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EVALUATION OF INSECTICIDES FOR THE CONTROL OF MAJOR PEST COMPLEX OF RADISH

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Chemical control of major pest complex of radish grown for its edible root was studied over three seasons at Bangalore. Results revealed that insecticide sprays were not necessary when the crop is either attacked by flea beetles alone or by flea beetles and lepidopterous pests at late crop growth stages, since it did not affect the marketable yield. However, there was a need to resort to insecticide sprays when the crop was attacked by both flea beetles and mustard sawfly. Significant reduction of both the pests was observed after application of 0.07% endosulfan, 0.05% monocrotophos, 0.07% phosalone, 0.05% methyl parathion, 0.01% fenvalerate and 0.0014% deltamethrin, with a consequent increase in yield.

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Radish (*Raphanus sativus* Linnaeus) is an important cruciferous crop grown in and around Bangalore for its edible root (Anon, 1983). Radish is attacked by flea beetles, *Phyllotreta downsei* Baly, diamondback moth, *Plutella xylostella* (Linnaeus), leaf-webber, *Crocidolomiabinotalis* Zeller and mustard sawfly, *Athalia lugens proxima* klug. A perusal of literature revealed that chemical control of mustard sawfly has been conducted in other localities in India eg. Poona (Patil and Pokharkar, 1973), Kanpur (Pandey *et al.*, 1977; Pandey *et al.*, 1979) and Kolhapur (Jagtap and Kadam, 1981). However, no attempt has been made to evaluate effectiveness of chemicals for the control of all these pests that occur on radish in different seasons of the year. To this end, field experiments were conducted for the control of pests of radish grown for its edible root and the results are presented in this paper.

Table 1. Efficacy of insecticides for the control of flea beetles on radish (Summer, 1985) (Figures in parenthesis denote log$_e$ (x+2) transformations)

Treatments	Concentration (%)	Population of flea beetles/plant on different days after I Spray 7	I Spray 14	II Spray 7	II Spray 14	Mean marketable yield(q/ha)
Endosulfan	0.07	0.80 (1.02)	0.47 (0.90)	0.10 (0.74)	0.23 (0.80)	33.93
Dichlorvos	0.1	0.43 (0.88)	0.60 (0.95)	0.53 (0.92)	0.13 (0.76)	30.04
Monocrotophos	0.05	0.77 (1.01)	0.33 (0.85)	0.33 (0.85)	0.40 (0.87)	31.35
Phosalone	0.07	0.47 (0.90)	0.70 (0.99)	0.03 (0.71)	0.27 (0.81)	26.93
Methyl parathion	0.05	0.70 (0.98)	0.60 (0.94)	0.00 (0.69)	0.03 (0.71)	29.31
Fenvalerate	0.01	0.77 (1.01)	0.83 (1.04)	0.00 (0.69)	0.00 (0.69)	35.53
Deltamethrin	0.0014	1.03 (1.11)	0.47 (0.89)	0.10 (0.74)	0.23 (0.80)	35.82
Control		0.67 (0.98)	2.43 (1.49)	3.20 (1.65)	4.03 (1.80)	23.13
CD 5%		NS	(0.19)	(0.16)	(0.11)	NS

NS : Non Significant

MATERIALS AND METHODS

Three field experiments in randomised block design were laid out with variety "Arka Nishant" during the summer (April - Map), rainy season (June-July) and winter (October-November) of 1985. Three replications were maintained. The individual plot size was 15m^2 . Treatments consisted of i) 0.07% endosulfan (Thiodan 35 EC) ii) 0.1% dichlorvos (Nuvan 100) iii) 0.05% monocrotophos (Nuvacron 40 EC) iv) 0.07% phosalone (Zolone 35 EC) v) 0.05% methyl parathion (Metacid 50 EC) vi) 0.01% fenvalerate (Sumicidin 20 EC) vii) 0.0014% deltamethrin (Decis 2.8 EC) and viii) Control (untreated check).

