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Señor

Jefe de la División de Nuevas Creaciones

Superintendencia de Industria y Comercio

Ministerio de Desarrollo Económico

E. S. D.

SUPERINDUSTRIA Y COMERCIO
Radicacion : 00057253 00000005 Folios: 2
Fecha (AMD): 2002-12-23 14:37:02
Tramite : 002 PATENTES D 1 REGISTRO/ 530 PETICION
Dependencia: 2020 DIVISION DE NUEVAS CREACIONES

Re.: Expediente No. **00.057.253**

Solicitud del examen de patentabilidad correspondiente a la Patente de Invención para:

"UNA COMPOSICIÓN HERBICIDA QUE COMPRENDE UNA SAL DE GLIFOSATO Y UN SURFACTANTE DE OXIDO DE ALQUILO Y/O ALQUELINO AMIDOAMINA"

Solicitante : **HUTSMAN INTERNATIONAL LLC**

SOLICITUD EXAMEN DE PATENTABILIDAD

Yo, **MARGARITA CASTELLANOS ABONDANO**, mayor de edad, identificada y domiciliada como aparece al pié de mi firma, obrando en mi calidad de apoderada de la sociedad solicitante, atentamente me permito solicitar a Ud. que se realice el examen de patentabilidad de la invención arriba citada, para lo cual anexo el comprobante de pago **No. 02-** 85.507 **de Diciembre** 20 **de 2002,** correspondiente a la tasa establecida para dicha solicitud.

En consecuencia, atentamente solicito a Ud. se anexe este memorial junto con el comprobante de pago al expediente correspondiente a esta solicitud de Patente de Invención, y se continúe con su tramitación.

Señor Jefe,

Margarita Castellanos

Margarita Castellanos Abondano
C.C. No. **39.779.654** de Usaquén
T.P.A. No. **70819** del Cons. Sup. de la Judicatura
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Bogotá, 23 DIC. 2002
MCA/gcb/4765

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Industria y Com rcio

SUPERINTENDENCIA

SUPERINTENDENCIA Y COMERCIO
Radicacion : 00057253 00000005 Folios: 2
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Dependencia: 2020 DIVISION DE NUEVAS CREACIONES

NIT : 800178989-2

RECIBO OFICIAL DE CAJA : 02 - 35,507
FECHA : DICIEMBRE 20 DE 2002

***** C O N S I S N A C I O N *****

DEPOSITANTE	TIPO PAGO	BANCO	CUENTA	No. PAGO	FECHA PGO	Vr. PAGO
MONICA VALENCIA ABONBANC CONSIGNACION		BANCO POPULAR	050-00119-4	9322275	20/12/2002	3,302,000.00

***** C O N C E P T O *****

CANT.	CENTISTICO	CONCEPTO	TOTAL CONCEPTO
1	50005-01-01 SOLICITUDES	112 PTC CAP-I EXAMEN DE PATENTIBILIDA	310,000.00
		TOTAL : $	310,000.00

SON: TRESCIENTOS DIEZ Y OCHO MIL PESOS

RECEPCIONADO : _____

RECIBO DE CAJA APLICADO AL EXPEDIENTE No._____

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SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO
DIVISIÓN DE NUEVAS CREACIONES

2020/
Bogotá, D.C.,

Doctor
Margarita Castellanos Abondano **Oficio N°**
Apoderado
RHODIA CONSUMER SPECIALITIES LIMITED

09295

REFERENCIA	**Radicación**	**00 57253**
	Trámite	**002**
	Evento	**001**
	Actuación	**430**
	Folios	**031**

Como resultado del examen de patentabilidad de la solicitud de patente de invención N° 00 57253, realizado según el artículo 45 de la decisión 486 de la comisión de la Comunidad Andina, se notifica:

Documentos estudiados:

. Descripción: folios 5 - 11
. Ejemplos: folios 11-14
. Capítulo reivindicatorio estudiado: folios 15 - 16

Objeto de la invención

La solicitud comprende óxidos de amino alquil amina, mezclados opcionalmente con carboxilatos de éter, surfactantes anfotéricos, quelatos, solventes, hidrotropos y otros agentes humectantes que se usan para preparar soluciones concentradas de Glifosato.

Clasificación Internacional de patentes **A 01 N 25/30 // 57/10**

Claridad de la solicitud

El art. 30 de la Decisión 486 contempla que *"Las reivindicaciones definirán la materia que se desea proteger mediante la patente. Deben ser claras y concisas y estar enteramente sustentadas por la descripción".*

El solicitante debe aclarar la reivindicación 11 en donde cita:

" Un rocío herbicida preparado diluyendo un concentrado de solución de acuerdo con cualquiera de las reivindicaciones 1 a 8, con agua".

En la reivindicación se describe el producto y el procedimiento para aplicar de la composición herbicida, si se tiene en cuenta que en la memoria descriptiva se establecen las características del producto y no del procedimiento esta reivindicación resta claridad a la solicitud.

De otro lado si dicha reivindicación es de procedimiento, es ampliamente conocido que para la aplicación de soluciones herbicidas se requiere diluir las soluciones concentradas en agua y de esta manera aplicar el producto sobre el blanco, en este caso la zona foliar de la planta. Así pues el procedimiento de aplicación tal como está reivindicado no define ninguna condición ó etapa característica diferente a la forma comúnmente utilizada para aplicar una cantidad determinada de una composición herbicida en un sitio específico, de tal forma que dicha composición ejerza su acción.

Se le recuerda al solicitante que una composición se debe definir por sus partes características y la proporción de las mismas que hacen a dicha composición nueva e inventiva frente a las del estado de la técnica.

Determinación del estado de la técnica:

Consultadas las fuentes de información con que cuenta este despacho, se encontraron los siguientes documentos, anteriores a la fecha de presentación de la presente solicitud – 31/07/1999 -, relacionados con la materia de la presente solicitud:

Nº	Documento	Título	Fecha de Publicación
D1	US 5700760	"Herbicidal and plant growth regulant compositions and their use"	23/12/1997
D2	EP 0508667	"Aqueous agricultural compositions, methods of making them and their use"	14/10/1992

Evaluación de los requisitos de patentabilidad:

El artículo 14 de la decisión 486 de la comisión de la comunidad andina establece que: "*Los países miembros otorgarán patentes para las invenciones, sean de producto o de procedimiento, en todos los campos de la tecnología, siempre que sean nuevas, tengan nivel inventivo y sean susceptibles de aplicación industrial*"

En cumplimiento del artículo 14 de la decisión 486 de la comisión de la comunidad andina, se procedió a evaluar el requisito de nivel inventivo con el fin de establecer la patentabilidad de la invención reivindicada en la solicitud en estudio.

Evaluación del NIVEL INVENTIVO

El artículo 18 de la decisión 486 dispone "*Se considerará que una invención tiene nivel inventivo, si para una persona del oficio normalmente versada en la Materia técnica correspondiente, esa invención no hubiese resultado obvia ni se hubiese derivado de manera evidente del estado de la técnica*"

La publicación D1 de la referencia comprende formulaciones de Glifosato en combinación con surfactantes del tipo óxidos de trihidrocarbil-amina como único agente de tensión superficial, que comprende la composición. El amin-óxido se encuentra sustituido por grupos alquil-dimetilo en donde el grupo alquilo lineal, presenta cadenas carbonadas de 10 a 14 átomos de carbono.

El tensioactivo en mención logra reducir la tensión superficial de la emulsión glifosato en agua a asperjar, hasta tal punto que aumenta la superficie de mojamiento y por consiguiente aumenta la absorción foliar.

El análisis comparativo de la anterioridad D1 con respecto a la solicitud objeto de estudio,evidencia que el uso de surfactantes del tipo óxido de alquilo y/o alquenilo amido amina se deriva del estado de la técnica,dado que existían con anterioridad a la presentación de la solicitud documentos que indicaban su amplia aplicación en el campo de los herbicidas, en particular en las formulaciones de Glifosato. De otro lado no se establece con claridad cuales son las ventajas técnicas de incluir en la estructura del surfactante un grupo amido y la insaturación, con respecto a los surfactantes de tipo amin-óxidos y alquil-amin- óxidos empleados en el arte previo.

Por otro lado no se observan las ventajas ó el aporte al estado del arte,relativo al uso de una combinación de surfactantes aplicados en las formulaciones de Glifosato como se reivindica en el numeral 9 y teniendo en cuenta que esta es la característica que se reivindica como novedosa en el documento, debe sustentarse con claridad al interior de la memoria descriptiva de la solicitud.

El documento D2 comprende el uso de tensioactivos tipo amin-óxidos aplicados a formulaciones de pesticidas, insecticidas, herbicidas, fungicidas y biocidas, tal es el caso de los herbicidas fosfóricos como la molécula N-(fosfonometil)glicina (Glifosato). La publicación enseña que el uso de tensioactivos como los amin-óxidos en las formulaciones de glifosato reducen el efecto irritante y corrosivo del activo con respecto al uso de las composiciones convencionales de Glifosato.

Así pues el nivel inventivo del documento en estudio se encuentra afectado, ya que la composición reclamada es de hecho, materia que una persona versada en el arte, pudiese a partir de los conocimientos técnicos que existían, en ese momento llegar a ella ó producirla.

Por tanto con respecto a las anterioridades D1 y D2 el cambio ó la ventaja técnica no es sustancial y no tiene un salto cualitativo que indique un avance inesperado con respecto al arte previo e implique una actividad intelectual verdaderamente inventiva.

Lo anterior hace que los documentos citados puedan afectar el nivel inventivo de la presente solicitud.

En conclusión los requisitos de patentabilidad de la presente solicitud se encuentran afectados así:

Nº	Documento	Reivindicaciones afectadas	Requisito que afecta
D1	US 5700760	1, 3, 9, 10	Nivel Inventivo
D2	EP 0508667	1, 3, 9,10	Nivel Inventivo

En cumplimiento del artículo 45 de la Decisión 486 de la Comisión de la Comunidad Andina, se le indica que debe dar respuesta dentro del término de sesenta días contados a partir de la fecha de la notificación de la presente comunicación. En caso de no dar respuesta al presente requerimiento, o si a pesar de la respuesta subsistieran los impedimentos para la concesión, se denegará la patente.

Notifíquese el presente oficio conforme a lo dispuesto en el numeral 5.2,literal e), del capítulo 5 del título primero de la Circular Única Nº 10 de 2001

Álix Carmenza Céspedes de Vergel
Jefe de la División de Nuevas Creaciones

El anterior requerimiento fue notificado por fijación en lista, de fecha 07 OCT. 2004

CONCEPTO TÉCNICO Número 01261	**EXAMINADOR TÉCNICO** Código 202044 ABS

US005700760A

United States Patent [19]

Magin et al.

[11] Patent Number: 5,700,760

[45] Date of Patent: Dec. 23, 1997

[54] **HERBICIDAL AND PLANT GROWTH REGULANT COMPOSITIONS AND THEIR USE**

[75] Inventors: Ralph W. Magin; Joe D. Sauer, both of Baton Rouge; Deborah A. Quebedeaux, Thibodaux, all of La.

[73] Assignee: Albemarle Corporation, Richmond, Va.

[21] Appl. No.: 627,853

[22] Filed: Apr. 3, 1996

[51] Int. Cl.[6] A01N 57/04

[52] U.S. Cl. 504/206; 504/116

[58] Field of Search 504/206, 116

[56] References Cited

U.S. PATENT DOCUMENTS

3,799,758	3/1974	Franz	504/206
4,075,002	2/1978	Dawes et al.	71/92
4,475,942	10/1984	Bakel	71/86
4,844,734	7/1989	Iwasaki et al.	71/120
5,258,359	11/1993	Knudsen et al.	504/206
5,324,708	6/1994	Morano et al.	504/206
5,464,806	11/1995	Knudsen et al.	504/206

FOREIGN PATENT DOCUMENTS

0274369	7/1988	European Pat. Off. .
0483095	4/1992	European Pat. Off. .
0498785	8/1992	European Pat. Off. .
0577914	1/1994	European Pat. Off. .
0617894	10/1994	European Pat. Off. .
9516351	6/1995	WIPO .

OTHER PUBLICATIONS

Wyrill, III, J. B. and Burnside, O. C. —"Glyphosate Toxicity to Common Milkweed and Hemp Dogbane as Influenced by Surfactants", Weed Science, vol. 25 Issue 3 (May), 1977, pp. 275–287.

Primary Examiner—José G. Dees
Assistant Examiner—Brian G. Bembenick
Attorney, Agent, or Firm—Philip M. Pippenger

[57] ABSTRACT

Glyphosate formulations which are effective even when employed at dosages below the dosage currently recommended for post-emergent herbicidal or plant growth regulant use are described. They are formulated as water solutions or as powders or granules of (a) one or more agriculturally acceptable amine, alkali metal, alkylsulfonium, alkylphosphonium, sulfonylamine, and/or aminoguanidine salts of glyphosate as the only herbicide or plant growth regulant used in forming said composition; and (b) a trihydrocarbyl amine oxide surfactant as the only surface active component used in forming said composition. The amine oxide is (i) a single alkyl dimethyl amine oxide in which the alkyl group is a linear alkyl group having in the range of 10 to 14 carbon atoms, or (ii) a combination of two alkyl dimethyl amine oxides of (i), or (iii) a combination of at least one alkyl dimethyl amine oxide in which the alkyl group is a linear alkyl group having in the range of 10 to 14 carbon atoms and at least one dialkyl methyl amine oxide in which the alkyl groups are linear alkyl groups each having in the range of 8 to 12 carbon atoms. Optionally, one or more agriculturally acceptable substances none of which is a herbicide, or a plant growth regulant or a surfactant can be included in the formulation.

