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- (71) Applicant (for all designated States except US): **SUMITOMO CHEMICAL COMPANY, LIMITED** [JP/JP];
27-1, Shinkawa 2-chome, Chuo-ku, Tokyo, 1048260 (JP).
- (72) Inventor; and
(75) Inventor/Applicant (for US only): **SASAKI, Takashi** [JP/JP]; c/o SUMITOMO CHEMICAL COMPANY, LIMITED, 2-1, Takatsukasa 4-chome, Takarazuka-shi, Hyogo, 6658555 (JP).
- (74) Agents: **SAMEJIMA, Mutsumi** et al.; AOYAMA & PARTNERS, IMP Building, 3-7, Shiromi 1-chome, Chuo-ku, Osaka-shi, Osaka, 5400001 (JP).
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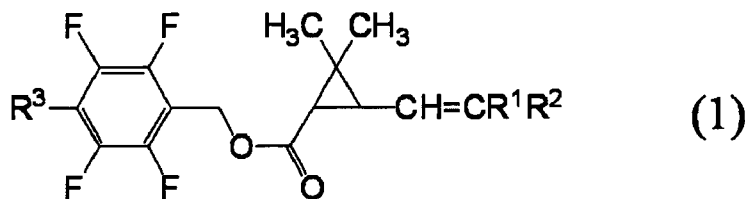
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(54) Title: PESTICIDAL COMPOSITION AND METHOD FOR CONTROLLING PESTS



(57) Abstract: The present invention relates to a pesticidal composition and a pest control method which have an excellent efficacy in controlling pests. The pesticidal composition comprises an ester compound of Formula (1): wherein R¹ and R² are each independently selected from the group consisting of hydrogen atom, methyl group, trifluoromethyl group and chlorine atom; and R³ is hydrogen atom, methyl group or methoxymethyl group, a glycol ether, and water wherein the glycol ether content is from 10 wt% to 50 wt% and water is from 20 wt% to 85 wt% of the total amount of the composition.

WO 2012/105424 A1

DESCRIPTION

PESTICIDAL COMPOSITION AND METHOD FOR CONTROLLING PESTS

5 Technical Field

[0001]

The present invention relates to a pesticidal composition and a method for controlling pests.

10 Background Art

[0002]

JP 2000-063329 A discloses that [2,3,5,6-tetrafluoro-4-(methoxymethyl)phenyl]methyl 2,2-dimethyl-3-(1-propenyl)-cyclopropane-carboxylate exhibits an activity in

15 controlling pests.

[0003]

Furthermore, JP 2000-063329 A discloses a composition comprising the above-mentioned compound.

20 Summary of Invention

[0004]

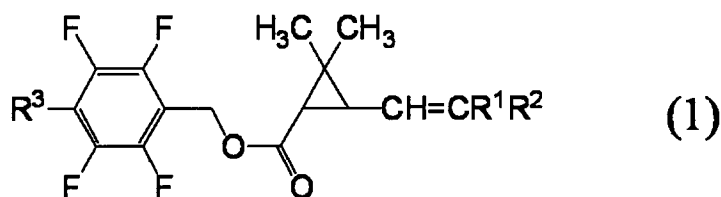
The present invention provides a pesticidal composition and a pest control method which have an excellent activity in controlling pests.

25 [0005]

The present inventors have extensively studied to find a pesticidal composition and a pest control method which exhibit an excellent efficacy in controlling pests; and then have found that a pesticidal composition comprising a specific compound, a specific solvent and water (wherein each content thereof is limited to a specific range) exhibits an excellent efficacy in controlling pests. Based upon the new findings, the present invention has been completed.

10 Namely, the present invention is as follows.

[1] A pesticidal composition comprising an ester compound of Formula (1):



15 wherein R^1 and R^2 are each independently selected from the group consisting of hydrogen atom, methyl group, trifluoromethyl group and chlorine atom; and R^3 is hydrogen atom, methyl group or methoxymethyl group,
 a glycol ether, and water wherein the glycol ether content
 20 is from 10 wt% to 50 wt% of the total amount of the composition and the water content is from 20 wt% to 85 wt% of the total amount of the composition.

[2] The pesticidal composition of [1] wherein the glycol ether is an ethylene glycol ether.

[3] The pesticidal composition of [1] wherein the glycol ether is at least one compound selected from the group consisting of an ethylene glycol ether and a propylene glycol ether.

[4] The pesticidal composition of [1] wherein the glycol ether is one or two compounds selected from the group consisting of ethylene glycol monobutyl ether and diethylene glycol monobutyl ether.

[5] The pesticidal composition of [1] wherein the glycol ether is at least one compound selected from the group consisting of ethylene glycol monobutyl ether, diethylene glycol monobutyl ether, propylene glycol monomethyl ether, propylene glycol monoethyl ether, and propylene glycol monopropyl ether.

20

[6] The pesticidal composition of any one of [1] to [5] wherein the glycol ether content is from 15 wt% to 40 wt% of the total amount of the composition.

[7] The pesticidal composition of any one of [1] to [6]

25

wherein the ester compound of Formula (1) is at least one compound selected from the group consisting of:

[2,3,5,6-tetrafluoro-4-(methoxymethyl)phenyl]methyl
2,2-dimethyl-3-(1-propenyl)cyclopropane-carboxylate,

5 [2,3,5,6-tetrafluoro-4-methylphenyl]methyl 2,2-
dimethyl-3-(1-propenyl)cyclopropane-carboxylate,

(2,3,5,6-tetrafluorophenyl)methyl 3-(2,2-
dichlorovinyl)-2,2-dimethylcyclopropane-carboxylate, and

[2,3,5,6-tetrafluoro-4-(methoxymethyl)phenyl]methyl 3-
10 (2,2-dichlorovinyl)-2,2-dimethylcyclopropane-carboxylate.

[8] The pesticidal composition of any one of [1] to [6] wherein the ester compound of Formula (1) is at least one compound selected from the group consisting of:

15 [2,3,5,6-tetrafluoro-4-(methoxymethyl)phenyl]methyl
2,2-dimethyl-3-(1-propenyl)cyclopropane-carboxylate,

[2,3,5,6-tetrafluoro-4-methylphenyl]methyl 2,2-
dimethyl-3-(1-propenyl)cyclopropane-carboxylate,

(2,3,5,6-tetrafluorophenyl)methyl 3-(2,2-
20 dichlorovinyl)-2,2-dimethylcyclopropane-carboxylate,

[2,3,5,6-tetrafluoro-4-(methoxymethyl)phenyl]methyl 3-
(2,2-dichlorovinyl)-2,2-dimethylcyclopropane-carboxylate,

[2,3,5,6-tetrafluoro-4-(methoxymethyl)phenyl]methyl
2,2-dimethyl-3-(2-methyl-1-propenyl)cyclopropane-
25 carboxylate, and

[2,3,5,6-tetrafluoro-4-(methoxymethyl)phenyl]methyl 3-(3,3,3-trifluoro-1-propenyl)-2,2-dimethylcyclopropane-carboxylate.

