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(56) Related Art

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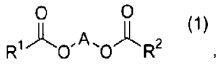
Emulsifiable Concentrate

Abstract

An emulsifiable concentrate containing the compound shown by the formula (1):



(1)

aromatic hydrocarbon, surfactant and 2', 4'-difluoro-2-(a,a,a-trifluoro-m-tolyloxy) nicotinanilide has a high stability of the emulsion even after dilution with water.

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AUSTRALIA

PATENTS ACT 1990

COMPLETE SPECIFICATION

FOR A STANDARD PATENT

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Invention Title:	Emulsifiable concentrate

The following statement is a full description of this invention, including the best method of performing it known to me/us:-

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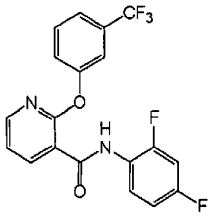
EMULSIFIABLE CONCENTRATE

FIELD OF THE INVENTION

The present invention relates to a pesticidal emulsifiable concentrate which contains 2',4'-difluoro-2-(a,a,a-trifluoro-m-tolyloxy)nicotinanilide as a herbicidal active ingredient.

BACKGROUND ART

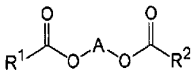
It is known that 2',4'-difluoro-2-(a,a,a-trifluoro-m-tolyloxy)nicotinanilide shown by the below formula is an active ingredient of herbicide in USP-4618366.



DISCLOSURE OF THE INVENTION

The present invention provides an emulsifiable concentrate containing 2',4'-difluoro-2-(a,a,a-trifluoro-m-tolyloxy)nicotinanilide as a herbicidal active ingredient which has an excellent stability of the emulsion even after diluted with water.

According to the present invention, an emulsifiable concentrate containing the compound shown by the formula (1):

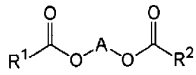

(1)

wherein, in the formula, R^1 and R^2 represent alkyl groups, A represents ethylene group, trimethylene group, propylene group or tetramethylene group, and the sum of the number of carbon atoms which consist of the groups of R^1, R^2 and A is 4 to 10; and an aromatic hydrocarbon as solvent and a surfactant and 2',4'-difluoro-2-(a,a,a-trifluoro-m-tolyloxy)nicotinanilide has an excellent stability of the emulsion even after diluted with water.

Namely, the present invention is as follows:

[1] An emulsifiable concentrate comprising 2',4'-difluoro-2-(a,a,a-trifluoro-m-tolyloxy)nicotinanilide ;

the compound shown by the below formula (1):


(1)

wherein, in the formula, R^1 and R^2 represent alkyl groups, A represents ethylene group, trimethylene group, propylene group or tetramethylene group, and the sum of the number of carbon atoms which consist of the groups of R^1, R^2 and A is 4 to 10; an aromatic hydrocarbon and

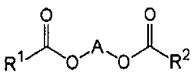
a surfactant.

[2] An emulsifiable concentrate comprising 2',4'-difluoro-2-(a,a,a-trifluoro-m-tolyloxy)nicotinanilide ;

4-cyano-2,6-dibromophenyl octanoate;

4-cyano-2,6-diiodophenyl octanoate;

the compound shown by the below formula (1):


(1)

wherein, in the formula, R^1 and R^2 represent alkyl groups, A represents ethylene group, trimethylene group, propylene group or tetramethylene group, and the sum of the number of carbon atoms which consist of the groups of R^1, R^2 and A is 4 to 10;

an aromatic hydrocarbon and

a surfactant.

[3] An emulsifiable concentrate comprising

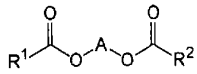
1 to 5 % by weight of

2',4'-difluoro-2-(a,a,a-trifluoro-m-tolyloxy)nicotinanilide;

1 to 30 % by weight of 4-cyano-2,6-dibromophenyl octanoate;

1 to 30 % by weight of 4-cyano-2,6-diiodophenyl octanoate;

5 to 80 % by weight of the compound shown by the below formula (1):


(1)

wherein, in the formula, R^1 and R^2 represent alkyl groups, A represents ethylene group, trimethylene group, propylene group or tetramethylene group, and the sum of the number of carbon atoms which consist of the groups of R^1, R^2 and A is 4 to 10;

an aromatic hydrocarbon and

4 to 20 % by weight of a surfactant;

and the total content of 4-cyano-2,6-dibromophenyl octanoate, 4-cyano-2,6-diiodophenyl octanoate and the aromatic hydrocarbon

in the emulsifiable concentrate is 15 to 80 % by weight.

[4] The emulsifiable concentrate according to [3], wherein the emulsifiable concentrate is essentially consisting of

1 to 5 % by weight of

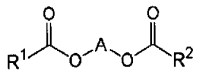
2',4'-difluoro-2-(a,a,a-trifluoro-m-tolyloxy)nicotinanilide

;

1 to 30 % by weight of 4-cyano-2,6-dibromophenyl octanoate;

1 to 30 % by weight of 4-cyano-2,6-diiodophenyl octanoate;

5 to 80 % by weight of the compound shown by the below formula (1):



(1)

wherein, in the formula, R^1 and R^2 represent alkyl groups, A represents ethylene group, trimethylene group, propylene group or tetramethylene group, and the sum of the number of carbon atoms which consist of the groups of R^1, R^2 and A is 4 to 10;

an aromatic hydrocarbon and

4 to 20 % by weight of a surfactant;

and the total content of 4-cyano-2,6-dibromophenyl octanoate, 4-cyano-2,6-diiodophenyl octanoate and the aromatic hydrocarbon in the emulsifiable concentrate is 15 to 80 % by weight.

[5] The emulsifiable concentrate according to any one of [1] to [4], wherein the amount of the compound shown by the formula (1) is in the range between 5 and 80 by weight per 1 part by weight of

2',4'-difluoro-2-(a,a,a-trifluoro-m-tolyloxy)nicotinanilide

.

[6] The emulsifiable concentrate according to any one of [1]

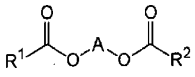
to [5], wherein the surfactant is a mixture of an anionic surfactant and a nonionic surfactant; and the ratio by weight of the anionic surfactant and the nonionic surfactant is 1:0.1 to 1:10.

