

PERSISTENCE OF SOME SYSTEMIC INSECTICIDES IN COWPEA, WHEN APPLIED AS GRANULES IN DIFFERENT SOIL TYPES OF KERALA

N. M. DAS, D. DALE and K. SASIDHARAN PILLAI

College of Agriculture, Vellayani, Kerala

Application of systemic insecticides, as granules in soil, will be more effective and economical if there is sufficient persistence to keep the crop free of pests particularly in early stages of growth. It will also cause less destruction of the natural enemies of various pests associated with the crop. The persistent toxicity of insecticides will also be influenced by conditions of the soil in which the crop is grown. No information on these aspects are available with reference to the different crops and soil types of Kerala. Hence a pot culture experiment was carried out at the College of Agriculture, Vellayani with a view to finding out the persistence of four systemic insecticides in cowpea, when applied as granules in different soil types in which the plants were grown.

Materials and Methods

'Philippines' variety of cowpea was used in these experiments. Five different types viz sandy, laterite, red, forest and black soils were collected from representative tracts in the State. Phorate (thimet), carbofuran (furadan), mephosfolan (cytolane), disulfoton (solvirex) were the insecticides used. Each insecticide was applied at three different doses viz, 1.0, 0.75 and 0.5 kg. ai/ha. Flower pots (45 cm dia.) were filled to $\frac{1}{2}$ with different types of soil and one cowpea seed was sown in each. Manuring, fertilisation and watering were done uniformly for all the treatments. The required quantities for each dose of the insecticides was applied in three pots for each soil type, two days after the sowing of seeds. Three pots without any insecticide were maintained for each type of soil as control.

The persistent toxicity of the insecticides was assessed by liberating the pea aphid *Aphis craccivora*, on the tender growing shoots of the plants which were then enclosed in muslin cloth cages supported inside by galvenised iron wire frames. The mortality of the aphids was observed at the end of 48 hours. PT indices for comparing the persistent toxicity were calculated by a method adopted by Pradhan (1967) where P is the period for which the toxicity persisted and T is the average per cent mortality.

Results and Discussion

The persistent toxicity of various insecticides is presented in Table 1. It is seen that disulfoton ranks top in toxicity with reference to all the different types of soils used. The order of persistent toxicity of the other insecticides to *A. craccivora*

Table I

Persistent toxicity of various systemic insecticides to the pea aphid *Aphis craccivora* when applied as granules in soil (PT indices)

Treatments	kg ai/ha.	Type of soil				
		Sandy	Laterite	Red	Forest	Black
Phorate	1.00	4480	4340	4200	4420	2520
Carbofuran	1.00	3080	4900	4200	4200	4200
Mephosfolan	1.00	4620	3780	4340	4480	4060
Disulfoton	1.00	5040	5180	5040	4900	5180
Phorate	0.75	2835	2625	3500	3920	2205
Carbofuran	0.75	2380	3640	3520	3920	3920
Mephosfolan	0.75	3080	2540	3640	3920	2940
Disulfoton	0.75	4760	4900	4760	4480	4900
Phorate	0.50	2310	2100	1785	2940	1190
Carbofuran	0.50	1260	2380	2100	2625	2520
Mephosfolan	0.50	1995	1680	2205	3640	1785
Disulfoton	0.50	4620	4480	4480	4480	4340

was mephosfolan > phorate > carbofuran in sandy and forest soils; carbofuran > phorate > mephosfolan in laterite soils; mephosfolan > phorate > carbofuran in red soil and carbofuran > mephosfolan > phorate in black soil. It is seen that the soil condition influences the persistence of the insecticides in plants. Disulfoton was the best in controlling *A. craccivora* on pea plants grown in all types of soil and mephosfolan was next best in sandy, red and forest soil whereas carbofuran was next to disulfoton in laterite and black soils.

