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(71) Applicant: UPL LTD [IN/IN]; Agrochemical Plant, Durgachak, Midnapore Dist., West Bengal, Haldia 721 602 (IN).

(72) Inventors: JADHAV, Prakash Mahadeo; 1202 Rustic Ct, Eagle Chase Lawrenceville, New Jersey, New Jersey 08648 (US). SKORCZYNSKI, Stephen; 24, Riverdale Road, Yardley, Pennsylvania 19067 (US). CHIARELLA, Emily; 287 East Valley Forge Road, King of Prussia, Pennsylvania 19406 (US). GRAY, Cody Jack; 11417 Cranston Drive, Peyton, Pennsylvania 80831 (US). SHROFF, Jaidev, Rajnikant; 206, Swiss Tower, Cluster Y Jumeirah Lake Towers, P.O. Box: 33421, Dubai (AE). SHROFF, Vikram, Rajnikant; 206, Swiss Tower, Cluster Y Jumeirah Lake Towers, P.O. Box: 33421, Dubai (AE).

(74) Agent: MAJUMDAR, Subhatosh et al.; S. Majumdar & Co., 5, Harish Mukherjee Road, West Bengal, Kolkata 700 025 (IN).

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(54) Title: AQUEOUS HERBICIDAL INTERMIXTURES

(57) Abstract: The present invention relates to aqueous homogeneous herbicide compositions comprising electrolytic herbicides and a multipart amine component wherein said multipart amine component comprises at least one tertiary amine having an alkyl group of at least 8 carbon atoms.

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AQUEOUS HERBICIDAL INTERMIXTURES

TECHNICAL FIELD OF THE INVENTION

The invention relates to herbicidal intermixtures. More particularly, the invention
5 relates to essentially aqueous homogeneous herbicide compositions comprising electrolytic herbicides and a multipart amine component.

BACKGROUND OF THE INVENTION

Controlling unwanted plants is of high importance in agriculture. Over the years,
10 various strategies have been developed for effective control of these unwanted plants. Depending upon the region it is necessary to find or develop appropriate techniques for desired weed control. A large part of the surface of the world is arid, characterized as too dry for conventional rain fed agriculture and hence it demands for precise or specific weed control techniques.

15 "Arid" implies prolonged dryness, and is used with respect to the climate and the land below it. In such regions the ability to produce agricultural crops is restricted. Usually on arid lands the potential evaporation of water from the land exceeds the rainfall. The land may be characterized according to the degree of aridity as dry
20 forest, chaparral or brushland, grassland or savannah, or desert. "Arid" does not adequately characterize the soils, however, for they may vary in many ways. Often they are alkaline or saline.

An arid ecosystem differs in many respects from one of tropical or temperate
25 zones. Unlike temperate zones, an arid zone is characterized as an area of low precipitation, high temperature, and high rate of evaporation. Frequency of rainfall does not describe accurately the type of the arid zone nor does the amount of precipitation govern the type of vegetation.

30 Among the various agronomic practices that could bring about immediate positive results in dryland and arid areas, optimum and effective weed control is the first and foremost management practice. However many weeds growing naturally in the

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arid region have evolved a more complicate overall drought adaptation strategy which usually involves several mechanisms of drought escape, tolerance and avoidance. The leaf shedding option, the tight stomatal control and the development of a prolific root system are all specific characteristics developed by the vegetation destined to grow in arid regions. The plants adopt to osmoregulation and increase in elasticity of the cell and a decrease in cell size. Due to such natural adaption of the plants/weeds to the specific conditions, they are tougher than those growing under normal conditions and is difficult to control. Further such weeds have thick and waxy cuticle layers defending them from the penetration of any use of foliar herbicides. It has been observed that the commonly used non-selective herbicide such as glufosinate based formulations were not providing an effective weed control in arid regions.

Glufosinate is a non-selective foliage application type herbicide which kills or controls many species of weeds. In the Pesticide Manual 15th Edition, glufosinate has been described as being widely used in burn-down segments, and for control of a wide range of broad-leaved weeds and grasses and sedges in cereals, cotton, corn and soy, fruit orchards, vineyards, rubber and oil palm plantations, ornamental trees and bushes, non-crop land, and pre-emergence in vegetables.

Glufosinate being a contact herbicide is known to be used with various adjuvants to improve the efficacy or to induce certain specific properties as required. US6642177 discloses that to be effective, glufosinate must be formulated with a high concentration of surfactants to get the required bio efficacy.