5 [9] The pesticidal composition of any one of [1] to [8] wherein the water content is from 50 wt% to 80 wt% of the total amount of the composition.

[10] The pesticidal composition of any one of [1] to [9]
10 which further comprises a glycol.

[11] The pesticidal composition of [10] wherein the glycol is at least one compound selected from the group consisting of ethylene glycol, diethylene glycol, triethylene glycol, propylene glycol, 1,3-butylene glycol, polyethylene glycol
15 and polypropylene glycol.

[12] The pesticidal composition of [10] wherein the glycol is at least one compound selected from the group consisting of ethylene glycol, diethylene glycol, triethylene glycol,
20 propylene glycol, 1,3-butylene glycol, polyethylene glycol, polypropylene glycol, dipropylene glycol, tripropylene glycol, and tetraethylene glycol.

25 [13] The pesticidal composition of any one of [10] to [12]

wherein the glycol is triethylene glycol.

[14] The pesticidal composition of any one of [10] to [12] wherein the glycol is at least one compound selected from
5 the group consisting of triethylene glycol, propylene glycol and dipropylene glycol.

[15] The pesticidal composition of any one of [10] to [14] wherein the glycol content is from 1 wt% to 45 wt% of the
10 total amount of the composition.

[16] The pesticidal composition of any one of [1] to [15] which is used in the form of a heat transpiratory preparation.

15 [17] The pesticidal composition of any one of [1] to [15] which is used in the form of a composition for an ultrasonic atomizer.

20 [18] A method for controlling pests which comprises applying an effective amount of the pesticidal composition of any one of [1] to [15] to pests or habitats thereof.

[19] The method of [18] which is carried out by dipping a
25 part of a porous liquid-absorbing wick in the pesticidal

composition of any one of [1] to [15] to absorb the composition into the wick, and then heating the upper part of the wick to make the absorbed composition vaporize.

5 [20] The method of [19] which is carried out by spraying the pesticidal composition of any one of [1] to [15] from an ultrasonic atomizer.

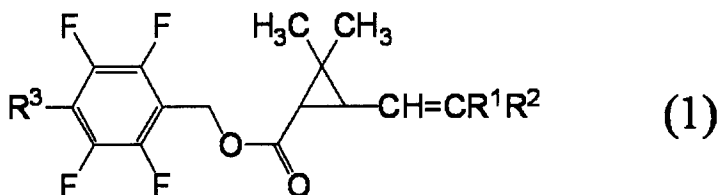
[0006]

10 The pesticidal composition of the present invention exhibits an excellent efficacy in controlling pests. Furthermore, the method for controlling pests of the present invention can be effective in controlling pests.

15 Description of Embodiments

[0007]

The pesticidal composition of the present invention (hereinafter, referred to as the present composition) comprises an ester compound of Formula (1):



wherein R¹ and R² each independently represent hydrogen atom, methyl group, trifluoromethyl group or chlorine atom, and R³ is hydrogen atom, methyl group or methoxymethyl

group (hereinafter, referred to as the present compound),

a glycol ether, and water wherein the glycol ether content is from 10 wt% to 50 wt% of the total amount of the composition and the water content is from 20 wt% to 85 wt% of the total amount of the composition.

The present composition may be prepared by, for example, mixing the present compound, a glycol ether and water (as well as the below-mentioned glycol and formulation additive if necessary) at room temperature or a heating temperature to obtain a solution.

[0008]

Specific examples of the present compounds used herein include the following:

[2,3,5,6-tetrafluoro-4-(methoxymethyl)phenyl]methyl
2,2-dimethyl-3-(1-propenyl)cyclopropane-carboxylate
(hereinafter, referred to as Compound A),

[2,3,5,6-tetrafluoro-4-methylphenyl]methyl 2,2-
dimethyl-3-(1-propenyl)cyclopropane-carboxylate
(hereinafter, referred to as Compound B),

(2,3,5,6-tetrafluorophenyl)methyl 3-(2,2-
dichlorovinyl)-2,2-dimethylcyclopropane-carboxylate
(hereinafter, referred to as Compound C),

[2,3,5,6-tetrafluoro-4-(methoxymethyl)phenyl]methyl 3-
(2,2-dichlorovinyl)-2,2-dimethylcyclopropane-carboxylate,

[2,3,5,6-tetrafluoro-4-(methoxymethyl)phenyl]methyl

2,2-dimethyl-3-(2-methyl-1-propenyl)cyclopropane-
carboxylate, and

[2,3,5,6-tetrafluoro-4-(methoxymethyl)phenyl]methyl
2,2-dimethyl-3-(3,3,3-trifluoro-1-propenyl)cyclopropane-
5 carboxylate.

The present compounds are disclosed in, for example,
JP 2000-063329 A, JP 2647411 B, JP 57 (1982)-123146 A, JP
2001-011022 A, JP 11 (1999)-222463 A and JP 2002-145828 A,
and the present compounds can be prepared according to the
10 processes disclosed therein.

The present compound may have isomers derived from the
two asymmetric carbon atoms on the cyclopropane ring and
the carbon double bond, and the present invention may
include an active isomer thereof in any ratio.

15 In addition, the present compound used herein may be
alone or a mixture of at least two types of the present
compounds.

[0009]

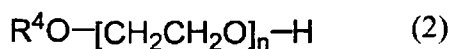
The content of the present compound in the present
20 composition is typically from 0.01 wt% to 5 wt%, preferably
from 0.05 wt% to 4 wt%, and more preferably from 0.1 wt% to
3 wt% of the total amount of the present composition.

[0010]

The glycol ether used herein includes an ethylene
25 glycol ether, a propylene glycol ether, and a dialkyl

glycol ether.

