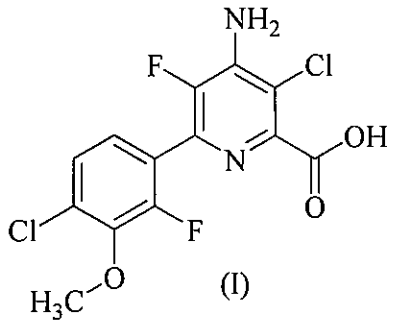
CLAIMS

1. A herbicidal composition, comprising:

a herbicidally effective amount of (a) a compound of the formula (I):



(I)

or an agriculturally acceptable salt or ester thereof; and

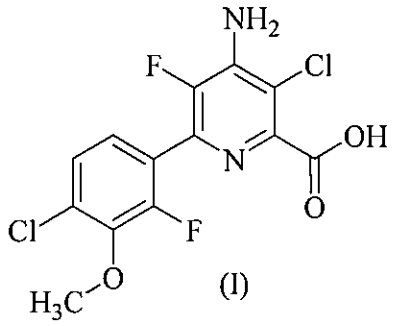
(b) at least one ACCase inhibitor, or a salt or ester thereof, selected from the group consisting of clethodim, clodinafop-propargyl, cyhalofop-R-butyl, diclofop-methyl, fenoxaprop-P-ethyl, fluazifop-P-butyl, haloxyfop-R-methyl, metamifop, pinoxaden, profoxydim, quizalofop-P-ethyl, sethoxydim or tralkoxydim, wherein (a) and (b) are present in the composition in a ratio such that the composition exhibits herbicidal synergy, wherein the ratio of (a):(b) is from about 1:560 to about 150:1, wherein when (b) is cyhalofop-R-butyl, or a carboxylic acid, carboxylate salt, or ester thereof, the composition further comprises penoxsulam, bentazon-sodium, triclopyr, bispyribac-sodium, imazamox, benzobicyclon, quinclorac, glyphosate, glufosinate, benfuresate, fentrazamide, indanofan, ipfencarbazone, mefenacet, oxaziclomefone, pretilachlor, propyrisulfuron, pyraclonil, pyriftalid, or pyrimisulfan, or an agriculturally acceptable salt, carboxylic acid, carboxylate salt, or ester thereof, in the composition.

2. The composition of claim 1, wherein (a) is a C_{1-4} alkyl or benzyl ester of compound (I).

3. The composition of claim 2, wherein (a) is a benzyl ester of compound (I).

4. The composition of claim 1, wherein (a) is the compound of formula (I), which is the carboxylic acid.

5. A method of controlling undesirable vegetation, comprising the steps of contacting the vegetation or the locus thereof with or applying to the soil or water to prevent the emergence or growth of the vegetation, a herbicidally effective amount of a combination comprising (a) a compound of the formula (I):



(I)

or an agriculturally acceptable salt or ester of thereof, and (b) an ACCase inhibitor or an agriculturally acceptable salt or ester therein selected from the group consisting of clethodim, clodinafop-propargyl, diclofop-methyl, fenoxaprop-P-ethyl, fluazifop-P-butyl, haloxyfop-R-methyl, metamifop, pinoxaden, profoxydim, quizalofop-P-ethyl, sethoxydim or tralkoxydim, wherein (a) and (b) are present in the combination in ratio such that the combination exhibits herbicidal synergy; wherein the undesirable vegetation is controlled in rice, cereals, wheat, barley, oats, rye, sorghum, maize, sugarcane, soybean, pastures, grasslands, rangelands, fallowland and turf, wherein the ratio of (a):(b) is from about 1:560 to about 150:1.

6. The method of claim 5, wherein the undesirable vegetation is immature.

7. The method of claim 5, wherein the (a) and (b) are applied to the water.

8. The method of claim 7, wherein the water is part of a flooded rice paddy.

9. The method of claim 5, wherein the (a) and (b) are applied post-emergently and/or post emergently to the undesirable vegetation or crop.

