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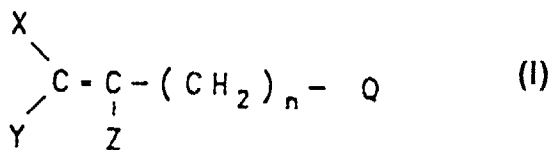
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Titre: Improved compositions for nematode control.

(57)

Abrégé:

The present invention provides novel compositions, unexpectedly advantageous for controlling nematode, insect or acarid infestation of a plant, comprising a quantitatively variable combination of a compound of formula (I) in combination with selected adjuvants from among the typical wetting, dispersing or emulsifying agents.



IMPROVED COMPOSITIONS FOR NEMATODE CONTROL

Field of the invention

The present invention relates to unexpectedly improved novel compositions that contain a compound active on foliage in downward
5 systemic control of plant pests, ie parasitic nematodes, insects and acarid infestation. The composition is a compound, particularly as disclosed in U.S. application Serial Number 07/827,231, filed February 3, 1992, which is a continuation-in-part of U.S. Serial number 07/663,218, filed March 1, 1991, incorporated herein by reference therefor, and published in the
10 Patent Cooperation Treaty application Number PCT/US92/1474, in combination with an adjuvant selected from among typical wetting, dispersing or emulsifying agents used in agricultural formulations. The invention relates also to a method for controlling nematodes, insects, and acarids and to the use of the novel compositions.

Background of the Invention

15 It is well-known to use wetting, dispersing or emulsifying agents in fluorinated alkene-containing nematocidal, insecticidal, or acaricidal compositions. For example, the above noted U.S. application discloses use of a blend of the calcium salt of dodecylbenzene sulfonate and nonionic 6-
20 molar ethylene oxide condensation product of nonylphenol, a blend of the calcium salt of dodecylbenzene sulfonate and a nonionic 30-molar ethylene oxide condensation product of nonyl phenol, a nonionic paste of polyalkylene glycol ether, refined xylene solvent and preferably Tween 20.

See also the above noted application, U.S. Patent 4,950,666, and
25 U.S. 4,876,285 for other typical surface-active wetting dispersing, and emulsifying agents used in agricultural formulations. For example, such agents include the alkyl and alkylaryl sulfonates and sulfates and their sodium salts; alkylamide sulfonates, including fatty methyltaurides; alkylaryl polyether alcohols, sulfated higher alcohols, polyvinyl alcohols;

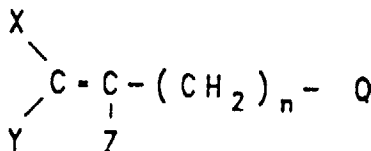
polyethylene oxides; sulfonated animal and vegetable oils; sulfonated petroleum oils; fatty acid esters of polyhydric alcohols and the ethylene oxide addition products of such esters; and the addition products of long-chain mercaptans and ethylene oxide.

5 Additionally, U.S. Patent Nos. 5,237,100, 5,236,938, and 5,232,949 disclose nematocides in compositions together with adjuvants including synergists exemplified as piperonyl butoxide or sesamex.

However, there remains a need in the art for nematocide, insecticide, or acaridicide compositions having improved plant uptake,
10 systemic mobility, and desirably low effective levels of use.

Summary of the Invention

The present invention provides compositions for controlling nematode, insect or acarid infestation of a plant, comprising a quantitatively variable combination of a compound of the formula I having
15 the structure



wherein:

$n = 1, 3, 5, 7, 9, \text{ or } 11$;

Q is CH_2NHR_6 , CH_2NO_2 , $\text{CH}_2\text{N}=\text{CHR}_2$, $\text{CH}_2\text{N}=\text{C}=\text{O}$, $\text{CH}_2\text{N}^+\text{R}_3\text{R}_4\text{R}_5\text{W}^-$,

25 or $(\text{C}=\text{O})-\text{R}_{11}$;

X, Y, and Z are independently H or F, provided that at

least one of X and Y is F, and further provided that when Q is $(\text{C}=\text{O})-\text{R}_{11}$ each of X, Y, and Z is F;

W⁻ is an agronomically acceptable anion;

30 R₂ is an aromatic group;

each of R_3 , R_4 , and R_5 is independently hydrogen; a lower

alkyl group, optionally substituted with at least one group
selected from hydroxy, alkoxy, halo, nitro, amino, thiol, alkylthio,
carboxyl, alkoxy-carbonyl, and phenyl; one of R_3 , R_4 , and R_5 is
5 hydroxy and the other two are hydrogen; or R_3 , R_4 , and R_5 taken
together with the nitrogen of Q form a cyclic quaternary
ammonium group;

R_6 is hydrogen; an aliphatic group, optionally
substituted with at least one group selected from hydroxy, alkoxy,
10 halo, nitro, amino, thiol, alkylthio, carboxyl, alkoxycarbonyl, and
phenyl; an amino acid amide of Q; (C=O)- R_7 ; C_1 - C_{12} aliphatic
amines, optionally substituted with at least one group selected
from hydroxy, alkoxy, halo, nitro, amino, thiol, alkylthio,
carboxyl, alkoxycarbonyl, and phenyl; C_2 - C_{12} aliphatic carboxylic
15 acids, their esters, thiol esters, and amides, all optionally
substituted with at least one group selected from hydroxy, alkoxy,
halo, nitro, amino, thiol, alkylthio, carboxyl, alkoxycarbonyl, and
phenyl; dihydro-3-oxo-pyrazolidinyl; or phenyl or thiophene,
optionally substituted with at least one group selected from
20 hydroxy, alkoxy, halo, nitro, amino, thiol, alkylthio, carboxyl,
alkoxycarbonyl, and phenyl;

or R_6 taken with the nitrogen of Q is guanidine;

hydrazine; alkyl or aryl hydrazine, optionally substituted with at
least one group selected from hydroxy, alkoxy, halo, nitro, amino,
25 thiol, alkylthio, carboxyl, alkoxycarbonyl, and phenyl; or an alkyl
or aryl sulfonamide, optionally substituted with at least one
group selected from hydroxy, alkoxy, halo, nitro, amino, thiol,
alkylthio, carboxyl, alkoxycarbonyl, and phenyl;

R_7 is (C=O)- R_{14} ; C_1 - C_{12} aliphatic group optionally

substituted with at least one group selected from hydroxy, alkoxy, halo, nitro, amino, thiol, alkylthio, carboxyl, alkoxycarbonyl, and phenyl; C₂-C₁₂ aliphatic carboxylic acid, esters, thiol esters, or amides thereof, all optionally substituted with at least one group selected from hydroxy, alkoxy, halo, nitro, amino, thiol, alkylthio, carboxyl, alkoxycarbonyl, and phenyl; or a N, O, or S group such that when taken with the carboxamide is a urea, semicarbazide, carbamate, or thiocarbamate group, all optionally substituted with an alkyl or aryl group, optionally substituted with at least one group selected from hydroxy, alkoxy, halo, nitro, amino, thiol, alkylthio, carboxyl, alkoxy-carbonyl, and phenyl;

R₁₁ is -OR₁₂, -SR₁₂, halogen, -NHOH, or -NR₁₂R₁₃ wherein each of R₁₂ and R₁₃ is independently hydrogen; an aliphatic or an aromatic group, optionally substituted with at least one group selected from hydroxy, alkoxy, halo, nitro, amino, thiol, alkylthio, carboxyl, alkoxycarbonyl, and phenyl; a C₁-C₁₂ aliphatic amine, optionally substituted with at least one group selected from hydroxy, alkoxy, halo, nitro, amino, thiol, alkylthio, carboxyl, alkoxycarbonyl, and phenyl; a C₂-C₁₂ aliphatic carboxylic acid, esters, amides and salts thereof, optionally substituted with at least one group selected from hydroxy, alkoxy, halo, nitro, amino, thiol, alkylthio, carboxyl, alkoxycarbonyl, and phenyl;

or R₁₂ and R₁₃ taken together with the N of R₁₁ are a protein amino acid or a cyclic group selected from morpholine, piperidine, piperazine, or pyrrolidine, optionally substituted with at least one group selected from hydroxy, alkoxy, halo, nitro, amino, thiol, alkylthio, carboxyl, alkoxycarbonyl, and phenyl;

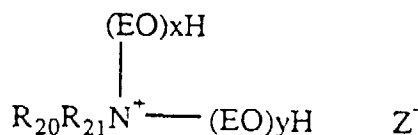
R₁₄ is OH, alkoxy, NH₂, or NHNH₂;

or any agronomically acceptable salt thereof;

together with or in combination with an activity enhancing amount of an adjuvant of the

(a) formula II which is alkyl glycosides wherein the alkyl group is a mixture of from about eight to fourteen carbons and the number of glycoside groups present in the formula are from one to about six but preferably one to two, and more preferably APG 325 or APG 225 where the alkyl group is a mixture of from nine to eleven carbons or Atplus 258 or either Rhodonat LMO which is coconut oil based sucroglyceride or Rhodonat MLP 704 which is modified LMO sucroglyceride;

(b) formula III which is a quaternized fatty amine ethoxylate wherein the fatty amine is an alkylamine wherein the alkyl group is a mixture of from about eight to twenty carbon atoms, preferably a mixture of from eight to sixteen carbon atoms, more preferably a mixture of from eight to twelve carbon atoms such as is found in cocomethyl ammonium chloride, and most preferably Ethoquad C/12 (the quaternized fatty amine ethoxylate may be represented by the formula



wherein:

R_{20} is a mixture of alkyl groups of from about eight to twenty-two carbon atoms, inclusive;

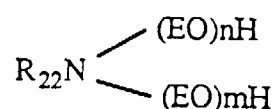
R_{21} is an alkyl of from one to four carbons, inclusive;

EO is an ethylene oxide monomer wherein x and y are independently a number of from zero to fourteen and are the number of moles of ethoxylation present with the proviso that x and y taken together must be from two to fourteen, preferably two; and

Z^- is an agronomically acceptable anion);

(c) formula IV which is a mixture of a fatty amine ethoxylate and ethoxylated alkylphenol, preferably Improve® (the fatty amine ethoxylate may be represented by the formula

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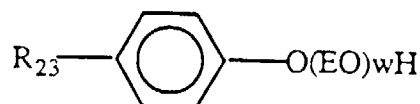
wherein:

10 R_{22} represents a mixture of alkyls of from about six to thirty carbons, inclusive, preferably from about twelve to twenty carbons, inclusive,

