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(54) Title: HERBICIDAL COMBINATION

(57) Abstract: Disclosed herein is a herbicidal combination comprising at least one acetyl CoA carboxylase inhibitor; at least one photosynthesis II inhibitor and at least one microtubule assembly inhibitor.



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HERBICIDAL COMBINATION

Technical Field:

The present invention relates to combinations of herbicides for controlling harmful
5 undesirable plants. The present invention more specifically relates to a synergistic
combination of herbicides.

Background and prior art:

Weeds are undesirable plants that can severely damage yield in crops. Farmers
10 usually control these plants at the pre-plant stage as well as after sowing. Modern
herbicides are used to either control or suppress these undesirable plants so as to
allow sown crops a greater share of nutrient.

Current practices include combining herbicides with varied modes of action, which
15 allows for broader spectrum of control and resistance management. However, the
combinations currently known are not sufficient to control the resistant and
persistent weeds. Growers increasingly face complex weed situations that may not
be controlled with just one herbicide.

20 Herbicides acting as Acetyl-CoA carboxylase (ACCase) inhibitors are known to
control undesired vegetation such as grasses (graminids). The ACCase inhibitors
were first introduced in 1978 and are widely used to control grass species. There
are three chemical groups of ACCase inhibitors, Aryloxyphenoxypropionates
(APP), Cylcohexanediones (CHD), and Phenylpyrazolines (PPZ). APPs are an
25 important class of herbicides due to their high efficiency, broad spectrum, low
toxicity and good selectivity. Some of the known APP herbicides are clodinafop-
propargyl, cyhalofop-butyl, diclofop-methyl, diclofop-P-methyl, fenoxaprop-P-ethyl,
fluazifop-butyl, fluazifop-P-butyl, haloxyfop, haloxyfop-P, haloxyfop-P-methyl,
propaquizafop, quizalofop, quizalofop-ethyl, quizalofop-P, quizalofop-P-ethyl and
30 quizalofop-P-tefuryl.

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The APP herbicide, such as clodinafop-propargyl, are employed as post-emergence grass herbicide (graminicide). Clodinafop-propargyl is 2-Propynyl-(2R)-2-[4-[(5-chlor-3-fluor-2-pyridinyl)oxy]phenoxy]propanoate which is an ester of 2-(4-(3-Chloro-5-fluoro-2-pyridyloxy)-phenoxy-propionic acid. It is a systemic herbicide that acts on post-emergent weeds such as wild oats, rough meadow-grass, green foxtail, barnyard grass, persian darnel and volunteer canary seed. Clodinafop-propargyl possesses herbicidal activity against grassy weeds in winter cereals especially in wheat and barley as well as pulses. Clodinafop-propargyl interacts with and inhibits the Acetyl-CoA carboxylase, which is essential for the production of lipids or fatty acids needed for plant growth. The selectivity of this herbicide is based on the difference in the speed of herbicide breakdown in the crop versus the weeds. Clodinafop-propargyl converts from the ester form to the active acid and then to biologically inactive compounds.

Microtubule Inhibitors are generally applied to control annual grasses and some broadleaf weeds in several crops and turf grass. Absorbed by both roots and shoots, these herbicides cause cell damage and are an excellent tool to control pre-emergent weeds. Pendimethalin is a microtubule inhibitor herbicide, which is used both pre and post emergent for control of broadleaf and annual grasses. Pendimethalin is known to be used in combination such as those known from **WO2012177860 (Mann et.al.)**, which is incorporated herein by reference in its entirety.

Photosynthetic Inhibitors control many broadleaf and some grass weeds by interfering in the electron transport chain and indirectly membrane leakage and cell damage. These herbicides are excellent tools for controlling pre-emergent weeds. Metribuzin is a photosynthesis inhibitor herbicide that is used for both pre and post emergent control of broadleaf and annual grasses. Metribuzin is known to be combined with other herbicides such as the combinations known from **WO2011082958 (Hubert et.al)**, which is incorporated herein by reference in its entirety.

Combinations of herbicides are used to control a broader range of weeds. However, the combination of herbicides may not always result in the desired effect. Combination of herbicides may lead to an additive effect or an antagonistic effect. It may also result in phytotoxicity to the crops making it an undesirable combination.

5 Agronomists must therefore carefully select the herbicides that can be combined to offer a synergistic effect that would control weeds while having no phytotoxic effect on the crop, and reduce the chances of development of herbicide resistant weeds.

10 There is therefore a need in the art for combinations that have advantageous properties such as a herbicidal combination that is synergistic, helps in resistance management, reduces dosage of herbicides used thus causing minimal damage to the environment, and a herbicidal combination that has excellent residual effects.

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Embodiments of the present invention may therefore ameliorate one or more of the above mentioned problems:

Summary of the invention:

20 Therefore, in one aspect, the present invention may provide a herbicidal combination comprising:

- (a) at least one acetyl CoA carboxylase inhibitor selected from arylphenoxy-propionate herbicides, cyclohexanedione herbicides, or phenylpyrazoline herbicides;
- 25 (b) at least one photosynthesis II inhibitor selected from a triazine herbicide, a triazinone herbicide, triazole herbicide, triazolone herbicide, triazolinone herbicide, uracil herbicide, pyridazinone herbicide, a triazolopyrimidine herbicide, or phenyl-carbamate herbicide;
- (c) at least one microtubule assembly inhibitor herbicide selected from a
30 dinitroaniline herbicide, a phosphoroamidate herbicide, pyridine herbicide, benzamide herbicide, or a benzoic acid herbicide.

In another aspect, the present invention may provide a herbicidal combination comprising:

- (a) at least one first herbicide selected from clodinafop, clodinafop-propargyl, cyhalofop-butyl, diclofop, diclofop-methyl, fenoxaprop-P-ethyl, fenoxaprop-P, fenoxaprop-ethyl, fenoxaprop, fluazifop, fluazifop-butyl, fluazifop-P-butyl, haloxyfop, haloxyfop-etotyl, haloxyfop-P-methyl, propaquizafop, quizalofop, quizalofop-ethyl, quizalofop-P, quizalofop-P-ethyl, and quizalofop-P-tefuryl, or an agriculturally acceptable salt;
- (b) at least one second herbicide selected from a triazine herbicide, triazinone herbicide, triazole herbicide, triazolone herbicide, or triazolopyrimidine herbicide; and
- (c) at least one third herbicide selected from dinitroaniline herbicide.

Therefore, in one aspect, the present invention may provide a method of controlling weeds at a locus, said method comprising applying to the locus a herbicidal combination comprising:

- (a) at least one acetyl CoA carboxylase inhibitor selected from arylphenoxypropionate herbicides, cyclohexanedione herbicides, or phenylpyrazoline herbicides;
- (b) at least one photosynthesis II inhibitor selected from a triazine herbicide, a triazinone herbicide, triazole herbicide, triazolone herbicide, triazolinone herbicide, uracil herbicide, pyridazinone herbicide, a triazolopyrimidine herbicide, or phenyl-carbamate herbicide;
- (c) at least one microtubule assembly inhibitor herbicide selected from a dinitroaniline herbicide, a phosphoroamidate herbicide, pyridine herbicide, benzamide herbicide, or a benzoic acid herbicide.

Another aspect of the present invention may provide a method of controlling weeds at a locus, said method comprising applying to the locus a combination comprising:

- (a) at least one first herbicide selected from clodinafop, clodinafop-propargyl, cyhalofop-butyl, diclofop, diclofop-methyl, fenoxaprop-P-ethyl, fenoxaprop-P, fenoxaprop-ethyl, fenoxaprop, fluazifop, fluazifop-

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butyl, fluazifop-P-butyl, haloxyfop, haloxyfop-etotyl, haloxyfop-P-methyl, propaquizafop, quizalofop, quizalofop-ethyl, quizalofop-P, quizalofop-P-ethyl, and quizalofop-P-tefuryl, or an agriculturally acceptable salt;

- 5 (b) at least one second herbicide selected from a triazine herbicide, triazinone herbicide, triazole herbicide, triazolone herbicide, or triazolopyrimidine herbicide; and
- (c) at least one third herbicide selected from dinitroaniline herbicide.

10 In an aspect, the present invention may provide a herbicidal composition comprising:

- (a) at least one acetyl CoA carboxylase inhibitor selected from arylphenoxy-propionate herbicides, cyclohexanedione herbicides, or phenylpyrazoline herbicides;
- 15 (b) at least one photosynthesis II inhibitor selected from a triazine herbicide, a triazinone herbicide, triazole herbicide, triazolone herbicide, triazolinone herbicide, uracil herbicide, pyridazinone herbicide, a triazolopyrimidine herbicide, or phenyl-carbamate herbicide;
- (c) at least one microtubule assembly inhibitor herbicide selected from a dinitroaniline herbicide, a phosphoroamidate herbicide, pyridine
- 20 herbicide, benzamide herbicide, or a benzoic acid herbicide.

Another aspect of the present invention may provide a composition comprising:

- (a) at least one first herbicide selected from clodinafop, clodinafop-propargyl, cyhalofop-butyl, diclofop, diclofop-methyl, fenoxaprop-P-ethyl, fenoxaprop-P, fenoxaprop-ethyl, fenoxaprop, fluazifop, fluazifop-butyl, fluazifop-P-butyl, haloxyfop, haloxyfop-etotyl, haloxyfop-P-methyl, propaquizafop, quizalofop, quizalofop-ethyl, quizalofop-P, quizalofop-P-ethyl, and quizalofop-P-tefuryl, or an agriculturally acceptable salt;
- 25 (b) at least one second herbicide selected from a triazine herbicide, triazinone herbicide, triazole herbicide, triazolone herbicide, or triazolopyrimidine herbicide; and
- 30 (c) at least one third herbicide selected from dinitroaniline herbicide.

Yet another aspect of the present invention may provide a method of increasing yield in a crop by application of a combination comprising:

- (a) at least one acetyl CoA carboxylase inhibitor selected from arylphenoxy-propionate herbicides, cyclohexanedione herbicides, or phenylpyrazoline herbicides;
- (b) at least one photosynthesis II inhibitor selected from a triazine herbicide, a triazinone herbicide, triazole herbicide, triazolone herbicide, triazolinone herbicide, uracil herbicide, pyridazinone herbicide, a triazolopyrimidine herbicide, or phenyl-carbamate herbicide;
- (c) at least one microtubule assembly inhibitor herbicide selected from a dinitroaniline herbicide, a phosphoroamidate herbicide, pyridine herbicide, benzamide herbicide, or a benzoic acid herbicide.

Another aspect of the present invention may provide a method of improving the plant health, said method comprising application at the locus of the plant a combination comprising:

- (a) at least one acetyl CoA carboxylase inhibitor selected from arylphenoxy-propionate herbicides, cyclohexanedione herbicides, or phenylpyrazoline herbicides;
- (b) at least one photosynthesis II inhibitor selected from a triazine herbicide, a triazinone herbicide, triazole herbicide, triazolone herbicide, triazolinone herbicide, uracil herbicide, pyridazinone herbicide, a triazolopyrimidine herbicide, or phenyl-carbamate herbicide;
- (c) at least one microtubule assembly inhibitor herbicide selected from a dinitroaniline herbicide, a phosphoroamidate herbicide, pyridine herbicide, benzamide herbicide, or a benzoic acid herbicide.

Detailed Description of the invention:

The term herbicide, as used herein, shall mean an active ingredient that kills, controls or otherwise adversely modifies the growth of plants. As used herein, a herbicidally effective or vegetation controlling amount is an amount of active ingredient that causes a "herbicidal effect," i.e., an adversely modifying effect and

includes deviations from natural development, killing, regulation, desiccation, retardation. The terms "plants" and "vegetation" include, but are not limited to, germinant seeds, emerging seedlings, plants emerging from vegetative propagules, and established vegetation. The term "locus" as used herein shall
5 denote the vicinity of a desired crop in which weed control, typically selective weed control, of weeds is desired. The locus includes the vicinity of desired crop plants wherein the weed infestation has either emerged or is yet to emerge. The term crop shall include a multitude of desired crop plants or an individual crop plant growing at a locus.

10 In any aspect or embodiment described hereinbelow, the phrase comprising may be replaced by the phrases "consisting of" or "consisting essentially of" or "consisting essentially of". In these aspects or embodiment, the combination or composition described includes or comprises or consists of or consists essentially
15 of or consists substantially of the specific components recited therein, to the exclusion of other fungicides or insecticide or herbicides or plant growth promoting agents or adjuvants or excipients not specifically recited therein.

Surprisingly, it has been found by the present inventors that a combination of acetyl CoA carboxylase inhibitors, microtubule inhibitor and photosystem II inhibitors results in a synergistic control of undesirable plants, at the locus of the plant.