10. The method of claim 5, wherein the undesirable vegetation is controlled in glyphosate-, 5-enolpyruvylshikimate-3-phosphate synthase inhibitor-, glufosinate-, glutamine synthetase inhibitor-, dicamba-, phenoxy auxin-, pyridyloxy auxin-, synthetic auxin-, auxin transport inhibitor-, aryloxyphenoxypropionate-, cyclohexanedione-, phenylpyrazoline-, acetyl CoA carboxylase inhibitor-, imidazolinone-, sulfonylurea-, pyrimidinylthiobenzoate-, triazolopyrimidine-, sulfonylaminocarbonyltriazolinone-, acetolactate synthase or acetohydroxy acid synthase inhibitor-, 4-hydroxyphenyl-pyruvate dioxygenase inhibitor-, phytoene desaturase inhibitor-, carotenoid biosynthesis inhibitor-, protoporphyrinogen oxidase inhibitor-, cellulose biosynthesis inhibitor-, mitosis inhibitor-, microtubule inhibitor-, long chain fatty acid inhibitor-, fatty acid and lipid biosynthesis inhibitor-, photosystem I inhibitor-, photosystem II inhibitor-, triazine-, or bromoxynil-tolerant crops.

11. The method of claim 10, wherein the tolerant crop possesses multiple or stacked traits conferring tolerance to multiple herbicides.

12. The method of claim 5, wherein the undesirable vegetation comprises a herbicide resistant or tolerant plant.

13. The method of claim 12, wherein the resistant or tolerant plant is resistant or tolerant to multiple herbicides.

14. The method of claim 12, wherein the resistant or tolerant plant is resistant or tolerant to acetolactate synthase or acetohydroxy acid synthase inhibitors, photosystem II inhibitors, acetyl CoA carboxylase inhibitors, synthetic auxins, auxin transport inhibitors, photosystem I inhibitors, 5-enolpyruvylshikimate-3-phosphate synthase inhibitors, microtubule assembly inhibitors, fatty acid and lipid synthesis inhibitors, protoporphyrinogen oxidase inhibitors, carotenoid biosynthesis inhibitors, long chain fatty acid inhibitors, phytoene desaturase inhibitors, glutamine synthetase inhibitors, 4-hydroxyphenyl-pyruvate-dioxygenase inhibitors, mitosis inhibitors, cellulose biosynthesis inhibitors, herbicides with multiple modes-of-action, quinclorac, arylaminopropionic acids, difenzoquat, endothall, or organoarsenicals.

15. The composition of claim 1, wherein (b) is cyhalofop-butyl or carboxylic acid, carboxylate salt, or ester thereof, wherein the composition further comprises penoxsulam, bentazon-sodium, triclopyr, bispyribac-sodium, imazamox, benzobicyclon, quinclorac, glyphosate, glufosinate, benfuresate, fentrazamide, indanofan, ipfencarbazone, mefenacet, oxazichlomefone, pretilachlor, propyrisulfuron, pyraclonil, pyriftalid, or pyrimisulfan, or an agriculturally acceptable salt, carboxylic acid, carboxylate salt, or ester thereof, in combination as a synergistic 3 way/ternary mixture.

16. The composition of claim 1, wherein (b) is fenoxaprop, metamifop, or profoxydim, or agriculturally acceptable salt, ester, carboxylate salt, or carboxylic acid thereof, wherein the composition further comprises penoxsulam, or an agriculturally acceptable salt, carboxylic acid, carboxylate salt, or ester thereof, in combination as a synergistic 3 way/ternary mixture.

17. The method of claim 5, wherein the undesirable vegetation is controlled in tree and vine orchards, aquatics, plantation crops, vegetables, industrial vegetation management (IVM) or rights of way (ROW).

18. The method of claim 12, wherein the resistant or tolerant plant is resistance or tolerance to multiple chemical classes, or multiple herbicide modes-of-action or via multiple resistance mechanisms.