EO is an ethyleneoxide monomer; and

15 n and m represent the number of moles of ethoxylation in the formula and are when taken together about from one to fifty, preferably five to fifteen, and the ethoxylated alkylphenol may be represented by the formula

20



wherein:

R_{23} is a mixture of alkyl groups of from zero to twenty carbons, inclusive, preferably from about eight to ten carbons, inclusive, and more preferably nine carbons;

25 EO is an ethylene oxide monomer; and

w is the number of moles of ethoxylation in the formula and is from about two to twenty, inclusive, and preferably from six to ten moles, inclusive);

(d) formula V which are ethoxylated acetylated diols, preferably 30 Surfynol 455, and more preferably present in the range from about 0.5% (the ethoxylated acetylated diols may be represented by the formula



10 * is a number of carbons to provide a total number of carbons in
the chain of from 10 through 12 carbons, inclusive; and EO is an ethylene
oxide monomer wherein q and p independently are numbers which
represent the number of moles of ethylene oxide monomers in the formula
and are when taken together in the range of from about 10 through 30,
15 inclusive, preferably 30);

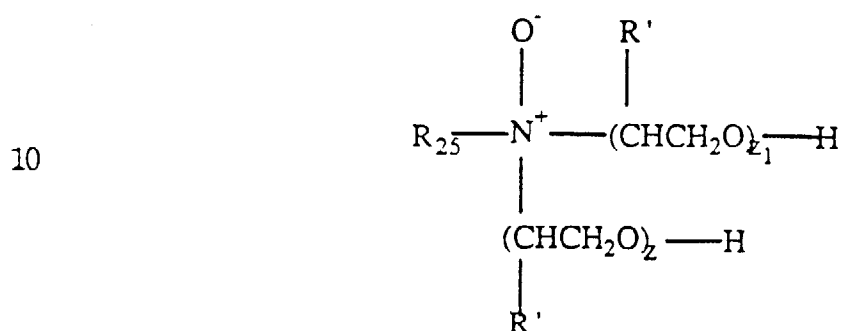
(e) formula VI which is a secondary alcohol ethoxylate wherein the number of moles of ethylene oxide monomers is from 7 to 15, inclusive, preferably Tergitol® 15-S-7, Tergitol® 15-S-9, or Tergitol® 15-S-12, and more preferably Tergitol® 15-S 12 (the formula VI may be shown as follows:



F.24a represents hydroxy or a Polyoxyethylene group wherein a represents the number of moles of ethylene oxide monomers present in the formula and is from about seven to fifteen, inclusive, preferably about 30 nine to twelve, inclusive, and C* represents the ends of the carbon chain such that altogether the chain is a mixture of carbons having a total of

from eleven to fifteen carbons, inclusive, preferably from twelve to fourteen carbons, inclusive);

(f) formula VII which is an alkoxyated fatty amine oxide, preferably Emcol XE 1656, including ethoxylated fatty amine oxide, preferably Flo-Mo 3153 (the alkoxyated fatty amine oxide is represented by the formula



15 wherein

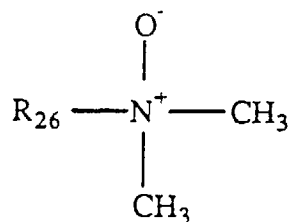
R_{25} represents a mixture of alkyls of from about six to thirty carbons, inclusive, preferably from about twelve to twenty carbons, inclusive;

R' is hydrogen or methyl; and

20 z and z_1 represent the number of moles of alkoxylation or preferably ethoxylation in the formula and are when taken together about from one to fifty, preferably five to fifteen);

(g) formula VIII which is an alkyl dimethyl amine oxide, preferably Empigen OB (the alkyl dimethyl amine oxide may be represented by the formula

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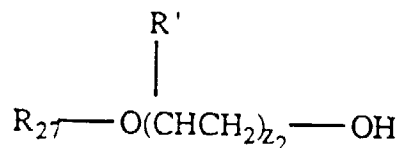
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wherein

R_{26} represents a mixture of alkyls of from about six to thirty carbons, inclusive, preferably from about twelve to twenty carbons, inclusive;

(h) formula IX which is a fatty alcohol polyglycol ether, preferably Genapol T250 or Neodol (the fatty alcohol polyglycol ether may be represented by the formula

15

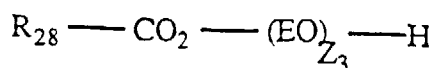


wherein

R_{27} represents a mixture of alkyls of from about six to thirty carbons, inclusive, preferably from about twelve to twenty carbons, inclusive; R' represents alkyl of from about one to two carbons, inclusive;

Z_2 represents the number of moles of ethoxylation in the formula and are when taken together about from one to fifty, preferably five to fifteen

(i) formula X which is a fatty acid esterified polyethoxyether, preferably Kaomul 230 or which is stearic acid polyethoxylate, preferably Simusol M52 (the coco esterified polyethoxyether and stearic acid polyethoxylate may be represented by the formula



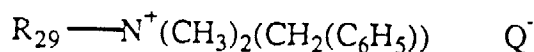
wherein

R_{28} represents a mixture of alkyls of from about six to thirty
5 carbons, inclusive, preferably from about twelve to twenty carbons,
inclusive;

EO represents ethoxylation in the formula and z_3 is from one
to fifty, preferably five to fifteen);

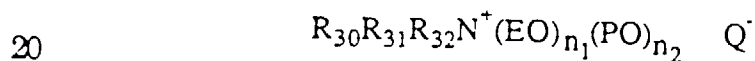
or

10 (j) formula XI which is a quaternary ammonium, preferably
Dodigen 226 (the quaternary ammonium may be represented by the
formula



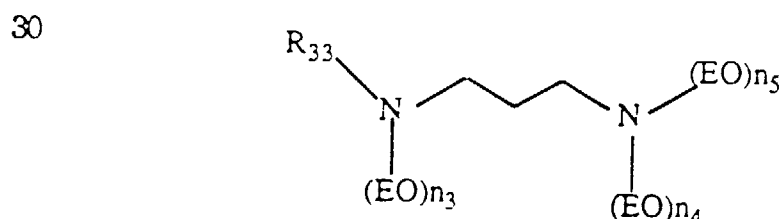
wherein R_{29} represents alkyl from C8 to C20, preferably C10 to C16 and
15 Q is an agronomically acceptable anion);

(k) formula XII which is a quaternary ammonium,
preferably Dodigen 4022 (the quaternary ammonium may be
represented by the formula



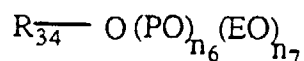
wherein R_{30} , R_{31} and R_{32} are independently alkyls of from one to three
carbons which together are from two to seven carbons, preferably all
methyl, or one of R_{30} , R_{31} , R_{32} is $((\text{EO})_{n_1}(\text{PO})_{n_2})$; EO is ethylene oxide;
PO is propylene oxide; n_1 is an integer of one to two; and n_2 is an
25 integer of three to fifteen, preferably six to ten; and Q is an
agronomically acceptable anion);

(l) formula XIII which is diamine ethoxylate, preferably
Ethodomeen (the diamine ethoxylate may be represented by the
formula



wherein R_{33} represents alkyl of from C8 to C20, preferably C10 to C16; and n_3, n_4, n_5 represent the number of moles of ethoxylation in the formula and are when taken together about from one to fifty, preferably five to fifteen);

- 5 (m) formula XIV which is an alkoxylated primary fatty alcohol, preferably Ethylan CPG 945 (the alkoxylated primary fatty alcohol may be represented by the formula



- 10 wherein R_{34} represents alkyl of from C8 to C18, preferably C13 to C15; EO is ethylene oxide; PO represents propylene oxide; n_6 is an integer of from 6 to 50, preferably from 6 to 9; n_7 is an integer from 4 to 8, preferably 4.5 to 6; and

- 15 (n) mixtures thereof.

Most preferably the adjuvant is of the formula represented by Improve® or Tergitol® 15-S-12.

- More preferably the compound of the formula I is an agronomically acceptable salt of 3,4,4-trifluoro-3-buten-1-amine, preferably the monohydrochloride salt thereof; N-(3,4,4-trifluoro-3-butenyl)glycine, preferably the monohydrochloride salt thereof; 2-amino-N-(3,4,4-trifluoro-2-butenyl)propanamide, preferably the monohydrochloride salt thereof; (S)-2-amino-4-(methylthio)-N-(3,4,4-trifluoro-3-butenyl)butanamide, preferably the monohydrochloride salt thereof; 4,4-difluoro-3-buten-1-amine, preferably the monohydrochloride salt thereof; 3,4,4-trifluoro-3-buten-1-amine, preferably the sodium salt thereof; a combination of 3,4,4-trifluoro-3-buten-1-amine and 3,4,4-trifluoro-3-buten-1-amine in a one to one ratio (1:1); (S)-2-amino-3-hydroxy-N-(3,4,4-trifluoro-3-butenyl)butanamide, preferably the monohydrochloride salt thereof; N-(4,4-difluoro-3-butenyl)glycine, methyl ester, preferably the monohydrochloride salt thereof; a combination of 3,4,4-trifluoro-2-buten-1-amine and 2-propanamine in a one to one ratio (1:1); N-(3,4,4-trifluoro-1-oxo-3-

butenyl)glycine; 2-[(3,4,4-trifluoro-3-butenyl)amino]acetamide, preferably the monohydrochloride salt thereof; or 3,4,4-trifluoro-3-butenic acid, 2-aminoethyl ester, preferably the monohydrochloride thereof.

5 More preferably the parasitically active ingredient is 3,4,4-trifluoro-3-butene-1-amine, preferably the monohydrochloride salt thereof; or N-(3,4,4-trifluoro-1-oxo-3-butenyl)glycine and most preferably the active ingredient is N-(3,4,4-trifluoro-1-oxo-3-butenyl)glycine.

10 It is surprising that a combination of a compound of the formula I and from about 0.05 to 20 % but less than an amount toxic to an infested plant, preferably about 0.10 to 2 %, of an adjuvant active ingredient of the formula II, III, IV, V, VI or mixtures thereof increases the effectiveness of the compound of formula I against
15 parasitic, particularly nematode infestation when applied to foliage of the infested plants by an unexpected difference compared to the a combination of the compound of formula I with other known surface-active wetting dispersing, and emulsifying agents commonly used in agricultural formulations. An ordinarily skilled artisan would be able
20 to find the % of adjuvant effective for a particular compound of the formula. The percentage expressed is by volume.

