

AN INSECTICIDAL COMPOSITION

TECHNICAL FIELD

This invention relates generally to an insecticidal composition and a method for application thereof.

Background

Various species of insects, especially the cockroach, have been a target for eradication by man for centuries. Lately, insecticides have been developed which have high toxicity for cockroaches, but such insecticides frequently present environmental hazards when used in effective concentrations. These insecticides, with the exception of the botanical ones, have several disadvantages. Most of them are highly toxic to fish, wildlife, and humans and must be used with caution. They are usually not natural biological constituents and tend to persist for long lengths of time after their initial application. Besides their initial toxic effect, these compounds can have sub-acute effects on non-target fauna and flora thereby causing biochemical, behavioural and physiological changes as well as reproductive failure. The breakdown products and secondary metabolites of most petrochemical pesticides and their impact on humans and other living organisms are poorly understood. The repeated application of low concentrations of available chemical toxicants reduces the danger to the environment but is also less effective and relatively more expensive. Accordingly, attempts have been made to develop methods and products for the controlled release of crawling insect toxicants over extended periods of time in a manner which is relatively less dangerous to man's environment and also is effective to protect the toxicants from premature degradation. There is therefore a need for a solution to address the foregoing issues.

Summary

In accordance with a first aspect of the invention, there is disclosed an insecticidal composition consisting essentially of at least one emulsifier and at least one salt of fatty acid. Wherein the mass proportion of the at least one emulsifier to the at least one salt of fatty acid is 3:4 to 2:5.

In accordance with a second aspect of the invention, there is disclosed a method for application of an insecticidal mixture, the method comprising atomizing an insecticidal mixture for discharge to a space, the insecticidal mixture comprising an insecticidal composition consisting essentially of at least one emulsifier, and at least one salt of fatty acid. Wherein the mass proportion of the at least one emulsifier to the at least one salt of fatty acid is 3:4 to 2:5.

In accordance with a third aspect of the invention, there is disclosed a process for the control of cockroaches in structures comprising mixing the insecticidal composition with water for forming an insecticidal mixture, the volume proportion of insecticidal composition to water is 2:1 to 1:10, and atomizing the insecticidal mixture for discharge to a space. The insecticidal mixture comprising an insecticidal composition consisting essentially of at least one emulsifier, and at least one salt of fatty acid, wherein the mass proportion of the at least one emulsifier to the at least one salt of fatty acid is 3:4 to 2:5.

In accordance with a fourth aspect of the invention, there is disclosed a sprinkler system comprising a container, at least one nozzle and a control module. The container is for containing an insecticidal mixture. The insecticidal mixture comprising an insecticidal composition comprising at least one emulsifier and at least one salt of fatty acid. The mass proportion of the at least one emulsifier to the at least one salt of fatty acid is 3:4 to 2:5. The control module intercouple the container and the at least one nozzle. The control module being operable for at least one of enabling and impeding flow of the insecticidal mixture from the container to the at least one nozzle for discharge therefrom, the at least one nozzle being adapted and positioned adjacent a chute for directing the insecticidal mixture discharged therefrom into the chute.

Detailed Description

The present disclosure may be embodied in other specific forms without departing from its structures, methods, or other essential characteristics as broadly described herein and claimed hereinafter. The described embodiments are to be considered in all respects only as illustrative, and not restrictive. The scope of the invention is, therefore, indicated by the appended claims, rather than by the foregoing description. All changes that come within the meaning and range of equivalency of the claims are to be embraced within their scope

Unless specified otherwise, the terms "comprising" and "comprise" as used herein, and grammatical variants thereof, are intended to represent "open" or "inclusive" language such that they include recited elements but also permit inclusion of additional, un-recited elements.

As used herein, the terms "approximately" or "about", in the context of concentrations of components, conditions, other measurement values, etc., means +/- 5% of the stated value, or +/- 4% of the stated value, or +/- 3% of the stated value, or +/- 2% of the stated value, or +/- 1% of the stated value, or +/- 0.5% of the stated value, or +/- 0% of the stated value.

Described hereinafter is an insecticidal composition and a method for the application of the insecticidal composition. Generally, the insecticidal composition comprises at least one emulsifier and at least one salt of fatty acid. For the avoidance of doubt, the at least one salt of fatty acid is also referred to as at least one fatty acid salt hereinafter. Specifically, the insecticidal composition consists essentially of the at least one emulsifier and the at least one salt of fatty acid. Preferably, the mass proportion of the at least one emulsifier to the at least one salt of fatty acid is 3:4 to 2:5. Further preferably, the mass proportion of methyl ester to the at least one salt of fatty acid is 1:40 to 1:100.

Preferably, the emulsifier comprises at least one of monoglyceride and diglyceride. The at least one salt of fatty acid being at least one of oleic acid and linoleic acid. The at least one salt of fatty acid can further comprise oleic acid, linoleic acid and a third fatty acid.

In one exemplary embodiment of the insecticidal composition, the mass proportion of linoleic acid to oleic acid is 3:5 to 3:25. When including the third fatty acid, the mass proportion of linoleic acid to the third fatty acid is 1:1 to 6:1. Alternatively, the mass proportion of linoleic acid to the third fatty acid is 3:20 to 3:5.

