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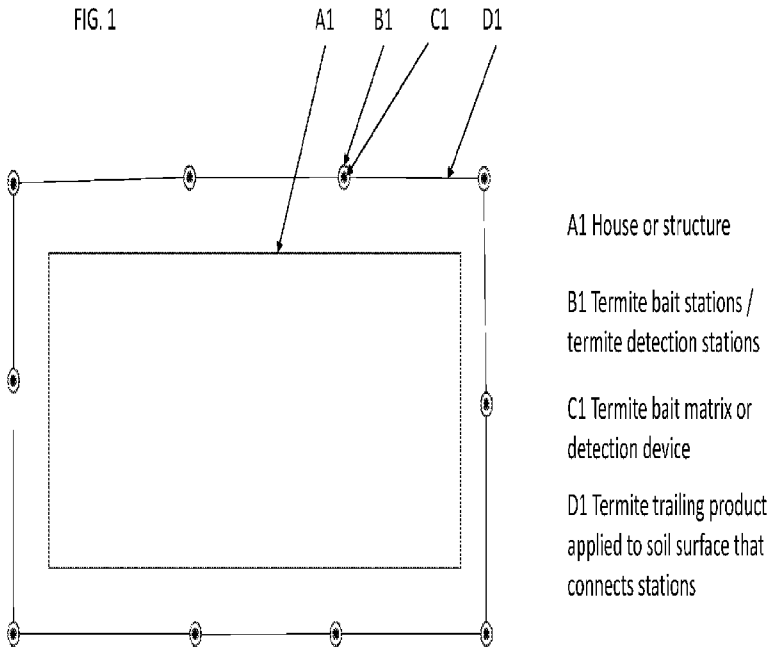
(54) Title: TERMITE TRAILING AND RECRUITMENT PRODUCT AND PROCESS



(57) Abstract: Termite trailing and recruitment compositions, systems, devices, and methods for using a trail pheromone mimic and salt solution to lead the subterranean termites to a toxicant (bait or residual treatment) or termite monitoring station (e.g., pop-up station) in order to detect subterranean termites using a termite activity station detector or other station to alert to the presence of termites, lead termites to a termiticide residual soil treatment, lead termites to a toxic bait station, and lead termites to wood treated with termiticide. A first composition includes phenoxyethanol dissolved in water at approximately 1000 ppm (between approximately 280 to approximately 2000 ppm) and applied to soil surrounding a location for detecting termites or killing termites. A second composition includes 2-phenoxyethanol dissolved in water at approximately 1000 ppm in combination with potassium carbonate or potassium chloride (KCl or K2CO3) at approximately 500 ppm (between approximately 129 to approximately 500 ppm) and applied to soil surrounding a location

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for detecting termites or killing termites. The first and second compositions can be applied to soil, or injected into wood in order to lead drywood termites to a bait station or for wood treatment.

TERMITE TRAILING AND RECRUITMENT PRODUCT AND PROCESS

CROSS REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of priority to U.S. Provisional Application Serial No. 63/442,639 filed February 1, 2023, which is incorporated by refence.

FIELD OF INVENTION

This invention relates to termite trailing and recruitment compositions, soil or wood treatment compositions, systems, devices, and methods for using 2-phenoxyethanol, which is hydroscopic and creates a moist micro-environment preferred by termites, and a potassium salt solution to lead the subterranean and drywood termites to a toxicant (bait or residual treatment) or termite monitoring station (e.g., pop-up station).

BACKGROUND AND PRIOR ART

2-phenoxyethanol is a solvent that mimics the trail pheromone of termites. It is found as a solvent in ballpoint pens, and also is used in food and cosmetics. Termites have been known to follow the ink trail for at least 50 years.

Greg Henderson and his colleagues (Jian Chen and Roger Laine identified the trail pheromone mimic in pen ink as 2-phenoxyethanol. (Chen, J, G. Henderson, and R. Laine, 1998. Isolation and Identification of 2-phenoxyethanol from ballpoint pen ink as a trail-following substance of Coptotermes formosanus and Reticulitermes. J. Entomological Science 33:97-105

Greg Henderson et al. at LSU patented 2-phenoxyethanol applications to baits to specifically kill termites (patent is attached), but not soil treatments of the trail pheromone mimic to allow discovery and mortality of termites as part of a total program. See U.S. Patent 6,352,703 to Henderson et al. issued March 5, 2002, which is incorporated by reference.

