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(54) Title  
**BAIT COMPOSITIONS FOR THE CONTROL OF ANTS**

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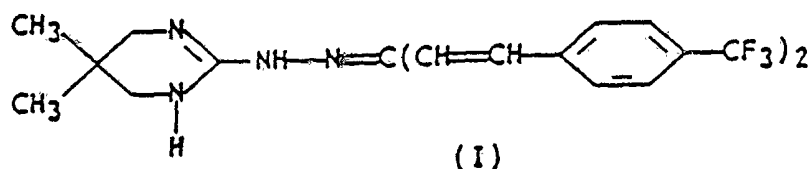
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(57) The present invention relates to solid, non-particulate, non-repellant bait compositions useful for the control of ants. The composition typically comprises liquid sugar, a polymeric binder, tetrahydro-5, 5-dimethyl-2-(1H)-pyrimidione-{3-[4-(trifluoro-methyl)-phenyl]-1-[2-[4-(trifluoro-methyl)phenyl]ethenyl]-2-propenylidene}-hydrazone or fatty acid salts thereof as the toxicant, or other suitable toxicants, and ground pupa of silkworm as a dried, ground protein composition. The insecticide is active as a stomach poison. The thereinabove named toxicant can be graphically illustrated by formula (I)



and the fatty acid salts thereof.

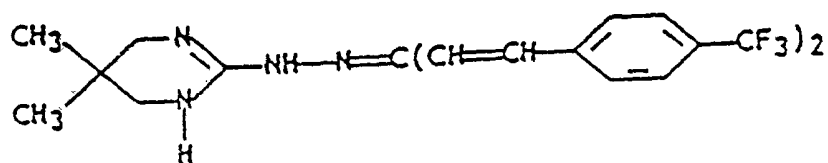
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**CLAIM**

1. A non-particulating, as herein defined, insecticidal bait composition comprising a toxicant, a liquid sugar, a dried, ground protein composition, and a polymeric binder.

4. The composition according to claim 1 wherein said toxicant is pyrimidinone-{3-[4-(trifluoromethyl)phenyl]-1-[2-[4-(trifluoromethyl)-phenyl]ethenyl]2-propenylidene}hydrazone having the formula (I)



or a fatty acid salt thereof.

609 143

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FORM 10

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952

COMPLETE SPECIFICATION

(ORIGINAL)

FOR OFFICE USE:

Class Int Class

Complete Specification Lodged:  
Accepted:  
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Related Art:

This document contains the amendments made under Section 49 and is correct for printing.

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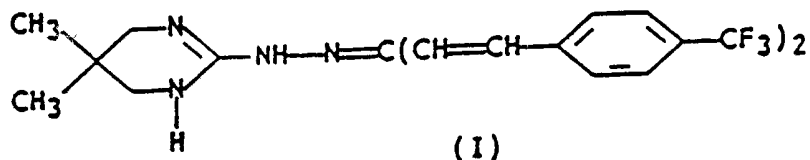


Complete Specification for the invention entitled:

Bait Compositions for the Control of Ants

The following statement is a full description of this invention, including the best method of performing it known to me/us

The present invention relates to solid, non-particulate, non-repellant bait compositions useful for the control of ants. The composition typically comprises liquid sugar, a polymeric binder, tetrahydro-5, 5-dimethyl-2-(1H)-pyrimidone-{3-[4-(trifluoro-methyl)-phenyl]-1-[4-(trifluoro-methyl)phenyl]ethenyl}-2-propenylidene)-hydrazone or fatty acid salts thereof as the toxicant, or other suitable toxicants, and ground pupa of silkworm as a dried, ground protein composition. The insecticide is active as a stomach poison. The thereinabove named toxicant can be graphically illustrated by formula (I)



and the fatty acid salts thereof.

The insecticide is disclosed in United States Patent No. 4,163,102 and its method of use is disclosed in United States 4,213,988, all of which are incorporated herein by reference. Insecticidal bait compositions of the above-named insecticide are disclosed in United States Patent No. 4,320,130, which describes solid corn based baits which are suitable for applicants over large areas of the control of insects.

