

1 A PESTICIDAL COMPOSITION

The present invention relates to a pesticidal composition comprising an insecticidally effective amount of 2-tert-butylimino-3-isopropyl-5-phenyl-3,4,5,6-tetrahydro-
5 2H-1,3,5-thiadiazin-4-one (hereinafter referred to as Buprofezin) and active carbon sufficient to prolong the lasting effects of said active ingredient.

Furthermore, the present invention relates to a method for controlling insects and the like by applying
10 said composition to places inhabited by those insects which are to be controlled.

Buprofezin is, as disclosed in Japanese Patent Kokai (Laid-open) Publication No. 53,206/'80, *ibid.* No. 31,603/82 and the like, an excellent insecticide which can
15 control a wide range of insects such as planthoppers, for example, brown planthoppers (Nilaparvata lugens), small brown hoppers (Laodelphax striatellus), white-backed plant-hoppers (Sogatella furcifera) and the like; and green rice leafhoppers (Nephotettix cincticeps) in rice: greenhouse
20 whitefly (Trialeurodes vaporariorum) and the like in fruit vegetables such as cucumbers, eggplants, tomatoes and the like: arrowhead scale (Unaspis yanonensis) in citrus fruit: white peach scale (Pseudaulacapis pentagona), tea green leafhoppers (Empoasca onukii) and the like in teas, with
25 long lasting effects.

1 It is known that the higher the temperature goes
up at or after the application of Buprofezin the more . .
Buprofezin vaporizes. Thus, the desired lasting effects
cannot be attained under such conditions.

5 The present inventors have found that, as a
result of intensive studies aimed at obtaining a composi-
tion which can maintain its effects for a long period of
time whilst inhibiting the vaporization of Buprofezin under
said climate conditions, such compositions can be obtained
10 by admixing active carbon therein, thereby prolonging
the effects of the Buprofezin.

 There is disclosed, in Japanese Patent Kokai
(Laid-open) Publication No. 38,326/'80, an insecticidal
composition prepared by having active carbon absorb a
15 pyrethroid compound which is a known active ingredient as
an insecticide. This preparation is intended to attain
the rapid effects and the lasting effects by absorbing
said pyrethroid compound directly to active carbon.
Furthermore, there is disclosed, in Japanese Kokai (Laid-
20 open) Publication No. 169,601/81, a slow-release type
granular formulation prepared by admixing an active ingre-
dient, whose solubility in water at the temperature of 25°C
is 5 ppm, with active carbon and one or more kinds of plant
oils. This formulation is also based on the technical
25 concept that the active ingredient is absorbed to active
carbon and it releases gradually the active ingredient,
the release speed being regulated by adjusting amounts
to be added thereto to attain the long lasting effects.

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The present invention provides a pesticidal composition capable of regulating the vaporization of the active ingredient after the application by using active carbon as both a carrier and an agent capable of controlling the vaporization of the active ingredient after application by collecting vaporized active ingredient from the surfaces of the places to which the present composition is applied.

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The present invention also provides a method for controlling insects or insects and fungi by applying said composition, with or without dilution, to places inhabited by the insects or insects and fungi which are to be controlled.

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The present invention, however, is different in technical concept from said prior art and this is based on the discovery that, not only the loss of the active ingredient, Buprofezin, can be prevented, but also the lasting effects can be retained, as expected, even at a high temperature by the gradual release of the active ingredient because active carbon collects vaporized active ingredient which vaporizes constantly from the active ingredient particles deposited onto the plants bodies and the like after application under climate conditions, such as high temperatures, under which the vaporization of Buprofezin occurs easily, while the active carbon only works as an inert carrier under normal conditions, that is, at a relatively low temperature, by using active carbon as

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a part or as a substituent of inorganic fillers without having active carbon absorb the active ingredient directly.

05 In the case that one will use Buprofezin according to the present invention in any form selected from a dust, a wettable powder, a dry flowable powder, a suspension, a light-dust, flowable concentrates and the like, active carbon can be used as a part or a substitute of fillers to prevent Buprofezin from vaporizing due to temperature conditions after application.