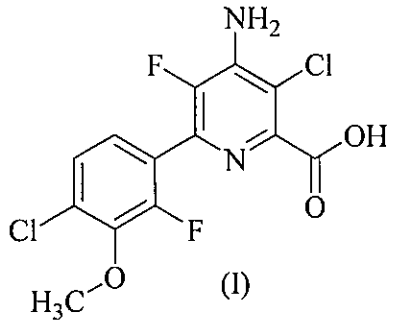
19. The composition according to claim 1, wherein the ratio of (a):(b) is selected from the group consisting of: from about 1:140 to about 9:1 when (b) is clethodim; from about 1:40 to about 60:1 when (b) is clodinafop-propargyl; from about 1:155 to about 6:1 when (b) is cyhalofop-R-butyl; from about 1:560 to about 5:1 when (b) is diclofop-methyl; from about 1:170 to about 30:1 when (b) is fenoxaprop-P-ethyl; from about 1:210 to about 3:1 when (b) is fluazifop-P-butyl; from about 1:45 to about 10:1 when (b) is haloxyfop-R-methyl; from about 1:150 to about 6:1 when (b) is metamifop; from about 1:30 to about 150:1 when (b) is pinoxaden; from about 1:10 to about 3:1 when (b) is profoxydim; from about 1:100 to about 12:1 when (b) is quizalofop-P-ethyl; from about 1:70 to about 29:1 when (b) is sethoxydim; and from about 1:38 to about 60:1 when (b) is tralkoxydim.

20. The method according to claim 5, wherein the ratio of (a):(b) is selected from the group consisting of: from about 1:140 to about 9:1 when (b) is clethodim; from about 1:40 to about 60:1 when (b) is clodinafop-propargyl; from about 1:155 to about 6:1 when (b) is cyhalofop-R-butyl; from about 1:560 to about 5:1 when (b) is diclofop-methyl; from about 1:170 to about 30:1 when (b) is fenoxaprop-P-ethyl; from about 1:210 to about 3:1 when (b) is fluazifop-P-butyl; from about 1:45 to about 10:1 when (b) is haloxyfop-R-methyl; from about 1:150 to about 6:1 when (b) is metamifop; from about 1:30 to about 150:1 when (b) is pinoxaden; from about 1:10 to about 3:1 when (b) is profoxydim; from about 1:100 to about 12:1 when (b) is quizalofop-P-ethyl; from about 1:70 to about 29:1 when (b) is sethoxydim; and from about 1:38 to about 60:1 when (b) is tralkoxydim.

CLAIMS

1. A herbicidal composition, comprising:

a herbicidally effective amount of (a) a compound of the formula (I):



(I)

or an agriculturally acceptable salt or ester thereof; and

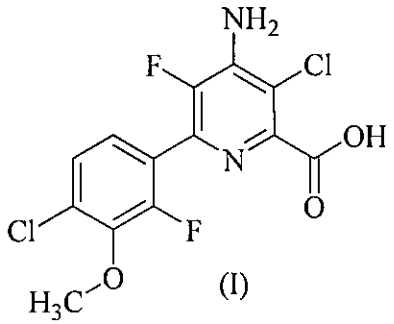
(b) at least one ACCase inhibitor, or a salt or ester thereof, selected from the group consisting of clethodim, clodinafop-propargyl, cyhalofop-R-butyl, diclofop-methyl, fenoxaprop-P-ethyl, fluazifop-P-butyl, haloxyfop-R-methyl, metamifop, pinoxaden, profoxydim, quizalofop-P-ethyl, sethoxydim or tralkoxydim, wherein (a) and (b) are present in the composition in a ratio such that the composition exhibits herbicidal synergy, wherein the ratio of (a):(b) is from about 43:1 to about 1:140, wherein when (b) is cyhalofop-R-butyl, or a carboxylic acid, carboxylate salt, or ester thereof, the composition further comprises penoxsulam, bentazon-sodium, triclopyr, bispyribac-sodium, imazamox, benzobicyclon, quinclorac, glyphosate, glufosinate, benfuresate, fentrazamide, indanofan, ipfencarbazone, mefenacet, oxazichlomefone, pretilachlor, propyrisulfuron, pyraclonil, pyriftalid, or pyrimisulfan, or an agriculturally acceptable salt, carboxylic acid, carboxylate salt, or ester thereof, in the composition.

