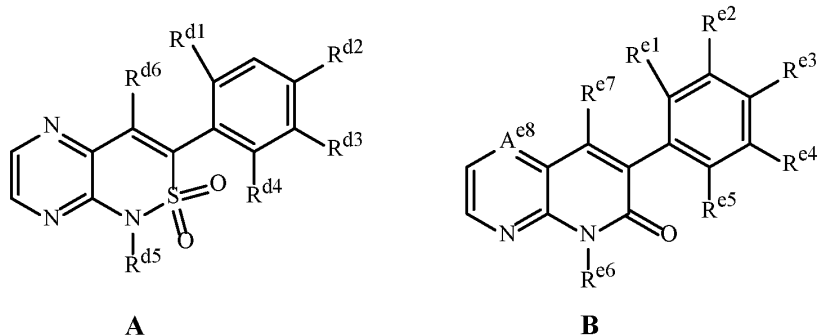
“Auxin transport inhibitors” (b10) are chemical substances that inhibit auxin transport in plants, such as by binding with an auxin-carrier protein. Examples of auxin transport inhibitors include diflufenzopyr, naptalam (also known as *N*-(1-naphthyl)phthalamic acid and 2-[(1-naphthalenylamino)carbonyl]benzoic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

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

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

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

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



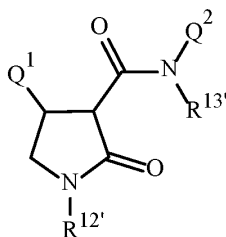
wherein R^{d1} is H, Cl or CF_3 ; R^{d2} is H, Cl or Br; R^{d3} is H or Cl; R^{d4} is H, Cl or CF_3 ; R^{d5} is CH_3 , CH_2CH_3 or CH_2CHF_2 ; and R^{d6} is OH or $-OC(=O)-i\text{-Pr}$; and R^{e1} is H, F, Cl, CH_3 or CH_2CH_3 ; R^{e2} is H or CF_3 ; R^{e3} is H, CH_3 or CH_2CH_3 ; R^{e4} is H, F or Br; R^{e5} is Cl, CH_3 , CF_3 , OCF_3 or CH_2CH_3 ; R^{e6} is H, CH_3 , CH_2CHF_2 or $C\equiv CH$; R^{e7} is OH, $-OC(=O)Et$, $-OC(=O)-i\text{-Pr}$ or $-OC(=O)-t\text{-Bu}$; and A^{e8} is N or CH.

“Cellulose biosynthesis inhibitors” (b14) inhibit the biosynthesis of cellulose in certain plants. They are most effective when applied preemergence or early postemergence on young

or rapidly growing plants. Examples of cellulose biosynthesis inhibitors include chlorthiamid, dichlobenil, flupoxam, indaziflam (*N*²-[(1*R*,2*S*)-2,3-dihydro-2,6-dimethyl-1*H*-inden-1-yl]-6-(1-fluoroethyl)-1,3,5-triazine-2,4-diamine), isoxaben and triaziflam.

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

“Other herbicides” (b15) also include a compound of Formula (b15A)



(b15A)

wherein

$R^{12'}$ is H, C_1-C_6 alkyl, C_1-C_6 haloalkyl or C_4-C_8 cycloalkyl;

$R^{13'}$ is H, C_1-C_6 alkyl or C_1-C_6 alkoxy;

Q^1 is an optionally substituted ring system selected from the group consisting of phenyl, thienyl, pyridinyl, benzodioxolyl, naphthalenyl, benzofuranyl, furanyl, benzothiophenyl and pyrazolyl, wherein when substituted said ring system is substituted with 1 to 3 $R^{14'}$;

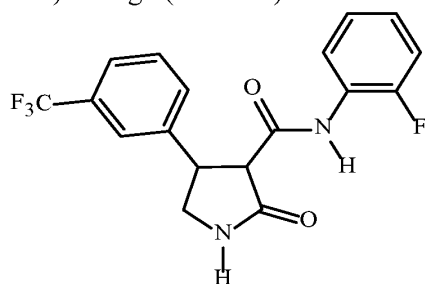
Q^2 is and optionally substituted ring system selected from the group consisting of phenyl, pyridinyl, benzodioxolyl, pyridinonyl, thiadiazolyl, thiazolyl, and oxazolyl, wherein when substituted said ring system is substituted with 1 to 3 $R^{15'}$;

each $R^{14'}$ is independently halogen, C_1-C_6 alkyl, C_1-C_6 haloalkyl, C_1-C_6 alkoxy, C_1-C_6 haloalkoxy, C_3-C_8 cyaloalkyl, cyano, C_1-C_6 alkylthio, C_1-C_6

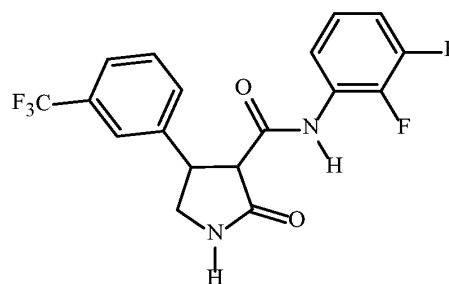
alkylsulfinyl, C₁–C₆ alkylsulfonyl, SF₅, NHR¹⁷; or phenyl optionally substituted by 1 to 3 R¹⁶; or pyrazolyl optionally substituted by 1 to 3 R¹⁶;
 each R^{15'} is independently halogen, C₁–C₆ alkyl, C₁–C₆ haloalkyl, C₁–C₆ alkoxy, C₁–C₆ haloalkoxy, cyano, nitro, C₁–C₆ alkylthio, C₁–C₆ alkylsulfinyl, C₁–C₆ alkylsulfonyl;
 each R^{16'} is independently halogen, C₁–C₆ alkyl or C₁–C₆ haloalkyl; and
 R^{17'} is C₁–C₄ alkoxycarbonyl.

In one Embodiment wherein “other herbicides” (b15) also include a compound of Formula (b15A), it is preferred that R^{12'} is H or C₁–C₆ alkyl; more preferably R^{12'} is H or methyl. Preferably R^{13'} is H. Preferably Q¹ is either a phenyl ring or a pyridinyl ring, each ring substituted by 1 to 3 R^{14'}; more preferably Q¹ is a phenyl ring substituted by 1 to 2 R^{14'}. Preferably Q² is a phenyl ring substituted with 1 to 3 R^{15'}; more preferably Q² is a phenyl ring substituted by 1 to 2 R^{15'}. Preferably each R^{14'} is independently halogen, C₁–C₄ alkyl, C₁–C₃ haloalkyl, C₁–C₃ alkoxy or C₁–C₃ haloalkoxy; more preferably each R^{14'} is independently chloro, fluoro, bromo, C₁–C₂ haloalkyl, C₁–C₂ haloalkoxy or C₁–C₂ alkoxy. Preferably each R^{15'} is independently halogen, C₁–C₄ alkyl, C₁–C₃ haloalkoxy; more preferably each R^{15'} is independently chloro, fluoro, bromo, C₁–C₂ haloalkyl, C₁–C₂ haloalkoxy or C₁–C₂ alkoxy.

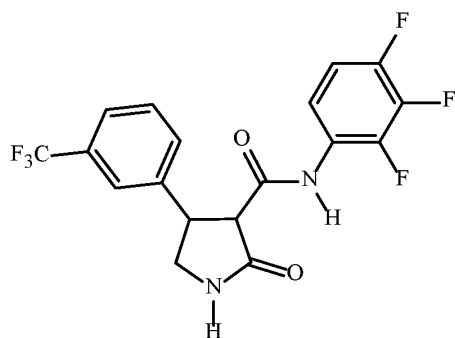
Specifically preferred as “other herbicides” (b15) include any one of the following (b15A-1) through (b15A-15):



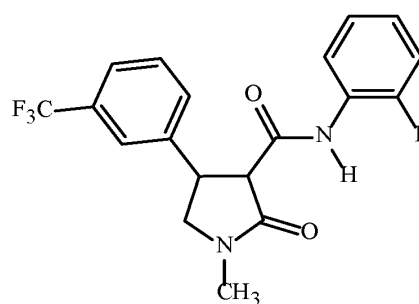
(b15A-1)



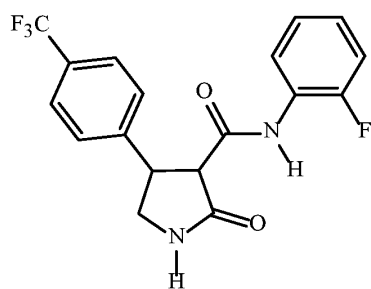
(b15A-2)



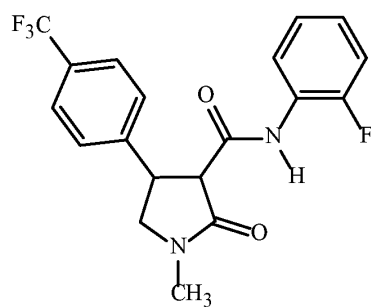
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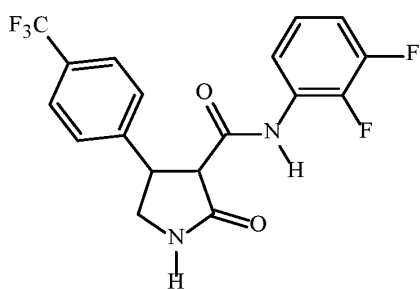
(b15A-4)



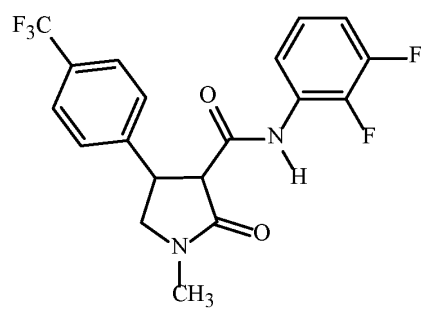
(b15A-5)



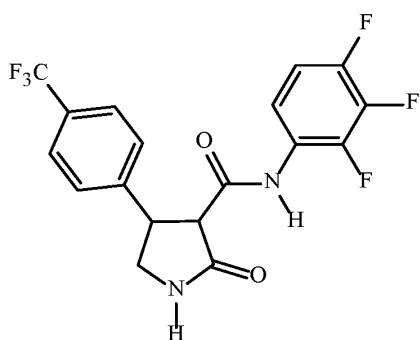
(b15A-6)



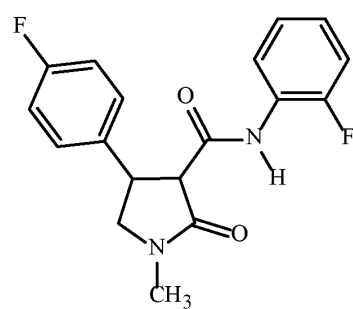
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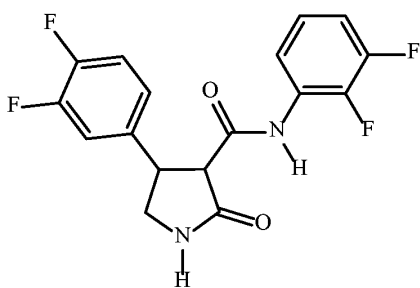
(b15A-8)



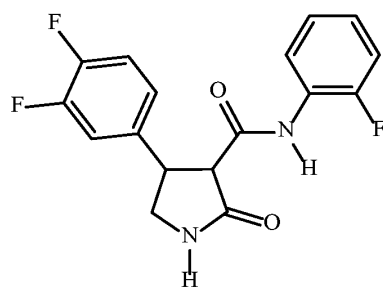
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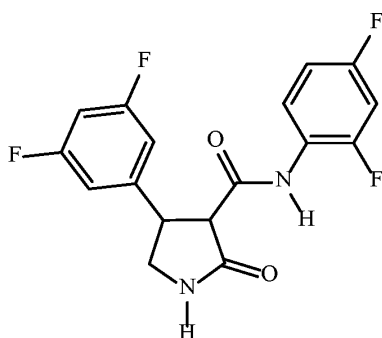
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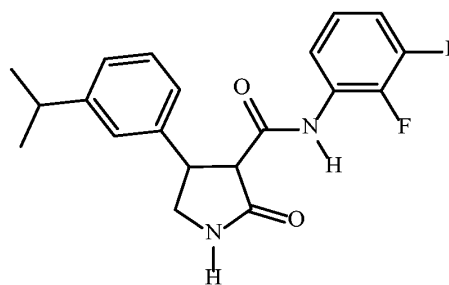
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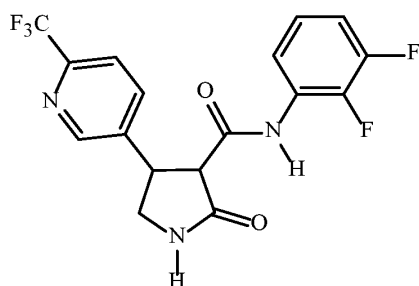
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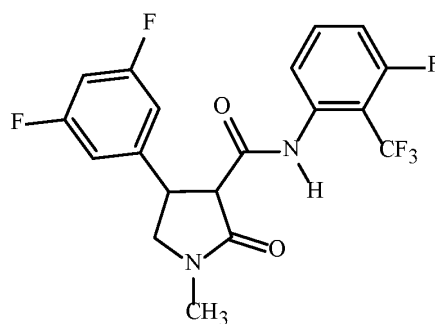
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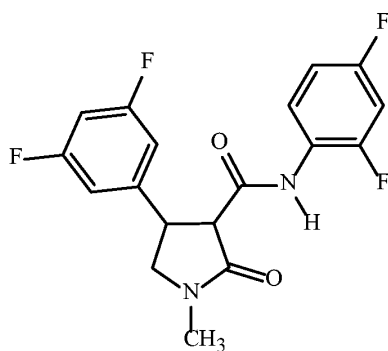
(b15A-14)



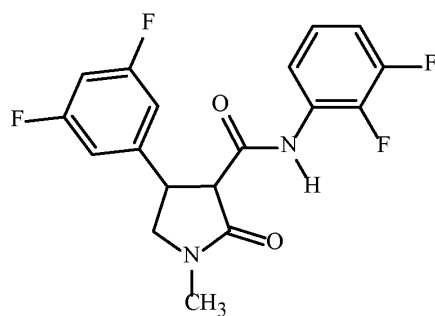
(b15A-15)



(b15A-16)

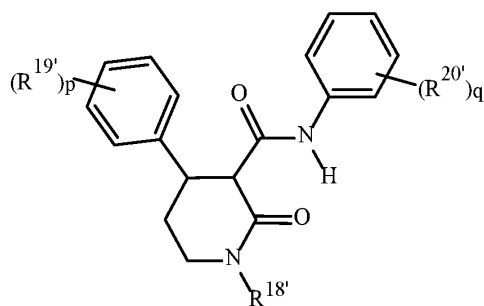


(b15A-17)



(b15A-18)

“Other herbicides” (b15) also include a compound of Formula (b15B)



(b15B)

wherein

$R^{18'}$ is H, C_1-C_6 alkyl, C_1-C_6 haloalkyl or C_4-C_8 cycloalkyl;

each $R^{19'}$ is independently halogen, C_1-C_6 haloalkyl or C_1-C_6 haloalkoxy;

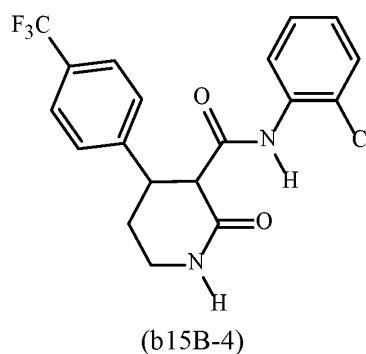
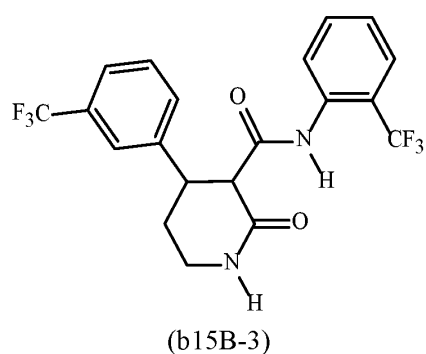
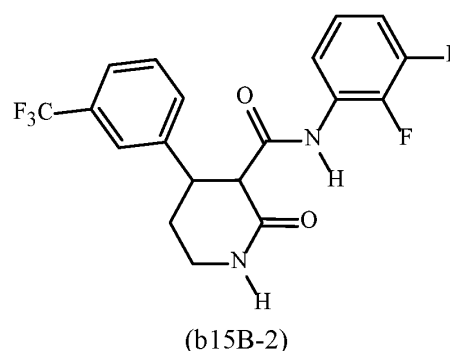
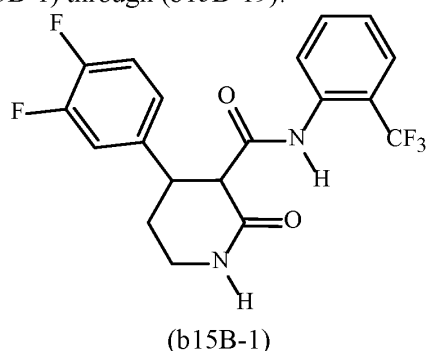
p is an integer of 0, 1, 2 or 3;

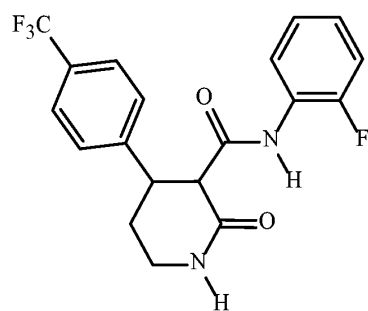
5 each $R^{20'}$ is independently halogen, C_1-C_6 haloalkyl or C_1-C_6 haloalkoxy; and

q is an integer of 0, 1, 2 or 3.

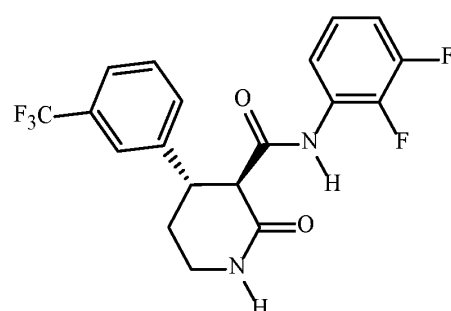
In one Embodiment wherein “other herbicides” (b15) also include a compound of Formula (b15B), it is preferred that R^{18} is H, methyl, ethyl or propyl; more preferably R^{18} is H or methyl; most preferably R^{18} is H. Preferrably each R^{19} is independently chloro, fluoro,
 10 C_1-C_3 haloalkyl or C_1-C_3 haloalkoxy; more preferably each R^{19} is independently chloro, fluoro, C_1 fluoroalkyl (i.e. fluoromethyl, difluoromethyl or trifluoromethyl) or C_1 fluoroalkoxy (i.e. trifluoromethoxy, difluoromethoxy or fluoromethoxy). Preferably each R^{20} is independently chloro, fluoro, C_1 haloalkyl or C_1 haloalkoxy; more preferably each R^{20} is independently chloro, fluoro, C_1 fluoroalkyl (i.e. fluoromethyl, difluoromethyl or trifluoromethyl) or C_1 fluoroalkoxy (i.e. trifluoromethoxy, difluoromethoxy or fluoromethoxy).
 15

Specifically preferred as “other herbicides” (b15) include any one of the following (b15B-1) through (b15B-19):

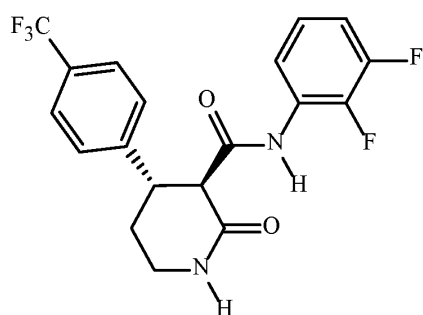




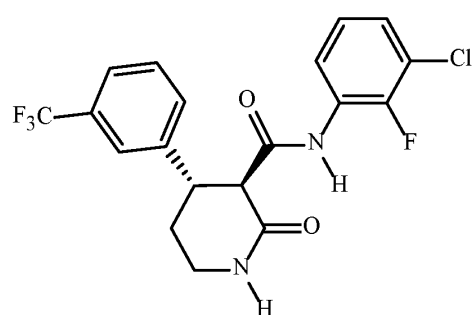
(b15B-5)



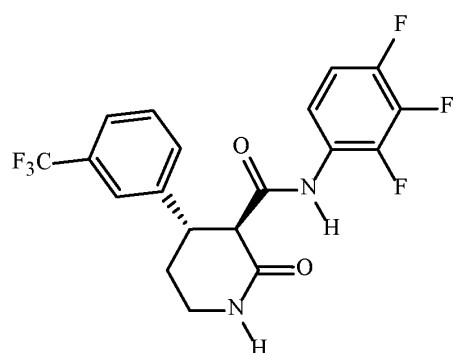
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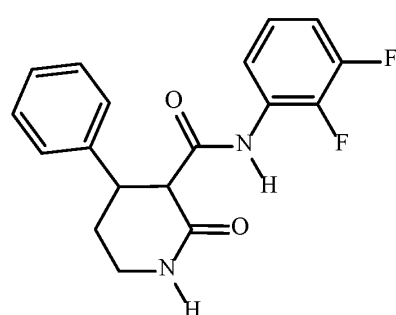
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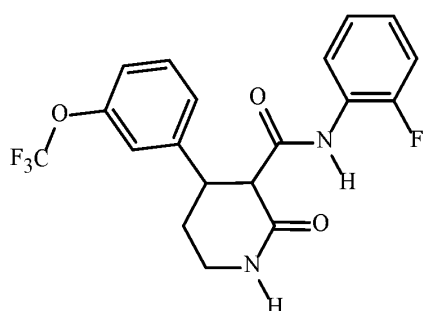
(b15B-8)



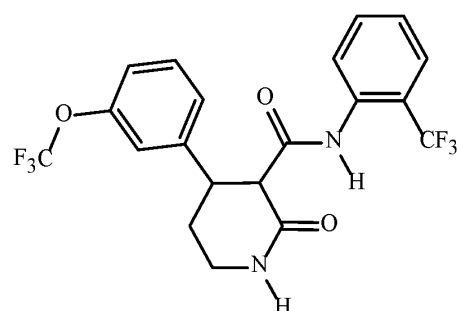
(b15B-9)



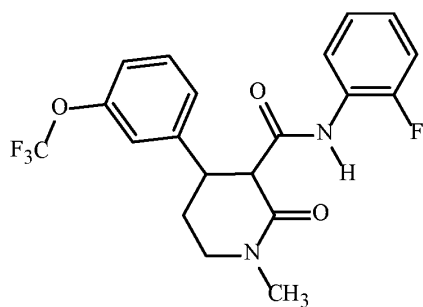
(b15B-10)



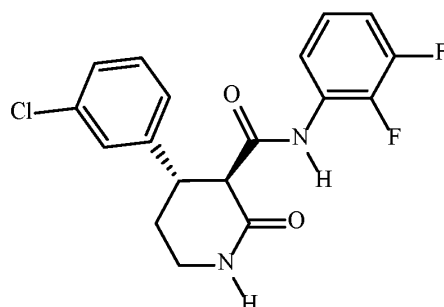
(b15B-11)



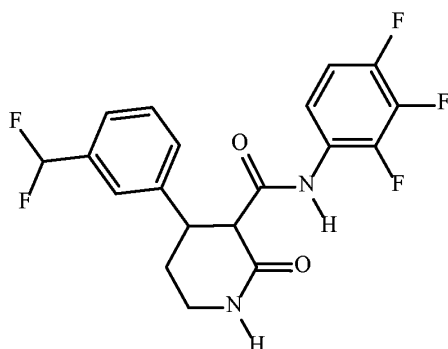
(b15B-12)



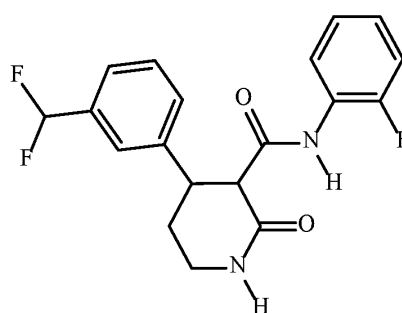
(b15B-13)



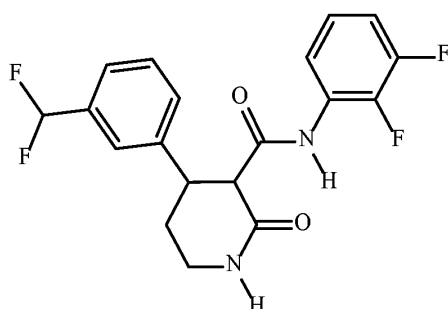
(b15B-14)



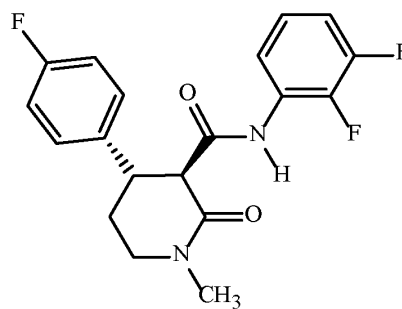
(b15B-15)



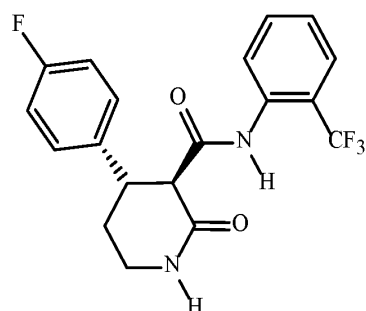
(b15B-16)



(b15B-17)

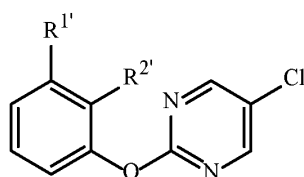


(b15B-18)



(b15B-19).

Another Embodiment wherein “other herbicides” (b15) also include a compound of Formula (b15C),



(b15C)

wherein R^{1'} is Cl, Br or CN; and R^{2'} is C(=O)CH₂CH₂CF₃, CH₂CH₂CH₂CH₂CF₃ or 3-CHF₂-isoxazol-5-yl.

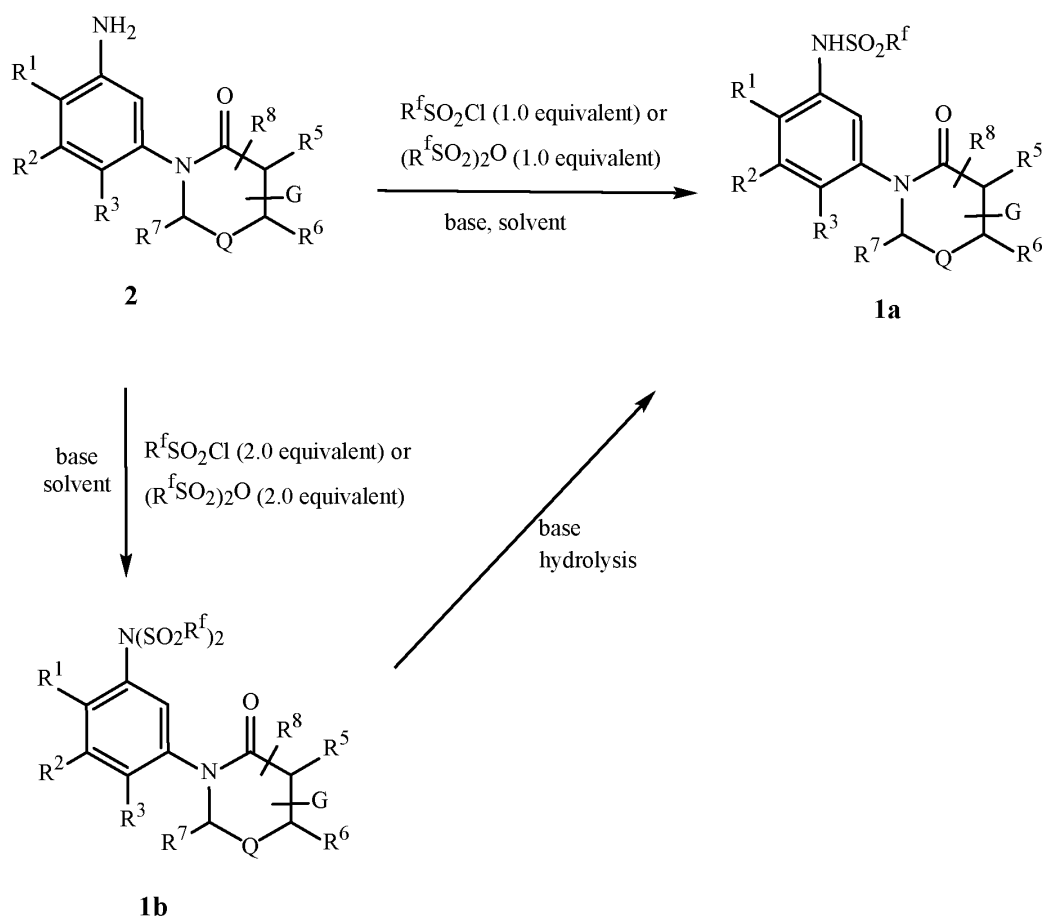
“Herbicide safeners” (b16) are substances added to a herbicide formulation to eliminate or reduce phytotoxic effects of the herbicide to certain crops. These compounds protect crops from injury by herbicides but typically do not prevent the herbicide from controlling undesired vegetation. Examples of herbicide safeners include but are not limited to benoxacor, cloquintocet-mexyl, cumyluron, cyometrinil, cyprosulfamide, daimuron, dichlormid, dicyclonon, dietholate, dimepiperate, fenchlorazole-ethyl, fenclorim, flurazole, fluxofenim, furilazole, isoxadifen-ethyl, mefenpyr-diethyl, mephenate, methoxyphenone, naphthalic anhydride, oxabetrinil, *N*-(aminocarbonyl)-2-methylbenzenesulfonamide and *N*-(aminocarbonyl)-2-fluorobenzenesulfonamide, 1-bromo-4-[(chloromethyl)sulfonyl]benzene, 2-(dichloromethyl)-2-methyl-1,3-dioxolane (MG 191), 4-(dichloroacetyl)-1-oxa-4-azospiro[4.5]decane (MON 4660), 2,2-dichloro-1-(2,2,5-trimethyl-3-oxazolidinyl)-ethanone and 2-methoxy-*N*-[[4-[(methylamino)carbonyl]amino]phenyl]sulfonyl]-benzamide.

One or more of the following methods and variations as described in Schemes 1–13 can be used to prepare the compounds of Formula 1. The definitions of G, Q, X, R¹-R¹⁰, and R^f in the compounds of Formulae 1–19 below are as defined above in the Summary of the Disclosure unless otherwise noted. Compounds of Formulae 1a, 1b, 1c, 1d, 3a, 4a, 4b, 4c, 5a and 5b are various subsets of the compounds of Formulae 1, 3, 4 and 5; and all substituents for Formulae 1a, 1b, 1c, 1d, 3a, 4a, 4b, 4c, 5a and 5b are as defined above for Formula 1 unless otherwise noted in the disclosure including the schemes.

As outlined in Scheme 1, compounds of Formula 1a (i.e a compound of Formula 1, wherein R⁴ is H) can be made by reaction of an appropriately substituted aniline of Formula 2 with 1 equivalent (or a slightly excess over 1 equivalent) of a haloalkylsulfonyl chloride of Formula R^fSO₂Cl or a corresponding haloalkylsulfonyl anhydride of Formula R^f(SO₂)₂O in the presence of a suitable base, in a compatible solvent including but not limited to tetrahydrofuran, acetonitrile, toluene, diethyl ether, dioxane, dichloromethane or *N,N*-dimethylformamide, at temperatures generally ranging from 0° C to ambient temperature. Some examples of the suitable base can be pyridine, triethylamine, Hunig’s base or potassium carbonate. Alternatively, bis-sulfonamides of Formula 1b (i.e a compound of Formula 1, wherein R⁴ is SO₂R^f and R^f is haloalkyl) are accessible by reacting an aniline of Formula 2

with 2 equivalents (or an excess over 2.0 equivalents) of a haloalkylsulfonyl chloride of Formula R^fSC_2Cl or a corresponding haloalkylsulfonyl anhydride of Formula $R^f(SO_2)_2O$ under similar reaction conditions described as above. Treating bis-sulfonamides of Formula **1b** with an excess of aqueous base followed by neutralization or acidification with acid readily provides the corresponding mono-sulfonamide of Formula **1a**. Preferred conditions for this hydrolysis are usually aqueous sodium or potassium hydroxide, optionally used with a cosolvent such as methanol, ethanol, dioxane or tetrahydrofuran, followed by neutralization or acidification with concentrated or aqueous hydrochloric acid.