Therefore, the present invention is also a method for controlling nematodes, insects, and acarids and for the use of the novel compositions for controlling nematodes, insects, and acarids
25 comprising treating an infestation of nematodes, insects, and acarids either on the foliage or the soil of infested plants with a compound of the formula I together with an activity enhancing amount of an adjuvant of the formula II which is alkyl glycoside, preferably APG® 325 or Atplus 258 in the amount of 0.25-1%;
30 an adjuvant of the formula III which is ethoxylated cocomethyl ammonium chloride, preferably Ethoquad C/12 in the amount of 0.25-1%;
an adjuvant of the formula IV which is fatty amine ethoxylate, preferably Improve® in the amount of 0.25-2%;

an adjuvant of the formula V acetylenic diol ethoxylate, preferably Surfynol 485 and preferably in the amount of 0.5-1%; or
an adjuvant of the formula VI an ethoxylated secondary alcohol, preferably Tergitol® 15-S-7 in the amount of about 0.5%, Tergitol® 15-S-9 in the amount of about 0.5%, or Tergitol® 15-S-12 in the amount of 0.5%.

Detailed Description of the Invention

The novel compositions of the present invention are useful as an unexpectedly effective systemic composition for controlling
10 nematode, insect, and acarid infestation of a plant. These compositions provide a lower effective foliar use rate of compound of formula I while maintaining efficacy in nematode, insect, and acarid disease control. That is, when applied to the foliage or stems of a plant they are able to move through the phloem and xylem of the plant and
15 provide control of nematodes, insects, or acarids at other locations of the plant.

The present methods for systemic control of nematodes, insects, and acarids use unexpectedly enhanced phloem mobile compositions of the present invention. These compositions having a
20 compound of Formula I and a sufficient amount of an adjuvant to unexpectedly provide enhanced effectiveness. It has been proposed the enhanced effectiveness of the present compositions results from improved phloem mobility in order to relocate the compound of Formula I downward in a plant without eliminating the nematode-,
25 insect- or acarid-controlling activity of the compound of Formula I.

To effectively control nematodes or other pests systemically by application to the above-ground surfaces of a plant, the present compositions may improve the active ingredient capability of passing through the cuticle of the foliage or stem of a plant, passing into the
30 phloem, and remaining there long enough to be transported throughout the plant so as to move to untreated areas including the roots. There such a compound of formula I may leak out or in some way contact the pests to such an extent that they are killed or repelled and the damage they would do to the plant is reduced or eliminated.

During these steps throughout the plant, a compound of formula I may undergo chemical reactions, such as hydrolysis, or biological reactions, such as enzymatic actions. In addition, the formula I of the present invention may be devised which, when placed on the plant,
5 prior to absorption into the plant, may undergo reactions that result in a compound that is readily absorbable, translocatable, and effective in preventing pest damage. An example of such compounds are those having UV-labile protecting groups which when exposed to natural light undergo reaction and result in active and mobile derivatives of
10 compounds of the formula I. Another example is silylated amine derivatives.

Therefore, what is placed on the foliage or stem of the plant may not be a composition wherein the compound of formula I is actually transported or the compound of formula I that actually
15 controls the pest. Thus, the methods of the present invention provide for compositions that may be transformed through chemical or biological reactions to have proper polarity for systemic activity.

Although the methods of the present invention include applying composition to the plant locus, preferably to the foliage, are
20 known, the present compositions are surprising combinations of compounds of the formula I as defined above and selected adjuvants of the formulae II, III, IV, V, VI or mixtures thereof. These combinations are for adjuvants that can not be predicted from among those commonly used in agronomics.

25 Among the compounds of the formula I, in order to control nematodes it is preferred that n is 1 and X, Y, and Z are all F, and Q1 is then $\text{CH}_2\text{NH}_3^+\text{W}^-$, that is, a salt of 3,4,4-trifluoro-3-butene-1-amine. When Q1 is CH_2NHR_6 , R_6 is preferably an alpha-amino acid linked by a peptide (amide) bond, more
30 preferably a protein amino acid. When Q1 is $(\text{C}=\text{O})\text{-R}_{11}$, R_{11} is preferably hydroxyl and the compound is thus 3,4,4-trifluoro-3-butenic acid or a salt thereof, including a salt formed with

3,4,4-trifluoro-3-butene-1-amine, that is,
3,4,4-trifluoro-3-butene-1-amine 3,4,4-
trifluoro-3-butenolate.

W- may be any agronomically acceptable anion.

- 5 This includes, but is not limited to chloride, iodide, bromide, oxalate, sulfate, phosphate, citrate, acetate, or a fluoroalkene carboxylate, for example, $F_2C=CFCH_2COO^-$.

In addition to the compounds specifically
10 described above, all agronomically acceptable salts of the compounds are within the scope of the present invention. For example, a compound of the present invention having a free amine group may also exist as the protonated form having various anions associated
15 therewith, for example, but not limited to, chloride, bromide, iodide, phosphate, oxalate, sulfate, citrate, and acetate. In addition, a fluoroalkene carboxylate ion, such as $F_2C=CFCH_2COO^-$, may be the counter-ion.

A compound of the present invention having a carboxylic
20 acid or hydroxyl group may exist as the salt having various cations associated therewith, for example, but not limited to, alkali earth metals, such as sodium, calcium, and potassium; magnesium; or quaternary ammonium ions, such as ammonium, mono-, di-, or
25 trialkylammonium, for example, isopropylammonium, or pyridinium. In addition, a fluoroalkenyl ammonium ion, such as $F_2C=CFCH_2CH_2NH_3^+$, may be the cation. All such compounds and others having similar characteristics, being agronomically acceptable, are encompassed by the present
30 invention.

As used herein, the term "halo", "halide", or "halogen" means fluorine, chlorine, iodine, or bromine or cognates thereof.

The term "alkyl" in the definitions of the formula I means straight-chain or branched groups of from one to about seven carbon

atoms. The term "lower alkyl" means a such a group containing from one to about four carbon atoms. The term "aliphatic" means saturated or unsaturated, branched or straight-chain, alkyl groups having from one to ten carbon atoms.

- 5 The term "alkoxy" means a lower alkyl group bonded via an oxygen atom. The term "alkylthio" means a lower alkyl group bonded via a sulfur atom. The term "alkoxycarbonyl" means the lower alkyl ester of a carboxyl group.

- The term "aliphatic amine" means an aliphatic group
10 wherein at least one hydrogen is replaced with -NH_2 . The term "aliphatic carboxylic acid, its esters, thiol esters, and amides" means an aliphatic group wherein at least one carbon is a carboxylic group, -COOH , or is the lower alkyl ester, lower alkyl thiol ester, or amide thereof.

- 15 The term "aromatic group" or "aryl" means phenyl, optionally substituted with at least one group selected from hydroxy, alkoxy, halo, nitro, amino, thiol, alkylthio, carboxyl, alkoxycarbonyl, and phenyl. It should be obvious to one of ordinary skill in the art that heterocycles could also be used for the aromatic group, for example,
20 thiadiazole, pyridine, thiazole, isothiazole, oxazole, pyrazole, triazole, benzothiazole, thiophene, furan, and the like, all of which may also be optionally substituted.

- As used herein, the phrase "amino acid amide of Q" (or Q_1) means that R_6 is an amino acid coupled via a peptide (amide) bond to
25 the N of CH_2NHR_6 . This amino acid may be a natural, i.e., protein, amino acid or a nonnaturally occurring amino acid. The amino group of the amino acid may be a substituent of any carbon in the group, for example, alpha, beta, or gamma to the carbonyl.

- The term "alkyl or aryl hydrazine" means a hydrazine group
30 substituted with a lower alkyl or phenyl group, which in turn may be optionally substituted. The term "alkyl or aryl sulfonamide" means a sulfonamide group substituted with a lower alkyl or phenyl group, which in turn may be optionally substituted.

COMPOUND SYNTHESIS

Methods of preparation for the compounds of formula I of the present invention are described in PCT application Number PCT/US92/1474 which is incorporated by reference therefor.

5

FORMULATIONS

In normal use, the compositions usually will not be employed free from further admixture or dilution, but ordinarily will be used in a suitable formulated composition compatible with the method of application and comprising an effective amount of the composition.

10 The compositions of this invention may be blended with additional agriculturally acceptable surface-active agents and carriers normally employed for facilitating the dispersion of active ingredients, recognizing the accepted fact that the formulation and mode of application may affect the activity of the composition. The present

15 composition may be applied, for example, as sprays, dusts, or granules, to the area where pest control is desired, the type of application varying with the pest and the environment. Thus, the compositions of this invention may be formulated as granules of large particle size, as powdery dusts, as wettable powders, as emulsifiable

20 concentrates, as solution, and the like.

Granules may comprise porous or nonporous particles, such as attapulgite clay or sand, for example, which serve as carriers for the present compounds. The granule particles are relatively large, a diameter of about 400-2500 microns typically. The particles are either

25 impregnated with the composition of the invention from solution or coated with the composition, adhesive sometimes being employed. Granules generally contain 0.05-10%, preferably 0.5-5%, active ingredient.

Dusts are admixtures of the compounds, with finely divided

30 solids such as talc, attapulgite clay, kieselguhr, pyrophyllite, chalk, diatomaceous earths, calcium phosphates, calcium and magnesium carbonates, sulfur, flours, and other organic and inorganic solids which act as carriers for the compound. These finely divided solids

have an average particle size of less than about 50 microns. A typical dust formulation contains 1 part of compound and 99 parts of talc.

The compositions of the present invention may be made into liquid concentrates by dissolution or emulsification in suitable liquids
5 and into solid concentrates by admixture with talc, clays, and other known solid carriers used in the agricultural chemical art. The concentrates are compositions containing about 5-50% active composition of which 98.00-99.25% may be of the formula I and 0.25- 2% may be adjuvant and 95-50% inert material, which includes surface-
10 active dispersing, emulsifying, and wetting agents not within the definition of adjuvant herein, but even higher concentrations of pesticidal active ingredient or adjuvant active ingredient may be employed experimentally. The concentrates are diluted with water or other liquids for practical application as sprays, or with additional
15 solid carrier for use as dusts.

A typical 50% wettable powder formulation would consist of 50.0% (wt/wt) of the composition, 22.0% attapulgite diluent, 22.0% of kaolin diluent, and 6.0% sodium salts of sulfonated Kraft lignin emulsifier.

20 Typical carriers for solid concentrates (also called wettable powders) include fuller's earth, clays, silicas, and other highly absorbent, readily wetted inorganic diluents. A suitable solid concentrate formulation may contain 1.5 parts each of sodium lignosulfonate and sodium lauryl sulfate as additional wetting agents,
25 25 parts of active compound and 72 parts of attapulgite clay.