The ethylene glycol ether includes glycol ethers of the following Formula (2):



5 wherein R⁴ is methyl group, isopropyl group, butyl group, isobutyl group, hexyl group, 2-ethylhexyl group, allyl group, phenyl group or benzyl group; and n is an integer of 1 to 10. The ethylene glycol ether includes ethylene glycol monomethyl ether, diethylene glycol monomethyl ether, 10 triethylene glycol monomethyl ether, ethylene glycol monoisopropyl ether, diethylene glycol monoisopropyl ether, ethylene glycol monobutyl ether, diethylene glycol monobutyl ether, triethylene glycol monobutyl ether, ethylene glycol monoisobutyl ether, diethylene glycol 15 monoisobutyl ether, and ethylene glycol monoallyl ether.

The propylene glycol ether includes glycol ethers of the following Formula (3):



20 wherein R⁵ is methyl group, propyl group, butyl group, phenyl group or allyl group; and m is an integer of 1 to 3. The propylene glycol ether includes propylene glycol monomethyl ether, dipropylene glycol monomethyl ether, dipropylene glycol monoethyl ether, tripropylene glycol monomethyl ether, propylene glycol monoethyl ether, 25 propylene glycol monopropyl ether, dipropylene glycol

monopropyl ether, propylene glycol monobutyl ether, dipropylene glycol monobutyl ether, and propylene glycol monoallyl ether.

The dialkyl glycol ether includes glycol ethers of the following Formula (4):



wherein R^6 and R^7 are each independently selected from the group consisting of methyl group, ethyl group and butyl group; and m is the same as defined above. The dialkyl glycol ether includes ethylene glycol dimethyl ether, diethylene glycol dimethyl ether, triethylene glycol dimethyl ether, diethylene glycol methyl ethyl ether, and diethylene glycol diethyl ether.

The glycol ether used herein is preferably an ethylene glycol ether and a propylene glycol ether from the viewpoint of stability of the present composition.

Among the ethylene glycol ethers, it is preferable to use ethylene glycol monobutyl ether and diethylene glycol monobutyl ether from the viewpoint of solubility of the present compound with water.

Among the propylene glycol ethers, it is preferable to use propylene glycol monomethyl ether, propylene glycol monoethyl ether and propylene glycol monopropyl ether, and it is more preferable to use propylene glycol monoethyl ether and propylene glycol monopropyl ether from the

viewpoint of solubility of the present compound with water.

In addition, the glycol ether used herein may be one or two types of the glycol ethers.

[0011]

5 The glycol ether content in the present composition is typically from 10 wt% to 50 wt%, preferably from 10 wt% to 45 wt%, and more preferably from 15 wt% to 40 wt% of the total amount of the present composition.

[0012]

10 The water content in the present composition is typically from 20 wt% to 85 wt%, preferably from 40 wt% to 80 wt%, more preferably from 50 wt% to 80 wt%, and even more preferably from 50 wt% to 75 wt% of the total amount of the present composition.

15 [0013]

The weight ratio between glycol ether and water (i.e. glycol ether : water) in the present composition is in the range of typically from 1:0.4 to 1:8.5, preferably from 1:1.3 to 1:5.3, and more preferably from 1:1.8 to 1:4.4.

20 Alternatively, the weight ratio between glycol ether and water in the present composition is in the range of typically from 1:0.4 to 1:8.5, preferably from 1:1 to 1:8.5, and more preferably from 1:1.4 to 1:3.6.

[0014]

25 The present composition may further comprise a glycol.

It is preferable that the present composition comprises a glycol because the glycol can keep the solution of the present composition stable and/or each ingredient of the present composition can be mixed more homogeneously.

5 The glycol used herein includes ethylene glycol, diethylene glycol, triethylene glycol, propylene glycol, 1,3-butylene glycol, polyethylene glycol, polypropylene glycol, tetraethylene glycol, dipropylene glycol, tripropylene glycol, and tetrapropylene glycol.

10 From the viewpoint of keeping the solution stable and/or mixing each ingredient of the present composition more homogeneously, the glycol used herein is preferably ethylene glycol, diethylene glycol and triethylene glycol, as well as propylene glycol and dipropylene glycol, and
15 more preferably triethylene glycol, propylene glycol and dipropylene glycol. It is preferable that the present composition comprises triethylene glycol as a glycol.

[0015]

The glycol content in the present composition is
20 typically from 1 wt% to 45 wt%, preferably from 3 wt% to 40 wt%, more preferably from 5 wt% to 30 wt%, and even more preferably from 5 wt% to 20 wt% of the total amount of the present composition.

In addition, the glycol used herein may be one or two
25 types of the glycols. The present composition comprising

two types of the glycols includes a composition comprising dipropylene glycol and triethylene glycol, a composition comprising ethylene glycol and triethylene glycol, a composition comprising propylene glycol and triethylene glycol, and a composition comprising dipropylene glycol and tripropylene glycol.

The weight of the glycol used herein is preferably not greater than 400 weight parts relative to 100 weight parts of the glycol ether.

When the present composition comprises at least one compound selected from the group consisting of dipropylene glycol and triethylene glycol, the content ratio of glycol ether, dipropylene glycol (DPG) and triethylene glycol (TEG) (i.e. glycol ether : DPG : TEG) is in the range of preferably 25-35:10:0 to 25-35:0:15, and more preferably 25-35:8:3 to 25-35:1:13.5.

[0016]

The present composition may comprise the present compound, glycol ether and water, or the present compound, glycol ether, water and glycol. However, as long as the homogeneity of the present composition is maintained and/or each ingredient of the present composition is adequately mixed, the present composition may optionally comprise at least one formulation additive such as a thickening agent, a dispersant [e.g. a surfactant (excluding the above-

mentioned glycol ether)], a stabilizing agent, a flavoring, and a preservative.

[0017]

The thickening agent used herein includes natural polysaccharides such as xanthan gum, rhamnan gum, locust bean gum, carrageenan and welan gum; synthetic polymers such as sodium polyacrylate; semisynthetic polymers such as carboxymethylcellulose; mineral powders such as aluminum magnesium silicate, smectite, bentonite, hectorite and fumed silica; alumina sol; and glycerin.

[0018]

The surfactant used herein includes non-ionic surfactants, anionic surfactants and amphoteric surfactants, and the non-ionic surfactants are preferable from the viewpoint of safety.

The dispersant used herein includes lignin sulfonate derivatives, naphthalene sulfonate derivatives, and water-soluble synthetic polymers (e.g. polyvinyl alcohol and polyvinylpyrrolidone).

[0019]

The stabilizing agent used herein includes BHT (2,6-di-t-butyl-4-methylphenol), BHA (a mixture of 2-t-butyl-4-methoxyphenol and 3-t-butyl-4-methoxyphenol), vitamin C and catechin.