41 Claims, No Drawings

HERBICIDAL AND PLANT GROWTH REGULANT COMPOSITIONS AND THEIR USE

TECHNICAL FIELD

This invention relates to glyphosate formulations which are highly effective even when employed at dosages below the dosage currently recommended for post-emergent herbicidal use against undesired vegetation.

BACKGROUND

Glyphosate, N-(phosphonomethyl)glycine, is a well-known widely used herbicide. It is generally employed in the form of an agriculturally acceptable salt.

In U.S. Pat. No. 5,116,401 to D. C. Young it is pointed out that although glyphosate, is a very active, broad spectrum, systemic, relatively environmentally safe herbicide, its solubility in water at 25° C. is only 1.2 weight percent and many of its homologs and salts are only slightly soluble or are essentially insoluble in water and organic solvents. Thus in practice, formulations of glyphosate salts with other components to enhance its solubility and its effectiveness are typically used.

Over the years a wide variety of substances, including surfactants, have been studied or proposed as adjuvants to enhance the effectiveness of glyphosate. For example, J. W. Kassebaum and H. C. Berk indicate in U.S. Pat. No. 5,317,003, that surfactants are usually employed to enhance the effectiveness of glyphosate when it is applied to the foliage of various plants, and that the most widely used surfactant in commercial compositions is an ethoxylated fatty amine. In addition, they refer to knowledge in the art that a particular surfactant used in an aqueous composition with a herbicide can enhance the effectiveness of the herbicide, whereas other surfactants have very little, if any, beneficial effect. They also note that some surfactants may exhibit antagonistic effects. As an example they cite the work of Wyrill and Burnside, *Weed Science, Volume* 25, (1977), pages 275–287 wherein, among other things, it was found that the surfactant ETHOQUAD 18/12 was relatively ineffective in enhancing phytotoxicity of glyphosate to hemp dogbane whereas in a separate experiment an analogous compound, ETHOQUAD 18/25, was one of the most effective surfactants tested.

Another similar finding of Wyrill and Burnside was that dimethyl cocoamine oxide (AROMOX DMCD) was less effective than dimethyl hexadecyl amine oxide in improving the phytotoxicity of glyphosate to hemp dogbane.

Despite the extensive studies and efforts devoted to improving the performance of glyphosate, a need exists for a way of potentiating the effectiveness of glyphosate salts such as the amine, sodium, alkylsulfonium, alkylphosphonium, sulfonylamine, and aminoguanidine salts thereof by means of an environmentally friendly aqueous formulation made from as few ingredients as possible, especially if this can be accomplished by use of readily available, cost-effective materials while at the same time avoiding the inclusion of polyvalent metal-containing and metalloid-containing components in the formulation.

This invention is deemed to fulfill this need in an effective and highly efficient manner.

THE INVENTION

This invention involves the discovery, inter alia, that despite the relative ineffectiveness of dimethyl cocoamine oxide in enhancing the effectiveness of glyphosate as compared to dimethyl hexadecyl amine oxide, certain linear alkyl dimethyl amine oxides with molecular weights lower than dimethyl hexadecyl amine oxide were even more effective than dimethyl hexadecyl amine oxide in increasing the phytotoxic effectiveness of glyphosate against a number of common plant species. This is surprising in light of the fact that the relatively ineffective dimethyl cocoamine oxide used by Wyrill and Burnside is a mixture of alkyl dimethyl amine oxides predominating in alkyl dimethyl amine oxides of molecular weights below that of dimethyl hexadecyl amine oxide.

Moreover, this invention makes it possible to achieve enhanced phytotoxic or plant growth regulant effectiveness in a formulation formed from as few as two active ingredients (glyphosate and amine oxide), both of which are readily available in the marketplace. Also, the particular amine oxides used are environmentally friendly and the formulation requires no polyvalent metal or metalloid components in its formation. Indeed the preferred compositions are devoid of metal and metalloid additive content, and most preferably contain only the elements C, H, O, N, P, and optionally S. Moreover, the liquid concentrates are most preferably formed using deionized water.

In accordance with one of its embodiments this invention provides a method of controlling vegetation by applying to plant foliage, preferably by spraying, a polyvalent metal-free and metalloid-free solution containing an effective herbicidal or plant growth regulant amount of a composition formed by intimately mixing the following ingredients with water: (a) at least one agriculturally acceptable amine, alkali metal, alkylsulfonium, alkylphosphonium, sulfonylamine, or aminoguanidine salt of glyphosate as the only herbicide used in forming the composition; and (b) a particular trihydrocarbyl amine oxide surfactant as the only surface active component used informing the composition. The particular trihydrocarbyl amine oxide used in forming the composition is:

1) a single alkyl dimethyl amine oxide in which the alkyl group is a linear alkyl group having in the range of 10 to 14 carbon atoms, or

2) a combination of two alkyl dimethyl amine oxides of 1) above, or

3) a combination of at least one alkyl dimethyl amine oxide in which the alkyl group is a linear alkyl group having in the range of 10 to 14 carbon atoms, and at least one dialkyl methyl amine oxide in which the alkyl groups are linear alkyl groups each having in the range of 8 to 12 carbon atoms.

Another embodiment of this invention is a herbicide or plant growth regulant formulation which comprises a polyvalent metal-free and metalloid-free solution containing an effective herbicidal or plant growth regulant amount of a composition formed by intimately mixing the following ingredients with water:

(a) at least one agriculturally acceptable amine, alkali metal, alkylsulfonium, alkylphosphonium, sulfonylamine, or aminoguanidine salt of glyphosate as the only herbicide used in forming the composition;

(b) a trihydrocarbyl amine oxide surfactant as the only surface active component used in forming the composition, which trihydrocarbyl amine oxide is as set forth as 1), 2) and 3) above; and

(c) optionally, one or more substances, that are not herbicides, or plant growth regulants, or surfactants, such as dyes, humectants, corrosion inhibitors, stickers, spreaders and thickeners.

Still another embodiment of this invention is a herbicide or plant growth regulant formulation which comprises a mixture in powder or granular form containing an effective herbicidal or plant growth regulant amount of a composition formed by intimately mixing together components (a) and (b) above, and optionally including one or more of (c) above. Such compositions can also be formed by evaporating to dryness (e.g., by spray drying, extrusion or pan granulation) a solution of components (a) and (b), and optionally (c) above. Application of the powder formulations to vegetation as foliar dusts for effecting control of the vegetation constitutes another embodiment of this invention.

It will be appreciated that to effect control of undesired plant vegetation pursuant to this invention, recourse may be had to herbicidal activity whereby undesired vegetation is killed and/or to plant growth regulant activity whereby the further growth of the vegetation is stunted, inhibited and/or slowed without actually killing all of the undesired vegetation treated with the composition.

The herbicidal (phytotoxic) and the growth regulant compositions include aqueous concentrates which can be shipped and stored until diluted with more water on site to produce the final solution for application to the foliage as by spraying. Likewise the herbicidal and the plant growth regulant compositions of this invention include the more dilute aqueous solutions for use in application to the foliage. These more dilute aqueous solutions are preferably formed simply by suitably diluting a concentrate of this invention with water (if a powder or granular concentrate) or with more water (if a liquid concentrate) to achieve the appropriate dosage, but alternatively, can be formed on site by intimately mixing the ingredients separately and/or in subcombinations with sufficient water on site to achieve the appropriate dosage. Use of the solid or liquid concentrates of this invention is preferable as it is a much simpler operation and minimizes the possibility of blending errors. Moreover, if desired, other components can be introduced into the final solution at the time the concentrate is blended with water to form the diluted solution for application to the foliage.

Of the particular amine oxides used in the practice of this invention, those of 1) above are preferred. The most preferred amine oxide ingredient is tetradecyl dimethyl amine oxide because of the great effectiveness which it has consistently exhibited in the test work conducted to date.

Component (a)

The identities and methods for the preparation of the glyphosate ingredient of the formulation are well known and are reported in the literature. See for example, U.S. Pat. No. 3,799,758 to J. E. Franz which describes amine salts and alkali metal salts of glyphosate, and the production of glyphosate by such methods as the phosphonomethylation of glycine, the reaction of ethyl glycinate with formaldehyde and diethylphosphite, and the oxidation of the corresponding aminophosphinic compounds. Another method involves conducting a Mannich reaction with phosphorous acid and formaldehyde on iminodiacetic acid followed by controlled oxidation to N-(phosphonomethyl)glycine. Typically the amine of the glyphosate amine salts has a molecular weight of less than 300. A preferred amine salt of glyphosate is a salt formed with isopropyl amine. Of the alkali metal salts of glyphosate, sodium is the preferred cation. Inasmuch as glyphosate has more than one replaceable hydrogen atom, either or both of mono- and dialkali metal salts of glyphosate can be formed and used. The alkylsulfonium salts of glyphosate are described for example in U.S. Pat. No. 4,315,765 to G. B. Large, and analogous procedures can be used for producing alkylphosphonium salts. Of the alkylsulfonium and alkylphosphonium salts, the trimethylsulfonium salt of glyphosate is preferred. Sulfonylamine and amidoguanidine salts of glyphosate which are also suitable for use pursuant to this invention are disclosed in EP-A-0 088 180. The patent literature contains numerous additional references to various other methods for the production of glyphosate. See for example U.S. Pat. Nos. 4,851,159; 4,898,972; 4,937,376; 4,952,723; 5,061,820; and 5,072,033 to Fields Jr. et al.; 5,023,369 to Fields, Jr.; 4,853,159 to Riley et. al; and 5,047,579 to Glowka et al., as well as relevant references cited in these patents. Fields, Jr. et al. U.S. Pat. No. 4,965,403 describes a process for producing the alkali metal salts of glyphosate. Aqueous solutions of glyphosate salts devoid of other adjuvants are commercially available from Monsanto Company and these solutions are suitable for use in forming the compositions of this invention.

Component (b)

Methods for producing the particular trialkyl amine oxides used in the practice of this invention are also well known and are reported in the literature. Typically they involve the controlled oxidation of the appropriate trialkyl amine, such as with hydrogen peroxide. See for example U.S. Pat. Nos. 4,889,954; 4,942,260; 4,960,934; 4,970,340; 4,970,341; 4,994,614; 5,130,488; 5,208,374; and 5,254,735. Highly suitable compounds of types 1) and 2) above and for use as in the combinations of type 3) above are available from Albemarle Corporation under the ADMOX trademark. Suitable dialkyl methyl amine oxides for use in the combinations of amine oxides of type 3) above are also available from Albemarle Corporation, in this case under the DAMOX trademark.

Table 1 sets forth general and preferred proportions for use in forming the liquid concentrate formulations of this invention. The percentages given in Table 1 are weight percentages, and represent weight percent of the total composition. The percentages for the amine, alkali metal, alkylsulfonium, alkylphosphonium, sulfonylamine, and/or amidoguanidine salt ("Glyphosate Salt") used in the practice of this invention as given in Table 1 are on an active ingredient basis and are in terms of glyphosate acid equivalent (i.e., the weight of the particular salt-forming portion of the product is excluded from the weight of the salt). Likewise the amount of any water associated with the salt as received is excluded from consideration as regards the percentages of the Glyphosate Salt shown in the table.

TABLE 1

Ingredient	General Range, wt %	Preferred Range, wt %
(a) Glyphosate Salt	0.1 to 69%	18 to 65%
(b) Amine Oxide	1 to 70%	10 to 25%
Other Ingredient(s)	0 to 20%	0 to 5%
Water	Balance to 100%	Balance to 100%

Table 2 sets forth the proportions which can be used in forming the powder or granular compositions of this invention. As in Table 1, the percentages given in Table 2 are weight percentages on an active ingredient basis, and represent weight percent of the total composition. And as above, the percentages for the amine, alkali metal, alkylsulfonium, alkylphosphonium, sulfonylamine, and/or amidoguanidine glyphosate salt ("Glyphosate Salt") used in the practice of this invention as given in Table 2 are in terms of glyphosate acid equivalent.