10 In the pesticidal compositions of the present invention, the active carbon is used in an amount of 0.2 to 10 parts by weight to 1 part by weight of Buprofezin.

15 An illustrative example of active carbon powder usable in the present invention includes active carbon from palm shells and activated with steam or zinc chloride, charcoal, sawdust charcoal, bone black and the like. The particle size of active carbon can be chosen as required for the intended use.

20 Active carbon may be used alone or together with other inorganic fillers. An illustrative example of the inorganic filler includes clay, talc, calcium carbonate, diatomaceous earth, plaster, bentonite, acid clay, hydrous silicon dioxide, calcium silicate or the like, but the fillers for the present invention are not limited to those listed.

25 The present invention may contain at least one active ingredient selected from commercially available insecticides and/or fungicides in addition to Buprofezin.

- 1 An illustrative example of those insecticides and fungicides can include a carbamate insecticide such as Isoproc carb, Metolcarb, Osfencarb, Carbaryl, Xylylcarb, XMC or the like; an organic phosphorus insecticide such as
- 5 Diazinon, Acephate, Methidathion, Phenthoate, Chlorpyrifos-methyl, Fenitrothion, Monocrotophos, Pyridaphenthion or the like; a synthetic pyrethroid insecticide such as Fenvalerate, Deltamethrin or the like; Cartap, Thiocyclam or the like.
- 10 An illustrative example of those fungicides may include Isoprothiolane, Phthalide, Chlorothalonil, IBP, Edifenphos, Blastocidin-S, Captan, Captafol, Thiophanate, Benomyl or the like.

The present composition can be prepared in

15 any form selected from a dust, a wettable powder, a granulated wettable powder, a suspension, a floating-dust, flowable concentrates and the like according to conventional means.

The present invention can be further illustrated

20 by the following Examples and Test Examples, but is not limited thereto. All the parts are by weight unless otherwise indicated.

Example 1

Buprofezin	25.0 parts
NPE 100 (Polyoxyethylene nonyl- phenyl ether)	0.5 part
Sodium lauryl sulphate	2.0 parts
Sodium ligninsulfonate	3.0 parts

- 1 Active carbon powder 25.0 parts
- Clay 44.5 parts

Mix said materials thoroughly, and pulverize the resultant to give a wettable powder.

5 Example 2

- Buprofezin 5.0 parts
- Diazinon 25.0 parts
- Polyoxyethylene }
- nonylphenylether }
- 10 ammoniumsulfate } 2.5 parts
- Calcium lignin- 4.0 parts
- sulfonate
- Hydrate silicon dioxide
- (Carplex # 1120 25.0 parts
- 15 mfd. by Shionogi
- Pharm. Co., Ltd.)
- Active carbon powder 10.0 parts
- Calcium carbonate 28.5 parts

 After impreganating Diazinon to hydrate silicone
20 dioxide # 1120, add the rest of the materials thereto, mix
 thoroughly and pulverize the resultant to give a wettable
 powder.

 Example 3

- Buprofezin 5.0 parts
- 25 Osfencarb 25.0 parts

1	Polyoxyethylene nonyl-phenylether ammonium sulphate	2.5 parts
	Calcium ligninsulfonate	4.0 parts
	Hydrated silicone dioxide (Carpalex #80 mfd. by Shionogi)	10.0 parts
	Active carbon powder	10.0 parts
5	Clay	43.5 parts

Mix thoroughly said materials, and pulverize the resultant to give a wettable powder.

Example 4

	Buprofezin	1.5 parts
10	Isopropyl phosphate	0.15 part
	Active carbon powder	3.0 parts
	Calcium carbonate	30.0 parts
	Clay	65.35 parts

Mix said materials thoroughly, and pulverize the resultant to give a dust.