The flavoring used herein includes natural flavorings,

synthetic flavorings, and extracted flavorings.

[0020]

The preservative used herein includes benzoic acid, sodium benzoate, methyl parahydroxybenzoate, butyl
5 parahydroxy benzoate, isopropyl methyl phenol, benzalkonium chloride, chlorhexidine hydrochloride, hydrogen peroxide water, chlorhexidine gluconate, salicylic acid, sodium salicylate, zinc pyrithione, sorbic acid, potassium sorbate, dehydroacetic acid, sodium dehydroacetate, phenoxyethanol,
10 isothiazoline derivatives (e.g. 5-chloro-2-methyl-4-isothiazoline-3-one and 2-methyl-4-isothiazoline-3-one), 2-bromo-2-nitropropane-1,3-diol, and salicylate derivatives. Specifically, the preservative used herein includes Biohope L (manufactured by K·I CHEMICAL INDUSTRY CO., LTD) and
15 Proxel GXL (manufactured by AVECIA CO., LTD).

[0021]

The present composition may further comprise at least one additive agent such as other pesticidal active ingredients, acaricidal active ingredients, repellent
20 active ingredients, and synergists.

[0022]

The synergists used herein include piperonyl butoxide, sesamex, sulfoxide, N-(2-ethylhexyl)-8,9,10-trinorborn-5-en-2,3-dicarboxyimide (MGK 264), N-decylimidazole, WARF-
25 antiresistant, TBPT, TPP, IBP, PSCP, methyl iodide (CH₃I),

t-phenylbutenone, diethylmaleate, DMC, FDMC, ETP, ETN and d-limonene.

[0023]

The present composition can be used in the form of,
5 for example, a heat transpiratory preparation. Furthermore,
the present composition can be applied to sprayers such as
an ultrasonic atomizer, an aerosol spray and a pump spray,
and a transpiratory preparation from which the present
composition spontaneously vaporizes, such as a preparation
10 which comprises an inorganic material, resin or fabrics as
a carrier of the composition.

It is especially preferable to use the present
composition in the form of a heat transpiratory preparation
or in the form of a composition for an ultrasonic atomizer.

15 [0024]

Pests which can be controlled by the present
composition include arthropods such as insects and mites.
Specific examples of the pests are as follows.

[0025]

20 *Lepidoptera*: Pyralid moths (*Pyralidae*) such as rice
stem borer (*Chilo suppressalis*), rice leafroller
(*Cnaphalocrocis medinalis*), and Indian meal moth (*Plodia
interpunctella*); armyworms (*Pseudaletia unipuncta*) such as
common cutworm (*Spodoptera litura*), rice armyworm
25 (*Pseudaletia separata*), and cabbage armyworm (*Mamestra*

brassicae); white butterflies (*Pieridae*) such as cabbage butterfly (*Pieris rapae*); tortricid moths (*Tortricidae*) such as summer fruit tortrix moth (*Adoxophyes orana*); fruitworm moths (*Carposinidae*); lyonetiid moths
5 (*Lyonetiidae*); tussock moths (*Lymantriidae*); *Autographa*; *Agrotis* spp. such as turnip moth (*Agrotis segetum*) and black cutworm (*Agrotis ipsilon*); *Helicoverpa* spp.; *Heliothis* spp.; diainondback moths (*Plutella xylostella*); common straight swift (*Parnara guttata*); casemaking clothes
10 moth (*Tinea translucens*); webbing clothes moth (*Tineola bisselliella*); and the like.

[0026]

Diptera: House mosquitos (*Culex*) such as common house mosquito (*Culex pipiens pallens*), small house mosquito
15 (*Culex tritaeniorhynchus*), and tropical house mosquito (*Culex quinquefasciatus*); striped mosquitoes (*Aedes*) such as yellow fever mosquito (*Aedes aegypti*) and Asian tiger mosquito (*Aedes albopictus*); anopheles mosquitoes (*Anopheles*) such as Chinese anopheles (*Anopheles sinensis*)
20 and African malaria mosquito (*Anopheles gambiae*); chironomids (*Chironomidae*); house flies (*Muscidae*) such as common housefly (*Musca domestica*), false stable fly (*Muscina stabulans*), and lesser housefly (*Fannia canicularis*); blow flies (*Calliphoridae*); flesh flies
25 (*Sarcophagidae*); anthomyiid flies (*Anthomyiidae*) such as

seedcorn fly (*Delia platura*) and onion fly (*Delia antiqua*);
fruit flies (*Tephritidae*); *Drosophilidae*; sand flies
(*Phlebotominae*); humpbacked flies (*Phoridae*); horse flies
(*Tabanidae*); black flies (*Simuliidae*); stable flies
5 (*Stomoxys*); biting midge (*Ceratopogonid*); and the like.

[0027]

Dictyoptera: German cockroach (*Blattella germanica*),
smokybrown cockroach (*Periplaneta fuliginosa*), american
cockroach (*Periplaneta americana*), Australian cockroach
10 (*Periplaneta australasiae*), brown cockroach (*Periplaneta
brunnea*), oriental cockroach (*Blatta orientalis*), and the
like.

[0028]

Hymenoptera: Ants (*Formicidae*), bees (*Hymenoptera*)
15 [e.g. Paper wasps (*Polistinae*) such as Asian paper wasp
(*Polistes chinensis antennalis*), *Polistes riparius*,
Polistes jadwigae jadwigae, yellow paper wasp (*Polistes
rothneyi*), *Polistes mandarinu*, *Polistes snelleni*, and
Polistes japonicus; vespid wasps (*Vespoidea*) such as
20 Japanese giant hornet (*Vespa mandarinia*), Japanese yellow
hornet (*Vespa simillima xanthoptera*), *Vespa analis*,
European hornet (*Vespa crabro*), *Vespa ducalis*, *Vespula
flaviceps*, *Vespula shidai*, and Median wasp (*Dolichovespula
media*); bethylid wasps (*Bethylidae*); carpenter bee
25 (*Xylocopa*); spider wasp (*Cyphononyx dorsalis*); digger wasp

(*Sphécidae*); and mason wasp (*Eumeninae*)], and the like.

[0029]

Siphonaptera: Dog flea (*Ctenocephalides canis*), cat flea (*Ctenocephalides felis*), human flea (*Pulex irritans*),
5 and the like.

[0030]

Anoplura: Human body louse (*Pediculus humanus*), crab louse (*Phthirus pubis*), head louse (*Pediculus humanus humanus*), human clothing louse (*Pediculus humanus corporis*),
10 and the like.