DE 3931051 discloses salts of herbicidal acids with long-chain nitrogen bases such as fatty amines.

It has been observed by the inventors of the present invention that existing formulations of non-selective herbicide such as glufosinate is not effective as desired particularly in arid environments. In view of such observation, there is a necessity for developing more effective formulations which are physically stable as

well as bio-efficacious irrespective of the environment such as arid, or non-arid regions.

With the forgoing in consideration, the primary object of the present invention is the
5 designing and preparation of a novel composition of glufosinate which is highly efficacious particularly in arid region where the weeds are having thick and waxy leaves and is difficult to penetrate with usual foliar herbicidal formulations.

OBJECTS OF THE INVENTION

10 It is an object of the present invention to provide an aqueous herbicidal formulation comprising glufosinate and a multi-part amine component.

It is another object of the present invention to provide an aqueous herbicidal formulation comprising glufosinate and a multi-part amine component for effective
15 weed control in arid regions.

It is another object of the present invention to provide a process or preparing an aqueous herbicidal formulation comprising glufosinate and a multi-part amine component.
20

Yet another object of the present invention is to provide a method for controlling unwanted plants in arid regions.

SUMMARY OF THE INVENTION

25 The present invention provides an herbicidal intermixture comprising:
a) An electrolytic herbicide; and
b) a multipart amine component.

The present invention provides an herbicidal intermixture comprising:
30 a) An electrolytic herbicide;
b) a multipart amine component; and
c) water.

The present invention further provides an herbicidal intermixture comprising:

- a) a phosphinic acid herbicide, its salts, its isomers, mixture of isomers, derivatives, or lower alkyl esters thereof;
- 5 b) a multipart amine component;
- c) optionally other agrochemical excipients; and
- d) water.

10 In another aspect the present invention provides an aqueous herbicidal composition comprising:

- (a) a phosphinic acid herbicide, its salts, its isomers, mixture of isomers, derivatives, or lower alkyl esters thereof;
- (b) a multipart amine component;
- (c) one or more organic solvents;
- 15 (d) optionally one or more adjuvants; and
- (e) water,

wherein said multipart amine component comprises at least one tertiary amine having an alkyl group of at least 8 carbon atoms.

20 In another aspect of the present invention, there is provided a process for preparing herbicidal intermixture according to the present invention.

Another aspect of the present invention is to provide a method controlling unwanted plants in crop and non-crop areas, said method comprising applying to
25 the plants, unwanted plants or to their locus, a herbicidally effective amount of herbicidal intermixtures according to the present invention.

The present invention further provides a method of controlling unwanted plants in crop and non-crop areas in arid region, said method comprising applying to the
30 plants, unwanted plants or to their locus in arid region, an herbicidally effective amount of herbicidal intermixtures according to the present invention.

DETAILED DESCRIPTION

It has been found out that highly efficacious herbicidal compositions comprising glufosinate can be developed by intermixing glufosinate with multipart amine components. In order to overcome the inefficiencies of the existing formulations particularly in arid regions, inventors of the present invention surprisingly found out that herbicidal intermixture of glufosinate with multipart amine components can be effectively used.

Thus according to an aspect of the present invention, there is provided an herbicidal intermixture comprising:

- a) An electrolytic herbicide; and
- b) a multipart amine component.

In an embodiment, the intermixture comprises water.

The present invention thus provides an herbicidal intermixture comprising:

- a) An electrolytic herbicide;
- b) a multipart amine component; and
- c) water.

In another embodiment, the intermixture of the present invention possesses superior herbicidal activity.

In an embodiment, the term intermixture includes an admixture.

In certain embodiments, the term intermixture includes the mixtures resulting from any one of the processes selected from reaction, solubilisation, neutralization or partial neutralization occurring between the components of the intermixture.

In certain other embodiments, the term intermixture includes a composition or formulation according to the present invention.

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Accordingly, in certain other embodiments, there is provided an herbicidal mixture comprising:

- a) An electrolytic herbicide; and
- b) a multipart amine component.

5

In an embodiment, the herbicidal mixture comprises water.

Accordingly, in certain other embodiments, there is provided an herbicidal mixture comprising:

- 10 a) An electrolytic herbicide;
- b) a multipart amine component; and
- c) water.

In another embodiment, the herbicidal mixture of the present invention possesses
15 superior herbicidal activity.