Manufacturing concentrates are useful for shipping low melting products of this invention. Such concentrates are prepared by melting the low melting solid products together with one percent or more of a solvent to produce a concentrate which does not solidify on
30 cooling to the freezing point of the pure product or below.

Useful liquid concentrates include the emulsifiable concentrates, which are homogeneous liquid or paste compositions readily dispersed in water or other liquid carriers. They may consist entirely of the active compound with a liquid or solid emulsifying

agent, or they may also contain a liquid carrier such as xylene, heavy aromatic naphthas, isophorone and other relatively non-volatile organic solvents. For application, these concentrates are dispersed in water or other liquid carriers and normally applied as sprays to areas
5 to be treated.

A typical 50 gram per liter emulsifiable concentrate formulation would consist of 5.9% (wt/wt) of a composition of the invention; as emulsifiers a 1.80% of a blend of the calcium salt of dodecylbenzene sulfonate and nonionic 6-molar ethylene oxide
10 condensation product of nonylphenol, 2.70% of a blend of the calcium salt of dodecylbenzene sulfonate and a nonionic 30-molar ethylene oxide condensation product of nonylphenol, 1.50% of a nonionic paste of polyalkylene glycol ether, and 88.10% refined xylene solvent.

Typical surface-active wetting, dispersing, and emulsifying
15 agents for use in formulations in addition to the adjuvants of the present invention are other agricultural formulations which include, for example,, the alkyl and alkylaryl sulfonates and sulfates and their sodium salts; alkylamide sulfonates, including fatty methyl taurides; alkylaryl polyether alcohols, sulfated higher alcohols, polyvinyl
20 alcohols; polyethylene oxides; sulfonated animal and vegetable oils; sulfonated petroleum oils; fatty acid esters of polyhydric alcohols and the ethylene oxide addition products of such esters; and the addition products of long-chain mercaptans and ethylene oxide. The surface active agent normally comprises about 1-15% by weight of the active
25 ingredient. Thus, in the present compositions the surface active agent in addition to the adjuvant of the present invention composition may reduce this percentage of other surface active agents used to formulate this composition.

Other useful formulations include simple solutions of the
30 invention composition in a solvent in which it is completely soluble at the desired concentration, such as water, acetone, or other organic solvents. The preferred formulation for foliar application is an aqueous solution, more preferably containing a sufficient amount of adjuvant to provide an enhanced parasitically active compound of the

formula I as well as provide the desired concentration. However, glycerin and other surface active agents such as Tween®20, and most preferably 1% glycerin and 0.1% Tween®20 may also be part of the formulation.

5 The compositions may be formulated and applied with suitable pesticidal active ingredients, including insecticides, acaricides, fungicides, plant regulators, herbicides, fertilizers, etc.

METHODS OF USE

10 The present invention provides methods of controlling various pests that prey on agricultural crops, namely nematodes, insects, and acarids. An infestation of a plant by any of these pests may be controlled by applying to the plant locus an effective amount of any of the compounds of the present invention. The application may be made in a variety of ways, including applying the compound or a composition
15 containing it to the soil before or after planting or emergence, to the seed or seed pieces prior to or at planting, and to the plant foliage, stems, or trunks. The treatment may be made more than once during a growing season with one or more days between treatments. An appropriate treatment schedule will depend on the life cycle of the pest
20 to be controlled, ambient temperatures, and moisture levels. In addition the age or size of the plant may influence the treatment schedule.

 The methods of the present invention may be carried out on a variety of crops. These include, but are not limited to, fruit and
25 vegetable crops, such as potatoes, sweet potatoes, carrots, tomatoes, grapes, peaches, citrus, bananas, corn, and soybeans; tobacco; and cotton.

 Compounds of the present invention may be used to control any of the phytopathogenic nematodes. Insects which may be
30 controlled by the methods of the present invention include, but are not limited to, foliar pests such as green peach aphids, and soil-borne pests such as southern corn rootworm. Acarids which may be controlled by the methods of the present invention include, but are not limited to two spotted spider mites. Although no tests have been specifically

performed using the compositions tests conducted with a few of the parasitically active compounds of the present invention revealed no significant level of control of tobacco budworm or Colorado potato beetle.

- 5 A preferred rate of application of a composition wherein the compound of the formula I is enhanced by combination with from 0.25% to 2% by weight of active adjuvant of the formula II, for example in combination is found to be about 4 or 8 oz/acre to obtain levels of control (80-100%) that are comparable at 16 oz/acre with Triton CS7 for
10 control of root knot nematodes.

TEST EXAMPLES

The following methods were used to evaluate adjuvants that are combined with a compound of formula I, specifically, for example, N-(3,4,4-trifluoro-1-oxo-3-butenyl)glycine.

- 15 A track sprayer is used for foliar applications to approximate application procedures and volumes commonly used in the field (25 gal/A). Twenty mls of each test solution is formulated in water, estimating that 10 mls would actually be applied to the 5 plants/treatment (5" or 6" round pots; soil mix: 50% Metromix, 25%
20 fine sand, 25% medium sand , with 136 g Osmocote 14-14-14/ft³; one 3-4 week old Rutgers tomato plant/pot). Plants are often transplanted into the 5" or 6" pots; at least one day is allowed between transplanting and treatment. Pots are spaced along the track sprayer's 5 ft long center strip. A single 8001E nozzle tip is placed in a boom directly over the
25 plants and adjusted to 6-9" above the leaf canopy. Pressure is set to 15psi, resulting in 4.2-4.5 ml/sec release. The track sprayer speed is adjusted to approximately 95 on the dial giving an LCD speed readout of 1.75-1.85. Generally, tests are comprised of 20 treatments plus an uninoculated control treatment.

- 30 After chemical application, plants are allowed to dry for 2-4 hours and are then inoculated.
4-6 shallow holes are made in proximity to the plant stem using a thick pen, for the addition of *Meloidogyne incognita* (root knot) nematode eggs. 30 mls of egg suspension (720 eggs/ml, 21,000 eggs/plant) are

distributed among all holes in a pot using a large syringe. Plants are randomized before inoculation and then moved to either Greenhouse 16 or 21 for 3-4 weeks incubation. Greenhouse day temperatures are 25-30° C and supplemental overhead light brought day length to 12 hours. At 5 evaluation, foliage is examined for phytotoxic effects and then stems are cut to 1-2 inches above soil level. Excess soil is shaken from root ball and roots are washed free of soil mix using a high pressure water nozzle. Roots are evaluated for severity and quantity of galling visible and each replicate given a disease severity rating 0-100%. This data is 10 entered into a SAS program and results are compared to both the inoculated control and (S)-2-amino-4-(methylthio)-N-(3,4,4-trifluoro-3-butenyl)butanamide, monohydrochloride, with Triton CS7 or (S)-2-amino-4-(methylthio)-N-(3,4,4-trifluoro-3-butenyl)butanamide, monohydrochloride, without adjuvant. Several commercial and 15 experimental adjuvants were tested and are listed below with their active ingredient and percentages identified as follows:

TABLE 1		
Adjuvant	%ai	Active Ingredient
NH ₃ SO ₄	100	ammonium sulfate
20 AFG® 225	70	alkyl glycoside
AFG® 300	50	alkyl glycoside
AFG® 325	70	alkyl glycoside
Arcuad T 127W	27	trimethyl tallow ammonium chloride
Buffercode	10	phosphoric acid
25 Cayuse	42.5 + 16.5	phosphate ester of polyglycoethers ammonium salts
Improve®	64 + 14	fatty amine ethoxylate ethoxylated nonylphenol

	CropOil	17	polyoxyethylated polyol fatty acid ester + polyol fatty acid ester
	Ethoquad C/25	100	cocomethyl 15EO ammonium chloride
	Ethoquad C/12	100	cocomethyl 2EO ammonium chloride
	Emcol® CC9	100	propoxylated quaternary amine
5	Glycerin	100	glycerin
	MON 0818	15	polyoxyethylene alkyl (tallow) amine
	Nitrogen	28	28% nitrogen
	nonylphenol 4EO	100	nonylphenol 4EO
	nonylphenol 6EO	100	nonylphenol 6EO
10	nonylphenol 8EO	100	nonylphenol 8EO
	nonylphenol 10EO	100	nonylphenol 10EO
	nonylphenol 12EO	100	nonylphenol 12EO
	R-11	90	octyl phenoxy ethanol
	Silwet L77	100	organosilicone ethoxylate
15	Surfynol 465	100	10 mole EO acetylenic diol ethoxylate
	Surfynol 485	100	30 mole EO acetylenic diol ethoxylate
	Tergitol® 15-S-3	100	C ₁₁ -C ₁₅ secondary alcohol EO
	Tergitol® 15-S-5	100	C ₁₁ -C ₁₅ secondary alcohol EO
	Tergitol® 15-S-7	100	C ₁₁ -C ₁₅ secondary alcohol EO
20	Tergitol® 15-S-9	100	C ₁₁ -C ₁₅ secondary alcohol EO

Tergitol® 15-S-12	100	C ₁₁ -C ₁₅ secondary alcohol EO
Tergitol® 15-S-15	100	C ₁₁ -C ₁₅ secondary alcohol EO
Tween 20	100	polyoxyethylene (20) sorbitan monolaurate
Triton® CS-7	60	alkyl aryl polyethoxylate and sodium salt of alkyl sulfonated alkylate
5 Varion CDG-K	28	lauryl betaine

The following results using the above methods show compounds of the formula I, ie 2-amino-N-(3,4,4-trifluoro-2-butenyl)propanamide, monohydrochloride salt (denoted as A hereinafter), (S)-2-amino-4-
 10 (methylthio)-N-(3,4,4-trifluoro-3-butenyl)butanamide, monohydrochloride salt (denoted as B hereinafter), 3,4,4-trifluoro-3-butenic acid, sodium salt (denoted as C hereinafter), N-(3,4,4-trifluoro-1-oxo-3-butenyl)glycine(denoted as D hereinafter), 2-[(3,4,4-trifluoro-3-butenyl)amino]acetamide, monohydrochloride salt (denoted
 15 as E hereinafter), 3,4,4-trifluoro-3-butenic acid, 2-aminoethyl ester, monohydrochloride salt (denoted as F hereinafter), thereof that the selected adjuvants of the present invention combination provide an unexpected enhancement of the compound of the formula I. (*FOR I)

