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MITICIDES

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U.S. Cl. 424—300 3 Claims

ABSTRACT OF THE DISCLOSURE

Miticidal agents containing a 3-dimethylamino-methyleneimino-phenyl-N-methyl carbamate, or their salts with inorganic or organic acids have an increased effect against phosphoric esterresistant mites and other insects.

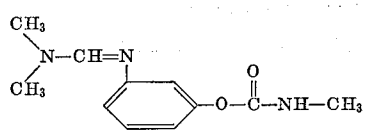
This invention concerns an agent with an increased effect against phosphoric ester-resistant mites, particularly phytoparasitic spider mites.

It is known that mites, (Acarina), and particularly spider mites, (Tetranychidae), become resistant to chemical agents which are used for their control. This resistance is built up by agents particularly on the basis of phosphoric esters, which belong to the best known and most effective acaricides. It was disconcerting that such resistance of the pests is directed not only against the active substance used, but against all other active substances which belong to the same class of compounds. Beyond that, a resistance is also observed against active substances of other compound classes provided they display their resistance, just like the resistance-causing active substance, apparently due to the inhibition of the cholinesterase enzyme in the animal body.

Various methods have already been shown to control pests that have become resistant. Thus, it was suggested in particular to reduce and apply compounds with a different mode of action, which does not exclude, however, that resistance can also develop against such new active substance, parallel to the former.

It was suggested several years ago to find compounds which are particularly effective against resistant pests that show a higher sensitivity than non-resistant normal animals, which is called "negative cross resistance," i.e., increased sensitivity induced by resistance. So far, however, only a few compounds having such properties have been found, which could not assert themselves in practice, because their effect as pest control agents was not satisfactory.

It was found that agents containing 3-dimethylamino-methyleneiminophenyl-N-methyl carbamate of the formula:



and/or their salts with inorganic or organic acids, in addition to their known effect against insects, and normally sensitive mites, also show an increased effect against phosphoric ester-resistant mites, particularly phytoparasitic spider mites. Such agents are therefore suitable for the control of these pests in an amount which is less than that generally used for normal sensitive mites.

The insecticidal and acaricidal effect of the above mentioned compound as well as of its salts is already known

from German Patent No. 1,169,194 and British Patent No. 987,381. Inferences on an effect, particularly against phosphoric ester-resistant mites, could not be drawn, however, from this known effect, because no such effect was found so far in insecticidal and acaricidal compounds of a similar constitution. Besides, it is a surprising and extremely rare phenomenon that the observed effect against phosphoric ester-resistant mites already sets in with concentrations which are usually below the amount necessary in practice to control non-resistant, that is, normal resistant mites. The finding that phosphoric ester-resistant mites can already be controlled with a smaller, and thus more economical, amount of the substances to be used according to the invention that non-resistant mites must therefore be considered a particularly inventive achievement.

By usual amounts we understand application concentrations of about 20 to 50 g. per liter spray broth, which must frequently be exceeded by a multiple when using known acaricides on the basis of phosphoric esters for the control of resistant pests, in order to ensure positive results.

The agent according to the invention, on the other hand, permits the successful controls of phosphoric ester-resistant mites with a lower and thus more economical concentration, which represents considerable technical progress. Resistant spider mites which can be controlled according to the invention are particularly those which show mortality values LC–50 of at least 50 p.p.m. (parts by weight active substance per million), compared to acaricidal phosphoric esters.

The agent according to the invention can be used per se in conjunction with other pest control agents, such as acaricides, insecticides or fungicides. Its preparation is effected in a manner customary for plant-protectives, using liquid or solid vehicles. Suitable liquid vehicles are, in addition to water, mineral oils or solvents; solid vehicles are, for example, bentonite, bleaching earth, gypsum, lime, kieselguhr, pyprophylite, silicon dioxide, talcum, or flours of vegetable origin, such as from cotton seeds or nut shells. The preparations may contain additives, such as emulsifiers, wetting agents, binders, stabilizers, propellant gases, odoriferous substances, attractants or repellents. The agents can be used among others as atomizable or sprayable substances, such as suspensions, emulsion or solutions.

The active substance, as mentioned above, is known in itself and can be produced according to methods known in the art.

The active substance to be used according to the invention can be applied as such and/or in the form of its salts with inorganic or organic acids, for example, the water-soluble hydrochlorides.

The content of active substance in the various preparations can vary within wide limits. It depends, among others, on the type of formulation and on the application method and amounts to about 0.1 to 90% by weight of the agent. As mentioned above, lower concentrations than usual are sufficient for the control of phosphoric ester-resistant mites. For example, 2 g. of active substance per 100 liter spray broth can be used as can be seen from Example 3, an increase up to 10 g. active substance per 100 liter spray broth already including the safety margin customary in practice.

The following illustrative examples will show the effect according to the invention, compared to the known acaricides.

EXAMPLE 1

The following table contains the LC_{50} values (lethal concentration with 50% mortality) which were obtained for female spider mites by means of the leaf piece method.