[0031]

Isoptera: Japanese subterranean termite (*Reticulitermes speratus*), Formosan subterranean termite (*Coptotermes formosanus*), and the like.

15 [0032]

Hemiptera: Planthoppers (*Delphacidae*) such as small brown planthopper (*Laodelphax striatellus*), brown rice planthopper (*Nilaparvata lugens*), and white-backed rice planthopper (*Sogatella furcifera*); leafhoppers (*Deltocephalidae*) such as green rice leafhopper (*Nephotettix cincticeps*) and Taiwan green rice leafhopper (*Nephotettix virescens*); aphids (*Aphididae*); stink bugs (*Pentatomidae*); whiteflies (*Aleyrodidae*); scale insects (*Coccoidea*); lace bugs (*Tingidae*); psyllids (*Psyllidae*);
20 bed bugs (*Cimicidae*); and the like.
25

[0033]

Coleoptera: Black carpet beetle (*Attagenus japonicus*); varied carpet beetle (*Anthrenus verbasci*); corn root worms (*Diabrotica* spp.) such as Western corn root worm (5 *Diabrotica virgifera virgifera*) and Southern corn root worm (*Diabrotica undecimpunctata howardi*); scarabs (*Scarabaeidae*) such as cupreous chafer (*Anomala cuprea*) and soybean beetle (*Anomala rufocuprea*); weevils (*Curculionidae*) such as maize weevil (*Sitophilus zeamais*), 10 rice water weevil (*Lissorhoptrus oryzophilus*), boll weevil (*Anthonomus grandis*), and azuki bean weevil (*Callosobruchus chinensis*); darkling beetles (*Tenebrionidae*) such as yellow mealworm (*Tenebrio molitor*) and red flour beetle (*Tribolium castaneum*); leaf beetles (*Chrysomelidae*) such as rice leaf 15 beetle (*Oulema oryzae*), striped flea beetle (*Phyllotreta striolata*), and cucurbit leaf beetle (*Aulacophora femoralis*); deathwatch beetles (*Anobiidae*); *Epilachna* spp. such as Twenty-eight-spotted ladybird (*Epilachna vigintioctopunctata*); powder post beetles (*Lyctus 20 brunneus*); horned powder-post beetles (*Bostrichidae*); longhorn beetles (*Cerambycidae*); rove beetles (*Paederus fuscipes*); and the like.

[0034]

Thysanoptera: Melon thrip (*Thrips parvi*), yellow 25 citrus thrip (*Frankliniella occidentalis*), Hawaiian flower

thrip (*Thrips hawaiiensis*), and the like.

[0035]

Orthoptera: Mole cricket (*Gryllotalpa brachyptera*), grasshopper (*Locust*), and the like.

5 [0036]

Acari: House dust mites (*Pyroglyphidae*) such as American house dust mite (*Dermatophagoides farinae*) and European house dust mite (*Dermatophagoides pteronyssinus*); acarid mites (*Acaridae*) such as mold mite (*Tyrophagus putrescentiae*) and brown legged grain mite (*Aleuroglyphus ovatus*); *Glycyphagidae* such as *Glycyphagus privatus*, house mite (*Glycyphagus domesticus*), and parasitic mite (*Glycyphagus destructor*); cheyletide mites (*Cheyletidae*) such as *Cheyletus malaccensis* and *Cheyletus fortis*;

10

15 tarsonemid mites (*Tarsonemidae*); *Chortoglyphidae*; *Haplochthonius simplex*; spider mites (*Tetranychidae*) such as two-spotted spider mite (*Tetranychus urticae*), Kanzawa spider mite (*Tetranychus kanzawai*), citrus red mite (*Panonychus citri*), and European red mite (*Panonychus*

20 *ulmi*); ticks (*Ixodidae*) such as New Zealand cattle tick (*Haemaphysalis longicornis*); and the like.

[0037]

The method for controlling pests of the present invention is typically carried out by applying the present

25 composition to the pests or habitats thereof.

The methods of applying the present composition are, for example, the following methods, and any of them may be selected depending on factors such as the form of the present composition and the place of application.

5 (1) A method of using the present composition in the form of a heat transpiratory preparation to fumigate habitats of the pests with the present composition.

(2) A method of using the present composition with sprayers (e.g. an ultrasonic atomizer, an aerosol spray,
10 and a pump spray) to spray the present composition over the pests or habitats thereof.

In any methods, the amount and the concentration of the present compound may be determined depending on factors such as the form of the present composition; the season,
15 place, and method of the application; the types of pests; and the extent of damage.

[0038]

Among the pest control methods of the present invention, a method of applying the present composition in
20 the form of a heat transpiratory preparation is carried out by, for example, dipping a part of a porous liquid-absorbing wick in the present composition to absorb the composition into the wick, and then heating the upper part, i.e. one end part of the wick to make the absorbed
25 composition can vaporize. The apparatus used herein is

known in the technical field, and for example, a pesticidal apparatus for heat transpiratory preparation disclosed in JP 2(1990)-025885 B may be used.

The material of the porous liquid-absorbing wick is, for example, inorganic powders (e.g. clay, talc, kaolin, diatomaceous earth, gypsum, perlite, bentonite, acid clay, glass fiber, and asbestos) which are shaped by binding with pastes (e.g. carboxymethylcellulose, starch, gum arabic, gelatin, and polyvinyl alcohol); inorganic substances (e.g. clay, talc, bentonite, alumina, and silica) which are fixed to form a wick and then burnt; resins which are shaped/modified to form a wick; and glass fibers or the like which are tied together.

[0039]

Among the pest control methods of the present invention, a method of applying the present composition with an ultrasonic atomizer is carried out by, for example, spraying the present composition from the ultrasonic atomizer. In this case, the present composition is atomized by ultrasound and then sprayed. In addition, an ultrasonic atomizer disclosed in, for example, JP 2009-118792 A may be used herein.

[0040]

Among the pest control methods of the present invention, a method of applying the present composition

with an aerosol is carried out by, for example, loading an aerosol container with the present composition, attaching an aerosol valve to the container, loading the container with a propellant by a stem, shaking the container, attaching an actuator to the container to prepare an aerosol, and then spraying the composition from the aerosol. In addition, the propellant used herein includes nitrogen gas, compressed air, carbon dioxide gas, liquefied petroleum gas (LPG) and dimethyl ether. The actuator used herein includes button-type actuator and trigger-type actuator.