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Therefore, in one aspect, the present invention may provide a herbicidal combination comprising:

- (a) at least one acetyl CoA carboxylase inhibitor selected from arylphenoxy-propionate herbicides, cyclohexanedione herbicides, or
25 phenylpyrazoline herbicides;
- (b) at least one photosynthesis II inhibitor selected from a triazine herbicide, a triazinone herbicide, triazole herbicide, triazolone herbicide, triazolinone herbicide, uracil herbicide, pyridazinone herbicide, a triazolopyrimidine herbicide, or phenyl-carbamate herbicide; and

- (c) at least one microtubule assembly inhibitor herbicide selected from a dinitroaniline herbicide, a phosphoroamidate herbicide, pyridine herbicide, benzamide herbicide, or a benzoic acid herbicide.

5 In an embodiment, the herbicidal combinations of the present invention comprise one herbicide from these three classes of herbicides.

Therefore, in one aspect, the present invention may provide a herbicidal combination comprising:

- 10 (a) an acetyl CoA carboxylase inhibitor selected from arylphenoxypropionate herbicides, cyclohexanedione herbicides, or phenylpyrazoline herbicides;
- (b) a photosystem II inhibitor selected from a triazine herbicide, a triazinone herbicide, triazole herbicide, triazolone herbicide, triazolinone herbicide, 15 uracil herbicide, pyridazinone herbicide, a triazolopyrimidine herbicide, or phenyl-carbamate herbicide; and
- (c) a microtubule assembly inhibitor herbicide selected from a dinitroaniline herbicide, a phosphoroamidate herbicide, pyridine herbicide, benzamide herbicide, or a benzoic acid herbicide.

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In another aspect, the present invention provides a method of controlling weeds at a locus by applying the combination of the present invention to the locus.

Thus, in this aspect, the present invention may provide a method of controlling 25 weeds at a locus, said method comprising applying to the locus a combination comprising:

- (a) at least one acetyl CoA carboxylase inhibitor selected from arylphenoxypropionate herbicides, cyclohexanedione herbicides, or phenylpyrazoline herbicides;
- 30 (b) at least one photosynthesis II inhibitor selected from a triazine herbicide, a triazinone herbicide, triazole herbicide, triazolone herbicide,

triazolinone herbicide, uracil herbicide, pyridazinone herbicide, a triazolopyrimidine herbicide, or phenyl-carbamate herbicide;

- (c) at least one microtubule assembly inhibitor herbicide selected from a dinitroaniline herbicide, a phosphoroamidate herbicide, pyridine herbicide, benzamide herbicide, or a benzoic acid herbicide.

In another aspect, the present invention provides a composition comprising the combinations of the present invention, and at least another agrochemically acceptable excipient.

Therefore, in this aspect, the present invention may provide a composition comprising:

- (a) at least one acetyl CoA carboxylase inhibitor selected from arylphenoxy-propionate herbicides, cyclohexanedione herbicides, or phenylpyrazoline herbicides;
- (b) at least one photosynthesis II inhibitor selected from a triazine herbicide, a triazinone herbicide, triazole herbicide, triazolone herbicide, triazolinone herbicide, uracil herbicide, pyridazinone herbicide, a triazolopyrimidine herbicide, or phenyl-carbamate herbicide;
- (c) at least one microtubule assembly inhibitor herbicide selected from a dinitroaniline herbicide, a phosphoroamidate herbicide, pyridine herbicide, benzamide herbicide, or a benzoic acid herbicide.

In another aspect, the present invention provides a method for increasing yield in a crop by using the combinations of the present invention.

Therefore, in this aspect, the present invention may provide a method of increasing yield in a crop by application of a combination comprising:

- (a) at least one acetyl CoA carboxylase inhibitor selected from arylphenoxy-propionate herbicides, cyclohexanedione herbicides, or phenylpyrazoline herbicides;

- (b) at least one photosynthesis II inhibitor selected from a triazine herbicide, a triazinone herbicide, triazole herbicide, triazolone herbicide, triazolinone herbicide, uracil herbicide, pyridazinone herbicide, a triazolopyrimidine herbicide, or phenyl-carbamate herbicide;
- 5 (c) at least one microtubule assembly inhibitor herbicide selected from a dinitroaniline herbicide, a phosphoroamidate herbicide, pyridine herbicide, benzamide herbicide, or a benzoic acid herbicide.

In another aspect, the present invention may provide a method of improving the
10 plant health using the combinations of the present invention.

Therefore, in this aspect, the present invention may provide a method of improving the plant health, said method comprising application at the locus of the plant a combination comprising:

- 15 (a) at least one acetyl CoA carboxylase inhibitor selected from arylphenoxy-propionate herbicides, cyclohexanedione herbicides, or phenylpyrazoline herbicides;
- (b) at least one photosynthesis II inhibitor selected from a triazine herbicide, a triazinone herbicide, triazole herbicide, triazolone herbicide,
20 triazolinone herbicide, uracil herbicide, pyridazinone herbicide, a triazolopyrimidine herbicide, or phenyl-carbamate herbicide;
- (c) at least one microtubule assembly inhibitor herbicide selected from a dinitroaniline herbicide, a phosphoroamidate herbicide, pyridine herbicide, benzamide herbicide, or a benzoic acid herbicide.

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Each of the aspect described above may have one or more embodiments.

Each of the embodiments described hereinafter may apply to one or all of the aspects described hereinabove. These embodiments are intended to be read as
30 being preferred features of one or all of the aspects described hereinabove. Each of the embodiments described hereinafter applies to each of the aspects described hereinabove individually.

In an embodiment, the acetyl CoA carboxylase inhibitor is an arylphenoxy-propionate herbicide.

- 5 In an embodiment, the arylphenoxy-propionate herbicide is selected from the group consisting of clodinafop, clodinafop-propargyl, cyhalofop-butyl, diclofop, diclofop-methyl, fenoxaprop-P-ethyl, fenoxaprop-P, fenoxaprop-ethyl, fenoxaprop, fluazifop, fluazifop-butyl, fluazifop-P-butyl, haloxyfop, haloxyfop-etotyl, haloxyfop-P-methyl, propaquizafop, quizalofop, quizalofop-ethyl, quizalofop-P, quizalofop-P-ethyl, and quizalofop-P-tefuryl, or an agriculturally acceptable salt thereof.
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In an embodiment, the arylphenoxy-propionate herbicide is clodinafop or clodinafop-propargyl.

- 15 In an embodiment, the arylphenoxy-propionate herbicide is haloxyfop, haloxyfop-etotyl, or haloxyfop-P-methyl.

In an embodiment, the arylphenoxy-propionate herbicide is quizalofop, quizalofop-ethyl, quizalofop-P, quizalofop-P-ethyl, or quizalofop-P-tefuryl.

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In an embodiment, the acetyl CoA carboxylase inhibitor is a cyclohexanedione herbicide.

- In an embodiment, the cyclohexadione herbicide is a benzoylcyclohexanedione herbicide selected from fenquinotrine, ketospiradox, lancotrione, mesotrione, sulcotrione, tefuryltrione or tembotrione.
- 25

In an embodiment, the cyclohexadione herbicide is mesotrione.

- 30 In an embodiment, the cyclohexadione herbicide is sulcotrione.

In an embodiment, the cyclohexadione herbicide is tembotrione.

In an embodiment, the acetyl CoA carboxylase inhibitor is a phenylpyrazoline herbicide.

- 5 In an embodiment, the phenylpyrazoline herbicide is selected from fluazolate, nipyraclufen, pinoxaden or pyraflufen.

In an embodiment, the phenylpyrazoline herbicide is pinoxaden.

- 10 In an aspect, the combination comprises a photosynthesis II inhibitor.

- In an embodiment, the photosynthesis II inhibitor is selected from a triazine herbicide, a triazinone herbicide, triazole herbicide, triazolone herbicide, triazolinone herbicide, uracil herbicide, pyridazinone herbicide, a triazolopyrimidine
15 herbicide, or phenyl-carbamate herbicide.

In an embodiment, the photosynthesis II inhibitor is a triazine herbicide.

- In an embodiment, the triazine herbicide is selected from the group consisting of
20 dipropetryn, fucaojing, trihydroxytriazine, atrazine, chlorazine, cyanazine, cyprazine, eglinazine, ipazine, mesoprazine, procyazine, proglinazine, propazine, sebuthylazine, simazine, terbuthylazine, trietazine, indaziflam, triaziflam, atraton, methometon, prometon, secbumeton, simeton, terbumeton, ametryn, aziprotryne, cyanatryn, desmetryn, dimethametryn, methoprotryne, prometryn, simetryn, and
25 terbutryn.

In an embodiment, the triazine herbicide is atrazine.

- In an embodiment, the photosynthesis II inhibitor is a triazinone herbicide.
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In an embodiment, the triazinone herbicide is selected from ametridione, amibuzin, ethiozin, hexazinone, isomethiozin, metamitron, metribuzin and trfludimoxazin.

In an embodiment, the triazinone herbicide is selected from hexazinone, metamitron and metribuzin.

5 In an embodiment, the triazinone herbicide is hexazinone.

In an embodiment, the triazinone herbicide is metamitron.

In an embodiment, the triazinone herbicide is metribuzin.

10

In an embodiment, the photosynthesis II inhibitor is a triazole herbicide.

In an embodiment, the triazole herbicide is selected from amitrole, cafenstrole, epronaz and flupoxam.

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In an embodiment, the photosynthesis II inhibitor is a triazolone herbicide.

In an embodiment, the triazolone herbicide is selected from amicarbazone, bencarbazone, carfentrazone, flucarbazone, ipfencarbazone, propoxycarbazone, 20 sulfentrazone and thienicarbazone.

In an embodiment, the triazolone herbicide is selected from carfentrazone, flucarbazone and sulfentrazone.

25 In an embodiment, the triazolone herbicide is sulfentrazone.

In an embodiment, the photosynthesis II inhibitor is a triazolopyrimidine herbicide.

In an embodiment, the triazolopyrimidine herbicide is selected from cloransulam, 30 diclosulam, florasulam, flumetsulam, metosulam, penoxsulam and pyroxsulam.

In an embodiment, the triazolopyrimidine herbicide is penoxsulam.

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In an embodiment, the photosynthesis II inhibitor is an uracil herbicide.

In an embodiment, the uracil herbicide is selected from benzfendizone, bromacil,
5 butafenacil, flupropacil, isocil, lenacil, saflufenacil, terbacil or tiafenacil.

In an embodiment, the uracil herbicide is saflufenacil.

In an embodiment, the photosynthesis II inhibitor is a pyridazinone herbicide.

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In an embodiment, the pyridazinone herbicide is selected from brompyrazon, chloridazon, dimidazon, flufenpyr, metflurazon, norflurazon, oxapyrazon or pydanon.

15 In an embodiment, the photosystem II inhibitor is a phenyl-carbamate herbicide.

In an embodiment, the phenyl-carbamate herbicide is desmedipham.

In an embodiment, the phenyl-carbamate herbicide is phenmedipham.

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In an aspect, the combination of the present invention comprises at least one microtubule assembly inhibitor.

In an embodiment, the microtubule assembly inhibitor herbicide is selected from a
25 dinitroaniline herbicide, a phosphoroamidate herbicide, pyridine herbicide, benzamide herbicide, or a benzoic acid herbicide.

In an embodiment, the microtubule assembly inhibitor is a dinitroaniline herbicide.

30 In an embodiment, the dinitroaniline herbicide may be selected from benfluralin, butralin, chlornidine, dinitramine, dipropalin, ethalfluralin, fluchloralin, isopropalin, nitralin, oryzalin, pendimethalin, prodiamine, profluralin and trifluralin.

In an embodiment, the dinitroaniline herbicide may be selected from oryzalin and pendimethalin.

- 5 In an embodiment, the microtubule assembly inhibitor is a phosphoroamidate herbicide.

In an embodiment, the phosphoroamidate herbicide is selected from amiprofos-methyl or butamifos.

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In an embodiment, the microtubule assembly inhibitor is a pyridine herbicide.

- In an embodiment, the pyridine herbicide is selected from aminopyralid, clodinate, clopyralid, diflufenican, dithiopyr, florpyrauxifen, flufenican, fluroxypyr, halauxifen,
15 haloxydine, picloram, picolinafen, pyriclor, pyroxsulam, thiazopyr, and triclopyr.

In an embodiment, the pyridine herbicide is diflufenican.

- In an embodiment, the pyridine herbicide is fluroxypyr.

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In an embodiment, the pyridine herbicide is halauxifen.

In an embodiment, the pyridine herbicide is picloram.

- 25 In an embodiment, the pyridine herbicide is pyroxsulam.

In an embodiment, the microtubule assembly inhibitor is a benzamide herbicide.

- In an embodiment, the benzamide herbicide is selected from pronamide or
30 isoxaben.

In an embodiment, the microtubule assembly inhibitor is a benzoic acid herbicide.

In an embodiment, the benzoic acid herbicide is selected from cambendichlor, chloramben, dicamba, 2,3,6-TBA, tricamba, bispyribac, pyriminobac or pyriithiobac.

5 In an embodiment, the benzoic acid herbicide is dicamba.

In an embodiment, the benzoic acid herbicide is bispyribac.