Scheme 1



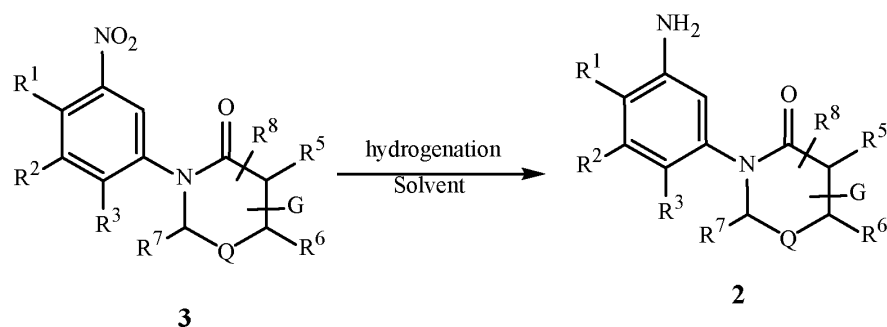
10

Substituted anilines of Formula **2** are readily accessed by hydrogenation of nitrobenzenes of Formula **3** under conditions that include but not limited to catalytic hydrogenation with 5-10% palladium metal on carbon or platinum oxide in solvents such as methanol, ethanol or ethyl acetate under an atmosphere of hydrogen. This reaction can generally be done in a Parr Hydrogenator. Alternatively, reduction of the nitro group can be accomplished with activated zinc metal in acetic acid, with stannous chloride in aqueous hydrochloric acid, iron metal in acetic acid or in aqueous alcohol or in an aqueous ethyl acetate

15

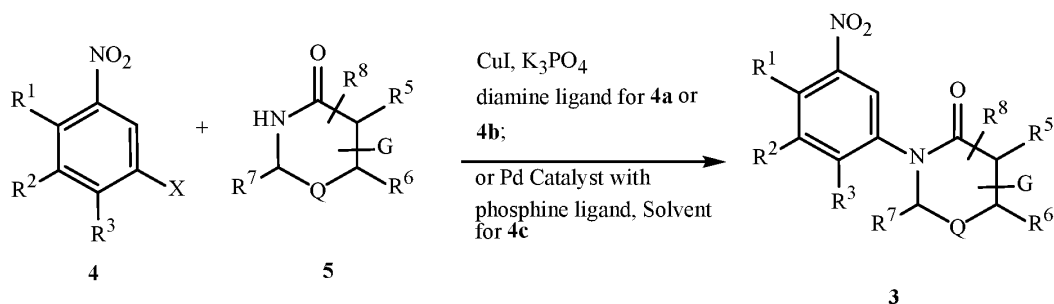
mixture with ammonium chloride (i.e. Fe with 3 equivalents of ammonium chloride in aqueous ethanol) or with sodium borohydride in methanol in the presence of $\text{NiAC}_2 \cdot 4\text{H}_2\text{O}$ (see *J. Am. Chem. Soc.*, 2005, 119).

Scheme 2



Intermediates of Formula **3** can be accessed by copper-mediated coupling of a meta-bromo or meta-iodo substituted nitrobenzene of Formula **4a** or **4b** (wherein X is bromine for **4a** and X is iodine for **4b**) with a cyclic amide of Formula **5** in the presence of copper (I) iodide with a diamine ligand, e.g. *trans*-*N,N'*-Dimethylcyclohexane-1,2-diamine or tetramethylethylenediamine (TMEDA), and potassium phosphate (K_3PO_4) in an appropriate solvent. The solvent can be, for example, *N,N*-dimethylformamide, acetonitrile, tetrahydrofuran or dioxane, optionally with water as a cosolvent. A similar copper-mediated coupling can also be carried out under Chan-Lam conditions where a boronic acid of Formula **4c** (i.e. a compound of Formula **4** wherein X is $\text{B}(\text{OH})_2$) is coupled with a compound of Formula **5** in the presence of copper II acetate ($\text{Cu}(\text{II})\text{AC}_2$) and pyridine in dichloromethane. Alternatively, this cross-coupling can also be carried out with a compound of Formula **4c** and a compound for Formula **5** under the well-documented Buchwald-Hartwig amination protocol involving palladium-mediation with a suitable phosphine ligand, either as part of the pre-catalyst or as an additive in an appropriate solvent such as tetrahydrofuran, toluene or dichloromethane. In some cases, an auxiliary base, i.e. sodium *tert*-butoxide or cesium carbonate, is used in the reaction. Examples of palladium catalysts suitable for this transformation include but are not limited to tetrakis(triphenylphosphine) palladium(0) [$\text{Pd}(\text{PPh}_3)_4$], bistrisphenylphosphine palladium chloride [$\text{PdCl}_2(\text{PPh}_3)_2$], palladium(II) chloride-tris(2-methylphenyl)phosphine [$\text{PdCl}_2[\text{P}(\text{o-Tol})_3]_2$] or [1,1'-bis(diphenylphosphino)ferrocene] dichloropalladium(II) [$\text{Pd}(\text{dppf})\text{Cl}_2$]. Finally, this cross-coupling can also be accomplished with palladium acetate [$\text{Pd}(\text{OAc})_2$] or tris(dibenzylideneacetone) dipalladium(0) [$\text{Pd}_2(\text{dba})_3$] optionally used in combination with a suitable phosphine ligand with a base such as sodium *tert*-butoxide in toluene or cesium carbonate in *N,N*-dimethylformamide.

Scheme 3



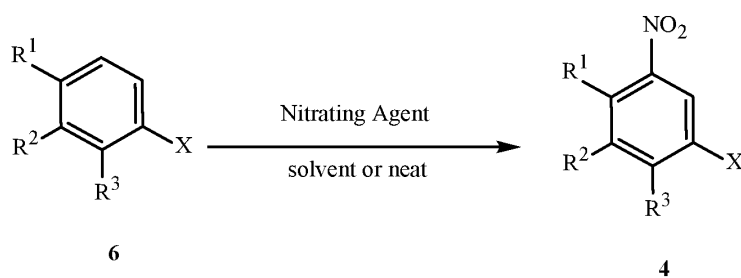
4a wherein X is Br;

4b wherein X is I; and

4c wherein X is $B(OH)_2$;

As illustrated in Scheme 4, nitrobenzenes of Formula **4** can be prepared by nitration of a substituted benzene of Formula **6** in a mixture of nitric acid and sulfuric acid at temperatures ranging from 0 °C to ambient temperature to afford nitrobenzenes of Formula **4**. Other sources of nitronium ion for this nitration include nitronium tetrafluoroborate, acetyl nitrate, guanidinium nitrate, used in an appropriate solvent such as tetramethylene sulfone. Substituted benzenes of Formula **6** are, in some cases, commercially available and in other cases readily prepared by established methods from the literature. It is recognized that nitration of some substituted benzenes of Formula **6** can give rise to regioisomeric mixture of nitrobenzenes that require separation by chromatography or fractional crystallization techniques.

Scheme 4

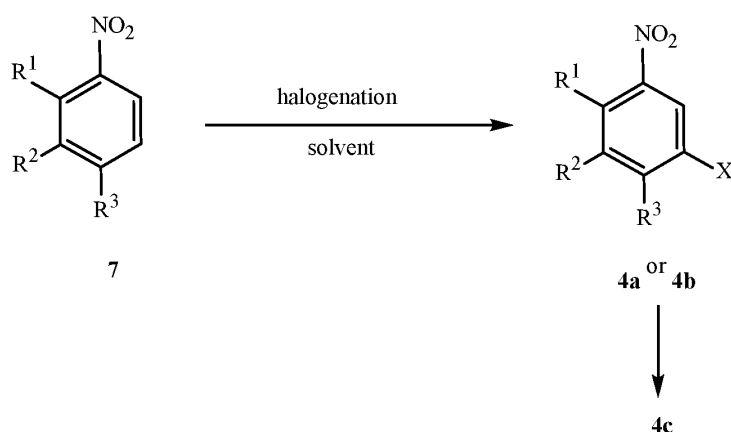


X is halogen

Alternatively, a nitrobenzene of Formula **4a** (i.e. a compound of Formula **4** wherein X is bromine) or a nitrobenzene of Formula **4b** (i.e. a compound of Formula **4** wherein X is iodine) can be prepared by halogenation of a substituted nitrobenzene of Formula **7** with an appropriate halogenating reagent, such as bromine, iodine, N-bromosuccinimide or N-iodosuccinimide, in an appropriate solvent, such as acetic acid, dichloromethane, carbon tetrachloride, chloroform, acetonitrile or *N,N*-dimethylformamide by established methods as shown in Scheme 5. Iodobenzenes of Formula **4b** can also be made from benzenes of Formula **7** by treating with 2,2,6,6-tetramethylpiperidylzincchloride-LiCl (TMPZnCl·LiCl) in

tetrahydrofuran or dioxane, followed by the addition of iodine and a mixture of nitric acid and sulfuric acid at temperatures ranging from 0° C to ambient temperature. Bromo and iodo benzenes of Formulae **4a** and **4b** can be lithiated with an alkyl lithium reagent, preferably n-butyl lithium, in tetrahydrofuran or dioxane typically at temperatures generally ranging from -78°C to 0 °C, followed by addition of trimethyl boroxine and subsequent acidic hydrolysis to afford the corresponding aryl boronic acids of Formula **4c** (i.e. a compound of Formula **4** wherein X is B(OH)₂). Conversion of aryl halides to aryl boronic acids is a well-established synthetic transformation in the organic chemistry literature.

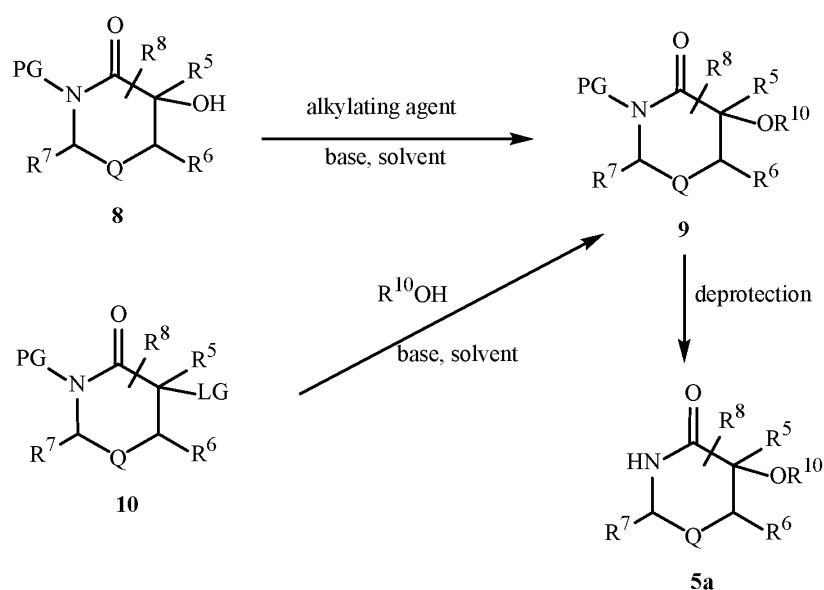
Scheme 5



10

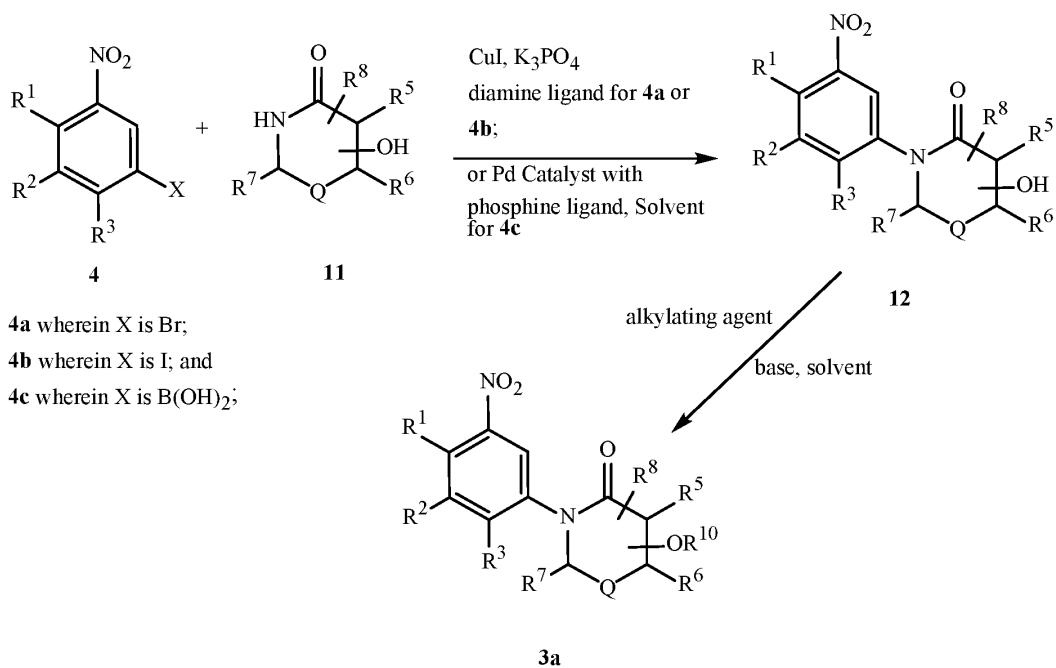
As shown in Scheme 6, a cyclic amide of Formula **5a** can be made from hydroxy-substituted N-protected cyclic amides of Formula **8**, where PG represents a protecting group such as a Cbz (benzyloxycarbonyl) or BOC (tert-butyloxycarbonyl) group. Alkylating the compound of Formula **8** with an appropriate alkylating agent, in the presence of a base, such as sodium hydride, potassium tert-butoxide or sodium methoxide, in a solvent like tetrahydrofuran or dioxane at temperatures generally ranging from 0 °C to reflux temperature of the solvent affords a compound of Formula **9**. The N-protecting group CBZ can then be removed by catalytic hydrogenation (generally under hydrogen in the presence of palladium-on-carbon in methanol or ethanol) to give a compound of Formula **5a**. The N-protecting group BOC can be removed by trifluoroacetic acid to provide a compound of Formula **5a**. Intermediate cyclic amides of Formula **9** can also be made from cyclic amides of Formula **10** where LG represents an appropriate leaving group such as a halogen (i.e. chlorine, bromine or iodine) or mesylate. Reacting a compound of Formula **10** with a nucleophile of Formula R¹⁰OH, in the presence of a base such as sodium hydride, potassium tert-butoxide or sodium methoxide, in a solvent such as tetrahydrofuran or dioxane at temperatures generally ranging from 0°C to reflux temperature of the solvent afford a compound of Formula **9**.

Scheme 6

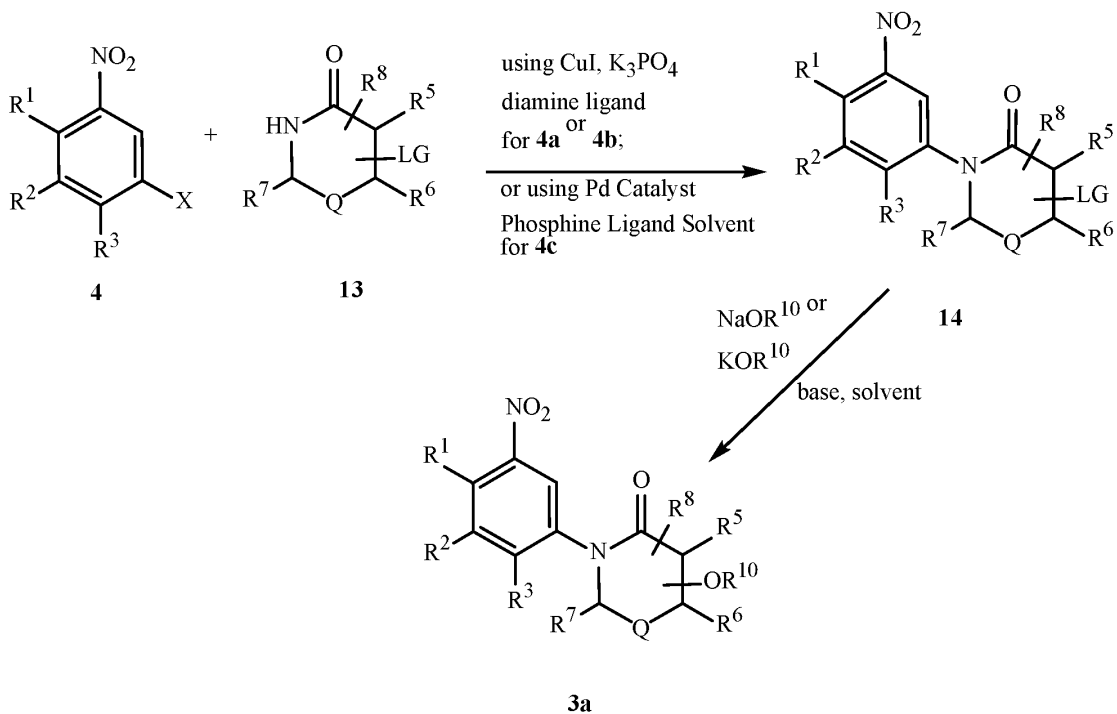


A compound of Formula **3a** (i.e. a compound of Formula **3**, wherein G is OR¹⁰) can also be accessed by the synthetic route outlined in Scheme 7. Cross-coupling of a meta-bromo or meta-iodo substituted nitrobenzene of Formula **4a** or **4b** (i.e. a compound of Formula **4**, wherein X is bromine or iodine) with a hydroxy-substituted cyclic amide of Formula **11** by the same methods described for the cross-coupling in Scheme 3, affords a compound of Formula **12** with a free hydroxy group. Alkylation of **12** with an appropriate alkylating agent in the presence of a base such as sodium hydride, potassium tert-butoxide or sodium methoxide in a solvent such as tetrahydrofuran or dioxane at temperatures generally ranging from 0 °C to reflux temperature of the solvent, gives a compound of Formula **3a**. Alternatively, a compound of Formula **3a** can be made in some cases by the method outlined in Scheme 8. Cross-coupling of an unprotected cyclic amide of Formula **13** with a substituted nitrobenzene of Formula **4** under the same cross-coupling conditions as described in Scheme 3, can give a compound of Formula **14**. The unprotected cyclic amide of Formula **13** contains both a suitable leaving group LG, wherein LG is bromine, chlorine or iodine, and a free amide NH group. Displacement of the leaving group LG on **14** with a sodium or potassium alkoxide (NaOR¹⁰ or KOR¹⁰) in a suitable solvent such as tetrahydrofuran, dioxane, methanol, ethanol, dimethylsulfoxide or *N,N*-dimethylformamide provides a compound of Formula **3a**.

Scheme 7

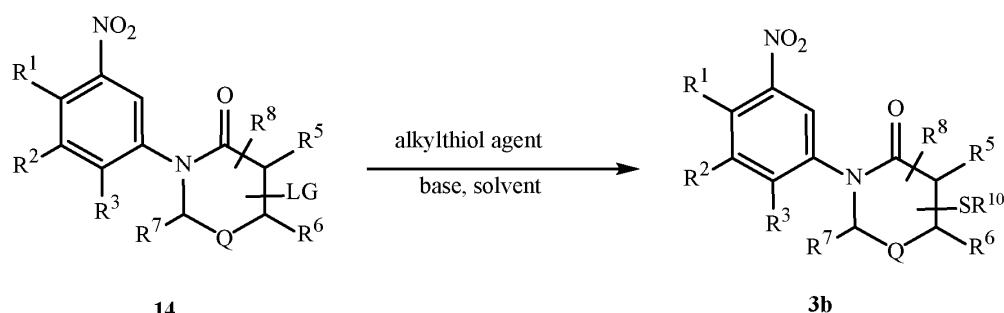


Scheme 8



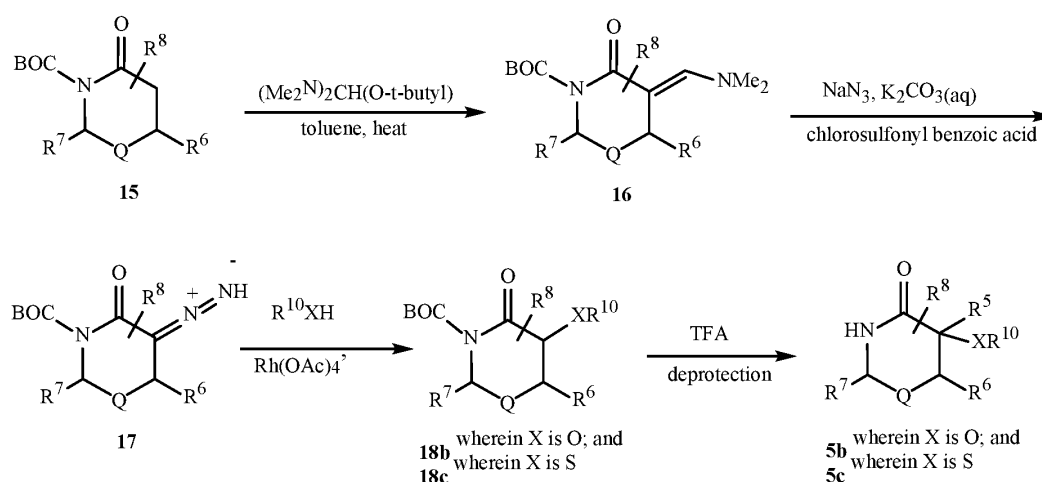
Alternatively, a compound of Formula **3b** (i.e. a compound of Formula **3**, wherein G is SR¹⁰) can be made as outlined in Scheme 9. Displacement of the leaving group LG on a compound of Formula **14** with a sodium or potassium thiol reagent (NaSR¹⁰ or KSR¹⁰) in a suitable solvent such as tetrahydrofuran, dioxane, acetonitrile or *N,N*-dimethylformamide at temperatures ranging 0° C to the reflux temperature of the solvent can afford a compound of Formula **3b**. Oxidation of the sulfur with an appropriate oxidizing agent such as meta-chloroperoxybenzoic (MCPBA), sodium periodate or Oxone can provide the corresponding sulfoxide (SOR¹⁰) and sulfone (SO₂R¹⁰).

Scheme 9



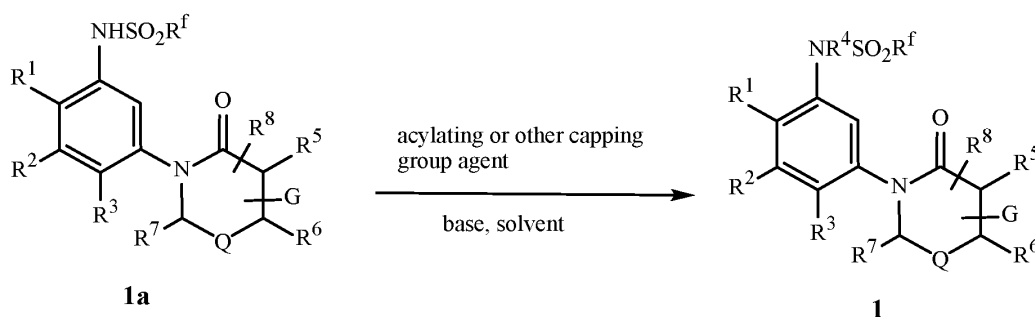
A method for making a compound of Formula **5b** (i.e. a compound of Formula **5** wherein X is O) or a compound of Formula **5c** (i.e. a compound of Formula **5** wherein X is S) is outlined in Scheme 10. Based on a known method (see *Eur. J. Org. Chem.* 2020, 3013–3018), heating a BOC (tert-butyloxycarbonyl)-protected cyclic amide of Formula **15** with *t*-butoxy bis-(dimethylamino)methane in toluene or xylene at the reflux temperature gives the corresponding enamine adduct **16**. A compound of **16** can be reacted with sodium azide in the presence of chlorosulfonyl benzoic acid and potassium carbonate, in aqueous acetonitrile, to generate the diazo compound **17**. A compound of Formula **17** can undergo a rhodium-catalyzed carbenoid insertion into an alcohol (R¹⁰OH) O-H bond or thiol (R¹⁰SH) S-H bond to generate an OR¹⁰ or SR¹⁰ substituted BOC-protected cyclic amide of Formula **18b** wherein X is O or Formula **18c** wherein X is S. Removal of the BOC-protecting group under acidic conditions, generally in trifluoroacetic acid, gives the free cyclic amide of Formula **5b** wherein X is O or Formula **5c** wherein X is S. This is a particularly useful method for introducing OR¹⁰ and SR¹⁰ groups where the R¹⁰ moiety may be a branched-chain, cyclic or bulky substituent.

Scheme 10



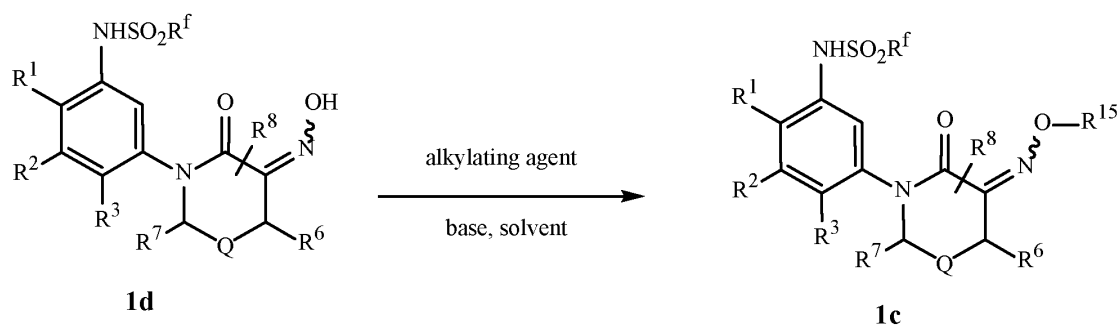
Compounds of Formula **1** where R^4 is $\text{C}(=\text{O})\text{R}^{14}$, $\text{C}(=\text{S})\text{R}^{14}$, CO_2R^{14} , $\text{C}(=\text{O})\text{SR}^{14}$, $\text{S}(\text{O})_2\text{R}^{14}$, $\text{CONR}^{13}\text{R}^{14}$, $\text{S}(\text{O})_2\text{NR}^{13}\text{R}^{14}$, $\text{CH}_2\text{OC}(=\text{O})\text{NR}^{13}\text{R}^{14}$, $\text{CH}_2\text{OC}(=\text{O})\text{OR}^{14}$ or $\text{CH}_2\text{O}(\text{C}=\text{O})\text{R}^{14}$ can be made by reaction of a sulfonanilide of Formula **1** where R^4 is hydrogen with an appropriately substituted acyl halide, thioacyl halide, carbamoyl halide, sulfonyl halide, sulfamoyl halide, acyloxymethyl halide (i.e. $\text{ClCH}_2\text{O}(\text{C}=\text{O})\text{R}^{14}$) or a similar halide, or other capping agents in the presence of a base such as triethylamine, pyridine, diisopropylethyl amine (Hunig's Base) or potassium carbonate in a solvent including but not limited to tetrahydrofuran, dioxane, dichloromethane, acetonitrile or *N,N*-dimethylformamide (Scheme 11).

Scheme 11



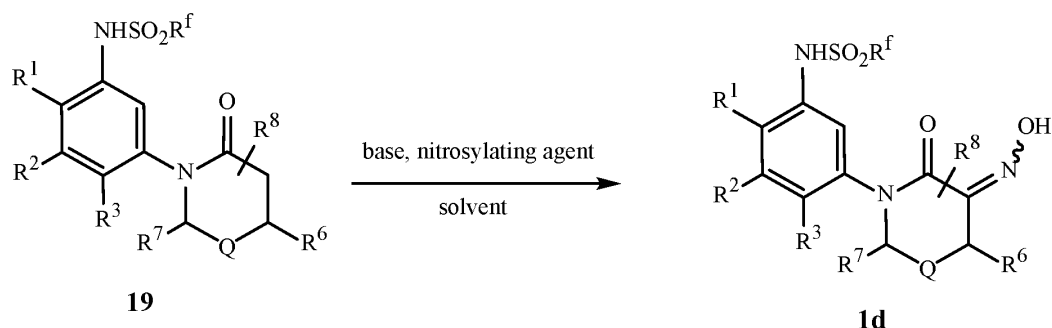
Compounds of Formula **1c** (i.e. a compound of Formula **1** where R^4 is H, and G and R^5 are taken together to form N-OR^{15} where R^{15} is not H) can be prepared by treatment of a compound of Formula **1d** (i.e. a compound of Formula **1** where R^4 is H, and G and R^5 are taken together to form N-OH) with an appropriate alkylating agent, in the presence of a base such as potassium tert-butoxide or sodium hydride, in a solvent like tetrahydrofuran at temperatures generally ranging from 0°C to the reflux temperature of the solvent.

Scheme 12



Compounds of Formula **1d** (i.e. a compound of Formula **1** where R^4 is H, and G and R^5 are taken together to form N-OH) can be prepared by treatment of a compound of Formula **19**, with a strong base such as, but not limited to sodium bis(trimethylsilyl)amide, lithium bis(trimethylsilyl)amide, potassium bis(trimethylsilyl)amide or lithium diisopropylamide and a nitrosylating agent, for example an alkyl nitrite such as, but not limited to isopentyl nitrite or tert-butyl nitrite. The reactions are typically performed in a solvent such as tetrahydrofuran at temperatures ranging from approximately -78°C to 50°C . Representative examples may be found in *Chem. Pharm. Bull.* **1986**, vol. 34, pp. 2732–2742 and *Org. Lett.* **2021**, vol. 23, pp. 5394 – 5399. Compounds of Formula **19** can be prepared using the preceding description.

Scheme 13



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

the Sandmeyer reaction, to various halides, providing compounds of Formula 1. The above reactions can also in many cases be performed in alternate order.

It is recognized that some reagents and reaction conditions described above for preparing compounds of Formula 1 may not be compatible with certain functionalities present in the intermediates. In these instances, the incorporation of protection/deprotection sequences or functional group interconversions into the synthesis will aid in obtaining the desired products. The use and choice of the protecting groups will be apparent to one skilled in chemical synthesis (see, for example, Greene, T. W.; Wuts, P. G. M. *Protective Groups in Organic Synthesis*, 2nd Ed.; Wiley: New York, 1991). One skilled in the art will recognize that, in some cases, after the introduction of a given reagent as it is depicted in any individual scheme, it may be necessary to perform additional routine synthetic steps not described in detail to complete the synthesis of compounds of Formula 1. One skilled in the art will also recognize that it may be necessary to perform a combination of the steps illustrated in the above schemes in an order other than that implied by the particular 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 description can utilize the present invention to its fullest extent. The following non-limiting Examples are illustrative of the invention. Steps in the following Examples illustrate a procedure for each step in an overall synthetic transformation, and the starting material for each step may not have necessarily been prepared by a particular preparative run whose procedure is described in other Examples or Steps. Percentages are by weight except for chromatographic solvent mixtures or where otherwise indicated. Parts and percentages for chromatographic solvent mixtures are by volume unless otherwise indicated. ¹H NMR spectra are reported in ppm downfield from tetramethylsilane; “s” means singlet, “d” means doublet, “t” means triplet, “q” means quartet, “m” means multiplet, “dd” means doublet of doublets, “ddd” means doublet of doublets of doublets, “dt” means doublet of triplets, and “br s” means broad singlet. Mass spectra (MS) 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 or (M–1) formed by the loss of H⁺ (molecular weight of 1) from the molecule, observed by using liquid chromatography coupled to a mass spectrometer (LCMS) using either atmospheric pressure chemical ionization (AP⁺) where “amu” stands for unified atomic mass units.

The following non-limiting Examples are meant to be illustrative of the present processes for preparing compounds of Formula 1 and corresponding intermediates. All NMR

spectra are reported in CDCl₃ at 500 MHz downfield from tetramethyl silane unless otherwise indicated.