[0041]

Among the pest control methods of the present invention, a method of applying the present composition with a pump spray is carried out by, for example, loading a pump spray (which does not require a propellant, i.e. which works by pumping action) with the present composition, and then spraying the composition from the pump spray. In addition, the pump spray used herein is known in the technical field, and for example, a pump spray disclosed in JP 8 (1996)-295359 A and a trigger-type pump spray disclosed in JP 2002-233798 A may be used.

Example

[0042]

The present inventions are illustrated in more detail in the following examples such as Formulation Examples and Test Examples, but the present inventions should not be construed to be limited thereto.

5 [0043]

Hereinafter, Formulation Examples of the present compositions are illustrated, in which "parts" denotes "parts by weight".

10 In Formulation Examples, Compound A, Compound B and Compound C were as follows.

Compound A: [2,3,5,6-tetrafluoro-4-(methoxymethyl)-phenyl]methyl (1*R*)-*trans*-2,2-dimethyl-3-((*Z*)-1-propenyl)-cyclopropane-carboxylate

15 Compound B: [2,3,5,6-tetrafluoro-4-methylphenyl]methyl (1*R*)-*trans*-2,2-dimethyl-3-((*Z*)-1-propenyl)cyclopropane-carboxylate

Compound C: (2,3,5,6-tetrafluorophenyl)methyl (1*R*)-*trans*-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropane-carboxylate

20

[0044]

Formulation Example 1

0.15 Part of Compound A, 70 parts of water and 29.85 parts of ethylene glycol monobutyl ether were mixed, and
25 the mixture was stirred to obtain 100 parts of a liquid

composition [hereinafter, referred to as Composition (1)].

[0045]

Formulation Example 2

0.15 Part of Compound A, 70 parts of water and 29.85
5 parts of diethylene glycol monobutyl ether were mixed, and
the mixture was stirred to obtain 100 parts of a liquid
composition [hereinafter, referred to as Composition (2)].

[0046]

Formulation Example 3

10 0.15 Part of Compound B, 70 parts of water and 29.85
parts of diethylene glycol monobutyl ether were mixed, and
the mixture was stirred to obtain 100 parts of a liquid
composition [hereinafter, referred to as Composition (3)].

[0047]

15 Formulation Example 4

0.15 Part of Compound C, 70 parts of water and 29.85
parts of diethylene glycol monobutyl ether were mixed, and
the mixture was stirred to obtain 100 parts of a liquid
composition [hereinafter, referred to as Composition (4)].

20 [0048]

Formulation Example 5

0.15 Part of Compound A, 65 parts of water and 34.85
parts of ethylene glycol monobutyl ether were mixed, and
the mixture was stirred to obtain 100 parts of a liquid
25 composition [hereinafter, referred to as Composition (5)].

[0049]

Formulation Example 6

1.2 Parts of Compound B, 65 parts of water and 33.8 parts of ethylene glycol monobutyl ether were mixed, and
5 the mixture was stirred to obtain 100 parts of a liquid composition [hereinafter, referred to as Composition (6)].

[0050]

Formulation Example 7

0.6 Part of Compound C, 65 parts of water and 34.4
10 parts of ethylene glycol monobutyl ether were mixed, and the mixture was stirred to obtain 100 parts of a liquid composition [hereinafter, referred to as Composition (7)].

[0051]

Formulation Example 8

0.2 Part of Compound A, 70 parts of water, 19.8 parts
15 of ethylene glycol monobutyl ether and 10 parts of triethylene glycol were mixed, and the mixture was stirred to obtain 100 parts of a liquid composition [hereinafter, referred to as Composition (8)].

20 [0052]

Formulation Example 9

0.2 Part of Compound A, 50 parts of water, 39.8 parts
of propylene glycol monoethyl ether and 10 parts of triethylene glycol were mixed, and the mixture was stirred
25 to obtain 100 parts of a liquid composition [hereinafter,

referred to as Composition (9)].

[0053]

Formulation Example 10

0.2 Part of Compound A, 60 parts of water, 29.8 parts
5 of propylene glycol monopropyl ether and 10 parts of
propylene glycol were mixed, and the mixture was stirred to
obtain 100 parts of a liquid composition [hereinafter,
referred to as Composition (10)].

[0054]

10 Formulation Example 11

0.2 Part of Compound A, 60 parts of water, 29.8 parts
of propylene glycol monopropyl ether and 10 parts of
dipropylene glycol were mixed, and the mixture was stirred
to obtain 100 parts of a liquid composition [hereinafter,
15 referred to as Composition (11)].

[0055]

Formulation Example 12

0.2 Part of Compound A, 55 parts of water, 29.8 parts
of propylene glycol monopropyl ether and 15 parts of
20 triethylene glycol were mixed, and the mixture was stirred
to obtain 100 parts of a liquid composition [hereinafter,
referred to as Composition (12)].

[0056]

Formulation Example 13

25 0.2 Part of Compound A, 57.5 parts of water, 29.8

parts of propylene glycol monopropyl ether, 5 parts of dipropylene glycol and 7.5 parts of triethylene glycol were mixed, and the mixture was stirred to obtain 100 parts of a liquid composition [hereinafter, referred to as Composition
5 (13)].

[0057]

Formulation Example 14

0.2 Part of Compound A, 56 parts of water, 29.8 parts of propylene glycol monopropyl ether, 2 parts of
10 dipropylene glycol and 12 parts of triethylene glycol were mixed, and the mixture was stirred to obtain 100 parts of a liquid composition [hereinafter, referred to as Composition (14)].

[0058]

15 Formulation Example 15

Any of Compositions (1) to (14) (60 g) are put into an aerosol can. After attaching an aerosol valve to the aerosol can, the aerosol can is charged with nitrogen gas (40 g) and shaken. Then, an actuator is attached to the
20 aerosol can to obtain Aerosol Formulation 1.

[0059]

Formulation Example 16

Any of Compositions (1) to (14) (60 g) are put into an aerosol can. After attaching an aerosol valve to the
25 aerosol can, the aerosol can is charged with dimethyl ether

(40 g) and shaken. Then, an actuator is attached to the aerosol can to obtain Aerosol Formulation 2.

[0060]

Formulation Example 17

5 A chemical bottle (10 mL), which has been charged with Composition (1), is attached to an ultrasonic atomizer (SCENTS RISER manufactured by NIPPON MMI TECHNOLOGY) to obtain an ultrasonic atomizer for controlling pests.

[0061]

10 Formulation Example 18

A plastic bottle is charged with the present composition and then a pump spray head is attached to the bottle to obtain a pump spray.