[7] The emulsifiable concentrate according to any one of [1] to [5], wherein the surfactant is a mixture of dodecyl benzene sulfonic acid salt and polyoxyethylene castor oil; and the ratio by weight of the dodecyl benzene sulfonic acid salt and the polyoxyethylene castor oil is 1:0.1 to 1:10.

[8] The emulsifiable concentrate according to any one of [1] to [7], wherein the compound shown by the formula (1) is the compound selected from the group consisting of ethylene glycol diacetate, ethylene glycol dipropionate, ethylene glycol dibutyrate, propylene glycol diacetate, propylene glycol dipropionate and 1,3-propanediol diacetate.

[9] An aqueous composition which is obtainable by diluting the emulsifiable concentrate according to any one of [1] to [8] with water.

The emulsifiable concentrate of the present invention comprises 2',4'-difluoro-2-(a,a,a-trifluoro-m-tolyloxy)nicotinanilide ; the compound shown by the below formula (1):



(1)

;

an aromatic hydrocarbon and a surfactant.

2',4'-difluoro-2-(a,a,a-trifluoro-m-tolyloxy)nicotinanilide is the compound named diflufenican as common name(referred as diflufenican hereinafter).

The emulsifiable concentrate of the present invention usually contains 4-cyano-2,6-dibromophenyl octanoate and 4-cyano-2,6-diiodophenyl octanoate as herbicidal active ingredients. 4-cyano-2,6-dibromophenyl octanoate is the compound named bromoxynil octanoate as common name(referred as bromoxynil=octanoate, hereinafter). 4-cyano-2,6-diiodophenyl octanoate is the compound named ioxynil octanoate as common name(referred as ioxynil=octanoate, hereinafter).

Diflufenican is the compound disclosed in "The Pesticide Manual"(by British Crop Protection Council, Thirteenth Edition) as reference number 251. It is a solid compound and its melting point is about 159 to 161 °C. It can be produced by the method disclosed in USP-4618366. Bromoxynil=octanoate is the compound disclosed in "The Pesticide Manual"(mentioned above) as reference number 95. It is a solid compound and its melting point is about 45 to 46 °C. It can be produced by the method disclosed in USP-3397054. Ioxynil=octanoate is the compound disclosed in "The Pesticide Manual"(mentioned above) as reference number 467. It is a solid compound and its melting point is about 56 to 57 °C. It can be produced by the method disclosed in USP-3397054.

In the emulsifiable concentrate of the present invention, the total amount of diflufenican, bromoxynil=octanoate and ioxynil=octanoate is usually 1 to 60 % by weight, preferably 3 to 40 % by weight based on the total weight of the emulsifiable concentrate of the present invention. The amount of diflufenican is usually 1 to 5 % by weight based on the total weight of the

emulsifiable concentrate of the present invention, the amount of bromoxynil=octanoate is usually 1 to 30 % by weight based on the total weight of emulsifiable concentrate of the present invention; and the amount of ioxynil=octanoate is usually 1 to 30 % by weight based on the total weight of the emulsifiable concentrate of the present invention. Preferably, the amount of diflufenican is 1 to 4 % by weight, bromoxynyl=octanoate is 6 to 20 % by weight, ioxynyl=octanoate is 4 to 12 % by weight based on the total weight of the emulsifiable concentrate of the present invention. More preferably, the amount of diflufenican is 1.5 to 4 % by weight, bromoxynyl=octanoate is 8 to 18 % by weight, ioxynyl=octanoate is 4 to 10 % by weight based on the total weight of the emulsifiable concentrate of the present invention.

The emulsifiable concentrate of the present invention contains the compound shown by the formula (1)(referred as the present solvent 1, hereinafter) as a solvent.

In the formula (1), A represents ethylene group, trimethylene group, propylene group or tetramethylene group. In the formula (1), each of R^1 and R^2 independently represents alkyl group such as C1 to C4 alkyl group include methyl group, ethyl group, isopropyl group and butyl group. The sum of the number of carbon atoms which consist of the group of R^1, R^2 and A in the formula (1) is 4 to 10, preferably 4 to 8.

Examples of the present solvent 1 include ethylene glycol diacetate, ethylene glycol dipropionate, ethylene glycol dibutyrate, propylene glycol diacetate, propylene glycol

dipropionate and 1,3-propanediol diacetate. The present solvent can be used by itself or mixture of above mentioned compound. For the emulsifiable concentrate of the present invention, ethylene glycol diacetate or propylene glycol diacetete is preferably used.

The amount of the present solvent 1 is usually 5 to 80 % by weight, preferably 20 to 70 % by weight based on the total weight of the emulsifiable concentrate of the present invention. And the amount of the present solvent 1 is preferably 5 to 80 by weight, more preferably 8 to 80 by weight, far more preferably 30 to 50 % by weight based on the weight of diflufenican.

The emulsifiable concentrate of the present invention further includes an aromatic hydrocarbon. In the present invention, aromatic hydrocarbon means an aromatic hydrocarbon compound which is a liquid at room temperature(25 °C). The aromatic hydrocarbon(referred as the present solvent 2, hereinafter) includes alkylbenzene(for example, xylene, tetramethylbenzene and the like), alkylnaphthalene(for example, methylnaphthalene), diphenylethane, dixylylethane, phenylxylylethane and the mixture thereof.