SYNTHESIS EXAMPLE 1

Preparation of [[5-[3-(Cyclopentyloxy)-2-oxo-1-pyrrolidinyl]-2,4-dimethylphenyl][(trifluoromethyl)sulfonyl]amino]methyl 2,2-dimethylpropanoate
(Compound 5)

Step A: Preparation of tert-butyl 3-(cyclopentoxo)-2-oxo-pyrrolidine-1-carboxylate

To a solution of tert-butyl 3-diazo-2-oxopyrrolidine-1-carboxylate (300 mg, 1.42 mmol) and cyclopentanol (0.26 mL, 2.84 mmol) in dichloromethane (5 mL) was added dirhodium tetraacetate (19 mg, 3 mol%). The mixture was stirred at room temperature for 2 h and then concentrated under reduced pressure. The residue was purified by column chromatography (0-60% ethyl acetate in hexanes gradient on silica) to afford the desired product (342 mg) as a clear oil.

¹H NMR (CDCl₃) δ 1.53 (s, 9H), 1.55–1.62 (m, 4H), 1.71–1.82 (m, 4H), 1.86–1.98 (m, 1H), 2.23–2.29 (m, 1H), 3.52 (ddd, *J*=10.92, 8.08, 7.17 Hz, 1H), 3.79 (ddd, *J*=10.88, 8.51, 3.78 Hz, 1H), 4.05 (t, *J*=7.88 Hz, 1H), 4.36–4.41 (m, 1H).

Step B: Preparation of 3-(cyclopentoxo)pyrrolidin-2-one

To a solution of tert-butyl 3-(cyclopentoxo)-2-oxo-pyrrolidine-1-carboxylate (i.e. the product of Step A) (342 mg, 1.27 mmol) in dichloromethane (5 mL) was added trifluoroacetic acid (0.29 mL, 3.81 mmol). The reaction mixture was stirred at room temperature for 2 h before quenched with NaHCO₃ (aq.) and extracted with dichloromethane. Combined organic layers were dried with magnesium sulfate and concentrated under reduced pressure to afford 3-(cyclopentoxo)pyrrolidin-2-one (191 mg) as a clear oil and used without further purification.

¹H NMR (CDCl₃) δ 1.48–1.62 (m, 4H), 1.64–1.86 (m, 4H), 2.01–2.10 (m, 1H), 2.37–2.46 (m, 1H), 3.27 (dt, *J*=9.50, 7.23 Hz, 1H), 3.41 (td, *J*=8.99, 3.63 Hz, 1H), 4.02 (t, *J*=7.49 Hz, 1H), 4.30–4.38 (m, 1H), 6.03 (br s, 1H).

Step C: Preparation of 3-(cyclopentoxo)-1-(2,4-dimethyl-5-nitro-phenyl)pyrrolidin-2-one

To a 25 mL scintillation vial with septum, copper(I) iodide (45 mg, 25 mol%), potassium carbonate (390 mg, 2.82 mmol), 3-(cyclopentoxo)pyrrolidin-2-one (i.e. the product of Step B) (191 mg, 1.13 mmol) and 1-bromo-2,4-dimethyl-5-nitrobenzene (216 mg, 0.94 mmol) were added. The reaction vial was purged with nitrogen gas before dioxane (5 mL) and trans-*N,N'*-dimethyl-cyclohexane-1,2-diamine (0.074 mL, 50 mol%) were added to the reaction vial via syringe. The reaction mixture was stirred under nitrogen at 100 °C overnight, then diluted with ethyl acetate and filtered through a pad of Celite® diatomaceous earth filter aid. The resulting filtrate was dried over magnesium sulfate and concentrated under reduced pressure to a residue. The residue was purified by column chromatography (0-60% ethyl acetate in hexanes gradient on silica) to afford the desired product (279 mg) as a clear oil.

¹H NMR (CDCl₃) δ: 1.49–1.61 (m, 3H), 1.67–1.86 (m, 5H), 2.17 (ddt, *J*=13.00, 8.04, 6.42, 6.42 Hz, 1H), 2.27 (s, 3H), 2.46–2.54 (m, 1H), 2.60 (s, 3H), 3.64 (ddd, *J*=9.65, 7.29, 6.38 Hz, 1H), 3.73 (ddd, *J*=9.62, 8.04, 4.57 Hz, 1H), 4.18–4.21 (m, 1H), 4.38–4.49 (m, 1H), 7.24 (s, 1H), 7.86 (s, 1H)

5 Step D: Preparation of 1-(5-amino-2,4-dimethyl-phenyl)-3-(cyclopentoxypyrrolidin-2-one

To a stirred solution of 3-(cyclopentoxypyrrolidin-2-one (i.e. the product of Step C) (278 mg, 0.87 mmol) in ethyl acetate (4 mL) was added a solution of ammonium chloride (93 mg, 1.75 mmol) in water (1 mL). Iron powder (146 mg, 10 2.62 mmol) was then added and stirred at 80 °C under nitrogen overnight. The mixture was cooled to room temperature, diluted with ethyl acetate and filtered through a pad of Celite® diatomaceous earth filter aid. The filtrate was concentrated under reduced pressure to afford the title compound (275 mg) and used without further purification.

¹H NMR (CDCl₃) δ 1.42–1.62 (m, 3H), 1.66–1.86 (m, 5H), 2.04–2.25 (m, 7H), 2.38–2.51 (m, 1H), 3.53 (ddd, *J*=9.77, 7.41, 6.46 Hz, 1H), 3.65 (ddd, *J*=9.81, 8.16, 4.41 Hz, 1H), 4.16–4.18 (m, 1H), 4.37–4.53 (m, 1H), 6.48 (s, 1H) 6.92 (s, 1H).

Step E: Preparation of *N*-[5-[3-(cyclopentoxypyrrolidin-2-ylidene)-2,4-dimethylphenyl]-1,1,1-trifluoro-*N*-[(trifluoromethyl)sulfonyl]methanesulfonamide

20 To a stirred solution of 1-(5-amino-2,4-dimethyl-phenyl)-3-(cyclopentoxypyrrolidin-2-one (i.e. the product of Step D) (275 mg, 0.95 mmol) in dichloromethane (4.8 mL) was added triethylamine (0.279 mL, 2.00 mmol). The mixture was cooled to –78 °C, then trifluoromethanesulfonic anhydride (0.34 mL, 2.00 mmol) was added dropwise. The reaction mixture was then stirred at room temperature for 1 h before quenched with aqueous NaHCO₃ solution and extracted with dichloromethane. The combined organic layers were dried with magnesium sulfate, concentrated under reduced pressure and purified by column chromatography (0-60% ethyl acetate in hexanes gradient on silica) to afford the title compound (380 mg).

30 ¹H NMR (CDCl₃) δ 1.50–1.61 (m, 3H), 1.68–1.89 (m, 5H), 2.16 (ddt, *J*=13.10, 8.18, 6.54, 6.54 Hz, 1H), 2.25 (s, 3H), 2.39 (s, 3H), 2.45–2.55 (m, 1H), 3.56–3.63 (m, 1H), 3.66–3.73 (m, 1H), 4.20 (dd, *J*=7.41, 6.62 Hz, 1H), 4.43 (tt, *J*=5.87, 3.59 Hz, 1H), 7.08 (s, 1H), 7.26 (s, 1H).

Step F: Preparation of *N*-[5-[3-(cyclopentoxypyrrolidin-2-ylidene)-2,4-dimethylphenyl]-1,1,1-trifluoro-*N*-[(trifluoromethyl)sulfonyl]methanesulfonamide

35 To a stirred solution of *N*-[5-[3-(cyclopentoxypyrrolidin-2-ylidene)-2,4-dimethylphenyl]-1,1,1-trifluoro-*N*-[(trifluoromethyl)sulfonyl]methanesulfonamide (i.e. the product of Step E) (380 mg, 0.69 mmol) in dioxane (6.8 mL) was added 1 N aqueous sodium hydroxide solution (0.72 mL, 0.72 mmol) dropwise. The reaction mixture was stirred at room

temperature for 3 h, then neutralized with 1 N aqueous hydrogen chloride solution and extracted with dichloromethane. The combined organic layers were dried with magnesium sulfate, concentrated under reduced pressure and purified by column chromatography (0-50% ethyl acetate in hexanes gradient, on silica) to afford the title compound (160 mg) as a white solid.

¹H NMR (CDCl₃) δ 1.50–1.60 (m, 2H), 1.65–1.86 (m, 6H), 2.12–2.19 (m, 7H), 2.43–2.52 (m, 1H), 3.54 (ddd, *J*=10.01, 7.49, 6.46 Hz, 1H), 3.66 (ddd, *J*=10.01, 8.28, 4.41 Hz, 1H), 4.24 (dd, *J*=7.72, 6.31 Hz, 1H), 4.46–4.53 (m, 1H), 6.87 (s, 1H), 7.03 (s, 1H), 8.65 (br s, 1H).

- 10 Step G: Preparation of [[5-[3-(cyclopentyloxy)-2-oxo-1-pyrrolidinyl]-2,4-dimethylphenyl][(trifluoromethyl)sulfonyl]amino]methyl 2,2-dimethylpropanoate

To a stirred solution of *N*-[5-[3-(cyclopentyloxy)-2-oxo-1-pyrrolidinyl]-2,4-dimethylphenyl]-1,1,1-trifluoromethanesulfonamide (i.e. the product of Step F) (70 mg, 0.17 mmol) in dichloromethane (5 mL) was added triethylamine (0.058 mL, 0.42 mmol) and chloromethyl 2,2-dimethylpropanoate (0.048 mL, 0.33 mmol). The reaction mixture was stirred overnight at 45–50 °C before concentrated under reduced pressure. The residue was purified by column chromatography (0-100% ethyl acetate in hexane gradient, on silica) to afford the title compound (75 mg) as a clear oil.

¹H NMR (CDCl₃) δ 1.20 (d, *J*=3.63 Hz, 9H), 1.50–1.60 (m, 2H), 1.66–1.87 (m, 6H), 2.10–2.18 (m, 1H), 2.21 (d, *J*=9.62 Hz, 3H), 2.38 (s, 3H), 2.41–2.52 (m, 1H), 3.52–3.57 (m, 1H), 3.64–3.75 (m, 1H), 4.13–4.18 (m, 1H), 4.41–4.45 (m, 1H), 5.42 (t, *J*=10.64 Hz, 1H), 5.70 (t, *J*=11.59 Hz, 1H), 7.05 (d, *J*=17.50 Hz, 1H), 7.22 (s, 1H).

SYNTHESIS EXAMPLE 2

- 25 Preparation of *N*-[2,4-dimethyl-5-[2-oxo-3-(2-propyn-1-yloxy)-1-pyrrolidinyl]phenyl]-1,1,1-trifluoromethanesulfonamide (Compound 1)

Step A: Preparation of 1-(2,4-dimethyl-5-nitro-phenyl)-3-hydroxy-pyrrolidin-2-one

To a solution of 1-bromo-2,4-dimethyl-5-nitrobenzene (2.50 g, 10.86 mmol) in 1,4-dioxane (20 mL) was added 3-hydroxypyrrolidin-2-one (2.74 g, 27.17 mmol), K₂CO₃ (4.50 g, 32.60 mmol), copper(I) iodide (2.06 g, 10.86 mmol) and *N,N'*-Dimethylethylenediamine (DMEDA) (2.3 mL, 21.73 mmol) at room temperature. The reaction mixture was degassed under N₂ for 10 min and then stirred at 110 °C for 16 h. The reaction mixture was filtered through Celite® diatomaceous earth filter aid and washed with ethyl acetate (50 mL). The filtrate was evaporated under reduced pressure and triturated with n-pentane (25 mL), and diethyl ether (5 mL) to give the desired product (2.2 g) as off-white solid.

¹H NMR (CDCl₃) δ 7.87 (s, 1H), 7.26 (s, 1H), 5.54–4.99 (t, 1H), 3.76–3.65 (m, 2H), 2.94 (br, 1H), 2.66–2.63 (m, 1H), 2.60 (s, 3H), 2.27 (s, 3H), 2.26–2.20 (m, 1H).

Step B: Preparation of 1-(2,4-dimethyl-5-nitro-phenyl)-3-prop-2-ynoxy-pyrrolidin-2-one

To a solution of 1-(2,4-dimethyl-5-nitro-phenyl)-3-hydroxy-pyrrolidin-2-one (i.e. the product of Step A) (1.5 g, 6 mmol) in THF (30 mL) was added NaH (0.432 g, 18 mmol, 60%) and propargyl bromide (1.36 mL, 18 mmol) at 0 °C. The reaction mixture was stirred at room temperature for 16 h. The reaction mixture was quenched with saturated aqueous NH₄Cl solution (10 mL) and extracted with ethyl acetate (25 mL x 2). Combined organic layers were dried over anhydrous Na₂SO₄. The solvent was concentrated under reduced pressure to give the crude product. The cruder product was charged on silica gel column. Elution of the column with 30% ethyl acetate/petroleum ether gave the desired product (500 mg) as a light yellow solid.

LCMS (M+1) = 289.

Step C: Preparation of 1-(5-amino-2,4-dimethylphenyl)-3-(2-propyn-1-yloxy)-2-pyrrolidinone

To a solution of 1-(2,4-dimethyl-5-nitro-phenyl)-3-prop-2-ynoxy-pyrrolidin-2-one (i.e. the product of Step B) (0.400 g, 1.38 mmol) in ethanol (16 mL) and water (4 mL) was added iron (power, 0.387 g, 6.94 mmol) and NH₄Cl (0.074 g, 1.38 mmol). The reaction mixture was heated to the reflux temperature at 80 °C for 3 h. After completion of the reaction, the reaction mixture was filtered through Celite® diatomaceous earth filter aid and washed with ethyl acetate (25 mL). The filtrate was evaporated under reduced pressure to give the crude product (0.240 g) as an off-white solid which was used in the next step.

LCMS (M+1) = 259.

Step D: Preparation of *N*-[2,4-dimethyl-5-[2-oxo-3-(2-propyn-1-yloxy)-1-pyrrolidinyl]phenyl]-1,1,1-trifluoromethanesulfonamide

To a solution of 1-(5-amino-2,4-dimethylphenyl)-3-(2-propyn-1-yloxy)-2-pyrrolidinone (i.e. the product of Step C) (0.210 g, 0.81 mmol) in dichloromethane (10 mL) was added triethylamine (0.2 mL, 1.62 mmol) and Trifluoromethanesulfonic anhydride (Tf₂O) (0.08 mL, 0.48 mmol) at -78°C. The reaction mixture was stirred at room temperature for 1 h. After completion of the reaction, the reaction mixture was quenched with water (20 mL) and extracted with dichloromethane (20 mL x 2). The organic layer was separated and washed with brine (10 mL) and concentrated under reduced pressure to give the crude compound which was loaded on silica gel column. Elution of the column with 30% ethyl acetate/petroleum ether gave the desired product (80 mg) as an off-white solid.

¹H NMR (CDCl₃) δ 7.99 (br, 1H), 7.06 (s, 1H), 6.97 (s, 1H), 4.65–4.53 (m, 2H), 4.46–4.42 (t, 1H), 3.70–3.57 (m, 2H), 2.59–2.56 (m, 1H), 2.50–2.49 (t, 1H), 2.26–2.24 (m, 1H), 2.21 (s, 3H), 2.16 (s, 3H).

SYNTHESIS EXAMPLE 3

Preparation of *N*-[5-[3-(cyclopropoxy)-2-oxo-1-pyrrolidinyl]-2,4-dimethylphenyl]-1,1,1-trifluoromethanesulfonamide (also known as *N*-[5-[3-(cyclopropoxy)-2-oxo-pyrrolidin-1-yl]-2,4-dimethylphenyl]-1,1,1-trifluoromethanesulfonamide (Compound 3)

5

Step A: Preparation of tert-butyl 3-(cyclopropoxy)-2-oxo-pyrrolidine-1-carboxylate

To a solution of tert-butyl 3-diazo-2-oxopyrrolidine-1-carboxylate (2 g, 9.47 mmol) and cyclopropanol (0.82 g, 14.21 mmol) in dichloromethane (20 mL) was added dirhodium tetraacetate (41 mg, 0.01 mmol). The mixture was stirred at room temperature for 1 h. Analysis by thin layer chromatography (50% ethyl acetate/petroleum ether) showed completion of the reaction. The reaction mixture was filtered through Celite® diatomaceous earth filter aid; and the filtrate was evaporated under reduced pressure to obtain the crude product. The crude product was loaded on a silica gel column. Elution of the column with 30% ethyl acetate/petroleum ether gave the pure desired product (0.680 g) as off-white solid.

10

¹H NMR (CDCl₃) δ 4.17–4.13 (t, 1H), 3.82–3.77 (m, 2H), 3.57–3.52 (m, 1H), 2.28–2.27 (m, 1H), 1.96–1.91 (m, 1H), 1.53 (s, 9H), 0.72–0.49 (m, 4H).

15

Step B: Preparation of 3-(cyclopropoxy)pyrrolidin-2-one

To a solution of tert-butyl 3-(cyclopropoxy)-2-oxo-pyrrolidine-1-carboxylate (i.e. the product of Step A) (0.680 g, 2.61 mmol) in dichloromethane (10 mL) was added trifluoroacetic acid (0.89 g, 7.84 mmol) dropwise. The reaction mixture was stirred at room temperature for 4 h. Analysis by thin layer chromatography (45% ethyl acetate/petroleum ether) showed completion of the reaction. The reaction mixture was evaporated under reduced pressure to obtain the crude product. The crude product was co-distilled with CHCl₃ (10 mL x 2) to get 3-(cyclopropoxy)pyrrolidin-2-one (0.6 g) as a clear oil liquid.

20

¹H NMR (CDCl₃) δ 7.69 (br, 1H), 4.3–4.26 (m, 1H), 3.71–3.68 (m, 1H), 3.56–3.50 (m, 1H), 3.43–3.37 (m, 1H), 2.52–2.44 (m, 1H), 2.16–2.07 (m, 1H), 0.74–0.54 (m, 4H).

25

Step C: Preparation of 3-(cyclopropoxy)-1-(2,4-dimethyl-5-nitro-phenyl)pyrrolidin-2-one

To a solution of 3-(cyclopropoxy)pyrrolidin-2-one (i.e. the product of Step B) (0.6 g, 4.25 mmol) in dioxane in a sealed vessel was added 1-bromo-2,4-dimethyl-5-nitrobenzene (2.12 g, 8.5 mmol), K₂CO₃ (2.5 g, 17.02 mmol) and *N,N'*-Dimethylethylenediamine (DMEDA) (0.81 g, 8.5 mmol). The reaction was degassed with N₂ gas for 5 min. Copper(I) iodide (0.875 g, 4.2 mmol) was added to the reaction mixture and the reaction mixture was heated to the reflux temperature at 110 °C for 12 h. The reaction mixture was diluted with ethyl acetate and filtered through a pad of Celite® diatomaceous earth filter aid. The resulting filtrate was concentrated under reduced pressure to afford a residue. The residue was purified by column chromatography (30% ethyl acetate in petroleum ether on silica) to afford the desired product (0.650 g) as a white solid.

30

35

¹H NMR (CDCl₃) δ 7.86 (s, 1H), 7.26 (s, 1H), 4.32–4.28 (t, 1H), 3.82–3.79 (m, 1H), 3.75–3.70 (m, 2H), 2.60 (s, 3H), 2.28 (s, 3H), 2.58–2.53 (m, 1H), 2.23–2.18 (m, 1H), 0.79–0.54 (m, 4H).

Step D: Preparation of 1-(5-amino-2,4-dimethylphenyl)-3-(cyclopropyloxy)-2-pyrrolidinone

To a solution of 3-(cyclopropoxy)-1-(2,4-dimethyl-5-nitro-phenyl)pyrrolidin-2-one (i.e. the product of Step C) (0.610 g, 2.10 mmol) in ethanol (5 mL) and water (5 mL) was added iron (powder, 0.587 g, 10.55 mmol) and NH₄Cl (0.336 g, 6.310 mmol). The reaction mixture was heated at 80 °C for 2 h. After completion of the reaction, the reaction mixture was filtered through Celite® diatomaceous earth filter aid and washed with ethyl acetate (25 mL). The filtrate was evaporated under reduced pressure to give the crude product which was loaded on silica gel column. Elution of the column with 40% ethyl acetate/petroleum ether gave the desired product (0.49 g) as an off-white solid.

¹H NMR (CDCl₃) δ 6.93 (s, 1H), 6.46 (s, 1H), 4.29–4.26 (t, 1H), 3.83–3.80 (m, 1H), 3.66–3.55 (m, 2H), 2.49–2.44 (m, 1H), 2.18–2.12 (m, 1H), 2.11 (s, 3H), 2.08 (s, 3H), 0.76–0.52 (m, 4H).

Step E: Preparation of *N*-[5-[3-(cyclopropoxy)-2-oxo-1-pyrrolidinyl]-2,4-dimethylphenyl]-1,1,1-trifluoromethanesulfonamide (also known as *N*-[5-[3-(cyclopropoxy)-2-oxo-pyrrolidin-1-yl]-2,4-dimethyl-phenyl]-1,1,1-trifluoromethanesulfonamide)

To a solution of 1-(5-amino-2,4-dimethylphenyl)-3-(cyclopropyloxy)-2-pyrrolidinone (i.e. the product of Step D) (350 mg, 1.34 mmol) in dichloromethane (10 mL) was added triethylamine (0.37 mL, 2.26 mmol) and Tf₂O (0.34 mL, 2.01 mmol) at –20°C. The reaction mixture was stirred at room temperature for 3 h. Analysis by thin layer chromatography (50% ethyl acetate/petroleum ether) showed completion of the reaction. The reaction mixture was quenched with water (50 mL) and extracted with dichloromethane (50 mL x 2). The organic layer was separated, washed with brine (25 mL) and dried over Na₂SO₄. The solvent was evaporated and loaded on silica gel column. Elution of the column with 20% ethyl acetate/petroleum ether gave the desired product (140 mg) as an off-white solid.

¹H NMR (CDCl₃) δ 8.12 (s, 1H), 7.06 (s, 1H), 6.95 (s, 1H), 4.35–4.31 (t, 1H), 3.89–3.84 (m, 1H), 3.69–3.55 (m, 2H), 2.55–2.48 (m, 1H), 2.22 (s, 3H), 2.17 (s, 3H), 2.17 (m, 1H), 0.81–0.76 (m, 1H), 0.68–0.62 (m, 3H).

SYNTHESIS EXAMPLE 4

Preparation of 1,1,1-trifluoro-*N*-[5-[3-(hydroxyimino)-2-oxo-1-pyrrolidinyl]-2,4-dimethylphenyl]methanesulfonamide (Compound 10)

Step A: Preparation of 1-(2,4-dimethyl-5-nitro-phenyl)pyrrolidin-2-one

To a stirred solution of 1-bromo-2,4-dimethyl-5-nitro-benzene (5 g, 21.7 mmol) in 1,4-dioxane (50 mL) was added pyrrolidin-2-one (4.6 g, 54.1 mmol), potassium carbonate (8.9 g, 64.4 mmol), copper(I) iodide (3.9 g, 20.5 mmol) and *N,N'*-dimethylethylenediamine (3.82 g, 43.3 mmol). The mixture was sparged with nitrogen gas for 10 min then stirred at 130 °C for 16 h. The mixture was filtered through a pad of Celite, rinsing with ethyl acetate (50 mL). The filtrate was concentrated under reduced pressure and triturated with *n*-pentane (25 mL) and diethyl ether (5 mL) to give the title compound as an off white solid (5 g).

¹H NMR (CDCl₃) δ 7.87 (s, 1H), 7.24 (s, 1H), 3.78–3.75 (m, 2H), 2.61–2.57 (m, 5H), 2.30–2.24 (m, 5H).

Step B: Preparation of 1-(5-amino-2,4-dimethyl-phenyl)pyrrolidin-2-one

To a stirred solution of 1-(2,4-dimethyl-5-nitro-phenyl)pyrrolidin-2-one (i.e. the product of Step A) (5 g, 21.3 mmol) in ethanol (40 mL) and water (12 mL) was added iron powder (6 g, 107 mmol) followed by ammonium chloride (1.13 g, 21.1 mmol). The mixture was stirred at 80 °C for 3 h then filtered through a pad of Celite® diatomaceous earth filter aid, rinsing with ethyl acetate (25 mL). The filtrate was concentrated under reduced pressure to give the title compound as an off white solid (4 g), which was used without further purification.

¹H NMR (CDCl₃) δ 6.92 (s, 1H), 6.46 (s, 1H), 3.67–3.64 (m, 2H), 3.53 (br s, 2H), 2.55–2.52 (m, 2H), 2.21–2.15 (m, 2H), 2.11 (s, 3H), 2.08 (s, 3H).

Step C: Preparation of *N*-[2,4-dimethyl-5-(2-oxopyrrolidin-1-yl)phenyl]-1,1,1-trifluoro-methanesulfonamide

To a stirred solution of 1-(5-amino-2,4-dimethyl-phenyl)pyrrolidin-2-one (i.e. the product of Step B) (4 g, 19.6 mmol) in dichloromethane (40 mL) at –78°C was added triethylamine (5.9 mL, 42 mmol) and trifluoromethanesulfonic anhydride (3.2 mL, 19 mmol). After 2 h, water (20 mL) was added and the mixture was extracted with ethyl acetate (200 mL x 2). The combined organic layer was washed with brine (50 mL) and concentrated under reduced pressure. Column chromatography on silica gel gave the title compound as an off white solid (3 g).

¹H NMR (CDCl₃) δ 7.05 (s, 1H), 6.95 (s, 1H), 3.70–3.67 (m, 2H), 2.63–2.60 (m, 2H), 2.27–2.21 (m, 2H), 2.20 (s, 3H), 2.17 (s, 3H).

Step D: Preparation of 1,1,1-trifluoro-*N*-[5-[3-(hydroxyimino)-2-oxo-1-pyrrolidinyl]-2,4-dimethylphenyl]methanesulfonamide

To a stirred solution of *N*-[2,4-dimethyl-5-(2-oxopyrrolidin-1-yl)phenyl]-1,1,1-trifluoro-methanesulfonamide (i.e. the product of Step C) (3 g, 8.9 mmol) in anhydrous tetrahydrofuran (30 mL) at 0 °C was added sodium bis(trimethylsilyl)amide (30 mL, 30 mmol, 1 M in tetrahydrofuran). The mixture was stirred at 0 °C for 30 min then isopentyl nitrite (2.2 g, 18.8 mmol) was added and the mixture was stirred at 0 °C for 2 h. The mixture was

quenched with 1 N hydrochloric acid (30 mL) and extracted with ethyl acetate (100 mL x 2). The combined organic layer was dried over sodium sulfate and concentrated under reduced pressure. Trituration with 10% diethyl ether/pentane gave the title compound as an off white solid (1.6 g).

- 5 ^1H NMR (DMSO- d_6) δ 11.95 (s, 1H), 11.52 (br s, 1H), 7.24 (br s, 1H), 7.16 (s, 1H), 3.72 (m, 2H), 2.88 (m, 2H), 2.27 (s, 3H), 2.10 (s, 3H).

SYNTHESIS EXAMPLE 5

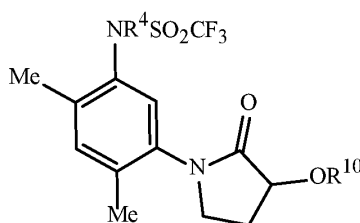
Preparation of *N*-[5-[3-(Ethoxyimino)-2-oxo-1-pyrrolidinyl]-2,4-dimethylphenyl]-1,1,1-trifluoromethanesulfonamide (Compound 12)

- 10 To a stirred solution of 1,1,1-Trifluoro-*N*-[5-[3-(hydroxyimino)-2-oxo-1-pyrrolidinyl]-2,4-dimethylphenyl]methanesulfonamide (i.e. the product of Step D in Synthesis Example 4) (0.4 g, 1.09 mmol) in tetrahydrofuran (20 mL) was added potassium *tert*-butoxide (3.8 mL, 3.8 mmol, 1 M in tetrahydrofuran) at room temperature. The mixture was stirred for 20 min then bromoethane (0.1 mL, 1.3 mmol) was added. After stirring for 16 h, the mixture
15 was acidified to pH~4 with 1 N hydrochloric acid and extracted with ethyl acetate (50 mL x2). The combined organic layer was dried over sodium sulfate and concentrated under reduced pressure. Column chromatography on silica gel gave the title compound as an off white solid (160 mg).

- 20 ^1H NMR (DMSO- d_6) δ 11.48 (br s, 1H), 7.26 (s, 1H), 7.19 (s, 1H), 4.24 (q, 2H), 3.73 (m, 2H), 2.90 (m, 2H), 2.28 (s, 3H), 2.11 (s, 3H), 1.27 (t, 3H).

- By the procedures described herein together with methods known in the art, the following compounds of Tables 1 to 11 can be prepared. The following abbreviations are used in the Tables which follow: *t* means tertiary, *s* means secondary, *n* means normal, *i* means iso, *c* means cyclo, Me means methyl, Et means ethyl, Pr means propyl, Bu means butyl,
25 *i*-Pr means isopropyl, Bu means butyl, *c*-Pr cyclopropyl, *c*-Bu means cyclobutyl, Ph means phenyl, OMe means methoxy, OEt means ethoxy, SMe means methylthio, SEt means ethylthio, NHMe means methylamino, -CN means cyano, Py means pyridinyl, -NC₂ means nitro, TMS means trimethylsilyl, S(O)Me means methylsulfinyl, and S(O)₂Me means methylsulfonyl.

- 30 Table 1



R⁴ = H

R ¹⁰	R ¹⁰	R ¹⁰	R ¹⁰
-----------------	-----------------	-----------------	-----------------

CH ₂ CF ₃	CH ₂ CHF ₂	CH ₂ CH ₂ Cl	CH ₂ CH ₂ Br
CH ₂ CH=CH ₂	CH(Me)C=CH ₂	CH ₂ CH=CH(Me)	CH ₂ CH=C(Me) ₂
CH ₂ C(Cl)=CH ₂	CH ₂ CH ₂ CH=CH ₂	CH ₂ CO ₂ Me	CH ₂ (C=O)Me
propargyl	<i>c</i> -pro	<i>c</i> -butyl	<i>c</i> -pentyl
allyl	<i>c</i> -hexyl	CH ₂ CF=CH ₂	CH ₂ CH ₂ CN
J-1	J-2	J-3	J-4
J-5	J-6	J-7	J-8
J-9	J-10	J-11	J-12
J-13	J-14	J-15	J-16
J-17	J-18	J-19	J-20
J-21	J-22		

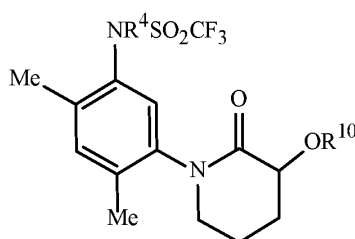
See Exhibit 2 for J-1 through J-22.

