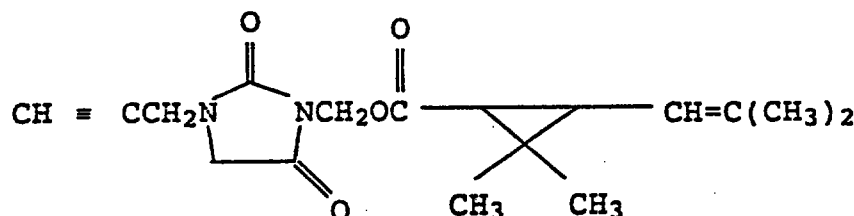


INSECTICIDAL COMPOSITIONS

1 The present invention relates to an insecticidal composition.

2,4-Dioxo-1-(2-propynyl)imidazolidin-3-ylmethyl chrysanthemate having the formula (hereinafter
5 Compound A),



is a compound disclosed in US-A-4176189, and is known to be useful as an active ingredient for insecticides. However, the compound does not exhibit a satisfactorily high insecticidal activity when used alone.

10 We have made extensive studies in an attempt to strengthen the insecticidal activity of Compound A, and as a result have found that when (b) at least one carboxylic acid ester selected from

monocarboxylic acid esters having 16 to 19 carbon
15 atoms and dicarboxylic acid esters having 16 to 19 carbon atoms is added to (a) Compound A so that the weight ratio of (a) to (b) is from 3:1 to 1:100, the insecticidal activity of Compound A is remarkably strengthened.

According to one aspect, the present invention provides an insecticidal composition comprising:

(a) 2,4-dioxo-1-(2-propynyl)imidazolidin-3-ylmethyl chrysanthemate (Compound A),

- 5 (b) at least one member selected from monocarboxylic acid esters having 16 to 19 carbon atoms and dicarboxylic acid esters having 16 to 19 carbon atoms, the weight ratio of (a) to (b) being from 3:1 to 1:100, and optionally
- (c) at least one inert carrier.

10 According to another aspect, the invention provides a method of controlling insects which comprises:

applying to insects an insecticidal composition comprising:

(a) 2,4-dioxo-1-(2-propynyl)imidazolidin-3-ylmethyl chrysanthemate and

15

(b) at least one carboxylic ester selected from monocarboxylic acid esters having 16-19 carbon atoms and dicarboxylic acid esters having 16-19 carbon atoms,

the weight ratio of (a) to (b) being from 3:1 to

20 1:100.

Compound A includes various optical and geometrical isomers. Of the isomers, an isomer exhibiting an insecticidal activity and the mixtures thereof can be incorporated in the insecticidal composition of the

25 present invention. The content of Compound A in the composition of the present invention is usually 0.001% to

75% by weight.

Specific examples of the monocarboxylic acid esters having 16 to 19 carbon atoms and the dicarboxylic acid esters having 16 to 19 carbon atoms are dibutyl phthalate, isopropyl palmitate, isopropyl myristate and hexyl laurate. These compounds may also be used in admixture thereof. One or more compounds selected from these compounds are usually blended in the composition of the present invention in an amount of 0.0003% to 75% by weight.

Into the composition of the present invention may be incorporated one or more of other insecticides,

1 synergists, perfumes, fungicides, solvents, propellants,
solid carriers, etc.

Specific examples of the other insecticides
are:

