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(54) AN INSECTICIDAL COMPOSITION FOR ELECTRIC FUMIGATOR

(71) We, SUMITOMO CHEMICAL COMPANY, LIMITED, a Corporation organised under the laws of Japan, of 15, Kitahama-5-chome, Higashi-ku, Osaka, Japan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to an insecticidal composition consisting essentially of at least one allethrin or related compound as hereinafter described, a suitable amount of one or more antioxidants described hereinafter and release controllers, such compositions being useful for impregnating a carrier such as a fibrous plate or a porous synthetic resin which is to be heated at 120° to 160°C by suitable means such as an electric heater thereby vaporizing the insecticidal component in the carrier and exterminating harmful insects.

Extermination of harmful insects by electric fumigators is widely used domestically, as is extermination by aerosols, oil sprays and emulsifiable concentrates of a liquid form. The former method is different from the latter one in that the concentration in a given space of the components necessary for extermination or knocking down of insects is maintained at that level for a longer period of time than when using the latter methods. In this respect, the former method is similar to that when using mosquito coils. Another important feature of the method of extermination of harmful insects using an electric fumigator is that the insecticidal components alone can be released into the air. In other words, this method has the advantage that it does not release into the air inactive components such as the solvents and propellants released by aerosols, the solvents released by oil sprays or the smoke released by mosquito coils. This is very important in terms of reducing environmental pollution.

However, even the use of an electric fumigator has problems associated with it. One of the problems is how to control the thermal decomposition and prevent the vaporization rate of the insecticidal components from being too rapid, these problems arising because a temperature as high as from 120° to 160°C is essential to this method and moreover because the temperature should be kept for a time as long as from 8 to 10 hours.

In known insecticidal compositions, controlling the vaporization of the insecticidal component (referred to hereinafter as "release controlling"), is commonly achieved by blending of the insecticidal compound with piperonyl-butoxide (referred to hereinafter as "PBO") which is frequently used as a synergist for pyrethroid type insecticides. Many of the insecticidal compositions for use with an electric fumigator now on the market contain PBO. Recently, many different opinions have been put forward as to the toxicity of PBO, and the present climate of opinion is that a lack of toxicity of PBO to mammals cannot always be guaranteed. Further, when PBO is blended with insecticides in known compositions for use with an electric fumigator, the PBO itself is also released into the air by heating. It is therefore expected that PBO will be controlled by regulations in future, so that there is a strong demand for release controllers which can act as a substitute for PBO. As alternatives to PBO, it is well known that surface active agents are very promising since, in general, they have a large molecular weight and do not vaporize at a temperature of about 120° to 160°C. The results of our study on release controllers also show that relatively high-boiling compounds, for example, some kinds of pyrethroid type insecticides, paraffins, oils and fats (e.g. olive oil, peanut

oil, corn oil, soybean oil, etc.), hydrogenated products of the oils and fats and repellents (e.g. diethyltoluamide, etc.), have a sufficient release controlling effect upon the insecticidal component with which they are mixed depending upon the amount added.

In particular, the release of an allethrin or related compound (as hereinafter described), as active ingredient can be controlled by incorporating it in a composition containing substances having a boiling point equal to or higher than that of the allethrin or related compound, these substances having a release controlling effect to a greater or lesser degree. Such substances exist in larger numbers and, we have discovered, any of these can be employed to good effect as release controllers, there being no need to use PBO.

The second consideration is that of controlling the decomposition of active ingredients (referred to hereinafter as "stabilization"), and this is achieved by blending the insecticidal components with antioxidants. We found that many of the commercial products in this field contain 3,5-di-tert-butyl-4-hydroxytoluene (referred to hereinafter as "BHT") and that the amount blended is about 20 mg per mat (about 800 to 900 mg of pulp plate) for a composition for use with an electric fumigator. Thus, BHT has been regarded as an essential constituent, as a stabilizer, for insecticidal compositions for use with an electric fumigator.

In a study of the stabilization of allethrin-containing insecticidal compositions for use with an electric fumigator, we found that BHT stabilizes allethrins themselves or allethrins included in a mat for an electric fumigator, but unexpectedly the BHT displays little stabilizing effect when actually heated on electric fumigator. As a result of further investigations on this matter, we found that, since BHT is easier to vaporize than allethrins, it vaporizes more rapidly when heated on electric heaters, and therefore that the stabilizing effect of BHT is not displayed sufficiently. Since BHT does not vaporize instantaneously, some effect will probably be displayed when BHT is blended in large amounts. Such blending is not, however, desirable economically, nor is it desirable that constituents other than the insecticidal component are released into space in large amounts.

