

PATENT SPECIFICATION

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A5E 1A1F3 1A1K 1A1M 1A2F 1A2H 1A2N4 1A2P 1A3A
1A3B 1A3C 1A3E 1A3F 1A3G 1A5A1 1A5A2
1A5B1 1A5B2 1A5B3 1C12G 1C15A1 1C15A3
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1C5M 1C5P 1C7C 1C7G 1C7L 1C7M 1C7N 1C8A
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(54) IMPROVEMENTS IN OR RELATING TO FLOWABLE AQUEOUS PESTICIDE COMPOSITIONS

- (71) We, DIAMOND SHAMROCK CORPORATION, of 1100 Superior Avenue, Cleveland, Ohio, United States of America, a corporation organised and existing under the laws of the State of Delaware, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—
- Many pesticides including herbicides, fungicides, insecticides and nematocides, are practically insoluble in water and oftentimes may be sparingly soluble in petroleum hydrocarbons, which liquids are both convenient and inexpensive as carriers for providing easily applied pesticide formulations. Because of their insoluble nature, various methods thus have been devised heretofore for applying these pesticidally-active ingredients onto the substrate to be protected. Conventionally, such pesticides have long been applied in rather dilute compositions containing a low percentage of active ingredient. As handling of these dilute compositions and their transport to the point of use is both burdensome and expensive, various improved formulations have been developed which contain insoluble pesticides in concentrated form. Such formulations include, e.g., wettable powders, dust concentrates, aqueous suspensions, and oil/water suspensions.
- Wettable powders consists of the active ingredient mixed with a suitable solid carrier and may also contain a surfactant or dispersant. For application, the wettable powder is measured out in certain proportions, is diluted with water, and then stirred to form a suspension. Use of a wettable powder is disadvantageous in that it is somewhat difficult to handle when preparing the suspensions. Further, it has a tendency to cake during storage prior to contact with water, and can be extremely sensitive to high temperatures.
- Water-in-oil suspensions wherein the oil is

a continuous phase usually are very thick pastes. These are not easily flowable and dispersible in water. Also, they oftentimes may be unstable during storage due to changes in the crystal structure of the pesticide which promote its settling and agglomeration.

Aqueous suspensions of insoluble pesticides heretofore typically have contained only low concentrations of pesticide together with numerous adjuvants for promoting storage stability in the formulation by preventing undue caking and/or agglomeration of the pesticidal component. These suspensions, however, have not consistently possessed good water dispersibility, nor has settling or caking of the pesticide been adequately prevented.

There has long been a need in the art for a flowable aqueous pesticide composition which is easily handled during preparation and use, which has excellent shelf-life even during extended storage and which is completely dispersible in water. Particularly, a flowable, storage-stable and water-dispersible composition which can contain a high concentration of pesticide component, e.g., up to and including about 6 lbs. pesticide per gallon of formulation, has long been desired.

The present invention provides a liquid, easily-flowable pesticide composition which is completely dispersible in water and has excellent storage stability. Most significantly, the composition according to the invention retains its outstanding stability and dispersibility characteristics even when incorporating extremely high solids concentration, e.g., up to and including 6 lbs. of pesticide per gallon.

According to this invention, a flowable aqueous pesticide composition comprises by weight,

- (a) 10% to 60% of at least one finely-divided essentially water-insoluble pesticide having a particle size up to 10 microns;
(b) 1% to 10% of a nonionic surfactant;

- (c) 0.02% to 1.0% of a heteropoly-saccharide gum, as herein defined;
 (d) 0% to 10% of an anticaking agent;
 (e) 0% to 5% of an antifcaming agent;
 and
 (f) 0% to 10% of a freezing-point depressant, the balance being water.
- Depending upon the specific storage and use conditions intended for any particular composition, as will be discussed more fully hereinafter, optional adjuvants such as freeze-point depressants, anticaking agents and anti-foaming agents are advantageously incorporated into the composition.
- As used herein, the terms "active", "pesticidally - active", "pesticide" and "pesticidal" refer to toxicants and to biological compositions containing these chemicals which are effective in killing, preventing or controlling the growth of undesirable pests, e.g., plants, insects, mice, microorganisms, algae, fungi and bacteria, such chemicals and compositions being commonly known, e.g., as insecticides, miticides, bactericides, algacides, fungicides, nematocides and herbicides. The toxicant chemicals employed in the flowable pesticide formulations of this invention are essentially insoluble in water, that is to say, they are typically less than 1% soluble in water. Exemplary of specific toxicant compounds known and used heretofore as pesticides which suitable may be employed as such in the composition of this invention include the following:

- DDT (dichloro - diphenyl - trichloroethane)
 2,4 - D (2,4 - dichlorophenoxyacetic acid)
 2,4 - 5 - T (2,4,5 - trichlorophenoxyacetic acid)
 Dieldrin (1,2,3,4,10,10 - hexachloro - *exo* - 6,7 - epoxy - 1,4,4a,5,6,7,8,8a - octahydro - 1,4 - *endo,exo* - 5,8 - dimethanonaphthalene)
 Atrazine (2 - chloro - 4 - ethylamino - 6 - isopropylamine - *s* - triazine)
 Endrin (hexachloroepoxycyclooctahydro - *endo,endo* - dimethanonaphthalene)
 Heptachlor (1,4,5,6,7,8,8 - heptachloro - 3a,4,7,7a - tetrahydro - 4,7 - methanoindane)
 Ovex (*p* - chlorophenyl - *p* - chlorobenzene-sulfonate)
 Lindane (gamma isomer of 1,2,3,4,5,6 - hexachlorocyclohexane)
 Dacthal (Regd. Trademark) (dimethyl ester of tetrachloroterephthalic acid)
 Lasso (Regd. Trademark) [2,2 - chloro - 2',6' - diethyl - N - (methoxymethyl)-acetanilide]
 Simazine [2 - chloro - 4,6 - bis(ethylamino) - *s* - triazine]
 Monuron [3 - (*p* - chlorophenyl) - 1,1 - dimethylurea]
 Diuron [3 - (3,4 - dichlorophenyl) - 1,1 - dimethylurea]

- Sinmate (3,4- and 2,3 - dichlorobenzyl - N - methylcarbamate) 65
 Benefin (N - butyl - N - ethyl - *a,a,a* - trifluoro - 2,6 - dinitro - *p* - toluidine)
 Bayer 73 (Regd. Trademark) (5,2' - dichloro - 4' - nitrosalicylanilide, ethanol-amine salt) 70
 Captan [cis - N - (trichloromethylthio) - 4 - cyclohexane - 1,2 - dicarboximide]
 Sevin (Regd. Trademark) (N - methyl - 1 - naphthylcarbamate) 75
 Daconil (Regd. Trademark) 2787 (tetrachloroisophthalonitrile)
 Demosan (1,4 - dichloro - 2,5 - dimethoxybenzene)
 Neburon [1 - *m* - butyl - 3 - (3,4 - dichlorophenyl) - 1 - methylurea] 80
 Linuron [3 - (3,4 - dichlorophenyl) - 1 - methoxy - 1 - methylurea]
 Siduron [1 - (2 - methylcyclohexyl) - 3 - phenylurea] 85
 Ramrod (Regd. Trademark) (2 - chloro - N - isopropylacetanilide)
 Prometryne [2,4 - bis(isopropylamino) - 6 - methylmercapto - *s* - triazine]
 Bromacil (5 - bromo - 3 - *sec* - butyl - 6 - methyluracil) 90
 Thiram (tetramethylthiuram disulfide)
 Ziram (zinc dimethyldithiocarbamate).

In general, the pesticide content of the flowable compositions of this invention may vary from about 10% to 60%, by weight. In those compositions containing a high solids content, the pesticide content typically ranges from about 40% to 60%, by weight. In practice, the pesticide is employed in a finely-divided form having a particle size of up to 10 microns and ranging preferably from 1 to 10 microns. It is desirable that the pesticide materials have an average particle size within the stated range so that the greatest pesticide surface per unit area will be provided, thereby allowing the pesticide to be most homogeneously suspended. Likewise, pesticides which are extremely finely-divided provide per unit area greater biological activity. In preparing the pesticide compositions of this invention, in order to assure that the pesticide ingredient will have the desired average particle size, it may sometimes be necessary to subject the pesticide to air-milling, hammer milling, ball milling, or other conventional comminuting treatment known in the art.