Concretely, the commercially available products such as Hisol SAS-296 (commercial name of Nippon Oil Corp., a mixture of 1-phenyl-1-xylylethane and 1-phenyl-1-ethylphenylethane), Cactus Solvent HP-MN (commercial name of Nikko Petrochemical Company, containing 80% of methylnaphthalene), Cactus Solvent HP-DMN (commercial name of Nikko Petrochemical Company, containing 80% of dimethylnaphthalene), Cactus Solvent P-100

(commercial name of Nikko Petrochemical Company, alkylbenzene having 9 to 10 carbon atoms), Cactus Solvent P-150 (commercial name of Nikko Petrochemical Company, alkylbenzene), Cactus Solvent P-180 (commercial name of Nikko Petrochemical Company, a mixture of methylnaphthalene and dimethylnaphthalene), Cactus Solvent P-200 (commercial name of Nikko Petrochemical Company, a mixture of methylnaphthalene and dimethylnaphthalene), Cactus Solvent P-220 (commercial name of Nikko Petrochemical Company, a mixture of methylnaphthalene and dimethylnaphthalene), Cactus Solvent PAD-1 (commercial name of Nikko Petrochemical Company, dimethylmonoisopropylnaphthalene), Solvesso 100 (commercial name of Exxon Chemical Corp., aromatic hydrocarbon, mainly C9 to C10 dialkyl and trialkyl benzene), Solvesso 150 (commercial name of Exxon Chemical Corp., aromatic hydrocarbon, mainly C10 to C11 alkylbenzene), Solvesso 150 ND (commercial name of Exxon Mobil Chemical Company, aromatic hydrocarbon, mainly C10 to C11 alkylbenzene), Solvesso 200 (commercial name of Exxon Chemical Corp., aromatic hydrocarbon, mainly C10 to C14 alkylnaphthalene), ULTRA LOW NAPHTHALENE AROMATIC 150 (commercial name of Exxon Mobil Chemical Company, aromatic hydrocarbon, mainly C10 to C11 alkylbenzene), ULTRA LOW NAPHTHALENE AROMATIC 200 (commercial name of Exxon Mobil Chemical Company, aromatic hydrocarbon, mainly C11 to C14 alkylnaphthalene), Solvesso 200 ND (commercial name of Exxon Mobil Chemical Company, aromatic hydrocarbon, mainly C11 to C14 alkylnaphthalene), Suwasol 100 (commercial name of Maruzen Petrochemical Company, toluene) and Suwasol 200 (commercial name of Maruzen Petrochemical Company, xylene) can be used as the present solvent 2.

In the emulsifiable concentrate of the present invention, the total amount of bromoxynil=octanoate, ioxynil=octanoate and the present solvent 2 is usually 15 to 80 % by weight based on the total weight of the emulsifiable concentrate of the present invention.

The emulsifiable concentrate of the present invention contains a surfactant. The surfactant used for the emulsifiable concentrate of the present invention is preferably a mixture of an anionic surfactant and a nonionic surfactant.

Examples of anionic surfactant include
alkyl aryl sulfonic acid salt such as dodecyl benzene sulfonic acid salt and the like,
polyoxyethylene(poly)arylaryl ether sulfates such as polyoxyethylene distyryl phenyl ether sulfate and the like,
polyoxyethylene(poly)arylaryl ether phosphate such as polyoxyethylene tristyryl phenyl ether phosphate and the like,
polyoxyethylenealkylaryl phosphate ester, and
polyoxyethylenealkyl phosphate ester.

Generally, sodium salt, calcium salt and ammonium salt are exemplified as sulfonic acid salt, sulfate salt or phosphate salt.

Preferably alkyl aryl sulfonic acid salt, especially dodecyl benzene sulfonic acid salt such as sodium salt and calcium salt is used for the emulsifiable concentrate of the present invention.

Commercially available surfactant such as Rhodacal 70, Rhodacal70/B and Rhodacal60/BE(each produced by Rhodia Nicca)

can be used as dodecyl benzene sulfonic acid salt. Commercially available surfactant such as Soprophor DSS/11(produced by Rhodia Nicca) can be used as polyoxyethylene distyryl phenyl ether sulfate. Commercially available surfactant such as Soprophor FLK(produced by Rhodia Nicca) can be used as polyoxyethylene tristiryl phenyl ether phosphoric acid. Commercially available surfactant such as Rhodafac PS/17(produced by Rhodia Nicca) can be used as polyoxyethylenealkylaryl phosphate ester. Commercially available surfactant such as Rhodafac MB(produced by Rhodia Nicca) can be used as polyoxyethylenealkyl phosphate ester.

Examples of nonionic surfactant include

polyoxyethylene-polyoxypropylene block polymer;

fatty acid ester of polyoxyethylene-polyoxypropylene block polymer;

polyoxyethylene-polyoxypropylene alkyl ether;

polyoxyethylene-polyoxypropylene polyaryl ether ;

polyoxyethylene-polyoxypropylene alkyl aryl ether;

polyoxyethylene alkyl aryl ether;

polyoxyethylene polyaryl ether;

polyoxyethylene vegetable oil such as polyoxyethylene castor oil and the like;

polyoxyethylene hardened vegetable oil such as polyoxyethylene hardened castor oil and the like;

polyoxyethylene-polyoxypropylene vegetable oil such as polyoxyethylene-polyoxypropylene castor oil and the like;

polyoxyethylene fatty acid esters;

polyoxyethylene alkyl ether;

polyoxyethylene tristyryl phenyl phosphate diester;
polyoxyethylene-polyoxypropylene tristyryl phenyl phosphate diester;
fatty acid alcohol polyglycol ether; and
fatty acid ester of glycerin.

Preferable examples include
polyoxyethylene vegetable oil,
polyoxyethylene hardened vegetable oil,
polyoxyethylene alkyl aryl ether,
polyoxyethylene tristyryl phenyl phosphate diester and
polyoxyethylene-polyoxypropylene tristyryl phenyl phosphate diester, especially include polyoxyethylene castor oil.

Commercially available surfactant such as Teric PE 64(produced by Huntsman) can be used as polyoxyethylene-polyoxypropylene block polymer. Commercially available surfactant such as Antarox BO/327, 340 Antarox BO series(each produced by Rhodia Nicca) can be used as polyoxyethylene-polyoxypropylene alkyl ether. Commercially available surfactant such as Solpol T26(produced by Toho Chemical Industry) can be used as polyoxyethylene alkyl aryl ether. Commercially available surfactant such as Alkamuls OR40, Alkamuls BR(each produced by Rhodia Nicca) can be used as polyoxyethylene castor oil. Commercially available surfactant such as Newcol 150(produced by Nippon Nyukazai) can be used as polyoxyethylene fatty acid ester. Commercially available surfactant such as Newcol 1100, Newcol 1105(each produced by Nippon Nyukazai) can be used as polyoxyethylene alkyl aryl ester. Commercially available surfactant such as PIONIN D-900 series(produced by

TAKEMOTO Oil & Fat) can be used as fatty acid ester of glycerin.