This disclosure also includes TABLES 2 through 25 wherein the Header Row Phrase in TABLE 1 (i.e. “R⁴ = H”) is replaced with the Header Row Phrase listed in the respective

5 TABLE, and the remaining variable(s) are as defined in TABLE 1.

TABLE	Header Row Phrase	TABLE	Header Row Phrase
2	R ⁴ = SO ₂ CF ₃	14	R ⁴ CH ₂ OCOMe
3	R ⁴ = is SO ₂ CH ₃	15	R ⁴ CH ₂ OCOCH ₂ CH ₃
4	R ⁴ = COMe	16	R ⁴ = CH ₂ OCOPh
5	R ⁴ = COEt	17	R ⁴ = CH ₂ OCO- <i>n</i> -Pr
6	R ⁴ = CH ₂ OCO- <i>t</i> -Bu	18	R ⁴ = CH ₂ OCO- <i>i</i> -Pr
7	R ⁴ = CH ₂ OCO- <i>n</i> -Bu	19	R ⁴ = (C=O)SMe
8	R ⁴ = CH ₂ OCO- <i>sec</i> -Bu	20	R ⁴ = COOMe
9	R ⁴ = CH ₂ OCO- <i>i</i> -Bu	21	R ⁴ = COOEt
10	R ⁴ = CH ₂ OCO- <i>c</i> -hexyl	22	R ⁴ = CO- <i>n</i> -Pr
11	R ⁴ = CH ₂ OCO- <i>c</i> -pentyl	23	R ⁴ = CONMe ₂
12	R ⁴ = CH ₂ OCO- <i>c</i> -butyl	24	R ⁴ = (C=O)N-morpholine
13	R ⁴ = CH ₂ OCO- <i>c</i> -propyl	25	R ⁴ = (C=S)N-morpholine

Table 26



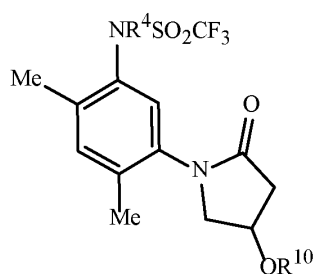
R⁴ = H

R ¹⁰	R ¹⁰	R ¹⁰	R ¹⁰
CH ₂ CF ₃	CH ₂ CHF ₂	CH ₂ CH ₂ Cl	CH ₂ CH ₂ Br
CH ₂ CH=CH ₂	CH(Me)C=CH ₂	CH ₂ CH=CH(Me)	CH ₂ CH=C(Me) ₂
CH ₂ C(Cl)=CH ₂	CH ₂ CH ₂ CH=CH ₂	CH ₂ CO ₂ Me	CH ₂ (C=O)Me
propargyl	<i>c</i> -pro	<i>c</i> -butyl	<i>c</i> -pentyl
allyl	<i>c</i> -hexyl	CH ₂ CF=CH ₂	CH ₂ CH ₂ CN
J-1	J-2	J-3	J-4
J-5	J-6	J-7	J-8
J-9	J-10	J-11	J-12
J-13	J-14	J-15	J-16
J-17	J-18	J-19	J-20
J-21	J-22		

This disclosure also includes TABLES 27 through 50 wherein the Header Row Phrase in TABLE 26 (i.e. “R⁴ = H”) is replaced with the Header Row Phrase listed in the
5 respective TABLE, and the remaining variable(s) are as defined in TABLE 26.

TABLE	Header Row Phrase	TABLE	Header Row Phrase
27	R ⁴ = SC ₂ CF ₃	39	R ⁴ = CH ₂ OCOMe
28	R ⁴ = SO ₂ CH ₃	40	R ⁴ = CH ₂ OCOCH ₂ CH ₃
29	R ⁴ = COMe	41	R ⁴ = CH ₂ OCOPh
30	R ⁴ = COEt	42	R ⁴ = CH ₂ OCO- <i>n</i> -Pr
31	R ⁴ = CH ₂ OCO- <i>t</i> -Bu	43	R ⁴ = CH ₂ OCO- <i>i</i> -Pr
32	R ⁴ = CH ₂ OCO- <i>n</i> -Bu	44	R ⁴ = (C=O)SMe
33	R ⁴ = CH ₂ OCO- <i>sec</i> -Bu	45	R ⁴ = COOMe
34	R ⁴ = CH ₂ OCO- <i>i</i> -Bu	46	R ⁴ = COOEt
35	R ⁴ = CH ₂ OCO- <i>c</i> -hexyl	47	R ⁴ = CO- <i>n</i> -Pr
36	R ⁴ = CH ₂ OCO- <i>c</i> -pentyl	48	R ⁴ = CONMe ₂
37	R ⁴ = CH ₂ OCO- <i>c</i> -butyl	49	R ⁴ = (C=O)N-morpholine
38	R ⁴ = CH ₂ OCO- <i>c</i> -propyl	50	R ⁴ = (C=S)N-morpholine

Table 51

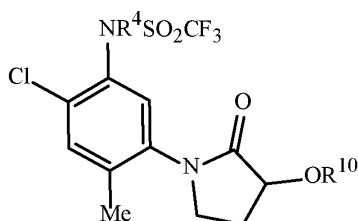
R⁴ = H

R ¹⁰	R ¹⁰	R ¹⁰	R ¹⁰
CH ₂ CF ₃	CH ₂ CHF ₂	CH ₂ CH ₂ Cl	CH ₂ CH ₂ Br
CH ₂ CH=CH ₂	CH(Me)C=CH ₂	CH ₂ CH=CH(Me)	CH ₂ CH=C(Me) ₂
CH ₂ C(Cl)=CH ₂	CH ₂ CH ₂ CH=CH ₂	CH ₂ CO ₂ Me	CH ₂ (C=O)Me
propargyl	<i>c</i> -pro	<i>c</i> -butyl	<i>c</i> -pentyl
allyl	<i>c</i> -hexyl	CH ₂ CF=CH ₂	CH ₂ CH ₂ CN
J-1	J-2	J-3	J-4
J-5	J-6	J-7	J-8
J-9	J-10	J-11	J-12
J-13	J-14	J-15	J-16
J-17	J-18	J-19	J-20
J-21	J-22		

This disclosure also includes TABLES 52 through 75 wherein the Header Row
 5 Phrase in TABLE 51 (i.e. “R⁴ is H”) is replaced with the Header Row Phrase listed in the
 respective Table, and the R¹⁰ are as defined in TABLE 51.

TABLE	Header Row Phrase	TABLE	Header Row Phrase
52	R ⁴ = SO ₂ CF ₃	64	R ⁴ = CH ₂ OCOMe
53	R ⁴ is SO ₂ CH ₃	65	R ⁴ = CH ₂ OCOCH ₂ CH ₃
54	R ⁴ is COMe	66	R ⁴ = CH ₂ OCOPh
55	R ⁴ = COEt	67	R ⁴ = CH ₂ OCO- <i>n</i> -Pr
56	R ⁴ = CH ₂ OCO- <i>t</i> -Bu	68	R ⁴ = CH ₂ OCO- <i>i</i> -Pr
57	R ⁴ = CH ₂ OCO- <i>n</i> -Bu	69	R ⁴ = (C=O)SMe
58	R ⁴ = CH ₂ OCO- <i>sec</i> -Bu	70	R ⁴ = COOMe
59	R ⁴ = CH ₂ OCO- <i>i</i> -Bu	71	R ⁴ = COOEt
60	R ⁴ = CH ₂ OCO- <i>c</i> -hexyl	72	R ⁴ = CO- <i>n</i> -Pr
61	R ⁴ = CH ₂ OCO- <i>c</i> -pentyl	73	R ⁴ = CONMe ₂
62	R ⁴ = CH ₂ OCO- <i>c</i> -butyl	74	R ⁴ = (C=O)N-morpholine
63	R ⁴ = CH ₂ OCO- <i>c</i> -propyl	75	R ⁴ = (C=S)N-morpholine

Table 76

R⁴ = H

R ¹⁰	R ¹⁰	R ¹⁰	R ¹⁰
CH ₂ CF ₃	CH ₂ CHF ₂	CH ₂ CH ₂ Cl	CH ₂ CH ₂ Br
CH ₂ CH=CH ₂	CH(Me)C=CH ₂	CH ₂ CH=CH(Me)	CH ₂ CH=C(Me) ₂
CH ₂ C(Cl)=CH ₂	CH ₂ CH ₂ CH=CH ₂	CH ₂ CO ₂ Me	CH ₂ (C=O)Me
propargyl	<i>c</i> -pro	<i>c</i> -butyl	<i>c</i> -pentyl
allyl	<i>c</i> -hexyl	CH ₂ CF=CH ₂	CH ₂ CH ₂ CN
J-1	J-2	J-3	J-4
J-5	J-6	J-7	J-8
J-9	J-10	J-11	J-12
J-13	J-14	J-15	J-16
J-17	J-18	J-19	J-20
J-21	J-22		

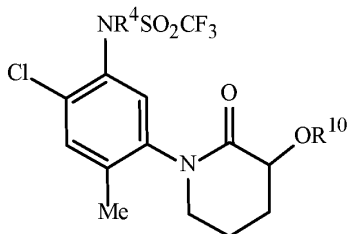
5

This disclosure also includes TABLES 77 through 100 wherein the Header Row Phrase in TABLE 76 (i.e. “R⁴ = H”) is replaced with the Header Row Phrase listed in the respective TABLE, and the R¹⁰ are as defined in TABLE 76.

TABLE	Header Row Phrase	TABLE	Header Row Phrase
77	R ⁴ = SO ₂ CF ₃	89	R ⁴ CH ₂ OCOMe
78	R ⁴ = SO ₂ CH ₃	90	R ⁴ CH ₂ OCOCH ₂ CH ₃
79	R ⁴ = COMe	91	R ⁴ = CH ₂ OCOPh
80	R ⁴ = COEt	92	R ⁴ = CH ₂ OCO- <i>n</i> -Pr
81	R ⁴ = CH ₂ OCO- <i>t</i> -Bu	93	R ⁴ = CH ₂ OCO- <i>i</i> -Pr
82	R ⁴ = CH ₂ OCO- <i>n</i> -Bu	94	R ⁴ = (C=O)SMe
83	R ⁴ = CH ₂ OCO- <i>sec</i> -Bu	95	R ⁴ = COOMe
84	R ⁴ = CH ₂ OCO- <i>i</i> -Bu	96	R ⁴ = COOEt
85	R ⁴ = CH ₂ OCO- <i>c</i> -hexyl	97	R ⁴ = CO- <i>n</i> -Pr
86	R ⁴ = CH ₂ OCO- <i>c</i> -pentyl	98	R ⁴ = CONMe ₂
87	R ⁴ = CH ₂ OCO- <i>c</i> -butyl	99	R ⁴ = (C=O)N-morpholine

88	$R^4 = \text{CH}_2\text{OCO-}i\text{-propyl}$	100	$R^4 = (\text{C}=\text{S})\text{N-morpholine}$
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Table 101

 $R^4 = \text{H}$

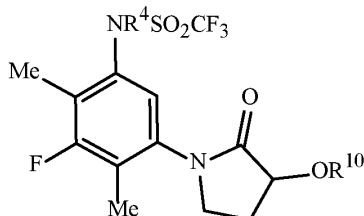
R^{10}	R^{10}	R^{10}	R^{10}
CH_2CF_3	CH_2CHF_2	$\text{CH}_2\text{CH}_2\text{Cl}$	$\text{CH}_2\text{CH}_2\text{Br}$
$\text{CH}_2\text{CH}=\text{CH}_2$	$\text{CH}(\text{Me})\text{C}=\text{CH}_2$	$\text{CH}_2\text{CH}=\text{CH}(\text{Me})$	$\text{CH}_2\text{CH}=\text{C}(\text{Me})_2$
$\text{CH}_2\text{C}(\text{Cl})=\text{CH}_2$	$\text{CH}_2\text{CH}_2\text{CH}=\text{CH}_2$	$\text{CH}_2\text{CO}_2\text{Me}$	$\text{CH}_2(\text{C}=\text{O})\text{Me}$
propargyl	<i>c</i> -pro	<i>c</i> -butyl	<i>c</i> -pentyl
allyl	<i>c</i> -hexyl	$\text{CH}_2\text{CF}=\text{CH}_2$	$\text{CH}_2\text{CH}_2\text{CN}$
J-1	J-2	J-3	J-4
J-5	J-6	J-7	J-8
J-9	J-10	J-11	J-12
J-13	J-14	J-15	J-16
J-17	J-18	J-19	J-20
J-21	J-22		

This disclosure also includes TABLES 102 through 125 wherein the Header Row
5 Phrase in TABLE 101 (i.e. " $R^4 = \text{H}$ ") is replaced with the Header Row Phrase listed in the
respective TABLE, and the remaining variable(s) are as defined in TABLE 101.

TABLE	Header Row Phrase	TABLE	Header Row Phrase
102	$R^4 = \text{SO}_2\text{CF}_3$	114	$R^4 = \text{CH}_2\text{OCOMe}$
103	$R^4 = \text{SO}_2\text{CH}_3$	115	$R^4 = \text{CH}_2\text{OCOCH}_2\text{CH}_3$
104	$R^4 = \text{COMe}$	116	$R^4 = \text{CH}_2\text{OCOPh}$
105	$R^4 = \text{COEt}$	117	$R^4 = \text{CH}_2\text{OCO-}n\text{-Pr}$
106	$R^4 = \text{CH}_2\text{OCO-}i\text{-Bu}$	118	$R^4 = \text{CH}_2\text{OCO-}i\text{-Pr}$
107	$R^4 = \text{CH}_2\text{OCO-}n\text{-Bu}$	119	$R^4 = (\text{C}=\text{O})\text{SMe}$
108	$R^4 = \text{CH}_2\text{OCO-}sec\text{-Bu}$	120	$R^4 = \text{COOMe}$
109	$R^4 = \text{CH}_2\text{OCO-}i\text{-Bu}$	121	$R^4 = \text{COOEt}$
110	$R^4 = \text{CH}_2\text{OCO-}c\text{-hexyl}$	122	$R^4 = \text{CO-}n\text{-Pr}$
111	$R^4 = \text{CH}_2\text{OCO-}c\text{-pentyl}$	123	$R^4 = \text{CONMe}_2$
112	$R^4 = \text{CH}_2\text{OCO-}c\text{-butyl}$	124	$R^4 = (\text{C}=\text{O})\text{N-morpholine}$

113	$R^4 = \text{CH}_2\text{OCO-}c\text{-propyl}$	125	$R^4 = (\text{C}=\text{S})\text{N-morpholine}$
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Table 126

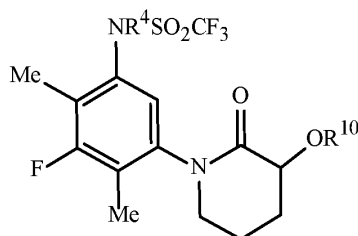
 $R^4 = \text{H}$

R^{10}	R^{10}	R^{10}	R^{10}
CH_2CF_3	CH_2CHF_2	$\text{CH}_2\text{CH}_2\text{Cl}$	$\text{CH}_2\text{CH}_2\text{Br}$
$\text{CH}_2\text{CH}=\text{CH}_2$	$\text{CH}(\text{Me})\text{C}=\text{CH}_2$	$\text{CH}_2\text{CH}=\text{CH}(\text{Me})$	$\text{CH}_2\text{CH}=\text{C}(\text{Me})_2$
$\text{CH}_2\text{C}(\text{Cl})=\text{CH}_2$	$\text{CH}_2\text{CH}_2\text{CH}=\text{CH}_2$	$\text{CH}_2\text{CO}_2\text{Me}$	$\text{CH}_2(\text{C}=\text{O})\text{Me}$
propargyl	<i>c</i> -pro	<i>c</i> -butyl	<i>c</i> -pentyl
allyl	<i>c</i> -hexyl	$\text{CH}_2\text{CF}=\text{CH}_2$	$\text{CH}_2\text{CH}_2\text{CN}$
J-1	J-2	J-3	J-4
J-5	J-6	J-7	J-8
J-9	J-10	J-11	J-12
J-13	J-14	J-15	J-16
J-17	J-18	J-19	J-20
J-21	J-22		

- This disclosure also includes TABLES 127 through 150 wherein the Header Row
- 5 Phrase in TABLE 126 (i.e. " $R^4 = \text{H}$ ") is replaced with the Header Row Phrase listed in the respective TABLE, and the remaining variable(s) are as defined in TABLE 126.

TABLE	Header Row Phrase	TABLE	Header Row Phrase
127	$R^4 = \text{SO}_2\text{CF}_3$	139	$R^4 = \text{CH}_2\text{OCOMe}$
128	$R^4 = \text{SO}_2\text{CH}_3$	140	$R^4 = \text{CH}_2\text{OCOCH}_2\text{CH}_3$
129	$R^4 = \text{COMe}$	141	$R^4 = \text{CH}_2\text{OCOPh}$
130	$R^4 = \text{COEt}$	142	$R^4 = \text{CH}_2\text{OCO-}n\text{-Pr}$
131	$R^4 = \text{CH}_2\text{OCO-}t\text{-Bu}$	143	$R^4 = \text{CH}_2\text{OCO-}i\text{-Pr}$
132	$R^4 = \text{CH}_2\text{OCO-}n\text{-Bu}$	144	$R^4 = (\text{C}=\text{O})\text{SMe}$
133	$R^4 = \text{CH}_2\text{OCO-}sec\text{-Bu}$	145	$R^4 = \text{COOMe}$
134	$R^4 = \text{CH}_2\text{OCO-}i\text{-Bu}$	146	$R^4 = \text{COOEt}$
135	$R^4 = \text{CH}_2\text{OCO-}c\text{-hexyl}$	147	$R^4 = \text{CO-}n\text{-Pr}$
136	$R^4 = \text{CH}_2\text{OCO-}c\text{-pentyl}$	148	$R^4 = \text{CONMe}_2$
137	$R^4 = \text{CH}_2\text{OCO-}c\text{-butyl}$	149	$R^4 = (\text{C}=\text{O})\text{N-morpholine}$
138	$R^4 = \text{CH}_2\text{OCO-}c\text{-propyl}$	150	$R^4 = (\text{C}=\text{S})\text{N-morpholine}$

Table 151

R⁴ = H

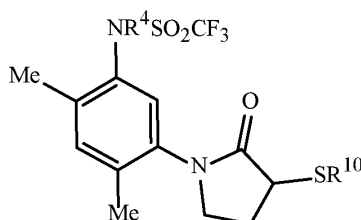
R ¹⁰	R ¹⁰	R ¹⁰	R ¹⁰
CH ₂ CF ₃	CH ₂ CHF ₂	CH ₂ CH ₂ Cl	CH ₂ CH ₂ Br
CH ₂ CH=CH ₂	CH(Me)C=CH ₂	CH ₂ CH=CH(Me)	CH ₂ CH=C(Me) ₂
CH ₂ C(Cl)=CH ₂	CH ₂ CH ₂ CH=CH ₂	CH ₂ CO ₂ Me	CH ₂ (C=O)Me
propargyl	<i>c</i> -pro	<i>c</i> -butyl	<i>c</i> -pentyl
allyl	<i>c</i> -hexyl	CH ₂ CF=CH ₂	CH ₂ CH ₂ CN
J-1	J-2	J-3	J-4
J-5	J-6	J-7	J-8
J-9	J-10	J-11	J-12
J-13	J-14	J-15	J-16
J-17	J-18	J-19	J-20
J-21	J-22		

- 5 This disclosure also includes TABLES 152 through 175 wherein the Header Row Phrase in TABLE 151 (i.e. “R⁴ is H”) is replaced with the Header Row Phrase listed in the respective TABLE, and the remaining variable(s) are as defined in TABLE 151.

TABLE	Header Row Phrase	TABLE	Header Row Phrase
152	R ⁴ = SO ₂ CF ₃	164	R ⁴ = CH ₂ OCOMe
153	R ⁴ = SO ₂ CH ₃	165	R ⁴ = CH ₂ OCOCH ₂ CH ₃
154	R ⁴ = COMe	166	R ⁴ = CH ₂ OCOPh
155	R ⁴ = COEt	167	R ⁴ = CH ₂ OCO- <i>n</i> -Pr
156	R ⁴ = CH ₂ OCO- <i>i</i> -Bu	168	R ⁴ = CH ₂ OCO- <i>i</i> -Pr
157	R ⁴ = CH ₂ OCO- <i>n</i> -Bu	169	R ⁴ = (C=O)SMe
158	R ⁴ = CH ₂ OCO- <i>sec</i> -Bu	170	R ⁴ = COOMe
159	R ⁴ = CH ₂ OCO- <i>i</i> -Bu	171	R ⁴ = COOEt
160	R ⁴ = CH ₂ OCO- <i>c</i> -hexyl	172	R ⁴ = CO- <i>n</i> -Pr
161	R ⁴ = CH ₂ OCO- <i>c</i> -pentyl	173	R ⁴ = CONMe ₂
162	R ⁴ = CH ₂ OCO- <i>c</i> -butyl	174	R ⁴ = (C=O)N-morpholine

163	$R^4 = \text{CH}_2\text{OCO-}i\text{-propyl}$	175	$R^4 = (\text{C}=\text{S})\text{N-morpholine}$
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Table 176

 $R^4 = \text{H}$

R^{10}	R^{10}	R^{10}	R^{10}
CH_2CF_3	CH_2CHF_2	$\text{CH}_2\text{CH}_2\text{Cl}$	$\text{CH}_2\text{CH}_2\text{Br}$
$\text{CH}_2\text{CH}=\text{CH}_2$	$\text{CH}(\text{Me})\text{C}=\text{CH}_2$	$\text{CH}_2\text{CH}=\text{CH}(\text{Me})$	$\text{CH}_2\text{CH}=\text{C}(\text{Me})_2$
$\text{CH}_2\text{C}(\text{Cl})=\text{CH}_2$	$\text{CH}_2\text{CH}_2\text{CH}=\text{CH}_2$	$\text{CH}_2\text{CO}_2\text{Me}$	$\text{CH}_2(\text{C}=\text{O})\text{Me}$
propargyl	<i>c</i> -pro	<i>c</i> -butyl	<i>c</i> -pentyl
allyl	<i>c</i> -hexyl	$\text{CH}_2\text{CF}=\text{CH}_2$	$\text{CH}_2\text{CH}_2\text{CN}$
J-1	J-2	J-3	J-4
J-5	J-6	J-7	J-8
J-9	J-10	J-11	J-12
J-13	J-14	J-15	J-16
J-17	J-18	J-19	J-20
J-21	J-22		

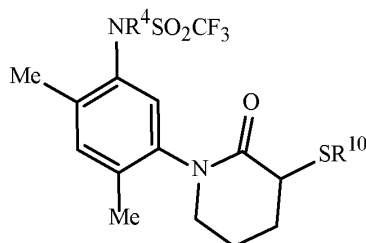
5

This disclosure also includes TABLES 177 through 200 wherein the Header Row Phrase in TABLE 176 (i.e. " $R^4 = \text{H}$ ") is replaced with the Header Row Phrase listed in the respective TABLE, and the remaining variable(s) are as defined in TABLE 176.

TABLE	Header Row Phrase	TABLE	Header Row Phrase
177	$R^4 = \text{SO}_2\text{CF}_3$	189	$R^4 = \text{CH}_2\text{OCOMe}$
178	$R^4 = \text{SO}_2\text{CH}_3$	190	$R^4 = \text{CH}_2\text{OCOCH}_2\text{CH}_3$
179	$R^4 = \text{COMe}$	191	$R^4 = \text{CH}_2\text{OCOPh}$
180	$R^4 = \text{COEt}$	192	$R^4 = \text{CH}_2\text{OCO-}n\text{-Pr}$
181	$R^4 = \text{CH}_2\text{OCO-}i\text{-Bu}$	193	$R^4 = \text{CH}_2\text{OCO-}i\text{-Pr}$
182	$R^4 = \text{CH}_2\text{OCO-}n\text{-Bu}$	194	$R^4 = (\text{C}=\text{O})\text{SMe}$
183	$R^4 = \text{CH}_2\text{OCO-}sec\text{-Bu}$	195	$R^4 = \text{COOMe}$
184	$R^4 = \text{CH}_2\text{OCO-}i\text{-Bu}$	196	$R^4 = \text{COOEt}$
185	$R^4 = \text{CH}_2\text{OCO-}c\text{-hexyl}$	197	$R^4 = \text{CO-}n\text{-Pr}$
186	$R^4 = \text{CH}_2\text{OCO-}c\text{-pentyl}$	198	$R^4 = \text{CONMe}_2$

187	$R^4 = \text{CH}_2\text{OCO-}i\text{-butyl}$	199	$R^4 = (\text{C=O})\text{N-morpholine}$
188	$R^4 = \text{CH}_2\text{OCO-}i\text{-propyl}$	200	$R^4 = (\text{C=S})\text{N-morpholine}$

Table 201

 $R^4 = \text{H}$

R^{10}	R^{10}	R^{10}	R^{10}
CH_2CF_3	CH_2CHF_2	$\text{CH}_2\text{CH}_2\text{Cl}$	$\text{CH}_2\text{CH}_2\text{Br}$
$\text{CH}_2\text{CH}=\text{CH}_2$	$\text{CH}(\text{Me})\text{C}=\text{CH}_2$	$\text{CH}_2\text{CH}=\text{CH}(\text{Me})$	$\text{CH}_2\text{CH}=\text{C}(\text{Me})_2$
$\text{CH}_2\text{C}(\text{Cl})=\text{CH}_2$	$\text{CH}_2\text{CH}_2\text{CH}=\text{CH}_2$	$\text{CH}_2\text{CO}_2\text{Me}$	$\text{CH}_2(\text{C}=\text{O})\text{Me}$
propargyl	<i>c</i> -pro	<i>c</i> -butyl	<i>c</i> -pentyl
allyl	<i>c</i> -hexyl	$\text{CH}_2\text{CF}=\text{CH}_2$	$\text{CH}_2\text{CH}_2\text{CN}$
J-1	J-2	J-3	J-4
J-5	J-6	J-7	J-8
J-9	J-10	J-11	J-12
J-13	J-14	J-15	J-16
J-17	J-18	J-19	J-20
J-21	J-22		

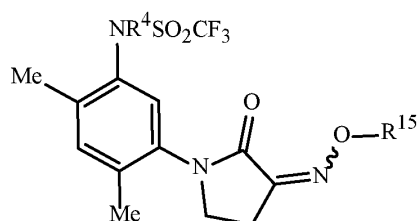
5

This disclosure also includes TABLES 202 through 225 wherein the Header Row Phrase in TABLE 201 (i.e. " $R^4 = \text{H}$ ") is replaced with the Header Row Phrase listed in the respective TABLE, and the remaining variable(s) are as defined in TABLE 201.

TABLE	Header Row Phrase	TABLE	Header Row Phrase
202	$R^4 = \text{SO}_2\text{CF}_3$	214	$R^4 = \text{CH}_2\text{OCOMe}$
203	$R^4 = \text{SO}_2\text{CH}_3$	215	$R^4 = \text{CH}_2\text{OCOCH}_2\text{CH}_3$
204	$R^4 = \text{COMe}$	216	$R^4 = \text{CH}_2\text{OCOPh}$
205	$R^4 = \text{COEt}$	217	$R^4 = \text{CH}_2\text{OCO-}n\text{-Pr}$
206	$R^4 = \text{CH}_2\text{OCO-}t\text{-Bu}$	218	$R^4 = \text{CH}_2\text{OCO-}i\text{-Pr}$
207	$R^4 = \text{CH}_2\text{OCO-}n\text{-Bu}$	219	$R^4 = (\text{C=O})\text{SMe}$
208	$R^4 = \text{CH}_2\text{OCO-}sec\text{-Bu}$	220	$R^4 = \text{COOMe}$
209	$R^4 = \text{CH}_2\text{OCO-}i\text{-Bu}$	221	$R^4 = \text{COOEt}$

210	$R^4 = \text{CH}_2\text{OCO-}i\text{-hexyl}$	222	$R^4 = \text{CO-}n\text{-Pr}$
211	$R^4 = \text{CH}_2\text{OCO-}i\text{-pentyl}$	223	$R^4 = \text{CONMe}_2$
212	$R^4 = \text{CH}_2\text{OCO-}i\text{-butyl}$	224	$R^4 = (\text{C=O})\text{N-morpholine}$
213	$R^4 = \text{CH}_2\text{OCO-}i\text{-propyl}$	225	$R^4 = (\text{C=S})\text{N-morpholine}$

Table 226



$\sim$ indicates the bond can be cis or trans

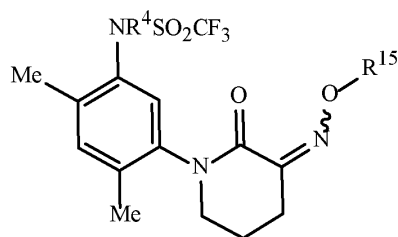
$R^4 = \text{H}$

R^{15}	R^{15}	R^{15}	R^{15}
H	Me	Et	n-Pr
i-Pr	n-Bu	i-Bu	CH_2F
CF_2H	CH_2CF_3	$\text{CH}_2\text{CF}_2\text{H}$	allyl
propargyl	$\text{CH}_2c\text{-Pr (J-5)}$	$\text{CH}_2c\text{-Bu (J-6)}$	

- 5 This disclosure also includes TABLES 227 through 250 wherein the Header Row Phrase in TABLE 226 (i.e. " $R^4 = \text{H}$ ") is replaced with the Header Row Phrase listed in the respective TABLE, and the remaining variable(s) are as defined in TABLE 226.

TABLE	Header Row Phrase	TABLE	Header Row Phrase
227	$R^4 = \text{SO}_2\text{CF}_3$	239	$R^4 \text{CH}_2\text{OCOMe}$
228	$R^4 = \text{SO}_2\text{CH}_3$	240	$R^4 \text{CH}_2\text{OCOCH}_2\text{CH}_3$
229	$R^4 = \text{COMe}$	241	$R^4 = \text{CH}_2\text{OCOPh}$
230	$R^4 = \text{COEt}$	242	$R^4 = \text{CH}_2\text{OCO-}n\text{-Pr}$
231	$R^4 = \text{CH}_2\text{OCO-}i\text{-Bu}$	243	$R^4 = \text{CH}_2\text{OCO-}i\text{-Pr}$
232	$R^4 = \text{CH}_2\text{OCO-}n\text{-Bu}$	244	$R^4 = (\text{C=O})\text{SMe}$
233	$R^4 = \text{CH}_2\text{OCO-}sec\text{-Bu}$	245	$R^4 = \text{COOMe}$
234	$R^4 = \text{CH}_2\text{OCO-}i\text{-Bu}$	246	$R^4 = \text{COOEt}$
235	$R^4 = \text{CH}_2\text{OCO-}i\text{-hexyl}$	247	$R^4 = \text{CO-}n\text{-Pr}$
236	$R^4 = \text{CH}_2\text{OCO-}i\text{-pentyl}$	248	$R^4 = \text{CONMe}_2$
237	$R^4 = \text{CH}_2\text{OCO-}i\text{-butyl}$	249	$R^4 = (\text{C=O})\text{N-morpholine}$
238	$R^4 = \text{CH}_2\text{OCO-}i\text{-propyl}$	250	$R^4 = (\text{C=S})\text{N-morpholine}$

Table 251



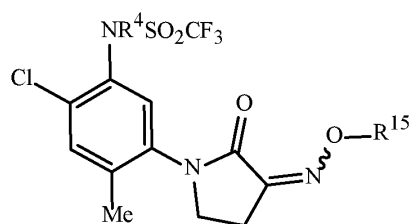
indicates the bond can be cis or trans

$R^4 = H$

R^{15}	R^{15}	R^{15}	R^{15}
H	Me	Et	n-Pr
i-Pr	n-Bu	i-Bu	CH_2F
CF_2H	CH_2CF_3	CH_2CF_2H	allyl
propargyl	$CH_2c\text{-Pr}$ (J-5)	$CH_2c\text{-Bu}$ (J-6)	

- 5 This disclosure also includes TABLES 252 through 275 wherein the Header Row Phrase in TABLE 251 (i.e. " $R^4 = H$ ") is replaced with the Header Row Phrase listed in the respective TABLE, and the remaining variable(s) are as defined in TABLE 251.