- 5 (RS)-3-allyl-2-methyl-4-oxocyclopent-2-enyl
(1RS)-cis,trans-chrysanthemate [allethrin];
3,4,5,6-tetrahydrophthalimidomethyl (1RS)-
cis,trans-chrysanthemate [tetramethrin];
(S)-2-methyl-4-oxo-3-(2-propynyl)cyclopent-2-
10 enyl (1R)-cis,trans-chrysanthemate [prallethrin];
3-phenoxybenzyl (1RS)-cis,trans-chrysanthemate
[phenothrin];
5-benzyl-3-furylmethyl (1RS)-cis,trans-
chrysanthemate [resmethrin];
15 (RS)- α -cyano-3-phenoxybenzyl (1R)-cis,trans-
chrysanthemate [cyphenothrin];
3-phenoxybenzyl (1RS)-cis,trans-3-(2,2-
dichlorovinyl)-2,2-dimethylcyclopropanecarboxylate
[permethrin];
20 (RS)- α -cyano-3-phenoxybenzyl (1RS)-cis,trans-
3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropane-
carboxylate [cypermethrin];
(S)- α -cyano-3-phenoxybenzyl (1R)-cis-3-(2,2-
dibromovinyl)-2,2-dimethylcyclopropanecarboxylate
25 [deltamethrin];
(RS)- α -cyano-4-fluoro-3-phenoxybenzyl (1RS)-
cis,trans-3-(2,2-dichlorovinyl)-2,2-dimethylcyclo-
propanecarboxylate [cyfluthrin];

- 1 5-(2-propynyl)furfuryl (1RS)-cis,trans-
chrysanthemate [furamethrin];
2-(4-ethoxyphenyl)-2-methylpropyl 3-
phenoxybenzyl ether [ethofenprox];
- 5 1,2-dichlorovinyl dimethyl phosphate
[dichlorvos];
O,O-dimethyl O-(3-methyl-4-nitrophenyl)-
phosphorothioate [fenitrothion];
2-(1-methoxyethoxy)phenyl methylcarbamate
- 10 [propoxur];
4-phenoxyphenyl (RS)-2-(2-pyridyloxy)propyl
ether [pyriproxyfen];
isopropyl (2E,4E)-11-methoxy-3,7,11-trimethyl-
2,4-dodecadienoate [methoprene];
- 15 ethyl (2E,4E)-3,7,11-trimethyldodeca-2,4-
dienoate [hydroprene];
N-(4-chlorophenyl)-3-(2,6-difluorobenzoyl)urea
[diflubenzuron]; and
N-cyclopropyl-1,3,5-triazine-2,4,6-triamine
- 20 [cyromazine].

Specific examples of the synergists are α -[2-(2-butoxyethoxy)ethoxy]-4,5-methylenedioxy-2-propyltoluene (piperonyl butoxide), N-(2-ethylhexyl)-bicyclo[2,2,1]hept-5-ene-2,3-dicarboximide (MGK-264),
25 octachlorodipropyl ether (S-421), etc.

Specific examples of the solvents are isopropyl alcohol, kerosene, dodecylbenzene, etc.

1 Specific examples of the propellants are
propane/butane, dimethyl ether, Freon gas
(fluorocarbons), etc ("Freon" is a Trade Mark).

 The composition of the present invention is
5 prepared, for example, by mixing a prescribed amount of
Compound A and a prescribed amount of at least one
carboxylic acid ester described above, and if necessary
other insecticides, synergists, perfumes, fungicides,
solvents, propellants, solid carriers, etc. at room
10 temperature or under heating.

 Insects and acarina against which
compositions of the present invention thus prepared are
effective are listed below:

Lepidoptera

15 casemaking clothes moth (Tinea pellionella),
webbing clothes moth (Tineola bisselliella),
etc.

Diptera

Culex spp. such as common mosquito (Culex
20 pipiens pallens) and Culex tritaeniorhynchus;
Aedes spp. such as Aedes aegypti; and Aedes
albopictus; Anopheles spp. such as Anopheles
sinensis midges (Chironomidae);
Muscidae such as housefly (Musca domestica)
25 and false stablefly (Muscina stabulans);
Calliphoridae; Sarcophagidae; little housefly
(Fannia canicularis);

- 1 Anthomyiidae such as seedcorn maggot (Delia
platura) and onion maggot (Delia antiqua); ✓
fruit flies (Tephritidae); Drosophilidae; moth
flies (Psychodidae); black flies (Simuliidae);
5 Tabanidae; stable flies (Stomoxysidae) etc.