There is a patent on the use of the natural trail pheromone (dodecatrianol) for termite detection and control (see U.S. Patent 5,024,832), but not for using 2-phenoxyethanol.

A May 2022 Thesis by L. Prescott, discussed, the use of 2-phenoxyethanol as a soil treatment to lead termites to pop-up termite detection stations. The project showed that termites will feed more on cellulose material surrounded by the treatment and in the field the treatment will lead them to detection stations (5 of 20 2-phenoxyethaol soil-treated stations hit, compared to 0 of 20 that were not treated. See Prescott, Luke, Master's Thesis for Soil Tunneling/Tubing by Subterranean Termites in Response to 2-phenoxyethanol, Department of Entomology and Nematology, University of Florida, May 2022.

Other scientists have discovered that termites follow salts in soils that leach from logs as they decay. See Botch and Judd., Effects of Soil Cations on the Foraging Behavior of Reticulitermes flavipes (Isoptera: Rhinotermitidae). Ecology and Behavior, Journal of Economic Entomology, Vol. 104, No. 2, pages 425-435, April 2011. Potassium cations were the only ones to attract termites.

Scientists have also found that salts in sports drinks are followed by termites. These salts can include potassium salts that mimic the salts that leach from logs. We have hypothesized that by combining 2-phenoxyethanol and

potassium salt, termites will reliably follow the trail to detection traps or termite treatments. See Cornelius et al., Efficacy of Bait Supplements for Improving the Rate of Discovery of Bait Stations in the Field by Formosan Subterranean Termites (Isoptera: Rhinotermitidae), Journal of Economic Entomology, Vol, 102, no. 3, pages 1175-1181, 2009.

There is no product that is used or patented that utilizes both 2-phenoxyethanol and potassium salts to direct termites to toxicants or activity monitors. Thus, the need exists for solutions to the above problems with the prior art.

SUMMARY OF THE INVENTION

A primary objective of the present invention is to provide termite trailing and recruitment compositions, systems, devices, and methods for using a trail pheromone mimic and salt solution to lead the subterranean termites to a toxicant (bait or residual treatment) or termite monitors (e.g., pop-up termite stations) that are positioned about a house or structure.

A secondary objective of the present invention is to provide termite trailing and recruitment composition compositions, systems, devices, and methods for using a trail pheromone mimic and salt solution to lead termites in termite infested wood to a termite station attached to the wood surface.

A third objective of the present invention is to provide termite trailing and recruitment compositions, systems, devices, and methods for that can include 2-phenoxyethanol dissolved in water, so the termites will reliably follow a trail to detection traps or for termite treatments.

A fourth objective of the present invention is to provide termite trailing and recruitment compositions, systems, devices, and methods for combining 2-phenoxyethanol and potassium salt, so the termites will reliably follow a trail to detection traps or for termite treatments.

A first termite trailing and recruitment composition can include 2-phenoxyethanol dissolved in water between approximately 280 ppm to approximately 2000 ppm, more specifically approximately 1000 ppm, and applied to soil surrounding a location for detecting termites or for termite treatments.

A second termite trailing and recruitment composition can include 2-phenoxyethanol dissolved in water at approximately 1000 ppm in combination with potassium salts (e.g., potassium carbonate or potassium chloride (KCl or K2CO3)) between approximately 129 to approximately 500 ppm, more specifically approximately 240 ppm, and applied to soil surrounding a location for detecting termites or for termite treatments.

The first and second compositions can be injected into wood in order to lead drywood termites to a bait station or for termite treatment.

Further objects and advantages of this invention will be apparent from the following detailed description of the presently preferred embodiments which are illustrated schematically in the accompanying drawings.

BRIEF DESCRIPTION OF THE FIGURES

The drawing figures depict one or more implementations in accord with the present concepts, by way of example only, not by way of limitations. In the

figures, like reference numerals refer to the same or similar elements.

FIG. 1 shows a diagrammatic layout view of the novel termite treatment composition applied to soil between termite treatment devices spaced about an exterior of a structure to be protected.

FIG. 2 shows a diagrammatic layout view of the novel termite treatment composition injected into a termite tunnel within termite infested wood adjacent to a termite bait station attached to the wood surface.

FIG. 3 is a graph showing the average percent of paper consumed by termites with the novel trailing and recruitment compositions in the invention compared to untreated control repetitions.