In usual practice herein, compositions of the invention will contain either one or a combination of solid, essentially water-insoluble pesticide components. It is to be noted, however, that it is also possible to prepare suitable compositions which incorporate, in addition to at least one of the aforescribed pesticides, one or more solid, water-soluble pesticide components. In these compositions, the soluble pesticide will of

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imide]
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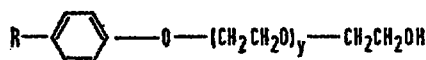
The heteropolysaccharide gum and the nonionic surfactant, in combination, comprise the dispersing-suspending system of the flowable pesticide composition of this invention. It is critical to employ these components in certain prescribed ratios both in relation to each other and to the concentration of pesticide component in order to obtain compositions with the desired storage stability and water-dispersibility.

The terms "heteropolysaccharide" and "heteropolysaccharide gum" as used herein mean polysaccharides in the form of colloids and their salts, e.g., amine derivatives, prepared by the method disclosed, for example, in U.S. Patent 3,244,695.

The heteropolysaccharide, which is commonly designated in the art as a xanthan gum, is a high molecular weight linear exocellular material prepared by the action of bacteria of the genus *Xanthomonas* on carbohydrates. It has a molecular weight in excess of 200,000, preferably over 1,000,000. A variety of carbohydrates can be fermented with various species of the genus *Xanthomonas* to produce the heteropolysaccharide. Examples of suitable bacterium species of the genus *Xanthomonas* include *X. campestris*, *X. carotae*, *X. inconnue*, *X. begoniae*, *X. melvacearum*, *X. vesicatoria*, *X. translucens*, and *X. vasculorum*. Suitable carbohydrates include, e.g., glucose, sucrose, fructose, maltose, lactose, galactose, soluble starch, corn starch and potato starch. Preparation of heteropolysaccharides suitably used herein is described in greater detail but not solely in U.S. Patent 3,020,206. It is to be understood that neither the heteropolysaccharides per se nor their preparation constitute a part of the present invention.

In general, any nonionic surfactant which has a suitable hydrophilic-lyophilic balance may be employed in the suspending-dispersing system of the flowable composition of this invention. Specific suitable surfactants are selected from the following classes or types of nonionic surfactant materials: ethoxylated alkylphenols (also designated in the art as alkylaryl polyether alcohols); ethoxylated aliphatic alcohols (or alkyl polyether alcohols); ethoxylated fatty acids (or polyoxyethylene fatty acid esters); ethoxylated anhydrosorbitol esters (or polyoxyethylenesorbitan fatty acid esters); and ethoxylated polyoxypropylene glycols (polyalkylene oxide block copolymers).

Of these, the preferred surfactants at present are the ethoxylated alkylphenols, i.e., alkylaryl polyether alcohols of the general formula:



wherein R=a C₈-C₁₂ linear or branched alkyl group and y=an integer of 8-30, as formulations with both optimum water-dispersibility and adequate storage stability are obtained by using these surfactants. Within this class, especially preferred are those alkylaryl polyether alcohols wherein R is a C₉ or C₁₀ alkyl group and y is an integer of 9-15.

In practice of the invention, any of the aforescribed nonionic surfactant compounds generally may be employed as the sole surfactant in the composition, or two or more of these compounds may be employed in combination. Likewise, a portion of any of these compounds, designated herein as primary surfactants, suitably may be replaced by an equivalent quantity of a nonionic surfactant such as, e.g., a liquid lower alkylene glycol ester of a fatty acid, as a secondary surfactant.