As described above, known methods of stabilizing allethrins are clearly unsatisfactory.

For the reasons as described above, we further continued our study on effective antioxidants, and found that an allethrin, as active ingredient, is sufficiently stabilized by blending it with one or more of the antioxidants hereinafter described.

An insecticidal composition of the present invention contains 1 to 50 W/V% of at least one active ingredient which is an allethrin or ($\pm$)2-allyl-3-methyl-cyclopent-2-ene-1-one-4-yl 2,2,3,3-tetramethylcyclopropane-carboxylate, 0.1 to 20 W/V% of an antioxidant hereinafter defined and 1 to 50 W/V% of a release controller, examples of which are liquid paraffins, oils and fats (e.g. olive oil, peanut oil, corn oil, soybean oil, etc.), hydrogenated products of oils or fats and surface active agents.

These constituents of the insecticidal composition preferably are dissolved in a solvent such as acetone, ethylether, n-hexane, methanol, dichloromethane, 1,1,1-trichloroethane or a mixture of any of these.

Mats for the electric fumigator can be obtained by impregnating a fibrous or porous carrier such as pulp plate, asbestos and synthetic resin with the composition.

The active ingredient in a composition of the present invention may, for example, be any of the following compounds:—

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Common name	Chemical name
(1) Allethrin	(±)2-Allyl-3-methyl-cyclopent-2-ene-1-one-4-yl (±)cis,trans-chrysanthemate
(2) d-Allethrin	(±)2-Allyl-3-methyl-cyclopent-2-ene-1-one-4-yl (+)cis,trans-chrysanthemate
(3) d-Trans-allethrin	(±)2-Allyl-3-methyl-cyclopent-2-ene-1-one-4-yl (+)trans-chrysanthemate
(4) d-Lone, d-allethrin	(+)2-Allyl-3-methyl-cyclopent-2-ene-1-one-4-yl (+)cis,trans-chrysanthemate
(5) d-Lone, d-trans-allethrin	(+)2-Allyl-3-methyl-cyclopent-2-ene-1-one-4-yl (+)trans-chrysanthemate
(6) M-108	(±)2-Allyl-3-methyl-cyclopent-2-ene-1-one-4-yl 2,2,3,3-tetramethylcyclopropanecarboxylate

The amount of active ingredient is 1 to 50 W/V%, preferably 2 to 20 W/V%, based on the volume of the composition. The antioxidant in a composition of the present invention is any of the following compounds.

5	2,2'-Methylene-bis(6-tert-butyl-4-methylphenol) (referred to as "AO-1" hereinafter)	5
	2,2'-Methylene-bis(6-tert-butyl-4-ethylphenol) (referred to as "AO-2" hereinafter)	
10	4,4'-Methylene-bis(2,6-di-tert-butylphenol) (referred to as "AO-3" hereinafter)	10
	4,4'-Butylidene-bis(6-tert-butyl-3-methylphenol) (referred to as "AO-4" hereinafter)	
	4,4'-Thio-bis(6-tert-butyl-3-methylphenol) (referred to as "AO-5" hereinafter)	
15	1,1'-Bis(4-hydroxyphenyl)cyclohexane (referred to as "AO-6" hereinafter)	15
	1,3,5-Trimethyl-2,4,6-tris(3,5-di-tert-butyl-4-hydroxybenzyl)benzene (referred to as "AO-7" hereinafter)	
20	Tris(2-methyl-4-hydroxy-5-tert-butylphenyl)butane (referred to as "AO-8" hereinafter)	20
	Tetrakis[methylene(3,5-di-tert-butyl-4-hydroxyhydrocinnamate)]methane (referred to as "AO-9" hereinafter)	
	Octadecyl-3,5-di-tert-butyl-4-hydroxyhydrocinnamate (referred to as "AO-10" hereinafter)	
25	Phenyl-β-naphthylamine (referred to as "AO-11" hereinafter)	25
	N,N'-Diphenyl-p-phenylenediamine (referred to as "AO-12" hereinafter)	
30	2,2,4-Trimethyl-1,2-dihydroquinoline polymer (referred to as "AO-13" hereinafter)	30
	6-Ethoxy-2,2,4-trimethyl-1,2-dihydroquinoline (referred to as "AO-14" hereinafter)	
35	3,5-Di-tert-butyl-4-hydroxytoluene (referred to as "A" hereinafter)	35
	3-tert-Butyl-4-hydroxyanisole (referred to as "B" hereinafter)	
40	3,5-Di-tert-butyl-4-hydroxyanisole (referred to as "C" hereinafter)	40
	Mercaptobenzimidazole (referred to as "D" hereinafter)	
	Dilauryl-thio-di-propionate (referred to as "E" hereinafter)	

