

INSECTICIDAL MAT FOR ELECTRIC FUMIGATOR

This invention relates to a fibrous mat for use in an electric fumigator.

So-called mosquito coils have been conventionally used to exterminate mosquitos, mainly in the home. The conventional mosquito coil has been recently improved to provide a new device, called an electric fumigator, which comprises an electric heater and a molded fumigant, generally called a mosquito mat, which is put on the heater to vaporize insecticidal ingredients contained therein.

The special terminologies and the background knowledge relating to electric fumigators are explained in GB-A-1288138 and GB-A-1587396.

The mosquito mats now available aim only at mosquitos but in such areas as poultry houses, livestock sheds and disposal dumps, flies often breed, swarm and fly to residential zones located nearby and it is desired to apply, on a continuous basis, effective measures to deal with the nuisance caused by not only mosquitos but also flies and other vermin.

According to the invention there is provided a fibrous mat for use in an electric fumigator which is 1 to 1.25 mm thick and has a surface area of 5 to 15 cm² and is impregnated with a premix composition comprising at least one pyrethroidal insecticide, stabilizer and colorant in an amount of 75 to 300 mg per mat. We have found that a sufficient amount of pyrethroidal insecticide can be

vaporized in the air and kept in an effective concentration over a long period of time by heating the fibrous mat of the invention to a temperature between 140°C and 180°C, thereby exterminating flying insects such as flies and mosquitos, as well as crawling insects and the like such as cockroaches, fleas, bedbugs and other vermin.

The pyrethroidal insecticide used as the active ingredient in the mat of this invention may, for example, be any of the following compounds:-

10	<u>Common Name</u>	<u>Chemical Nomenclature</u>
	(1) Allethrins	(R,S)-3-allyl-2-methyl-4-oxocyclopent-2-en-1-yl (1R,S)-cis.trans-chrysanthemate (hereinafter described as Pynamin), and its optical or its geometrical isomers, or mixtures thereof; for instance, (R,S)-3-allyl-2-methyl-4-oxocyclopent-2-en-1-yl (1R)-cis.trans-chrysanthemate (hereinafter, Pynamin Forte), (R,S)-3-allyl-2-methyl-4-oxocyclopent-2-en-1-yl (1R)-trans-chrysanthemate (hereinafter, BAL), (S)-3-allyl-2-methyl-4-oxocyclopent-2-en-1-yl (1R)-trans-chrysanthemate (hereinafter, S-biol),
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(2) Prallethrins

(R,S)-2-methyl-3-(2-propynyl)-4-oxocyclopent-2-en-1-yl (1R,S)-cis-trans-chrysanthemate (hereinafter, S-4068),
and its optical or its geometrical isomers or mixtures thereof; for instance,

(R,S)-2-methyl-3-(2-propynyl)-4-oxocyclopent-2-en-1-yl (1R)-cis-trans-chrysanthemate (hereinafter, S-4068F),

(S)-2-methyl-3-(2-propynyl)-4-oxocyclopent-2-en-1-yl (1R)-trans-chrysanthemate (hereinafter, S-4068-d-T),

(S)-2-methyl-3-(2-propynyl)-4-oxocyclopent-2-en-1-yl (1R)-cis-trans-chrysanthemate (hereinafter, S-4068SF),

(3) Resmethrins

5-benzyl-3-furymethyl (1R,S)-cis-trans-chrysanthemate (hereinafter, Chrysron),
and its optical or its geometrical isomers or mixtures thereof; for instance,

5-benzyl-3-furymethyl (1R)-cis-trans-chrysanthemate (hereinafter, Chrysron Forte),

5-benzyl-3-furymethyl (1R)-trans-chrysanthemate (hereinafter, Chrysron-d-T),

(4) Others

3-phenoxybenzyl (1R)-cis-trans-chrysanthemate (hereinafter, Sumithrin),

(R,S)- α -cyano-3-phenoxybenzyl (1R)-cis-trans-chrysanthemate

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(hereinafter, S-2703F),
(R,S)-3-allyl-2-methyl-4-oxocyclopent-2-en-1-yl 2,2,3,3-tetramethylcyclopropanecarboxylate (hereinafter, Knockthrin).