Therefore, in one embodiment, the present invention may provide a herbicidal
10 combination comprising:

- (a) at least one acetyl CoA carboxylase inhibitor selected from clodinafop-propargyl, clodinafop, haloxyfop, haloxyfop-etotyl, haloxyfop-P-methyl, quizalofop, quizalofop-ethyl, quizalofop-P, quizalofop-P-ethyl, or quizalofop-P-tefuryl, mesotrione, sulcotrione, tembotrione, or pinoxaden;
- 15 (b) at least one photosynthesis II inhibitor selected from atrazine, hexazinone, metamiltron, metribuzin, flucarbazone, sulfentrazone, penoxsulam, saflufencil, desmedipham or phenmedipham; and
- (c) at least one microtubule assembly inhibitor herbicide selected from oryzalin, pendimethalin, diflufenican, fluroxypyr, halauxifen, picloram,
20 pyroxsulam, dicamba or bispyribac.

In a preferred embodiment, the combinations and methods of the present invention comprise clodinafop propargyl, a second herbicide and a third herbicide.

25 In a preferred embodiment, the second herbicide is selected from triazine, hexazinone, metamiltron, metribuzin, carfentrazone, flucarbazone, sulfentrazone or penoxsulam.

In an embodiment, the third herbicide is a dinitroaniline herbicide.

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In an embodiment, the dinitroaniline herbicide may be selected from benfluralin, butralin, chlornidine, dinitramine, dipropalin, ethalfluralin, fluchloralin, isopropalin, nitratin, oryzalin, pendimethalin, prodiamine, profluralin and trifluralin.

- 5 In an embodiment, the dinitroaniline herbicide may be selected from oryzalin and pendimethalin.

In an embodiment, the present invention provides preferred combinations, compositions and methods thereof. The methods of the invention include a method
10 of controlling weeds at a locus by applying to the locus the combination or the composition, a method of increasing yield in a crop by application of the combination or composition, or a method of improving the plant health by application at the locus of the plant the combination or the composition. The embodiments described herein describe the preferred embodiments of all these
15 possible combinations, compositions and methods of the invention.

Therefore, an embodiment of the present invention provides a combination and method comprising clodinafop propargyl; a second herbicide selected from triazine, hexazinone, metamitron, metribuzin, carfentrazone, flucarbazone, sulfentrazone
20 and penoxsulam; and a third herbicide selected from oryzalin and pendimethalin.

An embodiment of the present invention provides a combination and method comprising clodinafop propargyl, triazine, and oryzalin.

- 25 An embodiment of the present invention provides a combination and method comprising clodinafop propargyl, triazine, and pendimethalin.

An embodiment of the present invention provides a combination and method comprising clodinafop propargyl, hexazinone, and oryzalin.

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An embodiment of the present invention provides a combination and method comprising clodinafop propargyl, hexazinone, and pendimethalin.

An embodiment of the present invention provides a combination and method comprising clodinafop propargyl, metamitron, and oryzalin.

- 5 An embodiment of the present invention provides a combination and method comprising clodinafop propargyl, metamitron and pendimethalin.

An embodiment of the present invention provides a combination and method comprising clodinafop propargyl, metribuzin and oryzalin.

10

An embodiment of the present invention provides a combination and method comprising clodinafop propargyl, metribuzin, and pendimethalin.

- 15 An embodiment of the present invention provides a combination and method comprising clodinafop propargyl, carfentrazone, and oryzalin.

An embodiment of the present invention provides a combination and method comprising clodinafop propargyl, carfentrazone, and pendimethalin.

- 20 An embodiment of the present invention provides a combination and method comprising clodinafop propargyl, flucarbazone, and oryzalin.

An embodiment of the present invention provides a combination and method comprising clodinafop propargyl, flucarbazone, and pendimethalin.

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An embodiment of the present invention provides a combination and method comprising clodinafop propargyl, sulfentrazone and oryzalin.

- 30 An embodiment of the present invention provides a combination and method comprising clodinafop propargyl, sulfentrazone and pendimethalin.

An embodiment of the present invention provides a combination and method comprising clodinafop propargyl, penoxsulam, and oryzalin.

An embodiment of the present invention provides a combination and method
5 comprising clodinafop propargyl, penoxsulam and pendimethalin.

In an embodiment, the combinations of the present invention include the following preferred combinations.

10 In an embodiment, each individual row appearing in the table below represents the combinations in an embodiment of the present invention.

S No.	Acetyl CoA carboxylase inhibitor	Photosystem II inhibitor	Microtubule assembly inhibitor
1	Clodinafop-propargyl	Atrazine	Oryzalin
2	Clodinafop-propargyl	Atrazine	Pendimethalin
3	Clodinafop-propargyl	Atrazine	Diflufenican
4	Clodinafop-propargyl	Atrazine	Fluroxypyr
5	Clodinafop-propargyl	Atrazine	Halauxifen
6	Clodinafop-propargyl	Atrazine	Picloram
7	Clodinafop-propargyl	Atrazine	Pyroxsulam
8	Clodinafop-propargyl	Atrazine	Dicamba
9	Clodinafop-propargyl	Atrazine	Bispyribac
10	Clodinafop-propargyl	Hexazinone	Oryzalin
11	Clodinafop-propargyl	Hexazinone	Pendimethalin
12	Clodinafop-propargyl	Hexazinone	Diflufenican
13	Clodinafop-propargyl	Hexazinone	Fluroxypyr
14	Clodinafop-propargyl	Hexazinone	Halauxifen
15	Clodinafop-propargyl	Hexazinone	Picloram
16	Clodinafop-propargyl	Hexazinone	Pyroxsulam
17	Clodinafop-propargyl	Hexazinone	Dicamba

18	Clodinafop-propargyl	Hexazinone	Bispyribac
19	Clodinafop-propargyl	Metamitron	Oryzalin
20	Clodinafop-propargyl	Metamitron	Pendimethalin
21	Clodinafop-propargyl	Metamitron	Diflufenican
22	Clodinafop-propargyl	Metamitron	Fluroxypyr
23	Clodinafop-propargyl	Metamitron	Halauxifen
24	Clodinafop-propargyl	Metamitron	Picloram
25	Clodinafop-propargyl	Metamitron	Pyroxsulam
26	Clodinafop-propargyl	Metamitron	Dicamba
27	Clodinafop-propargyl	Metamitron	Bispyribac
28	Clodinafop-propargyl	Metribuzin	Oryzalin
29	Clodinafop-propargyl	Metribuzin	Pendimethalin
30	Clodinafop-propargyl	Metribuzin	Diflufenican
31	Clodinafop-propargyl	Metribuzin	Fluroxypyr
32	Clodinafop-propargyl	Metribuzin	Halauxifen
33	Clodinafop-propargyl	Metribuzin	Picloram
34	Clodinafop-propargyl	Metribuzin	Pyroxsulam
35	Clodinafop-propargyl	Metribuzin	Dicamba
36	Clodinafop-propargyl	Metribuzin	Bispyribac
37	Clodinafop-propargyl	Flucarbazone	Oryzalin
38	Clodinafop-propargyl	Flucarbazone	Pendimethalin
39	Clodinafop-propargyl	Flucarbazone	Diflufenican
40	Clodinafop-propargyl	Flucarbazone	Fluroxypyr
41	Clodinafop-propargyl	Flucarbazone	Halauxifen
42	Clodinafop-propargyl	Flucarbazone	Picloram
43	Clodinafop-propargyl	Flucarbazone	Pyroxsulam
44	Clodinafop-propargyl	Flucarbazone	Dicamba
45	Clodinafop-propargyl	Flucarbazone	Bispyribac
46	Clodinafop-propargyl	Sulfentrazone	Oryzalin
47	Clodinafop-propargyl	Sulfentrazone	Pendimethalin

48	Clodinafop-propargyl	Sulfentrazone	Diflufenican
49	Clodinafop-propargyl	Sulfentrazone	Fluroxypyr
50	Clodinafop-propargyl	Sulfentrazone	Halauxifen
51	Clodinafop-propargyl	Sulfentrazone	Picloram
52	Clodinafop-propargyl	Sulfentrazone	Pyroxsulam
53	Clodinafop-propargyl	Sulfentrazone	Dicamba
54	Clodinafop-propargyl	Sulfentrazone	Bispyribac
55	Clodinafop-propargyl	Carfentrazone	Oryzalin
56	Clodinafop-propargyl	Carfentrazone	Pendimethalin
57	Clodinafop-propargyl	Carfentrazone	Diflufenican
58	Clodinafop-propargyl	Carfentrazone	Fluroxypyr
59	Clodinafop-propargyl	Carfentrazone	Halauxifen
60	Clodinafop-propargyl	Carfentrazone	Picloram
61	Clodinafop-propargyl	Carfentrazone	Pyroxsulam
62	Clodinafop-propargyl	Carfentrazone	Dicamba
63	Clodinafop-propargyl	Carfentrazone	Bispyribac
64	Clodinafop-propargyl	Penoxsulam	Oryzalin
65	Clodinafop-propargyl	Penoxsulam	Pendimethalin
66	Clodinafop-propargyl	Penoxsulam	Diflufenican
67	Clodinafop-propargyl	Penoxsulam	Fluroxypyr
68	Clodinafop-propargyl	Penoxsulam	Halauxifen
69	Clodinafop-propargyl	Penoxsulam	Picloram
70	Clodinafop-propargyl	Penoxsulam	Pyroxsulam
71	Clodinafop-propargyl	Penoxsulam	Dicamba
72	Clodinafop-propargyl	Penoxsulam	Bispyribac
73	Clodinafop-propargyl	Saflufenacil	Oryzalin
74	Clodinafop-propargyl	Saflufenacil	Pendimethalin
75	Clodinafop-propargyl	Saflufenacil	Diflufenican
76	Clodinafop-propargyl	Saflufenacil	Fluroxypyr
77	Clodinafop-propargyl	Saflufenacil	Halauxifen

78	Clodinafop-propargyl	Saflufenacil	Picloram
79	Clodinafop-propargyl	Saflufenacil	Pyroxsulam
80	Clodinafop-propargyl	Saflufenacil	Dicamba
81	Clodinafop-propargyl	Saflufenacil	Bispyribac
82	Clodinafop-propargyl	Desmedipham	Oryzalin
83	Clodinafop-propargyl	Desmedipham	Pendimethalin
84	Clodinafop-propargyl	Desmedipham	Diflufenican
85	Clodinafop-propargyl	Desmedipham	Fluroxypyr
86	Clodinafop-propargyl	Desmedipham	Halauxifen
87	Clodinafop-propargyl	Desmedipham	Picloram
88	Clodinafop-propargyl	Desmedipham	Pyroxsulam
89	Clodinafop-propargyl	Desmedipham	Dicamba
90	Clodinafop-propargyl	Desmedipham	Bispyribac
91	Clodinafop-propargyl	Phenmedipham	Oryzalin
92	Clodinafop-propargyl	Phenmedipham	Pendimethalin
93	Clodinafop-propargyl	Phenmedipham	Diflufenican
94	Clodinafop-propargyl	Phenmedipham	Fluroxypyr
95	Clodinafop-propargyl	Phenmedipham	Halauxifen
96	Clodinafop-propargyl	Phenmedipham	Picloram
97	Clodinafop-propargyl	Phenmedipham	Pyroxsulam
98	Clodinafop-propargyl	Phenmedipham	Dicamba
99	Clodinafop-propargyl	Phenmedipham	Bispyribac
100	Haloxyp-P-methyl	Atrazine	Oryzalin
101	Haloxyp-P-methyl	Atrazine	Pendimethalin
102	Haloxyp-P-methyl	Atrazine	Diflufenican
103	Haloxyp-P-methyl	Atrazine	Fluroxypyr
104	Haloxyp-P-methyl	Atrazine	Halauxifen
105	Haloxyp-P-methyl	Atrazine	Picloram
106	Haloxyp-P-methyl	Atrazine	Pyroxsulam
107	Haloxyp-P-methyl	Atrazine	Dicamba

108	Haloxyfop-P-methyl	Atrazine	Bispyribac
109	Haloxyfop-P-methyl	Hexazinone	Oryzalin
110	Haloxyfop-P-methyl	Hexazinone	Pendimethalin
111	Haloxyfop-P-methyl	Hexazinone	Diflufenican
112	Haloxyfop-P-methyl	Hexazinone	Fluroxypyr
113	Haloxyfop-P-methyl	Hexazinone	Halauxifen
114	Haloxyfop-P-methyl	Hexazinone	Picloram
115	Haloxyfop-P-methyl	Hexazinone	Pyroxsulam
116	Haloxyfop-P-methyl	Hexazinone	Dicamba
117	Haloxyfop-P-methyl	Hexazinone	Bispyribac
118	Haloxyfop-P-methyl	Metamitron	Oryzalin
119	Haloxyfop-P-methyl	Metamitron	Pendimethalin
120	Haloxyfop-P-methyl	Metamitron	Diflufenican
121	Haloxyfop-P-methyl	Metamitron	Fluroxypyr
122	Haloxyfop-P-methyl	Metamitron	Halauxifen
123	Haloxyfop-P-methyl	Metamitron	Picloram
124	Haloxyfop-P-methyl	Metamitron	Pyroxsulam
125	Haloxyfop-P-methyl	Metamitron	Dicamba
126	Haloxyfop-P-methyl	Metamitron	Bispyribac
127	Haloxyfop-P-methyl	Metribuzin	Oryzalin
128	Haloxyfop-P-methyl	Metribuzin	Pendimethalin
129	Haloxyfop-P-methyl	Metribuzin	Diflufenican
130	Haloxyfop-P-methyl	Metribuzin	Fluroxypyr
131	Haloxyfop-P-methyl	Metribuzin	Halauxifen
132	Haloxyfop-P-methyl	Metribuzin	Picloram
133	Haloxyfop-P-methyl	Metribuzin	Pyroxsulam
134	Haloxyfop-P-methyl	Metribuzin	Dicamba
135	Haloxyfop-P-methyl	Metribuzin	Bispyribac
136	Haloxyfop-P-methyl	Flucarbazone	Oryzalin
137	Haloxyfop-P-methyl	Flucarbazone	Pendimethalin