In an embodiment of the present invention, the electrolytic herbicide is selected from phosphinic acid herbicides.

20 In some embodiments the phosphinic acid herbicide is selected from the group comprising glufosinate and glyphosate.

In certain embodiments glufosinate refers to its derivatives selected from lower alkyl esters thereof or salts thereof with acids or bases such as its hydrochloride,
25 monosodium salt, disodium salt, monopotassium salt, dipotassium salt, monocalcium salt, ammonium salt, $-\text{NH}_3(\text{CH}_3)^+$ salt, $-\text{NH}_2(\text{CH}_3)_2^+$ salt, $-\text{NH}(\text{CH}_3)_3^+$ salt, $-\text{NH}(\text{CH}_3)_2(\text{C}_2\text{H}_4\text{OH})^+$, $-\text{NH}_2(\text{CH}_3)(\text{C}_2\text{H}_4\text{OH})^+$, or its methyl ester, ethyl ester, propyl ester or butyl ester.

30 In certain other embodiments, glufosinate refers to isomers or mixture of isomers.

In a preferred embodiment, the isomer is glufosinate-P.

In some embodiments, glyphosate refers to glyphosate-mono ammonium, glyphosate diammonium, glyphosate-isopropylammonium, glyphosate-potassium or glyphosate isopropyl amine salt.

5

Thus according to another aspect of the present invention, there is provided an herbicidal intermixture comprising:

- a) a phosphinic acid herbicide, its salts, its isomers, mixture of isomers, derivatives, or their lower alkyl esters thereof;
- 10 b) a multipart amine component;
- c) optionally other agrochemical excipients; and
- d) water.

15 In an embodiment, the intermixture of the invention possesses superior herbicidal activity.

In an embodiment the multipart amine component comprises one or more tertiary amines having alkyl groups of 8 to 20 carbon atoms.

20 In another embodiment the multipart amine component comprises one or more tertiary dimethyl alkylamines wherein the alkyl groups have 8 to 20 carbon atoms.

In some embodiments, the multipart amine component comprises one or more tertiary dimethyl alkylamines wherein the alkyl groups have 10 to 20 carbon atoms.

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In an embodiment, the multipart amine component according to the present invention comprises at least two tertiary amines having alkyl groups of 8 to 20 carbon atoms.

30 In another embodiment, the multipart amine component according to the present invention comprises at least three tertiary amines having alkyl groups of 8 to 20 carbon atoms.

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In an embodiment, the multipart amine component according to the present invention comprises at least four tertiary amines having alkyl groups of 8 to 20 carbon atoms.

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In an embodiment, the multipart amine component according to the present invention comprises at least two tertiary dimethyl alkylamines having alkyl groups of 8 to 20 carbon atoms.

10 In another embodiment, the multipart amine component according to the present invention comprises at least three tertiary dimethyl alkylamines having alkyl groups of 8 to 20 carbon atoms.

15 In another embodiment, the multipart amine component according to the present invention comprises at least four tertiary dimethyl alkylamines having alkyl groups of 8 to 20 carbon atoms.

In another embodiment, the multipart amine component according to the present invention comprises at least one tertiary dimethyl alkylamine having alkyl groups
20 of 10 to 18 carbon atoms.

In an embodiment, the multipart amine component according to the present invention comprises at least two tertiary dimethyl alkylamines having alkyl groups of 8 to 20 carbon atoms wherein said tertiary dimethyl alkylamines are present in
25 a ratio of 1:99 to 99:1.

In another embodiment, the multipart amine component according to the present invention comprises at least two tertiary dimethyl alkylamines having alkyl groups of 8 to 20 carbon atoms wherein at least one dimethyl alkylamine is present at least
30 in an amount about 50% by weight of the multipart amine component.

In an embodiment, the term intermixture or admixture according to the present invention includes a composition or a formulation.

In an embodiment of the present invention, the composition comprises from about
5 0.1% to about 60% by weight of phosphinic acid herbicide.

In a preferred embodiment the composition comprises from about 1% to about 50% by weight of phosphinic acid herbicide.

10 In an embodiment the composition comprises from about 0.1% to about 60% by weight of multipart amine component.

In a preferred embodiment the composition comprises from about 1% to about 50% by weight of multipart amine component.

15 In an embodiment the composition comprises phosphinic acid herbicide and multipart amine component in a molar ratio of from about 1: 1.5 to about 1.5:1.