FIG. 4 is a graph showing the average mg of paper consumed by termites with the novel trailing and recruitment compositions in the invention compared to untreated control repetitions.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Before explaining the disclosed embodiments of the present invention in detail it is to be understood that the invention is not limited in its applications to the details of the particular arrangements shown since the invention is capable of other embodiments. Also, the terminology used herein is for the purpose of description and not of limitation.

In the Summary above and in the Detailed Description of Preferred Embodiments and in the accompanying drawings, reference is made to particular features (including method steps) of the invention. It is to be understood that the disclosure of the invention in this specification does not include all possible

combinations of such particular features. For example, where a particular feature is disclosed in the context of a particular aspect or embodiment of the invention, that feature can also be used, to the extent possible, in combination with and/or in the context of other particular aspects and embodiments of the invention, and in the invention generally.

In this section, some embodiments of the invention will be described more fully with reference to the accompanying drawings, in which preferred embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will convey the scope of the invention to those skilled in the art. Like numbers refer to like elements throughout, and prime notation is used to indicate similar elements in alternative embodiments.

Other technical advantages may become readily apparent to one of ordinary skill in the art after review of the following figures and description.

It should be understood at the outset that, although exemplary embodiments are illustrated in the figures and described below, the principles of the present disclosure may be implemented using any number of techniques, whether currently known or not. The present disclosure should in no way be limited to the exemplary implementations and techniques illustrated in the drawings and described below.

Unless otherwise specifically noted, articles depicted in the drawings are not necessarily drawn to scale.

A list of the components in the figures will now be described.

A1 house or structure

B1 Termite bait stations/termite detection stations

C1 Termite bait matrix or termite detection device

D1 Termite trailing product applied to soil surface that connects stations

A2 termite infested wood

B2 termite tunnel in wood

C2 termite treatment product injected into tunnel and absorbed in wood

D2 Termite bait station attached to wood surface.

A first embodiment of the termite trail pheromone mimic would be diluted in water using

2-phenoxyethanol between approximately 280 ppm to approximately 2000 ppm, and is dissolved in water and applied to soil surrounding a location for detecting termites or killing termites.

A preferred amount of the 2-phenoxyethanol would include approximately 1,000 ppm, and is dissolved in water and applied to soil surrounding a location for leading the termites to a termite treatment station.

A second embodiment of the novel termite trail pheromone mimic would be diluted in water using

2-phenoxyethanol dissolved in water at approximately 1000 ppm in combination with potassium carbonate or potassium chloride (KCl or K2CO3) at (between approximately 129 to approximately 500 ppm) and applied to soil surrounding a location for detecting termites or killing termites.

A preferred amount of the potassium carbonate or potassium chloride (KCl or K2CO3) would be approximately 500 ppm.

The combination of 2-phenoxyethanol dissolved in water, with potassium carbonate or potassium chloride (KCl or K2CO3), can be injected into wood in order to lead drywood termites to a bait station or for wood treatment.

FIG. 1 shows a diagrammatic layout view of the novel termite treatment composition applied to soil between termite treatment devices B1/C1 spaced about an exterior structure A1 to be protected.

The termite treatment devices B1/C1 can include but not be limited to B1 termite bait stations and termite detection stations, and C1 termite bait matrix and detection devices.

U.S. Patent 6,266,918 to Henderson, which is incorporated by reference, teaches about how 2-PE can be applied directly to termite baits improve foraging activity. The Henderson “918 patent did not address the application of 2-PE to soil, only to termite baits directly. U.S. Patent 8,111,155 to Barber, which is incorporated by reference describes a design of a station to contain termite bait.

A termite bait station referenced in FIG. 1 can include but is not limited to U.S. Patent RE40,884 to Masterson, which is incorporated by reference.

A termite detection station, referenced in FIG. 1 can include but is not limited to U.S. Published Patent Application 2006/0207164A1, which is incorporated by reference.

A termite bait matrix referenced in FIG. 1, can include, but is not limited to, U.S. Patent 6,585,991 B1 to Rojas et al., which is incorporated by reference.

A detection device referenced in FIG. 1, can include, but is not limited to U.S. Patent 6,266,918 to Henderson, which is incorporated by reference.

The structure A1 to be protected can include a house or other wood framed structure.

The termite treatment devices B1/C1 are generally spaced apart from one another exterior to the outside perimeter of the structure A1.

The composition (2-phenoxyethanol would include approximately 1,000 ppm, and is dissolved in water) can be used in both applications shown in FIG. 1 and FIG. 2.

The user can apply the novel treatment composition of the first embodiment referenced above to the surface of the soil between the treatment devices B1/C1.