[0062]

15 Comparative Formulation Example 1

0.15 Part of Compound A, 90 parts of water and 9.85 parts of ethylene glycol monobutyl ether were mixed, and the mixture was stirred to obtain 100 parts of a liquid composition [hereinafter, referred to as Comparative
20 Composition (1)].

[0063]

Hereinafter, Test Examples are illustrated. Compound A, Compound B and Compound C used herein were as follows.

Compound A: [2,3,5,6-tetrafluoro-4-(methoxymethyl)-
25 phenyl]methyl (1R)-trans-2,2-dimethyl-3-((Z)-1-propenyl)-

cyclopropane-carboxylate

Compound B: [2,3,5,6-tetrafluoro-4-methylphenyl]methyl
(1*R*)-*trans*-2,2-dimethyl-3-((*Z*)-1-propenyl)cyclopropane-
carboxylate

5 Compound C: (2,3,5,6-tetrafluorophenyl)methyl (1*R*)-
trans-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropane-
carboxylate

[0064]

Test Example 1

10 Composition (1) (40 g) obtained in Formulation Example
1 was put into a container, and a liquid-absorbing wick was
attached to the container to prepare a liquid-absorbing
wick-attached bottle containing Composition (1). The wick
of bottle was heated at 130°C with a pesticidal apparatus
15 for heat transpiratory preparation. The heating procedure
was carried out by continuously heating for 8 hours,
stopping the heating for 16 hours and then continuously
heating for 8 hours again, and this procedure was repeated.
The vaporized amount of the present compound was measured
20 for one hour after the beginning of the heating procedure,
on the 1st, 7th and 15th days. Using Compositions (2), (3)
and (4) instead of Composition (1), the same test was done
to measure the vaporized amount of the present compound in
each case.

25 In addition, the vaporized amount of the present

compound was calculated by sequentially collecting the vaporized present compound with a glass column filled with a polyurethane sponge as an adsorbent, and then extracting the polyurethane sponge with acetone to analyze the amount of the present compound on chromatograph.

The results are shown in Table 1.

[0065]

Table 1

	The amount of the present compound vaporized for one hour (mg)		
	Day 1	Day 7	Day 15
Composition (1)	0.15	0.25	0.18
Composition (2)	0.18	0.17	0.13
Composition (3)	0.15	0.16	0.18
Composition (4)	0.14	0.14	0.13

The present composition can make the present compound continuously vaporized for a long period, thus the present composition can exhibit a continuous pest-controlling effect for a long period.

[0066]

Test Example 1-1

Using Composition (8) instead of Composition (1), the same test as Test Example 1 was done to measure the vaporized amount of the present compound on the 1st, 14th and 29th days after the beginning of the heating procedure.

As a result, the vaporized amounts of the present compound on the 1st, 14th and 29th days after the beginning

of the heating procedure were 0.16 mg, 0.11 mg and 0.11 mg respectively.

[0067]

Test Examples 1-2 to 1-6

5 Using Compositions (9) to (14) instead of Composition (8), the same tests as Test Example 1-1 were done to measure the vaporized amount of the present compound in each case. The vaporized amounts in each case were measured on not exactly the same days as Test Example 1-1.

10 The results (including Test Example 1-1) are shown in Table 1-2.

[0068]

Table 1-2

Composition No.	The amount of the present compound vaporized for one hour (mg)									
	Day 1	Day 6	Day 7	Day 12	Day 14	Day 15	Day 18	Day 26	Day 28	Day 29
(8)	0.16				0.11					0.11
(9)	0.13						0.13			0.13
(10)	0.22		0.22			0.11				
(11)	0.14		0.13			0.12				
(12)	0.11			0.12				0.11		
(13)	0.20					0.18		0.12		
(14)		0.12			0.14				0.15	

[0069]

15 Test Example 2

Composition (5) (40 g) was put into a container, and a liquid-absorbing wick was attached to the container to

prepare a Composition (5)-containing bottle with a liquid-
 absorbing wick. The bottle was heated at 130°C for 4 hours
 with a pesticidal apparatus for heat transpiratory
 preparation, and then the heating was stopped. The bottle-
 5 attached pesticidal apparatus for heat transpiratory
 preparation was placed in the center of the testing room
 (rectangular parallelepiped of 3.0 m × 4.0 m × 2.3 m, 28
 m³) and was heated again, and then about 100 common house
 mosquitoes (*Culex pipiens pallens*) (female adult) were
 10 released in the room immediately. After a while, the
 knocked-down insects were counted, and based on such data,
 KT50 (time required for knocking-down 50 % of the testing
 insects) was calculated. Using Composition (6),
 Composition (7) and Comparative Composition (1) instead of
 15 Composition (5), the same test was done to calculate KT50
 in each case.

The results are shown in Table 2.

[0070]

Table 2

	KT50 (min)
Composition (5)	18.1
Composition (6)	19.8
Composition (7)	18.4
Comparative Composition (1)	>60

20 [0071]

Test Example 2-1

Composition (8) (35 g) was put into a container, and a liquid-absorbing wick was attached to the container to prepare a Composition (8)-containing bottle with a liquid-absorbing wick. The bottle was heated at 130°C for 20 hours with a pesticidal apparatus for heat transpiratory preparation, and then the heating was stopped. The bottle-attached pesticidal apparatus for heat transpiratory preparation was placed in the center of the testing room (rectangular parallelepiped of 3.0 m × 4.0 m × 2.3 m, 28 m³) and was heated again, and then about 100 common house mosquitoes (*Culex pipiens pallens*) (female adult) were released in the room immediately. 60 Minutes after the release, the number of knocked-down insects was counted to calculate the knocking-down rate (KD rate) after 60 minutes.

Using Composition (9), Composition (14) and Comparative Composition (1) instead of Composition (8), the same test was done to calculate the knocking-down rate after 60 minutes in each case.

The results are shown in Table 2-1.

[0072]

Table 2-1

	KD rate after 60 minutes (%)
Composition (8)	62
Composition (9)	90
Composition (14)	80

Comparative Composition (1)	2
-----------------------------	---

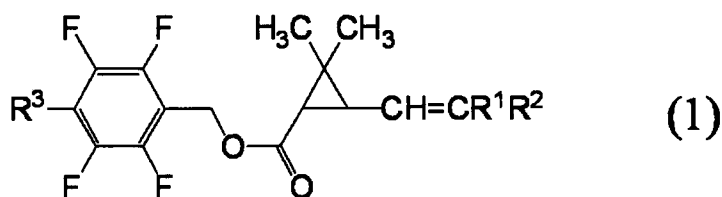
Industrial Applicability

[0073]

The present composition has an excellent efficacy in
5 controlling pests.