In a preferred embodiment the composition comprises phosphinic acid herbicide
20 and multipart amine component in a molar ratio of about 1: 1.5

In another preferred embodiment the composition comprises phosphinic acid herbicide and multipart amine component in an equimolar ratio.

25 In another embodiment, the compositions according to the present invention further comprises organic solvents.

Thus accordingly, the present invention provides an aqueous herbicidal composition comprising:

- 30 a) a phosphinic acid herbicide, its salts, its isomers, mixture of isomers, derivatives, or their lower alkyl esters thereof;
b) a multipart amine component;

- c) one or more organic solvents;
- d) optionally one or agrochemical excipients; and
- e) water;

wherein said multipart amine component comprises at least one tertiary amine
5 having an alkyl group of at least 8 carbon atoms.

In an embodiment, the solvents may be selected from but are not limited to:

a water miscible polar/non-polar or a water immiscible polar/non-polar solvent, for
10 example, alkyl esters of phthalic acid and trimellitic acid; aromatic hydrocarbons
such as xylene, solvesso-100, solvesso-150, solvesso-200, alkyl benzenes;
methylnaphthalene; mixtures of aromatics aliphatic or cycloaliphatic hydrocarbon
such as hexane and heptanes; phthalates; ketones such as cyclohexanone, 2-
octanone or acetophenone, methyl isobutyl ketone - saturated or unsaturated
15 cyclic ketones such as isophorone, chlorinated hydrocarbons; vegetable oils and
modified vegetable oils; glycols and their derivatives, polyglycols; aliphatic
alcohols, alkoxy aliphatic alcohols or mixtures of such two or more solvents. Other
solvents can be alkylene carbonates (like propylene carbonate), alkyl amides, and
esters such as alkyl esters of monocarboxylic acids and dicarboxylic acid, ester-
20 amides, cyclic ethers such furan and its derivatives or mixtures thereof.

In certain embodiments of the present invention, the herbicidal intermixtures further
comprises other agrochemical excipients.

25 In some embodiments, other agronomically suitable excipients are selected from
but are not limited to surfactants, solvent, fertilizer, pH modifiers, crystallization
inhibitors, viscosity modifiers, suspending agents, spray droplet modifiers,
pigments, antioxidants, foaming agents, light-blocking agents, compatibilizing
agents, antifoam agents, sequestering agents, neutralizing agents, corrosion
30 inhibitors, dyes, odorants, spreading agents, penetration aids, micronutrients,
emollients, lubricants, sticking agents, dispersing agents, thickening agents,
freezing point depressants, antimicrobial agents, and the like.

In an embodiment, the herbicidal intermixture of the present invention may be combined with at least another active ingredient selected from the group comprising herbicides, insecticides, fungicides, biological agents, plant growth
5 activators, fertilizers or combinations thereof.

Thus, in an embodiment, the herbicidal intermixture according to the present invention may be combined with an herbicide. Exemplary herbicides that may be combined with the herbicidal intermixture of the present invention may include, but
10 are not limited to, herbicides selected from classes such as ACCase inhibitors, ALS inhibitors, EPSP synthase inhibitors, synthetic auxins, auxin transport inhibitors, HPPD inhibitors, lipid synthesis inhibitors, long chain fatty acid inhibitors, as well as herbicides with unknown modes of action.

15 According to another aspect, the present invention further provides a process for preparing herbicidal intermixtures according to the invention.

In an embodiment, the present invention provides a process for preparing herbicidal intermixture according to the invention, said process comprising the
20 steps:

- a) mixing a multipart amine component with water;
- b) adding an electrolytic herbicide to prepare a clear solution.

Thus in an embodiment, there is provided a process for preparing an herbicidal
25 intermixture comprising:

- a) An electrolytic herbicide; and
- b) multipart amine component said process comprising the steps:
 - i. mixing said multipart amine component with water; and
 - ii. adding said electrolytic herbicide to prepare a clear solution.

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In some embodiments, the present invention provides a process for preparing herbicidal compositions according to the invention, said process comprising:

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- 5 a) mixing a multipart amine component with water;
 b) adding one or more organic solvents;
 c) optionally adding other agrochemical excipients; and
 d) intermixing an electrolytic herbicide with the mixture obtained in step c) until
 a clear solution is obtained.