TABLE 2 cont'd						
FOR I*	Adjuvant	Adj%	16	8	4	2
5	B no adj			35	38	
	B no adj			29	19	
	B no adj			28	13	
	B no adj			35	22	
	B no adj			38	24	
10	B no adj			24	9	
	B no adj			19	6	
	B NH ₃ SO ₄	2		22	9	
	B APG® 225	.25		59	14	
	B APG® 225	.25(ai)		47	9	
15	B APG® 225	.5		62	36	
	B APG® 225	1		56	34	
	B APG® 225	1(ai)		88	49	
	B APG® 300	.25		37	16	
	B APG® 300	.25(ai)		58	7	
20	B APG® 300	.5		73	19	
	B APG® 300	1		67	40	
	B APG® 300	1(ai)		92	55	
	B APG® 325	.25		88	49	
	B APG® 325	.25(ai)		64	9	
25	B APG® 325	.5		74	69	
	B APG® 325	1		70	29	
	B APG® 325	1(ai)		96	47	
	B Arquad T	.25(ai)		31	2	
	B Buffercide	.25		12	8	
30	B Cayuse	.25		41	21	
	B Cayuse	.75		47	27	
	B CropOil	.5		43	18	
	B CropOil	2	30	25		
	B CS7	.5			28	7
35	B CS7	.5		98	33	3
	B CS7	.5		81	28	13
	B CS7	.5		81	24	11
	B CS7	.5		92	62	21
	B CS7	.5		51	18	9

	B	CS7	.5(ai)	95	58	21	
	B	CS7	.5(ai)	93	63	54	
	B	CS7	.5(ai)	100	81	21	
	B	CS7	.5(ai)		50	11	
5	B	CS7	.5(ai)		55	15	
	B	CS7	.5(ai)		55	13	
	B	CS7+NH ₃ SO ₄	.5+2		23	14	
	B	CS7+28%N	.5+2		17	8	
	B	CS7	.5		90	40	
10	B	Emcol® CC9	1		5	5	
	B	Emcol® CC9	5		18	5	
	B	Ethoquad C/12	.25		91		
	B	Ethoquad C/12	.25(ai)		67	16	
	B	Ethoquad C/12	.5		91		
15	B	Ethoquad C/12	1		98		
	B	Ethoquad C/12	1(ai)		79	50	B
	B	Ethoquad C/25	1		21	8	
	B	Ethoquad C/25	5		38p	28	
	B	Ethoquad C/25	2.5(ai)		36	11	
20	B	Ethoquad C/25	1				
		+Surfynol 465	.5(ai)		62	26	
	C	Glycerin	1(ai)		82	40	
	D	Glycerin	1(ai)		61	27	
	B	Improve®	.25		73	10	
25	B	Improve®	.25		100	73	15
	B	Improve®	.5		80	23	
	B	Improve®	.5		93	30	
	B	Improve®	.5	100	98	28	
	B	Improve®	.5(ai)		94	56	
30	B	Improve®	.5(ai)		96	62	
	B	Improve®	.5(ai)		93	34	
	B	Improve®	1		80	20	
	B	Improve®	1	100	91	28	
	B	Improve®	1(ai)		99	74	
35	B	Improve®	2		91	46	
	B	Improve®	2		83	38	
	B	Improve®	2	100	88	48	
	B	Improve®	.5(ai)				

	+glycerin	1(ai)		73	37	
	Improve®	.5(ai)		97	93	
	Improve®	.5(ai)	97	86	54	
	Improve®	.5(ai)	100	99	93	
5	Improve®	.5(ai)		97	97	
	Improve®	.5(ai)	100	83	38	
	Improve®	.5(ai)				
	+glycerin	1(ai)		68	44	
	Improve®	.5(ai)	100	99	92	
10	TABLE 2					
	cont'd					
	*FOR 1	Adjuvant	Adj %	16	8	4 2
	Improve®	.5(ai)		100	96	
	Improve®	.5(ai)		92	37	21
15	Improve®	.5(ai)				
	+glycerin	1(ai)		88	80	51
	Improve®	.5(ai)	97	88	59	
	Improve®	.5	100	87		
	Improve®	.5(ai)			19	
20	Improve®	.5(ai)		76	46	
	Improve®	1	100	94		
	MON 0818	.25		42	26	
	MON 0818	.25		69	22	
	MON 0818	1		35	13	
25	28% N			42	6	
	28% N	2		56	12	
	nonylphenol 4EO	.5(ai)		11	9	
	nonylphenol 6EO	.5(ai)		20	18	
	nonylphenol 8EO	.5(ai)		29	4	
30	nonylphenol 10EO	.5(ai)		18	8	
	nonylphenol 12EO	.5(ai)		38	9	
	R-11	.06		33	13	
	R-11	.25		28	10	
	Silwet L77	.25(ai)		22	11	
35	Silwet L77	.5		24	15	
	Silwet L77	1		18	23	
	Silwet L77	2		23p	9p	

	+glycerin	1(ai)		73	37	
E	Improve®	.5(ai)		97	93	
E	Improve®	.5(ai)	97	86	54	
C	Improve®	.5(ai)	100	99	93	
5 C	Improve®	.5(ai)		97	97	
C	Improve®	.5(ai)	100	83	38	
C	Improve®	.5(ai)				
	+glycerin	1(ai)		68	44	
D	Improve®	.5(ai)	100	99	92	
10	TABLE 2					
	cont'd					
	*FOR I	Adjuvant	Adj %	16	8	4
						2
D	Improve®	.5(ai)		100	96	
D	Improve®	.5(ai)		92	37	21
15 D	Improve®	.5(ai)				
	+glycerin	1(ai)		88	80	51
A	Improve®	.5(ai)	97	88	59	
F	Improve®	.5	100	87		
F	Improve®	.5(ai)			19	
20 F	Improve®	.5(ai)		76	46	
F	Improve®	1	100	94		
B	MON 0818	.25		42	26	
B	MON 0818	.25		69	22	
B	MON 0818	1		35	13	
25 B	28% N			42	6	
B	28% N	2		56	12	
B	nonylphenol 4EO	.5(ai)		11	9	
B	nonylphenol 6EO	.5(ai)		20	18	
B	nonylphenol 8EO	.5(ai)		29	4	
30 B	nonylphenol 10EO	.5(ai)		18	8	
B	nonylphenol 12EO	.5(ai)		38	9	
B	R-11	.06		33	13	
B	R-11	.25		28	10	
B	Silwet L77	.25(ai)		22	11	
35 B	Silwet L77	.5		24	15	
B	Silwet L77	1		18	23	
B	Silwet L77	2		23p	9p	

B	Silwet L77	5		62 p	26p	
B	Silwet L77	5		48 p	32p	
B	Silwet L77	.25				

5

TABLE 2 cont'd						
*FOR I	Adjuvant	Adj %	16	8	4	2
	+MON 0818	.25		54	22	
B	Silwet L77	.5				
	+MON 0818	.25		47	18	
B	Surfynol 465	1		18	15	
B	Surfynol 465	5		33p	5p	
B	Surfynol 485	.25(ai)		67	11	
B	Surfynol 485	.25(ai)		57	14	
B	Surfynol 485	.5(ai)		83	13	
B	Surfynol 485	1(ai)		71	30	
B	Surfynol 485	1(ai)		92	51	
B	ITergitol® 15-S-3	.5(ai)		49	7	
B	ITergitol® 15-S-5	.5(ai)		51	21	
B	ITergitol® 15-S-5	.5(ai)		40	0	
B	ITergitol® 15-S-7	.5(ai)		86	49	
B	ITergitol® 15-S-7	.5(ai)		74	26	
F	ITergitol® 15-S-7	.5(ai)		35		
B	ITergitol® 15-S-9	.5(ai)		90	23	
B	ITergitol® 15-S-9	.5(ai)		91	58	
B	ITergitol® 15-S-12	.5(ai)		88	9	
B	ITergitol® 15-S-12	.5(ai)		100	78	
B	ITergitol® 15-S-12	.5(ai)		96	58	
B	ITergitol® 15-S-12	.5(ai)		96	60	
B	ITergitol® 15-S-12	.5(ai)		83	54	
C	ITergitol® 15-S-12	.5(ai)		97	76	
C	ITergitol® 15-S-12	.5(ai)		97	80	37

35

C	Tergitol® 15-S-12	.5(ai)				
	+glycerin	1(ai)		91	68	29

5

TABLE 2						
cont'd						
*FOR I	Adjuvant	Adj %	16	8	4	2
D	Tergitol® 15-S-12	.5(ai)		99	88	
10 D	Tergitol® 15-S-12	.5(ai)		96	88	43
D	Tergitol® 15-S-12	.5(ai)				
	+glycerin	1(ai)		95	55	
B	Tergitol® 15-S-15	.5(ai)		67	49	
B	Tergitol® 15-S-15	.5(ai)		7	45	
15 B	Tween 20	.25		36	7	
B	Varion	.25(ai)		47	0	

p = phytotoxicity noted on foliage

- 20 **Boldface % control** indicates statistically significant improvement in disease control compared to I-B, at the same rate, with either no adjuvant or Triton CS7, in the same test. Adj. % is as defined in Table I, except (ai) in the % Adj column means the volume of adjuvant noted in Table I is adjusted for the concentration of adjuvant active ingredient.
- 25 The surface-active or metting agents identified above are sold under the noted names as follows. APG® is sold by Henkel APG, Arquad is sold by Akzo, Chemical Division, Buffercide is sold by Custom Chemicals. Cayuse® is sold by Wilbur-Ellis Co. Improve® is sold by Dow-Elanco. CropOil is available from various sources. Ethoquad is also sold by Akzo,
- 30 Chemical Division, Emcol is available from Witco Corp. Organics Div., 28% Nitrogen can be made from usual nitrogen containing compounds. Nonylphenol is sold by, for example, Witco S.A. R-11 is available from Wilbur-Ellis Co. Silwet is from Union Carbide Corp., Special Chemicals Div. Surfynol is a product of Air Products and Chemicals, Inc. Tergitol is

also a product of Union Carbide Corp., Industrial Chemicals Div. Tween 20 is from ICI Americas, Inc. Triton® is from Rohm and Haas Co. Varion is from Sherex Chemical Co., Inc.

The following methods are also used to evaluate adjuvants that are
5 combined with a compound of formula I, specifically, for example, N-(3,4,4-trifluoro-1-oxo-3-butenyl)glycine, for effectiveness in controlling root knot nematodes (*Meloidogyne incognita*) on tomato roots when the adjuvant plus compound mixture is applied to the foliage of young plants.