In the emulsifiable concentrate of the present invention, the amount of surfactant is usually 4 to 20 % by weight, preferably 4 to 15 % by weight based on the total weight of the emulsifiable concentrate of the present invention. In case of the surfactant is a mixture of an anionic surfactant and a nonionic surfactant, the weight ratio of the anionic surfactant and the nonionic surfactant is 1:0.1 to 1:10 and the amount of anionic surfactant and nonionic surfactant is preferably 2 to 5 % each by weight based on the total weight of the emulsifiable concentrate of the present invention.

In the emulsifiable concentrate of the present invention, when a mixture of an anionic surfactant and a nonionic surfactant is used as a surfactant, the mixture of dodecyl benzene sulfonic acid salt and polyoxyethylene caster oil is preferably used.

Besides (a)diflufenican, (b)bromoxynil=octanoate, (c)ioxynil=octanoate, (d)the present solvent 1, (e)the present solvent 2 and (f)a surfactant; the emulsifiable concentrate of the present invention may contain another organic solvent, an additive and the like if necessary.

Another organic solvent includes monoester solvents such as methyl laurate, isopropyl myristate, isopropyl palmitate, methyl caprate, methyl oleate, isobutyl oleate, butyl propionate, isoamyl propionate, ethyl butyrate, butyl butyrate, isoamyl butyrate, isoamyl valerate, amyl lactate, methyl linoleate, methyl linolenate, palm fatty acid methyl and the like; aliphatic hydrocarbon solvents such as decane, tridecane, tetradecane,

hexadecane, octadecane and the like.

Examples of the additive include antioxidant such as 3-/2-t-butyl-4-hydroxyanisole, butyl hydroxy toluene and the like; coloring agent and the like.

The embodiments of the present invention will be explained below.

An emulsifiable concentrate comprising 1 to 5 % by weight of diflufenican; 1 to 30 % by weight of bromoxynil=octanoate; 1 to 30 % by weight of ioxynil=octanoate; 5 to 80 % by weight of the present solvent 1; the present solvent 2 and 4 to 20 % by weight of a surfactant;
and the total content of bromoxynil=octanoate, ioxynil=octanoate and the present solvent 2 in the emulsifiable concentrate is 15 to 80 % by weight.

An emulsifiable concentrate essentially consisting of 1 to 5 % by weight of diflufenican; 1 to 30 % by weight of bromoxynil=octanoate; 1 to 30 % by weight of ioxynil=octanoate; 5 to 80 % by weight of the present solvent 1; the present solvent 2 and 4 to 20 % by weight of a surfactant;
and the total content of bromoxynil=octanoate, ioxynil=octanoate and the present solvent 2 in the emulsifiable concentrate is 15 to 80 % by weight.

An emulsifiable concentrate comprising 1 to 5 % by weight of diflufenican; 1 to 30 % by weight of bromoxynil=octanoate;

1 to 30 % by weight of ioxynil=octanoate; 5 to 80 % by weight of the present solvent 1; the present solvent 2 and 4 to 20 % by weight of a surfactant;
and the total content of bromoxynil=octanoate, ioxynil=octanoate and the present solvent 2 in the emulsifiable concentrate is 15 to 80 % by weight;
and the amount of the present solvent 1 is in the range between 5 and 80 by weight per 1 pert by weight of diflufenican.

An emulsifiable concentrate essentially consisting of 1 to 5 % by weight of diflufenican; 1 to 30 % by weight of bromoxynil=octanoate; 1 to 30 % by weight of ioxynil=octanoate; 5 to 80 % by weight of the present solvent 1; the present solvent 2 and 4 to 20 % by weight of a surfactant;
and the total content of bromoxynil=octanoate, ioxynil=octanoate and the present solvent 2 in the emulsifiable concentrate is 15 to 80 % by weight;
and the amount of the present solvent 1 is in the range between 5 and 80 by weight per 1 pert by weight of diflufenican.

An emulsifiable concentrate comprising 1 to 5 % by weight of diflufenican; 1 to 30 % by weight of bromoxynil=octanoate; 1 to 30 % by weight of ioxynil=octanoate; 5 to 80 % by weight of the present solvent 1; the present solvent 2 and 4 to 20 % by weight of a surfactant;
and the total content of bromoxynil=octanoate, ioxynil=octanoate and the present solvent 2 in the emulsifiable concentrate is 15 to 80 % by weight;

and the surfactant is a mixture of an anionic surfactant and a nonionic surfactant;
and the ratio by weight of the anionic surfactant and the nonionic surfactant is 1:0.1 to 1:10.

An emulsifiable concentrate essentially consisting of 1 to 5 % by weight of diflufenican; 1 to 30 % by weight of bromoxynil=octanoate; 1 to 30 % by weight of ioxynil=octanoate; 5 to 80 % by weight of the present solvent 1; the present solvent 2 and 4 to 20 % by weight of a surfactant;
and the total content of bromoxynil=octanoate, ioxynil=octanoate and the present solvent 2 in the emulsifiable concentrate is 15 to 80 % by weight;
and the surfactant is a mixture of an anionic surfactant and a nonionic surfactant;
and the ratio by weight of the anionic surfactant and the nonionic surfactant is 1:0.1 to 1:10.

An emulsifiable concentrate comprising 1 to 5 % by weight of diflufenican; 1 to 30 % by weight of bromoxynil=octanoate; 1 to 30 % by weight of ioxynil=octanoate; 5 to 80 % by weight of the present solvent 1; the present solvent 2 and 4 to 20 % by weight of a surfactant;
and the total content of bromoxynil=octanoate, ioxynil=octanoate and the present solvent 2 in the emulsifiable concentrate is 15 to 80 % by weight;
and the amount of the present solvent 1 is in the range between 5 and 80 by weight per 1 pert by weight of diflufenican;

the surfactant is a mixture of an anionic surfactant and a nonionic surfactant;
and the ratio by weight of the anionic surfactant and the nonionic surfactant is 1:0.1 to 1:10.