2. The composition of claim 1, wherein (a) is a C_{1-4} alkyl or benzyl ester of compound (I).

3. The composition of claim 2, wherein (a) is a benzyl ester of compound (I).

4. The composition of claim 1, wherein (a) is the compound of formula (I), which is the carboxylic acid.

5. A method of controlling undesirable vegetation, comprising the steps of contacting the vegetation or the locus thereof with or applying to the soil or water to prevent the emergence or growth of the vegetation, a herbicidally effective amount of a combination comprising (a) a compound of the formula (I):



(I)

or an agriculturally acceptable salt or ester of thereof, and (b) an ACCase inhibitor or an agriculturally acceptable salt or ester therein selected from the group consisting of clethodim, clodinafop-propargyl, diclofop-methyl, fenoxaprop-P-ethyl, fluazifop-P-butyl, haloxyfop-R-methyl, metamifop, pinoxaden, profoxydim, quizalofop-P-ethyl, sethoxydim or tralkoxydim, wherein (a) and (b) are present in the combination in ratio such that the combination exhibits herbicidal synergy; wherein the undesirable vegetation is controlled in rice, cereals, wheat, barley, oats, rye, sorghum, maize, sugarcane, soybean, pastures, grasslands, rangelands, fallowland and turf, wherein the ratio of (a):(b) is from about 43:1 to about 1:140.

6. The method of claim 5, wherein the undesirable vegetation is immature.

7. The method of claim 5, wherein the (a) and (b) are applied to the water.

8. The method of claim 7, wherein the water is part of a flooded rice paddy.

9. The method of claim 5, wherein the (a) and (b) are applied post-emergently and/or post emergently to the undesirable vegetation or crop.

10. The method of claim 5, wherein the undesirable vegetation is controlled in glyphosate-, 5-enolpyruvylshikimate-3-phosphate synthase inhibitor-, glufosinate-, glutamine synthetase inhibitor-, dicamba-, phenoxy auxin-, pyridyloxy auxin-, synthetic auxin-, auxin transport inhibitor-, aryloxyphenoxypropionate-, cyclohexanedione-, phenylpyrazoline-, acetyl CoA carboxylase inhibitor-, imidazolinone-, sulfonylurea-, pyrimidinylthiobenzoate-, triazolopyrimidine-, sulfonylaminocarbonyltriazolinone-, acetolactate synthase or acetohydroxy acid synthase inhibitor-, 4-hydroxyphenyl-pyruvate dioxygenase inhibitor-, phytoene desaturase inhibitor-, carotenoid biosynthesis inhibitor-, protoporphyrinogen oxidase inhibitor-, cellulose biosynthesis inhibitor-, mitosis inhibitor-, microtubule inhibitor-, long chain fatty acid inhibitor-, fatty acid and lipid biosynthesis inhibitor-, photosystem I inhibitor-, photosystem II inhibitor-, triazine-, or bromoxynil-tolerant crops.

11. The method of claim 10, wherein the tolerant crop possesses multiple or stacked traits conferring tolerance to multiple herbicides.

12. The method of claim 5, wherein the undesirable vegetation comprises a herbicide resistant or tolerant plant.

13. The method of claim 12, wherein the resistant or tolerant plant is resistant or tolerant to multiple herbicides.

14. The method of claim 13, wherein the resistant or tolerant plant is resistant or tolerant to acetolactate synthase or acetohydroxy acid synthase inhibitors, photosystem II inhibitors, acetyl CoA carboxylase inhibitors, synthetic auxins, auxin transport inhibitors, photosystem I inhibitors, 5-enolpyruvylshikimate-3-phosphate synthase inhibitors, microtubule assembly inhibitors, fatty acid and lipid synthesis inhibitors, protoporphyrinogen oxidase inhibitors, carotenoid biosynthesis inhibitors, long chain fatty acid inhibitors, phytoene desaturase inhibitors, glutamine synthetase inhibitors, 4-hydroxyphenyl-pyruvate-dioxygenase inhibitors, mitosis inhibitors, cellulose biosynthesis inhibitors, herbicides with multiple modes-of-action, quinclorac, arylaminopropionic acids, difenzoquat, endothall, or organoarsenicals.