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An appropriate amount of these pyrethroidal insecticides in the impregnated mat is between 60 mg and 160 mg per mat. Preferred mats are those which contain an allethrin or a mixture thereof with another pyrethroidal insecticide in an amount of 80 to 160 mg per mat or which contain a prallethrin or a mixture thereof with another pyrethroidal insecticide in an amount of 60 to 80 mg per mat.

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Examples of suitable phenolic stabilizers include;

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2,2'-methylene-bis(6-tert-butyl-4-methylphenol)

(hereinafter, described as the stabilizer I),

2,2'-methylene-bis(6-tert-butyl-4-ethylphenol)

(hereinafter, the stabilizer II),

4,4'-methylene-bis(2,6-di-tert-butylphenol)

(hereinafter, the stabilizer III),

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4,4'-butylidene-bis(6-tert-butyl-3-methylphenol)

(hereinafter, the stabilizer IV),

4,4'-thio-bis(6-tert-butyl-3-methylphenol)

(hereinafter, the stabilizer V).

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Suitable colorants for incorporation in the premix

composition include allylamino anthraquinone,

1,4-diisopropylamino anthraquinone, 1,4-diamino

anthraquinone, 1,4-dibutylamino anthraquinone and 1-amino-4-anilino anthraquinone. The premix composition may also

contain suitable incense or fragrance and/or additives to

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reduce the viscosity and to ease the impregnation, such as

minor amounts of myristic acid isopropyl ester, palmitic acid isopropyl ester, lauryl acid hexyl ester and other aliphatic acid esters. Kerosene and other organic solvents may be used when preparing a premix composition to impregnate a mat..

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A fibrous mat of 1 to 1.25 m/m thick and 5 to 15 cm² in

surface area is impregnated with the premix consisting of the above mentioned components to provide the mat of this invention. If necessary, the premix may further be diluted with an aliphatic ester or kerosene as mentioned above before
5 impregnation. The fibrous mat may, for example, be a cotton lint mat, a mat consisting of a mixture of cotton lint and woodpulp, or any other absorptive mat.

The invention will be described further by reference to the following Examples in which parts are by weight.

10 Example 1

80 parts of Pynamin, Pynamin Forte, BAL or S-biol, 10 parts of the stabilizer I, 0.5 part of 1-amino-4-anilino anthraquinone and 9.5 parts of myristic acid isopropyl ester are mixed to provide a premix. Then 150 mg of the premix is
15 used to impregnate a cotton lint mat 1.14 m/m thick and 7.7 cm² in surface area.

Example 2

80 parts of Pynamin, Pynamin Forte, BAL or S-biol, 5 parts of the stabilizer I, 0.2 part of 1-amino-4-anilino
20 anthraquinone, 5.0 parts of Fragrance RS-7882 (fragrance: a product of Takasago Koryo Co.) and 9.8 parts of myristic acid isopropyl ester are mixed to provide a premix. Then 150 mg of the premix is used to impregnate a mat as described in Example 1.

25 Example 3

40 parts of S-4068, S-4068F or S-4068-d-T, 5.0 parts of the stabilizer I, 0.3 part of 1-amino-4-anilino anthraquinone and 54.7 parts of myristic acid isopropyl ester are admixed to provide premix. Then 150 g of the premix is used to
30 impregnate a mat as described in Example 1.

Example 4

A premix is prepared as described in Example 3 except that the amount of the stabilizer I is 10 parts instead of 5 parts, and that the amount of myristic acid isopropyl ester
35 is 49.7 parts instead of 54.7 parts. The premix is used to

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impregnate a mat as described in Example 1.

Example 5

40 parts of S-4068, S-4068F or S-4068-d-T, 7.0 parts of the stabilizer I, 0.3 part of 1-amino-4-anilino anthraquinone, 5.0 parts of Fragrance RS-7836 (fragrance: a product of Takasago Koryo Co.) and 47.7 parts of myristic acid isopropyl ester are mixed to provide a premix. Then 200 mg of the premix is used to impregnate a mat as described in Example 1.