138	Haloxypop-P-methyl	Flucarbazone	Diflufenican
139	Haloxypop-P-methyl	Flucarbazone	Fluroxypyr
140	Haloxypop-P-methyl	Flucarbazone	Halauxifen
141	Haloxypop-P-methyl	Flucarbazone	Picloram
142	Haloxypop-P-methyl	Flucarbazone	Pyroxsulam
143	Haloxypop-P-methyl	Flucarbazone	Dicamba
144	Haloxypop-P-methyl	Flucarbazone	Bispyribac
145	Haloxypop-P-methyl	Sulfentrazone	Oryzalin
146	Haloxypop-P-methyl	Sulfentrazone	Pendimethalin
147	Haloxypop-P-methyl	Sulfentrazone	Diflufenican
148	Haloxypop-P-methyl	Sulfentrazone	Fluroxypyr
149	Haloxypop-P-methyl	Sulfentrazone	Halauxifen
150	Haloxypop-P-methyl	Sulfentrazone	Picloram
151	Haloxypop-P-methyl	Sulfentrazone	Pyroxsulam
152	Haloxypop-P-methyl	Sulfentrazone	Dicamba
153	Haloxypop-P-methyl	Sulfentrazone	Bispyribac
154	Haloxypop-P-methyl	Carfentrazone	Oryzalin
155	Haloxypop-P-methyl	Carfentrazone	Pendimethalin
156	Haloxypop-P-methyl	Carfentrazone	Diflufenican
157	Haloxypop-P-methyl	Carfentrazone	Fluroxypyr
158	Haloxypop-P-methyl	Carfentrazone	Halauxifen
159	Haloxypop-P-methyl	Carfentrazone	Picloram
160	Haloxypop-P-methyl	Carfentrazone	Pyroxsulam
161	Haloxypop-P-methyl	Carfentrazone	Dicamba
162	Haloxypop-P-methyl	Carfentrazone	Bispyribac
163	Haloxypop-P-methyl	Penoxsulam	Oryzalin
164	Haloxypop-P-methyl	Penoxsulam	Pendimethalin
165	Haloxypop-P-methyl	Penoxsulam	Diflufenican
166	Haloxypop-P-methyl	Penoxsulam	Fluroxypyr
167	Haloxypop-P-methyl	Penoxsulam	Halauxifen

168	Haloxyfop-P-methyl	Penoxsulam	Picloram
169	Haloxyfop-P-methyl	Penoxsulam	Pyroxsulam
170	Haloxyfop-P-methyl	Penoxsulam	Dicamba
171	Haloxyfop-P-methyl	Penoxsulam	Bispyribac
172	Haloxyfop-P-methyl	Saflufenacil	Oryzalin
173	Haloxyfop-P-methyl	Saflufenacil	Pendimethalin
174	Haloxyfop-P-methyl	Saflufenacil	Diflufenican
175	Haloxyfop-P-methyl	Saflufenacil	Fluroxypyr
176	Haloxyfop-P-methyl	Saflufenacil	Halauxifen
177	Haloxyfop-P-methyl	Saflufenacil	Picloram
178	Haloxyfop-P-methyl	Saflufenacil	Pyroxsulam
179	Haloxyfop-P-methyl	Saflufenacil	Dicamba
180	Haloxyfop-P-methyl	Saflufenacil	Bispyribac
181	Haloxyfop-P-methyl	Desmedipham	Oryzalin
182	Haloxyfop-P-methyl	Desmedipham	Pendimethalin
183	Haloxyfop-P-methyl	Desmedipham	Diflufenican
184	Haloxyfop-P-methyl	Desmedipham	Fluroxypyr
185	Haloxyfop-P-methyl	Desmedipham	Halauxifen
186	Haloxyfop-P-methyl	Desmedipham	Picloram
187	Haloxyfop-P-methyl	Desmedipham	Pyroxsulam
188	Haloxyfop-P-methyl	Desmedipham	Dicamba
189	Haloxyfop-P-methyl	Desmedipham	Bispyribac
190	Haloxyfop-P-methyl	Phenmedipham	Oryzalin
191	Haloxyfop-P-methyl	Phenmedipham	Pendimethalin
192	Haloxyfop-P-methyl	Phenmedipham	Diflufenican
193	Haloxyfop-P-methyl	Phenmedipham	Fluroxypyr
194	Haloxyfop-P-methyl	Phenmedipham	Halauxifen
195	Haloxyfop-P-methyl	Phenmedipham	Picloram
196	Haloxyfop-P-methyl	Phenmedipham	Pyroxsulam
197	Haloxyfop-P-methyl	Phenmedipham	Dicamba

198	Haloxifop-P-methyl	Phenmedipham	Bispyribac
199	Quizalafop-P-ethyl	Atrazine	Oryzalin
200	Quizalafop-P-ethyl	Atrazine	Pendimethalin
201	Quizalafop-P-ethyl	Atrazine	Diflufenican
202	Quizalafop-P-ethyl	Atrazine	Fluroxypyr
203	Quizalafop-P-ethyl	Atrazine	Halauxifen
204	Quizalafop-P-ethyl	Atrazine	Picloram
205	Quizalafop-P-ethyl	Atrazine	Pyroxsulam
206	Quizalafop-P-ethyl	Atrazine	Dicamba
207	Quizalafop-P-ethyl	Atrazine	Bispyribac
208	Quizalafop-P-ethyl	Hexazinone	Oryzalin
209	Quizalafop-P-ethyl	Hexazinone	Pendimethalin
210	Quizalafop-P-ethyl	Hexazinone	Diflufenican
211	Quizalafop-P-ethyl	Hexazinone	Fluroxypyr
212	Quizalafop-P-ethyl	Hexazinone	Halauxifen
213	Quizalafop-P-ethyl	Hexazinone	Picloram
214	Quizalafop-P-ethyl	Hexazinone	Pyroxsulam
215	Quizalafop-P-ethyl	Hexazinone	Dicamba
216	Quizalafop-P-ethyl	Hexazinone	Bispyribac
217	Quizalafop-P-ethyl	Metamitron	Oryzalin
218	Quizalafop-P-ethyl	Metamitron	Pendimethalin
219	Quizalafop-P-ethyl	Metamitron	Diflufenican
220	Quizalafop-P-ethyl	Metamitron	Fluroxypyr
221	Quizalafop-P-ethyl	Metamitron	Halauxifen
222	Quizalafop-P-ethyl	Metamitron	Picloram
223	Quizalafop-P-ethyl	Metamitron	Pyroxsulam
224	Quizalafop-P-ethyl	Metamitron	Dicamba
225	Quizalafop-P-ethyl	Metamitron	Bispyribac
226	Quizalafop-P-ethyl	Metribuzin	Oryzalin
227	Quizalafop-P-ethyl	Metribuzin	Pendimethalin

228	Quizalafop-P-ethyl	Metribuzin	Diflufenican
229	Quizalafop-P-ethyl	Metribuzin	Fluroxypyr
230	Quizalafop-P-ethyl	Metribuzin	Halauxifen
231	Quizalafop-P-ethyl	Metribuzin	Picloram
232	Quizalafop-P-ethyl	Metribuzin	Pyroxsulam
233	Quizalafop-P-ethyl	Metribuzin	Dicamba
234	Quizalafop-P-ethyl	Metribuzin	Bispyribac
235	Quizalafop-P-ethyl	Flucarbazone	Oryalin
236	Quizalafop-P-ethyl	Flucarbazone	Pendimethalin
237	Quizalafop-P-ethyl	Flucarbazone	Diflufenican
238	Quizalafop-P-ethyl	Flucarbazone	Fluroxypyr
239	Quizalafop-P-ethyl	Flucarbazone	Halauxifen
240	Quizalafop-P-ethyl	Flucarbazone	Picloram
241	Quizalafop-P-ethyl	Flucarbazone	Pyroxsulam
242	Quizalafop-P-ethyl	Flucarbazone	Dicamba
243	Quizalafop-P-ethyl	Flucarbazone	Bispyribac
244	Quizalafop-P-ethyl	Sulfentrazone	Oryalin
245	Quizalafop-P-ethyl	Sulfentrazone	Pendimethalin
246	Quizalafop-P-ethyl	Sulfentrazone	Diflufenican
247	Quizalafop-P-ethyl	Sulfentrazone	Fluroxypyr
248	Quizalafop-P-ethyl	Sulfentrazone	Halauxifen
249	Quizalafop-P-ethyl	Sulfentrazone	Picloram
250	Quizalafop-P-ethyl	Sulfentrazone	Pyroxsulam
251	Quizalafop-P-ethyl	Sulfentrazone	Dicamba
252	Quizalafop-P-ethyl	Sulfentrazone	Bispyribac
253	Quizalafop-P-ethyl	Carfentrazone	Oryalin
254	Quizalafop-P-ethyl	Carfentrazone	Pendimethalin
255	Quizalafop-P-ethyl	Carfentrazone	Diflufenican
256	Quizalafop-P-ethyl	Carfentrazone	Fluroxypyr
257	Quizalafop-P-ethyl	Carfentrazone	Halauxifen

258	Quizalafop-P-ethyl	Carfentrazone	Picloram
259	Quizalafop-P-ethyl	Carfentrazone	Pyroxsulam
260	Quizalafop-P-ethyl	Carfentrazone	Dicamba
261	Quizalafop-P-ethyl	Carfentrazone	Bispyribac
262	Quizalafop-P-ethyl	Penoxsulam	Oryzalin
263	Quizalafop-P-ethyl	Penoxsulam	Pendimethalin
264	Quizalafop-P-ethyl	Penoxsulam	Diflufenican
265	Quizalafop-P-ethyl	Penoxsulam	Fluroxypyr
266	Quizalafop-P-ethyl	Penoxsulam	Halauxifen
267	Quizalafop-P-ethyl	Penoxsulam	Picloram
268	Quizalafop-P-ethyl	Penoxsulam	Pyroxsulam
269	Quizalafop-P-ethyl	Penoxsulam	Dicamba
270	Quizalafop-P-ethyl	Penoxsulam	Bispyribac
271	Quizalafop-P-ethyl	Saflufenacil	Oryzalin
272	Quizalafop-P-ethyl	Saflufenacil	Pendimethalin
273	Quizalafop-P-ethyl	Saflufenacil	Diflufenican
274	Quizalafop-P-ethyl	Saflufenacil	Fluroxypyr
275	Quizalafop-P-ethyl	Saflufenacil	Halauxifen
276	Quizalafop-P-ethyl	Saflufenacil	Picloram
277	Quizalafop-P-ethyl	Saflufenacil	Pyroxsulam
278	Quizalafop-P-ethyl	Saflufenacil	Dicamba
279	Quizalafop-P-ethyl	Saflufenacil	Bispyribac
280	Quizalafop-P-ethyl	Desmedipham	Oryzalin
281	Quizalafop-P-ethyl	Desmedipham	Pendimethalin
282	Quizalafop-P-ethyl	Desmedipham	Diflufenican
283	Quizalafop-P-ethyl	Desmedipham	Fluroxypyr
284	Quizalafop-P-ethyl	Desmedipham	Halauxifen
285	Quizalafop-P-ethyl	Desmedipham	Picloram
286	Quizalafop-P-ethyl	Desmedipham	Pyroxsulam
287	Quizalafop-P-ethyl	Desmedipham	Dicamba