The heteropolysaccharide, i.e., xanthan gum, is employed in the composition generally in an amount ranging between 0.02 and 1.0 parts per 100 parts of total formulation while from 1 to 10 parts of the nonionic surfactant moiety generally is incorporated, per 100 parts of the formulation. In compositions of high pesticide solids content, the xanthan gum generally is employed in an amount ranging from 0.1 to 0.5 parts, and the surfactant in an amount ranging generally from 2 to 7 parts, per 100 parts of formulation. If each of these components is employed separately as the sole suspending or dispersing agent in otherwise similar formulations, the solid pesticide component will soon settle out of the continuous water phase. Depending upon the length of time such compositions are then allowed to stand after solids settling, it often-times becomes extremely difficult to resuspend the solids therein, even with vigorous and prolonged agitation.

In the pesticide composition of this invention, it is necessary to employ both the heteropolysaccharide and surfactant components within the ranges stated above in order to obtain the desired composition. Formulations containing amounts of these components outside these ranges will either be too thin or too thick and nonflowable, exhibiting inferior water dispersibility.

In practice, viscosities of the prepared compositions may be employed as a general rule to determine whether or not they will possess the desired storage stability and dispersibility in water. Compositions having viscosities ranging from about 8,000 to 30,000 cps, as measured with a Brookfield Viscometer, Model RVT (No. 2 spindle-0.5 RPM), generally will exhibit the desired characteristics.

Water is present in varying amounts depending upon the quantities employed of the other ingredients, always being present in sufficient quantity to serve as the continuous

phase for the dispersed pesticide component and to provide, in combination with the other ingredients, 100 parts of finished formulation. In the preferred compositions, i.e., those which

5 incorporate high concentrations of pesticide, from about 30 to about 40 parts water will generally be employed per 100 parts of finished formulation.

As described previously herein, minor quantities of one or more components such as antifoaming agents, anticaking agents, and freeze-point depressants are incorporated into the composition if it is to be stored for any extended period of time prior to use, particularly under adverse storage conditions. The various, commercially available silicone emulsions are examples of suitable antifoaming agents which may be incorporated in amounts ranging generally from 0.1 to 5.0 parts per 100 parts of the total composition.

Several different types of finely-divided silicas now known in the art are examples of particularly suitable anticaking agents. If employed, from 0.2 to 10 parts of such materials per each 100 parts of the total composition will generally serve to maintain, in combination with the suspending-dispersing system, the desired storage stability of the composition under the most extreme storage conditions. It is particularly advantageous to incorporate anticaking materials into those compositions of high pesticide content.

Lower alkylene glycols, e.g., ethylene or propylene glycol, are examples of suitable freeze-point depressants which are used if the composition is likely to be stored under subtemperate climatic conditions. Amounts of these compounds ranging from about 1 to about 10 parts, per each 100 parts of total composition will adequately provide the composition with the desired antifreeze protection.

To prepare the composition, the order of adding the ingredients is not especially critical, although it is preferred to admix the heteropolysaccharide, surfactant, and any optional components to be incorporated thoroughly in the continuous water phase prior to adding the solid pesticide component or components. Preparation of the composition may be carried out at ambient temperature with mild agitation, no application of heat or undue pressure normally being needed to obtain the desired homogeneous, flowable suspension. However, further mixing of the composition may be carried out employing conventional homogenizing devices, if desired or deemed advisable to assure the most homogeneous suspension of the pesticide component.

60 The composition of this invention, even if containing a high concentration of pesticide, provides to the routineer an easily flowable formulation which utilizes water as the sole, inexpensive dispersion medium. This composition has excellent bloom characteristics,

i.e., it is totally dispersible when added to water. It can be diluted with water in all proportions to provide agglomerate-free, sprayable pesticide compositions of any desired toxicant concentration. Preparation of the spray formulation may be easily accomplished at the application site by simply pouring an appropriate amount of the concentrated composition into water within the spray tank or other convenient container. It is also possible to apply the composition in undiluted form, utilizing newer, specialized spray techniques.

The sprayable, agglomerate-free pesticide compositions formulated from the composition of this invention may be applied from all types of presently used spray equipment with no plugging of the spray nozzles or other malfunction of the spray equipment.

For a fuller understanding of the nature of the invention and the methods for carrying it out, the following illustrative examples are given. In these examples and elsewhere herein, where quantities of ingredients may be given in parts, such proportions are by weight, unless otherwise indicated.