An emulsifiable concentrate essentially consisting of 1 to 5 % by weight of diflufenican; 1 to 30 % by weight of bromoxynil=octanoate; 1 to 30 % by weight of ioxynil=octanoate; 5 to 80 % by weight of the present solvent 1; the present solvent 2 and 4 to 20 % by weight of a surfactant;
and the total content of bromoxynil=octanoate, ioxynil=octanoate and the present solvent 2 in the emulsifiable concentrate is 15 to 80 % by weight;
and the amount of the present solvent 1 is in the range between 5 and 80 by weight per 1 pert by weight of diflufenican;
the surfactant is a mixture of an anionic surfactant and a nonionic surfactant;
and the ratio by weight of the anionic surfactant and the nonionic surfactant is 1:0.1 to 1:10.

An emulsifiable concentrate comprising 1 to 5 % by weight of diflufenican; 1 to 30 % by weight of bromoxynil=octanoate; 1 to 30 % by weight of ioxynil=octanoate; 5 to 80 % by weight of the present solvent 1; the present solvent 2 and 4 to 20 % by weight of a surfactant;
and the total content of bromoxynil=octanoate, ioxynil=octanoate and the present solvent 2 in the emulsifiable concentrate is 15 to 80 % by weight;

and the surfactant is a mixture of dodecyl benzene sulfonic acid salt and polyoxyethylene caster oil;
and the ratio by weight of dodecyl benzene sulfonic acid salt and polyoxyethylene caster oil is 1:0.1 to 1:10.

An emulsifiable concentrate essentially consisting of 1 to 5 % by weight of diflufenican; 1 to 30 % by weight of bromoxynil=octanoate; 1 to 30 % by weight of ioxynil=octanoate; 5 to 80 % by weight of the present solvent 1; the present solvent 2 and 4 to 20 % by weight of a surfactant;
and the total content of bromoxynil=octanoate, ioxynil=octanoate and the present solvent 2 in the emulsifiable concentrate is 15 to 80 % by weight;
and the surfactant is a mixture of dodecyl benzene sulfonic acid salt and polyoxyethylene caster oil;
and the ratio by weight of dodecyl benzene sulfonic acid salt and polyoxyethylene caster oil is 1:0.1 to 1:10.

An emulsifiable concentrate comprising 1 to 5 % by weight of diflufenican; 1 to 30 % by weight of bromoxynil=octanoate; 1 to 30 % by weight of ioxynil=octanoate; 5 to 80 % by weight of the present solvent 1; the present solvent 2 and 4 to 20 % by weight of a surfactant;
and the total content of bromoxynil=octanoate, ioxynil=octanoate and the present solvent 2 in the emulsifiable concentrate is 15 to 80 % by weight;
and the amount of the present solvent 1 is in the range between 5 and 80 by weight per 1 pert by weight of diflufenican;

the surfactant is a mixture of dodecyl benzene sulfonic acid salt and polyoxyethylene caster oil;
and the ratio by weight of dodecyl benzene sulfonic acid salt and polyoxyethylene caster oil is 1:0.1 to 1:10.

An emulsifiable concentrate essentially consisting of 1 to 5 % by weight of diflufenican; 1 to 30 % by weight of bromoxynil=octanoate; 1 to 30 % by weight of ioxynil=octanoate; 5 to 80 % by weight of the present solvent 1; the present solvent 2 and 4 to 20 % by weight of a surfactant;
and the total content of bromoxynil=octanoate, ioxynil=octanoate and the present solvent 2 in the emulsifiable concentrate is 15 to 80 % by weight;
and the amount of the present solvent 1 is in the range between 5 and 80 by weight per 1 pert by weight of diflufenican;
the surfactant is a mixture of dodecyl benzene sulfonic acid salt and polyoxyethylene caster oil;
and the ratio by weight of dodecyl benzene sulfonic acid salt and polyoxyethylene caster oil is 1:0.1 to 1:10.

An emulsifiable concentrate comprising 1 to 5 % by weight of diflufenican; 1 to 30 % by weight of bromoxynil=octanoate; 1 to 30 % by weight of ioxynil=octanoate; 5 to 80 % by weight of the present solvent 1; the present solvent 2 and 4 to 20 % by weight of a surfactant;
and the total content of bromoxynil=octanoate, ioxynil=octanoate and the present solvent 2 in the emulsifiable concentrate is 15 to 80 % by weight;

and the surfactant is a mixture of dodecyl benzene sulfonic acid salt and polyoxyethylene caster oil;
and the ratio by weight of dodecyl benzene sulfonic acid salt and polyoxyethylene caster oil is 1:0.1 to 1:10;
and the solvent 1 is propylene glycol diacetate.

An emulsifiable concentrate essentially consisting of 1 to 5 % by weight of diflufenican; 1 to 30 % by weight of bromoxynil=octanoate; 1 to 30 % by weight of ioxynil=octanoate; 5 to 80 % by weight of the present solvent 1; the present solvent 2 and 4 to 20 % by weight of a surfactant;
and the total content of bromoxynil=octanoate, ioxynil=octanoate and the present solvent 2 in the emulsifiable concentrate is 15 to 80 % by weight;
and the surfactant is a mixture of dodecyl benzene sulfonic acid salt and polyoxyethylene caster oil;
and the ratio by weight of dodecyl benzene sulfonic acid salt and polyoxyethylene caster oil is 1:0.1 to 1:10;
and the solvent 1 is propylene glycol diacetate.

An emulsifiable concentrate comprising 1 to 5 % by weight of diflufenican; 1 to 30 % by weight of bromoxynil=octanoate; 1 to 30 % by weight of ioxynil=octanoate; 5 to 80 % by weight of the present solvent 1; the present solvent 2 and 4 to 20 % by weight of a surfactant;
and the total content of bromoxynil=octanoate, ioxynil=octanoate and the present solvent 2 in the emulsifiable concentrate is 15 to 80 % by weight;

and the amount of the present solvent 1 is in the range between 5 and 80 by weight per 1 pert by weight of diflufenican;
the surfactant is a mixture of dodecyl benzene sulfonic acid salt and polyoxyethylene caster oil;
and the ratio by weight of dodecyl benzene sulfonic acid salt and polyoxyethylene caster oil is 1:0.1 to 1:10;
and the solvent 1 is propylene glycol diacetate.