In another or the same exemplary embodiment, the emulsifier is between 20-30% of the insecticidal composition by weight and the at least one salt of fatty acid being between 40%-50% of the insecticidal composition by weight, with 18%-25% of the composition being moisture.

The constituents and corresponding mass of one example of the insecticidal composition is shown in Table 1, while the constituents and corresponding mass of the fatty acid salt of the one example of the insecticidal composition is shown in Table 2.

Table 1. Constituents and Corresponding Mass of Insecticidal Composition

Insecticidal Composition Constituents	Mass of Constituents
Total Fat (a)	69.21
Free Fatty Acid	0.42
Methyl Esther	0.40
Fatty Acid Salt	41.02
Monoglyceride and Diglyceride	27.37
Moisture (b)	19.18
Metal Cation in Salt (c)	5.62
Inorganic Chemicals, including Glycerol (d)	5.99
Final Mass of Insecticidal Composition (a+b+c+d)	100

Table 2. Constituents and Corresponding Mass of Fatty Acid Salt

Fatty Acid Salt Constituents	Mass of Fatty Acid Salt Constituents
Total Fatty Acid Salt	41.02
Oleic Acid	19.16
Linoleic Acid	5.17
Other Fatty Acid Salt	16.69

The insecticidal composition can be applied through a method which atomizes an insecticidal mixture for discharge to a space, a structure of parts thereof. The insecticidal mixture comprises the insecticidal composition. Prior to atomizing of the insecticidal mixture, the insecticidal composition is mixable with water for forming the insecticidal mixture with the volume proportion of insecticidal composition to water being 2:1 to 1:4. Alternatively, the volume proportion of insecticidal composition to water can be from 2:1 to 1:10. The moisture content of the insecticidal composition is due to the hygroscopic nature thereof and may vary due to location and duration of storage. The range limit of some of the constituents of the insecticidal composition falls within a 10% range which can be expected for a product that is derived from natural resources due to natural variation.

In an exemplary function of the insecticidal composition, the fatty acid salt penetrates an insect to disrupt of cell membranes of the insect, resulting in the insect's cells to leak their content to thereby cause the insect to dehydrate and die. This is but one of the mechanisms on how the insecticidal composition can and may function as an insecticide, or insecticidal soap. The fatty acid soap is one of potassium salt or sodium salt of fatty acid in most cases.

In the method for application of the insecticidal composition, the insecticidal composition is atomized through, for example, discharge through a nozzle shaped and dimension for atomizing the insecticidal composition, or atomized by use of a fogging apparatus, for example a cold fogger. Additionally or alternatively in fogging, the insecticidal composition may be blown as droplets into the air depending on the target distance to be covered or the

area coverage of the space or structure to be fogged. Hence, fogging may be done through the use of “mistblowers” (droplet size 50-80 μm), “foggers” (hot or cold droplets $<50\text{ }\mu\text{m}$) or the use of “Ultra-Low-Volume” (ULV) in which the amount of active is dispersed in a high volume of solvent.

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The method for applying the insecticidal composition may be further adapted as a process for the control of insects, also referred to as a process for the control of cockroach, where the insecticidal composition is first mixed with water to form an insecticidal mixture with the volume proportion of insecticidal composition to water being 2:1 to 1:4. In another implementation of the process for the control of insects, the volume proportion of insecticidal composition to water can alternatively be from 2:1 to 1:10. Similar to the method for application of the insecticidal composition, the formed insecticidal mixture is atomized for discharge to a space or structure.

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In an exemplary preferred embodiment of the process for cockroach control, one part of the insecticidal composition is mixed with three parts of water for forming the insecticidal mixture. An exemplary Vector Fog C100ULV Cold Fogger (with a fogging flowrate 60L/hr for covering an area at a rate of 100m²/min with droplet size of 5-50 micron) is used to fog or dose, for example, bin chutes for 2 minutes at a rate of 1L/min/chute. Each bin chute has an internal cross-sectional dimension, or foot-print, of 1.5m by 1.5m. The rate of discharge, or the rate of application, may be varied for dosing/fogging chutes of various internal dimensions.

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The process for the control of insects may be also adapted for use in a sprinkler system comprising a container for containing the insecticidal mixture, at least one nozzle, and a control module intercoupling the container and the at least one nozzle, the control module being operable for at least one of enabling and impeding flow of the insecticidal mixture from the container to the at least one nozzle for discharge therefrom, the at least one nozzle being adapted and positioned adjacent a chute for directing the insecticidal mixture discharged therefrom into the chute.

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The control module is preferably one of a flow control valve and a pump, for example a displacement pump or a centrifugal pump which may act on gravity feed or fluid displacement of the insecticidal mixture from the container to the at least one nozzle. A plurality of pipes are employed for fluid communicating the container with the control module and the control module with the at least one nozzle. The at least one nozzle may be disposed adjacent or within the chute or space whereinto the insecticidal mixture is to be discharged.