Example 5

	Buprofezin	50.0 parts
	Polyoxyethylene nonyl-phenylether ammonium sulphate	2.0 parts
	Polyoxyethylene styrenated phenylether ammonium sulphate	2.0 parts
20	Calcium ligninsulfonate	3.0 parts
	Corn starch	10.0 parts
	Active carbon	20.0 parts

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|---|---|---|------------|
| 1 | Diatomaceous earth
(Radiolite #200, mfd.
by Showa Kagaku) | } | 13.0 parts |
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Mix thoroughly Buprofezin, corn starch, Radiolite and active carbon, pulverize the resultant, add the surfactant dissolved in water to the resulting powder, knead the resultant, granulate the kneaded materials using an extruder type granulator having a screen of 0.7 mm and dry by 50°C the resultant to give a granulated wettable powder.

Example 6

10	Buprofezin	40.0 parts
	NPE 100	1.5 parts
	Polyoxyethylenestyrenated phenylether (40% soln.)	2.0 parts
	Polyoxyethylene nonyl-phenylether-formalin condensate (40% soln.)	3.0 parts
	Silicon oil (mfd. by Shinetsu Silicon, KM-73)	0.5 part
15	Propyleneglycol	5.0 parts
	Xanthane gum	1.5 parts
	Active carbon powder	10.0 parts
	Water	36.5 parts

Add Buprofezin and active carbon to a solution obtained by mixing surfactants, propyleneglycol, xanthane gum and silicon oil and crush the resultant by a wet type crusher (sand grinder, mfd. by Igarashi Machine Co., Ltd.) to give a suspension.

1 Example 7

	Buprofezin	20 parts
	Machine oil	40 parts
	Kerosine	15 parts
5	Methylnaphthalene	5 parts
	Polyoxyethyleneoleylether	5 parts
	Active carbon powder	15 parts

Add Buprofezin and active carbon to the solvents containing the surfactant, crush the resultant using a wet
10 type crusher to give an oil-based flowable concentrate.

Reference Example 1

Repeat the same procedure of Example 1 by using additionally 25.0 parts of clay instead of active carbon to give a wettable powder.

15 Reference Example 2

Repeat the same procedure of Example 2 by using additionally 10.0 parts of calcium carbonate instead of active carbon to give a wettable powder.

Reference Example 3

20 Repeat the same procedure of Example 3 by using additionally 10.0 parts of clay instead of active carbon to give a wettable powder.

Reference Example 4

Repeat the same procedure of Example 4 by using

- 1 additionally 3.0 parts of clay instead of active carbon to give a dust.

Reference Example 5

- Repeat the same procedure of Example 5 by using
5 additionally 20.0 parts of Radiolite # 200 instead of active carbon to give a granulated wettable powder.

Reference Example 6

- Repeat the same procedure of Example 6 by using
additionally 3 parts of hydrous silicate (Carplex # 80 mfd.
10 by Shionogi) and 7.0 parts of water instead of active carbon to give a suspension.

Reference Example 7

- Repeat the same procedure of Example 7 by using
additionally 15 parts of machine oil instead of active
15 carbon to give an oil-based flowable.

Test Example 1 Test on the Vaporization

- Each of the wettable powder, granulated wettable powder, suspension and oil-based flowable formulations of Examples and Reference Examples was diluted with water to
20 give the respective spray solutions containing 100 ppm of Buprofezin, and 1 ml each of the respective solutions was sprayed to the surfaces of the respective petri-dishes of 9 cm in diameter evenly and dried thereafter. The dust formulations thereof were scattered evenly onto the

- 1 surfaces of the respective petri-dishes of 9 cm in diameter. The thus prepared dishes were kept in a thermostatic chamber and were periodically taken out at pre-determined intervals to assay the amounts of Buprofezin.
- 5 remaining in the dishes using gas chromatography. The results are shown in Table 1.