288	Quizalafop-P-ethyl	Desmedipham	Bispyribac
289	Quizalafop-P-ethyl	Phenmedipham	Oryzalin
290	Quizalafop-P-ethyl	Phenmedipham	Pendimethalin
291	Quizalafop-P-ethyl	Phenmedipham	Diflufenican
292	Quizalafop-P-ethyl	Phenmedipham	Fluroxypyr
293	Quizalafop-P-ethyl	Phenmedipham	Halauxifen
294	Quizalafop-P-ethyl	Phenmedipham	Picloram
295	Quizalafop-P-ethyl	Phenmedipham	Pyroxsulam
296	Quizalafop-P-ethyl	Phenmedipham	Dicamba
297	Quizalafop-P-ethyl	Phenmedipham	Bispyribac
298	Mesotrione	Atrazine	Oryzalin
299	Mesotrione	Atrazine	Pendimethalin
300	Mesotrione	Atrazine	Diflufenican
301	Mesotrione	Atrazine	Fluroxypyr
302	Mesotrione	Atrazine	Halauxifen
303	Mesotrione	Atrazine	Picloram
304	Mesotrione	Atrazine	Pyroxsulam
305	Mesotrione	Atrazine	Dicamba
306	Mesotrione	Atrazine	Bispyribac
307	Mesotrione	Hexazinone	Oryzalin
308	Mesotrione	Hexazinone	Pendimethalin
309	Mesotrione	Hexazinone	Diflufenican
310	Mesotrione	Hexazinone	Fluroxypyr
311	Mesotrione	Hexazinone	Halauxifen
312	Mesotrione	Hexazinone	Picloram
313	Mesotrione	Hexazinone	Pyroxsulam
314	Mesotrione	Hexazinone	Dicamba
315	Mesotrione	Hexazinone	Bispyribac
316	Mesotrione	Metamitron	Oryzalin
317	Mesotrione	Metamitron	Pendimethalin

318	Mesotrione	Metamitron	Diflufenican
319	Mesotrione	Metamitron	Fluroxypyr
320	Mesotrione	Metamitron	Halauxifen
321	Mesotrione	Metamitron	Picloram
322	Mesotrione	Metamitron	Pyroxsulam
323	Mesotrione	Metamitron	Dicamba
324	Mesotrione	Metamitron	Bispyribac
325	Mesotrione	Metribuzin	Oryalin
326	Mesotrione	Metribuzin	Pendimethalin
327	Mesotrione	Metribuzin	Diflufenican
328	Mesotrione	Metribuzin	Fluroxypyr
329	Mesotrione	Metribuzin	Halauxifen
330	Mesotrione	Metribuzin	Picloram
331	Mesotrione	Metribuzin	Pyroxsulam
332	Mesotrione	Metribuzin	Dicamba
333	Mesotrione	Metribuzin	Bispyribac
334	Mesotrione	Flucarbazone	Oryalin
335	Mesotrione	Flucarbazone	Pendimethalin
336	Mesotrione	Flucarbazone	Diflufenican
337	Mesotrione	Flucarbazone	Fluroxypyr
338	Mesotrione	Flucarbazone	Halauxifen
339	Mesotrione	Flucarbazone	Picloram
340	Mesotrione	Flucarbazone	Pyroxsulam
341	Mesotrione	Flucarbazone	Dicamba
342	Mesotrione	Flucarbazone	Bispyribac
343	Mesotrione	Sulfentrazone	Oryalin
344	Mesotrione	Sulfentrazone	Pendimethalin
345	Mesotrione	Sulfentrazone	Diflufenican
346	Mesotrione	Sulfentrazone	Fluroxypyr
347	Mesotrione	Sulfentrazone	Halauxifen

348	Mesotrione	Sulfentrazone	Picloram
349	Mesotrione	Sulfentrazone	Pyroxsulam
350	Mesotrione	Sulfentrazone	Dicamba
351	Mesotrione	Sulfentrazone	Bispyribac
352	Mesotrione	Carfentrazone	Oryzalin
353	Mesotrione	Carfentrazone	Pendimethalin
354	Mesotrione	Carfentrazone	Diflufenican
355	Mesotrione	Carfentrazone	Fluroxypyr
356	Mesotrione	Carfentrazone	Halauxifen
357	Mesotrione	Carfentrazone	Picloram
358	Mesotrione	Carfentrazone	Pyroxsulam
359	Mesotrione	Carfentrazone	Dicamba
360	Mesotrione	Carfentrazone	Bispyribac
361	Mesotrione	Penoxsulam	Oryzalin
362	Mesotrione	Penoxsulam	Pendimethalin
363	Mesotrione	Penoxsulam	Diflufenican
364	Mesotrione	Penoxsulam	Fluroxypyr
365	Mesotrione	Penoxsulam	Halauxifen
366	Mesotrione	Penoxsulam	Picloram
367	Mesotrione	Penoxsulam	Pyroxsulam
368	Mesotrione	Penoxsulam	Dicamba
369	Mesotrione	Penoxsulam	Bispyribac
370	Mesotrione	Saflufenacil	Oryzalin
371	Mesotrione	Saflufenacil	Pendimethalin
372	Mesotrione	Saflufenacil	Diflufenican
373	Mesotrione	Saflufenacil	Fluroxypyr
374	Mesotrione	Saflufenacil	Halauxifen
375	Mesotrione	Saflufenacil	Picloram
376	Mesotrione	Saflufenacil	Pyroxsulam
377	Mesotrione	Saflufenacil	Dicamba

378	Mesotrione	Saflufenacil	Bispyribac
379	Mesotrione	Desmedipham	Oryzalin
380	Mesotrione	Desmedipham	Pendimethalin
381	Mesotrione	Desmedipham	Diflufenican
382	Mesotrione	Desmedipham	Fluroxypyr
383	Mesotrione	Desmedipham	Halauxifen
384	Mesotrione	Desmedipham	Picloram
385	Mesotrione	Desmedipham	Pyroxsulam
386	Mesotrione	Desmedipham	Dicamba
387	Mesotrione	Desmedipham	Bispyribac
388	Mesotrione	Phenmedipham	Oryzalin
389	Mesotrione	Phenmedipham	Pendimethalin
390	Mesotrione	Phenmedipham	Diflufenican
391	Mesotrione	Phenmedipham	Fluroxypyr
392	Mesotrione	Phenmedipham	Halauxifen
393	Mesotrione	Phenmedipham	Picloram
394	Mesotrione	Phenmedipham	Pyroxsulam
395	Mesotrione	Phenmedipham	Dicamba
396	Mesotrione	Phenmedipham	Bispyribac
397	Tembotrione	Atrazine	Oryzalin
398	Tembotrione	Atrazine	Pendimethalin
399	Tembotrione	Atrazine	Diflufenican
400	Tembotrione	Atrazine	Fluroxypyr
401	Tembotrione	Atrazine	Halauxifen
402	Tembotrione	Atrazine	Picloram
403	Tembotrione	Atrazine	Pyroxsulam
404	Tembotrione	Atrazine	Dicamba
405	Tembotrione	Atrazine	Bispyribac
406	Tembotrione	Hexazinone	Oryzalin
407	Tembotrione	Hexazinone	Pendimethalin

408	Tembotrione	Hexazinone	Diflufenican
409	Tembotrione	Hexazinone	Fluroxypyr
410	Tembotrione	Hexazinone	Halauxifen
411	Tembotrione	Hexazinone	Picloram
412	Tembotrione	Hexazinone	Pyroxsulam
413	Tembotrione	Hexazinone	Dicamba
414	Tembotrione	Hexazinone	Bispyribac
415	Tembotrione	Metamitron	Oryalin
416	Tembotrione	Metamitron	Pendimethalin
417	Tembotrione	Metamitron	Diflufenican
418	Tembotrione	Metamitron	Fluroxypyr
419	Tembotrione	Metamitron	Halauxifen
420	Tembotrione	Metamitron	Picloram
421	Tembotrione	Metamitron	Pyroxsulam
422	Tembotrione	Metamitron	Dicamba
423	Tembotrione	Metamitron	Bispyribac
424	Tembotrione	Metribuzin	Oryalin
425	Tembotrione	Metribuzin	Pendimethalin
426	Tembotrione	Metribuzin	Diflufenican
427	Tembotrione	Metribuzin	Fluroxypyr
428	Tembotrione	Metribuzin	Halauxifen
429	Tembotrione	Metribuzin	Picloram
430	Tembotrione	Metribuzin	Pyroxsulam
431	Tembotrione	Metribuzin	Dicamba
432	Tembotrione	Metribuzin	Bispyribac
433	Tembotrione	Flucarbazone	Oryalin
434	Tembotrione	Flucarbazone	Pendimethalin
435	Tembotrione	Flucarbazone	Diflufenican
436	Tembotrione	Flucarbazone	Fluroxypyr
437	Tembotrione	Flucarbazone	Halauxifen

438	Tembotrione	Flucarbazone	Picloram
439	Tembotrione	Flucarbazone	Pyroxsulam
440	Tembotrione	Flucarbazone	Dicamba
441	Tembotrione	Flucarbazone	Bispyribac
442	Tembotrione	Sulfentrazone	Oryzalin
443	Tembotrione	Sulfentrazone	Pendimethalin
444	Tembotrione	Sulfentrazone	Diflufenican
445	Tembotrione	Sulfentrazone	Fluroxypyr
446	Tembotrione	Sulfentrazone	Halauxifen
447	Tembotrione	Sulfentrazone	Picloram
448	Tembotrione	Sulfentrazone	Pyroxsulam
449	Tembotrione	Sulfentrazone	Dicamba
450	Tembotrione	Sulfentrazone	Bispyribac
451	Tembotrione	Carfentrazone	Oryzalin
452	Tembotrione	Carfentrazone	Pendimethalin
453	Tembotrione	Carfentrazone	Diflufenican
454	Tembotrione	Carfentrazone	Fluroxypyr
455	Tembotrione	Carfentrazone	Halauxifen
456	Tembotrione	Carfentrazone	Picloram
457	Tembotrione	Carfentrazone	Pyroxsulam
458	Tembotrione	Carfentrazone	Dicamba
459	Tembotrione	Carfentrazone	Bispyribac
460	Tembotrione	Penoxsulam	Oryzalin
461	Tembotrione	Penoxsulam	Pendimethalin
462	Tembotrione	Penoxsulam	Diflufenican
463	Tembotrione	Penoxsulam	Fluroxypyr
464	Tembotrione	Penoxsulam	Halauxifen
465	Tembotrione	Penoxsulam	Picloram
466	Tembotrione	Penoxsulam	Pyroxsulam
467	Tembotrione	Penoxsulam	Dicamba

468	Tembotrione	Penoxsulam	Bispyribac
469	Tembotrione	Saflufenacil	Oryzalin
470	Tembotrione	Saflufenacil	Pendimethalin
471	Tembotrione	Saflufenacil	Diflufenican
472	Tembotrione	Saflufenacil	Fluroxypyr
473	Tembotrione	Saflufenacil	Halauxifen
474	Tembotrione	Saflufenacil	Picloram
475	Tembotrione	Saflufenacil	Pyroxsulam
476	Tembotrione	Saflufenacil	Dicamba
477	Tembotrione	Saflufenacil	Bispyribac
478	Tembotrione	Desmedipham	Oryzalin
479	Tembotrione	Desmedipham	Pendimethalin
480	Tembotrione	Desmedipham	Diflufenican
481	Tembotrione	Desmedipham	Fluroxypyr
482	Tembotrione	Desmedipham	Halauxifen
483	Tembotrione	Desmedipham	Picloram
484	Tembotrione	Desmedipham	Pyroxsulam
485	Tembotrione	Desmedipham	Dicamba
486	Tembotrione	Desmedipham	Bispyribac
487	Tembotrione	Phenmedipham	Oryzalin
488	Tembotrione	Phenmedipham	Pendimethalin
489	Tembotrione	Phenmedipham	Diflufenican
490	Tembotrione	Phenmedipham	Fluroxypyr
491	Tembotrione	Phenmedipham	Halauxifen
492	Tembotrione	Phenmedipham	Picloram
493	Tembotrione	Phenmedipham	Pyroxsulam
494	Tembotrione	Phenmedipham	Dicamba
495	Tembotrione	Phenmedipham	Bispyribac
496	Pinoxaden	Atrazine	Oryzalin
497	Pinoxaden	Atrazine	Pendimethalin

498	Pinoxaden	Atrazine	Diflufenican
499	Pinoxaden	Atrazine	Fluroxypyr
500	Pinoxaden	Atrazine	Halauxifen
501	Pinoxaden	Atrazine	Picloram
502	Pinoxaden	Atrazine	Pyroxsulam
503	Pinoxaden	Atrazine	Dicamba
504	Pinoxaden	Atrazine	Bispyribac
505	Pinoxaden	Hexazinone	Oryalin
506	Pinoxaden	Hexazinone	Pendimethalin
507	Pinoxaden	Hexazinone	Diflufenican
508	Pinoxaden	Hexazinone	Fluroxypyr
509	Pinoxaden	Hexazinone	Halauxifen
510	Pinoxaden	Hexazinone	Picloram
511	Pinoxaden	Hexazinone	Pyroxsulam
512	Pinoxaden	Hexazinone	Dicamba
513	Pinoxaden	Hexazinone	Bispyribac
514	Pinoxaden	Metamitron	Oryalin
515	Pinoxaden	Metamitron	Pendimethalin
516	Pinoxaden	Metamitron	Diflufenican
517	Pinoxaden	Metamitron	Fluroxypyr
518	Pinoxaden	Metamitron	Halauxifen
519	Pinoxaden	Metamitron	Picloram
520	Pinoxaden	Metamitron	Pyroxsulam
521	Pinoxaden	Metamitron	Dicamba
522	Pinoxaden	Metamitron	Bispyribac
523	Pinoxaden	Metribuzin	Oryalin
524	Pinoxaden	Metribuzin	Pendimethalin
525	Pinoxaden	Metribuzin	Diflufenican
526	Pinoxaden	Metribuzin	Fluroxypyr
527	Pinoxaden	Metribuzin	Halauxifen