15. The composition of claim 1, wherein (b) is cyhalofop-butyl or carboxylic acid, carboxylate salt, or ester thereof, wherein the composition further comprises penoxsulam, bentazon-sodium, triclopyr, bispyribac-sodium, imazamox, benzobicyclon, quinclorac, glyphosate, glufosinate, benfuresate, fentrazamide, indanofan, ipfencarbazone, mefenacet, oxazichlomefone, pretilachlor, propyrisulfuron, pyraclonil, pyriftalid, or pyrimisulfan, or an agriculturally acceptable salt, carboxylic acid, carboxylate salt, or ester thereof, in combination as a synergistic 3 way/ternary mixture.

16. The composition of claim 1, wherein (b) is fenoxaprop, metamifop, or profoxydim, or agriculturally acceptable salt, ester, carboxylate salt, or carboxylic acid thereof, wherein the composition further comprises penoxsulam, or an agriculturally acceptable salt, carboxylic acid, carboxylate salt, or ester thereof, in combination as a synergistic 3 way/ternary mixture.

17. The method of claim 5, wherein the undesirable vegetation is controlled in tree and vine orchards, aquatics, plantation crops, vegetables, industrial vegetation management (IVM) or rights of way (ROW).

18. The method of claim 12, wherein the resistant or tolerant plant is resistance or tolerance to multiple chemical classes, or multiple herbicide modes-of-action or via multiple resistance mechanisms.

19. The composition according to claim 1, wherein the ratio of (a):(b) is selected from the group consisting of: from about 1:2.2 to about 1:17.5 when (b) is clethodim; from about 1:2.3 to about1:6 when (b) is clodinafop-propargyl; from about 1:1.1 to about 1:45 when (b) is cyhalofop-R-butyl; from about 1:8.8 to about 1:140 when (b) is diclofop-methyl; from about 1:2.3 to about 1:9.2 when (b) is fenoxaprop-P-ethyl; from about 1:1.5 to about 1:41.1when (b) is fluazifop-P-butyl; from about 2.6:1 to about 1:6.2 when (b) is haloxyfop-R-methyl; from about 3.5:1 to about 1:34.3 when (b) is metamifop; from about 2.2:1 to about 1:7.5 when (b) is pinoxaden; from about 1.4:1 to about 1:6.3 when (b) is profoxydim; from about 43:1 to about 1:7.2 when (b) is quizalofop-P-ethyl; from about 1:1.8 to about 1:61.7 when (b) is sethoxydim; and from about 1:3.2 to about 1:25 when (b) is tralkoxydim.

20. The method according to claim 5, wherein the ratio of (a):(b) is selected from the group consisting of: from about 1:2.2 to about 1:17.5when (b) is clethodim; from about 1:2.3 to about1:6 when (b) is clodinafop-propargyl; from about 1:1.1 to about 1:45 when (b) is cyhalofop-R-butyl; from about 1:8.8 to about 1:1401 when (b) is diclofop-methyl; from about 1:2.3 to about 1:9.2 when (b) is fenoxaprop-P-ethyl; from about 1:1.5 to about 1:41.1 when (b) is fluazifop-P-butyl; from about 2.6:1 to about 1:6.2 when (b) is haloxyfop-R-methyl; from about 3.5:1 to about 1:34.3 when (b) is metamifop; from about 2.2:1 to about 1:7.5 when (b) is pinoxaden; from about 1.4:1 to about 1:6.3 when (b) is profoxydim; from about 43:1 to about 1:7.2 when (b) is quizalofop-P-ethyl; from about 1:1.8 to about 1:61.7 when (b) is sethoxydim; and from about 1:3.2 to about 1:25 when (b) is tralkoxydim.