The above composition can apply under pressure to the soil surface using a tank, pump and hose assembly, or simply poured onto the soil. Alternately, in can be applied in a trench dug in the soil using a spray assembly or pouring from a reservoir of the composition.

The above composition can also be injected under the ground for the FIG. 2 application. The composition can be Injected into wood as per Fig. 2 with traditional pest control equipment that applies product under pressure, and it can be injected into the soils as previously described.

Referring to FIGURES 1 and 2, either of the referenced compositions can be applied between bait or monitoring stations to completely surround a structure or area of termite concern, in order lead termites into stations.

FIG. 2 shows a diagrammatic layout view of the novel termite treatment composition C2 injected into a termite tunnel within termite infested wood A2 adjacent to a termite bait station D2 attached to the wood surface.

A bait station D2 referenced in FIG. 2 can include, but is not limited to U.S. Patent 6,370,812B1 to Burns et al., which is incorporated by reference.

The second embodiment of the novel termite trail pheromone mimic would be diluted in water using

2-phenoxyethanol dissolved in water at approximately 1000 ppm in combination with potassium carbonate or potassium chloride (KCl or K2CO3) at (between approximately 129 to approximately 500 ppm) and injected into termite infested wood adjacent to a termite bait station.

A preferred amount of the potassium carbonate or potassium chloride (KCl or K2CO3) would be approximately 500 ppm.

The combination of 2-phenoxyethanol dissolved in water, with potassium carbonate or potassium chloride (KCl or K2CO3), can be injected into wood in order to lead drywood termites to a bait station or for wood treatment.

The second composition 2-phenoxyethanol dissolved in water with potassium carbonate or potassium chloride) can be used in both FIG. 1 and FIG. 2 applications. For the FIG. 1 application, the second composition can be applied to the soil as previously described.

The second composition 2-phenoxyethanol dissolved in water with potassium carbonate or potassium chloride) can be injected into termite galleries using a syringe or spray assembly. The termite galleries would be adjacent to the termite bait station and attached to the damaged wood.

Testing of the novel termite trailing and recruitment compositions took place at the New Orleans Mosquito, Termite and Control District in New Orleans, Louisianna from June 16 to June 20, 2023.

The objective of the tests was to determine which prepared formulation of Detour product most attracts and induces feeding behavior in Formosan subterranean termites.

Species:

For this protocol, individuals from a single colony of Formosan subterranean termites, *Coptotermes formosanus*, were used. Termites were collected from previously established field collection crates in New Orleans. This study was initiated within 3 days of termite collection.

Treatments:

The following ready-to-use solutions were tested for this study:

1. Detour 2Pe 0.1%
2. Detour + K_2CO_3 0.05%
3. Detour + KCl 0.05%

4. Water (untreated control)

Replicates:

There were 10 replicates for each choice test. Each choice test involved a combination of two of the treatments to be tested, listed in the previous section. The following is a summary Table A of each replicate for this study.

REMOVE THE COLOR AND SHADING FROM THIS TABLE

TABLE A.

Treatment A	**Treatment B**	**No. replicates**
Detour 2Pe 0.1%	Detour + K_2CO_3 0.05%	10
Detour + K_2CO_3 0.05%	Detour + KCl 0.05%	10
Detour 2Pe 0.1%	Detour + KCl 0.05%	10
Detour 2Pe 0.1%	Water (untreated control)	10
Detour + K_2CO_3 0.05%	Water (untreated control)	10
Detour + KCl 0.05%	Water (untreated control)	10
		Total = 60

A total of 60 replicates were performed for this study.

Arena Setup:

2-D termite foraging arenas consisting of two clear acrylic plates (24cm X 24cm) separated by spacers and were secured together with bolts. Each arena contained moistened sand and filter paper circles. The sand around each paper filter circle was treated with the pre-designated treatment.

To assemble each arena, first the top plate was placed face-down and moistened with distilled water using a spray bottle. Two pieces of filter paper (55mm diameter) were placed directly onto the top plate. These two pieces of filter paper were placed in such a way as to be equidistant from the release chamber and from the sides. Filter papers were approximately 10cm from the release chamber and approximately 5mm from the arena sides. Sand was

scattered over this plate, and excess sand was leveled off using a straight edge. The sand surface was misted again with distilled water using a spray bottle to the point of being damp without any runoff. A treated trail of pre-designated product was then pipetted on the sand around the circumference of the filter paper circles at a rate of approximately 0.18mL/cm. For each replicate, the location of Treatment A and Treatment B alternated. The bottom plate was then secured to the top of the arena and flipped over.