An emulsifiable concentrate essentially consisting of 1 to 5 % by weight of diflufenican; 1 to 30 % by weight of bromoxynil=octanoate; 1 to 30 % by weight of ioxynil=octanoate; 5 to 80 % by weight of the present solvent 1; the present solvent 2 and 4 to 20 % by weight of a surfactant;
and the total content of bromoxynil=octanoate, ioxynil=octanoate and the present solvent 2 in the emulsifiable concentrate is 15 to 80 % by weight;
and the amount of the present solvent 1 is in the range between 5 and 80 by weight per 1 pert by weight of diflufenican;
the surfactant is a mixture of dodecyl benzene sulfonic acid salt and polyoxyethylene caster oil;
and the ratio by weight of dodecyl benzene sulfonic acid salt and polyoxyethylene caster oil is 1:0.1 to 1:10;
and the solvent 1 is propylene glycol diacetate.

An emulsifiable concentrate comprising 1 to 4 % by weight of diflufenican; 6 to 20 % by weight of bromoxynil=octanoate; 4 to 12 % by weight of ioxynil=octanoate; 5 to 80 % by weight of the present solvent 1; the present solvent 2 and 4 to 20 %

by weight of a surfactant;
and the total content of bromoxynil=octanoate, ioxynil=octanoate and the present solvent 2 in the emulsifiable concentrate is 15 to 80 % by weight;
and the surfactant is a mixture of dodecyl benzene sulfonic acid salt and polyoxyethylene caster oil;
and the ratio by weight of dodecyl benzene sulfonic acid salt and polyoxyethylene caster oil is 1:0.1 to 1:10;
and the solvent 1 is propylene glycol diacetate.

An emulsifiable concentrate essentially consisting of 1 to 4 % by weight of diflufenican; 6 to 20 % by weight of bromoxynil=octanoate; 4 to 12 % by weight of ioxynil=octanoate; 5 to 80 % by weight of the present solvent 1; the present solvent 2 and 4 to 20 % by weight of a surfactant;
and the total content of bromoxynil=octanoate, ioxynil=octanoate and the present solvent 2 in the emulsifiable concentrate is 15 to 80 % by weight;
and the surfactant is a mixture of dodecyl benzene sulfonic acid salt and polyoxyethylene caster oil;
and the ratio by weight of dodecyl benzene sulfonic acid salt and polyoxyethylene caster oil is 1:0.1 to 1:10;
and the solvent 1 is propylene glycol diacetate.

An emulsifiable concentrate comprising 1 to 4 % by weight of diflufenican; 6 to 20 % by weight of bromoxynil=octanoate; 4 to 12 % by weight of
ioxynil=octanoate; 5 to 80 % by weight of the present solvent

1; the present solvent 2 and 4 to 20 % by weight of a surfactant; and the total content of bromoxynil=octanoate, ioxynil=octanoate and the present solvent 2 in the emulsifiable concentrate is 15 to 80 % by weight; and the amount of the present solvent 1 is in the range between 5 and 80 by weight per 1 pert by weight of diflufenican; the surfactant is a mixture of dodecyl benzene sulfonic acid salt and polyoxyethylene caster oil; and the ratio by weight of dodecyl benzene sulfonic acid salt and polyoxyethylene caster oil is 1:0.1 to 1:10; and the solvent 1 is propylene glycol diacetate.

An emulsifiable concentrate essentially consisting of 1 to 4 % by weight of diflufenican; 6 to 20 % by weight of bromoxynil=octanoate; 4 to 12 % by weight of ioxynil=octanoate; 5 to 80 % by weight of the present solvent 1; the present solvent 2 and 4 to 20 % by weight of a surfactant; and the total content of bromoxynil=octanoate, ioxynil=octanoate and the present solvent 2 in the emulsifiable concentrate is 15 to 80 % by weight; and the amount of the present solvent 1 is in the range between 5 and 80 by weight per 1 pert by weight of diflufenican; the surfactant is a mixture of dodecyl benzene sulfonic acid salt and polyoxyethylene caster oil; and the ratio by weight of dodecyl benzene sulfonic acid salt and polyoxyethylene caster oil is 1:0.1 to 1:10; and the solvent 1 is propylene glycol diacetate.

An emulsifiable concentrate comprising 1.5 to 4 % by weight of diflufenican; 8 to 18 % by weight of bromoxynil=octanoate; 4 to 10 % by weight of ioxynil=octanoate; 5 to 80 % by weight of the present solvent 1; the present solvent 2 and 4 to 20 % by weight of a surfactant;
and the total content of bromoxynil=octanoate, ioxynil=octanoate and the present solvent 2 in the emulsifiable concentrate is 15 to 80 % by weight;
and the surfactant is a mixture of dodecyl benzene sulfonic acid salt and polyoxyethylene caster oil;
and the ratio by weight of dodecyl benzene sulfonic acid salt and polyoxyethylene caster oil is 1:0.1 to 1:10;
and the solvent 1 is propylene glycol diacetate.

An emulsifiable concentrate essentially consisting of 1.5 to 4 % by weight of diflufenican; 8 to 18 % by weight of bromoxynil=octanoate; 4 to 10 % by weight of ioxynil=octanoate; 5 to 80 % by weight of the present solvent 1; the present solvent 2 and 4 to 20 % by weight of a surfactant;
and the total content of bromoxynil=octanoate, ioxynil=octanoate and the present solvent 2 in the emulsifiable concentrate is 15 to 80 % by weight;
and the surfactant is a mixture of dodecyl benzene sulfonic acid salt and polyoxyethylene caster oil;
and the ratio by weight of dodecyl benzene sulfonic acid salt and polyoxyethylene caster oil is 1:0.1 to 1:10;
and the solvent 1 is propylene glycol diacetate.