On the other hand, the following compounds have only little stabilizing effect and are not included in compositions of the present invention.

The amount of antioxidant is 0.1 to 20 W/V%, preferably 0.5 to 10 W/V%, based on the volume of the composition, and the amount of release controller is 1 to 50 W/V%, preferably 2 to 40 W/V%, based on the volume of the composition, and this release controller may be any of the previously mentioned high boiling point compounds and need not be PBO.

Further, in order to enhance its commercial value, a composition embodying the present composition may additionally contain other pyrethroidal insecticides such as 3-phenoxybenzyl-(+)-cis,trans-chrysanthemate, 3,4,5,6-tetrahydrophthalimidomethyl-(±)-cis,trans-chrysanthemate and 3-phenoxybenzyl-(±)-cis,trans-2,2-dimethyl-3-(2,2-dichlorovinyl)cyclopropane-1-carboxylate, synergists such as N-octylbicyclo[2,2,1]-5-heptene-2,3-dicarboximide and 1,2-methylenedioxy-4-[2-(octylsulphanyl)propyl]benzene, repellents such as diethyltoluamide and di-n-butylsuccinate, colouring matters or perfumes.

Compositions embodying the present invention (and, for comparison, compositions outside the scope of the invention) will now be illustrated in more detail with reference to the following Examples.

Example 1.

4.0 Grams of the insecticidal component, 4.0 g of a liquid paraffin (Ondina Oil — "Ondina" is a Registered Trade Mark of a product produced by Shell Sekiyu Co.) and 0.5 g of the antioxidant shown in Table 1 were dissolved in the solvent 1,1,1-trichloroethane to give 100 ml of solution. One millilitre of the resulting solution was uniformly coated on a pulp plate (blank mat) of 3.5 cm x 2.2 cm in size (800 to 900 mg), and the solvent was then removed to obtain a mat for use in an electric fumigator. This mat was heated on a heater at $145^{\circ} \pm 3^{\circ}\text{C}$ for 2 hours. Thereafter, the amounts of the insecticidal component vaporized into space and remaining in the mat respectively were measured by gas-chromatography, and a vaporization ratio and "remaining ratio" were calculated with the initial amount on the mat taken as 100%.

The amount vaporized was measured by adsorption of the vaporized insecticidal component on to silica gel.

The total amounts of insecticidal component measured were $97 \pm 3\%$, and therefore the rest was regarded as decomposed insecticidal component. Consequently, the decomposition ratio was calculated from the equation:

$$100 - (\text{vaporization ratio} + \text{remaining ratio}) (\%)$$

The test results are shown in Table 1.

TABLE 1

	Insecticidal component	Antioxidant	Insecticidal component		
			Vaporization ratio (%)	Remaining ratio (%)	Decomposition ratio (%)
Present Example	Allethrin	AO-4	43.2	52.7	4.1
	d-Allethrin	AO-1	45.7	50.7	3.6
	"	AO-2	47.9	50.1	2.0
	"	AO-3	37.2	59.1	3.7
	"	AO-4	41.6	57.3	1.1
	"	AO-5	37.8	56.8	5.4
	"	AO-6	39.9	57.4	2.7
	"	AO-7	40.7	57.5	1.8
	"	AO-8	40.8	55.7	3.5
	"	AO-9	38.1	58.8	3.1
	"	AO-10	37.4	58.4	4.2
	"	AO-11	38.7	59.1	2.2
	"	AO-12	45.7	49.0	5.3
	"	AO-13	40.6	57.1	2.3
	"	AL-14	37.4	57.0	5.6

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TABLE 1 (Continued)