EXAMPLE 1

As an illustration of the invention, 5.2 parts of a nonionic surfactant comprising a polyoxyethylene ether of *t*-octyl phenol having about 9-10 moles of ethylene oxide per mole of surfactant is dissolved in 38.7 parts of water at ambient temperature. To this solution is added 0.10 part of a heteropolysaccharide with agitation. The heteropolysaccharide gum employed is "Kelzan" (Regd. Trademark) manufactured by the Kelco Company, San Diego, California. Prepared from the bacteria species *X. campestris*, this heteropolysaccharide is linear in structure and has a molecular weight greater than 1,000,000. It is composed of recurring units of *D*-glucose, *D*-mannose, and *D*-glucuronic acid in a ratio of 2.8:3.0:2.0.

With continued agitation, 56 parts of tetrachloroisophthalonitrile (Daconil (Regd. Trademark) 2787 fungicide, manufactured by Diamond Shamrock Corporation, Cleveland, Ohio) is incorporated into the prepared suspending agent-surfactant solution. The resulting opaque formulation, grayish in color, is of quite thin consistency and pours easily. However, no phase separation or solids settling is evident in the formulation after it has remained undisturbed for several hours.

A portion of the formulation is poured into a large volume of water. It exhibits excellent bloom, i.e., it disperses completely throughout the water, providing a homogeneous, though diluted formulation.

With continued storage, a very small amount of solids are observed to settle in the formulation after several days. These are easily resuspended with minimum agitation. A

sample of the formulation is again poured into water, exhibiting excellent bloom.

- For comparison, two other formulations are similarly prepared except that the surfactant is excluded from one of these, and the heteropolysaccharide from the other. In contrast to the homogeneous stable composition described above, each of these formulations is unsatisfactory. That containing no surfactant is a mixture wherein the pesticide solids have not become wetted and dispersed in the water, remaining as a separate phase. In the formulation which contains the surfactant but no suspending agent, the pesticide solids are wetted and dispersed in the water, forming an apparent homogeneous suspension. After preparation, however, this formulation quickly separates into two phases, the solids settling completely out of the suspension as a cake-like mass in the bottom of the container. This solids cake cannot be broken up easily and resuspended in the aqueous phase.

EXAMPLE 2

- A flowable pesticide composition is prepared from the following formulation

	% by wt.
Tetrachloroisophthalonitrile	54.00
Alkylaryl polyether alcohol ¹	5.20
Heteropolysaccharide gum	0.10
30 Propylene glycol	3.70
"Cab-O-Sil" M-5 ²	1.50
Antifoam FG-10 ³	0.25
Water	35.25

- ¹ Triton X-100 (Regd. Trademark)—*t*-octylphenoxy ethoxylated ethanol (9—10 moles ethylene oxide per mole of surfactant)—Rohm and Haas Co.

² Submicroscopic anhydrous SiO₂—Cabot Corp.—("Cab-O-Sil" is a Regd. Trademark).

³ Silicone emulsion—Dow Corning Corp.

The ingredients of the composition other than the pesticide component are incorporated into the water at ambient temperature after which the pesticide is added. The resulting opaque suspension has a specific gravity of 1.34 g/cc and contains 6 lbs. of active ingredient per gallon. It has a Brookfield viscosity of 29,600 cps.

When poured into water, it disperses completely with no evidence of any floc or agglomerate formation.

After being stored for 7 weeks at 50°C, the composition is still a homogeneous suspension, containing no separated solids.

EXAMPLES 3—8

These examples illustrate flowable pesticide compositions according to the invention which incorporate, as the surfactant material, alkylaryl polyether alcohols, i.e., ethoxylated alkylphenols containing different concentrations of ethylene oxide per mole. The general formulation employed is the same as in Example 2, except that 1.0 parts of "Hi-Sil" (Regd. Trademark) 233 (precipitated, hydrated SiO₂, manufactured by PPG Chem.) is substituted for the "Cab-O-Sil" (Regd. Trademark). Also, in each example, 0.15% by weight of the formulation, of a secondary surfactant material, "Nopco" (Regd. Trademark) Soap "L", is employed along with 5.20% of the primary surfactant. Viscosities of the formulations are measured with a Brookfield viscometer, Model LV, using the No. 3 spindle at 60 RPM.