In previously filed, commonly assigned applications, Serial Number 723,401, filed April 15, 1985, now abandoned and refiled as Serial Number 839,774 on March 18, 1986, issued as United States Patent Number 4,657,912, was disclosed and ant bait containing the above described toxicant, solid sugars, fish meal, silkworm pupae, a natural powder binder such as flour, and rice, bran oil and oleic acid. This formulation suffered from certain physical problems when it was poured into a bait tray and allowed to solidify, it dried out over a period of time, became crumbly and could be



shaken out of the bait tray. This is a hazard to children and pets.

It is therefore an object of this invention to provide an ant bait which has good coherency.

It is a further object of this invention to provide an ant bait safe  
5 for use in bait trays in a household environment.

These and other objects of the invention will be become apparent as the description thereof proceeds.

According to a first embodiment of the invention there is provided a  
non-particulating, as herein defined, insecticidal bait composition  
10 comprising a toxicant, a liquid sugar, a dried, ground protein composition,  
and a polymeric binder.

According to a second embodiment of the invention there is provided a  
method of controlling ants at a locus, comprising applying to the locus a  
composition of the first embodiment in an amount which effectively controls  
15 said ants.

Throughout the specification and claims the term "non-particulating"  
means "having good coherency".

The bait composition of the present invention thus comprises a  
granular blend of solid food attractants such as sugars, a protein such as  
20 dry, ground silkworm pupae, and fish meal held together by liquid sugars  
and synthetic polymeric binders, and also containing a suitable toxicant,  
such as described above in a suitable dispersant material. Other dried,  
ground insect material may also be used as protein material.

Ant bait compositions in the prior art have been either liquids,  
25 powders or granular materials which are unsafe in the presence of children  
and pets. The solid bait of the present invention makes it possible to  
place non-particulating bait in child resistant bait trays. The present  
bait remains moist at ambient temperatures. At high temperature and



5 humidity conditions, the bait is capable of absorbing moisture without liquifying. Moreover, moist bait attracts ants and improves efficacy. Insecticide laden granules of food ingredients can be taken to the nest by worker ants and cause mortality of other workers and the queen, thus destroying the entire colony.

10 Among the species of ants which can be controlled by the bait of the present invention are the following, although this statement is not meant to limit effectiveness only to these.

	COMMON NAME	SCIENTIFIC NAME
	Pharaoh ants	<u>Monomorium pharaonis</u>
	Crazy ants	<u>Paratrechina longicornis</u>
15	Red imported fire ants	<u>Solenopsis invicta</u>
	Black Carpenter ants	<u>Campanotus Pennsylvanica</u>
	Pavement ants	<u>Tetramorium caesoitum</u>
	Carpenter ants	<u>Camoanotus</u> spp.
	Argentine Ant	<u>Iridomyrex numilis</u>
20	Acrobat Ant	<u>Crematoquaster . S#</u>
	Thief Ant	<u>Solenopsis molesta</u>
	Florida Carpenter Ant	<u>Lasius alienus</u>
	Cornfield ants	<u>Formica</u> spp.
	Field ants	<u>Monomorium minimum</u>
25	Little black ants	<u>Tapinoma sessile</u>
	Odorous house ants	

30 The composition may contain from 0.01% to 2% of the ~~formula (1) insecticide~~ <sup>insecticide, preferably of formula (1)</sup> and 10% to 40% dry pupa of silkworms, 15% to 50% fluid sugar, 5% to 15% fish meal.

35 A preferred embodiment of the invention also comprises a synthetic polymeric binder, a fatty acid, an oil from grain or vegetable, e.g. rice, bran, corn or soybean oil.