	Insecticidal component	Antioxidant	Insecticidal component		
			Vaporization ratio (%)	Remaining ratio (%)	Decomposition ratio (%)
Present Example	d-Trans-allevhrin	AO-3	36.5	59.6	3.9
	d-Lone, d-allevhrin	AO-2	38.8	58.4	2.8
	d-Lone, d-trans-allevhrin	AO-14	42.0	53.2	4.8
	M-108	AO-10	49.9	46.4	3.7
	{ d-Allevhrin d-Phenothrin *	AO-10	40.1	57.3	2.6
	{ M-108 d-Phenothrin *	AO-10	48.6	49.5	1.9
Reference Example	{ M-108 d-Allevhrin d-Phenothrin *	AO-10	45.5	52.1	2.4
	d-Allevhrin	A	46.5	18.1	35.4
	"	B	49.0	31.3	19.7
	"	D	40.2	37.9	21.9
	"	E	53.8	29.0	17.2
	"	None	33.8	14.2	52.0
	M-108	A	56.7	14.7	28.6
	"	None	41.4	13.2	45.4
	* d-phenothrin : 3-phenoxybenzyl-(+) cis, trans-chrysanthemate.				

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When one of the specific antioxidants used in a composition of the present invention is employed, the decomposition ratio is very low and is nearly within the error in measurement. In addition, a sufficient stabilizing effect is maintained for at least two hours even when the antioxidant content is as low as 5 mg/mat.

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In contrast, when the controls are used, the stabilizing effect is clearly insufficient as compared with the abovementioned specific antioxidants, although it is somewhat higher for those controls containing antioxidant used conventionally with an allethrin outside the scope of the invention than for those containing no antioxidant.

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Example 2.

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4.0 Grams of d-allethrin, 8.0 g of Ondina oil and a varying amount (0.5 g, 1.0 g, 2.0 g) of each antioxidant shown in Table 2 were dissolved in 1,1,1-trichloroethane, coated on a pulp plate and the solvent was removed in the same manner as that described in Example 1. A mat for an electric fumigator was thus obtained. This mat was kept at $145^{\circ} \pm 3^{\circ}\text{C}$, and the decomposition ratios of d-allethrin after 2, 4 and 8 hours were obtained in the same manner as that described in Example 1, as shown in the following Table 2.

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TABLE 2

	Antioxidant (mg/mat)	Decomposition ratio of d-allethrin (%)		
		After 2 hrs.	After 4 hrs.	After 8 hrs.
Present Example	AO-2 5	3.6	4.2	6.1
	10	2.0	2.3	4.0
	20	2.1	2.1	3.3
	AO-4 5	2.8	2.6	3.4
	10	2.4	2.6	2.7
	20	2.4	2.3	2.5
	AO-10 5	3.2	4.0	5.7
	10	1.8	2.5	4.0
	20	1.5	1.9	2.0
	AO-12 5	5.3	4.7	5.7
	10	2.0	2.5	2.8
	20	2.0	2.4	2.4
Reference Example	A 20	31.4	34.7	36.5
	D 20	18.6	26.7	28.4
	None	50.6	51.9	51.2

When one of the specific antioxidants used in a composition of the present invention is used, d-allethrin can be stabilized for at least 8 hours at an antioxidant content of 5 to 10 mg/mat. In contrast the controls show a relatively high decomposition ratio even at a content of 20 mg/mat.

For the controls, the decomposition ratios after 4 hours do not increase. This is due to the fact that almost all the active ingredient have been vaporized or decomposed before that time comes.

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Example 3.

4.0 Grams of d-allethrin, 8.0 g of glycerol borate oleate (a kind of surface active agents) and 1.0 g of each specific antioxidant used in a composition of the present invention (AO-2, AO-4) were dissolved in acetone, absorbed into a pulp plate and the solvent was removed in the same manner as that described in Example 1. A mat for an electric fumigator containing 40 mg of d-allethrin, 80 mg of glycerol borate oleate and 10 mg of an antioxidant used in a composition of the present invention was thus obtained. Separately from this, a mat for an electric fumigator containing 40 mg of d-allethrin, 80 mg glycerol borate oleate and 20 mg of antioxidant A was prepared as a control.

Using the mats heated for 0, 4 and 8 hours as samples, the insecticidal effect on adult northern house mosquitoes was examined as follows.

An electric fumigator having the mat thereon was placed in a Peet Grady's chamber. Fifty adult northern house mosquitoes were liberated therein and an electric current was switched on. The number of insects knocked down was counted at different time intervals and a knock-down ratio was obtained. Further, the time required for 50% of the insects to be knocked down (KT_{50}) was obtained from the relation between time and knock-down ratio.