TABLE	Header Row Phrase	TABLE	Header Row Phrase
252	$R^4 = SO_2CF_3$	264	$R^4 CH_2OCOMe$
253	$R^4 = SO_2CH_3$	265	$R^4 CH_2OCOCH_2CH_3$
254	$R^4 = COMe$	266	$R^4 = CH_2OCOPh$
255	$R^4 = COEt$	267	$R^4 = CH_2OCO\text{-}n\text{-Pr}$
256	$R^4 = CH_2OCO\text{-}i\text{-Bu}$	268	$R^4 = CH_2OCO\text{-}i\text{-Pr}$
257	$R^4 = CH_2OCO\text{-}n\text{-Bu}$	269	$R^4 = (C=O)SMe$
258	$R^4 = CH_2OCO\text{-}sec\text{-Bu}$	270	$R^4 = COOMe$
259	$R^4 = CH_2OCO\text{-}i\text{-Bu}$	271	$R^4 = COOEt$
260	$R^4 = CH_2OCO\text{-}c\text{-hexyl}$	272	$R^4 = CO\text{-}n\text{-Pr}$
261	$R^4 = CH_2OCO\text{-}c\text{-pentyl}$	273	$R^4 = CONMe_2$
262	$R^4 = CH_2OCO\text{-}c\text{-butyl}$	274	$R^4 = (C=O)N\text{-morpholine}$
263	$R^4 = CH_2OCO\text{-}c\text{-propyl}$	275	$R^4 = (C=S)N\text{-morpholine}$



$\sim$ indicates the bond can be cis or trans

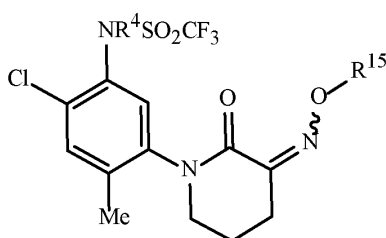
$R^4 = H$

R^{15}	R^{15}	R^{15}	R^{15}
H	Me	Et	n-Pr
i-Pr	n-Bu	i-Bu	CH_2F
CF_2H	CH_2CF_3	CH_2CF_2H	allyl
propargyl	$CH_2c\text{-}Pr$ (J-5)	$CH_2c\text{-}Bu$ (J-6)	

This disclosure also includes TABLES 277 through 300 wherein the Header Row Phrase in TABLE 276 (i.e. " $R^4 = H$ ") is replaced with the Header Row Phrase listed in the
 5 respective TABLE, and the remaining variable(s) are as defined in TABLE 276.

TABLE	Header Row Phrase	TABLE	Header Row Phrase
277	$R^4 = SO_2CF_3$	289	$R^4 CH_2OCOMe$
278	$R^4 = SO_2CH_3$	290	$R^4 CH_2OCOCH_2CH_3$
279	$R^4 = COMe$	291	$R^4 = CH_2OCOPh$
280	$R^4 = COEt$	292	$R^4 = CH_2OCO\text{-}n\text{-}Pr$
281	$R^4 = CH_2OCO\text{-}t\text{-}Bu$	293	$R^4 = CH_2OCO\text{-}i\text{-}Pr$
282	$R^4 = CH_2OCO\text{-}n\text{-}Bu$	294	$R^4 = (C=O)SMe$
283	$R^4 = CH_2OCO\text{-}sec\text{-}Bu$	295	$R^4 = COOMe$
284	$R^4 = CH_2OCO\text{-}i\text{-}Bu$	296	$R^4 = COOEt$
285	$R^4 = CH_2OCO\text{-}c\text{-}hexyl$	297	$R^4 = CO\text{-}n\text{-}Pr$
286	$R^4 = CH_2OCO\text{-}c\text{-}pentyl$	298	$R^4 = CONMe_2$
287	$R^4 = CH_2OCO\text{-}c\text{-}butyl$	299	$R^4 = (C=O)N\text{-}morpholine$
288	$R^4 = CH_2OCO\text{-}c\text{-}propyl$	300	$R^4 = (C=S)N\text{-}morpholine$

Table 301



$\sim$ indicates the bond can be cis or trans

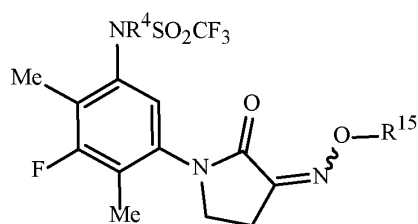
$R^4 = H$

R^{15}	R^{15}	R^{15}	R^{15}
H	Me	Et	n-Pr
i-Pr	n-Bu	i-Bu	CH_2F
CF_2H	CH_2CF_3	CH_2CF_2H	allyl
propargyl	$CH_2c\text{-}Pr$ (J-5)	$CH_2c\text{-}Bu$ (J-6)	

This disclosure also includes TABLES 302 through 325 wherein the Header Row
 5 Phrase in TABLE 301 (i.e. " $R^4 = H$ ") is replaced with the Header Row Phrase listed in the
 respective TABLE, and the remaining variable(s) are as defined in TABLE 301.

TABLE	Header Row Phrase	TABLE	Header Row Phrase
302	$R^4 = SO_2CF_3$	314	$R^4 CH_2OCOMe$
303	$R^4 = SO_2CH_3$	315	$R^4 CH_2OCOCH_2CH_3$
304	$R^4 = COMe$	316	$R^4 = CH_2OCOPh$
305	$R^4 = COEt$	317	$R^4 = CH_2OCO\text{-}n\text{-}Pr$
306	$R^4 = CH_2OCO\text{-}t\text{-}Bu$	318	$R^4 = CH_2OCO\text{-}i\text{-}Pr$
307	$R^4 = CH_2OCO\text{-}n\text{-}Bu$	319	$R^4 = (C=O)SMe$
308	$R^4 = CH_2OCO\text{-}sec\text{-}Bu$	320	$R^4 = COOMe$
309	$R^4 = CH_2OCO\text{-}i\text{-}Bu$	321	$R^4 = COOEt$
310	$R^4 = CH_2OCO\text{-}c\text{-}hexyl$	322	$R^4 = CO\text{-}n\text{-}Pr$
311	$R^4 = CH_2OCO\text{-}c\text{-}pentyl$	323	$R^4 = CONMe_2$
312	$R^4 = CH_2OCO\text{-}c\text{-}butyl$	324	$R^4 = (C=O)N\text{-}morpholine$
313	$R^4 = CH_2OCO\text{-}c\text{-}propyl$	325	$R^4 = (C=S)N\text{-}morpholine$

Table 326



indicates the bond can be cis or trans

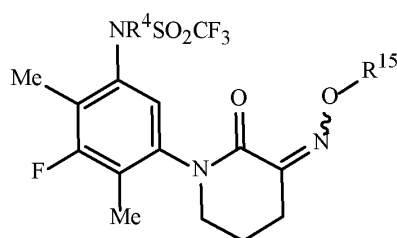
$R^4 = H$

R^{15}	R^{15}	R^{15}	R^{15}
H	Me	Et	n-Pr
i-Pr	n-Bu	i-Bu	CH_2F
CF_2H	CH_2CF_3	CH_2CF_2H	allyl
propargyl	$CH_2c\text{-Pr}$ (J-5)	$CH_2c\text{-Bu}$ (J-6)	

5 This disclosure also includes TABLES 327 through 350 wherein the Header Row Phrase in TABLE 326 (i.e. “ $R^4 = H$ ”) is replaced with the Header Row Phrase listed in the respective TABLE, and the remaining variable(s) are as defined in TABLE 326.

TABLE	Header Row Phrase	TABLE	Header Row Phrase
327	$R^4 = SO_2CF_3$	339	$R^4 CH_2OCOMe$
328	$R^4 = SO_2CH_3$	340	$R^4 CH_2OCOCH_2CH_3$
329	$R^4 = COMe$	341	$R^4 = CH_2OCOPh$
330	$R^4 = COEt$	342	$R^4 = CH_2OCO\text{-}n\text{-Pr}$
331	$R^4 = CH_2OCO\text{-}t\text{-Bu}$	343	$R^4 = CH_2OCO\text{-}i\text{-Pr}$
332	$R^4 = CH_2OCO\text{-}n\text{-Bu}$	344	$R^4 = (C=O)SMe$
333	$R^4 = CH_2OCO\text{-}sec\text{-Bu}$	345	$R^4 = COOMe$
334	$R^4 = CH_2OCO\text{-}i\text{-Bu}$	346	$R^4 = COOEt$
335	$R^4 = CH_2OCO\text{-}c\text{-hexyl}$	347	$R^4 = CO\text{-}n\text{-Pr}$
336	$R^4 = CH_2OCO\text{-}c\text{-pentyl}$	348	$R^4 = CONMe_2$
337	$R^4 = CH_2OCO\text{-}c\text{-butyl}$	349	$R^4 = (C=O)N\text{-morpholine}$
338	$R^4 = CH_2OCO\text{-}c\text{-propyl}$	350	$R^4 = (C=S)N\text{-morpholine}$

Table 351



5 indicates the bond can be cis or trans

R⁴ = H

R ¹⁵	R ¹⁵	R ¹⁵	R ¹⁵
H	Me	Et	n-Pr
i-Pr	n-Bu	i-Bu	CH ₂ F
CF ₂ H	CH ₂ CF ₃	CH ₂ CF ₂ H	allyl
propargyl	CH ₂ c-Pr (J-5)	CH ₂ c-Bu (J-6)	

This disclosure also includes TABLES 352 through 375 wherein the Header Row
 5 Phrase in TABLE 351 (i.e. “R⁴ = H”) is replaced with the Header Row Phrase listed in the
 respective TABLE, and the remaining variable(s) are as defined in TABLE 351.

TABLE	Header Row Phrase	TABLE	Header Row Phrase
352	R ⁴ = SO ₂ CF ₃	364	R ⁴ CH ₂ OCOMe
353	R ⁴ = SO ₂ CH ₃	365	R ⁴ CH ₂ OCOCH ₂ CH ₃
354	R ⁴ = COMe	366	R ⁴ = CH ₂ OCOPh
355	R ⁴ = COEt	367	R ⁴ = CH ₂ OCO- <i>n</i> -Pr
356	R ⁴ = CH ₂ OCO- <i>t</i> -Bu	368	R ⁴ = CH ₂ OCO- <i>i</i> -Pr
357	R ⁴ = CH ₂ OCO- <i>n</i> -Bu	369	R ⁴ = (C=O)SMe
358	R ⁴ = CH ₂ OCO- <i>sec</i> -Bu	370	R ⁴ = COOMe
359	R ⁴ = CH ₂ OCO- <i>i</i> -Bu	371	R ⁴ = COOEt
360	R ⁴ = CH ₂ OCO- <i>c</i> -hexyl	372	R ⁴ = CO- <i>n</i> -Pr
361	R ⁴ = CH ₂ OCO- <i>c</i> -pentyl	373	R ⁴ = CONMe ₂
362	R ⁴ = CH ₂ OCO- <i>c</i> -butyl	374	R ⁴ = (C=O)N-morpholine
363	R ⁴ = CH ₂ OCO- <i>c</i> -propyl	375	R ⁴ = (C=S)N-morpholine

10 Formulation/Utility

A compound of this disclosure will generally be used as a herbicidal active ingredient in a composition, i.e. formulation, with at least one additional component selected from the group consisting of surfactants, solid diluents and liquid diluents, which serves as a carrier. The formulation or composition ingredients are selected to be consistent with the physical

properties of the active ingredient, mode of application and environmental factors such as soil type, moisture and temperature.

Useful formulations include both liquid and solid compositions. Liquid compositions include solutions (including emulsifiable concentrates), suspensions, emulsions (including
5 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
10 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
15 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
20 intermediates for further formulation.

Sprayable formulations are typically extended in a suitable medium before spraying. Such liquid and solid formulations are formulated to be readily diluted in the spray medium, usually water, but occasionally another suitable medium like an aromatic or paraffinic hydrocarbon or vegetable oil. Spray volumes can range from about one to several
25 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.

30 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		
	<u>Active Ingredient</u>	<u>Diluent</u>	<u>Surfactant</u>
Water-Dispersible and Water-soluble Granules, Tablets and Powders	0.001–90	0–99.999	0–15
Oil Dispersions, Suspensions, Emulsions, Solutions (including Emulsifiable Concentrates)	1–50	40–99	0–50
Dusts	1–25	70–99	0–5
Granules and Pellets	0.001–99	5–99.999	0–15
High Strength Compositions	90–99	0–10	0–2

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

Liquid diluents include, for example, water, *N,N*-dimethylalkanamides (e.g., *N,N*-dimethylformamide), limonene, dimethyl sulfoxide, *N*-alkylpyrrolidones (e.g., *N*-methylpyrrolidinone), alkyl phosphates (e.g., triethyl phosphate), ethylene glycol, triethylene glycol, propylene glycol, dipropylene glycol, polypropylene glycol, propylene carbonate, butylene carbonate, paraffins (e.g., white mineral oils, normal paraffins, isoparaffins), alkylbenzenes, alkylnaphthalenes, glycerine, glycerol triacetate, sorbitol, aromatic hydrocarbons, dearomatized aliphatics, alkylbenzenes, alkylnaphthalenes, ketones such as cyclohexanone, 2-heptanone, isophorone and 4-hydroxy-4-methyl-2-pentanone, acetates such as isoamyl acetate, hexyl acetate, heptyl acetate, octyl acetate, nonyl acetate, tridecyl acetate and isobornyl acetate, other esters such as alkylated lactate esters, dibasic esters, alkyl and aryl benzoates and γ -butyrolactone, and alcohols, which can be linear, branched, saturated or unsaturated, such as methanol, ethanol, *n*-propanol, isopropyl alcohol, *n*-butanol, isobutyl alcohol, *n*-hexanol, 2-ethylhexanol, *n*-octanol, decanol, isodecyl alcohol, isooctadecanol, cetyl alcohol, lauryl alcohol, tridecyl alcohol, oleyl alcohol, cyclohexanol, tetrahydrofurfuryl alcohol, diacetone alcohol, cresol and benzyl alcohol. Liquid diluents also include glycerol esters of saturated and unsaturated fatty acids (typically C₆–C₂₂), 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.

5 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.

10 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
15 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
20 methyl esters; ethoxylated tristyrilphenol (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,
25 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
30 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
35 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 alkyl dimethylamine 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 as polyorganosiloxanes), sedimentation of active ingredients (suspending agents), viscosity (thixotropic thickeners), in-container microbial growth (antimicrobials), product freezing (antifreezes), color (dyes/pigment dispersions), wash-off (film formers or stickers), evaporation (evaporation retardants), and other formulation attributes. Film formers include, for example, polyvinyl acetates, polyvinyl acetate copolymers, polyvinylpyrrolidone-vinyl acetate copolymer, polyvinyl alcohols, polyvinyl alcohol copolymers and waxes. Examples of formulation auxiliaries and additives include those listed in *McCutcheon's Volume 2: Functional Materials*, annual International and North American editions published by McCutcheon's Division, The Manufacturing Confectioner Publishing Co.; and PCT Publication WO 03/024222.

The compound of Formula 1 and any other active ingredients are typically incorporated into the present compositions by dissolving the active ingredient in a solvent or by grinding in a liquid or dry diluent. Solutions, including emulsifiable concentrates, can be prepared by simply mixing the ingredients. If the solvent of a liquid composition intended for use as an emulsifiable concentrate is water-immiscible, an emulsifier is typically added to emulsify the active-containing solvent upon dilution with water. Active ingredient slurries, with particle diameters of up to 2,000 μm can be wet milled using media mills to obtain particles with

average diameters below 3 μm . Aqueous slurries can be made into finished suspension concentrates (see, for example, U.S. 3,060,084) or further processed by spray drying to form water-dispersible granules. Dry formulations usually require dry milling processes, which produce average particle diameters in the 2 to 10 μm range. Dusts and powders can be prepared by blending and usually grinding (such as with a hammer mill or fluid-energy mill). Granules and pellets can be prepared by spraying the active material upon preformed granular carriers or by agglomeration techniques. See Browning, "Agglomeration", *Chemical Engineering*, December 4, 1967, pp 147–48, *Perry's Chemical Engineer's Handbook*, 4th Ed., McGraw-Hill, New York, 1963, pages 8–57 and following, and WO 91/13546. Pellets can be prepared as described in U.S. 4,172,714. Water-dispersible and water-soluble granules can be prepared as taught in U.S. 4,144,050, U.S. 3,920,442 and DE 3,246,493. Tablets can be prepared as taught in U.S. 5,180,587, U.S. 5,232,701 and U.S. 5,208,030. Films can be prepared as taught in GB 2,095,558 and U.S. 3,299,566.

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

In the following Examples, all percentages are by weight and all formulations are prepared in conventional ways. Compound numbers refer to compounds in Index Table A. Without further elaboration, it is believed that one skilled in the art using the preceding description can utilize the present invention to its fullest extent. The following Examples are, therefore, to be construed as merely illustrative, and not limiting of the disclosure in any way whatsoever. Percentages are by weight except where otherwise indicated.

Example AHigh Strength Concentrate

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

Example BWettable Powder

Compound 1	65.0%
dodecylphenol polyethylene glycol ether	2.0%
sodium ligninsulfonate	4.0%
sodium silicoaluminate	6.0%
montmorillonite (calcined)	23.0%

Example CGranule

Compound 1	10.0%
attapulgite granules (low volatile matter, 0.71/0.30 mm; U.S.S. No. 25–50 sieves)	90.0%

Example DExtruded Pellet

Compound 1	25.0%
anhydrous sodium sulfate	10.0%
crude calcium ligninsulfonate	5.0%
sodium alkylnaphthalenesulfonate	1.0%
calcium/magnesium bentonite	59.0%

5

Example EEmulsifiable Concentrate

Compound 1	10.0%
polyoxyethylene sorbitol hexoleate	20.0%
C ₆ –C ₁₀ fatty acid methyl ester	70.0%

Example FMicroemulsion

Compound 1	5.0%
polyvinylpyrrolidone-vinyl acetate copolymer	30.0%
alkylpolyglycoside	30.0%
glyceryl monooleate	15.0%
water	20.0%

Example GSuspension Concentrate

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

Example HEmulsion in Water

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

Example IOil Dispersion

Compound 1	25%
polyoxyethylene sorbitol hexaoleate	15%
organically modified bentonite clay	2.5%
fatty acid methyl ester	57.5%

- Additional Example Formulations include Examples A through I above wherein
- 5 “Compound 1” is replaced in each of the Examples A through I with the respective compounds from Index Table A as shown below.

<u>Compound No.</u>	<u>Compound No.</u>	<u>Compound No.</u>	<u>Compound No.</u>	<u>Compound No.</u>
Compound 2	Compound 4	Compound 10	Compound 11	Compound 18
Compound 3	Compound 5	Compound 12	Compound 13	Compound 19
Compound 6	Compound 7	Compound 14	Compound 15	Compound 20
Compound 8	Compound 9	Compound 16	Compound 17	Compound 21

<u>Compound No.</u>	<u>Compound No.</u>	<u>Compound No.</u>	<u>Compound No.</u>	<u>Compound No.</u>
Compound 22	Compound 24	Compound 30	Compound 31	Compound 38
Compound 23	Compound 25	Compound 32	Compound 33	Compound 39
Compound 26	Compound 27	Compound 34	Compound 35	Compound 40
Compound 28	Compound 29	Compound 36	Compound 37	Compound 41
Compound 42	Compound 44	Compound 46	Compound 47	Compound 50
Compound 43	Compound 45	Compound 48	Compound 49	Compound 51
Compound 52	Compound 53	Compound 54	Compound 55	Compound 56
Compound 57	Compound 58	Compound 59	Compound 60	Compound 61
Compound 62	Compound 63	Compound 64		

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

As the compounds of the invention have both preemergent and postemergent herbicidal activity, to control undesired vegetation by killing or injuring the vegetation or reducing its

growth, the compounds can be usefully applied by a variety of methods involving contacting a herbicidally effective amount of a compound of the disclosure or a composition comprising said compound and at least one of a surfactant, a solid diluent or a liquid diluent, to the foliage or other part of the undesired vegetation or to the environment of the undesired vegetation such as the soil or water in which the undesired vegetation is growing or which surrounds the seed or other propagule of the undesired vegetation. Undesired vegetation includes at least one selected from the group consisting of grass weeds and broadleaf weeds. Undesired vegetation is selected from the group consisting of annual bluegrass, Benghal dayflower, blackgrass, black nightshade, broadleaf signalgrass, Canada thistle, cheat, common cocklebur (*Xanthium pensylvanicum*), common ragweed, corn poppies, field violet, giant foxtail, goosegrass, green foxtail, guinea grass, hairy beggarticks, herbicide-resistant black grass, horseweed, Italian rye grass, jimsonweed, Johnson grass (*Sorghum halepense*), large crabgrass, little seed canary grass, morning glory, Pennsylvania smartweed, pitted morning glory, prickly sida, quackgrass, redroot pigweed, shattercane, shepherd's purse, silky windgrass, sunflower (as weed in potato), wild buckwheat (*Polygonum convolvulus*), wild mustard (*Brassica kaber*), wild oat (*Avena fatua*), wild pointsettia, yellow foxtail, and yellow nutsedge (*Cyperus esculentus*).

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

In one common embodiment, a compound of the disclosure is applied, typically in a formulated composition, to a locus comprising desired vegetation (e.g., crops) and undesired vegetation (i.e. weeds), both of which may be seeds, seedlings and/or larger plants, in contact with a growth medium (e.g., soil). In this locus, a composition comprising a compound of the disclosure can be directly applied to a plant or a part thereof, particularly of the undesired vegetation, and/or to the growth medium in contact with the plant.

Plant varieties and cultivars of the desired vegetation in the locus treated with a compound of the disclosure can be obtained by conventional propagation and breeding methods or by genetic engineering methods. Genetically modified plants (transgenic plants) are those in which a heterologous gene (transgene) has been stably integrated into the plant's genome. A transgene that is defined by its particular location in the plant genome is called a transformation or transgenic event.

Genetically modified plant cultivars in the locus which can be treated according to the invention include those that are resistant against one or more biotic stresses (pests such as nematodes, insects, mites, fungi, etc.) or abiotic stresses (drought, cold temperature, soil

salinity, etc.) or that contain other desirable characteristics. Plants can be genetically modified to exhibit traits of, for example, herbicide tolerance, insect-resistance, modified oil profiles or drought tolerance.

Although most typically, compounds of the invention are used to control undesired
5 vegetation, contact of desired vegetation in the treated locus with compounds of the invention may result in super-additive or synergistic effects with genetic traits in the desired vegetation, including traits incorporated through genetic modification. For example, resistance to phytophagous insect pests or plant diseases, tolerance to biotic/abiotic stresses or storage stability may be greater than expected from the genetic traits in the desired vegetation.

10 Compounds of this invention can also be mixed with one or more other biologically active compounds or agents including herbicides, herbicide safeners, fungicides, insecticides, nematocides, bactericides, acaricides, growth regulators such as insect molting inhibitors and rooting stimulants, chemosterilants, semiochemicals, repellents, attractants, pheromones, feeding stimulants, plant nutrients, other biologically active compounds or entomopathogenic
15 bacteria, virus or fungi to form a multi-component pesticide giving an even broader spectrum of agricultural protection. Mixtures of the compounds of the invention with other herbicides can broaden the spectrum of activity against additional weed species, and suppress the proliferation of any resistant biotypes. Thus the present invention also pertains to a composition comprising a compound of Formula 1 (in a herbicidally effective amount) and at
20 least one additional biologically active compound or agent (in a biologically effective amount) and can further comprise at least one of a surfactant, a solid diluent or a liquid diluent. The other biologically active compounds or agents can be formulated in compositions comprising at least one of a surfactant, solid or liquid diluent. For mixtures of the present invention, one or more other biologically active compounds or agents can be formulated together with a
25 compound of Formula 1, to form a premix or one or more other biologically active compounds or agents can be formulated separately from the compound of Formula 1, and the formulations combined together before application (e.g., in a spray tank) or, alternatively, applied in succession.

A mixture of one or more of the following herbicides with a compound of this invention
30 may be particularly useful for weed control: acetochlor, acifluorfen and its sodium salt, aclonifen, acrolein (2-propenal), alachlor, alloxydim, ametryn, amicarbazone, amidosulfuron, aminocyclopyrachlor and its esters (e.g., methyl, ethyl) and salts (e.g., sodium, potassium), aminopyralid, amitrole, ammonium sulfamate, anilofos, asulam, atrazine, azimsulfuron, beflubutamid, beflubutamid-M, benazolin, benazolin-ethyl, bencarbazone, benfluralin,
35 benfuresate, bensulfuron-methyl, bensulide, bentazone, benzobicyclon, benzofenap, bicyclopyrone, bifenox, bilanafos, bispyribac and its sodium salt, bixlozone, bromacil, bromobutide, bromofenoxim, bromoxynil, bromoxynil octanoate, butachlor, butafenacil, butamifos, butralin, butroxydim, butylate, cafenstrole, carbetamide, carfentrazone-ethyl,

catechin, chlomethoxyfen, chloramben, chlorbromuron, chlorflurenol-methyl, chloridazon, chlorimuron-ethyl, chlorotoluron, chlorpropham, chlorsulfuron, chlorthal-dimethyl, chlorthiamid, cinidon-ethyl, cinmethylin, cinosulfuron, clacyfos, clefoxydim, clethodim, clodinafop-propargyl, clomazone, clomeprop, clopyralid, clopyralid-olamine, cloransulam-methyl, cumyluron, cyanazine, cycloate, cyclopyrimorate, cyclosulfamuron, cycloxydim, 5 cyhalofop-butyl, 2,4-D and its butotyl, butyl, isooctyl and isopropyl esters and its dimethylammonium, diolamine and trolamine salts, daimuron, dalapon, dalapon-sodium, dazomet, 2,4-DB and its dimethylammonium, potassium and sodium salts, desmedipham, desmetryn, dicamba and its diglycolammonium, dimethylammonium, potassium and sodium 10 salts, dichlobenil, dichlorprop, diclofop-methyl, diclosulam, difenzoquat metilsulfate, diflufenican, diflufenzopyr, dimefuron, dimepiperate, dimesulfazet, dimethachlor, dimethametryn, dimethenamid, dimethenamid-P, dimethipin, dimethylarsinic acid and its sodium salt, dinitramine, dinoterb, diphenamid, diquat dibromide, dithiopyr, diuron, DNOC, endothal, EPTC, epyrifencil, esprocarb, ethalfluralin, ethametsulfuron-methyl, ethiozin, 15 ethofumesate, ethoxyfen, ethoxysulfuron, etobenzanid, fenoxaprop-ethyl, fenoxaprop-P-ethyl, fenoxasulfone, fenquinotrione, fentrazamide, fenuron, fenuron-TCA, flamprop-methyl, flamprop-M-isopropyl, flamprop-M-methyl, flazasulfuron, florasulam, fluazifop-butyl, fluazifop-P-butyl, fluazolate, flucarbazone, flucetosulfuron, fluchloralin, flufenacet, flufenpyr, flufenpyr-ethyl, flumetsulam, flumiclorac-pentyl, flumioxazin, fluometuron, 20 fluoroglycofen-ethyl, flupoxam, flupyrsulfuron-methyl and its sodium salt, flurenol, flurenol-butyl, fluridone, flurochloridone, fluroxypyr, flurtamone, fluthiacet-methyl, fomesafen, foramsulfuron, fosamine-ammonium, glufosinate, glufosinate-ammonium, glufosinate-P, glyphosate and its salts such as ammonium, isopropylammonium, potassium, sodium (including sesquisodium) and trimesium (alternatively named sulfosate), halauxifen, 25 halauxifen-methyl, halosulfuron-methyl, haloxyfop-etotyl, haloxyfop-methyl, hexazinone, hydantocidin, imazamethabenz-methyl, imazamox, imazapic, imazapyr, imazaquin, imazaquin-ammonium, imazethapyr, imazethapyr-ammonium, imazosulfuron, indanofan, indaziflam, iofensulfuron, iodosulfuron-methyl, ioxynil, ioxynil octanoate, ioxynil-sodium, ipfencarbazone, isoproturon, isouron, isoxaben, isoxaflutole, isoxachlortole, lactofen, lenacil, 30 linuron, maleic hydrazide, MCPA and its salts (e.g., MCPA-dimethylammonium, MCPA-potassium and MCPA-sodium, esters (e.g., MCPA-2-ethylhexyl, MCPA-butotyl) and thioesters (e.g., MCPA-thioethyl), MCPB and its salts (e.g., MCPB-sodium) and esters (e.g., MCPB-ethyl), mecoprop, mecoprop-P, mefenacet, mefluidide, mesosulfuron-methyl, mesotrione, metam-sodium, metamifop, metamitron, metazachlor, metazosulfuron, 35 methabenzthiazuron, methylarsonic acid and its calcium, monoammonium, monosodium and disodium salts, methyldymron, metobenzuron, metobromuron, metolachlor, S-metolachlor, metosulam, metoxuron, metribuzin, metsulfuron-methyl, molinate, monolinuron, naproanilide, napropamide, napropamide-M, naptalam, neburon, nicosulfuron, norflurazon

orbencarb or thosulfamuron oryzalin, oxadiargyl, oxadiazon, oxasulfuron, oxaziclomefone, oxyfluorfen, paraquat dichloride, pebulate, pelargonic acid, pendimethalin, penoxsulam, pentanochlor, pentoxazone, perfluidone, pethoxamid, pethoxyamid, phenmedipham, picloram, picloram-potassium, picolinafen, pinoxaden, piperophos, pretilachlor, 5 primisulfuron-methyl, prodiamine, profoxydim, prometon, prometryn, propachlor, propanil, propaquizafop, propazine, propham, propisochlor, propoxycarbazone, propyrisulfuron, propyzamide, prosulfocarb, prosulfuron, pyraclonil, pyraflufen-ethyl, pyrasulfotole, pyrazogyl, pyrazolynate, pyrazoxyfen, pyrazosulfuron-ethyl, pyribenzoxim, pyributicarb, pyridate, pyriftalid, pyriminobac-methyl, pyrimisulfan, pyriothobac, pyriothobac-sodium, 10 pyroxasulfone, pyroxulam, quinclorac, quinmerac, quincloramine, quizalofop-ethyl, quizalofop-P-ethyl, quizalofop-P-tefuryl, rimsulfuron, saflufenacil, sethoxydim, siduron, simazine, simetryn, sulcotrione, sulfentrazone, sulfometuron-methyl, sulfosulfuron, 2,3,6-TBA, TCA, TCA-sodium, tebutam, tebuthiuron, tefuryltrione, tembotrione, tepraloxydim, terbacil, terbumeton, terbuthylazine, terbutryn, tetflupyrolimet, thenylchlor, thiazopyr, 15 thiencarbazone, thifensulfuron-methyl, thiobencarb, tiafenacil, tiocarbamil, tolpyralate, topramezone, tralkoxydim, tri-allate, triafamone, triasulfuron, triaziflam, tribenuron-methyl, triclopyr, triclopyr-butotyl, triclopyr-triethylammonium, tridiphane, trietazine, trifloxysulfuron, trifludimoxazin, trifluralin, triflusulfuron-methyl, tritosulfuron, vernolate, 3-(2-chloro-3,6-difluorophenyl)-4-hydroxy-1-methyl-1,5-naphthyridin-2(1*H*)-one, 5-chloro-3- 20 [(2-hydroxy-6-oxo-1-cyclohexen-1-yl)carbonyl]-1-(4-methoxyphenyl)-2(1*H*)-quinoxalinone, 2-chloro-*N*-(1-methyl-1*H*-tetrazol-5-yl)-6-(trifluoromethyl)-3-pyridinecarboxamide, 7-(3,5-dichloro-4-pyridinyl)-5-(2,2-difluoroethyl)-8-hydroxypyrido[2,3-*b*]pyrazin-6(5*H*)-one), 4-(2,6-diethyl-4-methylphenyl)-5-hydroxy-2,6-dimethyl-3(2*H*)-pyridazinone), 5-[[[(2,6-difluorophenyl)methoxy]methyl]-4,5-dihydro-5-methyl-3-(3-methyl-2-thienyl)isoxazole 25 (previously methioxolin), 4-(4-fluorophenyl)-6-[(2-hydroxy-6-oxo-1-cyclohexen-1-yl)carbonyl]-2-methyl-1,2,4-triazine-3,5(2*H*,4*H*)-dione, methyl 4-amino-3-chloro-6-(4-chloro-2-fluoro-3-methoxyphenyl)-5-fluoro-2-pyridinecarboxylate, 2-methyl-3-(methylsulfonyl)-*N*-(1-methyl-1*H*-tetrazol-5-yl)-4-(trifluoromethyl)benzamide and 2-methyl-*N*-(4-methyl-1,2,5-oxadiazol-3-yl)-3-(methylsulfinyl)-4-(trifluoromethyl)benzamide. Other 30 herbicides also include bioherbicides such as *Alternaria destruens* Simmons, *Colletotrichum gloeosporioides* (Penz.) Penz. & Sacc., *Drechslera monoceras* (MTB-951), *Myrothecium verrucaria* (Albertini & Schweinitz) Ditmar: Fries, *Phytophthora palmivora* (Butl.) Butl. and *Puccinia thlaspeos* Schub.

Compounds of this invention can also be used in combination with plant growth 35 regulators such as aviglycine, *N*-(phenylmethyl)-1*H*-purin-6-amine, epocholeone, gibberellic acid, gibberellin A₄ and A₇, harpin protein, mepiquat chloride, prohexadione calcium, prohydrojasmon, sodium nitrophenolate and trinexapac-methyl, and plant growth modifying organisms such as *Bacillus cereus* strain BP01.