Representative components and amounts are as follows:



	PREFERRED RANGE	BROAD RANGE	PREFERRED COMPOSITION
5	CORN SYRUP 11.70-21.70	10.00-25.00	16.70
	MOLASSES 5.00-15.00	5.00-25.00	10.00
	CARBOWAX 8000 0.00-14.00	0.00-15.00	9.00
	SILKWORM PUPAE 30.00	10.00-40.00	30.00
	FISH MEAL 10.00	5.00-15.00	10.00
10	SUGAR 20.00	5.00-30.00	20.00
	SODIUM SALICYLATE 0.10	0.00-0.50	0.10
	t.BUTYLHYDROQUINNE 0.20	0.00-0.50	0.20
	RICEBRAN OIL 2.00	0.50-5.00	2.00
15	OLEICACID 1.00	0.50-5.00	1.00
	HYDRAMETHYLNON 1.00	0.10-2.00	1.00

Antimicrobial agents such as sodium salicylate, sodium dehydroacetate and sodium benzoate may be added to inhibit microorganism growth, or antioxidants such as tert-butylhydroquinone, n-propyl gallate, 3-tert-butyl-4-hydroxy anisole, and butylated hydroxytoluene may be incorporated in the compositions to improve the storage characteristics of the final compositions.

EXAMPLES 1-7

A number of formulations were prepared and tested to prove the coherency of the bait formulation of the present invention. These formulations are shown in the following Table I.

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**TABLE I**

**FORMULATIONS TESTED TO PROVE NON-PARTICULATING BAIT BY THE USE OF A SIMULATED SHIP TEST.**

	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>
CORNSYRUP	16.70	11.70	21.70	16.70	21.70	11.70	16.70
MOLASSES	10.00	15.00	5.00	14.00	14.00	10.00	5.00
CARBOWAX 8000	9.00	9.00	9.00	5.00		14.00	14.00
SILKWORM PUPAE	30.00						
FISH MEAL	10.00						
SUGAR	20.00						
SODIUM SALICYLATE	0.10						
t.BHQ	0.20						
RICEBRAN OIL	2.00						
OLEIC ACID	1.00						
HYDRAMETHYLNON	1.00						

1  
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1

Corn syrup is a source of sugar and also used as binder. Other sugars can also be used such as glucose, fructose, sucrose, etc. Molasses is also a sugar source and binder. This also serves as a mask for the odor of fish meal and silkworm pupae.

5 Carbowax 8000 is used as a binder. Other polyethylene glycols can also be used. Silkworm pupae and fish meal are used as a source of protein, for protein feeding ants. Other types of dried, ground insects can also be used as a protein source. Sugar is granular sucrose, a disaccharide. The combination of corn syrup, molasses and sugar also controls the moisture content of the bait. This keeps the bait moist at all times. Sodium salicylate is a preservative. Other preservatives can also be used. Examples are sodium benzoate, sodium citrate, Dowcil 200, 5 Vancide 80RE, Tektamer 38AD, etc. Tertiary T.butylhydroquinone (t.BHQ) is used as an anti-oxidant for the rice bran oil. Other anti-oxidants are butylhydroxy anisole, propyl galletate, etc. Rice bran oil and oleic acid are the solubilizers for the active toxicant. One can also use soya bean oil, peanut oil, corn oil, etc. as a substrate for rice bran oil. Oleic acid can be replaced by stearic acid, palmitic acid, etc. Actives such as Hydramethylnon, Dursban, Temephos, Baygon, etc. can be used. The most preferred active ingredient is Hydramethylnon.

The formulation of Examples 1 through 7 were produced as follows:

MANUFACTURING PROCEDURE

PHASE A

1. Charge the batch tank with CORN SYRUP. Begin moderate agitation.
2. Begin heating the phase to 55°C ± 2°C.



3. While heating add MOLASSES and POLYETHYLENE GLYCOL 8000. Continue to mix until POLYETHYLENE GLYCOL 8000 is melted and batch is uniform.

5 4. Maintain  $55^{\circ} \pm 2^{\circ}\text{C}$  temperature and moderate agitation.