In certain embodiments, the present invention provides a process for preparing herbicidal compositions according to the invention, said process comprising the steps:

- 10 a) mixing a multipart amine component with water;
 b) adding one or more organic solvents;
 c) optionally adding other agrochemical excipients; and
 d) intermixing a phosphinic acid herbicide, its salts, its isomers, mixture of
 isomers, derivatives, or their lower alkyl esters thereof with the mixture
15 obtained in step c) until a clear solution is obtained.

In certain embodiments, the phosphinic acid herbicide is selected from glufosinate, its salts, its isomers, mixture of isomers, derivatives, or their lower alkyl esters thereof.

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Thus in certain embodiments, the present invention provides a process for preparing herbicidal compositions according to the invention, said process comprising the steps:

- 25 a) mixing a multipart amine component with water;
 b) adding one or more organic solvents;
 c) optionally adding other agrochemical excipients; and
 d) intermixing glufosinate, its salts, its isomers, mixture of isomers, derivatives,
 or their lower alkyl esters thereof with the mixture obtained in step c) until a
 clear solution is obtained.

30

In certain other embodiments, the present invention provides a process for preparing herbicidal compositions according to the invention, said process comprising the steps:

- a) mixing a multipart amine component with water;
- 5 b) adding one or more organic solvents;
- c) adding other agrochemical excipients selected from the group comprising nonionic surfactants, anionic surfactants, wetting agents and dispersing agents; and
- 10 d) intermixing glufosinate, its salts, its isomers, mixture of isomers, derivatives, or their lower alkyl esters thereof with the mixture obtained in step c) until a clear solution is obtained.

In certain embodiments the multipart amine component comprises one or more tertiary amines having alkyl groups of 8 to 20 carbon atoms.

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In certain other embodiments the multipart amine component comprises one or more tertiary dimethyl alkylamines wherein the alkyl groups have 8 to 20 carbon atoms.

- 20 In some embodiments, the multipart amine component comprises one or more tertiary dimethyl alkylamines wherein the alkyl groups have 10 to 18 carbon atoms. The present invention further provides a method of controlling unwanted plants in crop and non-crop areas, said method comprising applying to the plants, unwanted plants or to their locus a herbicidally effective amount of compositions according to
- 25 the present invention.

- Accordingly, the present invention provides a method of controlling unwanted plants in arid regions said method comprising applying to the to the plants, unwanted plants or to their locus a herbicidally effective amount of compositions
- 30 according to the present invention.

In an embodiment, the present invention provides a method of controlling unwanted plants in both crop and non-crop areas in arid region said method comprising applying to the unwanted plants or to their locus a herbicidally effective amount of compositions according to the present invention.

5

Thus in an embodiment there is provided a weed control method in arid region, said method comprising applying to the weeds or to their locus a herbicidally effective amount of herbicidal intermixture comprising:

- a) An electrolytic herbicide;
- 10 b) a multipart amine component; and
- c) water.

In another embodiment, there is provided a weed control method in arid region, said method comprising applying to the weeds or to their locus a herbicidally effective amount of herbicidal intermixture comprising:

15

- a) a phosphinic acid herbicide, its salts, its isomers, mixture of isomers, derivatives, or their lower alkyl esters thereof;
- b) a multipart amine component;
- c) optionally other agrochemical excipients; and
- 20 d) water.

Examples:

Example 1: A herbicidal intermixture according to the present invention comprising glufosinate ammonium is prepared as follows:

Ingredient	Quantity(% w/w)
glufosinate ammonium	25.2
multipart amine (C ₁₂ -C ₁₄)	20.0
wetting agent	15.0
organic solvent	10.0
ammonium sulfate	5.0
water	q.s.

The composition is prepared by a process as follows:

Required quantity of multipart amine component, wetting agent, organic solvent, ammonium sulfate and water were combined and mixed until a homogeneous mixture is obtained. Required quantity of glufosinate ammonium was added in portions and mixed vigorously until a clear solution is obtained.

Example 2: A herbicidal intermixture according to the present invention comprising glufosinate acid is prepared as follows:

10

Ingredient	Quantity(% w/w)
glufosinate acid	17.0
multipart amine (C ₁₀ -C ₁₄)	20.0
wetting agent	15.0
organic solvent	10.0
ammonium sulfate	5.0
water	q.s.

The composition was prepared by following process given for example 1.

Example 3: A herbicidal intermixture according to the present invention comprising glufosinate dipotassium salt is prepared as follows:

15

Ingredient	Quantity (% w/w)
glufosinate dipotassium salt	30.0
multipart amine (C ₁₀ -C ₁₈)	20.0
wetting agent	15.0
organic solvent	10.0
ammonium sulfate	5.0
water	q.s.