TABLE 2

Ingredient	General Range, wt %	Preferred Range, wt %
(a) Glyphosate Salt	10 to 99%	75 to 98%
(b) Amine oxide	1 to 90%	2 to 25%
Other Ingredient(s)	0 to 20%	0 to 10%

The diluted solutions for application to the plant foliage are typically formed prior to application using a tank mixer, spray tank or similar apparatus. The dosage level of the composition applied to the plant foliage will depend to some extent upon the plant species being treated, and the prevailing weather conditions. Generally speaking, however, the amount applied will be a herbicidal or plant growth regulant amount falling within the range of about 50 to about 1250 grams of glyphosate (on an acid equivalent basis, i.e., excluding the weight of the cationic salt associated therewith) per hectare. In terms of ounces avoirdupois per acre this range corresponds (on the same acid equivalent basis) to about 0.7 to about 20 ounces of glyphosate per acre. In accordance with this invention it is preferred to employ a herbicidal or growth regulant amount (again on an acid equivalent basis) falling within the range of about 200 to about 830 grams of glyphosate per hectare which corresponds (on the same acid equivalent basis) to about 3 to about 12 ounces avoirdupois of glyphosate per acre, as this is generally sufficient to control most undesired plant species, is below the dosage currently recommended for herbicidal use of glyphosate formulations, and is thus more economical and environmentally friendly. On the basis of this disclosure and the new technology described herein, it is now possible to make departures from the foregoing ranges whenever such is deemed necessary or desirable in any given situation.

The following non-limiting Examples illustrate the practice and advantages of this invention.

EXAMPLE I

A field test was conducted in which the effectiveness of 4 compositions of this invention was directly compared to the effectiveness of dimethyl hexadecyl amine oxide, the more effective alkyl amine oxide as reported by Wyrill and Burnside, loc. cit. All solutions were at equal concentration of glyphosate isopropyl amine salt and equal concentrations of the respective surfactants were used. Each test formulation consisted of the aqueous solution made from the N-(phosphonomethyl)glycine isopropyl amine salt, water, and the surfactant under test. No other component or ingredient was employed in forming the test formulations. The glyphosate used in forming the test formulations was ROUND-UP® D-Pak from Monsanto, which is a 62.0% aqueous solution of the glyphosate isopropyl amine salt in water with no other component therein. The control formulation contained the commercial adjuvant INDUCE® (Helena Chemical Company) which, according to *A Guide to Agricultural Spray Adjuvants Used in the United States*, by T. L. Harvey, 1992–93 Edition, Thomson Publications, Fresno, Calif., page 33 is alkyl polyoxyalkene ether, free fatty acids and IPA, which is an adjuvant currently recommended for use in glyphosate formulations. The control formulation was applied at the recommended dosage level of 15 fluid ounces of glyphosate (active ingredient basis) per acre (624 grams of glyphosate per hectare). The amine oxide test formulations were applied at the dosage level of 10 fluid ounces of glyphosate per acre (416 grams of glyphosate per hectare, active ingredient basis), and thus provided only two-thirds of the active glyphosate herbicide as the control formulation. All solutions contained one percent of the particular adjuvant used.

All tests were conducted at the same experimental test site at the same time, and were performed with four replicate tests for each composition, using randomized plots. Each plot was 8 feet by 15 feet (2.4 meters by 4.6 meters) in size. Single applications were made between 9:30 a.m. and 11:30 a.m. on the same cool, sunny day with a relative humidity reading of 70% and an air/soil temperature of 89° F. and 88° F. (ca. 32° C. and ca. 31° C.), respectively. The application was made with a carbon dioxide pressurized back pack sprayer. The weed species populations were wild poinsettia (2–7 inches in height with 2–5 leaves per plant), and a combination of Johnson grass and barnyard grass (3–6 inches in height with 3–5 leaves per plant). The soil and leaf conditions were both dry at the time of application. Observations of percentage of control in the test plots were made 4 days, 7 days and 14 days after the application. No rainfall occurred in the first 24 hours after application. Thereafter the rainfall (in inches and in millimeters, respectively) was 0.11/2.79 in first three days after application, 0.06/1.52 in days 4 to 7, and 0.95/24.1 during week two after application.

Table 3 identifies the designations used in subsequent tables to identify test formulations employed. Table 4 summarizes the results obtained in the above tests on the wild poinsettia weed species. Table 5 gives the same information for the Johnson grass/barnyard grass species.

TABLE 3

	Formulations Used in the Field Tests
	Composition
Formulations of the Invention	
A	Glyphosate IPA salt (10 fluid oz./acre) in water to which was added 1 wt % n-decyl dimethyl amine oxide
B	Glyphosate IPA salt (10 fluid oz./acre) in water to which was added 1 wt % n-dodecyl dimethyl amine oxide
C	Glyphosate IPA salt (10 fluid oz./acre) in water to which was added 1 wt % n-tetradecyl dimethyl amine oxide

TABLE 3-continued

Formulations Used in the Field Tests	
	Composition
Formulations Not of the Invention	
D	Glyphosate IPA salt (10 fluid oz./acre) in water to which was added 1 wt % n-hexadecyl dimethyl amine oxide
E	Glyphosate IPA salt (15 fluid oz./acre) in water to which was added 1 wt % INDUCE

TABLE 4

Wild Poinsettia Control			
Formulation	% Control, 4 Days	% Control, 7 Days	% Control, 14 Days
A	54	75	88
B	60	74	91
C	56	75	88
E	39	48	54
F	45	64	73

TABLE 5

Johnson Grass and Barnyard Grass Control			
Formulation	% Control, 4 Days	% Control, 7 Days	% Control, 14 Days
A	53	75	81
B	61	71	80
C	48	68	75
D	31	48	46
E	59	76	84

EXAMPLE II

Another group of field tests was conducted in the same manner as in Example I except that the plant species tested was morning glory. Single applications were made on another day between 9:30 a.m. and 11:30 a.m. On the date of application the weather was calm, and sunny day with a relative humidity reading of 70% and an air/soil temperature of 85° F. and 88° F. (ca. 30° C. and ca. 31° C.), respectively. The morning glory populations were 3–7 inches in height with 3–6 leaves per plant). Observations of percentage control were made 3, 7 and 14 days after application. Rainfall during the test period (inches/millimeters) was none in the first 24 hours after application, 0.54/13.7 in the first 3 days, 1.32/33.5 in days 4–7, and 0.23/5.84 in the second week of the test. Otherwise, the conditions and operations were conducted in essentially the same manner as in Example I. Table 6 summarizes the results of these tests on morning glory, which is a known to be a troublesome species that is difficult for control by glyphosate.

TABLE 6

Morning Glory Control			
Formulation	% Control, 4 Days	% Control, 7 Days	% Control, 14 Days
A	20	65	71
B	22	65	71
C	26	75	81
D	16	54	60
E	20	68	78

EXAMPLE III

Another group of field tests was conducted in the same manner as in Example I with the following exceptions:

a) Barnyard grass and crab grass; red weed; sickle pod; morning glory; and hemp sesbania were the plant species tested.

b) The tests were performed with three replicate tests for each composition, using randomized plots 10 feet by 15 feet (3.1 meters by 4.6 meters) in size.

c) Each amine oxide used (see Table 5) was employed in spray formulations in which the glyphosate concentrations were ½ and ⅓ of the recommended glyphosate concentration.

d) The applications were made between 10:00 am and 2:30 pm under weather conditions of 85°/92° F. (ca. 30°/33° C.) air/soil temperature, respectively, 75% relative humidity.

e) Observations of % control were made 7 days and 19 days after application.

f) In addition to formulations B and C, the compositions of the invention included the formulations set forth in Table 7.

TABLE 7

Formulations Used in the Field Tests

Formulations of the Invention	Composition
K	Glyphosate IPA salt (5 fluid oz./acre) in water to which was added 1 wt % n-dodecyl dimethyl amine oxide
L	Glyphosate IPA salt (5 fluid oz./acre) in water to which was added 1 wt % n-tetradecyl dimethyl amine oxide
M	Glyphosate IPA salt (5 fluid oz./acre) in water to which was added 0.65 wt % n-dodecyl dimethyl amine oxide and 0.35 wt % n-tetradecyl dimethyl amine oxide
N	Glyphosate IPA salt (10 fluid oz./acre) in water to which was added 0.65 wt % n-dodecyl dimethyl amine oxide and 0.35 wt % n-tetradecyl dimethyl amine oxide
O	Glyphosate IPA salt (5 oz./acre) in water to which was added 0.5 wt % n-dodecyl dimethyl amine oxide and 0.5 wt % bis(n-decyl)methyl amine oxide
P	Glyphosate IPA salt (10 fluid oz./acre) in water to which was added 0.5 wt. % n-dodecyl dimethyl amine oxide and 0.5 wt % bis(n-decyl)methyl amine oxide

Otherwise, the conditions and operations were conducted in essentially the same manner as in Example I. Tables 8–12 summarize the results of these tests on barnyard grass and crab grass; red weed; sickle pod; morning glory; and hemp sesbania, respectively. The dosages are in terms of fluid ounces of glyphosate (ROUNDUP D-PAK) per acre on an active ingredient basis.

TABLE 8

Barnyard Grass and Crab Grass Control

Formulation	Dosage	% Control, 7 days	% Control, 19 days
K	5 oz./acre	82	80
B	10 oz./acre	95	98
L	5 oz./acre	87	60
C	10 oz./acre	97	100
M	5 oz./acre	83	85
N	10 oz./acre	93	98
O	5 oz./acre	97	90
P	10 oz./acre	82	75
E	15 oz./acre	95	92

TABLE 9

Red Weed Control

Formulation	Dosage	% Control, 7 days	% Control, 19 days
K	5 oz./acre	58	75
B	10 oz./acre	75	87
L	5 oz./acre	57	68
C	10 oz./acre	85	88
M	5 oz./acre	48	60
N	10 oz./acre	82	85
O	5 oz./acre	45	75
P	10 oz./acre	90	92
E	15 oz./acre	98	92

TABLE 10

Sickle Pod Control

Formulation	Dosage	% Control, 7 days	% Control, 19 days
K	5 oz./acre	30	80
B	10 oz./acre	62	98

TABLE 10-continued

Sickle Pod Control

Formulation	Dosage	% Control, 7 days	% Control, 19 days
L	5 oz./acre	33	60
C	10 oz./acre	74	100
M	5 oz./acre	35	85
N	10 oz./acre	59	98
O	5 oz./acre	23	50
P	10 oz./acre	43	75
E	15 oz./acre	62	70

TABLE 11

Morning Glory Control

Formulation	Dosage	% Control, 7 days	% Control, 19 days
K	5 oz./acre	57	60
B	10 oz./acre	70	77
L	5 oz./acre	55	70
C	10 oz./acre	78	88
M	5 oz./acre	53	78
N	10 oz./acre	68	77
O	5 oz./acre	58	73
P	10 oz./acre	75	82
E	15 oz./acre	73	82

TABLE 12

Hemp Sesbania Control

Formulation	Dosage	% Control, 7 days	% Control, 19 days
K	5 oz./acre	17	83
B	10 oz./acre	18	90
L	5 oz./acre	12	60
C	10 oz./acre	35	80
M	5 oz./acre	11	63
N	10 oz./acre	20	78
O	5 oz./acre	13	67
P	10 oz./acre	28	82
E	15 oz./acre	25	90

Optionally, one or more other suitable substances can be employed in the formulations of this invention provided no such substance materially detracts from the effectiveness of

the composition in combatting the particular plant species to be controlled by use of the formulation. By "materially" in this context is meant that in tests conducted by concurrent application under identical conditions and using identical dosages of one or the other of two (2) test formulations to a plant species in three (3) identical pairs of test plots (each pair consisting of a Case I plot and a Case II plot) in the same substantially uniform test site, where in Case I the formulation of this invention does not contain such additional substance(s) whereas in Case II the identical formulation does additionally contain such additional substance(s), there is a reduction in the average percentages of the plant species controlled in the three (3) Case II plots as compared to the average percentages of the plant species controlled in the three (3) Case I plots, and the arithmetic difference between these averages exceeds 10%. Such other substances that may be used if they do not materially detract from the effectiveness of the composition include dyes, pigments, humectants, corrosion inhibitors, thickeners, adhering agents (stickers), spreading agents, and like materials. Such other substances can be introduced into the formulation in any sequence relative to components (a) and (b) hereof, i.e., such materials can be added before, after or at the same time as either or both of components (a) and (b). In this connection, it will be recalled that the one or more glyphosate salts constitute(s) the only herbicide(s) or plant growth regulant(s) used in forming the compositions of this invention. Likewise one or more of the herein-described amine oxides constitute(s) the only surfactant(s) used in forming the compositions of this invention. This ensures that the substantial benefits provided by this invention are realized in full.

The powder or granular formulations of this invention may be mixed with a finely-divided solid diluent such as talc, gypsum, Fuller's earth, kaolin, kieselguhr, bentonite, dolomite, calcium carbonate, and powdered magnesia. They may also be formulated as dispersible powders or grains, and in this case it is desirable to include a wetting agent to facilitate the dispersion of powder or grains in the liquid carrier. Additionally, formulations in the form of powders can be applied to vegetation as foliar dusts.

It is to be understood that the terms "ingredient" or "component" or "substance" as used anywhere in the specification or claims hereof, whether used in the singular or plural, are used in the sense that it is a substance employed in forming the powder or granular concentrate or aqueous solution, and thus at least prior to mixing with other ingredients, components and/or addition to an aqueous medium, the ingredient or component is in the chemical form specified. It matters not what chemical changes, transformations and/or reactions, if any, take place in the mixture or aqueous medium itself as such changes, transformations and/or reactions are the natural result of bringing the specified ingredients or components together as solids or in an aqueous medium.