PHASE B

1. Charge the side kettle with RICEBRAN OIL and OLEIC ACID.

10 2. Begin Moderate agitation and begin heating to temperature  $75^{\circ}$   $80^{\circ}\text{C}$ .

3. Maintain the temperature and moderate agitation.

4. Sprinkle in HYDRAMETHYLNON. Continue moderate mixing until batch is clear and uniform.

15 5. Turn off heat.

PHASE C

1. Dry blend SILKWORM PUPAE, FISHMEAL, SUCROSE, SODIUM SALICYATE and t.BUTYLHYDROQUINONE until uniform.

MIXING PHASES

20 1. Turn off heat to PHASE A.

2. With continued moderate mixing, add PHASE B to PHASE A. Mix until uniform.

3. Add PHASE C and increase agitation speed as necessary to insure uniform mixture.

25 EXAMPLE 8

This Example illustrates results of actual and simulated shipping tests of the formulation of the present invention and that of U.S. Patent Number 4,657,912.

30 The bait formulations of Examples 1 to 7 were poured into plastic bait trays and allowed to solidify to form ant bait feeding stations. Five cases of each formulation were packed (120 individual bait trays per case).

35 Testing was performed according to the "Pre-Shipment Test Procedures," Revised 1979 National

Safe Transit Association, 6022 W. Touhy Avenue, Chicago, Illinois protocol.

The testing consisted of both vibration and drop tests as follows:

5 Vibration test - Test equipment complying with ASTM D-999. A total of 14,200 vibrating impacts.

Drop test - Test equipment complying with ASTM D-775 and D-880; and TAPPI T-801 and 10 T=802.

Each carton dropped on each of its six flat surfaces from a height of 30 inches.

The results are shown in Table II.

TABLE II

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FORMULA CODE: LOOSENED BAITS (individually % :U

1	2	1.66
2	4	3.33
3	1	0.63
4	1	0.82
5	0	0.00
20 6	13	10.88
7	1	0.88
CONTROL	0	0.00

New formulations, except F, compare closely to the control samples.

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In comparison, cases of bait trays containing bait according to U.S. patent Number 4,657,912 were actually shipped between New Jersey and California. The bait was nearly 100% shaken out of the Trays by this shipment.

EXAMPLE 9

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EFFICACY OF MFB# 17750 AGAINST HOUSEHOLD ANTS

Summary

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Field trials were conducted to determine the efficacy of MFB# 17750 against several species of household ants. Bait acceptance and toxicity were demonstrated by these field tests. In field trials I7750 was extremely effective in controlling the

Pharaohs ants, Monomorium pharaonis; Argentine ant, Iridomyrex; Red imported fire ant, Solenopsis #ivicta; Crazy ants, Paratrechina longicornis; acrobat ant, Crematogaster sp. and was moderately effective against  
5 Black carpenter ants, Camponotus pennsylvanicus; Pavement ants, Tetramorium casevatum; Cornfield ants, Lasius Alienus; Odorous house ant, Tapinoma sessile; Thief ants, solenopsis molesta; Florida carpenter ant and carpenter ant.

10 Materials and Methods

The efficacy and acceptability of MFB# 17750 was determined against 12 ant species occurring in a diversity of habitats. Most of the sites selected were in or around human dwellings where ants were  
15 considered a nuisance. In the case of Pharaohs ants, a test was conducted in a hospital situation where it is a health hazard. Since the colony nucleus was hidden within the structure, assessment of bait effectiveness was accomplished by counting the number of ants trapped  
20 in a jar containing a sweet prebait and post counts done with ants around the bait at specified time intervals.

Some studies were done with a improved alternate pre and post count technique. Zero time counts and subsequent counts were done as follows:  
25

A point on the ant trail near the food source was used as a mark - counts were made of the number of ants passing that point, going toward the food source only, for three one  
30 minute intervals. Observations were made for reduced ant activity and in some cases feeding activity was also detected.