528	Pinoxaden	Metribuzin	Picloram
529	Pinoxaden	Metribuzin	Pyroxsulam
530	Pinoxaden	Metribuzin	Dicamba
531	Pinoxaden	Metribuzin	Bispyribac
532	Pinoxaden	Flucarbazone	Oryzalin
533	Pinoxaden	Flucarbazone	Pendimethalin
534	Pinoxaden	Flucarbazone	Diflufenican
535	Pinoxaden	Flucarbazone	Fluroxypyr
536	Pinoxaden	Flucarbazone	Halauxifen
537	Pinoxaden	Flucarbazone	Picloram
538	Pinoxaden	Flucarbazone	Pyroxsulam
539	Pinoxaden	Flucarbazone	Dicamba
540	Pinoxaden	Flucarbazone	Bispyribac
541	Pinoxaden	Sulfentrazone	Oryzalin
542	Pinoxaden	Sulfentrazone	Pendimethalin
543	Pinoxaden	Sulfentrazone	Diflufenican
544	Pinoxaden	Sulfentrazone	Fluroxypyr
545	Pinoxaden	Sulfentrazone	Halauxifen
546	Pinoxaden	Sulfentrazone	Picloram
547	Pinoxaden	Sulfentrazone	Pyroxsulam
548	Pinoxaden	Sulfentrazone	Dicamba
549	Pinoxaden	Sulfentrazone	Bispyribac
550	Pinoxaden	Carfentrazone	Oryzalin
551	Pinoxaden	Carfentrazone	Pendimethalin
552	Pinoxaden	Carfentrazone	Diflufenican
553	Pinoxaden	Carfentrazone	Fluroxypyr
554	Pinoxaden	Carfentrazone	Halauxifen
555	Pinoxaden	Carfentrazone	Picloram
556	Pinoxaden	Carfentrazone	Pyroxsulam
557	Pinoxaden	Carfentrazone	Dicamba

558	Pinoxaden	Carfentrazone	Bispyribac
559	Pinoxaden	Penoxsulam	Oryzalin
560	Pinoxaden	Penoxsulam	Pendimethalin
561	Pinoxaden	Penoxsulam	Diflufenican
562	Pinoxaden	Penoxsulam	Fluroxypyr
563	Pinoxaden	Penoxsulam	Halauxifen
564	Pinoxaden	Penoxsulam	Picloram
565	Pinoxaden	Penoxsulam	Pyroxsulam
566	Pinoxaden	Penoxsulam	Dicamba
567	Pinoxaden	Penoxsulam	Bispyribac
568	Pinoxaden	Saflufenacil	Oryzalin
569	Pinoxaden	Saflufenacil	Pendimethalin
570	Pinoxaden	Saflufenacil	Diflufenican
571	Pinoxaden	Saflufenacil	Fluroxypyr
572	Pinoxaden	Saflufenacil	Halauxifen
573	Pinoxaden	Saflufenacil	Picloram
574	Pinoxaden	Saflufenacil	Pyroxsulam
575	Pinoxaden	Saflufenacil	Dicamba
576	Pinoxaden	Saflufenacil	Bispyribac
577	Pinoxaden	Desmedipham	Oryzalin
578	Pinoxaden	Desmedipham	Pendimethalin
579	Pinoxaden	Desmedipham	Diflufenican
580	Pinoxaden	Desmedipham	Fluroxypyr
581	Pinoxaden	Desmedipham	Halauxifen
582	Pinoxaden	Desmedipham	Picloram
583	Pinoxaden	Desmedipham	Pyroxsulam
584	Pinoxaden	Desmedipham	Dicamba
585	Pinoxaden	Desmedipham	Bispyribac
586	Pinoxaden	Phenmedipham	Oryzalin
587	Pinoxaden	Phenmedipham	Pendimethalin

588	Pinoxaden	Phenmedipham	Diflufenican
589	Pinoxaden	Phenmedipham	Fluroxypyr
590	Pinoxaden	Phenmedipham	Halauxifen
591	Pinoxaden	Phenmedipham	Picloram
592	Pinoxaden	Phenmedipham	Pyroxsulam
593	Pinoxaden	Phenmedipham	Dicamba
594	Pinoxaden	Phenmedipham	Bispyribac

In an embodiment, the present invention may provide a combination comprising the three herbicides as listed in each individual row from row 1 to row 594 in the table above.

5

These combinations may be applied to the locus of the weeds, in an herbicidally effective amount.

10 In an embodiment, the combination of the present invention may be combined with at least one other active such as those selected from but not limited to herbicide, insecticide, fungicide, biological agent, plant growth activator, fertilizers or combinations thereof.

15 Thus, in an embodiment, the combination of the present invention may be combined with a herbicide. Exemplary herbicides that may be combined with the combination of the present invention may be selected from but not limited to herbicides belonging to classes such as ALS inhibitors, EPSP synthase inhibitors, synthetic auxins, auxin transport inhibitors, glutamate synthase inhibitors, HPPD inhibitors, lipid synthesis inhibitors, long chain fatty acid inhibitors, as well as
20 herbicides with unknown modes of action.

In an embodiment, the total amount of clodinafop propargyl in the composition may typically be in the range of 0.1 to 99% by weight, preferably 0.2 to 90% by weight.

In an embodiment, the total amount of pendimethalin in the composition may be in the range of 0.1 to 99% by weight.

5 In an embodiment, the total amount of metribuzin in the composition may be in the range of 0.1 to 99% by weight.

In an embodiment, the constituent herbicides of the combination of the present invention may be admixed in ratio of (1-80): (1-80): (1-80) of the three herbicides respectively.

10

In an embodiment, the constituent herbicides of the combination of the present invention may be admixed in ratio of (1-80): (1-80): (1-80) of clodinafop propargyl, metribuzin and pendimethalin respectively.

15 The herbicidal combination of the present invention maybe used to target weeds among the crops such corn, rice, wheat, barley, rye, oat, sorghum, cotton, soybean, peanut, buckwheat, beet, rapeseed, sunflower, sugar cane, tobacco, etc.; vegetables: solanaceous vegetables such as eggplant, tomato, pimento, pepper, potato, etc., cucurbit vegetables such as cucumber, pumpkin, zucchini,
20 water melon, melon, squash, etc., cruciferous vegetables such as radish, white turnip, horseradish, kohlrabi, Chinese cabbage, cabbage, leaf mustard, broccoli, cauliflower, etc., asteraceous vegetables such as burdock, crown daisy, artichoke, lettuce, etc, liliaceous vegetables such as green onion, onion, garlic, and asparagus, ammiaceous vegetables such as carrot, parsley, celery, parsnip, etc.,
25 chenopodiaceous vegetables such as spinach, Swiss chard, etc., lamiaceous vegetables such as Perilla frutescens, mint, basil, etc, strawberry, sweet potato, Dioscorea japonica, colocasia, etc., flowers, foliage plants, turf grasses, fruits: pome fruits such apple, pear, quince, etc, stone fleshy fruits such as peach, plum, nectarine, Prunus mume, cherry fruit, apricot, prune, etc., citrus fruits such as
30 orange, lemon, lime, grapefruit, etc., nuts such as chestnuts, walnuts, hazelnuts, almond, pistachio, cashew nuts, macadamia nuts, etc. berries such as blueberry, cranberry, blackberry, raspberry, etc., grape, kaki fruit, olive, plum, banana, coffee,

date palm, coconuts, etc. , trees other than fruit trees; tea, mulberry, flowering plant, trees such as ash, birch, dogwood, Eucalyptus, Ginkgo biloba, lilac, maple, Quercus, poplar, Judas tree, Liquidambar formosana, plane tree, zelkova, Japanese arborvitae, fir wood, hemlock, juniper, Pinus, Picea, and Taxus
5 cuspidate, etc.

In an aspect, the present invention may provide compositions of clodinafop propargyl, pendimethalin and metribuzin.

10 In an embodiment, the composition of the present invention may contain agriculturally acceptable adjuvants, carriers, diluents, emulsifiers, fillers, anti-foaming agents, thickening agents, anti-freezing agents, freezing agents etc. The compositions may be either solid or liquids. They can be solids, such as, for example, dusts, granules, water-dispersible granules, microcapsules or wettable
15 powders, or liquids, such as, for example, emulsifiable concentrates, solutions, emulsions or suspensions, ZC formulations. They can also be provided as a pre-mix or tank mixed.

Suitable agricultural adjuvants and carriers may include, but are not limited to, crop
20 oil concentrates; methylated seed oils, emulsified methylated seed oil, nonylphenol ethoxylate; benzylcocoalkyldimethyl quaternary ammonium salt; blend of petroleum hydrocarbon, alkyl esters, organic acid, and anionic surfactant; C9-C11 alkylpolyglycoside; phosphated alcohol ethoxylate; natural primary alcohol (C12-C16) ethoxylate; di-sec-butylphenol EO-PO block copolymer; polysiloxane-methyl
25 cap; nonylphenol ethoxylate, urea ammonium nitrate; tridecyl alcohol (synthetic) ethoxylate (8EO); tallow amine ethoxylate ; PEG(400) dioleate-99, alkyl sulfates, such as diethanolammonium lauryl sulfate; alkylarylsulfonate salts, such as calcium dodecylbenzenesulfonate; alkylphenol-alkylene oxide addition products, such as nonylphenol-C₁₈ ethoxylate; alcohol-alkylene oxide addition products, such
30 as tridecyl alcohol-C₁₆ ethoxylate; soaps, such as sodium stearate; alkyl-naphthalene-sulfonate salts, such as sodium dibutyl-naphthalenesulfonate; dialkyl esters of sulfosuccinate salts, such as sodium di(2-ethylhexyl)sulfosuccinate;

sorbitol esters, such as sorbitol oleate; quaternary amines, such as lauryl trimethylammonium chloride; polyethylene glycol esters of fatty acids, such as polyethylene glycol stearate; block copolymers of ethylene oxide and propylene oxide; salts of mono and dialkyl phosphate esters; vegetable or seed oils such as
5 soybean oil, rapeseed/canola oil, olive oil, castor oil, sunflower seed oil, coconut oil, corn oil, cottonseed oil, linseed oil, palm oil, peanut oil, safflower oil, sesame oil, tung oil and the like; and esters of the above vegetable oils, and in certain embodiments, methyl esters.

10 Suitable liquid carriers that may be employed in a composition of the present invention may include water or organic solvents. The organic solvents include, but are not limited to, petroleum fractions or hydrocarbons such as mineral oil, aromatic solvents, paraffinic oils, and the like; vegetable oils such as soybean oil, rapeseed oil, olive oil, castor oil, sunflower seed oil, coconut oil, corn oil, cottonseed oil,
15 linseed oil, palm oil, peanut oil, safflower oil, sesame oil, tung oil and the like; esters of the above vegetable oils; esters of monoalcohols or dihydric, trihydric, or other lower polyalcohols (4-6 hydroxy containing), such as 2-ethyl hexyl stearate, n-butyl oleate, isopropyl myristate, propylene glycol dioleate, di-octyl succinate, di-butyl adipate, di-octyl phthalate and the like; esters of mono, di and polycarboxylic acids
20 and the like. Organic solvents include, but are not limited to toluene, xylene, petroleum naphtha, crop oil, acetone, methyl ethyl ketone, cyclohexanone, trichloroethylene, perchloroethylene, ethyl acetate, amyl acetate, butyl acetate, propylene glycol monomethyl ether and diethylene glycol monomethyl ether, methyl alcohol, ethyl alcohol, isopropyl alcohol, amyl alcohol, ethylene glycol,
25 propylene glycol, glycerine, N-methyl-2-pyrrolidinone, N,N-dimethyl alkylamides, dimethyl sulfoxide.

Solid carriers that may be employed in the compositions of the present invention may include but are not limited to attapulgit, pyrophyllite clay, silica, kaolin clay,
30 kieselguhr, chalk, diatomaceous earth, lime, calcium carbonate, bentonite clay, Fuller's earth, talc, cottonseed hulls, wheat flour, soybean flour, pumice, wood flour, walnut shell flour, lignin, cellulose etc.

In an aspect, the present invention may provide methods of controlling weeds at a locus, said method comprising application of a combination of clodinafop propargyl, pendimethalin and metribuzin.

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Thus, embodiments of the present invention may provide, method of controlling weeds at a locus, said method comprising application of combinations of clodinafop propargyl, pendimethalin, Metribuzin and optionally a fourth active.

- 10 In an embodiment, the fourth active, may selected from herbicide, insecticide, fungicide, biological agent, plant growth activator, fertilizers or combinations thereof.