	Example	Primary Surfactant	Moles Ethylene Oxide	Formulation Viscosity—cps
	3	Nonylphenoxypoly-(ethyleneoxy) ethanol	10.5	12,140
80	4	—do—	15	12,640
	5	Octylphenoxypoly-(ethyleneoxy) ethanol	10	10,600
	6	—do—	12—13	10,480
85	7	—do—	16	9,880
	8	—do—	30	10,500

Each of these formulations which incorporates 6 lbs. of active ingredient per gallon, exhibits excellent bloom, i.e., it is completely dispersible in water, with no floc or solids settling developing.

- After extended storage at 50°C, each formulation is found to contain no agglomerated solids layer. A minimal water layer

is observed at the top of each sample which can be readily remixed with gentle swirling of the formulation.

EXAMPLE 9

A flowable herbicide composition is prepared as previously described using the following formulation:

	% by weight	
5	Dimethyl ester of tetrachloro-terephthalic acid	55.70
	Ethoxylated polyoxypropylene glycol ¹	5.20
	Heteropolysaccharide	0.10
	Propylene glycol	3.70
	"Hi-Sil" 233 (Regd. Trade-mark)	1.00
10	Antifoam FG-10	0.25
	Water	34.00
	¹ Pluronic P-104 (Regd. Trademark—BASF Wyandotte Corp.)	

15 This composition has the same excellent bloom characteristics and storage stability as the compositions of the previous examples.

EXAMPLE 10

A fungicide composition is prepared from the following formulation:

	% by weight
20	Tetrachloroisophthalonitrile "Hyonic" PE 100 ¹ —(Regd. Trademark) 3.00
	Heteropolysaccharide 0.30
25	Ethylene glycol 5.00
	"Hi-Sil" 233 (Regd. Trade- mark) 1.00
	Antifoam FG-10 0.25
	Water 50.50
30	¹ alkylphenoxypoly (etheneoxy) ethanol sur- factant—Diamond Shamrock Corp.

35 This formulation contains 4 lbs. of active ingredient per gallon. It is a storage-stable suspension with complete, nonagglomerating dispersibility in water.

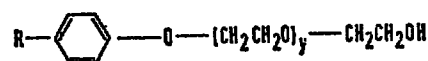
EXAMPLE 11

40 A mixed fungicide-insecticide composition is prepared as set forth in Example 10 above. This composition contains 20.5%, by weight each of tetrachloroisophthalonitrile fungicide and of 1 - naphthyl - N - methylcarbamate insecticide. The concentration of total active ingredient in this composition is 4 lbs. per gallon of formulation. The water-dispersibility 45 of the composition is excellent, as is its suspension stability in storage.

WHAT WE CLAIM IS:—

- 50 1. A flowable aqueous pesticide composition which comprises, by weight,
 (a) 10% to 60% of at least one finely-divided essentially water-insoluble pesticide having a particle size up to 10 microns;

- (b) 1% to 10% of a nonionic surfactant;
 (c) 0.02% to 1.0% of a heteropoly-saccharide gum, as herein defined;
 (d) 0% to 10% of an anticaking agent;
 (e) 0% to 5% of an antifoaming agent; and
 (f) 0% to 10% of a freezing-point depressant, the balance being water.
 2. A composition according to claim 1, wherein the nonionic surfactant is selected from alkylaryl polyether alcohols, alkyl polyether alcohols, polyoxyethylene fatty acid ethers, ethoxylated anhydrosorbitol esters and ethoxylated polyoxypropylene glycols.
 3. A composition according to claim 2, wherein the nonionic surfactant is an alkyl-aryl polyether alcohol of the formula: 70



wherein R is a C₈—C₁₂ alkyl group and y is 8 to 30.