Example 4: A herbicidal intermixture according to the present invention comprising glufosinate acid is prepared as follows:

Ingredient	Quantity (% w/w)
glufosinate acid	17.0
multipart amine(C ₁₀ -C ₁₈)	20.0
Wetting agent	25.0
organic solvent	10.0
ammonium sulfate	5.0
water	q.s.

Example 5: A herbicidal intermixture according to the present invention comprising
5 glufosinate ammonium is prepared as follows

Ingredient	Quantity (% w/w)
glufosinate ammonium	15.0
multipart amine(C ₁₂ -C ₁₆)	20.0
Wetting agent	17.0
Alkyl polyglycoside	10.0
organic solvent	10.0
ammonium sulfate	5.0
water	q.s.

Example 6: A herbicidal intermixture according to the present invention comprising glufosinate acid is prepared as follows:

Ingredient	Quantity (% w/w)
glufosinate acid	17.0
multipart amine(C ₁₂ -C ₁₆)	20.0
Sodium lauryl ether sulfate	16.5
Wetting agent	8.5
organic solvent	10.0
ammonium sulfate	5.0

water	q.s.
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Example 7: A herbicidal intermixture according to the present invention comprising glufosinate ammonium and glyphosate isopropyl amine is prepared as follows:

Ingredient	Quantity (% w/w)
glufosinate ammonium	15.00
glyphosate IPA	30.00
multipart amine(C ₁₂ -C ₁₄)	18.0
wetting agent	15.0
organic solvent	10.0
ammonium sulfate	5.0
water	q.s.

- 5 Example 8: A herbicidal intermixture according to the present invention comprising glufosinate acid and glyphosate isopropyl amine is prepared as follows:

Ingredient	Quantity (% w/w)
glufosinate acid	15.4
glyphosate IPA	29.0
multipart amine(C ₁₂ -C ₁₄)	20.0
wetting agent	15.0
organic solvent	10.0
ammonium sulfate	5.0
water	q.s.

Example 9: A herbicidal intermixture according to the present invention comprising glufosinate acid and glyphosate isopropyl amine is prepared as follows:

Ingredient	Quantity (% w/w)
glufosinate acid	15.4
glyphosate IPA	18.5
multipart amine(C ₁₀ -C ₁₈)	20.0

18

wetting agent	15.0
organic solvent	10.0
ammonium sulfate	5.0
water	q.s.

Example 10: A herbicidal intermixture according to the present invention comprising glufosinate acid and glyphosate isopropyl amine is prepared as follows

Ingredient	Quantity (% w/w)
glufosinate acid	15.4
glyphosate IPA	29.0
multipart amine(C ₁₀ -C ₁₈)	20.0
wetting agent	15.0
organic solvent	10.0
ammonium sulfate	5.0
water	q.s.

5

Example 11: A herbicidal intermixture according to the present invention comprising glufosinate acid and glyphosate acid is prepared as follows

Ingredient	Quantity (% w/w)
glufosinate acid	15.4
glyphosate acid	15.0
multipart amine(C ₈ -C ₂₀)	20.0
wetting agent	15.0
organic solvent	10.0
ammonium sulfate	5.0
water	q.s.

Example 12: A herbicidal intermixture according to the present invention comprising glufosinate acid and glyphosate acid is prepared as follows:

10

Ingredient	Quantity (% w/w)
glufosinate acid	15.4
glyphosate acid	15.0
multipart amine (C ₁₀ -C ₂₀)	20.0
wetting agent	15.0
organic solvent	10.0
ammonium sulfate	5.0
water	q.s.

Example 13: A herbicidal intermixture according to the present invention comprising glufosinate acid and glyphosate acid is prepared as follows:

Ingredient	Quantity (% w/w)
glufosinate acid	15.4
glyphosate acid	15.0
multipart amine (C ₁₀ -C ₁₈)	20.0
wetting agent	15.0
organic solvent	10.0
ammonium sulfate	5.0
water	q.s.