An emulsifiable concentrate comprising 1.5 to 4 % by weight of diflufenican; 8 to 18 % by weight of bromoxynil=octanoate; 4 to 10 % by weight of ioxynil=octanoate; 5 to 80 % by weight of the present solvent 1; the present solvent 2 and 4 to 20 % by weight of a surfactant; and the total content of bromoxynil=octanoate, ioxynil=octanoate and the present solvent 2 in the emulsifiable concentrate is 15 to 80 % by weight; and the amount of the present solvent 1 is in the range between 5 and 80 by weight per 1 pert by weight of diflufenican; the surfactant is a mixture of dodecyl benzene sulfonic acid salt and polyoxyethylene caster oil; and the ratio by weight of dodecyl benzene sulfonic acid salt and polyoxyethylene caster oil is 1:0.1 to 1:10; and the solvent 1 is propylene glycol diacetate.

An emulsifiable concentrate essentially consisting of 1.5 to 4 % by weight of diflufenican; 8 to 18 % by weight of bromoxynil=octanoate; 4 to 10 % by weight of ioxynil=octanoate; 5 to 80 % by weight of the present solvent 1; the present solvent 2 and 4 to 20 % by weight of a surfactant; and the total content of bromoxynil=octanoate, ioxynil=octanoate and the present solvent 2 in the emulsifiable concentrate is 15 to 80 % by weight; and the amount of the present solvent 1 is in the range between 5 and 80 by weight per 1 pert by weight of diflufenican; the surfactant is a mixture of dodecyl benzene sulfonic acid salt and polyoxyethylene caster oil;

and the ratio by weight of dodecyl benzene sulfonic acid salt and polyoxyethylene caster oil is 1:0.1 to 1:10;
and the solvent 1 is propylene glycol diacetate.

An emulsifiable concentrate essentially consisting of
1.5 to 4 % by weight of diflufenican;
8 to 18 % by weight of bromoxynil=octanoate;
4 to 10 % by weight of ioxynil=octanoate;
30 to 50 % by weight of the present solvent 1;
4 to 20 % by weight of a surfactant
and rest of the present solvent 2.

An emulsifiable concentrate essentially consisting of
1.5 to 4 % by weight of diflufenican;
8 to 18 % by weight of bromoxynil=octanoate;
4 to 10 % by weight of ioxynil=octanoate;
30 to 50 % by weight of the present solvent 1;
2 to 5 % by weight of an anionic surfactant;
2 to 5 % by weight of a nonionic surfactant
and rest of the present solvent 2.

An emulsifiable concentrate essentially consisting of
1.5 to 4 % by weight of diflufenican;
8 to 18 % by weight of bromoxynil=octanoate;
4 to 10 % by weight of ioxynil=octanoate;
30 to 50 % by weight of propylene glycol diacetate;
4 to 20 % by weight of a surfactant
and rest of the present solvent 2.

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An emulsifiable concentrate essentially consisting of
1.5 to 4 % by weight of diflufenican;
8 to 18 % by weight of bromoxynil=octanoate;
4 to 10 % by weight of ioxynil=octanoate;
30 to 50 % by weight of propylene glycol diacetate;
2 to 5 % by weight of an anionic surfactant;
2 to 5 % by weight of a nonionic surfactant
and rest of the present solvent 2.

An emulsifiable concentrate essentially consisting of
1.5 to 4 % by weight of diflufenican;
8 to 18 % by weight of bromoxynil=octanoate;
4 to 10 % by weight of ioxynil=octanoate;
30 to 50 % by weight of the present solvent 1;
2 to 5 % by weight of an anionic surfactant;
2 to 5 % by weight of a nonionic surfactant
and rest of the present solvent 2.

An emulsifiable concentrate essentially consisting of
1.5 to 4 % by weight of diflufenican;
8 to 18 % by weight of bromoxynil=octanoate;
4 to 10 % by weight of ioxynil=octanoate;
30 to 50 % by weight of propylene glycol diacetate;
2 to 5 % by weight of dodecyl benzene sulfonic acid salt;
2 to 5 % by weight of polyoxyethylene caster oil
and rest of the present solvent 2.

The emulsifiable concentrate of the present invention can be produced by mixing the present solvent 1, the present solvent 2, a surfactant and diflufenican, furthermore bromoxynil=octanoate and ioxynil=octanoate, if necessary, then stirring until the mixture becomes uniform. The temperature while stirring is usually in the range between room temperature and 85 °C. The mixing order of the component of the emulsifiable concentrate of the present invention may be properly decided.

The emulsifiable concentrate of the present invention is usually applied after diluted with water to a weed or soil surface where weed is predicted to grow. An aqueous composition which is obtained by diluted the emulsifiable concentrate of the present invention with water is a diluted composition of the emulsifiable concentrate of the present invention with water of the amount of usually 10 to 5000 times, preferably 20 to 2500 times based on the amount of the emulsifiable concentrate of the present invention. Generally, the water used to dilution may be soft water or hard water. Auxiliaries such as spreader may be added to the water used to dilution, if necessary.

Though the application amount of the aqueous composition which is obtained by diluted the emulsifiable concentrate of the present invention with water may vary depending on the ratio of diflufenican, bromoxynil=octanoate and ioxynil=octanoate; weather conditions; the treatment timing; the treatment place; the kind of a weed which is controlled, it is usually 40 to 2000g, preferably 80 to 1000g per hectare as total weight of diflufenican, bromoxynil=octanoate and ioxynil=octanoate.

EXAMPLES

Hereinafter, the present invention will be further explained in detail by way of Preparation Examples and Test Examples, but the present invention is not limited to these examples.

Preparation Example 1

Diflufenican(purity 91 %, 3.6 g as active ingredient), bromoxynil=octanoate(purity 95.4 %, 17.33 g as active ingredient) and ioxynil=octanoate(purity 96 %, 9.65 g as active ingredient) were added to propylene glycol diacetate(40.54 g) under heating and were dissolved. Then Rhodacal60/BE(surfactant produced by Rhodia Nicca; 3.83 g) and Alkamuls OR40(surfactant produced by Rhodia Nicca; 3.83 g) and were added to it. Furthermore, Solvesso 150 ND(aromatic hydrocarbon, mainly C10 to C11 alkylbenzene, CAS No. 64742-94-5, Exxon Mobil Chemical Company) was added until total amount being 100 ml, and stirred until uniform solution to give the emulsifiable concentrate of the present invention(referred as the emulsifiable concentrate of the present invention 1, hereinafter).