10 Example 6

80 parts of S-4068, S-4068F, S-4068-d-T or S-4068SF, 10 parts of the stabilizer II, 0.3 part of 1-amino-4-anilino anthraquinone, and 9.7 parts of palmitic acid isopropyl ester are mixed to provide a premix. Then the premix is diluted twice with myristic acid isopropyl ester and 150 mg of the diluted premix solution is used to impregnate a mat as described in Example 1.

Example 7

A premix prepared as described in Example 6 is diluted 1.25 times with kerosene. 100 mg of the diluted premix solution is used to impregnate a mat as described in Example 1.

Example 8

60 parts of Pynamin, Pynamin Forte, BAL or S-biol, 20 parts of Sumithrin, 10 parts of the stabilizer III, 0.5 part of 1-amino-4-anilino anthraquinone and 9.5 parts of myristic acid isopropyl ester are mixed to provide a premix. Then 100 mg of the premix is used to impregnate a pulp mat 1.14 m/m thick and 5.0 cm² in surface area.

30 Example 9

40 parts of S-4068, S-4068F or S-4068-d-T, 10 parts of Chrysron Forte, 10 parts of the stabilizer IV, 0.5 part of 1-amino-4-anilino anthraquinone and 39.5 parts of lauryl acid hexyl ester are mixed to provide a premix. Then 150 mg of the premix is used to impregnate a pulp mat 1.14 m/m thick

and 7.7 cm² in surface area.

Example 10

70 parts of Pynamin, Pynamin Forte, BAL or S-biol, 10 parts of S-2703F, 10 parts of the stabilizer V, 0.5 part of 1-amino-4-anilino anthraquinone and 9.5 parts of myristic acid isopropyl ester are mixed to provide a premix. Then 150 mg of the premix is used to impregnate a mat as described in Example 9.

Example 11

70 parts of S-4068, S-4068F or S-4068-d-T, 10 parts of S-2703F, 10 parts of the stabilizer I, 0.5 part of 1-amino-4-anilino anthraquinone and 9.5 parts of myristic acid isopropyl ester are mixed to provide a premix. Then the premix is diluted twice with kerosene and 300 mg of the diluted premix solution is used to impregnate a pulp mat 1.14 m/m thick and 15 cm² in surface area.

Example 12

40 parts of Pynamin, Pynamin Forte, BAL or S-biol, 40 parts of Knockthrin, 10 parts of the stabilizer I, 0.5 part of 1-amino-4-anilino anthraquinone and 9.5 parts of palmitic acid isopropyl ester are mixed to provide a premix. Then 200 mg of the premix is used to impregnate a pulp mat 1.14 m/m thick and 7.7 cm² in surface area.

Example 13

The procedures of Example 1 are repeated with the exception that a mat 1.2 m/m thick and 7.7 cm² in surface area is impregnated.

Test Example 1

Two premixes of Pynamin Forte and of S-4068F were prepared in the same manner as in Example 1 and Example 3 respectively. Then the premixes or the diluted solutions thereof with kerosene were made to soak, in an amount which corresponds to the quantity of active ingredient as shown in Table 1, into two kinds of cotton lint plates, one: 1.14 m/m thick and 7.7 cm² in surface area (hereinafter referred to as

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"mat A") and the other obtained in the market: 2.8 m/m thick and 7.7 cm² in surface area (hereinafter referred to as "mat B").

A fumigation test was conducted by putting each mat on a
5 heater for an electric mosquito _____

exterator available in the market and by heating the mat up to 160°C. Then, vaporized active ingredient was collected with a glass-made gas trap packed with silica gel. The amounts of active ingredient trapped therein was determined to calculate the vaporization ratio with the initial amount of active ingredient.

Results are shown in the Table 1.