Two sprays of chemicals were applied on 15 and 30 days after sowing. Counts of insects were taken on ten plants selected at random 7 and 14 days after each spray. Marketable yield of radish was expressed as Q/ha.

RESULTS AND DISCUSSION

During the summer of 1985, radish was attacked by flea beetles alone. Except for the counts made 7 days after first spray, all other observation records showed significant reduction of flea beetles among the treated plots as against control. The marketable yield recorded in all the treatments including control however, was not significant (Table 1). Radish puts forth numerous succulent leaves immediately after gerimination. Damage due to flea beetles results in appearance of tiny feeding holes on the leaves. Since the marketable yield of edible root was not significantly different among all the treatments, it is inferred that normal flea beetle damage does not warrant any insecticide application.

Incidence of flea beetles during the entire crop growth period and lepidopterous pests *viz*. diamondback month and leafwebber at late crop growth stage (around 29 days after sowing) was observed during the rainy season experiment. All the insecticides tested were equally effective in controlling flea beetles A similar trend was also observed for the control of diamondback month and leafwebber on all days of observation (Table 2). There was no significant difference in the marketable yield of edible root in various treatments (Table 2). This showed tolerance of radish to attack by flea beetles and lepidopterous pests (at late crop growth stage) without significant effect on marketable yield of produce.

Sufficient build up of flea beetles was observed even from early crop growth stages during the winter trial as is evidenced from pre treatment counts. All the insecticides proved effective in controlling flea beetles 7 and 14 days after first and second sprays (Table 3). Mustard sawfly also occurred in addition to to flea beetles during the winter trial. It was observed that application

Table 2 Efficacy of insecticides for the control of flea beetles (FB), diamondback moth (DBM) and leafwebber (LW) on radish (Rains, 1985)
(Figures in parenthesis denote $\log_e (X+2)$ transformations)

Treatments	Concentration %	Pretreatment Counts (FB)	Population of insects/plant on different days after I Spray 7 (FB)	I Spray 14 (FB)	II Spray (7 FB)	I Spray 14 (DBM)	II Spray[a] 7 (DBM)	II Spray[a] 7 [LW]	Mean marketeble yield (Q/ha)
Endosulfan	0.07	0.20 (0.07)	0.03 (0.71)	0.10 (0.74)	0.00 (0.69)	0 00 (0.69)	0.06 (0.73)	0.33 (0.84)	213.99
Dichlorvos	0.1	0.06 (0.72)	0.00 (0.69)	0.06 (0.72)	0.00 (0.69)	0.03 (0.71)	0.00 (0.69)	0.17 (0.77)	223.55
Monocrotophos	0.05	0.03 (0.71)	0.00 (0.69)	0.10 (0.74)	0.00 (0.69)	0.017 (0.77)	0.06 (0.72)	1.03 (1.06)	252.44
Phosalone	0.07	0.03 (0 71)	0.00 (0.69)	0.33 (0.95)	0.00 (0.69)	0.20 (0.79)	0.13 (0.76)	2.00 (1.32)	249.44
Methyl Parathion	0.05	0.00 (0.69)	0.00 (0.69)	0.10 (0.74)	0.03 (0.71)	0.00 (0.69)	0.03 (0.71)	2.03 (1.31)	225.55
Fenvalerate	0 01	0.00 (0.69)	0.00 (0.69)	0.67 (0.72)	0.00 (0.69)	0.10 (0.74)	0.06 (0.73)	0.06 (0.72)	213.77
Deltameterin	0.0014	0.00 (0.69)	0.00 (0.69)	0.13 (0.76)	0.00 (0.69)	0.33 ((0.71)	0.10 (0.74)	0.00 (0.63)	232.22
Contror		0.00 (0.69)	1.17 (1.15)	0.87 (1.05)	1.77 (1 32)	0.83 (1.03)	0.73 (1.00)	12.10 (2.63)	165.77
CD 5%		NS	(0.07)	(0.13)	(0.11)	(0.14)	(0.07)	(0.56)	NS