CLAIMS

1. A pesticidal composition comprising an ester compound of Formula (1):



wherein R^1 and R^2 are each independently selected from the group consisting of hydrogen atom, methyl group, trifluoromethyl group and chlorine atom; and R^3 is hydrogen atom, methyl group or methoxymethyl group,

10 a glycol ether, and water wherein the glycol ether content is from 10 wt% to 50 wt% of the total amount of the composition and the water content is from 20 wt% to 85 wt% of the total amount of the composition.

15 2. The pesticidal composition of claim 1 wherein the glycol ether is an ethylene glycol ether.

3. The pesticidal composition of claim 1 wherein the glycol ether is at least one compound selected from the group consisting of an ethylene glycol ether and a propylene glycol ether.

20

4. The pesticidal composition of claim 1 wherein the

glycol ether is one or two compounds selected from the group consisting of ethylene glycol monobutyl ether and diethylene glycol monobutyl ether.

5 5. The pesticidal composition of claim 1 wherein the glycol ether is at least one compound selected from the group consisting of ethylene glycol monobutyl ether, diethylene glycol monobutyl ether, propylene glycol monomethyl ether, propylene glycol monoethyl ether, and
10 propylene glycol monopropyl ether.

6. The pesticidal composition of any one of claims 1 to 5 wherein the glycol ether content is from 15 wt% to 40 wt% of the total amount of the composition.

15

7. The pesticidal composition of any one of claims 1 to 6 wherein the ester compound of Formula (1) is at least one compound selected from the group consisting of:

[2,3,5,6-tetrafluoro-4-(methoxymethyl)phenyl]methyl
20 2,2-dimethyl-3-(1-propenyl)cyclopropane-carboxylate,
[2,3,5,6-tetrafluoro-4-methylphenyl]methyl 2,2-
dimethyl-3-(1-propenyl)cyclopropane-carboxylate,
(2,3,5,6-tetrafluorophenyl)methyl 3-(2,2-
dichlorovinyl)-2,2-dimethylcyclopropane-carboxylate, and
25 [2,3,5,6-tetrafluoro-4-(methoxymethyl)phenyl]methyl 3-

(2,2-dichlorovinyl)-2,2-dimethylcyclopropane-carboxylate.

8. The pesticidal composition of any one of claims 1 to 6 wherein the ester compound of Formula (1) is at least one compound selected from the group consisting of:

[2,3,5,6-tetrafluoro-4-(methoxymethyl)phenyl]methyl 2,2-dimethyl-3-(1-propenyl)cyclopropane-carboxylate,

[2,3,5,6-tetrafluoro-4-methylphenyl]methyl 2,2-dimethyl-3-(1-propenyl)cyclopropane-carboxylate,

10 (2,3,5,6-tetrafluorophenyl)methyl 3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropane-carboxylate,

[2,3,5,6-tetrafluoro-4-(methoxymethyl)phenyl]methyl 3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropane-carboxylate,

15 [2,3,5,6-tetrafluoro-4-(methoxymethyl)phenyl]methyl 2,2-dimethyl-3-(2-methyl-1-propenyl)cyclopropane-carboxylate, and

[2,3,5,6-tetrafluoro-4-(methoxymethyl)phenyl]methyl 3-(3,3,3-trifluoro-1-propenyl)-2,2-dimethylcyclopropane-carboxylate.

20

9. The pesticidal composition of any one of claims 1 to 8 wherein the water content is from 50 wt% to 80 wt% of the total amount of the composition.

25 10. The pesticidal composition of any one of claims 1 to 9

which further comprises a glycol.

11. The pesticidal composition of claim 10 wherein the glycol is at least one compound selected from the group
5 consisting of ethylene glycol, diethylene glycol, triethylene glycol, propylene glycol, 1,3-butylene glycol, polyethylene glycol and polypropylene glycol.

12. The pesticidal composition of claim 10 wherein the
10 glycol is at least one compound selected from the group consisting of ethylene glycol, diethylene glycol, triethylene glycol, propylene glycol, 1,3-butylene glycol, polyethylene glycol, polypropylene glycol, dipropylene glycol, tripropylene glycol, and tetraethylene glycol.

15

13. The pesticidal composition of any one of claims 10 to 12 wherein the glycol is triethylene glycol.

14. The pesticidal composition of any one of claims 10 to
20 12 wherein the glycol is at least one compound selected from the group consisting of triethylene glycol, propylene glycol and dipropylene glycol.

15. The pesticidal composition of any one of claims 10 to
25 14 wherein the glycol content is from 1 wt% to 45 wt% of

the total amount of the composition.

16. The pesticidal composition of any one of claims 1 to
15 which is used in the form of a heat transpiratory
5 preparation.

17. The pesticidal composition of any one of claims 1 to
15 which is used in the form of a composition for an
ultrasonic atomizer.

10

18. A method for controlling pests which comprises
applying an effective amount of the pesticidal composition
of any one of claims 1 to 15 to pests or habitats thereof.

15 19. The method of claim 18 which is carried out by dipping
a part of a porous liquid-absorbing wick in the pesticidal
composition of any one of claims 1 to 15 to absorb the
composition into the wick, and then heating the upper part
of the wick to make the absorbed composition vaporize.

20

20. The method of claim 19 which is carried out by
spraying the pesticidal composition of any one of claims 1
to 15 from an ultrasonic atomizer.

INTERNATIONAL SEARCH REPORT

International application No
PCT/JP2012/051735

A. CLASSIFICATION OF SUBJECT MATTER
INV. A01N53/00 A01P7/04
ADD.
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
Minimum documentation searched (classification system followed by classification symbols)
A01N
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, CHEM ABS Data, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2009/326065 A1 (MATSUMOTO OSAMU [JP] ET AL) 31 December 2009 (2009-12-31) Claims 1-10, Prep. Ex. 1-7, Comp. Prep. 1-4	1-20
X	----- JP 2010 100762 A (DAINIPPON JOCHUGIKU KK) 6 May 2010 (2010-05-06) Claims 1-4, [0011]	1-20
X	----- WO 2009/074114 A1 (JOHNSON & SON INC S C [US]; ZHANG YONGHUA [CN]) 18 June 2009 (2009-06-18) Table 1, page 8(transfluthrin); ex 5, Claims 1-21	1-20

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
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Date of the actual completion of the international search 24 May 2012	Date of mailing of the international search report 08/06/2012
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Bueno Torres, Pilar

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/JP2012/051735

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