Dictyoptera

- German cockroach (Blattella germanica),
smokybrown cockroach (Periplaneta fuliginosa),
American cockroach (Periplaneta americana),
10 brown cockroach (Periplaneta brunnea),
oriental cockroach (Blatta orientalis), etc. ✓

Hymenoptera

- ants (Formicidae), hornets (Vespididae),
bethyridae, sawflies (Tenthredinidae) such as
15 cabbage sawfly (Athalia rosae ruficornis),
etc.

Isoptera

Reticulitermes speratus, Coptotermes
formosanus etc.

20 Ixodidae

Loophilus microplus, etc.

House dust mites

- acaridae such as Tyrophagus putrescentiae,
Pyrolyphidae such as Dermatophagoides
25 farinae, Cheyletidae such as Chelacaropsis
moorei, Macronyssidae such as Ornithonyssus
pacoti, etc.

1 The composition of the present invention can
be used as it is for killing the insect pests; however,
it is usually used formulated into the form of
preparation such as aerosols, oil sprays, etc. In the
5 latter case, the content of Compound A in the aerosols
or in the oil sprays is preferably 0.001% to 5% by
weight.

 The present invention is illustrated in more
detail with reference to the following Examples,
10 Comparative Examples and Test Example;
however, the present invention should not be interpreted
as being limited thereto.

 In Examples, Comparative Examples and Test
Example, parts are by weight.

15 Example 1

50.0 Parts of Compound A (acid moiety: d-
trans configuration) and 50.0 parts of isopropyl
myristate were mixed under heating (about 40 to 50°C) to
obtain a liquid insecticidal composition.

20 Table 1 lists the insecticidal compositions
obtained in the same manner as above.

Table 1

Composition (part by weight)										
Compound A (acid moiety: c-trans configura- tion)	Carboxylic acid ester							Ethyl acetate		
	iso- propyl- myris- tate	iso- propyl- palmi- tate	hexyl laurate	dibutyl phtha- late	Diiso propyl adipate	butyl stearate				
Example	1	99	0	0	0	0	0	0	0	0
	2	90	0	0	0	0	0	0	0	0
	3	50	0	0	0	0	0	0	0	0
	4	70	30	0	0	0	0	0	0	0
	5	50	0	50	0	0	0	0	0	0
	6	50	0	50	0	0	0	0	0	0
	7	50	0	0	50	0	0	0	0	0
Comparative Example	1	100	0	0	0	0	0	0	0	0
	2	50	0	0	0	50	0	0	0	0
	3	50	0	0	0	0	50	0	0	0
	4	50	0	0	0	0	0	0	50	50

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1 Example 8

0.1 Part of Compound A, 0.1 part of isopropyl myristate and 0.3 part of cyphenothrin were dissolved in a mixture of 20.0 parts of dodecylbenzene and 39.5 parts of kerosene. The resulting mixture was charged into a container. A nozzle was provided on the container. 40.0 Parts of a propellant mixture of propane and butane was compressed through the nozzle into the insecticidal composition to obtain an aerosol.

10 Example 9

3.0 Part of Compound A and 1.0 part of isopropyl myristate were dissolved in a mixture of 20.0 parts of isopropyl alcohol and 28.0 parts of kerosene. The resulting mixture was charged into a container. A nozzle was provided on the container. 50.0 Parts of a propellant mixture of propane, butane and dimethyl ether was compressed through the nozzle into the insecticidal composition to obtain an aerosol.

Example 10

20 1.0 Parts of Compound A and 31.0 parts of isopropyl myristate were dissolved in 18.0 parts of kerosene. The resulting mixture was charged into a container. A nozzle was provided on the container. 50.0 Parts of a propellant mixture of propane, butane and dimethyl ether was compressed through the nozzle into the insecticidal composition to obtain an aerosol.