TABLE 3

	Antioxidant	Knock-down effect of heated mat on northern house mosquito (KT_{50} , minute)		
		0 hour	4 hours	8 hours
Present	AO-2	11.2	14.7	18.1
Example	AO-4	10.7	13.8	16.9
Reference	A	12.7	29.6	>60.0
Example	None	12.4	33.6	>60.0

Hardly any difference in knock-down effect between the unheated samples is observed between any of the present and reference examples. In the present examples, the knock-down effects of the samples heated for more than 4 hours are almost equal to those of the unheated samples. In contrast, a great reduction of the knock-down effect is observed for each of the reference examples. From the above results, it can be seen that the compositions embodying the present invention very effectively maintain their knock-down effect.

Example 4.

2.0 Grams of M-108, 10.0 g of glycerol borate oleate and 1.0 g of each antioxidant used in a composition of the present invention (AO-2, AO-4) were dissolved in acetone absorbed into a pulp plate and the solvent was removed in the same manner as that described in Example 1. A mat for an electric fumigator containing 20 mg of M-108, 100 mg of glycerol borate oleate and 10 mg of an antioxidant used in a composition of the present invention was thus obtained. Separately from this, a mat for an electric fumigator containing 20 mg of M-108, 100 mg of glycerol borate oleate and 10 mg of antioxidant A was prepared as a control.

Using the mats heated for 0, 4 and 8 hours as samples, the insecticidal effect on adult northern house mosquitoes was examined in the same manner as that described in Example 3.

TABLE 4

	Antioxidant	Knock-down effect of heated mat on northern house mosquito (KT ₅₀ , minute)		
		0 hour	4 hours	8 hours
Present	AO-2	9.6	11.9	16.6
Example	AO-4	10.3	12.8	17.3
Reference	A	10.7	27.8	>60.0
Example	None	10.0	38.1	>60.0

Hardly any difference in knock-down effect between the unheated samples is observed between any of the present and reference examples. In the present examples, the knock-down effects of the samples heated for more than 4 hours are almost equal to those of the unheated samples. In contrast, a great reduction of the knock-down effect is observed for each of the reference examples. From the above results, it can be seen the compositions embodying the present invention very effectively maintain their knock-down effect.

WHAT WE CLAIM IS:—

1. An insecticidal composition for an electric fumigator consisting essentially of 0.1 to 20 W/V% of at least one antioxidant selected from 2,2'-methylene-bis(6-tert-butyl-4-methylphenol), 2,2'-methylene-bis(6-tert-butyl-4-ethylphenol), 4,4'-methylene-bis(2,6-di-tert-butylphenol), 4,4'-butylidene-bis(6-tert-butyl-3-methylphenol), 4,4'-thio-bis(6-tert-butyl-3-methylphenol), 1,1'-bis(4-hydroxyphenyl)-cyclohexane, 1,3,5-trimethyl-2,4,6-tris(3,5-di-tert-butyl-4-hydroxybenzyl)benzene, tris(2-methyl-4-hydroxy-5-tert-butylphenyl)butane, tetrakis[methylene(3,5-di-tert-butyl-4-hydroxyhydrocinnamate)]methane, octadecyl-3,5-di-tert-butyl-4-hydroxyhydrocinnamate, phenyl-β-naphthylamine, N,N'-diphenyl-p-phenylenediamine, 2,2,4-trimethyl-1,2-dihydroquinoline polymer and 6-ethoxy-2,2,4-trimethyl-1,2-dihydroquinoline, 1 to 50 W/V% of at least one active ingredient which is an allethrin or (±)2-allyl-3-methyl-cyclopent-2-ene-1-one-4-yl 2,2,3,3-tetramethyl-cyclopropanecarboxylate and 1 to 50 W/V% of a release controller:

2. An insecticidal composition according to claim 1, wherein said active ingredient is (±)2-allyl-3-methyl-cyclopent-2-ene-1-one-4-yl (±)cis,trans-chrysanthemate.

3. An insecticidal composition according to claim 1, wherein said active ingredient is (±)2-allyl-3-methyl-cyclopent-2-ene-1-one-4-yl (+)cis, trans-chrysanthemate.

4. An insecticidal composition according to claim 1, wherein said active ingredient is (±)2-allyl-3-methyl-cyclopent-2-ene-1-one-4-yl (+)trans-chrysanthemate.