1. Counts of FB was negligible on 14 days after II spray
2. Counts of DBM prior to treatment, 7 days after I spray and 14 days after II spray was negligible
3. Counts of LW prior to treatment, 7 and 14 days after I spray and 14 days after II spray was negligible
4. NS ; Non significant

Table 3. Efficacy of insecticides for the control of flea beetles on radish (Winter, 1985)
(Figures in parenthesis denote $\log_e (x+2)$ transformations)

Treatments	Concentration (%)	Pretreatment count	Population of flea beetle/Plant on different days after I Spray		II Spray	
			7	14	7	14
Endosulfan	0.07	1.16 (1.15)	0.33 (0.85)	0.90 (1.06)	1.03 (1.11)	2.70 (1.54)
Dichlorvos	0.1	1.26 (1.17)	0.20 (0.78)	0.80 (1.03)	0.33 (0.85)	2.10 (1.38)
Monocrotophos	0.05	0.76 (1.01)	0.33 (0.83)	0.53 (0 92)	0.03 (0.71)	2.00 (1.33)
Phosalone	0.07	1.53 (1.26)	0.43 (0.89)	0.93 (1.07)	0.46 (0.84)	1.76 (1.32)
Methyl Parathion	0.05	1 43 (1.23)	0.33 (0.84)	0.90 (1.06)	0.33 (0.85)	2.63 (1.53)
Fenvalerate	0.01	1.50 (1.24)	0.44 (0 87)	0.76 (0.02)	0.46 (0.90)	2.20 (1.42)
Deltamethrin	0.0014	1.53 (1.25)	0.36 (0.86)	0.80 (1.03)	0.73 (1.00)	1.70 (1.27)
Control	—	1.56 (1.26)	2.83 (1.58)	3.70 (1.74)	3.00 (1.60)	5.16 (1.96)
CD b%		NS	(0.11)	(0.15)	(0.12)	(0.33)

NS : Non Significant

of endosulfan. monocrotophos, phosalone, methyl parathion, fenvalerate and deltamethrin consistently provided effective control of larvae as compared to application of dichlorvos. Significant yield increase was also obtained in these treatments in consonance with reduction of sawfly population (Table 4).

An analysis of foregoing reports clearly indicated that insecticide sprays are not necessary when radish is attacked by either flea beetles alone or affected by flea beetles and lepidopterous pests at late crop growth stages. There was a necessity to resort to spray applications only when the crop is affected by flea beetles and mustard sawfly.

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Table 4. Efficacy of insecticides for the control of mustard sawfly on radish (Winter, 1985) Figures in parenthesis denote $\log_e (X+2)$ transformations

Treatments	Concentration %	*Population/plant on different days after I Spray		II Spray		Mean marketable yield Q/ha	
		7	14	7	14		
Endosulfan	0.07	0.00 (0.69)	0.86 (1.05)	0.23 (0.80)	0.13 (0.76)	161.77	ab
Dichlorvos	0.1	0.00 (0.69)	0.66 (0.97)	0.00 (0.69)	0.56 (0.94)	126.89	bc
Monocrotophos	0.05	0.00 (0.69)	0.43 (0.89)	0.00 (0.69)	0.00 (0.69)	172.22	a
Phosalone	0.07	0.00 (0.69)	0.73 (1.01)	0.10 (0.94)	0.06 (0.72)	184.22	a
Methyl Parathion	0.05	0.00 (0.69)	0.56 (0.94)	0.03 (0.71)	0.03 (0.71)	182.66	a
Fenvalerate	0 01	0.00 (0.69)	0.10 (0.74)	0.00 (0.69)	0.00 (0.69)	183.99	a
Deltamethrin	0.0014	0.00 (0.69)	0.16 (0.77)	0.00 (0.69)	0.13 (0.75)	169.22	ab
Control	—	2.33 (1.56)	5.20 (1.97)	2.90 (1.58)	3.33 (1.67)	106.77	c
CD 5%		(0.09)	(0.11)	(0.09)	(0.13)		

* Negligible population of mustard sawfly was recorded during pretreatment counts and hence data was not analysed

Means in the same column with letters in common are not significantly different

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