- 10 The control module may be remotely operated, for example by 3G/5G communication modules to start and stop discharge of the insecticidal mixture into the chute. Additionally or alternatively, the control module can comprise a user interface (UI), for example a switch panel, a control panel or a touch screen, to enable interaction therewith by a human operator for control thereof. The control module may further comprise a control module that enable
15 the discharged of the insecticidal mixture from the sprinkler device at pre-defined intervals or based on a pre-defined schedule overridable by the human operator through the UI or through remote control.

- Aspects of particular embodiments of the present disclosure address at least one aspect, problem, limitation, and/or disadvantage associated with existing pesticides and application thereof. While features, aspects, and/or advantages associated with certain embodiments have been described in the disclosure, other embodiments may also exhibit such features, aspects, and/or advantages, and not all embodiments need necessarily exhibit such features, aspects, and/or advantages to fall within the scope of the disclosure. It will be appreciated by
25 a person of ordinary skill in the art that several of the above-disclosed compositions and method, can be desirably combined into alternative method, compositions and/or applications. In addition, various modifications, alterations, and/or improvements may be made to various embodiments that are disclosed by a person of ordinary skill in the art within the scope of the present disclosure, which is limited only by the following claims.

Claims

1. An insecticidal composition comprising:
 at least one emulsifier; and
 5 at least one salt of fatty acid,
 wherein the mass proportion of the at least one emulsifier to the at least one salt of fatty acid is 3:4 to 2:5.
2. The insecticidal composition as in claim 1, the emulsifier comprising at least one of
 10 monoglyceride and diglyceride.
3. The insecticidal composition as in claim 1, the at least one salt of fatty acid being at least one of oleic acid and linoleic acid.
- 15 4. The insecticidal composition as in claim 4, the mass proportion of linoleic acid to oleic acid is 3:5 to 3:25.
5. The insecticidal composition as in claim 1, wherein the emulsifier being between 20-30% of the insecticidal composition by weight and the at least one salt of fatty acid
 20 being between 40%-50% of the insecticidal composition by weight, with 18%-25% of the composition being moisture.
6. A method for application of an insecticidal mixture, the method comprising:
 atomizing an insecticidal mixture for discharge to a space, the insecticidal
 25 mixture comprising an insecticidal composition comprising:
 at least one emulsifier; and
 at least one salt of fatty acid, wherein the mass proportion of the at least one emulsifier to the at least one salt of fatty acid is 3:4 to 2:5.

7. The method as in claim 6, further comprising:
 mixing the insecticidal composition with water for forming the insecticidal mixture, the volume proportion of insecticidal composition to water is 2:1 to 1:10.
- 5 8. The method as in claim 6, the emulsifier comprising at least one of monoglyceride and diglyceride.
9. The method as in claim 6, the at least one salt of fatty acid being at least one of oleic acid and linoleic acid.
- 10 10. The method as in claim 9, the mass proportion of linoleic acid to oleic acid is 3:5 to 3:25.
11. The method as in claim 6, wherein the emulsifier being between 20-30% of the
 15 insecticidal composition by weight and the at least one salt of fatty acid being between 40%-50% of the insecticidal composition by weight, with 18%-25% of the composition being moisture.
12. A process for the control of cockroaches in structures comprising:
 20 mixing the insecticidal composition with water for forming an insecticidal mixture, the volume proportion of insecticidal composition to water is 2:1 to 1:10; and
 atomizing the insecticidal mixture for discharge to a space,
 wherein the insecticidal mixture comprising an insecticidal composition
 25 comprising:
 at least one emulsifier; and
 at least one salt of fatty acid, wherein the mass proportion of the at least one emulsifier to the at least one salt of fatty acid is 3:4 to 2:5.

13. The process as in claim 12, atomizing the insecticidal mixture for discharge to a space comprising atomizing the insecticidal mixture using a cold fogger.

14. The process as in claim 12, the emulsifier comprising at least one of monoglyceride and diglyceride, and the at least one salt of fatty acid being at least one of oleic acid, and linoleic acid,

wherein the emulsifier being between 20-30% of the insecticidal composition by weight and the at least one salt of fatty acid being between 40%-50% of the insecticidal composition by weight, with 18%-25% of the composition being moisture.

15. The process as in claim 14, the mass proportion of linoleic acid to oleic acid is 3:5 to 3:25.

16. A sprinkler system comprising:

a container for containing an insecticidal mixture, the insecticidal mixture comprising an insecticidal composition comprising:

at least one emulsifier; and

at least one salt of fatty acid, wherein the mass proportion of the at least one emulsifier to the at least one salt of fatty acid is 3:4 to 2:5,

at least one nozzle; and

a control module intercoupling the container and the at least one nozzle, the control module being operable for at least one of enabling and impeding flow of the insecticidal mixture from the container to the at least one nozzle for discharge therefrom, the at least one nozzle being adapted and positioned adjacent a chute for directing the insecticidal mixture discharged therefrom into the chute.

17. The sprinkler system as in claim 16, the control module being at least one of a valve and a pump.