Table 1

No. of Example	% of Buprofezin remaining at 40°C			
	0	2	4	6
Days after the application				
Example 1	100	44.3	38.3	23.5
Example 2	100	57.0	42.6	32.0
Example 3	100	53.0	36.6	27.5
Example 4	100	60.3	53.4	40.3
Example 5	100	41.6	37.8	25.5
Example 6	100	79.0	58.3	50.2
Example 7	100	62.3	47.6	21.4
Reference Example 1	100	22.0	17.2	4.0
Reference Example 2	100	14.5	10.3	3.5
Reference Example 3	100	15.0	12.2	4.0
Reference Example 4	100	38.1	24.7	10.1
Reference Example 5	100	30.1	24.9	13.7
Reference Example 6	100	47.5	35.4	29.0
Reference Example 7	100	25.3	19.6	8.2

1 Test Example 2 Test on the Residual Effects

Each of the wettable powder, granulated wettable powder, suspension and oil-based flowable formulations of Examples and Reference Examples was diluted with water to give the respective spray solutions containing 200 ppm of Buprofezin. 50 ml each of the thus prepared solutions were sprayed onto the rice plants planted in the respective pots of 18 cm in diameter by spray guns and the pots thus treated were kept in a greenhouse. The dust formulations thereof were scattered evenly at the rate of 3 kg/10 ares with vacuum bell jar dusters onto the rice plants planted in the pots having same size as mentioned above, and the pots thus treated were kept in the greenhouse, too. To the thus prepared pots were artificially infested 40 brown planthoppers of the third instar per pot just after the applications and on the predetermined dates after the applications. The dead and alive hoppers were counted 7 days after the respective infestations. The corrected mortality was calculated according to the following equation:

$$\text{Corrected mortality (\%)} = \frac{\text{Survivors (\%)} \text{ of untreated pot} - \text{Survivors (\%)} \text{ of a treated pot}}{\text{Survivors (\%)} \text{ of untreated pot (\%)}} \times 100$$

The results are shown in Table 2.

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Table 2

No. of Example	% of Corrected mortality of brown planthoppers				
	0	7	14	21	28
Days upto the artifical infestation					
Example 1	100	100	100	91.1	88.8
Example 2	100	100	100	94.2	87.9
Example 3	100	100	100	95.5	88.8
Example 4	100	100	100	100	89.5
Example 5	100	100	100	94.2	91.1
Example 6	100	100	100	92.4	81.3
Example 7	100	100	100	100	85.5
Reference Example 1	100	94.4	100	67.6	60.7
Reference Example 2	100	100	100	55.3	45.4
Reference Example 3	100	100	100	70.3	57.6
Reference Example 4	100	100	94.2	91.1	57.6
Reference Example 5	100	100	100	63.2	53.8
Reference Example 6	100	100	100	61.5	44.4
Reference Example 7	100	98.1	93.2	57.3	42.1

CLAIMS

05 1. A pesticidal composition comprising 2-tert-butyl-
imino-3-isopropyl-5-phenyl-3,4,5,6-tetrahydro-2H-1,3,5-thia-
diazin-4-one and active carbon, wherein said active carbon
is present in an amount of 0.2 to 10 parts by weight to 1
part by weight of 2-tert-butylimino-3-isopropyl-5-phenyl-3,
4,5,6-tetrahydro-2H-1,3,5-thiadiazin-4-one.

10 2. A pesticidal composition according to claim 1
wherein said composition is prepared in a form selected
from a dust, a wettable powder, a suspension, a floating-
dust or a flowable concentrate.

3. A pesticidal composition according to claim 1 or
2 which comprises further an effective amount of at least
one commercially available insecticide and/or a fungicide.

15 4. A method for controlling insects or insects and
fungi which comprises applying a pesticidal composition
according to claim 1, 2 or 3 to a place inhabited by
insects or insects and fungi which are to be controlled.

20 5. A method for controlling insects or insects and
fungi which comprises applying a pesticidal composition
according to claim 3 to a place inhabited by insects or
insects and fungi which are to be controlled.

25 6. A pesticidal composition substantially as
hereinbefore described with reference to any one of
Examples 1 to 7.

7. A method for controlling insects or insects and
fungi substantially as hereinbefore described with
reference to Test Example 1 or Test Example 2.