Each and every patent or other publication referred to in any portion of this specification is fully incorporated into this disclosure by reference as if fully set forth herein.

This invention is susceptible to considerable variation in its practice. Therefore the foregoing description is not intended to limit, and should not be construed as limiting, the invention to the particular exemplifications presented hereinabove. Rather, what is intended to be covered is as set forth in the ensuing claims and the equivalents thereof permitted as a matter of law.

What is claimed is:

1. A method of controlling vegetation which comprises applying to plant foliage a polyvalent metal-free and metalloid-free solution containing a herbicidal or plant growth regulant amount of a composition formed by intimately mixing the following ingredients with water:

a) at least one agriculturally acceptable mine, alkali metal, alkylsulfonium, alkylphosphonium, sulfonylamine, or aminoguanidine salt of glyphosate as the only herbicide used in forming said composition; and

b) a trihydrocarbyl mine oxide surfactant as the only surface active component used in forming said composition, said trihydrocarbyl amine oxide being selected from the group consisting of (i) a single alkyl dimethyl mine oxide in which said alkyl group is a linear alkyl group having in the range of 10 to 14 carbon atoms, (ii) a combination of two alkyl dimethyl amine oxides of (i), and (iii) a combination of at least one alkyl dimethyl amine oxide in which said alkyl group is a linear alkyl group having in the range of 10 to 14 carbon atoms and at least one dialkyl methyl mine oxide in which said alkyl groups are linear alkyl groups each having in the range of 8 to 12 carbon atoms.

2. A method according to claim 1 wherein ingredient a) is an amine or alkylsulfonium salt of glyphosate.

3. A method according to claim 1 wherein ingredient a) is the isopropyl amine salt of glyphosate.

4. A method according to claim 1 wherein ingredient b) is a single linear alkyl dimethyl amine oxide in which the linear alkyl group has an even number of carbon atoms.

5. A method according to claim 1 wherein ingredient b) is n-tetradecyl dimethyl amine oxide.

6. A method according to claim 1 wherein ingredient b) is a combination of n-dodecyl dimethyl amine oxide and n-tetradecyl dimethyl amine oxide.

7. A method according to claim 1 wherein ingredient b) is a combination of n-dodecyl dimethyl amine oxide and bis(n-decyl) methyl amine oxide.

8. A method according to claim 1 wherein ingredient a) is the isopropyl amine salt of glyphosate and wherein ingredient b) is a single linear alkyl dimethyl amine oxide in which the linear alkyl group has an even number of carbon atoms.

9. A method according to claim 1 wherein ingredient a) is the isopropyl amine salt of glyphosate and wherein ingredient b) is n-tetradecyl dimethyl amine oxide.

10. A method according to claim 1 wherein ingredient a) is the isopropyl amine salt of glyphosate and wherein ingredient b) is a combination of n-dodecyl dimethyl amine oxide and n-tetradecyl dimethyl amine oxide.

11. A method according to claim 1 wherein ingredient a) is the isopropyl amine salt of glyphosate and wherein ingredient b) is a combination of n-dodecyl dimethyl amine oxide and bis(n-decyl) methyl amine oxide.

12. A herbicide or plant growth regulant formulation which comprises a polyvalent metal-free and metalloid-free solution containing a herbicidal or plant growth regulant amount of a composition formed by intimately mixing the following ingredients with water:

a) at least one agriculturally acceptable amine, alkali metal, alkylsulfonium, alkylphosphonium, sulfonylamine, or aminoguanidine salt of glyphosate as the only herbicide or plant growth regulant used in forming said composition;

b) a trihydrocarbyl amine oxide surfactant as the only surface active component used in forming said composition, said trihydrocarbyl amine oxide being selected from the group consisting of (i) a single alkyl dimethyl amine oxide in which said alkyl group is a linear alkyl group having in the range of 10 to 14

carbon atoms, (ii) a combination of two alkyl dimethyl amine oxides of (i), and (iii) a combination of at least one alkyl dimethyl amine oxide in which said alkyl group is a linear alkyl group having in the range of 10 to 14 carbon atoms and at least one dialkyl methyl amine oxide in which said alkyl groups are linear alkyl groups each having in the range of 8 to 12 carbon atoms; and

c) optionally, one or more agriculturally acceptable substances none of which is a herbicide, or a plant growth regulant or a surfactant.

13. A formulation according to claim 12 wherein ingredient a) is an amine or alkylsulfonium salt of glyphosate.

14. A formulation according to claim 12 wherein ingredient a) is the isopropyl amine salt of glyphosate.

15. A formulation according to claim 12 wherein ingredient b) is a single linear alkyl dimethyl amine oxide in which the linear alkyl group has an even number of carbon atoms.

16. A formulation according to claim 12 wherein ingredient b) is n-tetradecyl dimethyl amine oxide.

17. A formulation according to claim 12 wherein ingredient b) is a combination of n-dodecyl dimethyl amine oxide and n-tetradecyl dimethyl amine oxide.

18. A formulation according to claim 12 wherein ingredient b) is a combination of n-dodecyl dimethyl amine oxide and bis(n-decyl) methyl amine oxide.

19. A formulation according to claim 12 wherein ingredient a) is the isopropyl amine salt of glyphosate and wherein ingredient b) is a single linear alkyl dimethyl amine oxide in which the linear alkyl group has an even number of carbon atoms.

20. A formulation according to claim 12 wherein ingredient a) is the isopropyl amine salt of glyphosate and wherein ingredient b) is n-tetradecyl dimethyl amine oxide.

21. A formulation according to claim 12 wherein ingredient a) is the isopropyl amine salt of glyphosate and wherein ingredient b) is a combination of n-dodecyl dimethyl amine oxide and n-tetradecyl dimethyl amine oxide.

22. A formulation according to claim 12 wherein ingredient a) is the isopropyl amine salt of glyphosate and wherein ingredient b) is a combination of n-dodecyl dimethyl amine oxide and bis(n-decyl) methyl amine oxide.

23. A formulation according to claim 12 consisting of the solution resulting from intimately mixing ingredients a) and b) with water.

24. A herbicide or plant growth regulant formulation which comprises a polyvalent metal-free and metalloid-free powder or granular mixture containing a herbicidal or plant growth regulant amount of a composition formed by intimately mixing together the following ingredients:

a) at least one agriculturally acceptable amine, alkali metal, alkylsulfonium, alkylphosphonium, sulfonylamine, or aminoguanidine salt of glyphosate as the only herbicide or plant growth regulant used in forming said composition;

b) a trihydrocarbyl amine oxide surfactant as the only surface active component used in forming said composition, said trihydrocarbyl amine oxide being selected from the group consisting of (i) a single alkyl dimethyl amine oxide in which said alkyl group is a linear alkyl group having in the range of 10 to 14 carbon atoms, (ii) a combination of two alkyl dimethyl amine oxides of (i), and (iii) a combination of at least one alkyl dimethyl amine oxide in which said alkyl group is a linear alkyl group having in the range of 10 to 14 carbon atoms and at least one dialkyl methyl amine oxide in which said alkyl groups are linear alkyl groups each having in the range of 8 to 12 carbon atoms; and

c) optionally, one or more agriculturally acceptable substances none of which is a herbicide, or a plant growth regulant or a surfactant.

25. A formulation according to claim 24 wherein ingredient a) is an amine or alkylsulfonium salt of glyphosate.

26. A formulation according to claim 24 wherein ingredient a) is the isopropyl amine salt of glyphosate.

27. A formulation according to claim 24 wherein ingredient b) is a single linear alkyl dimethyl amine oxide in which the linear alkyl group has an even number of carbon atoms.

28. A formulation according to claim 24 wherein ingredient b) is n-tetradecyl dimethyl amine oxide.

29. A formulation according to claim 24 wherein ingredient b) is a combination of n-dodecyl dimethyl amine oxide and n-tetradecyl dimethyl amine oxide.

30. A formulation according to claim 24 wherein ingredient b) is a combination of n-octyl dimethyl amine oxide and bis(n-decyl) methyl amine oxide.

31. A formulation according to claim 24 wherein ingredient a) is the isopropyl amine salt of glyphosate and wherein ingredient b) is a single linear alkyl dimethyl amine oxide in which the linear alkyl group has an even number of carbon atoms.

32. A formulation according to claim 24 wherein ingredient a) is the isopropyl amine salt of glyphosate and wherein ingredient b) is n-tetradecyl dimethyl amine oxide.

33. A formulation according to claim 24 wherein ingredient a) is the isopropyl amine salt of glyphosate and wherein ingredient b) is a combination of n-dodecyl dimethyl amine oxide and n-tetradecyl dimethyl amine oxide.

34. A formulation according to claim 24 wherein ingredient a) is the isopropyl amine salt of glyphosate and wherein ingredient b) is a combination of n-octyl dimethyl amine oxide and bis(n-decyl) methyl amine oxide.

35. A formulation according to claim 24 formed by spray drying a water solution formed by mixing ingredients a) and b) with water.

36. A method of controlling vegetation which comprises applying to plant foliage a herbicidal or plant growth regulant amount of a polyvalent metal-free and metalloid-free herbicide or plant growth regulant composition formed by intimately mixing together the following ingredients:

a) at least one agriculturally acceptable amine, alkali metal, alkylsulfonium, alkylphosphonium, sulfonylamine, or aminoguanidine salt of glyphosate as the only herbicide or plant growth regulant used in forming said composition;

b) a trihydrocarbyl amine oxide surfactant as the only surface active component used in forming said composition, said trihydrocarbyl amine oxide being selected from the group consisting of (i) a single alkyl dimethyl amine oxide in which said alkyl group is a linear alkyl group having in the range of 10 to 14 carbon atoms, (ii) a combination of two alkyl dimethyl amine oxides of (i), and (iii) a combination of at least one alkyl dimethyl amine oxide in which said alkyl group is a linear alkyl group having in the range of 10 to 14 carbon atoms and at least one dialkyl methyl amine oxide in which said alkyl groups are linear alkyl groups each having in the range of 8 to 12 carbon atoms; and

c) optionally, one or more agriculturally acceptable substances none of which is a herbicide, or a plant growth regulant or a surfactant.

37. A method according to claim 36 wherein said herbicide or plant growth regulant composition is in the form of a powder, and wherein said composition is applied to the foliage as a foliar dust.

38. A method according to claim 1 wherein said ingredients consist of a) and b).

39. A formulation according to claim 12 wherein said ingredients consist of a) and b).

40. A formulation according to claim 24 wherein said ingredients consist of a) and b).

41. A method according to claim 36 wherein said ingredients consist of a) and b).

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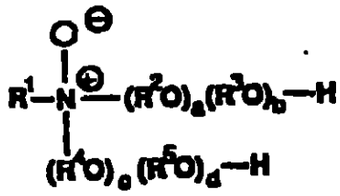
(54) Aqueous agricultural compositions, methods of making them and their use.

(57) The present invention discloses a method of producing an aqueous agricultural composition exhibiting reduced irritation to animals and corrosiveness to materials by admixing an agriculturally acceptable compound and an amine-oxide surfactant having the Formula:



wherein R^1 is a straight or branched chain about C_8 to about C_{20} alkyl or alkenyl group, R^2, R^3, R^4 and R^5 are each independently selected from the group of straight and branched chain lower alkylenyl groups, and a + b + c + d is about 5 to about 25. The compositions exhibit reduced eye irritation to animals and reduced corrosiveness to metals. A method of treating plants is also disclosed.

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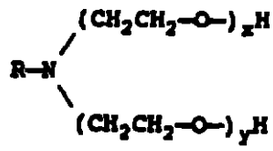
This invention relates to a method of producing an aqueous agricultural composition and agricultural compositions. Preferably, the agricultural compound of the composition is a herbicidally active compound.

Many agricultural compounds such as herbicides, fertilizers, pesticides and the like must be absorbed to be effective. For example, herbicides are utilized to inhibit or destroy plant growth.

A compound that enhances the absorption of agricultural compounds such as herbicides is a tertiary amine surfactant having the Formula:

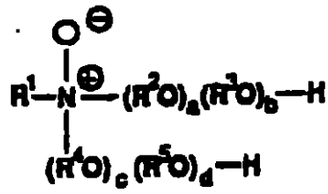


where R is derived from tallow oil having an average of 18 carbon atoms and x + y total 15.

However, these surfactants are irritants to animals and corrosive to materials. It is presently believed that the irritative and corrosive effects are due to the unshared pair of electrons in the amino group. The amine can be neutralized with an organic or inorganic acid, e.g., acetic acid, that converts the amino group to its ammonium derivative. However, neutralization with these organic or inorganic acids does not satisfactorily reduce the irritative or corrosive effect of the surfactant or the composition to which it is added.

Summary of the Invention

This invention is directed to a method of producing an aqueous agricultural composition exhibiting reduced eye irritation to animals and reduced corrosiveness to metals comprising admixing an agriculturally acceptable compound with an amine-oxide surfactant of the Formula I:

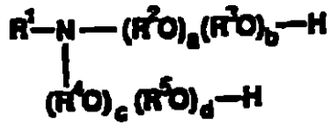


I.

wherein R^1 is a straight or branched chain about C_8 to about C_{20} alkyl or alkenyl group, R^2, R^3, R^4 and R^5 are each independently selected from the group of straight and branched chain lower alkylenyl groups, and a + b + c + d is about 5 to about 25. Preferably, a + c is about 5 to about 15 and b + d is 1 to about 10.