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

For embodiments where one or more of these various mixing partners are used, the mixing partners are typically used in the amounts similar to amounts customary when the mixture partners are used alone. More particularly in mixtures, active ingredients are often applied at an application rate between one-half and the full application rate specified on product labels for use of active ingredient alone. These amounts are listed in references such as *The Pesticide Manual* and *The BioPesticide Manual*. The weight ratio of these various mixing partners (in total) to the compound of Formula 1 is typically between about 1:3000 and about 3000:1. Of note are weight ratios between about 1:300 and about 300:1 (for example ratios between about 1:30 and about 30:1). One skilled in the art can easily determine through simple experimentation the biologically effective amounts of active ingredients necessary for the desired spectrum of biological activity. It will be evident that including these additional components may expand the spectrum of weeds controlled beyond the spectrum controlled by the compound of Formula 1 alone.

In certain instances, combinations of a compound of this invention with other biologically active (particularly herbicidal) compounds or agents (i.e. active ingredients) can result in a greater-than-additive (i.e. synergistic) effect on weeds and/or a less-than-additive effect (i.e. safening) on crops or other desirable plants. Reducing the quantity of active ingredients released in the environment while ensuring effective pest control is always desirable. Ability to use greater amounts of active ingredients to provide more effective weed control without excessive crop injury is also desirable. When synergism of herbicidal active ingredients occurs on weeds at application rates giving agronomically satisfactory levels of weed control, such combinations can be advantageous for reducing crop production cost and decreasing environmental load. When safening of herbicidal active ingredients occurs on crops, such combinations can be advantageous for increasing crop protection by reducing weed competition.

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

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

Compounds of the invention can also be mixed with: (1) polynucleotides including but not limited to DNA, RNA, and/or chemically modified nucleotides influencing the amount of a particular target through down regulation, interference, suppression or silencing of the genetically derived transcript that render a herbicidal effect; or (2) polynucleotides including but not limited to DNA, RNA, and/or chemically modified nucleotides influencing the amount of a particular target through down regulation, interference, suppression or silencing of the genetically derived transcript that render a safening effect.

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

Preferred for better control of undesired vegetation (e.g., lower use rate such as from synergism, broader spectrum of weeds controlled or enhanced crop safety) or for preventing the development of resistant weeds are mixtures of a compound of this invention with a

herbicide selected from the group consisting of atrazine, azimsulfuron, beflubutamid, *S*-beflubutamid, benzisothiazolinone, carfentrazone-ethyl, chlorimuron-ethyl, chlorsulfuron-methyl, clomazone, clopyralid potassium, cloransulam-methyl, 2-[(2,4-dichlorophenyl)methyl]-4,4-dimethyl-3-isoxazolidinone (CA No. 81777-95-9) and 2-[(2,5-dichlorophenyl)methyl]-4,4-dimethyl-3-isoxazolidinone (CA No. 81778-66-7) ethametsulfuron-methyl, flumetsulam, 4-(4-fluorophenyl)-6-[(2-hydroxy-6-oxo-1-cyclohexen-1-yl)carbonyl]-2-methyl-1,2,4-triazine-3,5-(2*H*,4*H*)-dione, flupyrsulfuron-methyl, fluthiacet-methyl, fomesafen, imazethapyr, lenacil, mesotrione, metribuzin, metsulfuron-methyl, pethoxamid, picloram, pyroxasulfone, quinclorac, rimsulfuron, rinskor, *S*-metolachlor, sulfentrazone, thifensulfuron-methyl, triflurosulfuron-methyl and tribenuron-methyl.

Table A1 lists specific combinations of a Component (a) with Component (b) illustrative of the mixtures, compositions and methods of the present invention. Compound # in the Component (a) column is identified in Index Table A. The second column of Table A1 lists the specific Component (b) compound (e.g., “2,4-D” in the first line). The third, fourth and fifth columns of Table A1 lists ranges of weight ratios for rates at which the Component (a) compound is typically applied to a field-grown crop relative to Component (b) (i.e. (a):(b)). Thus, for example, the first line of Table A1 specifically discloses the combination of Component (a) (i.e. Compound 45 in Index Table A) with 2,4-D is typically applied in a weight ratio between 1:192 – 6:1. The remaining lines of Table A1 are to be construed similarly.

TABLE A1

<u>Component (a)</u> <u>(Compound #)</u>	<u>Component (b)</u>	<u>Typical</u> <u>Weight Ratio</u>	<u>More Typical</u> <u>Weight Ratio</u>	<u>Most Typical</u> <u>Weight Ratio</u>
1	2,4-D	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Acetochlor	1:768 – 2:1	1:256 – 1:2	1:96 – 1:11
1	Acifluorfen	1:96 – 12:1	1:32 – 4:1	1:12 – 1:2
1	Aclonifen	1:857 – 2:1	1:285 – 1:3	1:107 – 1:12
1	Alachlor	1:768 – 2:1	1:256 – 1:2	1:96 – 1:11
1	Ametryn	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Amicarbazone	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Amidosulfuron	1:6 – 168:1	1:2 – 56:1	1:1 – 11:1
1	Aminocyclopyrachlor	1:48 – 24:1	1:16 – 8:1	1:6 – 2:1
1	Aminopyralid	1:20 – 56:1	1:6 – 19:1	1:2 – 4:1
1	Amitrole	1:768 – 2:1	1:256 – 1:2	1:96 – 1:11
1	Anilofos	1:96 – 12:1	1:32 – 4:1	1:12 – 1:2
1	Asulam	1:960 – 2:1	1:320 – 1:3	1:120 – 1:14
1	Atrazine	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Azimsulfuron	1:6 – 168:1	1:2 – 56:1	1:1 – 11:1

<u>Component (a)</u> <u>(Compound #)</u>	<u>Component (b)</u>	<u>Typical</u> <u>Weight Ratio</u>	<u>More Typical</u> <u>Weight Ratio</u>	<u>Most Typical</u> <u>Weight Ratio</u>
1	Beflubutamid	1:342 – 4:1	1:114 – 2:1	1:42 – 1:5
1	Benfuresate	1:617 – 2:1	1:205 – 1:2	1:77 – 1:9
1	Bensulfuron-methyl	1:25 – 45:1	1:8 – 15:1	1:3 – 3:1
1	Bentazone	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Benzobicyclon	1:85 – 14:1	1:28 – 5:1	1:10 – 1:2
1	Benzofenap	1:257 – 5:1	1:85 – 2:1	1:32 – 1:4
1	Bicyclopyrone	1:42 – 27:1	1:14 – 9:1	1:5 – 2:1
1	Bifenox	1:257 – 5:1	1:85 – 2:1	1:32 – 1:4
1	Bispyribac-sodium	1:10 – 112:1	1:3 – 38:1	1:1 – 7:1
1	Bromacil	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Bromobutide	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Bromoxynil	1:96 – 12:1	1:32 – 4:1	1:12 – 1:2
1	Butachlor	1:768 – 2:1	1:256 – 1:2	1:96 – 1:11
1	Butafenacil	1:42 – 27:1	1:14 – 9:1	1:5 – 2:1
1	Butylate	1:1542 – 1:2	1:514 – 1:5	1:192 – 1:22
1	Carfenstrole	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Carfentrazone-ethyl	1:128 – 9:1	1:42 – 3:1	1:16 – 1:2
1	Chlorimuron-ethyl	1:8 – 135:1	1:2 – 45:1	1:1 – 9:1
1	Chlorotoluron	1:768 – 2:1	1:256 – 1:2	1:96 – 1:11
1	Chlorsulfuron	1:6 – 168:1	1:2 – 56:1	1:1 – 11:1
1	Cincosulfuron	1:17 – 68:1	1:5 – 23:1	1:2 – 5:1
1	Cinidon-ethyl	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Cinmethylin	1:34 – 34:1	1:11 – 12:1	1:4 – 3:1
1	Clacyfos	1:34 – 34:1	1:11 – 12:1	1:4 – 3:1
1	Clethodim	1:48 – 24:1	1:16 – 8:1	1:6 – 2:1
1	Clodinafop-propargyl	1:20 – 56:1	1:6 – 19:1	1:2 – 4:1
1	Clomazone	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Clomeprop	1:171 – 7:1	1:57 – 3:1	1:21 – 1:3
1	Clopyralid	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Cloransulam-methyl	1:12 – 96:1	1:4 – 32:1	1:1 – 6:1
1	Cumyluron	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Cyanazine	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Cyclopyrimorate	1:17 – 68:1	1:5 – 23:1	1:2 – 5:1
1	Cyclosulfamuron	1:17 – 68:1	1:5 – 23:1	1:2 – 5:1
1	Cycloxydim	1:96 – 12:1	1:32 – 4:1	1:12 – 1:2

<u>Component (a)</u> <u>(Compound #)</u>	<u>Component (b)</u>	<u>Typical</u> <u>Weight Ratio</u>	<u>More Typical</u> <u>Weight Ratio</u>	<u>Most Typical</u> <u>Weight Ratio</u>
1	Cyhalofop	1:25 – 45:1	1:8 – 15:1	1:3 – 3:1
1	Daimuron	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Desmedipham	1:322 – 4:1	1:107 – 2:1	1:40 – 1:5
1	Dicamba	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Dichlobenil	1:1371 – 1:2	1:457 – 1:4	1:171 – 1:20
1	Dichlorprop	1:925 – 2:1	1:308 – 1:3	1:115 – 1:13
1	Diclofop-methyl	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Diclosulam	1:10 – 112:1	1:3 – 38:1	1:1 – 7:1
1	Difenzoquat	1:288 – 4:1	1:96 – 2:1	1:36 – 1:4
1	Diflufenican	1:857 – 2:1	1:285 – 1:3	1:107 – 1:12
1	Diflufenzopyr	1:12 – 96:1	1:4 – 32:1	1:1 – 6:1
1	Dimethachlor	1:768 – 2:1	1:256 – 1:2	1:96 – 1:11
1	Dimethametryn	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Dimethenamid-P	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Dithiopyr	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Diuron	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	EPTC	1:768 – 2:1	1:256 – 1:2	1:96 – 1:11
1	Esprocarb	1:1371 – 1:2	1:457 – 1:4	1:171 – 1:20
1	Ethalfuralin	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Ethametsulfuron-methyl	1:17 – 68:1	1:5 – 23:1	1:2 – 5:1
1	Ethoxyfen	1:8 – 135:1	1:2 – 45:1	1:1 – 9:1
1	Ethoxysulfuron	1:20 – 56:1	1:6 – 19:1	1:2 – 4:1
1	Etobenzanid	1:257 – 5:1	1:85 – 2:1	1:32 – 1:4
1	Fenoxaprop-ethyl	1:120 – 10:1	1:40 – 4:1	1:15 – 1:2
1	Fenoxasulfone	1:85 – 14:1	1:28 – 5:1	1:10 – 1:2
1	Fenquinothione	1:17 – 68:1	1:5 – 23:1	1:2 – 5:1
1	Fentrazamide	1:17 – 68:1	1:5 – 23:1	1:2 – 5:1
1	Flazasulfuron	1:17 – 68:1	1:5 – 23:1	1:2 – 5:1
1	Florasulam	1:2 – 420:1	1:1 – 140:1	2:1 – 27:1
1	Fluazifop-butyl	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Flucarbazone	1:8 – 135:1	1:2 – 45:1	1:1 – 9:1
1	Flucetosulfuron	1:8 – 135:1	1:2 – 45:1	1:1 – 9:1
1	Flufenacet	1:257 – 5:1	1:85 – 2:1	1:32 – 1:4
1	Flumetsulam	1:24 – 48:1	1:8 – 16:1	1:3 – 3:1
1	Flumiclorac-pentyl	1:10 – 112:1	1:3 – 38:1	1:1 – 7:1

<u>Component (a)</u> <u>(Compound #)</u>	<u>Component (b)</u>	<u>Typical</u> <u>Weight Ratio</u>	<u>More Typical</u> <u>Weight Ratio</u>	<u>Most Typical</u> <u>Weight Ratio</u>
1	Flumioxazin	1:25 – 45:1	1:8 – 15:1	1:3 – 3:1
1	Fluometuron	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Flupyr-sulfuron-methyl	1:3 – 336:1	1:1 – 112:1	2:1 – 21:1
1	Fluridone	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Fluroxypyr	1:96 – 12:1	1:32 – 4:1	1:12 – 1:2
1	Flurtamone	1:857 – 2:1	1:285 – 1:3	1:107 – 1:12
1	Fluthiacet-methyl	1:48 – 42:1	1:16 – 14:1	1:3 – 3:1
1	Fomesafen	1:96 – 12:1	1:32 – 4:1	1:12 – 1:2
1	Foramsulfuron	1:13 – 84:1	1:4 – 28:1	1:1 – 6:1
1	Glufosinate	1:288 – 4:1	1:96 – 2:1	1:36 – 1:4
1	Glyphosate	1:288 – 4:1	1:96 – 2:1	1:36 – 1:4
1	Halosulfuron-methyl	1:17 – 68:1	1:5 – 23:1	1:2 – 5:1
1	Halauxifen	1:20 – 56:1	1:6 – 19:1	1:2 – 4:1
1	Halauxifen methyl	1:20 – 56:1	1:6 – 19:1	1:2 – 4:1
1	Haloxyp-methyl	1:34 – 34:1	1:11 – 12:1	1:4 – 3:1
1	Hexazinone	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Hydantocidin	1:1100 – 16:1	1:385 – 8:1	1:144 – 4:1
1	Imazamox	1:13 – 84:1	1:4 – 28:1	1:1 – 6:1
1	Imazapic	1:20 – 56:1	1:6 – 19:1	1:2 – 4:1
1	Imazapyr	1:85 – 14:1	1:28 – 5:1	1:10 – 1:2
1	Imazaquin	1:34 – 34:1	1:11 – 12:1	1:4 – 3:1
1	Imazethabenz-methyl	1:171 – 7:1	1:57 – 3:1	1:21 – 1:3
1	Imazethapyr	1:24 – 48:1	1:8 – 16:1	1:3 – 3:1
1	Imazosulfuron	1:27 – 42:1	1:9 – 14:1	1:3 – 3:1
1	Indanofan	1:342 – 4:1	1:114 – 2:1	1:42 – 1:5
1	Indaziflam	1:25 – 45:1	1:8 – 15:1	1:3 – 3:1
1	Iodosulfuron-methyl	1:3 – 336:1	1:1 – 112:1	2:1 – 21:1
1	Ioxynil	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Ipfencarbazone	1:85 – 14:1	1:28 – 5:1	1:10 – 1:2
1	Isoproturon	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Isoxaben	1:288 – 4:1	1:96 – 2:1	1:36 – 1:4
1	Isoxaflutole	1:60 – 20:1	1:20 – 7:1	1:7 – 2:1
1	Lactofen	1:42 – 27:1	1:14 – 9:1	1:5 – 2:1
1	Lenacil	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Linuron	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6

<u>Component (a)</u> <u>(Compound #)</u>	<u>Component (b)</u>	<u>Typical</u> <u>Weight Ratio</u>	<u>More Typical</u> <u>Weight Ratio</u>	<u>Most Typical</u> <u>Weight Ratio</u>
1	MCPA	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	MCPB	1:288 – 4:1	1:96 – 2:1	1:36 – 1:4
1	Mecoprop	1:768 – 2:1	1:256 – 1:2	1:96 – 1:11
1	Mefenacet	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Mefluidide	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Mesosulfuron-methyl	1:5 – 224:1	1:1 – 75:1	1:1 – 14:1
1	Mesotrione	1:42 – 27:1	1:14 – 9:1	1:5 – 2:1
1	Metamifop	1:42 – 27:1	1:14 – 9:1	1:5 – 2:1
1	Metazachlor	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Metazosulfuron	1:25 – 45:1	1:8 – 15:1	1:3 – 3:1
1	Methabenzthiazuron	1:768 – 2:1	1:256 – 1:2	1:96 – 1:11
1	Metolachlor	1:768 – 2:1	1:256 – 1:2	1:96 – 1:11
1	Metosulam	1:8 – 135:1	1:2 – 45:1	1:1 – 9:1
1	Metribuzin	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Metsulfuron-methyl	1:2 – 560:1	1:1 – 187:1	3:1 – 35:1
1	Molinate	1:1028 – 2:1	1:342 – 1:3	1:128 – 1:15
1	Napropamide	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Napropamide-M	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Naptalam	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Nicosulfuron	1:12 – 96:1	1:4 – 32:1	1:1 – 6:1
1	Norflurazon	1:1152 – 1:1	1:384 – 1:3	1:144 – 1:16
1	Orbencarb	1:1371 – 1:2	1:457 – 1:4	1:171 – 1:20
1	Orthosulfamuron	1:20 – 56:1	1:6 – 19:1	1:2 – 4:1
1	Oryzalin	1:514 – 3:1	1:171 – 1:2	1:64 – 1:8
1	Oxadiargyl	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Oxadiazon	1:548 – 3:1	1:182 – 1:2	1:68 – 1:8
1	Oxasulfuron	1:27 – 42:1	1:9 – 14:1	1:3 – 3:1
1	Oxaziclomefone	1:42 – 27:1	1:14 – 9:1	1:5 – 2:1
1	Oxyfluorfen	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Paraquat	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Pendimethalin	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Penoxsulam	1:10 – 112:1	1:3 – 38:1	1:1 – 7:1
1	Pentoxamid	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Pentoxazone	1:102 – 12:1	1:34 – 4:1	1:12 – 1:2
1	Phenmedipham	1:102 – 12:1	1:34 – 4:1	1:12 – 1:2

<u>Component (a)</u> <u>(Compound #)</u>	<u>Component (b)</u>	<u>Typical</u> <u>Weight Ratio</u>	<u>More Typical</u> <u>Weight Ratio</u>	<u>Most Typical</u> <u>Weight Ratio</u>
1	Picloram	1:96 – 12:1	1:32 – 4:1	1:12 – 1:2
1	Picolinafen	1:34 – 34:1	1:11 – 12:1	1:4 – 3:1
1	Pinoxaden	1:25 – 45:1	1:8 – 15:1	1:3 – 3:1
1	Pretilachlor	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Primisulfuron-methyl	1:8 – 135:1	1:2 – 45:1	1:1 – 9:1
1	Prodiamine	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Profoxydim	1:42 – 27:1	1:14 – 9:1	1:5 – 2:1
1	Prometryn	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Propachlor	1:1152 – 1:1	1:384 – 1:3	1:144 – 1:16
1	Propanil	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Propaquizafop	1:48 – 24:1	1:16 – 8:1	1:6 – 2:1
1	Propoxycarbazone	1:17 – 68:1	1:5 – 23:1	1:2 – 5:1
1	Propyrisulfuron	1:17 – 68:1	1:5 – 23:1	1:2 – 5:1
1	Propyzamide	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Prosulfocarb	1:1200 – 1:2	1:400 – 1:4	1:150 – 1:17
1	Prosulfuron	1:6 – 168:1	1:2 – 56:1	1:1 – 11:1
1	Pyraclonil	1:42 – 27:1	1:14 – 9:1	1:5 – 2:1
1	Pyraflufen-ethyl	1:5 – 224:1	1:1 – 75:1	1:1 – 14:1
1	Pyrasulfotole	1:13 – 84:1	1:4 – 28:1	1:1 – 6:1
1	Pyrazolynate	1:857 – 2:1	1:285 – 1:3	1:107 – 1:12
1	Pyrazosulfuron-ethyl	1:10 – 112:1	1:3 – 38:1	1:1 – 7:1
1	Pyrazoxyfen	1:5 – 224:1	1:1 – 75:1	1:1 – 14:1
1	Pyribenzoxim	1:10 – 112:1	1:3 – 38:1	1:1 – 7:1
1	Pyributicarb	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Pyridate	1:288 – 4:1	1:96 – 2:1	1:36 – 1:4
1	Pyriftalid	1:10 – 112:1	1:3 – 38:1	1:1 – 7:1
1	Pyriminobac-methyl	1:20 – 56:1	1:6 – 19:1	1:2 – 4:1
1	Pyrimisulfan	1:17 – 68:1	1:5 – 23:1	1:2 – 5:1
1	Pyriothiobac	1:24 – 48:1	1:8 – 16:1	1:3 – 3:1
1	Pyroxasulfone	1:85 – 14:1	1:28 – 5:1	1:10 – 1:2
1	Pyroxulam	1:5 – 224:1	1:1 – 75:1	1:1 – 14:1
1	Quinclorac	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Quizalofop-ethyl	1:42 – 27:1	1:14 – 9:1	1:5 – 2:1
1	Rimsulfuron	1:13 – 84:1	1:4 – 28:1	1:1 – 6:1
1	Saflufenacil	1:25 – 45:1	1:8 – 15:1	1:3 – 3:1

<u>Component (a)</u> <u>(Compound #)</u>	<u>Component (b)</u>	<u>Typical</u> <u>Weight Ratio</u>	<u>More Typical</u> <u>Weight Ratio</u>	<u>Most Typical</u> <u>Weight Ratio</u>
1	Sethoxydim	1:96 – 12:1	1:32 – 4:1	1:12 – 1:2
1	Simazine	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Sulcotrione	1:120 – 10:1	1:40 – 4:1	1:15 – 1:2
1	Sulfentrazone	1:147 – 8:1	1:49 – 3:1	1:18 – 1:3
1	Sulfometuron-methyl	1:34 – 34:1	1:11 – 12:1	1:4 – 3:1
1	Sulfosulfuron	1:8 – 135:1	1:2 – 45:1	1:1 – 9:1
1	Tebuthiuron	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Tefuryltrione	1:42 – 27:1	1:14 – 9:1	1:5 – 2:1
1	Tembotrione	1:31 – 37:1	1:10 – 13:1	1:3 – 3:1
1	Tepaloxymid	1:25 – 45:1	1:8 – 15:1	1:3 – 3:1
1	Terbacil	1:288 – 4:1	1:96 – 2:1	1:36 – 1:4
1	Terbutylazine	1:857 – 2:1	1:285 – 1:3	1:107 – 1:12
1	Terbutryn	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Thenylchlor	1:85 – 14:1	1:28 – 5:1	1:10 – 1:2
1	Thiazopyr	1:384 – 3:1	1:128 – 1:1	1:48 – 1:6
1	Thiencarbazone	1:3 – 336:1	1:1 – 112:1	2:1 – 21:1
1	Thifensulfuron-methyl	1:5 – 224:1	1:1 – 75:1	1:1 – 14:1
1	Tiafenacil	1:17 – 68:1	1:5 – 23:1	1:2 – 5:1
1	Thiobencarb	1:768 – 2:1	1:256 – 1:2	1:96 – 1:11
1	Tolpyralate	1:31 – 37:1	1:10 – 13:1	1:3 – 3:1
1	Topramzone	1:6 – 168:1	1:2 – 56:1	1:1 – 11:1
1	Tralkoxydim	1:68 – 17:1	1:22 – 6:1	1:8 – 2:1
1	Triafamone	1:2 – 420:1	1:1 – 140:1	2:1 – 27:1
1	Triallate	1:768 – 2:1	1:256 – 1:2	1:96 – 1:11
1	Triasulfuron	1:5 – 224:1	1:1 – 75:1	1:1 – 14:1
1	Triaziflam	1:171 – 7:1	1:57 – 3:1	1:21 – 1:3
1	Tribenuron-methyl	1:3 – 336:1	1:1 – 112:1	2:1 – 21:1
1	Triclopyr	1:192 – 6:1	1:64 – 2:1	1:24 – 1:3
1	Trifloxysulfuron	1:2 – 420:1	1:1 – 140:1	2:1 – 27:1
1	Trifludimoxazin	1:25 – 45:1	1:8 – 15:1	1:3 – 3:1
1	Trifluralin	1:288 – 4:1	1:96 – 2:1	1:36 – 1:4
1	Triflusulfuron-methyl	1:17 – 68:1	1:5 – 23:1	1:2 – 5:1
1	Tritosulfuron	1:13 – 84:1	1:4 – 28:1	1:1 – 6:1

Table A2 is constructed the same as Table A1 above except that entries below the “Component (a)” column heading are replaced with the respective Component (a) Column

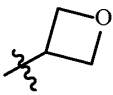
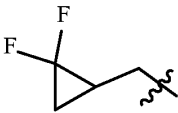
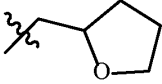
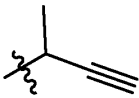
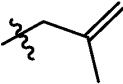
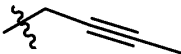
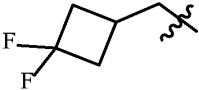
Entry shown below. Compound No. in the Component (a) column is identified in Index Table A. Thus, for example, in Table A2 the entries below the “Component (a)” column heading all recite “Compound 2” (i.e. Compound 2 identified in Index Table A), and the first line below the column headings in Table A2 specifically discloses a mixture of Compound 2 with 2,4-D. Tables A3 through A64 are constructed similarly.

<u>Table</u>	<u>Component</u> <u>(a) Column</u>	<u>Table</u> <u>Number</u>	<u>Component</u> <u>(a) Column</u>	<u>Table</u>	<u>Component</u> <u>(a) Column</u>	<u>Table</u> <u>Number</u>	<u>Component</u> <u>(a) Column</u>
<u>Number</u>	<u>Entries</u>		<u>Entries</u>	<u>Number</u>	<u>Entries</u>		<u>Entries</u>
A2	2	A18	18	A34	34	A50	50
A3	3	A19	19	A35	35	A51	51
A4	4	A20	20	A36	36	A52	52
A5	5	A21	21	A37	37	A53	53
A6	6	A22	22	A38	38	A54	54
A7	7	A23	23	A39	39	A55	55
A8	8	A24	24	A40	40	A56	56
A9	9	A25	25	A41	41	A57	57
A10	10	A26	26	A42	42	A58	58
A11	11	A27	27	A43	43	A59	59
A12	12	A28	28	A44	44	A60	60
A13	13	A29	29	A45	45	A61	61
A14	14	A30	30	A46	46	A62	62
A15	15	A31	31	A47	47	A63	63
A16	16	A32	32	A48	48	A64	64
A17	17	A33	33	A49	49		

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

The following Tests demonstrate the control efficacy of the compounds of this invention against specific weeds. The weed control afforded by the compounds is not limited, however, to these species. See Index Table A for compound descriptions. The following abbreviations are used in the Index Tables which follow: t is tertiary, s is secondary, n is normal, i is iso, c is cyclo, Me is methyl, Et is ethyl, Pr is propyl, i-Pr is isopropyl, Bu is butyl, c-Pr is cyclopropyl, c-Bu is cyclobutyl, c-Pen is cyclopentyl, t-Bu is tert-butyl, i-Bu is iso-butyl, Ph is phenyl,

OMe is methoxy, OEt is ethoxy, SMe is methylthio, SEt is ethylthio, -CN is cyano, -NC2 is nitro, TMS is trimethylsilyl, allyl is $\text{CH}_2\text{CH}=\text{CH}_2$, propargyl is $\text{CH}_2\text{C}\equiv\text{CH}$ and naphthyl means naphthalenyl. Some other structures are defined in the table below.

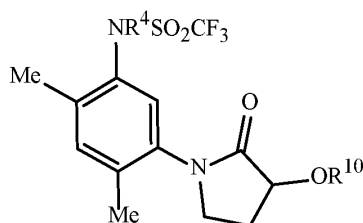
		
3-oxetanyl	2,2-difluorocyclopropylmethyl	tetrahydro-2-furanylmethyl
		
3-butyn-2-yl	2-methyl-2-propen-1-yl	2-butyn-1-yl
		
3,3-difluorocyclobutylmethyl		

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(*R*) or (*S*) denotes the absolute chirality of the asymmetric carbon center. The abbreviation “(d)” indicates that the compound appeared to decompose on melting. The abbreviation “Cmpd. #” stands for “Compound Number”. The abbreviation “Ex.” stands for “Example” and is followed by a number indicating in which example the compound is prepared. Mass spectra are reported with an estimated precision within ± 0.5 Da 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 using atmospheric pressure chemical ionization (AP+).

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INDEX TABLE A

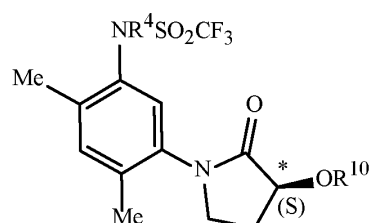
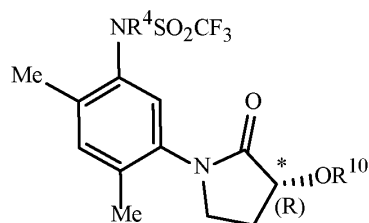


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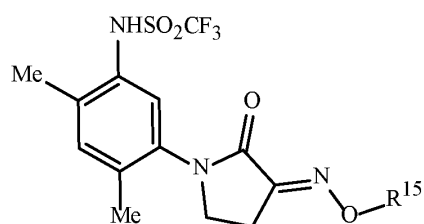
Cmpd #	R ⁴	R ¹⁰	M.S.	M.P. (°C)
1	H	Propargyl		164–167

2	H	Allyl		134–137
3	H	<i>c</i> -Pr		171–174
4	H	<i>c</i> -Bu		166–169
5	CH ₂ OCO- <i>t</i> -Bu	<i>c</i> -Pen	535.5	
6	H	<i>c</i> -Pen	421.4	
7	CH ₂ OCO- <i>t</i> -Bu	<i>c</i> -Pr	507.3	
8	CH ₂ OCO- <i>t</i> -Bu	<i>c</i> -Bu	521	
14	H	H		226–229
15	SO ₂ CF ₃	<i>c</i> -Pr	525.3	
16	CO ₂ Me	<i>c</i> -Pr	451	
17	COMe	<i>c</i> -Pr	435	
18	CO ₂ - <i>i</i> -Pr	<i>c</i> -Pr	479	
19	CO ₂ Et	<i>c</i> -Pr	465	
20	CH ₂ OCO-Pr	<i>c</i> -Pr	493	
21	CO ₂ - <i>i</i> -Bu	<i>c</i> -Pr	493	
22	H	CH ₂ - <i>c</i> -Pr	407.3	
29*	H	<i>c</i> -Pr		169–172
30*	H	<i>c</i> -Pr		166–169
34	H	3-oxetanyl	409.3	
41	H	2,2-difluorocyclopropylmethyl	443.4	
42	H	tetrahydro-2-furanyl methyl	437.3	
43	H	<i>c</i> -Bu-methyl	421.4	
52	H	2,2-difluorocyclobutylmethyl	457.5	
53	CH ₂ OCO- <i>t</i> -Bu	<i>c</i> -Pr-methyl	521	
54	CH ₂ OCO- <i>t</i> -Bu	2,2-difluorocyclopropylmethyl	557	
55	CH ₂ OCO- <i>t</i> -Bu	3,3-difluorocyclobutyl methyl	571	
56	CH ₂ OCO- <i>t</i> -Bu	<i>c</i> -Bu-methyl	535	
57	H	<i>c</i> -Pen-methyl		147–150
58	H	3-butyne-2-yl		189–192
59	H	2-methyl-2-propen-1-yl		160–163
60	H	2-butyne-1-yl		129–132
61	H	Benzyl		186–189
62	SO ₂ CF ₃	2-butyne-1-yl		101–104

*indicates that the compound is one of the following enantiomers.