To this end, round leaf pieces with a diameter of 18 mm., punched out from bean leaves, were placed with the backside up on round foam supports in water-filled Petridishes in each of which were put 10 female spider mites. The treatment was effected with 4 mg. spray broth per qcm., using four concentrations, each decreasing by half, in the proximity of the anticipated LC–50 value. For each concentration, 4 leaf pieces were used with a total of 40 animals. The mortality values were calculated after 3 to 4 days in percent of the dead animals to the total sum of the test animals, and entered on so-called Log-Probit-paper (probability grading). Through the respective points, a line was drawn and the value of the 50% mortality read in percent active substance. As spider mites were used (a) a normal sensitivity laboratory strain of the greenhouse spider mite (*Tetranychus urticae* Koch)= N; (b) a general phosphoric-ester resistant strain of the carnation spider mite (*Tetranychus dinathica* Dosse)= SR; (c) a resistant strain obtained by selection with O,O-dimethyl-S-2-(ethyl-sulfinyl)-ethyl thiophosphate=MR.

Active Substance	LC/50 in p.p.m. N	SR	MR
3-dimethylaminomethyleniminophenyl-N-methylcarbamate	2.9	0.21	0.34
Phosphoricester:			
O,O.dimethyl-S-2-(ethylsulfinyl)-ethyl-thiolphosphate	0.6	250	330
O,O-diethyl-0-(2-isopropyl-4-methyl)-pyrimidyl-(6)-thionophosphate+0,0-diethyl-2,5-dichlorophenylmercaptomethyl-dithiophosphate (5:1)	10	----------	500
O,O-dimethyl-N-methylcarbamoyl-methyldithiophosphate	1	----------	68
O,O-diethyl-S-(3,4-dihydro-4-oxo)-1,2,3-benzotriazinyl-(3)-dithio-phosphate	1	80	----------
O,O-dimethyl-S-(3,4-dihydro-4-oxo)-1,2,3-benzotriazinyl-(3)-dithio-phosphate	6	100	----------
O,O-diethyl-N-isopropylcarbamoyl-methyldithiophosphate	0.8	600	----------
O,O-dimethyl-S-(5-methoxy-1,3,4-thiadi-azol-2-on-yl-(3)-methyl)-dithiophosphate	0.6	80	----------
Carbamates:			
4-methlymercapto-3,5-dimethyl-phenylmethylcarbamate	13	122	55
4-dimethylamino-3,5-dimethyl-phenylmethylcarbamate	25	----------	140

EXAMPLE 2

In this table, the LC_{50} values are compiled which are obtained in the treatment of fresh-laid spider mite eggs by killing the larvae emerging from the eggs (ovolarvicidal effect). To this end, female spider mites were placed on leaf pieces and left there for 24 hours to lay their eggs.

About 100 to 150 eggs were obtained on 3 leaf pieces from 30 females. After removing the females, the treatment was effected with 4 mg. spray broth per qcm., four concentrations, each decreasing by half, being used in the proximity of the anticipated LC_{50} value. The observation of the mortality of the young larvae was made 2 days after the proven emergence in the untreated controls and 7 days respectively actively after the treatment. The further evaluation was effected as described in Example 1.

Active substances	LC–50 in p.p.m. N	SR	MR
3-dimethylaminomethylenimino-phenyl-N-methylcarbamate	21	3	3.7
O,O-dimethyl-S-2-(ethylsulfinyl)-ethylthiolphosphate	7	ca.4,000	ca.5,000
O,O-diethyl-S-(3,4-dihydro-4-oxo)-1,2,3-benzotriazinyl-(3)-dithiophos-phate	7.4	40	----------

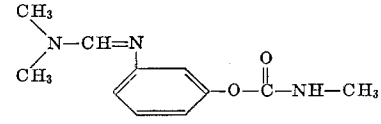
EXAMPLE 3

Potted bush bean plants in the 2-leaf stage were infected with all stages of the spider mites and sprayed on all sides dripping wet after 2 days with a solution and emulsion respectively of the agent to be tested. Then the plants were brought into the greenhouse and after washing the first 3-part leaflet, which was done after 10 days, the attack (B) on these leaves being estimated on the basis of the percentual portions of the white suction sports in the total leaf area. The estimated values were converted to effect (W). (W%)=100—B%.

Active substances	Conc., percent	Effect in percent N	MR	SR
3-dimethylaminomethyleneimino-phenyl-N-methylcarbamatehydro-chloride.	0.004	96	100	100
	0.002	70	100	100
	0.001	41	97	99
	0.0005	12	94	99
	0.00025	----------	51	82
	0.000125	----------	----------	78
O,O-dimethyl-S-2-(ethylsulfinyl)-ethylthiolphosphate.	0.4	----------	----------	96
	0.2	----------	----------	----------
	0.1	----------	----------	10
	0.05	----------	----------	0
	0.002	98	----------	----------
	0.001	97	----------	----------
	0.0005	90	----------	----------
	0.00025	23	----------	----------

What is claimed is:

1. A method of combating phosphoric ester resistant, phytoparasitic spider mites, comprising applying an effective amount of a spray broth containing as the active substance 3 - dimethylaminoethyleneiminophenyl N - methyl carbamate of the formula



or the hydrochlorides thereof onto infected plants, the amount of said active substance in the spray broth being in the range between 0.1 and 90% by weight thereof.

2. The method of claim **1** wherein the active substance is a hydrochloride.

3. The method of claim **1** wherein active substance is applied in a concentration of from about 2 grams to about 10 grams per 100 liters of spray broth.

References Cited

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