Agriculturally acceptable compounds include pesticides, herbicides, insecticides, fungicides and biocides.

The amine-oxide surfactant of Formula I can be produced by oxidizing a tertiary amine surfactant having the Formula II:



II.

wherein R^1, R^2, R^3, R^4, R^5, a, b, c and d are as described above.

This invention is also directed to an aqueous agricultural composition comprising an agriculturally acceptable pesticide admixed with an amine-oxide surfactant of Formula I. The compositions of the present invention exhibit reduced eye irritation to animals and reduced corrosiveness to metals compared to conventional compositions.

This invention is also directed to a method of treating plants comprising the step of applying the aqueous agricultural composition to the plant.

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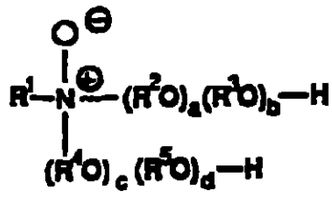
Detailed Description of the Preferred Embodiments

The method of the present invention produces an aqueous agricultural composition exhibiting reduced eye irritation to animals and reduced corrosiveness to metals. The method comprises admixing an agriculturally acceptable compound with an amine-oxide surfactant of the Formula I:



wherein R^1 is a straight or branched chain about C_8 to about C_{20} alkyl or alkenyl group, R^2, R^3, R^4 and R^5 are each independently selected from the group of straight and branched chain lower alkylenyl groups, and a + b + c + d is about 5 to about 25. Preferably, a + c is about 5 to about 15 and b + d is 1 to about 10.

Representative alkyl and alkenyl groups include hexyl, octyl, decyl, dodecyl, tetradecyl, hexadecyl, and octadecyl groups, their unsaturated counterparts and the like.

Preferably, R^1 is a straight or branched chain about C_8 to about C_{18} alkyl or alkenyl group that can be derived from a fatty acid such as tallow acid, coconut acid, soya acid, cottonseed acid, lauric acid and stearic acid.

Representative lower alkylenyl groups include C_2 to about C_4 alkylenyl groups, e.g., ethylenyl, propylenyl, butylenyl and the like. Preferred lower alkylenyl groups include ethylenyl, 1,2-propylenyl, 1,2-butylenyl and 2,3-butylenyl.

Preferably, R^2, R^3, R^4 and R^5 are each independently selected from the group of straight and branched chain C_2 and C_3 alkylenyl groups. Most preferably, R^2 and R^4 are alike, R^3 and R^5 are alike and R^2 and R^4 can be the same as, or different from, R^3 and R^5.

One of a and b can be 0 and one of c and d can be 0. Preferably, a + b + c + d is about 5 to about 20.

Representative commercially available surfactants of Formula II include:

ETHOXYLATED TALLOWAMINES SUCH AS:

- FLOMO TA-10, TA-15, TA-20 from DESOTO INC.,
- VARONIC T-205, T-210, T-215 from SHEREX,
- ETHOMEEN T/12, T/15 from ARMAK CHEMICAL,
- ALKAMINOX T-10, T-15 from ALKARIL CHEMICALS;

ETHOXYLATED COCOAMINES SUCH AS:

- VARONIC K-205, K-210, K-215 from SHEREX
- ETHOMEEN C/12, C/15 from ARMAK CHEMICAL,
- ACCOMEEN C10, C15 from CAPITAL CITY PRODUCTS,
- CHEMEEN C5, C10, C15 from CHEMAX ; and

ETHOXYLATED SOYAAMINES SUCH AS:

- ACCOMEEN S5, S10 from CAPITAL CITY PRODUCTS,
- ETHOMEEN S/12, S/15 from ARMAK CHEMICAL
- MAZEEN S2, S5 from MAZER CHEMICALS, and
- PEGAMEEN S5, S20, from BORG-WARNER CHEMICAL.

The surfactant of Formula I can be produced by oxidizing a tertiary amine surfactant having the Formula II:

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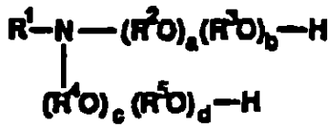

wherein R^1, R^2, R^3, R^4, R^5, a, b, c and d are as described above.

A conventional, strong oxidizing reagent is utilized to oxidize the tertiary amine surfactants of Formula II to produce the amine-oxide surfactants of Formula I. An oxidation reaction described in March, "Advanced Organic Chemistry," 3rd Edition, Wiley-Interscience, 1985, p. 1088 can be used to prepare the compounds of Formula I

Representative oxidizing reagents include hydrogen peroxide, per-acids, the like and mixtures thereof.

Representative per-acids include persulfuric acid, perchromic acid, peracetic acid and the like.

Peracids must be converted (in situ) into their salts to be effective, since these acids would neutralize the tertiary amine via the acid-base reaction, and thus prevent the oxidation from occurring.

If peracids are to be used as the oxidizing agents, the oxidation process would involve the careful, slow addition of the peracids to a mixture of tertiary amine and a strong alkaline, such as sodium hydroxide.

Salts of peracids can also be used as oxidizing agents. Representative salts are the sodium, potassium and ammonium salts. Preferred per-acid salts are sodium perborate and sodium percarbonate. When being added to the mixture of tertiary amine and water, these oxidizing agents would first react with water to yield hydrogen peroxide in which, in turn, would oxidize the tertiary amine to result in the N-oxide product.

A preferred oxidizing reagent is hydrogen peroxide because the by-product of the oxidation reaction is water which does not have to be removed. Although hydrogen peroxide is commercially available in many concentrations, it is preferably utilized as an aqueous solution having a concentration in the range of about 35 to about 50 weight percent (wt%) to achieve a relatively fast reaction that is easily controlled.

The amount of oxidizing reagent utilized to oxidize the tertiary amine surfactant of Formula II depends upon the strength of the oxidizing reagent. Preferably, the amount of oxidizing reagent is selected to oxidize about 90 to about 100, more preferably about 95 to about 100, percent of the amino groups.

The oxidation of the tertiary amine surfactant of Formula II is performed in a suitable reactor that can be a glass, glass-lined or stainless steel reactor. The reactor is preferably equipped with an internal agitator, a heating device capable of raising the temperature of the contents of the reactor, a cooling device to enable a quick reduction in the temperature of the contents of the reactor, and a temperature control device to maintain the temperature of the contents of the reactor at a desired level.

In the oxidation process, the tertiary amine of Formula II (1 mole) is introduced into the reactor. Agitation is initiated and maintained throughout the process, and the contents of the reactor are preheated to a temperature of about 75°C (167°F). To facilitate the control of the reaction, oxidizing agent (1.5 - 2.5 moles) is introduced into the reactor in two portions; the major portion, consisting of about 60-70 percent of the total amount of the oxidizing agent, is added slowly into the reactor over the period of 2-4 hours while the temperature of the contents in the reactor is maintained at or lower than about 120°C (248°F). The minor portion (the remaining quantity) of the oxidizing agent is then quickly introduced into the reactor to accelerate the reaction rate and drive the reaction to completion. The contents in the reactor are allowed to cool to about 75°C and maintained at this temperature until the pH value is within a range of about 4.2 to about 4.7. The resulting product is the amine-oxide surfactant of Formula I. Distilled or deionized water can then be introduced into the reactor to obtain an aqueous amine-oxide surfactant content in the range of about 50 to about 80 wt% based on the total weight of the surfactant solution.

When the R_1 group of the tertiary amine surfactants of Formula II is longer than 12 carbons, for example, as in ethoxylated tallowamines, the resulting amine-oxide surfactants are very viscous. A conventional viscosity reducing agent can be admixed with the amineoxide surfactant to reduce its viscosity and thus improve its handling. Representative viscosity reducing agents include glycerol, ethylene glycol, propylene glycol, and polyethylene glycol or polypropylene glycol having an average molecular weight of about 200 to about 1000, the like, and mixtures thereof.

The viscosity reducing agent can be internally contained in the tertiary amine surfactants, or can be added prior, during, or after the oxidation process. The viscosity reducing agent is preferably present in the surfactant solution in an amount in the range of about 1 to about 25 wt% based on the total weight of the surfactant solution.

Conventional preservatives having antimicrobial activity can be admixed with the amine-oxide surfactant. Representative preservatives include methyl paraben, propyl paraben, formaldehyde, Kathon CG/ICP [a commercially available preservative containing 1.5 wt% of the active ingredients 5-chloro-2-methyl-4-isothiazolin-

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3-one and 2-methyl-4-isothiazolin-3-one and 98.5 wt% of inert ingredients], the like and mixtures thereof.

The preservative is preferably present in the surfactant solution in an amount in the range of about 0.05 to about 0.15 wt% based on the total weight of the surfactant solution.

Representative agriculturally acceptable compounds include:

FUNGICIDES AND BACTERICIDES

Carbamate fungicides such as 3,3'-ethylenebis (tetrahydro-4,6-dimethyl-2H-1,3,5-thiadiazine-2-thione), zinc or manganese ethylenebis(dithiocarbamate), bis(dimethyldithiocarbamoyl)disulfide, zinc propylenebis (dithiocarbamate), bis(dimethyldithiocarbamoyl) ethylenediamine; nickel dimethyldithiocarbamate, methyl-1(butylcarbamoyl)-2-benzimidazolecarbamate, 1,2-bis(3-methoxycarbonyl-2-thioureido)benzene, 1-isopropylcarbamoyl-3-(3,5-dichlorophenyl)hydrate, potassium N-hydroxymethyl-N-methyldithiocarbamate and 5-methyl-10-butoxycarbonylamino-10,11-dihydrodibenzo (b,f)azepine; pyridine fungicides such as zinc bis(2-hydroxy-2-(1H)pyridinethionate) and 2-pyridinethiol-1-oxide sodium salt; phosphorus fungicides such as O,O-diisopropyl S-benzylphosphorothioate and O-ethyl S,S-diphenyldithiophosphate; phthalimide fungicides such as N-(2,6-p-diethylphenyl)phthalimide and N-(2,6-diethylphenyl)-4-methylphthalimide; dicarboxyimide fungicides such as N-trichloromethylthio-4-cyclohexene-1,2-dicarboxyimide and N-tetrachloroethylthio-4-cyclohexene-1,2-dicarboxyimide; oxathine fungicides such as 5,6-dihydro-2-methyl-1,4-oxathine-3-carboxanilido-4,4-dioxide and 5,6-dihydro-2-methyl-1,4-oxathine-3-carboxanilide; naphthoquinone fungicides such as 2,3-dichloro-1,4-naphthoquinone, 2-oxy-3-chloro-1,4-naphthoquinone copper sulfate; pentachloronitrobenzene; 1,4-dichloro-2,5-dimethoxybenzene; 5-methyl-s-triazol(3,4-b)benzthiazole; 2-(thiocyanomethylthio) benzothiazole; 3-hydroxy-5-methylisoxazole; N-2,3-dichlorophenyltetrachlorophthalamic acid; 5-ethoxy-3-trichloromethyl-1,2,4-thiadiazole; 2,4-dichloro-6-(O-chloroanilino)- 1,2,5-triazine; 2,1,-dicyano-1,4-dithioanthraquinone; copper 8-quinolinate; polyoxine; validamycine; cycloheximide; sodium methanearsonate; diisopropyl 1,3-dithiolane-2-ridene malonate; 3-allyloxy-1,2-benziosothiazol-1, 1-dioxide; kasugamycin; Blasticidin S; 4,5,6,7-tetrachlorophthalide; 3-(3,5-dichlorophenyl)5-ethenyl-5-methyloxazolizine-2,4-dione; N-3,5-dichlorophenyl)-1,2-dimethylcyclopropane-1,2-dicarboxyimide; S-n-butyl-5'-para-t-butyl-benzyl-N-3-pyridyldithiocarbonylimidate; 4-chlorophenoxy-3,3-dimethyl-1-(1H,1,3,4-triazol-1-yl)-2-butanone; methyl-D,L-N-(2,6-dimethylphenyl)-N-(N'-methyoxyacetyl)alaninate; N-propyl-N-(2-(2,4,6-trichlorophenoxy)ethyl)imidazol-1-carboxamide; N-3,5-dichlorophenyl succinamide; tetrachloroisophthalonitrile; 2-dimethylamino-4-methyl-5-n-butyl-6-hydroxypyrimidine; 2,6-dichloro-4-nitroaniline; 3-methyl-4-chlorobenzthiazol-2-one; 1,2,5,6-tetrahydro-4H-pyrrolo[3,2,1-i,j]quinoline-2-one; 3'-isopropoxy-2-methylbenzanilide; 1-[2-(2,4-dichlorophenyl)-4-ethyl-1-3-dioxorane-2-ylmethyl)hyl]-1H,1,2,4-triazol; 1,2-benzisothiazoline-3-one; basic copper chloride; basic copper sulfate; N'-dichlorofluoromethylthio-N,N-dimethyl-N-phenyl sulfamide; ethyl-N-(3-dimethylaminopropyl)thiocarbamate hydrochloride; piomycin; S,S-6-methylquinoxaline-2,3dl-yldithiocarbonate; complex of zinc and maneb; di-zinc bis(dimethyldithiocarbamate)ethylenebis (dithiocarbamate).