4. A composition according to claim 1, 2 or 3, which contains, by weight of the total composition, 75

(a) 40% to 60% of at least one finely-divided water-insoluble pesticide;

(b) 3% to 7% of the nonionic surfactant;

(c) 0.1% to 0.5% of the heteropoly-saccharide gum; 80

(d) 0.5% to 2% of the anticaking agent;

(e) 0.2% to 0.7% of the antifoaming agent; and

(f) 2% to 6% of the freezing-point depressant; the balance being water. 85

5. A composition according to claim 4, wherein the anticaking agent is a finely-divided silica containing less than 5% moisture; the antifoaming agent is a silicone emulsion; and the freezing-point depressant is ethylene glycol or propylene glycol. 90

6. A composition according to any preceding claim, wherein the pesticide comprises a fungicide. 95

7. A composition according to any preceding claim, wherein the pesticide is a mixture of a fungicide and an insecticide.

8. A composition according to claim 6 or 7, wherein the fungicide is tetrachloroisophthalonitrile. 100

9. A composition according to claim 7, wherein the fungicide is tetrachloroisophthalonitrile and the insecticide is N-methyl-1-naphthylcarbamate. 105

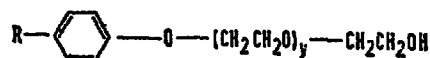
10. A composition according to any of claims 1 to 5, wherein the pesticide is a herbicide.



- | | | % by weight | |
|----|--|-------------|---|
| | Dimethyl ester of tetrachloro-terephthalic acid | 55.70 | (b) 1% to 10% of a nonionic surfactant; |
| 5 | Ethoxylated polyoxypropylene glycol ¹ | 5.20 | (c) 0.02% to 1.0% of a heteropoly-saccharide gum, as herein defined; |
| | Heteropolysaccharide | 0.10 | (d) 0% to 10% of an anticaking agent; |
| | Propylene glycol | 3.70 | (e) 0% to 5% of an antifoaming agent; and |
| | "Hi-Sil" 233 (Regd. Trade-mark) | 1.00 | (f) 0% to 10% of a freezing-point depressant, the balance being water. |
| 10 | Antifoam FG-10 | 0.25 | 2. A composition according to claim 1, wherein the nonionic surfactant is selected from alkylaryl polyether alcohols, alkyl polyether alcohols, polyoxyethylene fatty acid ethers, ethoxylated anhydrosorbitol esters and ethoxylated polyoxypropylene glycols. |
| | Water | 34.00 | 3. A composition according to claim 2, wherein the nonionic surfactant is an alkyl-aryl polyether alcohol of the formula: |
| | ¹ Pluronic P-104 (Regd. Trademark—BASF Wyandotte Corp.) | | |
- 15 This composition has the same excellent bloom characteristics and storage stability as the compositions of the previous examples.

EXAMPLE 10

A fungicide composition is prepared from the following formulation:



- | | | % by weight | |
|----|---|-------------|--|
| 20 | Tetrachloroisophthalonitrile | 40.0 | wherein R is a C ₈ —C ₁₂ alkyl group and y is 8 to 30. |
| | "Hyonic" PE 100 ¹ —(Regd. Trademark) | 3.00 | 4. A composition according to claim 1, 2 or 3, which contains, by weight of the total composition, |
| | Heteropolysaccharide | 0.30 | (a) 40% to 60% of at least one finely-divided water-insoluble pesticide; |
| 25 | Ethylene glycol | 5.00 | (b) 3% to 7% of the nonionic surfactant; |
| | "Hi-Sil" 233 (Regd. Trade-mark) | 1.00 | (c) 0.1% to 0.5% of the heteropolysaccharide gum; |
| | Antifoam FG-10 | 0.25 | (d) 0.5% to 2% of the anticaking agent; |
| | Water | 50.50 | (e) 0.2% to 0.7% of the antifoaming agent; and |
| 30 | ¹ alkylphenoxypoly (etheneoxy) ethanol surfactant—Diamond Shamrock Corp. | | (f) 2% to 6% of the freezing-point depressant; the balance being water. |
- 35 This formulation contains 4 lbs. of active ingredient per gallon. It is a storage-stable suspension with complete, nonagglomerating dispersibility in water.