Filter Paper:

Filter paper used in this study was approximately 55mm in diameter. It was oven dried at approximately 120°C for approximately 2 hours and weighed prior to placing them in each arena. It was dried, cleaned, and weighed again at the conclusion of this study, after being exposed to termites for 4 days.

Bioassay:

500 Formosan subterranean termites consisting of a 10% soldier ratio (450 workers: 50 soldiers) were placed into the release chamber of each of the 60 replicates and the lid placed on the release chamber. Arenas were maintained in an environmental chamber at 28°C and 80% RH for 4 days. At that time, arenas were disassembled, and filter paper collected, cleaned of sand residue, dried, and weighed.

Data Collection:

The following data points were collected for each replicate:

1. Treatment A filter paper dry weight before termite exposure
2. Treatment A filter paper dry weight after termite exposure

3. Weight of filter paper consumed (Treatment A)
4. Percent consumption for Treatment A filter paper
5. Treatment B filter paper dry weight before termite exposure
6. Treatment B filter paper dry weight after termite exposure
7. Weight of filter paper consumed (Treatment B)
8. Percent consumption for Treatment B filter paper

FIG. 3 is a graph showing the average percent of paper consumption from termites with the novel trailing and recruitment compositions in the invention. The results teach us that 2-PE and 2-PE + KCl increased termite activity and the percentage of paper consumption significantly when soil around the termite food source was treated.

FIG. 4 is a graph showing the average mg of paper consumption with the novel trailing and recruitment compositions in the invention. The results teach us that 2-PE and 2-PE + KCl increased termite activity and the mg of paper consumption significantly when soil around the termite food source was treated.

Results:

Completed data sheets of each arena were compiled after 4 days of termite activity.

Analysis of variance (ANOVA) followed by post-hoc Tukey test using SigmaPlot (Systat Software, Inc.) yielded a significant difference in weight of filter paper consumed across all treatments ($H=16.751$, $df=3$, $P<0.001$). TABLE B below shows differences between treatments:

TABLE B

Treatment	**Mean Weight Consumed (g) + SD. Different letters indicate significant differences according to Tukey's post hoc differentiation after ANOVA**
Detour + 2Pe 0.1%	0.0820 + 0.0473 A
Detour + K_2CO_3 0.05%	0.0419 + 0.0266 C
Detour + KCl 0.05%	0.0723 + 0.0424 AB
Water	0.0462 + 0.0361 BC

From this data analysis, it can be determined that termites fed more on filter paper surrounded by Detour + 2Pe 0.1% and Detour + KCl 0.05% than any other treatment, and there was not a significant difference in feeding between these two aforementioned treatments. Termites even preferred Detour +2Pe 0.1% to water as well, though there was no such preference for Detour + KCl 0.05% over water. Termites did not feed significantly more on filter paper surrounded by Detour + K_2CO_3 0.05% when compared to any other treatment. The trials prove that termites consume more treated filter paper media when 2PE and 2PE+KCl are present around the paper. The amount consumed is almost twice as much as untreated controls (H_2O).

The term "approximately"/" approximate" can be +/- 10% of the amount referenced. Additionally, preferred amounts and ranges can include the amounts and ranges referenced without the prefix of being approximately.

Although specific advantages have been enumerated above, various embodiments may include some, none, or all of the enumerated advantages.

Modifications, additions, or omissions may be made to the systems, apparatuses, and methods described herein without departing from the scope of the disclosure. For example, the components of the systems and apparatuses may be integrated or separated. Moreover, the operations of the systems and apparatuses disclosed herein may be performed by more, fewer, or other components and the methods described may include more, fewer, or other steps. Additionally, steps may be performed in any suitable order. As used in this document, "each" refers to each member of a set or each member of a subset of a set.

To aid the Patent Office and any readers of any patent issued on this application in interpreting the claims appended hereto, applicants wish to note that they do not intend any of the appended claims or claim elements to invoke 35 U.S.C. 112(f) unless the words "means for" or "step for" are explicitly used in the particular claim.

While the invention has been described, disclosed, illustrated and shown in various terms of certain embodiments or modifications which it has presumed in practice, the scope of the invention is not intended to be, nor should it be deemed to be, limited thereby and such other modifications or embodiments as may be suggested by the teachings herein are particularly reserved especially as they fall within the breadth and scope of the claims here appended.