Test Example 1

Into a 100 ml - graduated cylinder with stopper, 99 ml of CIPAC standard water D (342ppm) was charged. Then 1 ml of the emulsifiable concentrate of the present invention 1 was added into the graduated cylinder and mixed. The graduated cylinder was left at 30 °C for 2 hours. Then the stability of the emulsion was observed. The aqueous composition which was obtained by diluted the emulsifiable concentrate of the present invention

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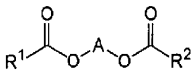
1 with water kept stable emulsion.

INDUSTRIAL APPLICABILITY

The emulsifiable concentrate of the present invention is useful as pesticide formulation because it has an excellent stability of the emulsion even after diluted with water.

The claims defining the invention are as follows:

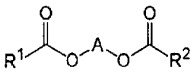
1. An emulsifiable concentrate comprising
2',4'-difluoro-2-(a,a,a-trifluoro-m-tolyloxy)nicotinanilide
;
the compound shown by the below formula (1):



(1)

wherein, in the formula, R^1 and R^2 represent alkyl groups, A represents ethylene group, trimethylene group, propylene group or tetramethylene group, and the sum of the number of carbon atoms which consist of the groups of R^1, R^2 and A is 4 to 10;
an aromatic hydrocarbon and
a surfactant.

2. An emulsifiable concentrate comprising
2',4'-difluoro-2-(a,a,a-trifluoro-m-tolyloxy)nicotinanilide
;
4-cyano-2,6-dibromophenyl octanoate;
4-cyano-2,6-diiodophenyl octanoate;
the compound shown by the below formula (1):

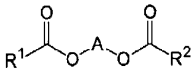


(1)

wherein, in the formula, R^1 and R^2 represent alkyl groups, A represents ethylene group, trimethylene group, propylene group or tetramethylene group, and the sum of the number of carbon atoms which consist of the groups of R^1, R^2 and A is 4 to 10;
an aromatic hydrocarbon and

a surfactant.

3. An emulsifiable concentrate comprising
1 to 5 % by weight of
2',4'-difluoro-2-(a,a,a-trifluoro-m-tolyloxy)nicotinanilide
;
1 to 30 % by weight of 4-cyano-2,6-dibromophenyl octanoate;
1 to 30 % by weight of 4-cyano-2,6-diiodophenyl octanoate;
5 to 80 % by weight of the compound shown by the below formula (1):

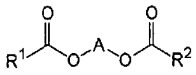

(1)

wherein, in the formula, R^1 and R^2 represent alkyl groups, A represents ethylene group, trimethylene group, propylene group or tetramethylene group, and the sum of the number of carbon atoms which consist of the groups of R^1, R^2 and A is 4 to 10;
an aromatic hydrocarbon and
4 to 20 % by weight of a surfactant;
and the total content of 4-cyano-2,6-dibromophenyl octanoate, 4-cyano-2,6-diiodophenyl octanoate and the aromatic hydrocarbon in the emulsifiable concentrate is 15 to 80 % by weight.

4. The emulsifiable concentrate according to claim 3, wherein the emulsifiable concentrate is essentially consisting of
1 to 5 % by weight of
2',4'-difluoro-2-(a,a,a-trifluoro-m-tolyloxy)nicotinanilide
;
1 to 30 % by weight of 4-cyano-2,6-dibromophenyl octanoate;

1 to 30 % by weight of 4-cyano-2,6-diiodophenyl octanoate;

5 to 80 % by weight of the compound shown by the below formula (1):


(1)

wherein, in the formula, R^1 and R^2 represent alkyl groups, A represents ethylene group, trimethylene group, propylene group or tetramethylene group, and the sum of the number of carbon atoms which consist of the groups of R^1, R^2 and A is 4 to 10;

an aromatic hydrocarbon and

4 to 20 % by weight of a surfactant;

and the total content of 4-cyano-2,6-dibromophenyl octanoate, 4-cyano-2,6-diiodophenyl octanoate and the aromatic hydrocarbon in the emulsifiable concentrate is 15 to 80 % by weight.

5. The emulsifiable concentrate according to any one of claims 1 to 4, wherein the amount of the compound shown by the formula (1) is in the range between 5 and 80 by weight per 1 part by weight of 2',4'-difluoro-2-(a,a,a-trifluoro-m-tolyloxy)nicotinanilide.

6. The emulsifiable concentrate according to any one of claims 1 to 5, wherein the surfactant is a mixture of an anionic surfactant and a nonionic surfactant; and the ratio by weight of the anionic surfactant and the nonionic surfactant is 1:0.1 to 1:10.

7. The emulsifiable concentrate according to any one of claims

1 to 5, wherein the surfactant is a mixture of dodecyl benzene sulfonic acid salt and polyoxyethylene castor oil; and the ratio by weight of the dodecyl benzene sulfonic acid salt and the polyoxyethylene castor oil is 1:0.1 to 1:10.

8. The emulsifiable concentrate according to any one of claims 1 to 7, wherein the compound shown by the formula (1) is the compound selected from the group consisting of ethylene glycol diacetate, ethylene glycol dipropionate, ethylene glycol dibutyrate, propylene glycol diacetate, propylene glycol dipropionate and 1, 3-propanediol diacetate.

9. An aqueous composition which is obtainable by dilution of the emulsifiable concentrate according to any one of claims 1 to 8 with water.

10. An emulsifiable concentrate, substantially as hereinbefore described with reference to any one of the examples.

11. An aqueous composition which is obtainable by dilution of the emulsifiable concentrate according to claim 10.

12. A concentrate according to any one of claims 1 to 8 or 10 when used as a pesticide.

13. An aqueous composition according to claim 9 or 11 when used as a pesticide.

Dated 16 February, 2006
Sumitomo Chemical Company, Limited

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