PLANT GROWTH REGULATORS AND HERBICIDES

Isourea plant growth regulators such as N-methoxycarbonyl-N'-methylphenylcarbamoylethylisourea and 1-(4-chlorophenylcarbamoyl)-3-ethoxycarbonyl-2-methylisourea; other type of plant growth regulators such as sodium naphthaleneacetate, 1,2-dihydropyridazine-3,-6-dione and gibberellins; triazine herbicides such as 2-methylthio-4,6-bisethylamino-1,3,5-triazine, 2-chloro-4,6-bisethylamino-1,3,5-triazine, 2-methoxy-4-ethylamino-6-isopropylamino-1,3,5-triazine, 2-chloro-4-ethylamino-6-isopropylamino-S-triazine, 2-methylthio-4,6-bis(isopropylamino)-S-triazine and 2-methylthio-4-ethylamino-6-isopropylamino-S-triazine; phenoxy herbicides such as 2,4-dichlorophenoxyacetic acid and methyl, ethyl, and butyl esters thereof. 2-chloro-4-methylphenoxyacetic acid, 4-chloro-2-methylphenoxyacetic acid and ethyl 2-methyl-4-chlorophenoxybutylate; diphenylether herbicides such as 2,4,6-trichlorophenyl-4'-nitrophenylether, 2,4-dichlorophenyl-4'-nitrophenylether and 3,5-dimethylphenyl-4'nitrophenylether; urea herbicides such as 3-(3,4-dichlorophenyl)-1-methoxy-1-methyl urea, 3-(3,4-dichlorophenyl)-1,1-dimethyl urea and 3-(4-chlorophenyl)1,1-dimethyl urea; carbamate herbicides such as 3-methoxycarbonylaminophenyl-N-(3-methylphenyl)carbamate, isopropyl-N-(3-chlorophenyl)carbamate and methyl-N-(3,4'-dichlorophenyl)carbamate; uracil herbicides such as 5-bromo-3-sec-butyl-6-methyluracil and 1-cyclohexyl-3,5-propyleneuracil; thiocarbamate herbicides such as S-(4-chlorobenzyl)-N,N-diethylthiocarbamate, S-ethyl-N-cyclohexyl-N-ethylthiocarbamate and S-ethyl-hexahydro-1H-azapine-1-carbothioate and S-ethyl-N,N-di-n-propylthiocarbamate; pyridinium herbicides such as 1,1'-di-methyl-4,4'-bispyridinium dichloride; phosphoric herbicides such as N-(phosphonomethyl)glycine; aniline herbicides such as alpha, alpha, alpha-trifluoro-2,6-dinitro-N,N-dipropyl-p-toluidine, 4-(methylsulfonyl)-2,6-dinitro-N,N-dipropylaniline and K<3>, N<3>-diethyl-2,4-dinitro-6-trifluoromethyl-12,3-phenylene diamine; acid anilide herbicides

such as 2-chloro-2',6'-diethyl-N-(butoxyethyl)acetonalide, 2-chloro-2',6'-diethyl-N-(methoxymethyl)acetonalide, and 3,4-dichloropropionoanilide; pyrazole herbicides such as 1,3-dimethyl-4-(2,4-dichlorobenzoyl)-5-hydroxypyrazole and 1,3-di-methyl-4-(2,4-dichlorobenzyol)-5-(p-toluenesulfonyloxy)pyrazole; 5-tert-butyl-3-(2,4-dichloro-5-isopropoxyphenyl)-1,3,4-oxadiazoline-2-one; 2-[N-isopropyl,N-(4-chlorophenyl)carbamoyl]-4-chloro-methyl-4-isoxazoline-3-one; 3-isopropylbenzo-2-thio-1,3-diazinone-(4-2,4-dioxide) and 3-(2-methylphenoxy)pyridazine.

INSECTICIDES

Phosphoric insecticides such as O,O-diethyl O-(2-isopropyl-4-methyl-6-pyrimidinyl)phosphorothioate, O,O-diethyl S-2-[(ethylthio)ethyl)phosphorodithioate, O,O-dimethyl O-(3-methyl-4-nitrophenyl)thiophosphate, O,O-dimethyl S-(N-methylcarbamoylmethyl)phosphorodithioate, O,O-dimethyl S-(N-methyl-N-formylcarbamoylmethyl)phosphorodithioate, O,O-dimethyl S-2-[(ethylthio)ethyl]phosphorodithioate, O,O-diethyl S-2-diethyl S-2-[(ethylthio)-ethyl)phosphorodithioate, O,O-dimethyl-1-hydroxy-2,2,2-trichloroethylphosphonate, O,O-diethyl-O-(5-phenyl-3-isoxyazolyl)phosphorothioate, O,O-dimethyl O-(2,5-dichloro-4-bromophenyl)phosphorothioate, O,O-dimethyl O-(3-methyl-4-methylmercaptophenyl)thiophosphate, O-ethyl O-p-cyanophenyl phenylphosphorothioate, O,O-dimethyl-S-(1,2-dicarboethoxyethyl)phosphorodithioate, 2-chloro-(2,4,5-trichlorophenyl)vinyldimethyl phosphate, 2-chloro-1-(2,4-dichlorophenyl)vinyldimethyl phosphate, O,O-dimethyl O-p-cyanophenyl phosphorothioate, 2,2-dichlorovinyl dimethyl phosphate, O,O-diethyl O-2,4-dichlorophenyl phosphorothioate, ethyl mercaptophenylacetate O,O-dimethyl phosphorodithioate, S-[(6-chloro-2-oxo-3-benzooxyazolinyl)methyl]O,O-diethyl phosphorodithioate, 2-chloro--(2,4-dichlorophenyl)vinyl diethylphosphate O,O-diethyl O-(3-oxo-2-phenyl-2H-pyridazine-6-yl)phosphorothioate, O,O-dimethyl S-(1-methyl-2-ethylsulfinyl)-ethyl phosphorothioate, O,O-dimethyl S-phthalimidomethyl phosphorodithioate, O,O-diethyl 2,2,2-trichloroethanol, 2-(p-tert-butylphenoxy)isopropyl-2'-chloroethylsulfite, azoxybenzene,di-(p-chlorophenyl)-cyclopropyl carbinol, di[tri(2,2-dimethyl-2-phenylethyl)tin]oxide. 1-(4-chlorophenyl)-3-(2,6-difluorobenzoyl)urea and S-tricyclohexyltin O,O-diisopropylphosphorodithioate.

INSECT REPELLENTS

The following insect repellents may be employed herein: 2-ethyl-1,3-hexanediol; N-octyl bicycloheptane dicarboximide; N,N-diethyl-M-toluamide; 2,3,4,5-Bis(2-butylene)tetrahydro-2-furaldehyde; di-n-propyl isocinchomeronate; and 2-hydroxyethyl-n-octyl sulfide.

Also useful herein are N-phosphonomethylglycines and salts thereof such as:

mono-isopropylamine salt of N-phosphonomethyl glycine;
mono-dimethylamine salt of N-phosphonomethyl glycine;
mono-ethanolamine salt of N-phosphonomethyl glycine;
mono-ammonium salt of N-phosphonomethyl glycine;
mono-butylamine) salt of N-phosphonomethyl glycine;
mono(methylamine) salt of N-phosphonomethyl glycine;
monosodium salt of N-phosphonomethyl glycine;
disodium salt of N-phosphonomethyl glycine;
trisodium salt of N-phosphonomethyl glycine; and
N-phosphonomethyl glycine.

Herbicides are preferred.

Representative herbicides include
N-(phosphonomethyl)glycine, 2,4-dichlorophenoxyacetic acid, 2-methoxy-3,6-dichlorobenzoic acid, and the salts thereof.

An aqueous agricultural composition of the present invention can comprise an agriculturally acceptable pesticide admixed with the amine-oxide surfactant of Formula I. This composition exhibits reduced irritation and reduced corrosion as compared to conventional agricultural compositions.

The agricultural composition can be diluted with water to obtain a solids concentration of about 50 to about 80 wt%.

The weight ratio of the agricultural compound to the amine-oxide surfactant of Formula I is preferably in the range of about 1:1 to about 5:1, preferably in the range of about 1:5 to about 4:1.

The present invention also includes a method of treating plants by applying thereto the aqueous agricultural composition. The plants are treated with a dose of agricultural composition effective to achieve the desired re-

sult, e.g., when the agriculturally acceptable pesticide is used, phytotoxicity is achieved.

The compositions of this invention are extremely useful in minimum tillage methods of crop culture. Thus, for example, in those instances where it is desirable to plant a sodded or otherwise vegetated acreage with corn or the like without plowing or otherwise mechanically preparing a seed bed, the crop seed can be drill planted in combination with a prior or subsequent application of a composition of this invention to kill undesired growing vegetation provided that the composition is applied before the emergence of the crop plant.

The compositions of this invention are also useful in sod (turf, alfalfa, pasture, etc.) renovation or conversion procedures. Thus, for example, in situations where a sod or parts thereof has become overgrown with undesirable plant species, the plants in said area can be sprayed with a phytotoxic composition of this invention to control all growing plants and from about 2 to 24 hours later depending upon weather conditions etc., the desired species can be seeded into the dying vegetation. Where a seed bed is to be prepared about 2 to 3 weeks should elapse between treatment and seed bed preparation, in order to provide sufficient time for the composition to be absorbed by all parts of the undesired plants. In an alternate method of sod renovation, the area can be seeded and immediately sprayed with a composition of this invention. In either method, the seeds fall among the vegetation and as the sprayed plants wither, and die, they act as a mulch and moisture retaining layer in which the seeds can germinate. This method is particularly useful in the spot renovation of lawns or golf greens or fairways since the herbicidal effect of the compositions of this invention is greatly decreased or totally inactivated by contact with soil. Thus, seeds which are in the soil can germinate and grow without any apparent effects from the spraying of the unwanted plants prior to the time that the seed actually germinates.

The compositions of this invention provide a wide spectrum of weed control and are also extremely useful as general herbicides as well as in controlling unwanted plants in orchards, tree farms, and various crops. For example, it has been found that by directing a spray of the compositions of this invention at the unwanted plants while essentially preventing such spray from contacting the leaves of trees, such unwanted plants are controlled while there is no apparent injury to the trees. In such directed spraying, the spray can fall on the woody portion of the fruit tree or other tree without any apparent effect. Thus, the directed spray method of control is useful with crops such as plantation crops, i.e. rubber, coffee, bananas, tea, etc. and in orchards such as citrus fruits, apples, peaches, pears, nuts, olive, in vineyards and in bramble crops and in nursery crops to control the undesired plants; and in crops such as cotton, soybeans, sugar cane and the like.

The compositions of this invention are also useful for control of weeds between cropping seasons, for the renovation of stale seed beds and the like.

In applying the compositions of this invention to the plants which it is desired to control, it has been found to be desirable that the plant be emerged from the ground and even more desirable, that the plant be at least at the 2-leaf stage for maximum effect. It has been found that when the plants to be controlled have a portion of their growth above the ground or water, and the above-ground or above-water portion of the plant contacted with the herbicidal compositions of this invention at appropriate rates, the herbicide is translocated to kill such plant parts which are below the ground or water surface.

One can obtain limited selectivity in crops such as cotton, soybeans, sugar cane and like crops by directing the spraying of a composition of this invention at a selected concentration on vegetation around the base of such plants with minimal spray contact with the leafy portions of such crop plants. The directed spraying can be done with or without a protective device to prevent contact of the spray with the leaves of such crop plants.

The application of an effective amount of the compounds of this invention to the plant is essential and critical for the practice of the present invention. The exact amount of active ingredient to be employed is dependent upon the response desired in the plant as well as such other factors as the plant species and stage of development thereof, and the amount of rainfall as well as the specific glycine employed. In foliar treatment for the control of vegetative growth, the active ingredients are applied in amounts from about 0.01 to about 20 or more pounds per acre. In applications for the control of aquatic plants, the active ingredients are applied in amounts of from about 0.01 parts per million to about 1000 parts per million, based on the aquatic medium. An effective amount for phytotoxic or herbicidal control is that amount necessary for overall or selective control, i.e., a phytotoxic or herbicidal amount. It is believed that one skilled in the art can readily determine from the teachings of this specification, including examples, the approximate application rate.

The compositions of this invention are also useful as harvesting aids in many crops. Thus, for example, the crop could be sprayed with the compositions of this invention to reduce the bulk of unwanted material and make the harvesting of the crops easier. Such crops are for example, peanuts, soybeans, and root crops such as potatoes, sugar beets, red beets, and the like.

The following Examples are provided by way of representation of the present invention and not by way of limitation.

