Research Paper :

Bio-efficacy of Botanicals and Chemical Insecticides for the Control of Castor Leaf Miner (*Liriomyza trifolii* Burgess) under Dry Land Condition

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SUMMARY

Field experiments were conducted with eight treatments *viz.*, Carbaryl 50 WP 0.2 per cent, Endosulfan 35 EC 0.05 per cent, Triazophos 40 EC 0.05 per cent, Spinosad 45 SC 0.018 per cent, Fipronil 5 SC 0.01 per cent, Neem seed extract 5 per cent (w/v), *Bacillus thuringiensis* 0.1 per cent and untreated control for the control of serpentine leaf miner (*Liriomyza trifolii* B.) on castor cultivar DCS-9 during *kharif* seasons of 2007-08 and 2008-09. The spray fluid @ 500 L ha^{-1} was used in each of the treatment. Two sprays of all the treatments except untreated control were applied 30 and 45 DAS. The treatment with 0.018 per cent Spinosad was the most effective in suppressing leaf miner incidence and produced good seed yield (883.28 kg ha^{-1}) followed by 0.05 per cent Triazophos (835.82 kg ha^{-1}). The other treatments were found relatively less effective for leaf miner control particularly under dry land conditions.

Key words : Bio-efficacy, Botanicals, Insecticides, Castor leaf miner, *Liriomyza trifolii*

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Castor (*Ricinus communis* L.) is an important non-edible oilseed crop grown throughout the world (more than 30 countries). However, the production of castor seed is confined mainly to India, China and Brazil, whereas its consumption is higher in EU countries, USA and Japan. The total castor seed and castor oil production of the world is 13.27 lakh MT and 5.47 lakh MT, respectively. In India, it is grown on 7.13 lakh ha area under rain fed conditions which yields about 8.50 lakh MT of castor seeds and 3.36 lakh MT of castor oil.

The crop is infested by a number of insect pests (Rai, 1976), the most important are the defoliators *viz.*, leaf miner (*Liriomyza trifolii* B.), semiloopers (*Achoea janata* L.) and tobacco caterpillar (*Spodoptera litura* F.). The magnitude of the pest problem is quite high, mostly in rain fed areas. The serpentine leaf miner is a polyphagous pest feeding on seventy nine host plants belonging to various vegetables, ornamentals and field crops (Srinivasan *et. al.*, 1995). In India, it was first recorded on castor as a new host during rainy season 1991 (Lakshminarayana *et. al.*, 1992). *Liriomyza trifolii* has high potential for the development of resistance to commonly used pesticides. Moreover, this pest is assuming importance on castor in recent years because of the wide host range, ability to survive and multiply over wide range of seasonal conditions and low sensitivity to common insecticides. Larva causes extensive damage to mesophyll tissues of leaves, which turn parchment-white and affect photosynthesis. It is thus, of utmost importance to undertake timely, effective and reliable management of this pest. Present investigation was therefore, undertaken with an objective to assess the efficacy of different insecticides and bio-pesticides in controlling the serpentine leaf miner.

MATERIALS AND METHODS

The field experiments were conducted at Zonal Agricultural Research Station, MPKV, Solapur- 413 002 (M.S.) during *kharif* 2007-2008 and 2008-09. The susceptible cultivar DCS-9 was selected for sowing. Similar cultural and agronomic practices were followed in all the plots. Total eight treatments including absolute control (Table 1) were considered for the evaluation. The sowing was done at 90 x 45 cm spacing in the gross plots of 5.40 x 6.00 m^2 with three replications. Two sprays were given at 30 and 45 DAS. The periodical observations on the incidence of leaf miner *i.e.* number of mines plant $^{-1}$ were recorded after both the sprays in top, middle and bottom leaves of five randomly selected plants in each plot. Seed yield (kg ha^{-1}) was recorded at harvest. The data were analyzed by following RBD (Panse and Sukhatme, 1967).