Results

35 Results of field experiments are summarized below and in Table III.

Monomorium pharaonis was effectively controlled by MFB# 17750 at 8 different locations. Ant

activity around the bait was as soon as 16 minutes after placement of bait. Ants preferred the bait even in presence of other food sources. No reduction or feeding observed at the ninth location is puzzling. More than 80% reduction was observed after a week of treatment.

Excellent control was obtained for Solenopsis invicta. Feeding activity and high consumption of bait was observed. 100% control after a week of treatment.

Paratrechina longicornis foraged on bait throughout the test. In one test 69% reduction was observed after a week, whereas in the other test 84% reduction was obtained after 3 weeks. Thus, excellent control was achieved.

Iridomyrex humilis consumed all the bait in 5 days and reduction of 60% was observed. Ant feeding was observed after a hour of bait placement.

Camponotus pennsylvanicus responded positively to the bait at all the 6 sites. Ants were observed feeding on bait, dead and ataxic ants were noticed 3 to 4 days after bait placement. No ants were seen after 2 weeks at all treatment sites.

Excellent control (100%) was obtained for Crematogaster sp.. Ant feed on bait within a hour and no ant activity after 5 days.

Within an hour of placement of bait Tapinoma sessile fed on the bait and 5 days later no ant activity was observed. Similar results were observed for Solenopsis molesta.

Satisfactory control was also obtained for Tetramorium caespitum and Lasium alienus. In both cases feeding and dead ants were observed. No ants observed after a week of bait placement.

#### Discussion and Conclusions

Ant feeding habits overall are extremely diverse, and even within species food preference can

vary from season to season, or even hour to hour, depending on colony requirements. Such selectivity complicates the use of a universal toxic food bait for general ant control.

5 Measurement to field effectiveness is also complicated by difficulties in measuring true mortality. Frequently, colonies under test cannot be excavated for true population counts, and the best available measurement is a relative one based on comparisons of  
10 foraging activity before and after bait placement. Such an approach, however, is realistic from the standpoint of how consumers perceive effectiveness.

Accordingly, the activity of MFB# 17750 against household ants varied with both species and location. Monomorium pharaonis a major household and  
15 institutional pest was effectively eliminated in all areas where the bait was placed. In one location a seven year history of infestation was eliminated. This site had earlier been treated with all available  
20 products. Excellent control was also obtained for Solenopsis invicta, Paratrechina longicornis, Iridomyrmex humilis, Tapinoma sessile, Solenopsis molesta, Crematogaster sp., Camponotus pennsylvanicus, Tetramorium caespitum, Lasius alienus, and two other  
25 species of Camponotus.

The time lag between bait placement and effect appear to depend on colony size and availability of other food sources. Effects observed in tests with MFB# 17750 were delayed 2-7 days. In certain instances, tests were not carried to 100% reduction due to  
30 sites being unavailable to cooperators.

MFB# 17750 contains Hydramethylnon as the active ingredient. This active is regarded as a non-repellent (as a result of its slow action) which is  
35 ideal for use in baits for social insects. The repellency and rapid knockdown of other bait products gives the consumer perceived efficacy. Ants contacting such

baits are killed quickly thereby precluding recruitment from the colony. The remaining ants subsequently disperse from the treated areas. The presence of a few dead workers and the disappearance of the remaining ants given the perception that these baits are effective.

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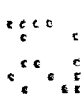
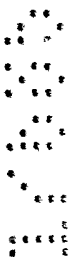
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TABLE III  
FIELD EVALUATION OF MFB# 17750