10 Tomato plants (cultivar 'Rutgers') were grown one per pot in six cm square plastic pots containing a mixture of equal parts fine sand, coarse sand, silt loam soil, and commercial potting medium. Compound/adjuvant mixtures were prepared by adding the compound to water to achieve final concentrations of 2400, 1200, and 600 ppm, and then
15 adding the adjuvant to the solution to achieve a final concentration of 0.5% volume of adjuvant/volume of water. This single adjuvant concentration was used with all 3 rates of the test compound, unless otherwise specified.

When the tomato plants were 18-21 days old the test solutions were sprayed onto the leaves and stems using a track sprayer which
20 approximates application procedures and volumes used in the field. The track sprayer is calibrated to apply the test solution at a volume of 25 gallons per acre, resulting in application rates of the compound of 8, 4, and 2 ounces active ingredient per acre. Three plants were sprayed for each treatment and then were air dried and kept under fluorescent lights
25 for 15-18 hours prior to inoculation. All plants then were inoculated with mature root knot nematode eggs containing J1 larvae, with 8,000 eggs per plant applied in 5 ml of water onto soil at the stem base. Plants then were incubated in a growth chamber at 27C and 60% RH with all replicate pots randomized throughout the chamber. During the two weeks immediately
30 following application of the test mixtures all plants received sub-irrigation and the foliage was kept dry.

Three to 7 days after treatment the plant foliage was examined for symptoms of phytotoxicity and assigned a rating value of 0-3 where 0= no damage, 1= mild spotting or chlorosis, 2= moderate damage but no stunting, and 3= severe damage and stunting. After three weeks

- 5 incubation as described above the plant roots were washed and nematode disease severity was assessed. Each root system was rated individually and a visual estimate of the percent of the root system damaged by nematode galling was determined and assigned a value of 0, 1, 3, 5, 10, 25, 50, 75 or 100% root damage.

ADJUVANTS TESTED

	<u>trade name</u>	<u>chemical name</u>	<u>concentration</u>
	Atplus 258	alkylpolyglucoside	62% a.i.
5	CS-7	alkyl aryl polyethoxylate and Na salt	
		alkyl sulfonated alkylate	60% a.i.
	Dodigen 226	cocoalkyldimethyl benzyl	ammonium
	chloride	50% a.i.	
	Dodigen 4022		
10	Emcol XE 1656	alkoxylated fatty amine oxide	70% a.i.
	Empigen OB	alkyldimethyl amine oxide	30% a.i.
	Ethylan CPG 945	modified alcohol alkoxylate	100% a.i.
	Flo-Mo 3153	ethoxylated fatty amine oxide	70% a.i.
	Genapol T250	fatty alcohol polyglycol ether	100% a.i.
15	Improve	fatty amine ethoxylate	64% a.i.
		+ ethoxylated nonylphenol	14% a.i.
	Kacmul 230	coco esterfied polyethoxyether	100% a.i.
	piperonyl butoxide		100% a.i.
	Rhodonat LMO	coconut oil based sucroglyceride	100% a.i.
20	Rhodonat MLP704	modified LMO sucroglyceride	100% a.i.
	Simusol M52	stearic acid polyethoxylated	100% a.i.
	Ethoduomeen	ethoxylated alkyl amine	100% a.i.
	Ethomeen C-15	ethoxylated alkyl amine diamine	100% a.i.

MANUFACTURERS OF ADJUVANTS TESTED

25

	Atplus 258	Imperial Chemical Industries
	Triton CS-7	Rohm & Haas Co.
	Dodigen 226	Hoechst AG
	Dodigen 4022	Hoechst AG
30	Emcol XE 1656	Witco Corp.
	Empigen OB	Albright & Wilsons

Ethylan CPG 94
Flo-Mo 3153
Genapol T250
Improve
5 Kaomul 230
piperonyl butoxide
Rhodonat LMO
Rhodonat MLP704
Simusol M52
10 Ethoduomeen
Ethomeen C-15

Harcros Chemicals Inc.
Witco Corp.
Hoechst AG
DowElanco
KAO Spain
Fluka Chemika
Rhone-Poulenc
Rhone-Poulenc
Seppic France
AKZO Corp.
ALZO Corp.

Table 3. Mean percent root damage due to nematode galling (% disease), the standard deviation of that mean (std dev), the % control of root damage (% control), and foliar phytotoxicity rating (0=no phyto, 3=severe phyto) after treatment of tomato plants with (MON 45700) 5 mixed with the indicated adjuvants.

Adjuvant (0.5% v/v unless noted)	D gai/ha	% disease		% control	phytotox average
		average	std dev		
CS-7	560	33.33	11.79	50.00	1.67
	280	66.67	11.79	0.00	1.00
Improve	560	20.00	7.07	70.00	2.00
	280	28.33	16.50	57.50	1.00
	140	58.33	11.79	12.50	0.67
Witco C5867	560	20.00	7.07	70.00	1.33
	280	50.00	20.41	25.00	0.67
	140	50.00	0.00	25.00	1.33
Dodigen 226	560	20.00	7.07	70.00	2.67
	280	41.67	11.79	37.50	2.67
	140	33.33	11.79	50.00	2.33
Neodol 25-9	560	20.00	7.07	70.00	1.67
	280	58.33	11.79	12.50	1.33
	140	58.33	11.79	12.50	0.67
Stepwet DF-90	560	20.00	7.07	70.00	1.67
	280	41.67	11.79	37.50	0.33
	140	58.33	11.79	12.50	0.33
Emcol XE 1656	560	41.67	11.79	37.50	1.00
	280	58.33	11.79	12.50	1.67
	140	66.67	11.79	0.00	1.00
Simusol M52	560	41.67	11.79	37.50	0.67
	280	66.67	11.79	0.00	0.33
	140	66.67	11.79	0.00	0.67
CS-7	560	15.00	7.07	77.50	2.00
	280	33.33	11.79	50.00	0.67
Improve	560	6.00	2.94	91.00	2.67
	280	15.00	7.07	77.50	2.33
	140	41.67	11.79	37.50	1.67
Ethylan CPG945	560	13.33	8.50	80.00	3.00
	280	41.67	11.79	37.50	2.33
	140	58.33	11.79	12.50	2.00
Rhodonat MLP704	560	8.33	2.36	87.50	2.67
	280	33.33	11.79	50.00	1.33
	140	58.33	11.79	12.50	0.67

	Adjuvant (0.5% v/v unless noted)	D gai/ha	% disease		% control	phytotox average
			average	std dev		
5	Rhodonat LMO	560	33.33	11.79	50.00	1.33
		280	58.33	11.79	12.50	0.67
		140	66.67	11.79	0.00	0.33
	Kaomul 230	560	15.00	7.07	77.50	1.67
		280	33.33	11.79	50.00	1.33
		140	62.50	12.50	6.25	0.67
10	Genapol T	560	5.00	0.00	92.50	2.67
		280	15.00	7.07	77.50	1.67
		140	41.67	11.79	37.50	0.67
	Aplus 258	560	6.00	2.94	91.00	1.67
		280	10.00	0.00	85.00	0.67
		140	41.67	11.79	37.50	0.67
	CS-7	560	4.33	0.94	93.50	1.00
		280	15.00	7.07	77.50	0.67
		140	28.33	16.50	57.50	1.67
15	Improve	560	1.67	0.94	97.50	1.67
		280	6.00	2.94	91.00	2.00
		140	28.33	16.50	57.50	1.67
	Flomo 3153	560	2.00	2.16	97.00	2.00
		280	6.67	2.36	90.00	0.67
		140	33.33	11.79	50.00	0.00
20	Ethomeen C15 0.3% + Tergitol 15S9 0.2%	560	0.33	0.47	99.50	3.00
		280	3.33	2.36	95.00	2.67
		140	41.67	11.79	37.50	2.00
	Ethoduomeen T25	560	1.00	0.00	98.50	2.00
		280	8.33	2.36	87.50	2.33
		140	41.67	11.79	37.50	1.33
25	Ethomeen C15 0.18% + Tergitol 15S12 0.12% + Tergitol 15S9 0.2%	560	11.67	9.43	82.50	2.67
		280	0.00	0.00	100.00	3.00
		140	0.00	0.00	100.00	3.00
	Tergitol 15S9	280	0.00	0.00	100.00	3.00
		140	0.00	0.00	100.00	3.00
		560	3.00	0.00	95.50	2.67
30	Empigen OB	280	11.67	10.27	82.50	2.67
		140	33.33	11.79	50.00	1.67
		560	3.67	1.89	92.67	1.67
	CS-7	280	8.33	2.36	83.33	1.33

	Adjuvant (0.5% v/v unless noted)	D gai/ha	% disease		% control	phytotox average
			average	std dev		
5	Improve	560	0.33	0.47	99.33	2.00
		280	6.67	2.36	86.67	1.33
		140	15.00	7.07	70.00	1.00
	Atplus 258 0.4% + piperonyl butoxide 0.1%	560	1.33	1.25	97.33	0.67
		280	5.00	0.00	90.00	0.33
		140	6.67	2.36	86.67	1.00
10	Atplus 258 0.5% + ammonium sulfate 2.0%	560	0.00	0.00	100.00	1.33
		280	2.33	0.94	95.33	0.67
		140	15.00	7.07	70.00	0.67
	Atplus 258 0.5%	560	0.33	0.47	99.33	1.33
		280	3.00	0.00	94.00	1.00
		140	20.00	7.07	60.00	0.33
15	Improve 0.5% + ammonium sulfate 2.0%	560	1.33	1.25	97.33	2.33
		280	3.33	2.36	93.33	1.33
		140	25.00	0.00	50.00	1.00
	Improve 0.5% + piperonyl butoxide 0.1%	560	3.67	0.94	92.67	1.67
		280	8.33	2.36	83.33	2.00
		140	41.67	11.79	16.67	1.00
20	CS-7 0.5% + piperonyl butoxide 0.1%	560	2.33	0.94	95.33	1.00
		280	6.67	2.36	86.67	1.67
		140	41.67	11.79	16.67	0.67
	CS-7	560	6.67	2.89	87.00	2.33
		280	28.33	20.21	43.00	1.33
	Improve	560	6.00	3.61	88.00	1.67
280		15.00	8.66	70.00	1.33	
140		41.67	14.43	17.00	0.67	
25	Docigen 4022	560	6.00	3.61	88.00	1.67
		280	13.33	10.41	73.00	1.67
		140	41.67	14.43	17.00	1.00
	Docigen 4022 0.4% + Tween 20 0.1%	560	5.00	0.00	90.00	2.00
		280	15.00	8.66	70.00	1.33
		140	41.67	14.43	17.00	1.33