Table 1 : Bio-efficacy of pesticides for the control of leaf miner on castor (pooled)

Treatment	Average leaf mines plant^{-1} after application						Seed yield (kg ha^{-1})		
	Ist spray			IInd spray					
	07-08	08-09	Mean	07-08	08-09	Mean	07-08	08-09	Mean
Carbaryl 50 WP 0.2 %	14.39	12.33	13.36	17.28	17.00	17.14	651.40	529.83	590.62
Endosulfan 35 EC 0.05%	17.17	15.00	16.08	15.33	18.00	16.67	641.65	362.14	501.90
Triazophos 40 EC 0.05%	16.11	08.00	12.06	15.39	12.00	13.69	1015.27	656.38	835.82
Spinosad 45SC 0.018 %	13.55	07.00	10.28	15.28	10.67	12.97	1072.12	694.44	883.28
Fipronil 5 SC 0.01%	15.52	20.00	17.76	19.39	22.33	20.86	527.94	432.09	480.02
Neem Seed Extract 5 %	15.50	21.00	18.25	18.11	23.00	20.56	360.62	370.37	365.50
Bacillus thuringiensis 0.1 %	16.17	17.33	16.75	16.28	23.33	19.81	334.63	308.64	321.64
Control	24.27	26.33	25.30	25.28	30.00	27.64	073.10	149.17	111.14
S.E.±	00.98	00.66	00.59	01.77	01.15	01.06	022.79	045.64	025.51
C. D. (P=0.05)	02.98	01.99	01.70	05.38	03.50	03.06	069.12	138.43	073.89
CV %	10.25	07.14	-	17.26	10.23	-	006.75	018.05	-

RESULTS AND DISCUSSION

Pooled and individual year data on leaf damage by leaf miner and seed yield as influenced by different treatments are given in Table 1. Results revealed that the leaf mines due to leaf miner after both the sprays were significantly influenced by the treatments studied. However, significantly highest damage (25.30 and 27.64 mines plant^{-1}) was recorded in absolute control over rest of treatments. Among the treatments, Spinosad 45 SC 0.018 per cent recorded the minimum leaf damage of 10.28 and 12.97 mines plant^{-1} after first and second sprays, respectively and thus controlled the leaf miner very effectively. However, after second spray, Spinosad was statistically at par with Triazophos 40 EC 0.05 per cent (13.69 mines plant^{-1}); Triazophos was at par with Endosulfan 35 EC 0.05 per cent (16.67 mines plant^{-1}); Endosulfan was at par with Carbaryl 50 WP 0.2 per cent (17.14 mines plant^{-1}) and Carbaryl was at par with *Bacillus thuringiensis* 0.1 per cent (19.81 mines plant^{-1}).

The data on seed yield revealed that significantly highest seed yield of 883.28 kg ha^{-1} was obtained from 0.018 per cent Spinosad, which was however at par with 0.05 per cent Triazophos (835.82 kg ha^{-1}) and were significantly superior over rest of the treatments. This was followed by 0.2 per cent Carbaryl 50 WP (590.62 kg ha^{-1}), 0.05 per cent Endosulfan 35 EC (501.90 kg ha^{-1}) and 0.01 per cent Fifronil 5 SC (480.02 kg ha^{-1}). The yield level of 2008-09 was low as compared to 2007-08 due to scanty and delayed rainfall during the season. The overall results showed that the protected crop recorded significantly less average number of leaf mines plant^{-1} due to castor leaf miner than the unprotected crop under field condition. A significantly highest seed yield and less leaf damage was recorded in the plots treated with 0.018 per cent Spinosad followed by 0.05 per cent Triazophos.

The castor yield losses due to defoliators were reported earlier (Anonymous, 2006). The susceptibility of cv. DCS-9 to serpentine leaf miner (*Liriomyza trifolii* B.) on castor was also reported by the earlier workers (Prasad and Anjani, 2001; Boreddy *et.al.*, 2003). Efficacy of insecticides on defoliator is supported by Ahuja *et.al.*, 1998. Singh and Kanujia, (2003) reported NSKE to be less effective against the defoliator which is in agreement with the present findings. It was also reported that the commonly recommended insecticides for the control of insect pests in castor *viz.*, monocrotophos, acephate and quinalphos increased the incidence of leaf miner. Only methyl oxydemeton 0.05 per cent, dimethoate 0.05 per cent and neem formulation (neem guard 0.5 %) contained the infestation as that of untreated control (Anonymous, 2006).

Conclusion:

Above results showed that the two sprays either of 0.018 per cent Spinosad or 0.05 per cent Triazophos or each one alternatively at 30 days after sowing and second at 45 days after sowing were found effective for the control of serpentine leaf miner as well as for producing the good seed yield of castor under dry land conditions. The pest incidence observed in untreated control coupled with lowest seed yield indicated the importance of castor leaf miner management through such newer insecticides as an alternative to the earlier recommended one.

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