EXAMPLE 11

- A mixed fungicide-insecticide composition is prepared as set forth in Example 10 above. This composition contains 20.5%, by weight each of tetrachloroisophthalonitrile fungicide and cf 1 - naphthyl - N - methylcarbamate insecticide. The concentration of total active ingredient in this composition is 4 lbs. per gallon of formulation. The water-dispersibility of the composition is excellent, as is its suspension stability in storage.

WHAT WE CLAIM IS:—

1. A flowable aqueous pesticide composition which comprises, by weight,
- 50 (a) 10% to 60% of at least one finely-divided essentially water-insoluble pesticide having a particle size up to 10 microns;
2. A composition according to claim 1, wherein the nonionic surfactant is selected from alkylaryl polyether alcohols, alkyl polyether alcohols, polyoxyethylene fatty acid ethers, ethoxylated anhydrosorbitol esters and ethoxylated polyoxypropylene glycols.
3. A composition according to claim 2, wherein the nonionic surfactant is an alkyl-aryl polyether alcohol of the formula:
4. A composition according to claim 1, 2 or 3, which contains, by weight of the total composition,
- (a) 40% to 60% of at least one finely-divided water-insoluble pesticide;
- (b) 3% to 7% of the nonionic surfactant;
- (c) 0.1% to 0.5% of the heteropolysaccharide gum;
- (d) 0.5% to 2% of the anticaking agent;
- (e) 0.2% to 0.7% of the antifoaming agent; and
- (f) 2% to 6% of the freezing-point depressant; the balance being water.
5. A composition according to claim 4, wherein the anticaking agent is a finely-divided silica containing less than 5% moisture; the antifoaming agent is a silicone emulsion; and the freezing-point depressant is ethylene glycol or propylene glycol.
6. A composition according to any preceding claim, wherein the pesticide comprises a fungicide.
7. A composition according to any preceding claim, wherein the pesticide is a mixture of a fungicide and an insecticide.
8. A composition according to claim 6 or 7, wherein the fungicide is tetrachloroisophthalonitrile.
9. A composition according to claim 7, wherein the fungicide is tetrachloroisophthalonitrile and the insecticide is N-methyl - 1 - naphthylcarbamate.
10. A composition according to any of claims 1 to 5, wherein the pesticide is a herbicide.



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factant: 55
sterop
ined;
agent;
ng agent;
zing-po 60
water.
claim 1,
s selected
ikyl poly-
atty acid 65
esters and
ols.
claim 2,
an alkyl-
ula: 70

 H_2CH_2OH

oup and y
claim 1, 2
f the total 75
one finely-
icide;
rfactant;
heteropoly- 80
ng agent;
ning agent;
ezing-point 85
g water.
claim 4,
a finely-
than 5%
s a silicone 90
depressant
ol.
any preced-
comprises a
95
any preced-
s a mixture
claim 6 or
rachloroiso- 100
o claim 7,
rachloroiso-
le is N -
105
to any of
sticide is a

11. A composition according to claim 10, wherein the herbicide is the dimethyl ester of tetrachloroterephthalic acid.

5 12. A flowable aqueous pesticide composition according to claim 1, substantially as herein described.

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PATENTS ACT 1949

SPECIFICATION NO 1421092

In accordance with the Decision of the Principal Examiner, acting for the Comptroller-General, dated 11 July 1978 this Specification has been amended under Section 14 also a statutory reference in the following manner:

Page 1, line 86. Page 6, line 50, delete 10% insert 40%

Page 1 line 90. Page 6, line 54, delete 1% to 10% insert 2% to 7%

Page 2, line 1. Page 6, line 55, delete 0.02% to 1.0% insert 0.1% to 0.5%

Page 2, delete lines 94 to 97 insert In general, the flowable compositions of this invention contain a high solids

Page 2, line 98. Page 3, line 91, after content delete comma insert and

Page 3, delete lines 84, to 90, insert The compositions are of high

Page 4, delete line 4, insert In the compositions, which

Page 4, line 60, delete , even if

Page 4, delete line 61, insert contains a high concentration of pesticide and

Reference has been directed in pursuance of Section 9 subsection (1) of the Patents Act, 1949 to Patent No. 1160674

THE PATENT OFFICE
10 October 1978

Bas 50974/6