Adjuvant (0.5% v/v unless noted)	D gai/ha	% disease		% control	phytotox average
		average	std dev		
5 Dodigen 4022 0.32% + Tween 20 0.08% + piperonyl butoxide 0.1%	560	13.33	10.41	73.00	2.00
	280	41.67	14.43	17.00	1.33
	140	58.33	14.43	-17.00	1.00
Tergitol 15-S-9 0.2%	560	6.67	2.89	87.00	2.00
	280	20.00	8.66	60.00	1.33
	140	41.67	14.43	17.00	2.00
10 Ethomeen C15 0.15% + Tergitol 15-S-9 0.1%	560	5.00	0.00	90.00	1.67
	280	15.00	8.66	70.00	1.33
	140	41.67	14.43	17.00	1.00
Crop Life 5.0%	560	8.33	2.89	83.00	1.67
	280	25.00	0.00	50.00	0.67
	140	50.00	0.00	0.00	1.00

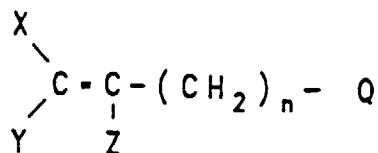
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CLAIMS

1. A composition comprising a combination of a compound of the formula (I)

5



10

I

wherein:

$n = 1, 3, 5, 7, 9, \text{ or } 11$;

Q is CH_2NHR_6 , CH_2NO_2 , $\text{CH}_2\text{N}=\text{CHR}_2$, $\text{CH}_2\text{N}=\text{C}=\text{O}$, $\text{CH}_2\text{N}^+\text{R}_3\text{R}_4\text{R}_5\text{W}^-$,
or $(\text{C}=\text{O})\text{-R}_{11}$;

- 15 X, Y, and Z are independently H or F, provided that at least one of X and Y is F, and further provided that when Q is $(\text{C}=\text{O})\text{-R}_{11}$ each of X, Y, and Z is F;

W^- is an agronomically acceptable anion;

R_2 is an aromatic group;

- 20 each of R_3 , R_4 , and R_5 is independently hydrogen; a lower

alkyl group, optionally substituted with at least one group selected from hydroxy, alkoxy, halo, nitro, amino, thiol, alkylthio, carboxyl, alkoxy-carbonyl, and phenyl; one of R_3 , R_4 , and R_5 is hydroxy and the other two are hydrogen; or R_3 , R_4 , and R_5 taken together with the nitrogen of Q

- 25 form a cyclic quaternary ammonium group;

R_6 is hydrogen; an aliphatic group, optionally

substituted with at least one group selected from hydroxy, alkoxy, halo, nitro, amino, thiol, alkylthio, carboxyl, alkoxycarbonyl, and phenyl; an amino acid amide of Q; $(\text{C}=\text{O})\text{-R}_7$; $\text{C}_1\text{-C}_{12}$ aliphatic amines, optionally

- 30 substituted with at least one group selected from hydroxy, alkoxy, halo,

- nitro, amino, thiol, alkylthio, carboxyl, alkoxycarbonyl, and phenyl; C₂-C₁₂ aliphatic carboxylic acids, their esters, thiol esters, and amides, all optionally substituted with at least one group selected from hydroxy, alkoxy, halo, nitro, amino, thiol, alkylthio, carboxyl, alkoxycarbonyl, and phenyl; dihydro-3-oxo-pyrazolidinyl; or phenyl or thiophene, optionally substituted with at least one group selected from hydroxy, alkoxy, halo, nitro, amino, thiol, alkylthio, carboxyl, alkoxycarbonyl, and phenyl; or R₆ taken with the nitrogen of Q is guanidine;
- hydrazine; alkyl or aryl hydrazine, optionally substituted with at least one group selected from hydroxy, alkoxy, halo, nitro, amino, thiol, alkylthio, carboxyl, alkoxycarbonyl, and phenyl; or an alkyl or aryl sulfonamide, optionally substituted with at least one group selected from hydroxy, alkoxy, halo, nitro, amino, thiol, alkylthio, carboxyl, alkoxycarbonyl, and phenyl;
- R₇ is (C=O)-R₁₄; C₁-C₁₂ aliphatic group optionally substituted with at least one group selected from hydroxy, alkoxy, halo, nitro, amino, thiol, alkylthio, carboxyl, alkoxycarbonyl, and phenyl; C₂-C₁₂ aliphatic carboxylic acid, esters, thiol esters, or amides thereof, all optionally substituted with at least one group selected from hydroxy, alkoxy, halo, nitro, amino, thiol, alkylthio, carboxyl, alkoxycarbonyl, and phenyl; or a N, O, or S group such that when taken with the carboxamide is a urea, semicarbazide, carbamate, or thiocarbamate group, all optionally substituted with an alkyl or aryl group, optionally substituted with at least one group selected from hydroxy, alkoxy, halo, nitro, amino, thiol, alkylthio, carboxyl, alkoxy-carbonyl, and phenyl;
- R₁₁ is -OR₁₂, -SR₁₂, halogen, -NHOH, or -NR₁₂R₁₃;
- each of R₁₂ and R₁₃ is independently hydrogen; an aliphatic or an aromatic group, optionally substituted with at least one group selected from hydroxy, alkoxy, halo, nitro, amino, thiol, alkylthio, carboxyl, alkoxycarbonyl, and phenyl; a C₁-C₁₂ aliphatic

- amine, optionally substituted with at least one group selected from hydroxy, alkoxy, halo, nitro, amino, thiol, alkylthio, carboxyl, alkoxy carbonyl, and phenyl; a C₂-C₁₂ aliphatic carboxylic acid, esters, amides and salts thereof, optionally substituted with at least one group
- 5 selected from hydroxy, alkoxy, halo, nitro, amino, thiol, alkylthio, carboxyl, alkoxy carbonyl, and phenyl;
- or R₁₂ and R₁₃ taken together with the N of R₁₁ are a
- protein amino acid or a cyclic group selected from morpholine, piperidine, piperazine, or pyrrolidine, optionally substituted with at
- 10 least one group selected from hydroxy, alkoxy, halo, nitro, amino, thiol, alkylthio, carboxyl, alkoxy carbonyl, and phenyl;
- R₁₄ is OH, alkoxy, NH₂, or NHNH₂;
- or any agronomically acceptable salt thereof;
- together with or in combination with
- 15 (a) formula II which is alkyl glycosides wherein the alkyl group is a mixture of from about eight to about fourteen carbons and the number of glycoside groups present in the formula are from one to about six;
- (b) formula III which is a quaternized fatty amine ethoxylate wherein the fatty amine is an alkylamine wherein the alkyl group is a mixture of
- 20 from about eight to about twenty carbon atoms, inclusive, and the ethoxylate is an ethylene oxide monomer from about two to about fourteen moles of ethoxylation;
- (c) formula IV which is a mixture of (i) a fatty amine ethoxylate wherein the fatty amine is an alkylamine wherein the alkyl group is a
- 25 mixture of from about six to about thirty carbon atoms, inclusive, and the ethoxylate is an ethylene oxide monomer of from one to about fifty moles of ethoxylation and (ii) ethoxylated alkylphenol wherein the alkyl is of from zero to about twenty carbons, inclusive, the ethoxylate is an ethylene oxide monomer of from about two to about twenty moles of ethoxylation;
- 30 (d) formula V which is ethoxylated acetylated diols wherein the number of carbons in the acetylated chain is of from ten to twelve carbon

atoms, inclusive, and the ethoxylate is an ethylene oxide monomer of from ten to about thirty moles of ethoxylation;

(e) formula VI which is a secondary alcohol or ethoxylate wherein the ethoxylate is of from seven to fifteen, inclusive, of an ethylene oxide
5 monomer and the alkyl of the secondary alcohol or ethoxylate is of from about seven to about fifteen, inclusive;

(f) formula VII which is an alkoxyated fatty amine oxide wherein the alkyls are of from about six to thirty carbons, inclusive; and the number of moles of alkoxylation are when taken together about from
10 one to fifty;

(g) formula VIII which is an alkyldimethyl amine oxide wherein the alkyls are of from about six to thirty carbons;

(h) formula IX which is a fatty alcohol polyglycol ether wherein the fatty alcohol represents a mixture of alkyls of from about six to thirty
15 carbons, inclusive; and the number of moles of ethoxylation are when taken together about from one to fifty;

(i) formula X which is a coco esterified polyethoxyether wherein the coco ester represents a mixture of alkyls of from about six to thirty carbons, inclusive; and the ethoxylation is from one to fifty;

20 (j) formula XI which is a quaternary ammonium including an alkyl of from C8 to C20 and an agronomically acceptable anion;

(k) formula XII which is a quaternary ammonium having groups which are independently alkyl of from one to three carbons and together are from two to seven carbons; and of from three to fifteen
25 ethylene oxide and propylene oxide groups and an agronomically acceptable anion;

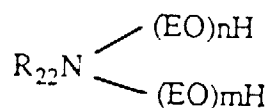
(l) formula XIII which is diamine ethoxylate with an alkyl of from C8 to C20 and ethoxylation of from about from one to fifty;

30 (m) formula XIV which is an alkoxyated primary fatty alcohol with an alkyl of from C13 to C18 and of from 6 to 50 propylene oxide groups; and

(n) mixtures thereof.