Table 1

used mat	active ingredient	initial amount (mg/mat)	vaporization ratio with time (%)			
			after 2 hrs	after 4 hrs	after 6 hrs	after 8 hrs
"mat A"	Pynamin Forte	120	22.4	47.5	68.1	81.8
	S-4068F	60	26.3	54.0	71.9	81.3
"mat B"	Pynamin Forte	40	22.9	46.5	62.4	74.7
		120	10.8	21.8	33.5	43.8
	S-4068F	20	33.6	48.6	68.4	87.1
		60	8.2	18.8	27.2	37.4

Test Example 2

Into a glass chamber (0.34 m³) were liberated 20 flies and 20 mosquitos. A mat containing Pynamin Forte or S-4068F in an amount as shown in the Table 2, which was prepared by the method described in the Example 1 or 3 respectively, was placed on the same kind of heater as used in the Test Example 1 in the draft chamber, and heated for 15 minutes. Subsequently, the mat was transferred in the test chamber with the heater, and heated continuously. And the number of knocked-down insects was counted at certain intervals for 20 minutes to calculate the time required for 50% of insects to be knocked-down (KT-50) by the Finny's graphic method.

And then, all insects under test were transferred into a cage for observation and given water and food. After 24 hours, the dead were counted to calculate the mortality. Results are shown in the

5 Table 2.

Table 2

active ingre- dient	amount of active ingredient (mg/mat)	KT-50 (min.)-mortality (%)	
		fly	mosquito
Pynamin Forte	120	6.41-61.8	1.77-76.1
S-4068F	60	6.17-73.2	2.03-97.4

15 Test Example 3

The 100 flies and 100 mosquitos were liberated in a chamber having 28 m³, wherein a mat containing Pynamin Forte as active ingredient, obtained
20 in the Example 1, was heated continuously on the same kind of heater as used in the Test Example 1 at 160°C. Then, the number of knocked-down insects was counted at intervals as shown in the Table 3.

25 All insects under test were transferred after 8 hours into a cage for observation and given food and water. After 24 hours, the dead were counted to calculate the mortality. Results are shown in the Table 3.

Table 3

insect under test	knocked-down ratio (%)								mortality (%)
	after 15 min.	after 30 min.	after 45 min.	after 1 hr	after 2 hrs	after 4 hrs	after 6 hrs	after 8 hrs	
fly	1	59	82	98	100	100	100	100	100
mos- quito	28	92	100	100	100	100	100	100	100

Test Example 4

Three glass cylinders each having an inner diameter of 20 cm and a height of 20 cm were placed one on top of another to form a cylinder 60 cm high. Both ends of the middle cylinder were covered with a 16 mesh Nylon net.

Twenty German cockroaches (common species) were released into the middle cylinder and a mat containing Pynamin Forte as active ingredient obtained in Example 1 was put on and continuously heated by the same kind of heater as used in Test Example 1 which was set in the bottom cylinder. Then the number of knocked-down insects was counted at intervals as shown in Table 4 to count the knocked-down ratio.

All insects were transferred after 8 hours into a cage for observation and given food and water. After 72 hours, the dead were counted to calculate mortality. The results are shown in Table 4.

Table 4

amount of active- ingredient (mg/ mat)	knocked-down (%)									mor- tali- ty (%)
	after 30 min.	after 40 min.	after 50 min.	after 60 min.	after 90 min.	after 120 min.	after 180 min.	after 240 min.	after 480 min.	
120	10.0	52.5	80.0	82.5	90.0	100	100	100	100	100

CLAIMS

1. A fibrous mat for use in an electric fumigator which is 1 to 1.25 mm thick and has a surface area of 5 to 15 cm² and is impregnated with a premix composition comprising at least
5 one pyrethroidal insecticide, stabilizer and colorant in an amount of 75 to 300 mg per mat.
 2. A fibrous mat according to claim 1, wherein the premix composition also comprises fragrance and/or additives to reduce the viscosity.
 - 10 3. A fibrous mat according to claim 1 or 2, which contains an allethrin or a mixture thereof with another pyrethroidal insecticide in an amount of 80 to 160 mg per mat.
 4. A fibrous mat according to claim 1 or 2, which contains a prallethrin or a mixture thereof with another pyrethroidal
15 insecticide in an amount of 60 to 80 mg per mat.
 5. A fibrous mat according to claim 1, 2, 3 or 4, wherein the mat is 1.14 mm thick and has a surface area of 7.7 cm².
 6. A fibrous mat according to claim 1 substantially as described by reference to any one of Examples 1 to 13.
 - 20 7. An electric fumigator containing a fibrous mat as claimed in any one of the preceding claims.
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