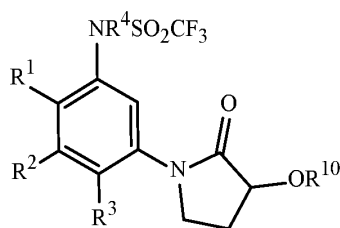
INDEX TABLE B



5

Cmpd #	R ¹⁵	M.S.	M.P. (°C)
9	Me		226–229
10	H		213–216
11	Allyl		184–187
12	Et		201–204
13	Propargyl		175–178

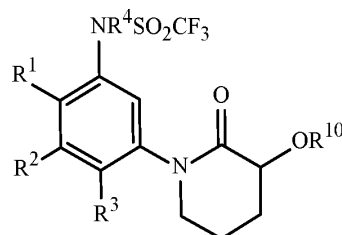
INDEX TABLE C



Cmpd #	R ¹	R ²	R ³	R ⁴	R ¹⁰	M.S.	M.P. (°C)
23	Me	F	Me	CH ₂ OCO- <i>t</i> -Bu	<i>c</i> -Pr		110–113
24	Me	F	Me	SO ₂ CF ₃	<i>c</i> -Pr	543.3	
25	Me	F	Me	H	<i>c</i> -Bu		149–152
26	Me	F	Me	H	<i>c</i> -Pr		151–154
27	Me	F	Me	SO ₂ CF ₃	<i>c</i> -Bu		60–63
28	Me	F	Me	CH ₂ OCO- <i>t</i> -Bu	<i>c</i> -Bu		88–91
31	Cl	H	Me	H	<i>c</i> -Pr		166–169

32	H	H	Me	SO ₂ CF ₃	<i>c</i> -Pr		119–122
33	Cl	H	Me	CH ₂ OCO- <i>t</i> -Bu	<i>c</i> -Pr		93–96
38	Cl	H	Me	COMe	<i>c</i> -Pr	455.24	
40	Cl	H	Me	CO ₂ Me	<i>c</i> -Pr		71–74
44	Me	Me	Me	SO ₂ CF ₃	<i>c</i> -Bu	553.34	
45	Me	Me	Me	H	<i>c</i> -Bu		197–200
46	Me	Me	Me	SO ₂ CF ₃	<i>c</i> -Pr		127–130
47	Me	Me	Me	H	<i>c</i> -Pr		193–196
48	Me	Me	Me	CO ₂ - <i>i</i> -Bu	<i>c</i> -Bu	521.49	
49	Me	Me	Me	CH ₂ OCO- <i>t</i> -Bu	<i>c</i> -Pr		103–106
50	Me	Me	Me	CO ₂ - <i>i</i> -Bu	<i>c</i> -Pr	507.4	
51	Me	Me	Me	CH ₂ OCO- <i>t</i> -Bu	<i>c</i> -Bu	534.9	
63	Me	F	Me	H	<i>c</i> -Pr-methyl		138–141
64	Me	F	Me	H	<i>c</i> -Bu-methyl		146–149

INDEX TABLE D



Cmpd #	R ¹	R ²	R ³	R ⁴	R ¹⁰	M.S.	M.P. (°C)
35	Me	F	Me	H	<i>c</i> -Pr		211–214
36	Me	F	Me	H	<i>c</i> -Bu		199–202
37	Me	F	Me	CH ₂ OCO- <i>t</i> -Bu	<i>c</i> -Pr		86–89
39	Me	F	Me	CH ₂ OCO- <i>t</i> -Bu	<i>c</i> -Bu	553.36	

BIOLOGICAL EXAMPLES OF THE INVENTION

5 TEST A

Seeds of plant species selected from barnyardgrass (*Echinochloa crus-galli*), blackgrass (*Alopecurus myosuroides*), corn (*Zea mays*), foxtail, giant (giant foxtail, *Setaria faberi*), goosegrass (*Eleusine indica*), kochia (*Bassia scoparia*), oat, wild (wild oat, *Avena fatua*), pigweed, palmer (palmer amaranth, *Amaranthus palmeri*), pigweed, redroot (redroot pigweed, *Amaranthus retroflexus*), ragweed (common ragweed, *Ambrosia artemisiifolia*), ryegrass, Italian (Italian ryegrass, *Lolium multiflorum*), soybean (*Glycine max*), and wheat (*Triticum aestivum*) were planted into a blend of loam soil and sand and treated preemergence

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

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

Table A		Compounds							
125 g ai/ha		1	2	3	4	5	6	7	8
Preemergence									
15	Barnyardgrass	100	100	–	–	–	–	–	–
	Blackgrass	–	–	100	90	40	90	80	70
	Corn	–	–	90	90	20	80	50	10
	Foxtail, Giant	100	100	100	100	50	100	90	100
	Goosegrass	–	–	100	100	90	100	100	100
20	Kochia	100	90	100	100	60	90	100	100
	Oat, Wild	–	–	100	100	40	90	100	70
	Pigweed, Palmer	–	–	100	100	50	100	100	90
	Pigweed, Redroot	100	100	–	–	–	–	–	–
	Ragweed	90	80	100	100	40	90	90	90
25	Ryegrass, Italian	100	100	100	100	90	90	100	90
	Soybean	–	–	80	100	20	90	40	50
	Wheat	–	–	100	100	20	100	80	50

Table A		Compounds							
31 g ai/ha		1	2	3	4	5	6	7	8
Preemergence									
30	Barnyardgrass	80	0	–	–	–	–	–	–
	Blackgrass	–	–	80	20	0	50	30	30
	Corn	–	–	90	40	0	30	0	0
	Foxtail, Giant	90	100	100	100	0	100	90	90
35	Goosegrass	–	–	70	100	10	90	80	70
	Kochia	70	50	100	70	0	30	60	0
	Oat, Wild	–	–	70	80	0	70	20	0
	Pigweed, Palmer	–	–	100	100	10	70	50	30

	Pigweed, Redroot	90	90	-	-	-	-	-
	Ragweed	30	20	90	90	0	30	30
	Ryegrass, Italian	100	90	90	100	20	80	100
	Soybean	-	-	30	70	0	50	20
5	Wheat	-	-	100	70	0	80	0

Table A

Compounds

	125 g ai/ha	1	2	3	4	5	6	7	8
	Postemergence								
	Barnyardgrass	90	90	-	-	-	-	-	-
10	Blackgrass	50	40	70	-	0	40	50	40
	Corn	90	90	90	0	80	90	90	80
	Foxtail, Giant	60	50	90	80	80	60	90	80
	Galium	100	100	100	100	90	90	100	100
	Goosegrass	-	-	90	90	90	90	90	90
15	Horseweed	-	-	90	100	-	-	90	90
	Kochia	80	60	100	90	70	80	80	80
	Oat, Wild	-	-	80	60	30	20	70	30
	Pigweed, Palmer	-	-	60	90	70	60	60	90
	Pigweed, Redroot	90	90	-	-	-	-	-	-
20	Ragweed	80	70	90	90	80	90	90	90
	Ryegrass, Italian	70	70	90	80	40	50	90	100
	Soybean	-	-	70	70	70	70	90	90
	Wheat	70	70	80	50	50	60	60	70

Table A

Compounds

25	31 g ai/ha	1	2	3	4	5	6	7	8
	Postemergence								
	Barnyardgrass	80	30	-	-	-	-	-	-
	Blackgrass	10	20	40	-	0	0	20	30
	Corn	50	0	90	90	0	0	90	30
30	Foxtail, Giant	40	30	70	40	0	10	60	30
	Galium	80	80	70	100	60	80	90	100
	Goosegrass	-	-	80	70	50	80	90	80
	Horseweed	-	-	70	90	-	-	80	70
	Kochia	30	20	50	60	20	20	70	60
35	Oat, Wild	-	-	40	30	20	0	30	10
	Pigweed, Palmer	-	-	40	60	20	50	30	60
	Pigweed, Redroot	80	90	-	-	-	-	-	-
	Ragweed	60	50	80	70	60	60	90	70

Ryegrass, Italian	70	70	90	80	20	0	50	40
Soybean	-	-	60	50	60	70	90	60
Wheat	60	70	80	50	0	60	30	60

5 TEST B

Plant species in the flooded paddy test selected from barnyardgrass (*Echinochloa crus-galli*), ducksalad (*Heteranthera limosa*), rice (*Oryza sativa*), and sedge, umbrella (small-flower umbrella sedge, *Cyperus difformis*) were grown to the 2-leaf stage for testing. At time of treatment, test pots were flooded to 3 cm above the soil surface, treated by application of test compounds directly to the paddy water, and then maintained at that water depth for the duration of the test. Treated plants and controls were maintained in a greenhouse for 10 to 14 days, after which time all species were compared to controls and visually evaluated. Plant response ratings, summarized in Table B, are based on a scale of 0 to 100 where 0 is no effect and 100 is complete control. A dash (-) response means no test result.

Table B	Compounds							
250 g ai/ha	1	2	3	4	5	6	7	8
Flood								
Barnyardgrass	60	40	90	45	95	30	98	98
Ducksalad	80	75	98	100	95	85	95	95
Rice	30	10	50	0	0	10	30	35
Sedge, Umbrella	90	85	98	100	85	75	90	95

TEST C

Seeds of plant species selected from blackgrass (*Alopecurus myosuroides*), corn (*Zea mays*), foxtail, giant (giant foxtail, *Setaria faberi*), goosegrass (*Eleusine indica*), kochia (*Bassia scoparia*), oat, wild (wild oat, *Avena fatua*), pigweed, palmer (palmer amaranth, *Amaranthus palmeri*), ragweed (common ragweed, *Ambrosia artemisiifolia*), ryegrass, Italian (Italian ryegrass, *Lolium multiflorum*), soybean (*Glycine max*) and wheat (*Triticum aestivum*) were planted into a blend of loam soil and sand and treated preemergence with a directed soil spray using test chemicals formulated in a non-phytotoxic solvent mixture which included a surfactant.

At the same time, plants selected from these crop and weed species and also galium (catchweed bedstraw, *Galium aparine*) and horseweed (*Erigeron canadensis*) were planted in pots containing the same blend of loam soil and sand and treated with postemergence applications of test chemicals formulated in the same manner. Plants ranged in height from 2 to 10 cm and were in the one- to two-leaf stage for the postemergence treatment. Treated plants and untreated controls were maintained in a greenhouse for 10 or 12 days, after which time all treated plants were compared to untreated controls and visually evaluated for injury. Plant

response ratings, summarized in Table A, are based on a 0 to 100 scale where 0 is no effect and 100 is complete control. A dash (–) response means no test result.

Table C		Compounds													
5	125 g ai/ha	9	10	11	12	13	14	16	17	18	19	20	21	22	23
	Preemergence														
	Blackgrass	–	–	100	100	100	90	0	90	0	40	100	80	90	10
	Corn	100	90	100	100	100	100	0	90	0	0	90	90	90	20
	Foxtail, Giant	100	100	100	100	100	100	0	100	0	10	100	100	100	90
10	Goosegrass	100	100	100	100	100	100	0	100	0	70	100	100	100	100
	Kochia	100	100	100	100	100	100	0	100	60	70	100	90	100	90
	Oat, Wild	100	100	100	100	100	60	0	100	0	40	100	90	100	90
	Pigweed, Palmer	100	100	100	100	100	100	0	100	20	60	100	100	100	100
	Ragweed	90	30	90	100	100	60	0	90	0	10	90	80	100	90
15	Ryegrass, Italian	100	100	90	100	100	100	0	100	0	0	100	100	100	100
	Soybean	100	70	90	100	100	100	20	100	30	90	90	60	90	40
	Wheat	100	100	100	100	100	100	0	100	0	10	100	90	100	30
Table C		Compounds													
	125 g ai/ha	25	26	28	29	30	31	33	34	35	36	37	38	39	40
20	Preemergence														
	Blackgrass	90	90	60	90	100	80	80	50	100	100	60	90	20	90
	Corn	90	90	20	90	90	70	60	80	50	90	10	80	10	90
	Foxtail, Giant	100	100	100	100	100	100	100	90	100	100	90	100	10	100
	Goosegrass	100	100	100	100	100	100	100	100	100	100	100	100	60	100
25	Kochia	100	100	90	100	100	100	100	100	80	90	90	100	60	100
	Oat, Wild	90	100	20	90	100	90	50	80	90	90	20	100	0	90
	Pigweed, Palmer	100	100	80	100	100	100	80	100	100	100	90	100	40	100
	Ragweed	100	100	100	90	100	100	80	100	90	90	90	90	80	90
	Ryegrass, Italian	100	100	90	100	100	100	100	80	100	100	70	100	60	100
30	Soybean	90	90	80	100	90	90	60	90	90	90	30	90	60	90
	Wheat	100	100	30	100	100	100	40	80	100	100	20	90	0	100
Table C		Compounds													
	125 g ai/ha	41	42	43	45	47	48	49	50	51	52	53	54	55	56
	Preemergence														
35	Blackgrass	100	70	50	90	–	–	–	–	–	–	–	–	–	–
	Corn	100	70	100	100	90	60	50	90	40	90	50	30	10	10
	Foxtail, Giant	100	100	100	100	100	100	90	100	90	100	90	80	10	80

5	Goosegrass	100	100	100	100	100	100	90	100	90	100	100	100	100	90
	Kochia	100	90	80	100	100	90	70	100	80	100	50	30	10	70
	Oat, Wild	100	30	50	90	100	80	90	80	50	90	90	80	20	0
	Pigweed, Palmer	100	100	100	100	100	100	100	100	60	100	90	50	30	90
	Ragweed	90	60	60	100	100	90	100	90	70	30	70	60	40	30
	Ryegrass, Italian	100	90	100	90	90	100	100	100	100	80	100	90	60	80
	Soybean	100	90	90	100	90	70	40	60	30	50	40	30	0	30
	Wheat	100	90	100	100	100	80	90	100	60	100	90	80	40	0
10	Table C	Compounds													
	125 g ai/ha	57	58	59	60	61	63	64							
	Preemergence														
	Blackgrass	80	100	90	90	90	90	70							
15	Corn	50	100	100	100	100	100	60							
	Foxtail, Giant	100	100	100	100	100	100	100							
	Goosegrass	100	100	100	100	100	100	100							
	Kochia	80	90	100	100	100	100	90							
	Oat, Wild	80	100	100	100	90	100	90							
	Pigweed, Palmer	100	100	100	100	100	100	100							
	Ragweed	80	90	70	100	90	100	100							
	Ryegrass, Italian	90	100	100	100	90	100	90							
20	Soybean	90	100	90	90	90	100	90							
	Wheat	80	100	100	100	100	100	70							
	Table C	Compounds													
	31 g ai/ha	9	10	11	12	13	14	16	17	18	19	20	21	22	23
25	Preemergence														
	Blackgrass	-	-	60	80	90	60	0	80	0	0	80	10	50	0
	Corn	50	30	50	70	40	10	0	70	0	0	60	20	90	10
	Foxtail, Giant	100	90	100	100	100	80	0	90	0	0	90	100	100	20
30	Goosegrass	100	80	100	90	90	90	0	100	0	0	100	90	100	70
	Kochia	100	90	80	100	100	50	0	80	0	0	80	60	90	20
	Oat, Wild	90	90	30	90	100	10	0	90	0	0	60	30	90	40
	Pigweed, Palmer	100	50	70	100	100	90	0	80	0	20	90	100	100	30
	Ragweed	50	0	80	100	50	20	0	80	0	0	60	40	50	30
	Ryegrass, Italian	60	50	40	90	40	40	0	100	0	0	100	70	100	30
	Soybean	80	60	50	90	80	100	20	80	0	30	70	0	80	30
	Wheat	90	90	90	90	90	50	0	30	0	0	70	10	90	10
35	Table C	Compounds													

	31 g ai/ha	25	26	28	29	30	31	33	34	35	36	37	38	39	40
	Preemergence														
	Blackgrass	80	70	50	90	80	60	20	30	70	80	10	80	0	50
	Corn	30	60	0	80	90	30	30	10	30	30	0	20	0	50
5	Foxtail, Giant	100	90	70	90	100	90	70	90	90	50	20	80	0	100
	Goosegrass	90	90	70	100	90	90	90	30	100	90	50	100	10	100
	Kochia	70	100	20	90	90	100	100	90	20	20	0	100	20	90
	Oat, Wild	40	60	0	90	80	60	10	30	20	30	20	30	0	10
	Pigweed, Palmer	100	100	30	100	100	90	70	100	100	90	50	90	0	80
10	Ragweed	90	90	40	80	100	90	30	50	50	70	0	70	0	70
	Ryegrass, Italian	90	90	30	100	100	60	20	40	100	100	30	80	0	90
	Soybean	80	70	20	90	80	70	0	40	50	90	0	80	0	70
	Wheat	60	60	20	90	90	30	10	30	20	40	0	40	0	60
	Table C	Compounds													
15	31 g ai/ha	41	42	43	45	47	48	49	50	51	52	53	54	55	56
	Preemergence														
	Blackgrass	80	20	40	60	-	-	-	-	-	-	-	-	-	-
	Corn	90	0	40	90	30	20	0	10	0	10	0	0	0	0
	Foxtail, Giant	100	20	30	100	100	30	20	50	10	90	10	0	0	0
20	Goosegrass	90	50	60	100	100	80	60	90	0	80	60	20	10	10
	Kochia	100	20	60	90	70	10	30	20	30	70	0	0	0	0
	Oat, Wild	60	0	0	80	80	50	60	70	20	20	0	0	0	0
	Pigweed, Palmer	100	80	70	100	100	100	30	90	20	70	30	0	0	10
	Ragweed	70	10	10	80	70	20	100	30	0	0	60	0	-	0
25	Ryegrass, Italian	100	20	80	50	50	60	40	50	40	0	60	0	20	30
	Soybean	60	0	10	50	50	30	0	30	0	30	20	0	0	0
	Wheat	90	30	20	60	90	30	30	30	10	90	60	0	10	0
	Table C	Compounds													
	31 g ai/ha	57	58	59	60	61	63	64							
30	Preemergence														
	Blackgrass	40	80	70	80	60	70	20							
	Corn	0	20	40	30	20	30	10							
	Foxtail, Giant	80	100	100	100	100	100	100							
	Goosegrass	90	100	90	90	100	100	70							
35	Kochia	60	80	80	90	90	90	70							
	Oat, Wild	20	90	80	90	50	70	20							
	Pigweed, Palmer	100	100	100	100	100	100	100							
	Ragweed	0	80	50	90	0	90	90							

Ryegrass, Italian	70	90	30	70	60	50	50
Soybean	70	100	60	50	40	60	40
Wheat	20	90	40	40	30	80	20

Table C

Compounds

5	125 g ai/ha	9	10	11	12	13	14	16	17	18	19	20	21	22	23
	Postemergence														
	Blackgrass	90	90	90	100	90	70	0	80	0	40	90	80	90	50
	Corn	90	90	100	100	100	90	0	90	0	20	90	90	90	90
	Foxtail, Giant	90	90	90	90	90	90	0	90	0	20	90	90	60	80
10	Galium	100	100	100	100	100	100	50	100	70	90	100	100	100	100
	Goosegrass	90	90	100	100	100	90	0	90	0	90	90	90	90	90
	Horseweed	100	90	70	100	90	90	30	100	0	30	90	90	90	90
	Kochia	90	90	90	90	90	70	10	90	70	70	80	80	70	80
	Oat, Wild	80	80	-	90	90	60	0	70	0	30	80	70	40	50
15	Pigweed, Palmer	90	90	90	100	90	90	0	90	20	10	80	70	80	70
	Ragweed	80	50	80	90	90	80	90	90	50	90	90	90	80	90
	Ryegrass, Italian	80	80	30	80	60	100	0	90	0	50	100	100	80	100
	Soybean	80	80	100	100	100	80	60	80	80	80	70	60	70	60
	Wheat	80	80	90	90	90	60	0	70	0	10	70	50	60	60
20	Table C														
	125 g ai/ha	25	26	28	29	30	31	33	34	35	36	37	38	39	40
	Postemergence														
	Blackgrass	90	90	70	70	90	100	60	60	60	30	60	70	10	60
	Corn	60	90	30	90	90	90	90	90	90	20	90	90	10	100
25	Foxtail, Giant	30	90	70	90	80	90	90	90	90	30	80	90	10	90
	Galium	100	100	100	100	100	100	100	100	100	80	90	100	90	100
	Goosegrass	90	100	70	90	90	100	90	80	90	90	90	90	30	90
	Horseweed	-	-	-	-	-	100	100	100	100	70	80	100	90	80
	Kochia	90	90	80	90	90	90	90	90	90	80	70	90	60	90
30	Oat, Wild	20	50	30	80	80	90	70	70	70	30	70	60	20	80
	Pigweed, Palmer	90	90	90	90	90	90	80	100	70	70	30	80	20	90
	Ragweed	80	80	80	80	90	90	90	90	90	90	90	90	80	80
	Ryegrass, Italian	70	100	40	100	100	90	90	90	60	40	60	70	30	80
	Soybean	100	100	60	100	60	70	100	70	60	70	70	80	90	80
35	Wheat	60	70	60	70	70	80	70	80	60	60	60	60	60	70
	Table C														
	125 g ai/ha	41	42	43	45	47	48	49	50	51	52	53	54	55	56

	Postemergence															
5	Blackgrass	60	50	50	40	70	30	60	40	20	40	60	90	40	20	
	Corn	90	90	90	90	90	50	100	90	60	60	60	80	70	30	
	Foxtail, Giant	90	90	90	80	90	60	90	80	40	50	90	70	70	40	
	Galium	100	90	90	100	90	100	90	100	90	100	-	-	-	-	
	Goosegrass	90	90	90	90	90	40	80	80	20	70	90	90	90	60	
10	Horseweed	100	80	60	90	100	90	100	-	90	90	90	90	80	80	
	Kochia	80	60	60	100	80	60	60	70	70	70	50	50	20	30	
	Oat, Wild	30	40	20	30	60	20	70	50	30	60	50	80	30	10	
	Pigweed, Palmer	90	70	90	90	70	70	50	60	60	40	70	50	40	40	
	Ragweed	70	90	90	80	80	80	90	80	80	70	90	80	80	60	
15	Ryegrass, Italian	100	70	70	50	90	60	90	90	50	100	70	70	60	60	
	Soybean	90	80	90	100	90	70	80	80	60	70	60	60	70	50	
	Wheat	60	80	70	60	80	70	70	80	70	70	80	70	70	70	
	Table C	Compounds														
	125 g ai/ha	57	58	59	60	61	63	64								
20	Postemergence															
	Blackgrass	80	70	80	90	70	30	20								
	Corn	40	90	90	100	60	50	10								
	Foxtail, Giant	70	90	90	90	50	30	20								
	Galium	90	90	100	100	90	100	100								
25	Goosegrass	90	100	90	90	90	90	70								
	Horseweed	80	90	80	100	60	90	60								
	Kochia	70	90	80	90	90	90	100								
	Oat, Wild	10	90	90	90	80	40	10								
	Pigweed, Palmer	70	80	80	90	80	90	70								
30	Ragweed	60	90	70	90	80	80	70								
	Ryegrass, Italian	60	70	70	70	60	10	20								
	Soybean	100	90	80	100	90	100	90								
	Wheat	70	70	80	90	80	40	20								
	Table C	Compounds														
35	31 g ai/ha	9	10	11	12	13	14	16	17	18	19	20	21	22	23	
	Postemergence															
	Blackgrass	80	60	40	80	80	10	0	70	0	0	90	40	20	10	
	Corn	90	90	90	100	100	70	0	90	0	0	90	90	50	30	
	Foxtail, Giant	40	40	60	90	60	20	0	90	0	0	80	40	20	0	
	Galium	90	100	80	100	100	100	50	90	10	30	90	100	100	90	
	Goosegrass	90	90	90	100	70	60	0	90	0	0	90	90	70	30	

	Horseweed	100	80	20	90	70	90	0	70	0	10	60	60	90	80
	Kochia	80	60	40	90	90	50	20	80	20	30	70	70	60	30
	Oat, Wild	80	80	-	90	90	30	0	30	0	0	30	40	20	20
	Pigweed, Palmer	70	60	40	80	80	40	0	40	0	0	50	30	50	50
5	Ragweed	70	50	60	90	80	60	80	70	0	60	80	80	60	90
	Ryegrass, Italian	50	80	0	70	60	60	0	60	0	0	60	50	70	50
	Soybean	80	80	100	100	100	80	40	60	50	80	60	60	60	60
	Wheat	80	80	80	80	90	60	0	70	0	0	70	10	50	10
	Table C	Compounds													
10	31 g ai/ha	25	26	28	29	30	31	33	34	35	36	37	38	39	40
	Postemergence														
	Blackgrass	0	40	10	60	50	50	0	30	50	20	0	40	0	10
	Corn	30	50	10	80	90	70	80	60	50	0	10	80	0	80
	Foxtail, Giant	30	40	30	90	50	30	50	40	40	10	10	50	0	50
15	Galium	100	100	90	80	80	100	100	100	70	60	60	90	80	80
	Goosegrass	50	80	30	90	80	60	60	30	70	30	0	30	0	50
	Horseweed	-	-	-	-	-	100	70	90	90	40	80	90	70	80
	Kochia	60	70	50	60	80	80	80	80	50	40	50	80	30	70
	Oat, Wild	0	20	20	20	50	60	30	30	40	30	20	50	0	50
20	Pigweed, Palmer	70	70	50	60	60	70	20	70	40	30	0	50	0	30
	Ragweed	60	60	80	60	90	90	90	90	60	40	60	80	30	60
	Ryegrass, Italian	20	60	40	70	90	40	20	40	50	0	0	30	0	60
	Soybean	100	70	50	60	50	60	80	60	60	70	60	70	50	70
	Wheat	50	60	20	70	70	60	50	70	60	60	10	60	0	60
25	Table C	Compounds													
	31 g ai/ha	41	42	43	45	47	48	49	50	51	52	53	54	55	56
	Postemergence														
	Blackgrass	40	0	0	10	40	10	30	10	10	20	20	30	0	0
	Corn	40	20	40	20	70	0	50	30	0	0	20	0	0	0
30	Foxtail, Giant	20	20	10	30	70	20	60	50	0	0	30	30	30	10
	Galium	100	50	70	100	80	90	80	60	60	70	-	-	-	-
	Goosegrass	90	40	20	70	50	0	20	20	0	0	60	60	40	0
	Horseweed	70	20	30	30	-	70	-	-	60	80	80	70	80	20
	Kochia	70	10	20	70	40	20	40	20	30	20	20	30	0	0
35	Oat, Wild	30	0	10	10	10	10	30	20	0	10	10	10	20	10
	Pigweed, Palmer	50	50	40	70	30	30	10	20	10	0	40	0	0	0
	Ragweed	50	40	50	50	60	30	70	70	60	40	70	50	50	20
	Ryegrass, Italian	30	20	30	0	50	40	50	50	20	40	0	60	0	0

Soybean	90	70	80	80	70	30	60	60	30	60	50	50	50	40
Wheat	60	0	30	20	80	30	70	60	20	20	40	30	20	0

Table C Compounds

31 g ai/ha	57	58	59	60	61	63	64
5 Postemergence							
Blackgrass	40	50	10	50	30	0	0
Corn	0	60	20	90	10	0	0
Foxtail, Giant	60	60	10	80	20	0	0
Galium	50	90	100	100	70	100	100
10 Goosegrass	70	100	70	80	40	0	30
Horseweed	0	90	20	80	60	90	10
Kochia	50	70	70	100	60	80	50
Oat, Wild	10	60	30	30	20	0	0
Pigweed, Palmer	40	50	40	60	50	70	60
15 Ragweed	40	70	10	80	50	40	30
Ryegrass, Italian	20	60	10	50	0	0	0
Soybean	80	60	60	80	60	50	60
Wheat	70	70	50	80	70	10	0

20

TEST D

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

Table D

Compounds

250 g ai/ha	9	10	11	12	13	14	16	17	18	19	20	21	22	23
Flood														
35 Barnyardgrass	10	0	25	0	10	0	0	85	0	0	90	95	90	95
Ducksalad	95	90	100	100	100	65	0	95	0	0	90	98	90	80
Rice	30	0	45	40	35	25	0	15	0	0	15	85	55	40

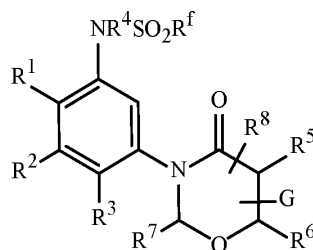
5	Sedge, Umbrella	85	80	100	100	100	35	0	95	0	0	98	98	95	95
	Table D	Compounds													
	250 g ai/ha	25	26	28	29	30	31	33	34	35	36	37	38	39	40
	Flood														
	Barnyardgrass	0	30	60	95	95	30	90	35	0	0	90	0	35	0
	Ducksalad	75	75	70	45	90	75	80	65	55	65	70	65	55	70
	Rice	15	65	30	85	75	30	45	25	0	0	0	0	0	0
	Sedge, Umbrella	90	95	95	95	98	80	90	80	95	95	95	75	95	90
10	Table D	Compounds													
	250 g ai/ha	41	42	43	45	47	48	49	50	51	52	53	54	55	56
	Flood														
	Barnyardgrass	15	0	25	95	75	80	100	90	100	20	40	45	50	35
	Ducksalad	60	95	95	85	95	95	95	90	85	90	70	90	90	85
	Rice	10	15	30	55	30	25	40	20	10	0	25	0	15	0
	Sedge, Umbrella	70	90	95	90	95	90	90	95	90	80	98	98	95	95
	Table D	Compounds													
20	250 g ai/ha	57	58	59	60	61	63	64							
	Flood														
	Barnyardgrass	15	90	60	90	95	45	25							
	Ducksalad	90	80	80	90	75	95	80							
	Rice	10	60	40	35	20	45	15							
	Sedge, Umbrella	95	95	95	95	90	95	95							

CLAIMS

What is claimed is:

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

5

**1**

wherein

- R¹ is H, C₁–C₇ alkyl, halogen, CN, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₃–C₇ haloalkynyl, C₂–C₇ alkoxyalkyl, C₁–C₇ alkoxy, C₁–C₅ alkylthio, C₂–C₃ alkoxycarbonyl or C₂–C₇ haloalkoxyalkyl;
- R² is H, C₁–C₇ alkyl, halogen, CN, C₁–C₇ haloalkyl, C₁–C₇ alkoxy or C₁–C₅ alkylthio;
- R³ is H, C₁–C₇ alkyl, halogen, CN, C₂–C₆ alkenyl, C₂–C₇ alkynyl, C₃–C₇ cycloalkyl, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₃–C₇ haloalkynyl, C₂–C₇ alkoxyalkyl, C₁–C₇ alkoxy, C₁–C₅ alkylthio, C₂–C₃ alkoxycarbonyl or C₂–C₇ haloalkoxyalkyl;
- R⁴ is H, C(=O)R¹⁴, -C(=S)R¹⁴, -CO₂R¹⁴, -C(=O)SR¹⁴, -S(O)₂R¹⁴, C(=O)NR¹³R¹⁴, -S(O)₂NR¹³R¹⁴, CH₂OC(=O)OR¹⁴, CH₂OC(=O)NR¹³R¹⁴ or CH₂OC(=O)R¹⁴; or propargyl, allyl or benzyl;
- R⁵ is H, C₂–C₆ alkenyl, C₂–C₇ haloalkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₄–C₇ cycloalkylalkyl, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₃–C₇ alkylthioalkyl, C₁–C₇ haloalkoxy, C₂–C₇ alkoxyalkyl or C₄–C₇ alkylcycloalkyl;
- R⁶ is H, C₁–C₇ alkyl, halogen, CN, C₁–C₅ alkylthio, C₂–C₃ alkoxycarbonyl, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₄–C₇ cycloalkylalkyl, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₂–C₇ alkoxyalkyl, C₃–C₇ alkylthioalkyl, C₁–C₇ alkoxy, C₁–C₇ haloalkoxy, C₂–C₇ haloalkoxyalkyl or C₄–C₇ alkylcycloalkyl;
- R⁷ is H, C₁–C₇ alkyl, halogen, CN, C₁–C₅ alkylthio, C₂–C₃ alkoxycarbonyl, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₄–C₇ cycloalkylalkyl, C₂–C₄

30

cyanoalkyl, C₁-C₇ haloalkyl, C₂-C₇ haloalkenyl, C₂-C₇ alkoxyalkyl, C₃-C₇ alkylthioalkyl, C₁-C₇ alkoxy, C₁-C₇ haloalkoxy, C₂-C₇ haloalkoxyalkyl or C₄-C₇ alkylcycloalkyl;

5 R⁸ is H, C₁-C₇ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₇ cycloalkyl, C₄-C₇ cycloalkylalkyl, C₂-C₄ cyanoalkyl, C₁-C₇ haloalkyl, C₂-C₇ haloalkenyl, C₂-C₇ alkoxyalkyl, C₃-C₇ alkylthioalkyl, C₁-C₇ alkoxy, C₁-C₇ haloalkoxy, C₂-C₇ alkoxyalkyl or C₄-C₇ alkylcycloalkyl;

Q is CHR⁹, O or a direct bond;