5. An insecticidal composition according to claim 1, wherein said active ingredient is (+)2-allyl-3-methyl-cyclopent-2-ene-1-one-4-yl (+)cis,trans-chrysanthemate.

6. An insecticidal composition according to claim 1, wherein said active ingredient is (+)2-allyl-3-methyl-cyclopent-2-ene-1-one-4-yl (+)trans-chrysanthemate.

7. An insecticidal composition according to claim 1, wherein said active ingredient is (±)2-allyl-3-methyl-cyclopent-2-ene-1-one-4-yl 2,2,3,3-tetramethyl-cyclopropanecarboxylate.

8. Insecticidal compositions according to claim 1 substantially as herein described and exemplified.

TABLE 4

	Antioxidant	Knock-down effect of heated mat on northern house mosquito (KT ₅₀ , minute)		
		0 hour	4 hours	8 hours
Present	AO-2	9.6	11.9	16.6
Example	AO-4	10.3	12.8	17.3
Reference	A	10.7	27.8	>60.0
Example	None	10.0	38.1	>60.0

Hardly any difference in knock-down effect between the unheated samples is observed between any of the present and reference examples. In the present examples, the knock-down effects of the samples heated for more than 4 hours are almost equal to those of the unheated samples. In contrast, a great reduction of the knock-down effect is observed for each of the reference examples. From the above results, it can be seen the compositions embodying the present invention very effectively maintain their knock-down effect.

WHAT WE CLAIM IS:—

1. An insecticidal composition for an electric fumigator consisting essentially of 0.1 to 20 W/V% of at least one antioxidant selected from 2,2'-methylene-bis(6-tert-butyl-4-methylphenol), 2,2'-methylene-bis(6-tert-butyl-4-ethylphenol), 4,4'-methylene-bis(2,6-di-tert-butylphenol), 4,4'-butylidene-bis(6-tert-butyl-3-methylphenol), 4,4'-thio-bis(6-tert-butyl-3-methylphenol), 1,1'-bis(4-hydroxyphenyl)-cyclohexane, 1,3,5-trimethyl-2,4,6-tris(3,5-di-tert-butyl-4-hydroxybenzyl)benzene, tris(2-methyl-4-hydroxy-5-tert-butylphenyl)butane, tetrakis[methylene(3,5-di-tert-butyl-4-hydroxyhydrocinnamate)]-methane, octadecyl-3,5-di-tert-butyl-4-hydroxyhydrocinnamate, phenyl- β -naphthylamine, N,N'-diphenyl-p-phenylenediamine, 2,2,4-trimethyl-1,2-dihydroquinoline polymer and 6-ethoxy-2,2,4-trimethyl-1,2-dihydroquinoline, 1 to 50 W/V% of at least one active ingredient which is an allethrin or ($\pm$)2-allyl-3-methyl-cyclopent-2-ene-1-one-4-yl 2,2,3,3-tetramethyl-cyclopropanecarboxylate and 1 to 50 W/V% of a release controller.

2. An insecticidal composition according to claim 1, wherein said active ingredient is ($\pm$)2-allyl-3-methyl-cyclopent-2-ene-1-one-4-yl ($\pm$)cis,trans-chrysanthemate.

3. An insecticidal composition according to claim 1, wherein said active ingredient is ($\pm$)2-allyl-3-methyl-cyclopent-2-ene-1-one-4-yl (+)cis, trans-chrysanthemate.

4. An insecticidal composition according to claim 1, wherein said active ingredient is ($\pm$)2-allyl-3-methyl-cyclopent-2-ene-1-one-4-yl (+)trans-chrysanthemate.

5. An insecticidal composition according to claim 1, wherein said active ingredient is (+)2-allyl-3-methyl-cyclopent-2-ene-1-one-4-yl (+)cis,trans-chrysanthemate.

6. An insecticidal composition according to claim 1, wherein said active ingredient is (+)2-allyl-3-methyl-cyclopent-2-ene-1-one-4-yl (+)trans-chrysanthemate.

7. An insecticidal composition according to claim 1, wherein said active ingredient is ($\pm$)2-allyl-3-methyl-cyclopent-2-ene-1-one-4-yl 2,2,3,3-tetramethyl-cyclopropanecarboxylate.

8. Insecticidal compositions according to claim 1 substantially as herein described and exemplified.



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