1 Example 11

2 0 Part of Compound A and 1.0 part of dibutyl
phthalate were dissolved in a mixture of 2.5 parts of
isopropyl alcohol and 45.5 parts of dodecylbenzene. The
5 resulting mixture was charged into a container. A nozzle
was provided on the container. 50.0 Parts of a
propellant mixture of propane, butane and dimethyl ether
was compressed through the nozzle into the insecticidal
composition to obtain an aerosol.

10 Test Example

Each of the insecticidal compositions obtained
in Examples 1 to 7 and Comparative Examples 1 to 4 was
diluted with acetone to obtain a solution containing
0.189 g/l of Compound A. 0.3 Milliliter of the solution
15 was coated onto a petri dish of 8.5 cm in diameter so
that Compound A was attached to the petri dish in an
amount of 0.0567 mg. That is, Compound A was attached
to the petri dish in a ratio of 10 mg/m². After the
petri dish had been dried by evaporation of acetone, 10
20 German cockroaches (Blattella germanica) were released
therein. The knock-down effect, KT50 (a time required
for knocking down 50% of the cockroaches) was
determined. Table 2 shows the results.

Table 2

		KT50 (min) to German cockroach
Example	1	0.8
	2	0.9
	3	1.0
	4	0.9
	5	1.1
	6	0.9
	7	1.2
Comparative Example	1	3.0
	2	2.8
	3	4.1
	4	3.3



CLAIMS:

1. An insecticidal composition which comprises:
 - (a) 2,4-dioxo-1-(2-propynyl)imidazolidin-3-ylmethyl chrysanthemate,
 - (b) at least one carboxylic acid ester selected from monocarboxylic acid esters having 16-18 carbon atoms and dicarboxylic acid esters having 16-18 carbon atoms, and optionally
 - (c) at least one inert carrier,
 the weight ratio of (a) to (b) being from 3:1 to 1:100.
2. An insecticidal composition according to Claim 1, wherein the carboxylic acid ester is selected from dibutyl phthalate, isopropyl palmitate, isopropyl myristate and hexyl laurate.
3. An insecticidal composition according to Claim 2, wherein the carboxylic acid ester is dibutyl phthalate.
4. An insecticidal composition according to Claim 2, wherein the carboxylic acid ester is isopropyl palmitate.
5. An insecticidal composition according to Claim 2, wherein the carboxylic acid is isopropyl myristate.
6. An insecticidal composition according to Claim 2, wherein the carboxylic acid is hexyl laurate.
7. A method for controlling insects which comprises:
 - applying to insects an insecticidal



composition comprising:

(a) 2,4-dioxo-1-(2-propynyl)imidazolidin-3-ylmethyl carysanthemate and

(b) at least one carboxylic ester selected from monocarboxylic acid esters having 16-19 carbon atoms and dicarboxylic acid esters having 16-19 carbon atoms,

the weight ratio of (a) to (b) being from 3:1 to 1:100.

8. A process for preparing an insecticidal composition which comprises:

mixing

(a) 2,4-dioxo-1-(2-propynyl)imidazolidin-3-ylmethyl carysanthemate and

(b) at least one carboxylic ester selected from monocarboxylic acid esters having 16-19 carbon atoms and dicarboxylic acid esters having 16-19 carbon atoms,

in a weight ratio of (a) to (b) of from 3:1 to 1:100, under heat.

9. A process for preparing an insecticidal aerosol which comprises:

charging an insecticidal composition comprising:

(a) 2,4-dioxo-1-(2-propynyl)imidazolidin-3-ylmethyl carysanthemate and

(b) at least one carboxylic ester selected from monocarboxylic acid esters



having 16-19 carbon atoms and dicarboxylic acid esters
having 16-19 carbon atoms, wherein the weight ratio of
(a) to (b) is from 3:1 to 1:100, into a container,

providing the container with a nozzle, and
compressing a propellant through the nozzle
into the insecticidal composition in the container.