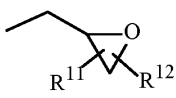
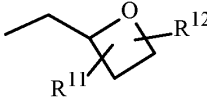
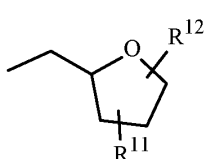
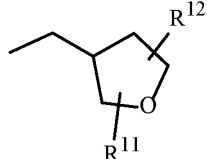
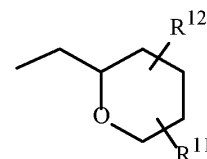
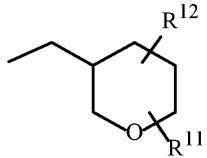
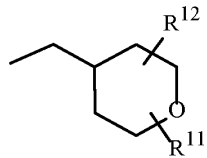
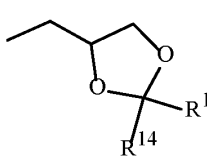
10 R⁹ is H, C₁-C₇ alkyl, halogen, CN, C₁-C₅ alkylthio, C₂-C₃ alkoxy carbonyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₇ cycloalkyl, C₄-C₇ cycloalkylalkyl, C₂-C₄ cyanoalkyl, C₁-C₇ haloalkyl, C₂-C₇ haloalkenyl, C₂-C₇ alkoxyalkyl, C₃-C₇ alkylthioalkyl, C₁-C₇ alkoxy, C₁-C₇ haloalkoxy, C₂-C₇ alkoxyalkyl, C₂-C₇ haloalkoxyalkyl or C₄-C₇ alkylcycloalkyl;

G is OR¹⁰, SR¹⁰, SOR¹⁰ or SO₂R¹⁰; or

15 G and R⁵ are taken together to form N-OR¹⁵;

20 R¹⁰ is H, C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₇ cycloalkyl, C₃-C₇ halocycloalkyl, C₄-C₇ alkylcycloalkyl, C₄-C₇ cycloalkylalkyl, C₄-C₇ halocycloalkylalkyl, C₅-C₇ alkylcycloalkylalkyl, C₁-C₇ haloalkoxy, C₂-C₇ alkoxyalkyl, C₂-C₄ cyanoalkyl, C₁-C₇ haloalkyl, C₂-C₇ haloalkenyl, C₃-C₇ alkylthioalkyl, C₂-C₄ cyanoalkyl, C₄-C₇ alkylcycloalkyl, C₁-C₆ nitroalkyl, C₃-C₆ alkylcarboalkyl, C₃-C₆ alkoxy carboalkyl, C₂-C₇ haloalkoxyalkyl, benzyl or C₃-C₆ alkylcarboalkoxy; or

R¹⁰ is selected from the group consisting of

					
R ¹⁰ -1	,	R ¹⁰ -2	,	R ¹⁰ -3	,
					
R ¹⁰ -4	,	R ¹⁰ -5	,	R ¹⁰ -6	,
					

R ¹⁰⁻⁷	,	R ¹⁰⁻⁸	,	R ¹⁰⁻⁹	,
R ¹⁰⁻¹⁰	,	R ¹⁰⁻¹¹	,	R ¹⁰⁻¹²	,
R ¹⁰⁻¹³	,	R ¹⁰⁻¹⁴	,	R ¹⁰⁻¹⁵	and
R ¹⁰⁻¹⁶	;				

R¹¹ is H, C₁-C₇ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₇ cycloalkyl, C₄-C₇ cycloalkylalkyl, C₇ haloalkyl, C₂-C₇ haloalkenyl, C₂-C₇ alkoxyalkyl, C₃-C₇ alkylthioalkyl, C₁-C₇ alkoxy, C₁-C₇ haloalkoxy, C₂-C₇ alkoxyalkyl or C₄-C₇ alkylcycloalkyl;

5 R¹² is H, C₁-C₇ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₇ cycloalkyl, C₄-C₇ cycloalkylalkyl or C₇ haloalkyl;

each R¹³ and R¹⁴ is independently H, C₁-C₇ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₇ cycloalkyl, C₄-C₇ cycloalkylalkyl, C₂-C₃ cyanoalkyl, C₁-C₇ haloalkyl, C₂-C₇ haloalkenyl, C₂-C₇ alkylalkoxyalkyl, C₃-C₇ alkylthioalkyl, C₁-C₇ alkoxy; C₂-C₇ alkoxyalkyl, C₄-C₇ alkylcycloalkyl, Ph or benzyl;

10 R^f is C₁-C₇ haloalkyl;

G and R⁸ can be attached to any ring carbon(s) with available valency, said ring is the

cyclic amide ring shown in Formula 1;

each R¹¹ or R¹² can be attached to any ring carbon(s) with available valency, said ring is illustrated in R¹⁰⁻¹ through R¹⁰⁻¹⁶ as above; and

15 R¹⁵ is H, C₁-C₆ alkyl, C₁-C₆ haloalkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl or C₄-C₇ cycloalkylalkyl.

2. The compound of Claim 1 wherein

Q is direct bond;

- R^1 is H, C_1-C_7 alkyl, halogen, C_2-C_6 alkenyl, C_2-C_6 alkynyl, C_3-C_7 cycloalkyl, C_1-C_7 haloalkyl;
 R^2 is H, C_1-C_7 alkyl, halogen or CN;
 R^3 is H, C_1-C_7 alkyl, halogen, CN, C_1-C_7 alkoxy or C_1-C_7 haloalkyl;
 5 R^4 is H, $C(=O)R^{14}$, $-C(=S)R^{14}$, $-CO_2R^{14}$, $-C(=O)SR^{14}$, $-S(O)_2R^{14}$,
 $C(=O)NR^{13}R^{14}$, $-S(O)_2NR^{13}R^{14}$, $CH_2OC(=O)OR^{14}$, $CH_2OC(=O)NR^{13}R^{14}$ or
 $CH_2OC(=O)R^{14}$;
 R^5 is H, C_2-C_6 alkenyl, C_2-C_7 haloalkenyl, C_2-C_6 alkynyl, C_3-C_7 cycloalkyl, C_4-C_7
 cycloalkylalkyl, C_2-C_7 alkoxyalkyl or C_4-C_7 alkylcycloalkyl;
 10 R^6 is H, C_1-C_7 alkyl, C_3-C_7 cycloalkyl, C_1-C_7 haloalkyl, C_2-C_7 alkoxyalkyl, C_1-C_7
 alkoxy or C_1-C_7 haloalkoxy;
 R^7 is H, C_1-C_7 alkyl, C_2-C_6 alkenyl, C_2-C_6 alkynyl, C_3-C_7 cycloalkyl, C_2-C_4
 cyanoalkyl, C_1-C_7 haloalkyl, C_2-C_7 haloalkenyl, C_2-C_7 alkoxyalkyl, C_1-C_7
 alkoxy or C_1-C_7 haloalkoxy;
 15 R^8 is H, C_1-C_7 alkyl, C_2-C_6 alkenyl, C_2-C_6 alkynyl, C_3-C_7 cycloalkyl, C_2-C_4
 cyanoalkyl, C_1-C_7 haloalkyl, C_2-C_7 haloalkenyl, C_2-C_7 alkoxyalkyl, C_1-C_7
 alkoxy or C_1-C_7 haloalkoxy;
 G is OR^{10} , SR^{10} , SOR^{10} or SO_2R^{10} ;
 R^{10} is H, C_2-C_6 alkenyl, C_2-C_6 alkynyl, C_3-C_7 cycloalkyl, C_3-C_7 halocycloalkyl,
 20 C_4-C_7 alkylcycloalkyl, C_4-C_7 cycloalkylalkyl, C_4-C_7 halocycloalkylalkyl, C_5-C_7
 alkylcycloalkylalkyl, C_1-C_7 haloalkoxy, C_2-C_7 alkoxyalkyl, C_2-C_4
 cyanoalkyl, C_1-C_7 haloalkyl, C_2-C_7 haloalkenyl, C_3-C_7 alkylthioalkyl, C_2-C_7
 haloalkoxyalkyl, benzyl or C_4-C_7 alkylcycloalkyl;
 R^{11} is H or C_1-C_7 alkyl;
 25 R^{12} is H or C_1-C_7 alkyl;
 each R^{13} and R^{14} is independently H, C_1-C_7 haloalkyl or C_1-C_7 alkyl; and
 R^f is C_1-C_3 haloalkyl.
3. The compound of Claim 2 wherein
 R^1 is H, C_1-C_3 alkyl, halogen or C_3-C_4 cycloalkyl;
 30 R^2 is H, Me, F, Cl or CN;
 R^3 is H, Me, F, Cl, -CN, OMe or CF_3 ;
 R^4 is H, SO_2CF_3 , SO_2CH_3 , CO_2Me , COMe, $CH_2OCO-t-Bu$, $CH_2OCO-n-Bu$,
 $CH_2OCO-c-hexyl$, $CH_2OCO-c-pentyl$, $CH_2OCOCH_2CH_3$, COMe, CH_2OCOPh ,
 $CH_2OCO-i-Bu$, CH_2OCOME , $CH_2OCO-sec-Bu$, $CH_2OCO-n-Pr$ and $CH_2OCO-i-$
 35 Pr or $(C=O)SMe$;
 R^5 is H, C_4-C_7 cycloalkylalkyl or C_2-C_7 alkoxyalkyl;
 R^6 is H, C_1-C_7 alkyl or C_1-C_7 alkoxy;

R⁷ is H, C₁-C₇ alkyl, C₃-C₇ cycloalkyl, C₁-C₇ haloalkyl, C₂-C₇ alkoxyalkyl, C₁-C₇ alkoxy or C₁-C₇ haloalkoxy;

R⁸ is H, C₁-C₇ alkyl or C₁-C₇ alkoxy;

G is OR¹⁰ or SR¹⁰; and

5 R¹⁰ is C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₇ cycloalkyl, C₃-C₇ halocycloalkyl, C₄-C₇ alkylcycloalkyl, C₄-C₇ cycloalkylalkyl, C₄-C₇ halocycloalkylalkyl, C₅-C₇ alkylcycloalkylalkyl, C₂-C₄ cyanoalkyl, C₃-C₇ alkylthioalkyl, benzyl or C₄-C₇ alkylcycloalkyl.

4. The compound of Claim 3 wherein

10 R¹ is H, Me, halogen or cyclopropyl;

R² is H or F;

R³ is Me or F;

R⁴ is H, CH₂OCOR¹⁴ or -S(O)₂R¹⁴;

R⁵ is H;

15 R⁶ is H, Me or OMe;

R⁷ is H, Me or OMe;

R⁸ is H, Me or OMe;

G is OR¹⁰;

20 R¹⁰ is H, C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₇ cycloalkyl, C₄-C₇ cycloalkylalkyl, C₄-C₇ halocycloalkylalkyl or C₄-C₇ alkylcycloalkyl.

5. The compound of Claim 4 wherein

R¹ is H, Me, F, Cl, Br or cyclopropyl;

R⁴ is H, CH₂OCO-*t*-Bu or SO₂CF₃;

R⁸ is H; and

25 R¹⁰ is C₂-C₆ alkenyl, C₂-C₆ alkynyl or C₃-C₇ cycloalkyl.

6. The compound of Claim 5 wherein

R¹ is Me;

R³ is Me;

R⁴ is H;

30 R⁶ is H;

R⁷ is H; and

R¹⁰ is cyclopropyl, cyclobutyl, cyclopentyl, allyl or propargyl.

7. The compound of Claim 1 wherein

Q is CHR⁹;

35 R¹ is H, C₁-C₇ alkyl, halogen, C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₇ cycloalkyl, C₁-C₇ haloalkyl;

R² is H, C₁-C₇ alkyl, halogen or CN;

- R^3 is H, C_1-C_7 alkyl, halogen, CN, C_1-C_7 alkoxy or C_1-C_7 haloalkyl;
 R^4 is H, $C(=O)R^{14}$, $-C(=S)R^{14}$, $-CO_2R^{14}$, $-C(=O)SR^{14}$, $-S(O)_2R^{14}$,
 $C(=O)NR^{13}R^{14}$, $-S(O)_2NR^{13}R^{14}$, $CH_2OC(=O)OR^{14}$, $CH_2OC(=O)NR^{13}R^{14}$ or
 $CH_2OC(=O)R^{14}$;
5 R^5 is H, C_2-C_6 alkenyl, C_2-C_7 haloalkenyl, C_2-C_6 alkynyl, C_3-C_7 cycloalkyl, C_4-C_7
cycloalkylalkyl, C_2-C_7 alkoxyalkyl or C_4-C_7 alkylcycloalkyl;
 R^6 is H, C_1-C_7 alkyl, C_3-C_7 cycloalkyl, C_1-C_7 haloalkyl, C_2-C_7 alkoxyalkyl, C_1-C_7
alkoxy or C_1-C_7 haloalkoxy;
 R^7 is H, C_1-C_7 alkyl, C_2-C_6 alkenyl, C_2-C_6 alkynyl, C_3-C_7 cycloalkyl, C_2-C_4
10 cyanoalkyl, C_1-C_7 haloalkyl, C_2-C_7 haloalkenyl, C_2-C_7 alkoxyalkyl, C_1-C_7
alkoxy or C_1-C_7 haloalkoxy;
 R^8 is H, C_1-C_7 alkyl, C_2-C_6 alkenyl, C_2-C_6 alkynyl, C_3-C_7 cycloalkyl, C_2-C_4
cyanoalkyl, C_1-C_7 haloalkyl, C_2-C_7 haloalkenyl, C_2-C_7 alkoxyalkyl, C_1-C_7
alkoxy or C_1-C_7 haloalkoxy;
15 G is OR^{10} , SR^{10} , SOR^{10} or SO_2R^{10} ;
 R^9 is H, C_1-C_7 alkyl, C_3-C_7 cycloalkyl, C_1-C_7 haloalkyl, C_2-C_7 alkoxyalkyl, C_1-C_7
alkoxy or C_1-C_7 haloalkoxy;
 R^{10} is H, C_2-C_6 alkenyl, C_2-C_6 alkynyl, C_3-C_7 cycloalkyl, C_3-C_7 halocycloalkyl,
 C_4-C_7 alkylcycloalkyl, C_4-C_7 cycloalkylalkyl, C_4-C_7 halocycloalkylalkyl, C_5-C
20 C_7 alkylcycloalkylalkyl, C_1-C_7 haloalkoxy, C_2-C_7 alkoxyalkyl, C_2-C_4
cyanoalkyl, C_1-C_7 haloalkyl, C_2-C_7 haloalkenyl, C_3-C_7 alkylthioalkyl, C_2-C_7
haloalkoxyalkyl, benzyl or C_4-C_7 alkylcycloalkyl;
 R^{11} is H or C_1-C_7 alkyl;
 R^{12} is H or C_1-C_7 alkyl;
25 each R^{13} and R^{14} is independently H, C_1-C_7 haloalkyl or C_1-C_7 alkyl; and
 R^f is C_1-C_3 haloalkyl.
8. The compound of Claim 7 wherein
 R^1 is H, C_1-C_3 alkyl, halogen or C_3-C_4 cycloalkyl;
 R^2 is H, Me, F, Cl or CN;
30 R^3 is H, Me, F, Cl, -CN, OMe or CF_3 ;
 R^4 is H, SO_2CF_3 , SO_2CH_3 , CO_2Me , COMe, $CH_2OCO-t-Bu$, $CH_2OCO-n-Bu$,
 $CH_2OCO-c-hexyl$, $CH_2OCO-c-pentyl$, $CH_2OCOCH_2CH_3$, COMe, CH_2OCOPh ,
 $CH_2OCO-i-Bu$, CH_2OCOME , $CH_2OCO-sec-Bu$, $CH_2OCO-n-Pr$ and $CH_2OCO-i-$
Pr or $(C=O)SMe$;
35 R^5 is H, C_4-C_7 cycloalkylalkyl or C_2-C_7 alkoxyalkyl;
 R^6 is H, C_1-C_7 alkyl or C_1-C_7 alkoxy;
 R^7 is H, C_1-C_7 alkyl, C_3-C_7 cycloalkyl, C_1-C_7 haloalkyl, C_2-C_7 alkoxyalkyl, C_1-C_7
alkoxy or C_1-C_7 haloalkoxy;

R⁸ is H, C₁–C₇ alkyl or C₁–C₇ alkoxy;

G is OR¹⁰ or SR¹⁰;

R⁹ is H, C₁–C₇ alkyl or C₁–C₇ alkoxy; and

5 R¹⁰ is C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₃–C₇ halocycloalkyl, C₄–C₇ alkylcycloalkyl, C₄–C₇ cycloalkylalkyl, C₄–C₇ halocycloalkylalkyl, C₅–C₇ alkylcycloalkylalkyl, C₂–C₄ cyanoalkyl, C₃–C₇ alkylthioalkyl or C₄–C₇ alkylcycloalkyl;

9. The compound of Claim 8 wherein

R¹ is H, Me, halogen or cyclopropyl;

10 R² is H or F;

R³ is Me or F;

R⁴ is H, CH₂OCOR¹⁴ or -S(O)₂R¹⁴;

R⁵ is H;

R⁶ is H, Me or OMe;

15 R⁷ is H, Me or OMe;

R⁸ is H, Me or OMe;

G is OR¹⁰;

R⁹ is H, Me or OMe;

20 R¹⁰ is H, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₄–C₇ cycloalkylalkyl, C₄–C₇ halocycloalkylalkyl or C₄–C₇ alkylcycloalkyl.

10. The compound of Claim 9 wherein

R¹ is H, Me, F, Cl, Br or cyclopropyl;

R⁴ is H, CH₂OCO-*t*-Bu or SO₂CF₃;

R⁸ is H;

25 R⁹ is H; and

R¹⁰ is C₂–C₆ alkenyl, C₂–C₆ alkynyl or C₃–C₇ cycloalkyl.

11. The compound of Claim 1 wherein

Q is O;

30 R¹ is H, C₁–C₇ alkyl, halogen, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₁–C₇ haloalkyl;

R² is H, C₁–C₇ alkyl, halogen or CN;

R³ is H, C₁–C₇ alkyl, halogen, CN, C₁–C₇ alkoxy or C₁–C₇ haloalkyl;

35 R⁴ is H, C(=O)R¹⁴, -C(=S)R¹⁴, -CO₂R¹⁴, -C(=O)SR¹⁴, -S(O)₂R¹⁴, C(=O)NR¹³R¹⁴, -S(O)₂NR¹³R¹⁴, CH₂OC(=O)OR¹⁴, CH₂OC(=O)NR¹³R¹⁴ or CH₂OC(=O)R¹⁴;

R⁵ is H, C₂–C₆ alkenyl, C₂–C₇ haloalkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₄–C₇ cycloalkylalkyl, C₂–C₇ alkoxyalkyl or C₄–C₇ alkylcycloalkyl;

- R⁶ is H, C₁–C₇ alkyl, C₃–C₇ cycloalkyl, C₁–C₇ haloalkyl, C₂–C₇ alkoxyalkyl, C₁–C₇ alkoxy or C₁–C₇ haloalkoxy;
- R⁷ is H, C₁–C₇ alkyl, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₂–C₇ alkoxyalkyl, C₁–C₇ alkoxy or C₁–C₇ haloalkoxy;
- R⁸ is H, C₁–C₇ alkyl, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₂–C₇ alkoxyalkyl, C₁–C₇ alkoxy or C₁–C₇ haloalkoxy;
- G is OR¹⁰, SR¹⁰, SOR¹⁰ or SO₂R¹⁰;
- R¹⁰ is H, C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₃–C₇ halocycloalkyl, C₄–C₇ alkylcycloalkyl, C₄–C₇ cycloalkylalkyl, C₄–C₇ halocycloalkylalkyl, C₅–C₇ alkylcycloalkylalkyl, C₁–C₇ haloalkoxy, C₂–C₇ alkoxyalkyl, C₂–C₄ cyanoalkyl, C₁–C₇ haloalkyl, C₂–C₇ haloalkenyl, C₃–C₇ alkylthioalkyl, C₂–C₇ haloalkoxyalkyl, benzyl or C₄–C₇ alkylcycloalkyl;
- R¹¹ is H or C₁–C₇ alkyl;
- R¹² is H or C₁–C₇ alkyl;
- each R¹³ and R¹⁴ is independently H, C₁–C₇ haloalkyl or C₁–C₇ alkyl; and
- R^f is C₁–C₃ haloalkyl.
12. The compound of Claim 11 wherein
- R¹ is H, C₁–C₃ alkyl, halogen or C₃–C₄ cycloalkyl;
- R² is H, Me, F, Cl or CN;
- R³ is H, Me, F, Cl, -CN, OMe or CF₃;
- R⁴ is H, SO₂CF₃, SO₂CH₃, CO₂Me, COMe, CH₂OCO-*t*-Bu, CH₂OCO-*n*-Bu, CH₂OCO-*c*-hexyl, CH₂OCO-*c*-pentyl, CH₂OCOCH₂CH₃, COMe, CH₂OCOPh, CH₂OCO-*i*-Bu, CH₂OCOME, CH₂OCO-*sec*-Bu, CH₂OCO-*n*-Pr and CH₂OCO-*i*-Pr or (C=O)SMe;
- R⁵ is H, C₄–C₇ cycloalkylalkyl or C₂–C₇ alkoxyalkyl;
- R⁶ is H, C₁–C₇ alkyl or C₁–C₇ alkoxy;
- R⁷ is H, C₁–C₇ alkyl, C₃–C₇ cycloalkyl, C₁–C₇ haloalkyl, C₂–C₇ alkoxyalkyl, C₁–C₇ alkoxy or C₁–C₇ haloalkoxy;
- R⁸ is H, C₁–C₇ alkyl or C₁–C₇ alkoxy;
- G is OR¹⁰ or SR¹⁰; and
- R¹⁰ is C₂–C₆ alkenyl, C₂–C₆ alkynyl, C₃–C₇ cycloalkyl, C₃–C₇ halocycloalkyl, C₄–C₇ alkylcycloalkyl, C₄–C₇ cycloalkylalkyl, C₄–C₇ halocycloalkylalkyl, C₅–C₇ alkylcycloalkylalkyl, C₂–C₄ cyanoalkyl, C₃–C₇ alkylthioalkyl, benzyl or C₄–C₇ alkylcycloalkyl.
13. The compound of Claim 12 wherein
- R¹ is H, Me, halogen or cyclopropyl;

R² is H or F;

R³ is Me or F;

R⁴ is H, CH₂OCOR¹⁴ or -S(O)₂R¹⁴;

R⁵ is H;

5 R⁶ is H, Me or OMe;

R⁷ is H, Me or OMe;

R⁸ is H, Me or OMe;

G is OR¹⁰;

10 R¹⁰ is C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₇ cycloalkyl, C₄-C₇ cycloalkylalkyl, C₄-C₇ halocycloalkylalkyl or C₄-C₇ alkylcycloalkyl.

14. The compound of Claim 13 wherein

R¹ is H, Me, F, Cl, Br or cyclopropyl;

R⁴ is H, CH₂OCO-*t*-Bu or SO₂CF₃;

R⁸ is H; and

15 R¹⁰ is C₂-C₆ alkenyl, C₂-C₆ alkynyl or C₃-C₇ cycloalkyl.

15. The compound of Claim 14 wherein

R¹ is Me;

R³ is Me;

R⁴ is H;

20 R⁶ is H;

R⁷ is H; and

R¹⁰ is cyclopropyl, cyclobutyl, cyclopentyl, allyl or propargyl.

16. The compound of Claim 1 wherein

25 R¹ is H, C₁-C₇ alkyl, halogen, C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₇ cycloalkyl, C₁-C₇ haloalkyl;

R² is H, C₁-C₇ alkyl, halogen or CN;

R³ is H, C₁-C₇ alkyl, halogen, CN, C₁-C₇ alkoxy or C₁-C₇ haloalkyl;

30 R⁴ is H, C(=O)R¹⁴, -C(=S)R¹⁴, -CO₂R¹⁴, -C(=O)SR¹⁴, -S(O)₂R¹⁴, C(=O)NR¹³R¹⁴, -S(O)₂NR¹³R¹⁴, CH₂OC(=O)OR¹⁴, CH₂OC(=O)NR¹³R¹⁴ or CH₂OC(=O)R¹⁴;

R⁶ is H, C₁-C₇ alkyl, C₃-C₇ cycloalkyl, C₁-C₇ haloalkyl, C₂-C₇ alkoxyalkyl, C₁-C₇ alkoxy or C₁-C₇ haloalkoxy;

35 R⁷ is H, C₁-C₇ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₇ cycloalkyl, C₃-C₇ alkenylalkyl, C₃-C₇ alkynylalkyl, C₂-C₄ cyanoalkyl, C₁-C₇ haloalkyl, C₂-C₇ haloalkenyl, C₂-C₇ alkoxyalkyl, C₁-C₇ alkoxy or C₁-C₇ haloalkoxy;

R⁸ is H, C₁-C₇ alkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl, C₃-C₇ cycloalkyl, C₂-C₄ cyanoalkyl, C₁-C₇ haloalkyl, C₂-C₇ haloalkenyl, C₂-C₇ alkoxyalkyl, C₁-C₇ alkoxy or C₁-C₇ haloalkoxy;

G and R⁵ are taken together to form N-OR¹⁵;

5 R¹¹ is H or C₁-C₇ alkyl;

R¹² is H or C₁-C₇ alkyl;

each R¹³ and R¹⁴ is independently H, C₁-C₇ haloalkyl or C₁-C₇ alkyl;

R^f is C₁-C₃ haloalkyl; and

10 R¹⁵ is H, C₁-C₆ alkyl, C₁-C₆ haloalkyl, C₂-C₆ alkenyl, C₂-C₆ alkynyl or C₄-C₇ cycloalkylalkyl.

17. The compound of Claim 16 wherein

R¹ is H, C₁-C₃ alkyl, halogen or C₃-C₄ cycloalkyl;

R² is H, Me, F, Cl or CN;

R³ is H, Me, F, Cl, -CN, OMe or CF₃;

15 R⁴ is H, SO₂CF₃, SO₂CH₃, CO₂Me, COMe, CH₂OCO-*t*-Bu, CH₂OCO-*n*-Bu, CH₂OCO-*c*-hexyl, CH₂OCO-*c*-pentyl, CH₂OCOCH₂CH₃, COMe, CH₂OCOPh, CH₂OCO-*i*-Bu, CH₂OCOME, CH₂OCO-*sec*-Bu, CH₂OCO-*n*-Pr and CH₂OCO-*i*-Pr or (C=O)SMe;

R⁶ is H, C₁-C₇ alkyl or C₁-C₇ alkoxy;

20 R⁷ is H, C₁-C₇ alkyl, C₃-C₇ cycloalkyl, C₁-C₇ haloalkyl, C₂-C₇ alkoxyalkyl, C₁-C₇ alkoxy or C₁-C₇ haloalkoxy; and

R⁸ is H, C₁-C₇ alkyl or C₁-C₇ alkoxy.

18. The compound of Claim 17 wherein

R¹ is H, Me, halogen or cyclopropyl;

25 R² is H or F;

R³ is Me or F;

R⁴ is H, CH₂OCOR¹⁴ or -S(O)₂R¹⁴;

R⁶ is H, Me or OMe;

R⁷ is H, Me or OMe; and

30 R⁸ is H, Me or OMe.

19. The compound of Claim 18 wherein

R¹ is H, Me, F, Cl, Br or cyclopropyl;

R⁴ is H, CH₂OCO-*t*-Bu or SO₂CF₃; and

R⁸ is H.

35 20. The compound of Claim 19 wherein

R¹ is Me;

R³ is Me;

R⁴ is H;
 R⁶ is H;
 R⁷ is H; and
 R¹⁵ is H, Me, Et, CH₂CH=CH₂ or CH₂C≡CH.

- 5 21. The compound of any one of Claims 16-19 wherein
 Q is direct bond.

22. The compound of Claim 1 selected from the group consisting of

<i>N</i> -[5-[3-(cyclopentyloxy)-2-oxo-1-pyrrolidinyl]-2,4-dimethylphenyl]-1,1,1-trifluoromethanesulfonamide (Compound 6);	
[[5-[3-(cyclopentyloxy)-2-oxo-1-pyrrolidinyl]-2,4-dimethylphenyl][(trifluoromethyl)sulfonyl]amino]methyl 2,2-dimethylpropanoate (Compound 5)	
<i>N</i> -[2,4-dimethyl-5-[2-oxo-3-(2-propyn-1-yloxy)-1-pyrrolidinyl]phenyl]-1,1,1-trifluoromethanesulfonamide (Compound 1);	
<i>N</i> -[5-[3-(cyclopropyloxy)-2-oxo-1-pyrrolidinyl]-2,4-dimethylphenyl]-1,1,1-trifluoromethanesulfonamide (Compound 3);	
[[5-[3-(cyclopropyloxy)-2-oxo-1-pyrrolidinyl]-2,4-dimethylphenyl][(trifluoromethyl)sulfonyl]amino]methyl	2,2-dimethylpropanoate (Compound 7);
[[5-[3-(cyclobutyloxy)-2-oxo-1-pyrrolidinyl]-2,4-dimethylphenyl][(trifluoromethyl)sulfonyl]amino]methyl	2,2-dimethylpropanoate (Compound 8);
<i>N</i> -[2,4-dimethyl-5-[2-oxo-3-(2-propen-1-yloxy)-1-pyrrolidinyl]phenyl]-1,1,1-trifluoromethanesulfonamide (Compound 2); and	
<i>N</i> -[5-[3-(cyclobutyloxy)-2-oxo-1-pyrrolidinyl]-2,4-dimethylphenyl]-1,1,1-trifluoromethanesulfonamide (Compound 4).	

23. The compound of Claim 1 selected from the group consisting of

<i>N</i> -[5-[3-(cyclopentyloxy)-2-oxo-1-pyrrolidinyl]-2,4-dimethylphenyl]-1,1,1-trifluoromethanesulfonamide (Compound 6);	
[[5-[3-(cyclopentyloxy)-2-oxo-1-pyrrolidinyl]-2,4-dimethylphenyl][(trifluoromethyl)sulfonyl]amino]methyl 2,2-dimethylpropanoate (Compound 5)	
<i>N</i> -[2,4-dimethyl-5-[2-oxo-3-(2-propyn-1-yloxy)-1-pyrrolidinyl]phenyl]-1,1,1-trifluoromethanesulfonamide (Compound 1);	
<i>N</i> -[5-[3-(cyclopropyloxy)-2-oxo-1-pyrrolidinyl]-2,4-dimethylphenyl]-1,1,1-trifluoromethanesulfonamide (Compound 3);	

[[5-[3-(cyclopropyloxy)-2-oxo-1-pyrrolidinyl]-2,4-dimethylphenyl][(trifluoromethyl)sulfonyl]amino]methyl (Compound 7);	2,2-dimethylpropanoate
[[5-[3-(cyclobutyloxy)-2-oxo-1-pyrrolidinyl]-2,4-dimethylphenyl][(trifluoromethyl)sulfonyl]amino]methyl (Compound 8);	2,2-dimethylpropanoate
<i>N</i> -[2,4-dimethyl-5-[2-oxo-3-(2-propen-1-yloxy)-1-pyrrolidinyl]phenyl]-1,1,1-trifluoromethanesulfonamide (Compound 2); and	
<i>N</i> -[5-[3-(cyclobutyloxy)-2-oxo-1-pyrrolidinyl]-2,4-dimethylphenyl]-1,1,1-trifluoromethanesulfonamide (Compound 4).	
<i>N</i> -[5-[3-(Ethoxyimino)-2-oxo-1-pyrrolidinyl]-2,4-dimethylphenyl]-1,1,1-trifluoromethanesulfonamide (Compound 12)	
<i>N</i> -[2,4-Dimethyl-5-[2-oxo-3-[(2-propyn-1-yloxy)imino]-1-pyrrolidinyl]phenyl]-1,1,1-trifluoromethanesulfonamide (Compound 13)	
1,1,1-Trifluoro- <i>N</i> -[5-[3-(methoxyimino)-2-oxo-1-pyrrolidinyl]-2,4-dimethylphenyl]methanesulfonamide (Compound 9)	

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

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

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

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

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

28. The method of Claim 29 further comprising contacting the vegetation or its environment with a herbicidally effective amount of at least one additional active ingredient selected from (b1) through (b16) and salts of compounds of (b1) through (b16).