- The target weeds may be selected from *Alopecurus myosuroides* Huds. (blackgrass, ALOMY), *Amaranthus palmeri* (Palmer amaranth, AMAPA) *Amaranthus viridis* (slender amaranth, AMAVI), *Avena fatua* (wild oat, AVEFA), *Brachiaria decumbens* Stapf. or *Urochloa decumbens* (Stapf), *Brachiaria brizantha* or *Urochloa brizantha*, *Brachiaria platyphylla* (Groseb.) Nash or *Urochloa platyphylla* (broadleaf signalgrass, BRAPP), *Brachiaria plantaginea*. or *Urochloa plantaginea* (alexandergrass, BRAPL), *Cenchrus echinatus* (southern sandbur, CENEC), *Digitaria horizontalis* Willd. (Jamaican crabgrass, DIGHO), *Digitaria insularis* (sourgrass, TRCIN), *Digitaria sanguinalis* (large crabgrass, DIGSA), *Echinochloa crus-galli* (barnyardgrass, ECHCG), *Echinochloa colonum* (junglerice, ECHCO), *Eleusine indica* Gaertn. (goosegrass, ELEIN), *Lolium multiflorum* Lam. (Italian ryegrass, LOLMU), *Panicum dichotomiflorum* Michx. (fall panicum, PANDI), *Panicum miliaceum* L. (wild-proso millet, PANMI), *Sesbania exaltata* (hemp sesbania, SEBEX), *Setaria faberi* Herrm. (giant foxtail, SETFA), *Setaria viridis* (green foxtail, SETVI), *Sorghum halepense* (Johnsongrass, SORHA), *Sorghum bicolor*, Moench ssp., *Arundinaceum* (shattercane, SORVU), *Cyperus esculentus* (yellow nutsedge, CYPES), *Cyperus rotundus* (purple nutsedge, CYPRO), *Abutilon theophrasti* (velvetleaf, ABUTH), *Amaranthus* species (pigweeds and amaranths, AMASS), *Ambrosia artemisiifolia* L. (common ragweed, AMBEL), *Ambrosia*

psilostachya DC. (western ragweed, AMBPS), Ambrosia trifida (giant ragweed, AMBTR), Anoda cristata (spurred anoda, ANVCR), Asclepias syriaca (common milkweed, ASCSY), Bidens pilosa (hairy beggarticks, BIDPI), Borreria species (BOISS), Borreria alata or Spermacoce alata Aubl. or Spermacoce latifolia
 5 (broadleaf buttonweed, BOILF), Chenopodium album L. (common lambsquarters, CHEAL), Cirsium arvense (Canada thistle, CIRAR), Commelina benghalensis (tropical spiderwort, COMBE), Datura stramonium (jimsonweed, DATST), Daucus carota (wild carrot, DAUCA), Euphorbia heterophylla (wild poinsettia, EPHHL), Euphorbia hirta or Chamaesyce hirta (garden spurge, EPHHI), Euphorbia dentata
 10 Michx. (toothed spurge, EPHDE), Erigeron bonariensis or Conyza bonariensis (hairy fleabane, ERIBO), Erigeron canadensis or Conyza canadensis (horseweed, ERICA), Conyza sumatrensis (tall fleabane, ERIFL), Helianthus annuus (common sunflower, HELAN), Jacquemontia tamnifolia (smallflower morningglory, IAQTA), Ipomoea hederacea (ivy leaf morningglory, IPOHE), Ipomoea lacunosa (white
 15 morningglory, IPOLA), Lactuca serriola (prickly lettuce, LACSE), Portulaca oleracea (common purslane, POROL), Richardia species (pusley, RCHSS), Salsola tragus (Russian thistle, SASKR), Sida species (sida, SIDSS), Sida spinosa (prickly sida, SIDSP), Sinapis arvensis (wild mustard, SINAR), Solanum ptychanthum (eastern black nightshade, SOLPT), Tridax procumbens (coat
 20 buttons, TRQPR), Rumex dentatus (RUMDE) or Xanthium strumarium (common cocklebur, XANST).

In an embodiment, the combinations of the present invention may be applied to the locus either simultaneously or sequentially, such that Clodinafop, the second
 25 herbicide and third herbicide may be applied in a tank mix or as a pre-mixed composition.

Thus, in this aspect, the present invention provides a tank-mix comprising:

- 30 (a) at least one acetyl CoA carboxylase inhibitor selected from arylphenoxypropionate herbicides, cyclohexanedione herbicides, or phenylpyrazoline herbicides;

- (b) at least one photosynthesis II inhibitor selected from a triazine herbicide, a triazinone herbicide, triazole herbicide, triazolone herbicide, triazolinone herbicide, uracil herbicide, pyridazinone herbicide, a triazolopyrimidine herbicide, or phenyl-carbamate herbicide;
- 5 (c) at least one microtubule assembly inhibitor herbicide selected from a dinitroaniline herbicide, a phosphoroamidate herbicide, pyridine herbicide, benzamide herbicide, or a benzoic acid herbicide.

10 In an embodiment, the present invention may be applied either pre or post emergent. The advantage of the combination is surprisingly good residual effects, when applied in pre-emergent as well as quick knockdown when applied post emergent leading to quick control of weeds. In another embodiment, the present invention may be applied for quick burndown of weeds. Another advantage is quick knockdown in the case of burndown.

15 The method of control of the present invention may be carried out by spraying the suggested tank mixes, or the individual herbicides may be formulated as a kit-of-parts containing various components that may be mixed as instructed prior to spraying.

20 In an embodiment, the present invention provides a kit-of-parts comprising a plurality of components, wherein said plurality of components comprises:

- (a) at least a first component comprising an acetyl CoA carboxylase inhibitor selected from arylphenoxy-propionate herbicides, cyclohexanedione herbicides, or phenylpyrazoline herbicides;
- 25 (b) at least a second component comprising a photosynthesis II inhibitor selected from a triazine herbicide, a triazinone herbicide, triazole herbicide, triazolone herbicide, triazolinone herbicide, uracil herbicide, pyridazinone herbicide, a triazolopyrimidine herbicide, or phenyl-carbamate herbicide;
- 30 (c) at least a third component comprising a microtubule assembly inhibitor herbicide selected from a dinitroaniline herbicide, a phosphoroamidate

herbicide, pyridine herbicide, benzamide herbicide, or a benzoic acid herbicide.

In an embodiment, the kit-of-parts comprises an instructions manual, said
5 instructions manual comprising instructions directing a user to admix the components before being used.

In an embodiment, the components of the present invention may be packaged such that clodinafop propargyl, the first herbicide and the second herbicide may be
10 packaged separately and then tank mixed before the spraying.

In another embodiment, the components of the present invention may be packaged such that clodinafop propargyl, the first herbicide and the second herbicide may be packaged separately, whereas other additives are packaged separately, such that
15 the two maybe tank mixed at the time of spraying.

In another embodiment, the components of the present invention may be packaged as composition such that clodinafop propargyl, the first herbicide and the second herbicide are formulated into one composition and other additives are packaged
20 separately, such that the two maybe tank mixed at the time of spraying.

Surprisingly, it has been found by the present inventors, that clodinafop propargyl, the first herbicide and the second herbicide of the present invention, when applied individually, was ineffective in the control of weeds, but demonstrated excellent
25 synergistic control on when applied together. The combination controlled the weed both pre and post emergently. As will be demonstrated by the examples, the combination of clodinafop propargyl, the first herbicide and the second herbicide synergistically controlled broadleaf as well as grasses and sedges at a locus. The current invention therefore provides advantageous methods of controlling weeds
30 both pre and post emergently. The present method also provides a broader spectrum of controlling weeds that helps in resistance management, thus

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preventing the weed from becoming resistant to either of the herbicides while providing a broader spectrum of control at lower use rates.

Examples:

Field trial were conducted to check the efficacy of the combination of clodinafop

- 5 Propargyl + Metribuzin + Pendimethalin. These trials were conducted in spring wheat crop for the percentage weed control. The results are depicted in table 1:

TABLE 1

Dose		Percentage weed control burn down symptoms generation on different grasses					
		PHAMI	RUMDE	PHAMI	RUMDE	PHAMI	RUMDE
Active	Rate g-ai/ha	30 DAA		45 DAA		75 DAA	
Untreated Check	-	48.3	3.3	51.7	3.3	51.7	3.3
Clodinafop – propargyl	60 g/ha	76.7 b	81.7 b	73.3 c	80.0 b	70.0 b	79.0 b
Clodinafop-propargyl + Metribuzin	60 + 210 g/ha	76.7 b	85.0 ab	73.3 c	83.3 ab	71.7 b	81.7 ab
Clodinafop-propargyl + Metribuzin + Pendimethalin	60 + 252 + 812 g/ha	97.0 a	94.3 a	95.0 a	93.3 a	93.3 a	91.7 a
LSD P = 0.05		9.69	7.25	11.5	8.39	9.64	7.82
SD		5.45	4.08	6.46	4.71	5.42	4.4
CV		6.36	5.41	7.78	6.53	6.72	6.21

Means followed by same letter or symbol do not differ significantly ($P=.05$, Student-Newman-Keuls)

Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL.

Thus, in an embodiment, the present invention provides a combination comprising clodinafop-propargyl in an amount of 60 g/ha, metribuzin in an amount of 252 g/ha and pendimethalin in an amount of 812 g/ha.

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The results in table 1 clearly demonstrates synergy between Clodinafop Propargyl + metribuzin and pendimethalin in controlling various weeds.

Thus, in an embodiment, it was surprisingly found that the addition of a microtubule assembly inhibitor to a combination of a photosystem II inhibitor and an acetyl CoA carboxylase inhibitor led to a surprising and unexpected synergistic enhancement in efficacy of the combination of a photosystem II inhibitor and an acetyl CoA carboxylase inhibitor.

15 In an embodiment, it was surprisingly found that the addition of pendimethalin to a combination of clodinafop-propargyl and metribuzin led to a surprising and unexpected synergistic enhancement in efficacy of the combination of clodinafop-propargyl and metribuzin.

20 In an embodiment, it was surprisingly found that the addition of a photosystem II inhibitor to a combination of a microtubule assembly inhibitor and an acetyl CoA carboxylase inhibitor led to a surprising and unexpected synergistic enhancement in efficacy of the combination of a microtubule assembly inhibitor and an acetyl CoA carboxylase inhibitor.

25

In an embodiment, it was surprisingly found that the addition of metribuzin to a combination of clodinafop-propargyl and pendimethalin led to a surprising and

unexpected synergistic enhancement in efficacy of the combination of clodinafop-propargyl and pendimethalin.

In an embodiment, it was surprisingly found that the addition of a acetyl CoA
5 carboxylase inhibitor to a combination of a microtubule assembly inhibitor and a photosystem II inhibitor led to a surprising and unexpected synergistic enhancement in efficacy of the combination of a microtubule assembly inhibitor and a photosystem II inhibitor.

10 In this embodiment, it was surprisingly found that the addition of clodinafop-propargyl to a combination of metribuzin and pendimethalin led to a surprising and unexpected synergistic enhancement in efficacy of the combination of metribuzin and pendimethalin.

15 In an embodiment, the present invention provides a combination comprising clodinafop-propargyl, pendimethalin, and metribuzin wherein pendimethalin and metribuzin are used in a ratio of about 6:1.

In an embodiment, the present invention provides a combination comprising
20 clodinafop-propargyl, pendimethalin, and metribuzin wherein pendimethalin is used in an amount of about 384.4 g/ha and metribuzin is used in an amount of about 65.6 g/ha.

In an embodiment, the present invention provides a combination comprising
25 clodinafop-propargyl, pendimethalin, and metribuzin wherein pendimethalin and metribuzin are present as a ZC formulation.

In an embodiment, the present invention provides a combination comprising
30 clodinafop-propargyl, pendimethalin, and metribuzin wherein pendimethalin and metribuzin are present as a ZC formulation, wherein said ZC formulation comprises encapsulated pendimethalin and a suspension concentrate of metribuzin.

In an embodiment, the present invention provides a combination comprising clodinafop-propargyl, pendimethalin, and metribuzin wherein pendimethalin and metribuzin are present as a ZC formulation, wherein said ZC formulation comprises capsule suspension (CS) of pendimethalin and a suspension concentrate (SC) of metribuzin.

While the foregoing written description of the invention enables one of ordinary skill to make and use what is considered presently to be the best mode thereof, those of ordinary skill will understand and appreciate the existence of variations, combinations, and equivalents of the specific embodiment, method, and examples herein. The invention should therefore not be limited by the above described embodiment, method, and examples, but by all embodiments and methods within the scope and spirit of the invention.