5 Field Trial:

Field trials were carried out in arid regions using the herbicidal intermixtures comprising glufosinate prepared according to the present invention as the broad-spectrum herbicide in arid regions. Two comparative compositions were prepared (in the absence of multipart amine component) and tested along with the inventive compositions to find out the bio-efficacy. The details of the compositions are as given below:

Example 14: A herbicidal intermixture according to the present invention comprising glufosinate acid is prepared as follows:

Ingredient	Quantity (% w/w)
Glufosinate acid	17.0
multipart amine (C ₁₀ -C ₁₄)	20.0
Synergen GA	12.0
Synergen PFA	6.0
1-methoxy-2-propanol	6.0
propylene glycol	8.0
ammonium sulfate	5.0
water	QS

Comparative example (Example 15):

A composition of glufosinate acid (in the absence of multipart amine component) was prepared as follows:

Ingredient	Quantity (% w/w)
Glufosinate acid	17.0
Synergen GA	17.0
Synergen PFA	10.0
1-methoxy-2-propanol	10.0
ammonium sulfate	5.0
Propylene glycol	14.0
water	QS

5

Comparative example (Example 16):

A composition of glufosinate salt (in the absence of multipart amine component) was prepared as follows:

Ingredient	Quantity (% w/w)
Glufosinate ammonium	25.2
Synergen GA	17.0
Synergen PFA	10.0
1-methoxy-2-propanol	10.0
ammonium sulfate	5.0

Propylene glycol	14
water	QS

The compositions were diluted with water and applied to broad leave weeds, grasses and sedges in the arid region.

- 5 After treatment using composition (Example 14) prepared according to the present invention, chlorosis followed by necrosis of the weeds were observed demonstrating the bio-efficacy of the new compositions. Comparative compositions (Example 15 and Example 16) and market sample of glufosinate ammonium (Liberty 280 SL Glufosinate ammonium) were also tested to compare
- 10 the results. The observations at 7 days, 14 days and 21 days after application were summarized in below table (table 1).

Table 1: % weed control

Treatment	Rate of application	% weed control (Palmer Amaranth)			% weed control (Kochia)		
		7 days	14 days	21 days	7 days	14 days	21 days
Example 14	0.61 lb /A	36.7	83.3	90.0	43.3	86.7	90.0
Example 14	0.835 lb /A	43.3	90.0	90.0	46.7	90.0	90.0
Market sample	0.73 lb/A	26.7	63.3	53.3	30.0	56.7	56.7
Example 15	0.61lb/A	22.4	45.7	30.3	21.1	37.4	26.5
Example 15	0.835 lb/A	25.7	50.3	34.6	23.5	40.2	31.8
Example 16	0.61lb/A	25.3	51.2	37.8	24.3	45.6	36.5
Example 16	0.835 lb/A	28.2	58.3	51.1	27.5	48.7	39.2

- 15 The field-testing results as shown in the above table evidently reveal that the compositions according to the present invention is extremely effective for weed control in arid region. It has been noted that due to natural adaption of the weeds to the arid conditions, they are tougher than those growing under normal conditions

and was difficult to control. Further these weeds displayed thick and waxy cuticle layers defending them from the penetration of the herbicide spray. It has been noted that the commonly used glufosinate based formulations and market sample of glufosinate were not providing an effective weed control in arid regions. The
5 inventive compositions even at a low rate, is found to be highly efficacious in controlling tough weeds in the area.

The instant invention is more specifically explained by above examples. However, it should be understood that the scope of the present invention is not limited by the
10 examples in any manner. It will be appreciated by any person skilled in this art that the present invention includes aforesaid examples and further can be modified and altered within the technical scope of the present invention.

CLAIMS

1. An herbicidal intermixture comprising:
 - a) An electrolytic herbicide; and
 - 5 b) a multipart amine component.
2. An herbicidal intermixture according to claim 1 comprising:
 - a) An electrolytic herbicide;
 - b) a multipart amine component; and
 - c) water.
- 10 3. An herbicidal intermixture according to claim 1 wherein said electrolytic herbicide is a phosphinic acid herbicide selected from the group comprising glufosinate and glyphosate
4. An herbicidal intermixture according to claim 3 wherein said phosphinic acid herbicide is selected from glufosinate, its salts, its isomers, mixture of
- 15 isomers, derivatives, or their lower alkyl esters
5. An aqueous herbicidal composition comprising:
 - (a) a phosphinic acid herbicide, its salts, its isomers, mixture of isomers, derivatives, or lower alkyl esters thereof;
 - (b) a multipart amine component;
 - 20 (c) one or more organic solvents;
 - (d) optionally one or more adjuvants; and
 - (e) water,
 - wherein said multipart amine component comprises at least one tertiary amine having an alkyl group of at least 8 carbon atoms.
- 25 6. An aqueous herbicidal composition according to claim 5 wherein said phosphinic acid herbicide is selected from the group comprising glufosinate and glyphosate.
7. An aqueous herbicidal composition according to claim 5 wherein said multipart amine component comprises at least one tertiary amine having an
- 30 alkyl group of 10 to 20 carbon atoms