We claim:

1. A termite trailing and recruitment composition, comprising:

2-phenoxyethanol dissolved in water, wherein the dissolved 2-phenoxyethanol, is useful as a trail pheromone mimic to lead subterranean termites to soil surrounding a location for detecting the termites or killing the termites.

2. The termite trailing and recruitment treatment composition of claim 1, wherein the amount of the 2-phenoxyethanol is between approximately 280 to approximately 2000 ppm.

3. The termite trailing and recruitment treatment composition of claim 2, wherein the amount of the 2-phenoxyethanol is approximately 1000 ppm.

4. The termite trailing and recruitment composition of claim 1, wherein the composition is applied to soil between termite treatment or monitoring stations located about a house or structure.

5. The termite trailing and recruitment composition of claim 1, wherein the dissolved 2-phenoxyethanol, is injected into termite infested wood, in order to lead the termites to a bait or monitoring station.

6. The termite trailing and recruitment composition of claim 1, wherein the dissolved 2-phenoxyethanol, is injected onto soil, into wood or in a bait station applied to termite galleries as a wood treatment.

7. A termite trailing and recruitment composition, comprising in combination:

2-phenoxyethanol dissolved in water; and

Potassium salt, wherein the composition is useful as a trail pheromone mimic to lead subterranean termites to soil surrounding a location for detecting the termites or killing the termites.

8. The termite trailing and recruitment composition, of claim 7, wherein the 2-phenoxyethanol is approximately 1,000 ppm.

9. The termite trailing and recruitment composition, of claim 7, wherein the Potassium salt is selected from potassium carbonate or potassium chloride (KCl or K2CO3).

10. The termite trailing and recruitment composition, of claim 7, wherein the Potassium salt includes between approximately 129 to approximately 500 ppm.

11. The termite trailing and recruitment composition, of claim 7, wherein the Potassium salt is approximately 500 ppm.

12. The termite trailing and recruitment composition, of claim 9, wherein the Potassium salt includes potassium carbonate.

13. The termite trailing and recruitment composition, of claim 9, wherein the Potassium salt includes potassium chloride (KCl or K2CO3).

14. The termite trailing and recruitment composition of claim 7, wherein the composition is applied to soil between termite treatment or monitoring stations located about a house or structure.

15. The termite trailing and recruitment composition of claim 7, wherein the composition is injected into termite infested wood, in order to lead the termites to a bait or monitoring stations.

16. The termite trailing and recruitment composition of claim 7, wherein the composition is injected onto soil, into wood or into a bait or monitoring station, or applied to termite galleries as a wood treatment.

17. A method for using a termite trailing and recruitment composition to lead subterranean termites to soil surrounding a location for killing the termites, comprising the steps of:

providing a composition that includes 2-phenoxyethanol dissolved in water; and;

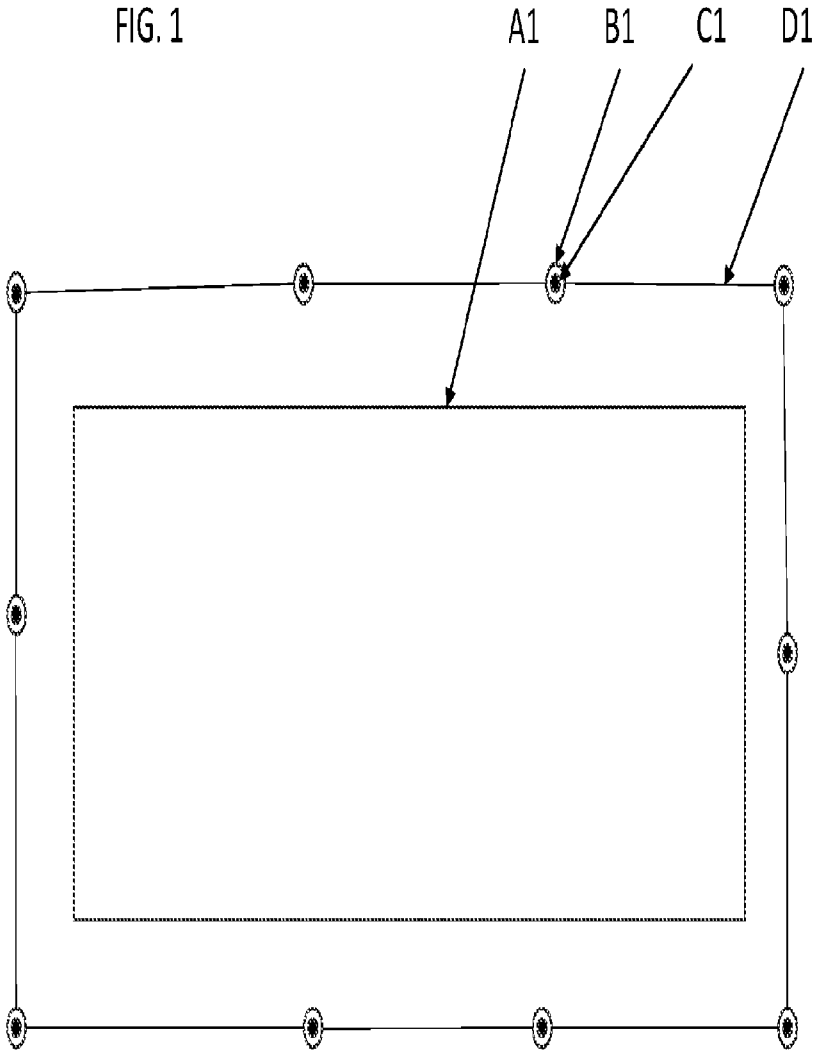
leading termites with the composition to bait or monitoring stations.