CLAIMS

1. A herbicidal combination comprising:
 - (a) at least one acetyl CoA carboxylase inhibitor selected from
5 arylphenoxy-propionate herbicides, cyclohexanedione herbicides, or
phenylpyrazoline herbicides;
 - (b) at least one photosynthesis II inhibitor selected from a triazine
herbicide, a triazinone herbicide, triazole herbicide, triazolone
herbicide, triazolinone herbicide, uracil herbicide, pyridazinone
10 herbicide, a triazolopyrimidine herbicide, or phenyl-carbamate
herbicide;
 - (c) at least one microtubule assembly inhibitor herbicide selected from
a dinitroaniline herbicide, a phosphoroamidate herbicide, pyridine
herbicide, benzamide herbicide, or a benzoic acid herbicide.
2. The herbicidal combination as claimed in claim 1 wherein
 - 15 a. a arylphenoxy-propionate herbicides is selected from of clodinafop,
clodinafop-propargyl, cyhalofop-butyl, diclofop, diclofop-methyl,
fenoxaprop-P-ethyl, fenoxaprop-P, fenoxaprop-ethyl, fenoxaprop,
fluazifop, fluazifop-butyl, fluazifop-P-butyl, haloxyfop, haloxyfop-
etotyl, haloxyfop-P-methyl, propaquizafop, quizalofop, quizalofop-
20 ethyl, quizalofop-P, quizalofop-P-ethyl, and quizalofop-P-tefuryl;
 - b. a cyclohexanedione herbicides is selected from fenquinotrine,
ketospiradox, lancotrione, mesotrione, sulcotrione, tefuryltrione or
tembotrione;
 - c. a phenylpyrazoline herbicides is selected from fluazolate,
25 nipyraclufen, pinoxaden or pyraflufen.
3. The herbicidal combination as claimed in claim 1 wherein
 - a. a triazine herbicide is selected from dipropetryn, fucaojing,
trihydroxytriazine, atrazine, chlorazine, cyanazine, cyprazine,
eglinazine, ipazine, mesoprazine, procyazine, proglinazine,
30 propazine, sebuthylazine, simazine, terbuthylazine, trietazine,
indaziflam, triaziflam, atraton, methometon, prometon, secbumeton,

- simeton, terbumeton, ametryn, aziprotryne, cyanatryn, desmetryn, dimethametryn, methoprotryne, prometryn, simetryn, and terbutryn;
- b. a triazinone herbicide is selected from ametridione, amibuzin, ethiozin, hexazinone, isomethiozin, metamitron, metribuzin and trfludimoxazin;
- c. a triazole herbicide is selected from amitrole, cafenstrole, epronaz and flupoxam;
- d. a triazolone herbicide is selected from amicarbazone, bencarbazone, carfentrazone, flucarbazone, ipfencarbazone, propoxycarbazone, sulfentrazone and thiencarbazone;
- e. a triazolinone herbicide is selected from carfentrazone, flucarbazone and sulfentrazone;
- f. a uracil herbicide is selected from benzfendizone, bromacil, butafenacil, flupropacil, isocil, lenacil, saflufenacil, terbacil or tiafenacil;
- g. a pyridazinone herbicide is selected from brompyrazon, chloridazon, dimidazon, flufenpyr, metflurazon, norflurazon, oxapyrazon or pydanon
- h. a triazolopyrimidine herbicide is selected from cloransulam, diclosulam, florasulam, flumetsulam, metosulam, penoxsulam and pyroxsulam;
- i. a phenyl-carbamate herbicide is selected from desmedipham and phenmedipham;
4. The herbicidal combination as claimed in claim 1 wherein
- a. a dinitroaniline herbicide is selected from benfluralin, butralin, chlornidine, dinitramine, dipropalin, ethalfluralin, fluchloralin, isopropalin, nitratin, oryzalin, pendimethalin, prodiamine, profluralin and trifluralin;
- b. a phosphoroamidate herbicide is selected from amiprofos-methyl or butamifos;
- c. a pyridine herbicide is selected from aminopyralid, clodinate, clopyralid, diflufenican, dithiopyr, florpyrauxifen, flufenican,

fluroxypyr, halauxifen, haloxydine, picloram, picolinafen, pyridlor, pyroxsulam, thiazopyr, and triclopyr;

d. a benzamide herbicide is selected from pronamide or isoxaben.

e. a benzoic acid herbicide is selected from cambendichlor, chloramben, dicamba, 2,3,6-TBA, tricamba, bispyribac, pyriminobac or pyriithiobac.

5. A herbicidal composition comprising:

(a) at least one acetyl CoA carboxylase inhibitor selected from arylphenoxy-propionate herbicides, cyclohexanedione herbicides, or phenylpyrazoline herbicides;

(b) at least one photosynthesis II inhibitor selected from a triazine herbicide, a triazinone herbicide, triazole herbicide, triazolone herbicide, triazolinone herbicide, uracil herbicide, pyridazinone herbicide, a triazolopyrimidine herbicide, or phenyl-carbamate herbicide;

(c) at least one microtubule assembly inhibitor herbicide selected from a dinitroaniline herbicide, a phosphoramidate herbicide, pyridine herbicide, benzamide herbicide, or a benzoic acid herbicide; and

(d) at least one agrochemically acceptable excipient.

6. A herbicidal combination comprising:

(a) at least one acetyl CoA carboxylase inhibitor selected from clodinafop-propargyl, clodinafop, haloxyfop, haloxyfop-etotyl, haloxyfop-P-methyl, quizalofop, quizalofop-ethyl, quizalofop-P, quizalofop-P-ethyl, or quizalofop-P-tefuryl, mesotrione, sulcotrione, tembotrione, or pinoxaden;

(b) at least one photosynthesis II inhibitor selected from atrazine, hexazinone, metamiltron, metribuzin, flucarbazone, sulfentrazone, penoxsulam, saflufencil, desmedipham or phenmedipham; and

(c) at least one microtubule assembly inhibitor herbicide selected from oryzalin, pendimethalin, diflufenican, fluroxypyr, halauxifen, picloram, pyroxsulam, dicamba or bispyribac.

7. A herbicidal combination comprising:
- a. clodinafop propargyl, hexazinone, and oryzalin
 - b. clodinafop propargyl, hexazinone, and pendimethalin
 - c. clodinafop propargyl, metamitron, and oryzalin
 - 5 d. clodinafop propargyl, metamitron and pendimethalin
 - e. clodinafop propargyl, metribuzin and oryzalin
 - f. clodinafop propargyl, metribuzin, and pendimethalin
 - g. clodinafop propargyl, carfentrazone, and oryzalin
 - h. clodinafop propargyl, carfentrazone, and pendimethalin
 - 10 i. clodinafop propargyl, flucarbazone, and oryzalin
 - j. clodinafop propargyl, flucarbazone, and pendimethalin
 - k. clodinafop propargyl, sulfentrazone and oryzalin.
 - l. clodinafop propargyl, sulfentrazone and pendimethalin
 - m. clodinafop propargyl, penoxsulam, and oryzalin
 - 15 n. clodinafop propargyl, penoxsulam and pendimethalin
8. A method of controlling weeds at a locus wherein said method comprises applying to the locus a herbicidal combination comprising:
- 20 (a) at least one acetyl CoA carboxylase inhibitor selected from arylphenoxy-propionate herbicides, cyclohexanedione herbicides, or phenylpyrazoline herbicides;
 - (b) at least one photosynthesis II inhibitor selected from a triazine herbicide, a triazinone herbicide, triazole herbicide, triazolone herbicide, triazolinone herbicide, uracil herbicide, pyridazinone herbicide, a triazolopyrimidine herbicide, or phenyl-carbamate herbicide;
 - 25 (c) at least one microtubule assembly inhibitor herbicide selected from a dinitroaniline herbicide, a phosphoroamidate herbicide, pyridine herbicide, benzamide herbicide, or a benzoic acid herbicide.
 - 30
9. The method as claimed in claim 8, wherein the weed is *Phalaris minor*.

10. The method as claimed in claim 8, wherein the weed is *Rumex dentatus*.

11. Kit-of-parts comprising a plurality of components, wherein said plurality of components comprises:

- 5 (a) at least a first component comprising an acetyl CoA carboxylase inhibitor selected from arylphenoxy-propionate herbicides, cyclohexanedione herbicides, or phenylpyrazoline herbicides;
- (b) at least a second component comprising a photosynthesis II inhibitor selected from a triazine herbicide, a triazinone herbicide, triazole
10 herbicide, triazolone herbicide, triazolinone herbicide, uracil herbicide, pyridazinone herbicide, a triazolopyrimidine herbicide, or phenyl-carbamate herbicide;
- (c) at least a third component comprising a microtubule assembly inhibitor herbicide selected from a dinitroaniline herbicide, a
15 phosphoroamidate herbicide, pyridine herbicide, benzamide herbicide, or a benzoic acid herbicide.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB2019/057044

A. CLASSIFICATION OF SUBJECT MATTER

A01N 43/707 (2006.01) A01N 43/40 (2006.01) A01N 33/18 (2006.01) A01N 43/64 (2006.01) A01N 43/653 (2006.01)
A01N 43/90 (2006.01) A01N 47/38 (2006.01) A01N 41/06 (2006.01) A01P 13/00 (2006.01)

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

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

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

EPOQUE 5.2 (PATENW): Applicant/Inventor names (UPL Ltd, Jaidev Rajnikant Shroff, Vikram Rajnikant Shroff); CPC/IPC symbols (A01N 43/40, 43/707, 33/18, 43/64, 43/653, 43/90, 47/38, 41/06); Keywords (clodinafop-propargyl, metribuzin, pendimethalin, hexazinone, metamitron, carfentrazone, flucarbazone, sulfentrazone, penoxsulam, oryzalin, *etc.*). **NEW STN (CAplus, BIOSIS, CABA, Registry, CN/DE/FR/IN/JP/KR FULL):** Applicant/Inventor names (*as above*); CAS Registry numbers (105512-06-9, 21087-64-9, 51235-04-2, 128621-72-7, 122836-35-5, 219714-96-2, 41394-05-2, 145026-88-6, 40487-42-1, 19044-88-3, *etc.*); Keywords (clodinafop-propargyl, metribuzin, pendimethalin, hexazinone, metamitron, carfentrazone, flucarbazone, sulfentrazone, penoxsulam, oryzalin, Phalaris minor, Rumex dentatus, *etc.*). **ONLINE DATABASES (Espacenet, Google):** Applicant/Inventor names (*as above*); Keywords (*as above*). **INTERNAL DATABASES:** Applicant/Inventor names (*as above*).

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Documents are listed in the continuation of Box C	

☒ Further documents are listed in the continuation of Box C☒ See patent family annex

* Special categories of cited documents:		
"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention	
"D" document cited by the applicant in the international application	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone	
"E" earlier application or patent but published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art	
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family	
"O" document referring to an oral disclosure, use, exhibition or other means		
"P" document published prior to the international filing date but later than the priority date claimed		
Date of the actual completion of the international search 21 October 2019	Date of mailing of the international search report 21 October 2019	
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA Email address: pct@ipaustalia.gov.au	Authorised officer Austin Smith AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No. +61262832381	

INTERNATIONAL SEARCH REPORT		International application No.
C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		PCT/IB2019/057044
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2009/089165 A2 (AUBURN UNIVERSITY) 16 July 2009 Table 3	1-6, 8 & 11
X	WO 2016/116531 A1 (BASF AGRO B.V.) 28 July 2016 Table 35, p50 ln 29-39	1-6, 8 & 11
X	CN 108041050 A (BEIJING KEFA WEIYE PESTICIDE TECH CT) 18 May 2018 Abstract, Table 3 (based on English machine translation obtained from Espacenet, 17 OCT 2019)	1-6, 8 & 11
X	SINGH, S. <i>et al.</i> , "Assess the effect of different combinations of herbicides on weed population and economic feasibility of treatments in late sown wheat crop", <i>Journal of Pharmacognosy and Phytochemistry</i> (2017) vol 6, no 5, pages 648-651. Abstract, Tables 1-4	1-11
X	KHAN, I. A., <i>et al.</i> , "Efficacy of some pre and post-emergence herbicides on yield and yield components of canola", <i>Pakistan Journal of Botany</i> (2008) vol 40, no 5, pages 1943-1947. Materials and Methods (p1944), "Weeds density m ⁻² " (p1944-5), Table 1	1-11
X	HUSSAIN, Z. <i>et al.</i> , "Evaluation of different herbicides for weed control in onion", <i>Sarhad Journal of Agriculture</i> (2008) vol 24, no 3, pages 453-456. Abstract, Tables I & II	1-11
A	ABBAS, T. <i>et al.</i> , "Role of allelopathic crop mulches and reduced doses of tank-mixed herbicides in managing herbicide-resistant <i>Phalaris minor</i> in wheat", <i>Crop Protection</i> (2018) vol 110, pages 245-250 [available online 23 June 2017]. Abstract, Table 1, Section 3.1	
A	WO 2013/186652 A1 (UNITED PHOSPHORUS LIMITED) 19 December 2013 Examples 2-3	
X	JONES, N. E. <i>et al.</i> , "Effects of selective herbicide treatment, row width and spring cultivation on weed and arthropod communities in winter wheat", <i>Aspects of Applied Biology</i> (2007) vol 81, pages 39-46. Tables 1 & 4 (BX Treatments B, E, F & H)	1-4 & 11
A	CN 107810959 A (DAQIAN ECOLOGY & ENV GROUP CO LTD) 20 March 2018 Abstract, Examples (based on English machine translation obtained from Espacenet, 17 OCT 2019)	
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