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8. An aqueous herbicidal composition according to claim 5 wherein said multipart amine component comprises at least one tertiary dimethyl alkylamine having an alkyl group of 8 to 20 carbon atoms
9. An aqueous herbicidal composition according to claim 5 wherein said
5 multipart amine component comprises at least two tertiary dimethyl alkylamines having alkyl groups of 8 to 20 carbon atoms.
10. An aqueous herbicidal composition according to claim 5 wherein said multipart amine component comprises at least two tertiary dimethyl alkylamines having alkyl groups of 8 to 20 carbon atoms wherein at least
10 one dimethyl alkylamine is present at least in an amount about 50% by weight of the multipart amine component
11. An aqueous herbicidal composition according to claim 5 wherein said composition comprises phosphinic acid herbicide and multipart amine component in a molar ratio of from about 1: 1.5 to about 1.5:1.
12. A process for preparing an herbicidal intermixture, wherein said process
15 comprises steps of;
- a. mixing said multipart amine component with water; and
 - b. adding said electrolytic herbicide to prepare a clear solution.
13. A process for preparing herbicidal intermixture according to claim 12,
20 wherein process comprising the steps of :
- a) mixing a multipart amine component with water;
 - b) adding one or more organic solvents;
 - c) optionally adding other agrochemical excipients; and
 - d) intermixing an electrolytic herbicide with the mixture obtained in step c)
25 until a clear solution is obtained.
14. A process according to claim 13, wherein said multipart amine component comprises at least one tertiary amine having an alkyl group of at least 8 carbon atoms.
15. A process according to claim 13, wherein said electrolytic herbicide is a
30 phosphinic acid herbicide selected from the group comprising glufosinate and glyphosate

16. A method controlling unwanted plants in crop and non-crop areas, said method comprising applying to the plants, unwanted plants or to their locus, a herbicidally effective amount of an herbicidal intermixture comprising:

a) An electrolytic herbicide; and

5 b) a multipart amine component.

17. A method of controlling unwanted plants in crop and non-crop areas in arid region, said method comprising applying to the plants, unwanted plants or to their locus in arid region, an herbicidally effective amount of an herbicidal intermixture comprising:

10 a) An electrolytic herbicide; and

b) a multipart amine component.

INTERNATIONAL SEARCH REPORT

 International application No.
PCT/IB2019/053769

A. CLASSIFICATION OF SUBJECT MATTER

A01N 57/20 (2006.01) A01N 33/02 (2006.01) A01N 25/24 (2006.01) A01N 25/02 (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)

PATENW, CAplus, BIOSIS, CABA, CNFULL, GOOGLE and ESPACENET. IPC/CPC: A01N57/20, A01N33/02/low, A01N25/24, A01N25/02 with Keywords: Glyphosate, Glufosinate, mulipart amine, amine mixture, solvent, water, arid and similar terms and/or truncations.

Applicant (UPL LTD) and Inventor (JADHAV, Prakash OR SKORCZYNSKI, Stephen OR CHIARELLA, Emily OR GRAY, Cody OR SHROFF, Jaidev OR SHROFF, Vikram) names searched in GOOGLE, ESPACENET and IP Australia internal databases.

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
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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

 Luke Sweetman
 AUSTRALIAN PATENT OFFICE
 (ISO 9001 Quality Certified Service)
 Telephone No. +61262256163

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		PCT/IB2019/053769
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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X	WO 02/32227 A1 (VICTORIAN CHEMICAL INTERNATIONAL PTY LTD) 25 April 2002 Abstract, Example 11, Claim 1	1-17
X	US 7135437 B2 (PALLAS et al.) 14 November 2006 Field of the invention, Columns 14-15, Example 150, Claim 1	1-17
X	US 5668085 A (FORBES et al.) 16 September 1997 Abstract, Column 4 lines 55-66, Table 1	1-17
X	WO 2007/054540 A2 (RHODIA RECHERCHES ET TECHNOLOGIES) 18 May 2007 Abstract, Pages 7-8, Table II, Claim 11	1-17

Form PCT/ISA/210 (fifth sheet) (July 2019)

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