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PYRETHRIN SYNERGIST

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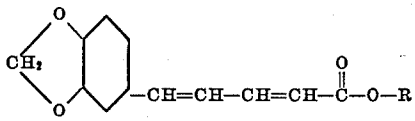
No Drawing. Application August 3, 1944, Serial No. 547,982

3 Claims. (Cl. 167—24)

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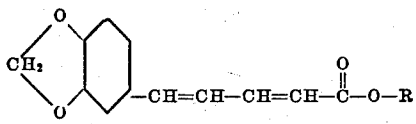
This invention relates to the esters of piperic acid and has for its object the provision of a new class of esters of piperic acid which are particularly suitable for insecticidal purposes. More particularly, the invention provides an improved insecticidal compound and composition. Insecticidal compositions of the invention, especially those comprising pyrethrin, or the like, are very efficient in combating insect pests, such as flies, moths, or mosquitoes.

I have discovered a class of esters of piperic acid, prepared by known methods of esterification, and having the formulae



where R is represented by a radical of the group consisting of ethyl, n-propyl, iso-propyl, n-butyl, allyl, benzyl, cinnamyl, and tetrahydrofurfuryl, which are suitable for insecticidal purposes. The compounds are exceptional synergistic agents in compositions comprising pyrethrin in a spray medium, advantageously in a mutual solvent. Spray compositions comprising one or more of the compounds and pyrethrin in a hydrocarbon or mineral oil, such as odorless kerosene or naphtha are especially effective insecticides.

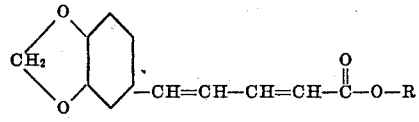
The aforementioned compounds increase the toxic effect of pyrethrin to a very marked extent and when they are incorporated in a suitable spraying medium with pyrethrin or like extracts the resulting composition has more killing effect against such insects as the ordinary housefly than the combined effects of the pyrethrin and the compound when used alone. The invention provides an improved insecticidal composition comprising one or more piperic acid esters of the group consisting of



where R is a radical of the group consisting of ethyl, n-propyl, iso-propyl, n-butyl, allyl, benzyl, cinnamyl, and tetrahydrofurfuryl, and pyrethrin in a liquid spray medium, for example, of hydrocarbon character, such as odorless kerosene or naphtha.

The synergistic effect of the compounds is shown in the following table in which the results were obtained by the Standard Peet-Grady method with five-day old flies as described on pages 92 to 98 of "Pyrethrum Flowers" by C. B. Gnadinger, 1936 edition, with compositions comprising compounds represented by the formulae

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in which the various compounds are identified by the radical R, and 0.025 gm. pyrethrins per 100 ml. of odorless kerosene:

R	Grams per 100 ml.	Per Cent Kill	OTI Per Cent Kill	Adj. Per Cent Kill
Ethyl	0.5	91	50	91
	0.25	68	46	73
β-Bromoethyl	0.5	87	56	82
n-Propyl	0.5	98	76	
	0.25	91	58	86
	0.125	77	56	72
Iso-propyl	0.5	100	58	98
	0.125	65	51	65
	0.06	81	56	76
β-Bromoisopropyl	1.0	98	35	99
	0.5	92	47	93
	0.25	84	46	85
	0.05	38	46	43
o-Chlorophenyl	0.1	63	46	65
	0.05	62	41	47
n-Butyl	0.5	98	68	94
	0.25	94	68	85
	0.125	90	63	79
2-nitroisobutyl	0.5	60	36	73
	0.25	71	47	73
n-Amyl	0.5	95	72	
	0.25	81	53	78
Allyl	1.0	93	35	97
	0.5	91	49	91
	0.25	63	48	63
	0.1	44	50	44
	0.05	32	46	34
Cinnamyl	1.0	65	47	80
	0.25	66	56	60
Benzyl	0.5	95	58	94
	0.25	82	56	77
Tetrahydrofurfuryl	0.25	94	58	91
	0.06	66	53	63
Bornyl	1.0	97	49	97
	0.5	79	47	80

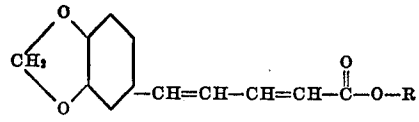
Compounds used without pyrethrins

R	Grams per 100 ml.	Per Cent Kill	Per Cent Knock-down	OTI Per Cent Kill	Adjusted Per Cent Kill
o-Chlorophenyl	0.05	0	70	40	0
Allyl	0.1	22	91	51	21
Tetrahydrofurfuryl	0.1	17	90	46	19

I claim:

1. An insecticidal composition comprising py-

rethrin and a compound represented by the formulae



where R is a radical of the group consisting of ethyl, n-propyl, iso-propyl, n-butyl, allyl, benzyl, cinnamyl, and tetrahydrofurfuryl.

2. An insecticidal composition according to claim 1 in which the compound and pyrethrin are dissolved in a hydrocarbon solvent.

3. An insecticidal composition according to claim 1 in which the compound and pyrethrin are dissolved in a mineral oil base solvent.

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