The mean yield in various treatments is recorded in Table 2. The yields in most of the treatments were significantly higher than those of corresponding controls. But there was no direct correlation between the persistent toxicity of various insecticides observed and the yield data. It was mainly because of the low natural infestation of *A. craccivora* during the period of experiment. In sandy and

Table 2
Mean yield of cowpea plants (in g) grown in soil treated with various systemic insecticides

Treatments	kg ai/ha.	Type of Soil				
		Sandy	Laterite	Red	Forest	Black
Phorate	1.0	131.66	143.30	170.00	190.00	171.60
Carbofuran	1.0	110.00	185.00	136.60	130.00	106.60
Mephosfolan	1.0	108.00	153.00	120.00	113.30	145.00
Disulfoton	1.0	140.00	140.00	105.00	191.60	75.00
Phorate	0.75	113.33	130.00	85.00	150.00	120.00
Carbofuran	0.75	100.00	170.00	170.00	150.00	120.00
Mephosfolan	0.75	95.00	108.30	133.30	96.60	95.00
Disulfoton	0.75	115.00	75.00	113.30	170.00	78.30
Phorate	0.5	91.66	130.00	70.00	106.60	95.00
Carbofuran	0.5	115.00	130.00	161.60	85.00	60.00
Mephosfolan	0.5	61.66	115.30	110.00	95.00	91.60
Disulfoton	0.5	121.66	83.30	170.00	175.00	80.00
Control	—	61.66	48.30	56.60	76.00	75.00
C. D.	—	35.79	38.01	54.79	35.66	35.18

Data significant at 0.01 per cent level.

forest soils solvirex-treated plants recorded the highest yield. In laterite soil, carbofuran gave the best yield. In red soil, phorate, carbofuran and mephosfolan gave the best yield in the highest, middle and lowest doses respectively. In black soil phorate-treated plants gave the best yield. The yield data indicates that the application of insecticides in soil influences the plant growth by favouring some soil factors apart from the control of insect damage.

Summary

A pot trial was conducted to study the persistent toxicity of phorate, carbofuran, mephosfolan and disulfoton to the pea aphid, *Aphis craccivora* on cowpea

grown in sandy, laterite, red, forest and black soils treated with the above insecticides as granule. The persistent toxicity was highest in plants treated with disulfoton in all types of soils. Mephosfolan was next best in sandy, red and forest soils whereas carbofuran was next to disulfoton in laterite and black soils. The yields obtained from treated plants were significantly higher than those of corresponding controls. But there was no direct correlation between the persistent toxicity of insecticides and the yield. The yield factor appears to be influenced by the impact of the insecticide on some soil factors favouring plant growth.

സംഗ്രഹം

ഫോറോൻ, കാർബോഫ്യൂറാൻ, മിഫോസ്ഫോലാൻ, ഡൈസൽഫോട്ടോൺ എന്നീ തരിരൂപത്തിലുള്ള കീടനാശിനികളുടെ വിഷവീര്യം മണൽ, ചരൽ, ചെമ്മണ്ണു, വനമണ്ണു, കരിമണ്ണു എന്നീ മണ്ണിനങ്ങളിൽ പയർച്ചെടിയെ ബാധിക്കുന്ന മുഞ്ഞ (എഫിസ് ക്രാക്കവോറാ) കൈതിരായി എത്രകാലം നീണ്ടുനിൽക്കുമെന്ന് മനസ്സിലാക്കാനായി ഒരു പോട്ടുകുറച്ചർ പരീക്ഷണം നടത്തി. അതിൽ ഡൈസൽഫോട്ടോൺ എല്ലാ ഇനം മണ്ണുകളിലും ഏറ്റവും കൂടുതൽ കാലം നിലനിൽക്കുന്നതായും അടുത്തതായി fflffirLDOcro-GojDoejoGJ, മണൽ, ചെമ്മണ്ണു, rum മണ്ണു എന്നിവയിലും കാർബോഫ്യൂറാൻ, ചരൽ, കരിമണ്ണു, എന്നിവയിലും നിലനിൽക്കുന്നതായി കാണപ്പെട്ടു. കീടനാശിനി ഉപയോഗിച്ച എല്ലാ ചെടികളിൽനിന്നും വളരെ ഉയർന്ന തോതിലുള്ള വിളവുലഭിച്ചുവെങ്കിലും വിഷവീര്യത്തിന്റെ നിലനിൽപ്പും വിളവുമായി ബന്ധം കണ്ടില്ല. കീടനാശിനികളും ffl|fg> rancaTejggjiv.jtnT പ്രവർത്തനമായിരിക്കണം ഉയർന്ന തോതിലുള്ള വിളവിന് കാരണം.

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