<u>ANT SPECIES</u>	<u>LOCATION</u>	<u>FEEDING ACTIVITY OBSERVED</u>	<u>MORTALITY OBSERVED</u>	<u>ANT ACTIVITY FOLLOWING BAIT PLACEMENT</u>
Pharaoh Ant ( <u>Monomorium pharaonis</u> )	Gainesville, FL House, outside walls & porches	YES	9 stations	Trail to bait 16 min later. 24 hrs later 8 of 9 baits had trails.
			DAY # ANTS % RED.	
			0 757	
			7 0 100	
Gainesville, FL House outside walls	YES	12 stations	Swarmed in great numbers, no visible ants after 1 week.	
		DAY # ANTS % RED.		
		0 1404		
		7 27 98 21 0 100		
Baton Rouge, LA House, inside all around the house	YES	14 stations	Few ants after one week.	
		DAY # ANTS % RED.		
		0 1140		
		7 11 99 14 0 100		
Pt. Huenene, CA* Apt. Bldg. inside, 28 apts. treated	YES	6 stations/apt. average reduction of 87.6% after 4 weeks	After 4 weeks 3 apts with more than 2 ants and 6 with less than 2 ants.	

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TABLE III (cont)

			4 stations**		1 hr reduction due	
Gainesville, FL	NO		TIME	COUNT	%RED.	to ants hesitation
Neonatal ICU,			0	11.6		to enter station.
inside			1 hr	5.3		No feeding
			24 hr	7.7		activity observed
			1 wk	17.1		No reduction in
						ants.
<u>Crazy Ant</u>	Gainesville, FL	YES	12 stations			Ants foraged on
<u>(Paratrechina</u>	house, outside		DAY # ANTS	% RED.		bait throughout
<u>longicornis)</u>	walls		0	249		the test
			7	77	69	
	Gainesville, FL	YES	11 stations			Ants foraged on
	house, outside		DAY # ANTS	% RED.		bait throughout
	walls & porches		0	175		the test
			7	75	57	
			21	28	84	
<u>Red Imported</u>	Gainesville, FL	YES	3 stations			Ants swarmed the
<u>Fire Ant</u>	Townhouse, dresser,		DAY # ANTS	% RED.		bait. No ants
<u>(Solenopsis</u>	bathroom & porch		0	132		after 2 days
<u>invicta)</u>			7	0	100	
	Auburn, AL	YES	2 stations			Ants foraged
	outside		5 days, 40%			on bait after
			reduction.			5 mins.

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TABLE III (cont)

			2 stations**		
			TIME	COUNT	%RED.
Gainesville, FL Hospital, Patient room	YES		0	54.7	
			1 hr	45.3	17.3
			24 hr	21.3	61.1
			1 wk	0	100
Gainesville, FL House, patio, closets, bathroom, bedroom floor	YES		7		
			0	61	
			7	0	100
Argentine Ant ( <u>Iridomyrmex</u> <u>humilis</u> )	Auburn, AL outside	YES	2		
			5 days,	60%	
Odorous House Ant ( <u>Tapinoma</u> <u>sessile</u> )	Auburn, AL House, inside	YES	2		
			5 days,	100%	
Thief Ant ( <u>Solenopsis</u> <u>molesta</u> )	Auburn, AL House, inside & outside	YES	2		
			5 days,	100	

48 hrs later the baits used up. No ant activity after 48 hrs.

Ants fed on all but 1 station. 3 on patio empty on day 4. One in closet practically empty.

Ants feeding on bait in 1 hr. Total bait consumed.

Ants feed on bait within a hour.

Ants foraged on bait in a hour.

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TABLE III (cont)

Acrobat Ant ( <u>Crematogaster</u> sp.)	Auburn, AL outside	YES	2 stations 5 days, 100 reduction.	Ants feed on bait within a hour.
Florida Carpenter Ant	Gainesville, FL Entomology lab	YES	3 stations** TIME COUNT %RED 0 18.7 4 hr 12.6 32.6 24 hr 1.6 91.4 1 wk 2.3 87.7	Ants fed for 2-3 days only. Colony in next room died two weeks later.
Black Carpenter Ant ( <u>Camponotus</u> <u>pennsylvanicus</u> )	W. Milford, NJ House	YES	3 stations Yes	Pretreat: 10-15 ants observed daily. Post treat: dead ants observed daily.
	E. Windsor, NJ House	NO	3 stations No	Pretreat: 6-8 ants. Bait consumed and ant activity reduced in 3-4 days.
	Oakland, NJ House	NO	3 stations No	Pretreat: 6-8 ants. Ants gone 3-4 days after bait placement.