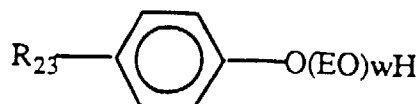
2. A composition of claim 1 wherein the compound of the formula I is an agronomically acceptable salt of 3,4,4-trifluoro-3-butene-1-amine, or

- the monohydrochloride salt thereof; N-(3,4,4-trifluoro-3-butenyl)glycine or the monohydrochloride salt thereof; 2-amino-N-(3,4,4-trifluoro-2-butenyl)propanamide or the monohydrochloride salt thereof; (S)-2-amino-4-(methylthio)-N-(3,4,4-trifluoro-3-butenyl)butanamide or the
- 5 monohydrochloride salt thereof; 4,4-difluoro-3-buten-1-amine or the monohydrochloride salt thereof; 3,4,4-trifluoro-3-buten-1-amine or the monohydrochloride salt thereof; 3,4,4-trifluoro-3-buten-1-amine or the sodium salt thereof; a combination of 3,4,4-trifluoro-3-buten-1-amine and 3,4,4-trifluoro-3-buten-1-amine in a one to one ratio (1:1); (S)-2-amino-3-hydroxy-N-(3,4,4-trifluoro-3-butenyl)butanamide or the
- 10 monohydrochloride salt thereof; N-(4,4-difluoro-3-butenyl)glycine, methyl ester, or the monohydrochloride salt thereof; a combination of 3,4,4-trifluoro-2-buten-1-amine and 2-propanamine in a one to one ratio (1:1); N-(3,4,4-trifluoro-1-oxo-3-butenyl)glycine; 2-[(3,4,4-trifluoro-3-butenyl)amino]acetamide or the monohydrochloride salt thereof; or
- 15 3,4,4-trifluoro-3-buten-1-amine, 2-aminoethyl ester or the monohydrochloride thereof.
3. A composition of Claim 1 wherein the adjuvant is
- (a) the alkyl glycosides of the formula II wherein the alkyl group is a mixture of from about nine to eleven carbons, inclusive, and the
- 20 number of glycoside groups present in the formula are from one to two;
- (b) the quaternized fatty amine ethoxylate of the formula III wherein the alkyl group of the fatty amine is a mixture of from eight to sixteen carbon atoms and the number of moles of ethoxylates is two;
- (c) the mixture of the formula IV is (i) the fatty amine ethoxylate of
- 25 the formula



30 wherein:

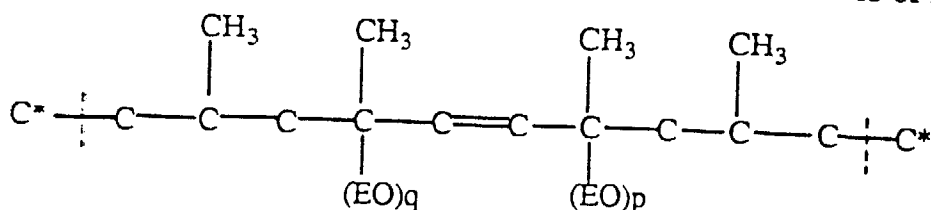
R_{22} represents a mixture of alkyls of from about twelve to twenty carbons, inclusive; EO is an ethylene oxide monomer and n and m represent the number of moles of ethoxylation in the formula and are when taken together about from five to fifteen, and (ii) the ethoxylated alkylphenol is the formula



wherein:

10 R_{23} is a mixture of alkyl groups of from about eight to ten carbons; EO is the ethylene oxide monomer and w is the number of moles of ethoxylation in the formula and is from about six to ten moles;

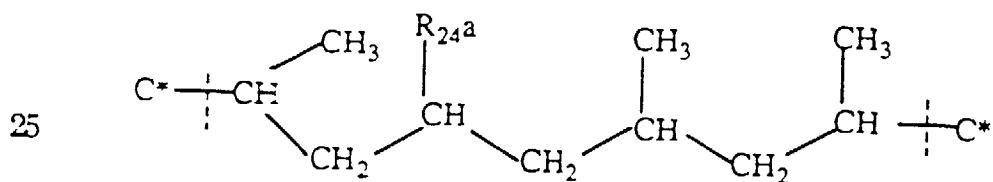
(d) the ethoxylated acetylated diols of the formula V is of formula



15 wherein:

* is a number of carbons to provide a total number of carbons in the chain of from 10 through 12 carbons, inclusive; EO is ethylene oxide monomer wherein q and p represent the number of moles of ethoxylates in the formula and are when taken together 30;

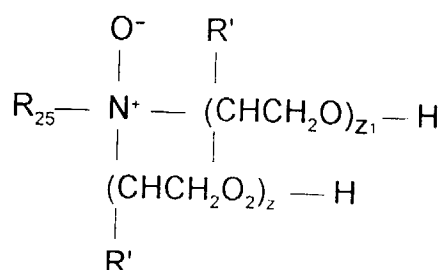
20 (e) the secondary alcohol ethoxylate of the formula VI is wherein:



R_{24a} represents hydroxy or an ethylene oxide monomer wherein a represents the number of moles of ethoxylate present in the formula

and is from nine to twelve, inclusive, and C* represents the ends of the carbon chain such that altogether the chain is a mixture of carbons having a total of from twelve to fourteen carbons, inclusive;

(f) formula VII which is an alkoxyated fatty amine oxide, including ethoxylated fatty amine oxide, (the alkoxyated fatty amine oxide is represented by the formula



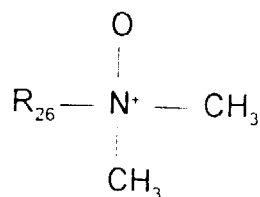
wherein

R₂₅ represents a mixture of alkyls of from about six to thirty carbons inclusive, preferably from about twelve to twenty carbons, inclusive.

R' is hydrogen or methyl; and

z and z₁ represent the number of moles of alkoxylation or preferably ethoxylation in the formula and are when taken together about from one to fifty, preferably five to fifteen);

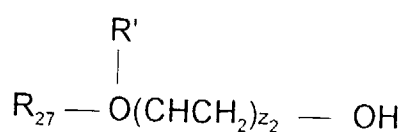
(g) formula VIII which is an alkyl dimethyl amine oxide, (the alkyl dimethyl amine oxide may be represented by the formula



wherein

R_{26} represents a mixture of alkyls of from about six to thirty carbons, inclusive, preferably from about twelve to twenty carbons, inclusive;

- 5 (h) formula IX which is a fatty alcohol polyglycol ether, (the fatty alcohol polyglycol ether may be represented by the formula



10

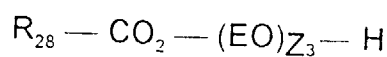
wherein

R_{27} represents a mixture of alkyls of from about six to thirty carbons, inclusive, preferably from about twelve to twenty carbons, inclusive; R' is of hydrogen or alkyl of from one to two carbons;

15

Z_2 represents the number of moles of ethoxylation in the formula and are when taken together about from one to fifty, preferably five to fifteen)

- (i) formula X which is a fatty acid esterified polyethoxyether, or which is stearic acid polyethoxylate,
20 the coco esterified polyethoxyether and stearic acid polyethoxylate may be represented by the formula



25

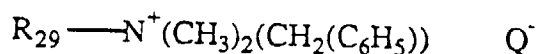
wherein

R_{28} represents a mixture of alkyls of from about twelve to twenty carbons inclusive;

EO represents ethoxylation in the formula and z_3 is from five to fifteen;

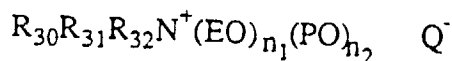
(j) formula XI which is a quaternary ammonium may be represented by the formula

5



wherein R_{29} represents alkyl from C10 to C16 and Q is an agronomically acceptable anion;

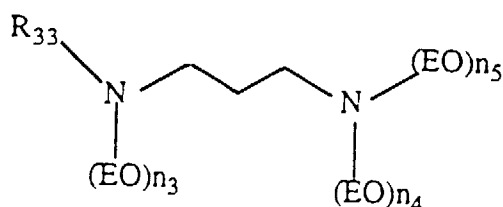
(k) formula XII which is a quaternary ammonium represented by
10 the formula



wherein R_{30} , R_{31} and R_{32} are all methyl or one of R_{30} , R_{31} , R_{32} is $((EO)_{n_1}(PO)_{n_2})$; EO is ethylene oxide; PO is propylene oxide; n_1 is an
15 integer of one to two; and n_2 is an integer of about six to ten; and Q is an agronomically acceptable anion);

(l) formula XIII which is diamine ethoxylate represented by the formula

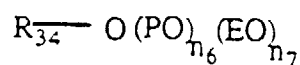
20



25 wherein R_{33} represents alkyl of from about C10 to C16; and n_3 , n_4 , n_5 represent the number of moles of ethoxylation in the formula and are when taken together about from five to fifteen;

(m) formula XI which is an alkoxylated primary fatty alcohol, represented by the formula

30



Wherein R_{32} represents alkyl of from about C13 to C15; EO is ethylene oxide; PO represents propylene oxide; n_6 is an integer of from about 6 to 9; n_7 is an integer from about 4,5 to 6; and

5 (j) mixtures thereof.

4. A composition of Claim 2 wherein the formula is

(a) the alkyl glycosides which is C9 to C11 alkyl 1.6 polyglycoside where the number of glycoside groups is one to two and the alkyl group is a mixture of from nine to eleven carbons;

10 (b) the quaternized fatty amine ethoxylate is cocomethyl ammonium chloride or coco dimethyl diethoxylated ammonium chloride;

(c) a mixture which is blend of fatty amine ethoxylate + nonylphenol ethoxylate;

(e) the secondary alcohol ethoxylate is 15 carbon branched secondary alcohol 9 molar ethoxylate, or 15 carbon secondary alcohol 12 molar ethoxylate;

15 (f) mixtures thereof;

5. A composition of claim 4 wherein the adjuvant is the alkyl glycosides of the formula II wherein the alkyl group is a mixture of from about nine to eleven carbons, inclusive, and the number of glycoside groups present in the formula are from one to two.

20 6. A composition of claim 5 wherein the formula I is N-(3,4,4-trifluoro-3-butenyl) glycine or the monohydrochloride salt thereof.

7. A composition of claim 5 wherein the formula I is 3,4,4-trifluoro-3-butene-1-amine, or the monohydrochloride salt thereof.

25 8. A composition for controlling nematode, insect, or acarid infestation of a plant comprising an effective amount of a composition of Claim 1 in an agronomically acceptable carrier.

9. A composition for controlling nematode, insect, or acarid infestation of a plant comprising an effective amount of a composition of claim 5 in an agronomically acceptable carrier.

30 10. A composition for controlling nematode, insect, or acarid infestation of a plant comprising an effective amount of a composition of claim 6 in an agronomically acceptable carrier.

11. A composition for controlling nematode, insect, or acarid infestation of a plant comprising an effective amount of a composition of claim 7 in an agronomically acceptable carrier.
12. A method of controlling nematode, insect, or acarid infestation of a
5 plant, comprising applying to a plant locus an effective amount of a composition of claim 1.
13. A method of systemically controlling nematode, insect or acarid infestation of a plant, comprising applying to a plant locus an effective amount of a composition of claim 9 that has or is transformed after
10 application to have polarity providing phloem mobility without reducing nematode-controlling effectiveness.
14. A method of claim 12 wherein the compound of the formula I in the composition is N-(3,4,4-trifluoro-3-butenyl)glycine or the monohydrochloride salt thereof.
- 15 15. A method of claim 12 wherein the compound of the formula I in the composition is 3,4,4-trifluoro-3-butene-1-amine, or the monohydrochloride salt thereof.