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EXAMPLE 1:

PREPARATION OF AN AMINE-OXIDE SURFACTANT SOLUTION FROM TALLOWAMINE ETHOXYLATED WITH 15 MOLES OF ETHYLENE OXIDE

A 1,000 milliliter (ml) three-necked flask equipped with an internal agitator, a heating mantle and a temperature regulator was charged with 400 grams (g) of DeSomeen TA-15 (a tallowamine ethoxylate commercially available from DeSoto, Inc. that is the condensation reaction product of one mole of tallowamine with 15 moles of ethylene oxide and that contains about 20 wt% of polyethylene glycol). Agitation was initiated and maintained throughout the preparation process. The temperature of the contents of the flask was elevated to about 90°C. Then, 40 g of hydrogen peroxide having a concentration of 50 wt% were introduced into the flask over a time period of 2 hours while maintaining the temperature of the contents of the flask in the range of about 100° to about 120°C. The temperature of the contents of the flask was maintained in the range of about 100° to about 120°C for one hour after the completion of the addition of the hydrogen peroxide. Then, 20 g of hydrogen peroxide having a concentration of 50 wt% were quickly introduced into the flask. The contents of the flask were slowly cooled to a temperature of about 75°C. After a time period of 2 hours, the pH value of the contents of the flask was 4.5. Then, 50 g of deionized water were introduced into the flask. Agitation was discontinued 15 minutes after the deionized water had been introduced into the flask. A total of 500 g of an aqueous amine-oxide surfactant solution having 80 wt% of the amine-oxide surfactant of Formula I was produced. The yield was 98.42% based on the activity, i.e., the amine concentration, of the starting material.

Conversion of the tallowamine ethoxylate into the amine-oxide surfactant of Formula I and the structure and purity of the amine-oxide surfactant of Formula I were confirmed by the following chemical and instrumental analyses:

- the pH value changed from a pH value in the range of 9 to 11, which indicates the presence of a free amine to a pH value in the range of 4.2 to 4.7, which indicates a totally oxidized amine;
- results from the analysis by Proton and Carbon 13 Nuclear Magnetic Spectroscopy confirmed not only the structure of the product, but also its purity, i.e., the starting material was not detected on the spectra of the product; and
- when the product was heated to about 150°C. for a prolonged time period it decomposed to yield the products of the typical Cope elimination reaction of an amine-oxide. The Cope elimination reaction is described in March, Id., p. 909.

EXAMPLE 2:

PREPARATION OF AN AMINE-OXIDE SURFACTANT SOLUTION FROM TALLOWAMINE ETHOXYLATED WITH 20 MOLES OF ETHYLENE OXIDE

The experiment of EXAMPLE 1 was repeated utilizing the same equipment and reaction parameters but replacing the DeSomeen TA-15 with an equal amount of DeSomeen TA-20 (a surfactant commercially available from DeSoto, Inc. that is the condensation reaction product of one mole of tallowamine and 20 moles of ethylene oxide and that contains about 20% wt% of polyethylene glycol) and utilizing a total of 50 g of hydrogen peroxide having a concentration of 50 wt%. The resulting amine-oxide surfactant solution exhibited the same pH value, purity, and Cope elimination reaction as the surfactant solution of EXAMPLE 1. The yield was 98.9% based on the activity of the starting material.

EXAMPLE 3:

PREPARATION OF AN AMINE-OXIDE SURFACTANT SOLUTION FROM TALLOWAMINE ETHOXYLATED WITH 10 MOLES OF ETHYLENE OXIDE

The experiment of EXAMPLE 1 was repeated utilizing the same equipment and reaction parameters but replacing the DeSomeen TA-15 with an equal amount of DeSomeen TA-10 (a surfactant commercially available from DeSoto, Inc. that is the condensation reaction product of one mole of tallowamine and 10 moles of ethylene oxide and that contains about 15% wt% of polyethylene glycol) and utilizing a total of 75 g of hydrogen peroxide having a concentration of 50 wt%. The resulting amine-oxide surfactant solution exhibited the same pH value, purity, and Cope elimination reaction as the surfactant solution of EXAMPLE 1. The yield was 99.1% based on the activity of the starting material.

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EXAMPLE 4:

PREPARATION OF AN AMINE-OXIDE SURFACTANT SOLUTION FROM TALLOWAMINE ETHOXYLATED WITH 20 MOLES OF ETHYLENE OXIDE AND 4 MOLES OF PROPYLENE OXIDE

The experiment of EXAMPLE 1 was repeated utilizing the same equipment and reaction parameters but replacing the DeSomeen TA-15 with an equal amount of FloMo 1513 (a surfactant commercially available from DeSoto, Inc. that is the condensation reaction product of one mole of tallowamine and 20 moles of ethylene oxide followed by the condensation reaction therewith of 4 moles of propylene oxide and that contains about 20 wt% of polyethylene glycol) and utilizing a total of 60 g of hydrogen peroxide having a concentration of 50 wt%. The resulting amine-oxide surfactant solution exhibited substantially the same pH value, purity, and Cope elimination reaction as the surfactant solution of EXAMPLE 1. The yield was 98.5% based on the activity of the starting material.

EXAMPLE 5:

PREPARATION OF AN AMINE-OXIDE SURFACTANT SOLUTION FROM LAURYLAMINE ETHOXYLATE

The experiment of EXAMPLE 1 was repeated utilizing the same equipment and reaction parameters but replacing the DeSomeen TA-15 with an equal amount of DeSomeen LA-16.5 (a surfactant commercially available from DeSoto, Inc. that is the condensation reaction product of one mole of laurylamine and 16.5 moles of ethylene oxide) and utilizing a total of 75 g of hydrogen peroxide having a concentration of 50 wt%. The resulting amine-oxide surfactant solution product exhibited substantially the same pH value, purity, and Cope elimination reaction as the surfactant solution of EXAMPLE 1. The yield was 99.0% based on the activity of the starting material.

EXAMPLE 6:

PREPARATION OF AN AMINE-OXIDE SURFACTANT SOLUTION FROM HYDROGENATED TALLOWAMINE ETHOXYLATE

The experiment of EXAMPLE 1 was repeated utilizing the same equipment and reaction parameters but replacing the DeSomeen TA-15 with an equal amount of Varonic U215 (a surfactant commercially available from Sherex that is the condensation reaction product of one mole of hydrogenated tallowamine and 15 moles of ethylene oxide) and utilizing a total of 75 g of hydrogen peroxide having a concentration of 50 wt%. The amine-oxide surfactant was admixed with 200 g of deionized water and 150 g of polyethylene glycio having average molecular weight of 300 to obtain a surfactant solution having about 50 wt% of the amine-oxide surfactant. The resulting amine-oxide surfactant solution exhibited substantially the same pH value, purity, and Cope elimination reaction as the surfactant solution of EXAMPLE 1. The yield was 98.3% based on the activity of the starting material.

EXAMPLE 7:

PREPARATION OF AN AMINE-OXIDE SURFACTANT SOLUTION FROM COCOAMINE ETHOXYLATE

The experiment of EXAMPLE 1 was repeated utilizing the same equipment and reaction parameters but replacing the DeSomeen TA-15 with an equal amount of Varonic K215 (a surfactant commercially available from Sherex that is the condensation reaction product of one mole of cocoamine and 15 moles of ethylene oxide) and utilizing a total of 75 g of hydrogen peroxide having a concentration of 50 wt%. The resulting amine-oxide surfactant solution exhibited the same pH value, purity, and Cope elimination reaction as the surfactant solution of EXAMPLE 1. The yield was 99.1% based on the activity of the starting material.

EXAMPLE 8:

PREPARATION OF AMINE-OXIDE SURFACTANT SOLUTION UTILIZING HYDROGEN PEROXIDE HAVING A CONCENTRATION OF 35 WEIGHT PERCENT

EXAMPLE 1 was repeated using scale-up quantities but hydrogen peroxide having a concentration of 35

wt%, which is a lower strength oxidizing reagent, was utilized in place of hydrogen peroxide having a concentration of 50 wt%. The yield was about 98.9% based on the activity of the starting material.

The results of this Example confirm that oxidizing reagents of lesser strength can be utilized to produce the amine-oxide surfactants of Formula I. However, larger quantities of the lower strength oxidizing reagents and longer time periods, as compared to when a stronger oxidizing reagent is utilized, are required to obtain the desired yield and an amine-oxide surfactant of Formula I having the same properties.

EXAMPLE 9:

EYE-IRRITATION TEST

The amine-oxide surfactants produced in EXAMPLES 1 to 5, a control of N-(2-hydroxyethyl)-acetamide (control A), a known non-irritant, and an ethoxylated tallow amine (FloMo® TD-20) (control B) were tested for eye-irritation in accordance with the Consumer Product Safety Commission, Volume 36, Number 167, Part II, Test No. 1500.42. In this test, one-tenth milliliter of each amine-oxide surfactant or the control was placed in the eyes of six rabbits. The cornea, iris and conjunctive of the eyes were observed after 24, 48 and 72 hours of exposure. Results of the tests confirmed that all of the amine-oxide surfactants of EXAMPLES 1 to 5 are not eye irritants.

The following scoring table for eye table for eye irritation grades for ocular lesions was used:

Cornea

No ulceration or opacity 0

Scattered or diffused areas of opacity (other than slight dulling of normal luster), details of iris clearly visible. 1

Easily discernible translucent area, details of iris slightly obscured. 2

Nacreous areas, no details of iris visible, size of pupil barely discernible 3

Iris

Normal 0

Markedly deepened folds, congestion, swelling, moderate circumcorneal injection (any of these or a combination of any thereof), iris still reacting to light (sluggish reaction is positive) 1

No reaction to light, hemorrhage, gross destruction (any or all of these). 2

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Conjunctiva

Redness (refers to the palpebral and bulbar conjunctivae excluding the cornea and iris)

Vessels normal 0

Some vessels definitely injected 1

Diffuse, crimson red, individual vessels not easily discernible 2

Diffuse, beefy red 3

Chemosis

No swelling. 0

Any swelling above normal (includes nictitating membrane). 1

Obvious swelling with partial eversion of lids . . . 2

Swelling with lids about half closed 3

Swelling with lids more than half closed 4

Table 1

Control A

Rabbit Number	1			2			3		
Hours After Treatment	24	48	72	24	48	72	24	48	72
Cornea	0	0	0	0	0	0	0	0	0
Iris	0	0	0	0	0	0	0	0	0
Conjunctiva: Erythema	1	0	0	0	0	0	0	0	0
Chemosis	0	0	0	0	0	0	0	0	0
Rabbit Number	1			2			3		
Hours After Treatment	24	48	72	24	48	72	24	48	72
Cornea	0	0	0	0	0	0	0	0	0
Iris	0	0	0	0	0	0	0	0	0
Conjunctiva: Erythema	0	0	0	1	0	0	1	0	0
Chemosis	0	0	0	0	0	0	0	0	0

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Conjunctiva

Redness (refers to the palpebral and bulbar conjunctivae excluding the cornea and iris)

Vessels normal 0

Some vessels definitely injected 1

Diffuse, crimson red, individual vessels not easily discernible 2

Diffuse, beefy red 3

Chemosis

No swelling. 0

Any swelling above normal (includes nictitating membrane). 1

Obvious swelling with partial eversion of lids . . . 2

Swelling with lids about half closed 3

Swelling with lids more than half closed 4

Table 1

Control A

Rabbit Number	1			2			3		
Hours After Treatment	24	48	72	24	48	72	24	48	72
Cornea	0	0	0	0	0	0	0	0	0
Iris	0	0	0	0	0	0	0	0	0
Conjunctiva: Erythema	1	0	0	0	0	0	0	0	0
Chemosis	0	0	0	0	0	0	0	0	0

Rabbit Number	1			2			3		
Hours After Treatment	24	48	72	24	48	72	24	48	72
Cornea	0	0	0	0	0	0	0	0	0
Iris	0	0	0	0	0	0	0	0	0
Conjunctiva: Erythema	0	0	0	1	0	0	1	0	0
Chemosis	0	0	0	0	0	0	0	0	0

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Table 2

Control B

Rabbit Number	1			2			3		
Hours After Treatment	24	48	72	24	48	72	24	48	72
Cornea	1	2	2	1	1	2	1	2	2
Iris	1	1	1	1	1	1	1	1	1
Conjunctiva: Erythema	2	2	2	2	2	2	2	2	2
Chemosis	3	3	3	3	3	3	3	3	2

Rabbit Number	1			2			3		
Hours After Treatment	24	48	72	24	48	72	24	48	72
Cornea	1	2	2	1	1	2	1	2	2
Iris	1	1	1	1	1	1	1	1	2
Conjunctiva: Erythema	2	2	2	2	2	2	2	2	2
Chemosis	3	3	2	2	2	2	3	3	3

Table 3

Product of Example 1

Rabbit Number	1			2			3		
Hours After Treatment	24	48	72	24	48	72	24	48	72
Cornea	0	0	0	0	0	0	0	0	0
Iris	0	0	0	0	0	0	0	0	0
Conjunctiva: Erythema	2	2	1	1	1	1	1	1	1
Chemosis	2	1	1	1	0	0	1	1	1