TABLE III (cont)

	Waldwick, NJ House	NO	3 stations Yes	Pretreat: 15-20 ants daily. Post treat: staggering ants around station.
	Lodi, NJ Two family home	NO	3 stations No	Pretreat: 10-15 ants. No ants after two weeks of bait placement.
	W. Milford, NJ House	YES	3 stations No	Pretreat: 20-30 ants. Ants seen entering station. Noticeable reductions.
Carpenter Ant	Wyckoff, NJ House	NO	3 stations No	Pretreat: 6-7 ants. Noticeable reduction after bait placement.
	Allendale, NJ House	YES	3 stations YES	Pretreat: 10-12 ants. Trail formed after bait placement. Staggering ants observed.



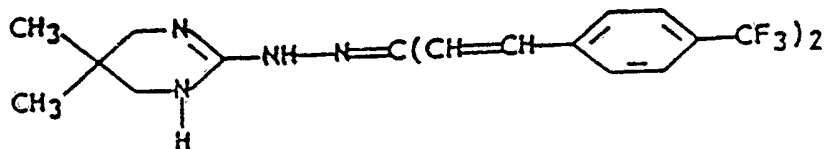
The claims defining the invention are as follows:

1. A non-particulating, as herein defined, insecticidal bait composition comprising a toxicant, a liquid sugar, a dried, ground protein composition, and a polymeric binder.

2. The composition of claim 1 wherein said protein composition is dried, ground silkworm pupa or fish meal, or a mixture thereof.

3. The composition of claim 1 or claim 2 comprising in addition a vegetable or grain oil.

4. The composition according to claim 1 wherein said toxicant is pyrimidinone-{3-[4-(trifluoromethyl)phenyl]-1-[2-[4-(trifluoromethyl)-phenyl]ethenyl]}2-propenylidene}hydrazone having the formula (I)



or a fatty acid salt thereof.

5. The composition of claim 4 wherein said protein composition is dried, ground silkworm pupa or fish meal, or a mixture thereof.

6. The composition of claim 4 or claim 5 containing in addition a vegetable or grain oil.

7. A non-particulating, as herein defined, insecticidal bait composition, substantially as herein described with reference to Example 1.

8. A method of controlling ants at a locus, comprising applying to the locus a composition of any one of claims 1 to 7 in an amount which effectively controls said ants.

DATED this TWENTY-SECOND day of JANUARY 1991

American Cyanamid Company

Patent Attorneys for the Applicant  
SPRUSON & FERGUSON



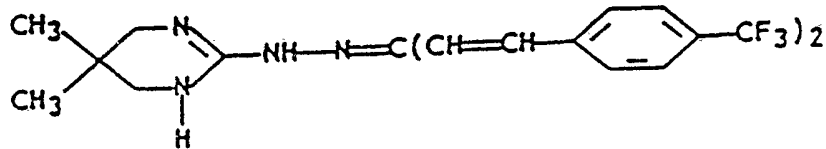
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4. The composition according to claim 1 wherein said toxicant is pyrimidinone-{3-[4-(trifluoromethyl)phenyl]-1-[2-[4-(trifluoromethyl)-phenyl]ethenyl]2-propenylidene}hydrazone having the formula (I)



or a fatty acid salt thereof.

5. The composition of claim 4 wherein said protein composition is dried, ground silkworm pupa or fish meal, or a mixture thereof.

6. The composition of claim 4 or claim 5 containing in addition a vegetable or grain oil.

7. A non-particulating, as herein defined, insecticidal bait composition, substantially as herein described with reference to Example 1.

8. A method of controlling ants at a locus, comprising applying to the locus a composition of any one of claims 1 to 7 in an amount which effectively controls said ants.

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