18. The method of claim 17, wherein the step of providing a composition includes the step of: providing the amount of the 2-phenoxyethanol is between approximately 280 to approximately 2000 ppm.

19. The method of claim 17, wherein the step of providing a composition includes the step of: providing potassium salt in combination with the 2-phenoxyethanol dissolved in water.

20. The method of claim 17, wherein the leading step includes the step of: applying the composition to soil between termite treatment or monitoring stations located about a house or structure., or injecting the composition into termite infested wood, in order to lead the termites to a bait or monitoring station.

FIG. 1



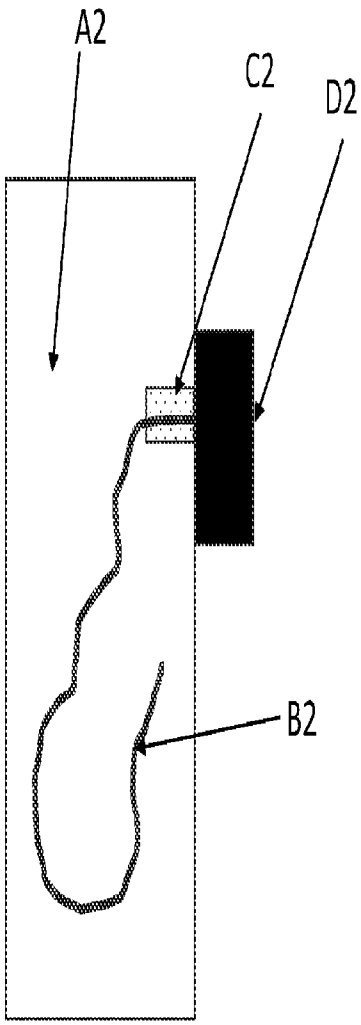
A1 House or structure

B1 Termite bait stations / termite detection stations

C1 Termite bait matrix or detection device

D1 Termite trailing product applied to soil surface that connects stations

FIG. 2



A2 Termite infested wood

B2 Termite tunnel in wood

C2 2-PE + KCl injected into tunnel and absorbed into wood

D2 Termite bait station attached to wood surface

FIG. 3

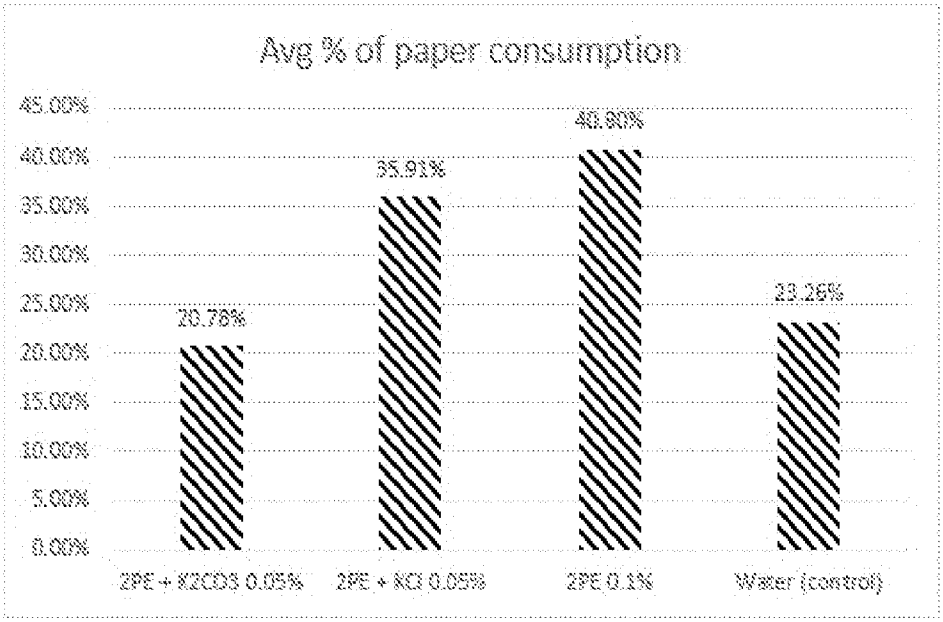
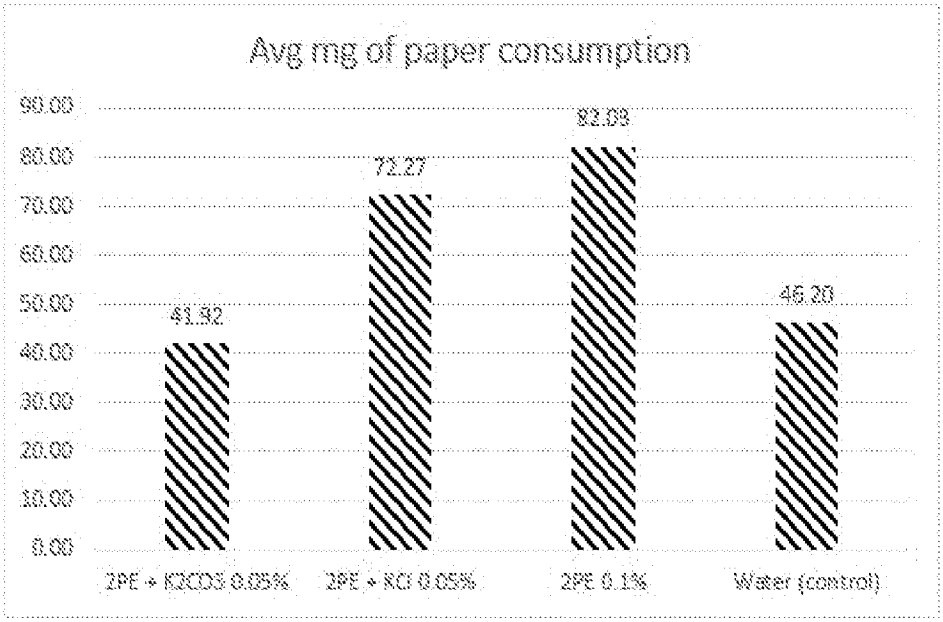

Avg % of paper consumption
45.00%
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
20.78%
35.91%
40.80%
23.26%
2PE + K2CO3 0.05%
2PE + KCl 0.05%
2PE 0.1%
Water (control)

FIG. 4


Avg mg of paper consumption
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
41.32
72.27
82.08
46.20
2PE + K2CO3 0.05%
2PE + KCl 0.05%
2PE 0.1%
Water (control)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2023/032741

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - INV. - A01N 39/02, 25/02, 31/14, 59/00; A01P 19/00 (2023.01)
ADD. - A01P 7/04 (2023.01)

CPC - INV. - A01N 39/02, 25/02, 31/14, 59/00; A01P 19/00 (2023.08)

ADD. - A01N 2300/00, 25/006; A01P 7/04 (2023.08)

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)
See Search History document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
See Search History document

Electronic database consulted during the international search (name of database and, where practicable, search terms used)
See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2003/0124164 A1 (BRODE, III et al.) 03 July 2003 (03.07.2003) entire document	1-20
Y	JP 2005-179258 A (SUZUKI YUSHI KOGYO KK) 07 July 2005 (07.07.2005) see machine translation	1-20
Y	US 2008/0268008 A1 (KING et al.) 30 October 2008 (30.10.2008) entire document	7-11, 13-16, 19
Y	US 2019/0124920 A1 (KOP-COAT INC.) 02 May 2019 (02.05.2019) entire document	7, 9, 12

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
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"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
06 November 2023	FEB 08 2024
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