Rabbit Number	1			2			3		
Hours After Treatment	24	48	72	24	48	72	24	48	72
Cornea	0	0	0	0	0	0	0	0	0
Iris	0	0	0	0	0	0	0	0	0
Conjunctiva: Erythema	1	1	0	1	1	0	1	1	0
Chemosis	0	0	0	0	0	0	0	0	0

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Table 4

Product of Example 2

Rabbit Number	1			2			3		
Hours After Treatment	24	48	72	24	48	72	24	48	72
Cornea	0	0	0	0	0	0	0	0	0
Iris	0	0	0	0	0	0	0	0	0
Conjunctiva: Erythema	1	1	0	0	0	0	1	0	0
Chemosis	0	0	0	0	0	0	0	0	0

Rabbit Number	1			2			3		
Hours After Treatment	24	48	72	24	48	72	24	48	72
Cornea	0	0	0	0	0	0	0	0	0
Iris	0	0	0	0	0	0	0	0	0
Conjunctiva: Erythema	0	0	0	1	1	0	1	1	0
Chemosis	0	0	0	0	0	0	0	0	0

Table 5

Product of Example 1

Rabbit Number	1			2			3		
Hours After Treatment	24	48	72	24	48	72	24	48	72
Cornea	0	0	0	0	0	0	0	0	0
Iris	0	0	0	0	0	0	0	0	0
Conjunctiva: Erythema	2	2	1	1	1	0	2	1	1
Chemosis	2	1	1	1	1	0	1	1	0

Rabbit Number	1			2			3		
Hours After Treatment	24	48	72	24	48	72	24	48	72
Cornea	0	0	0	0	0	0	0	0	0
Iris	0	0	0	0	0	0	0	0	0
Conjunctiva: Erythema	1	1	1	1	1	0	1	1	0
Chemosis	1	1	0	1	0	0	1	0	0

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Table 7

Product of Example 5

Rabbit Number	1			2			3		
Hours After Treatment	24	48	72	24	48	72	24	48	72
Cornea	0	0	0	0	0	0	0	0	0
Iris	0	0	0	0	0	0	0	0	0
Conjunctiva: Erythema	0	0	0	0	0	0	0	0	0
Chemosis	0	0	0	0	0	0	0	0	0

Rabbit Number	1			2			3		
Hours After Treatment	24	48	72	24	48	72	24	48	72
Cornea	0	0	0	0	0	0	0	0	0
Iris	0	0	0	0	0	0	0	0	0
Conjunctiva: Erythema	0	0	0	1	0	0	0	0	0
Chemosis	0	0	0	0	0	0	0	0	0

EXAMPLE 10:

PREPARATION OF AQUEOUS HERBICIDE COMPOSITIONS

Aqueous herbicide compositions A, B and C were prepared utilizing the amine-oxide surfactant of EXAMPLE 1, 2 or 3, respectively. These herbicide compositions were produced by charging a suitable flask having an agitator with 65 parts by weight (pbw) of the herbicidally active composition N-(phosphonomethyl)glycine, isopropylamine salt (an aqueous solution having 62 wt% solids). Agitation was initiated and maintained throughout the preparation. A charge of 20 pbw of deionized water was introduced into the flask. Fifteen minutes after the introduction of the water a clear solution was obtained. Then, 15 pbw of the amine-oxide surfactant of EXAMPLE 1, 2 or 3 was introduced into the flask over a time period of 5 minutes. Agitation was discontinued 15 minutes after the completion of the introduction of the amine-oxide surfactant to produce an aqueous herbicide composition.

EXAMPLE 11:

PREPARATION OF AQUEOUS HERBICIDE COMPOSITIONS D

Aqueous herbicide composition D was prepared utilizing a suitable flask having an agitator into which was introduced 20 pbw of the herbicidally active composition N-(phosphonomethyl)glycine, isopropylamine salt (an aqueous solution having 62 wt% solids) and 22 pbw of the herbicidally active composition 2,2-dichlorophenoxyacetic acid, isopropylamine salt (an aqueous solution having 53 wt% solids). Agitation was initiated and maintained throughout the preparation. A charge of 45 pbw of deionized water was introduced into the flask. Fifteen minutes after the introduction of the water a clear solution was obtained. Then, 13 pbw of the amine-oxide surfactant of EXAMPLE 1 was introduced into the flask over a time period of about 5 minutes. Agitation was discontinued 15 minutes after the completion of the introduction of the amine-oxide surfactant to produce the aqueous herbicide composition D.

EXAMPLE 12:

PREPARATION OF AQUEOUS HERBICIDE COMPOSITION E

Aqueous herbicide composition E was produced utilizing a stainless steel beaker equipped with an agitator into which was introduced 27 pbw of the herbicidally active composition N-(phosphonomethyl)glycine, isopropylamine salt (an aqueous solution having 62 wt% solids) and 33.5 pbw of deionized water. Agitation was initiated and maintained throughout the preparation. After a time period of 10 minutes, 18 pbw of the herbicidally active composition 2-methoxy-3,6-dichlorobenzoic acid, isopropylamine salt were introduced into the beaker. Fifteen minutes after the introduction of the isopropylamine salt of the dichlorobenzoic acid a clear solution was obtained. Then, 21.5 pbw of the amine-oxide surfactant of EXAMPLE 2 were introduced into the beaker over a time period of 5 minutes. Agitation was discontinued 15 minutes after the completion of the introduction of amine-oxide surfactant to produce the aqueous herbicide composition of E.

EXAMPLE 13:

TEST FOR EFFICACY OF THE HERBICIDE COMPOSITIONS

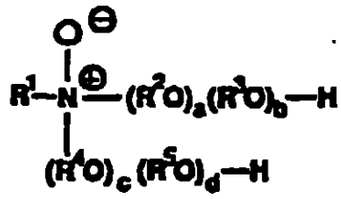
Aliquots of herbicide compositions A, B and C prepared in EXAMPLE 11 were tested to evaluate their efficacy. Control herbicide compositions A and B were prepared in accordance with the procedure of EXAMPLE 11 *with the amine-oxide surfactant being replaced with an equal amount of either DeSonsan TA-20 to produce* control herbicide composition A or N-(2-hydroxyethyl) acetamide to produce control herbicide composition B.

Herbicide compositions A to C and controlled herbicide compositions A and B were then diluted with deionized water at a dilution weight ratio of composition:water of 1:80. The diluted compositions were then sprayed on bermuda grass (Cynodon dactylon) at an application rate equivalent to 25 gallons of diluted composition per acre of grass.

The treated grass was observed six days after application of the diluted compositions. Phytotoxicity, manifested by burnt leaves, was observed in grass sprayed with herbicide compositions A to C and control herbicide composition A. No phytotoxicity was observed for the grass treated with control herbicide composition B. Thus, the amine-oxide surfactant does not adversely affect the herbicidal activity of the herbicidally active composition.

Claims

1. A method of producing an aqueous agriculturally acceptable composition exhibiting reduced eye irritation to animals and reduced corrosiveness to metals comprising admixing an agriculturally acceptable compound with an amine-oxide surfactant having the Formula:



wherein R^1 is a straight or branched chain about C_8 to about C_{20} alkyl or alkenyl group, R^2, R^3, R^4 and R^5 are each independently selected from the group of straight and branched chain lower alkylenyl groups and a + b + c + d is about 5 to about 25.

2. An aqueous agricultural composition exhibiting reduced eye irritation to animals and corrosiveness to metals comprising an agriculturally acceptable compound admixed with an amine-oxide surfactant having the Formula given and defined in claim 1.

3. A method or composition according to claim 1 or claim 2 wherein a + c is about 5 to about 15 and b + d is 1 to about 10.

4. A method or composition according to claim 1, claim 2 or claim 3 wherein R^1 is derived from an acid selected from the group consisting of tallow acid, coconut acid, soya acid, cottonseed acid, lauric acid and stearic acid and mixtures thereof.

5. A method or composition according to any one of the preceding claims wherein one of a and b is 0, one of c and d is 0, R^2, R^3, R^4 and R^5 are all ethylenyl groups and a + b + c + d is about 5 to about 20.

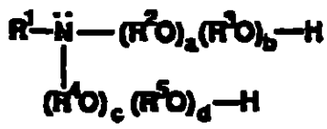
6. A method or composition according to any one of claims 1 to 4 wherein one of a and b is 0, one of c and d is 0, R^2, R^3, R^4 and R^5 are all 1,2-propylenyl groups and a + b + c + d is about 5 to about 20.

7. A method or composition according to any one of claims 1 to 4 wherein R^2 and R^4 are alike and are selected from the group of ethylenyl and 1,2-propylenyl, R^3 and R^5 are alike and are selected from the group of ethylenyl and 1,2-propylenyl, a + c is about 5 to about 15 and b + d is 1 to about 10.

8. A method or composition according to claim 7 wherein R^2, R^3, R^4 and R^5 are alike.

9. A method or composition according to claim 7 or claim 8 wherein a + b + c + d is about 5 to about 20.

10. A method or composition according to any one of the preceding claims wherein the amine-oxide surfactant is produced by oxidation of a tertiary amine surfactant having the Formula:



wherein R^1, R^2, R^3, R^4, R^5, a, b, c and d are as defined in claim 1.

11. The method or composition according to claim 10 wherein the tertiary amine surfactant is oxidized with an oxidizing reagent in an amount effective to oxidize about 80 to about 100 percent of the amino groups.

12. A method or composition according to claim 11 wherein the tertiary amine surfactant is oxidized with an oxidizing reagent in an amount effective to oxidize about 90 to about 100 percent of the amino groups.

13. A method or composition according to any one of the preceding claims wherein the agriculturally acceptable compound is a herbicide compound.

14. A method or composition according to claim 13 wherein the herbicidally active compound is selected from the group consisting of N-(phosphonomethyl)glycine, 2,4-dichlorophenoxyacetic acid, 2-methoxy-3,6-dichlorobenzoic acid and the salts thereof.

15. A method of treating plants comprising applying to the plant an agriculturally acceptable composition according to any one of claims 2 to 14.

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Table 6

Product of Example 4

Rabbit Number	1			2			3		
Hours After Treatment	24	48	72	24	48	72	24	48	72
Cornea	0	0	0	0	0	0	0	0	0
Iris	0	0	0	0	0	0	0	0	0
Conjunctiva: Erythema	1	1	0	1	0	0	1	0	0
Chemosis	0	0	0	0	0	0	0	0	0

Rabbit Number	1			2			3		
Hours After Treatment	24	48	72	24	48	72	24	48	72
Cornea	0	0	0	0	0	0	0	0	0
Iris	0	0	0	0	0	0	0	0	0
Conjunctiva: Erythema	1	0	0	0	0	0	1	0	0
Chemosis	0	0	0	0	0	0	0	0	0

Table 6

Product of Example 4

Rabbit Number	1			2			3		
Hours After Treatment	24	48	72	24	48	72	24	48	72
Cornea	0	0	0	0	0	0	0	0	0
Iris	0	0	0	0	0	0	0	0	0
Conjunctiva: Erythema	1	1	0	1	0	0	1	0	0
Chemosis	0	0	0	0	0	0	0	0	0

Rabbit Number	1			2			3		
Hours After Treatment	24	48	72	24	48	72	24	48	72
Cornea	0	0	0	0	0	0	0	0	0
Iris	0	0	0	0	0	0	0	0	0
Conjunctiva: Erythema	1	0	0	0	0	0	1	0	0
Chemosis	0	0	0	0	0	0	0	0	0

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SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

RADICACIÓN: 0-67253 EDICTO No. 1821

LA SECRETARÍA GENERAL AD-HOC
HACE SABER:

Que esta Superintendencia profirió Resolución No. 1938 de 31-ENE-2005. Que el contenido de la parte resolutiva es como sigue: El Superintendente de Industria y Comercio.

RESUELVE

ARTICULO PRIMERO: Negar el privilegio de patente de invención para la solicitud correspondiente a "UNA COMPOSICION HERBICIDA QUE COMPRENDE UNA SAL DE GLIFOSATO Y UN SURFACTANTE DE OXIDO DE ALQUILO Y/O ALQUENILO AMIDOAMIDA".

ARTICULO SEGUNDO: Notificar personalmente el contenido de la presente resolución a la doctora Margarita Castellanos Abondano, o a quien haga sus veces, en su calidad de apoderada de Rhodia Consumer Specialties Limited., entregándole copia de la misma, advirtiéndole que contra ella procede el recurso de reposición interpuesto ante el Superintendente de Industria y Comercio, al momento de la notificación o dentro de los 5 días hábiles siguientes a ella.

NOTIFÍQUESE Y CUMPLASE
Dada en Bogotá, D.C., a los 31 ENE 2005

EL SUPERINTENDENTE DE INDUSTRIA Y COMERCIO,

JAIME BUSTO ESCOBAR

Para notificar a los interesados, se fija el presente EDICTO en lugar visible al público en la SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO, por el término de (10) diez días hábiles contados a partir de las 8:30 a.m. de hoy.

Secretaría General Ad-Hoc 14-FEB-2005 Este edicto se desfija hoy 25-FEB-2005 a las cinco (5:00 p.m.)
Secretaría General Ad-Hoc
EDICTO No. 1821