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Study on different insecticide application methods against white grub, *H. consanguinea*.

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Abstract

A field experiment comprised of two insecticides with four different application methods tested against white grub on groundnut was conducted in endemic area of Junagadh District at Oil Seed Research Station, Manavadar. Different methods of insecticides application (Seed treatment, Drenching, Chemigation and Broadcasting) in groundnut against the white grub, seed treatment of clothianidin 50% WDG (ST) @ 250 gm per ha and chlorpyrifos 20% EC (ST) @ 4000 ml per ha were found most effective treatments against white grub in groundnut and maximum yield can be found. Although, seed treatment with clothianidin 50% WDG (ST) @ 250 gm per ha was the most profitable treatment (NICBR = 1:2.42).

Keywords: White grub, application methods, insecticides, *H. Consanguinea*, clothianidin, chlorpyrifos

Introduction

The term white grub or root grub is applied to immature stage of beetles popularly known as cochafer, chafers beetle, May beetle or June beetles. They belong to the family Scarabaeidae of the order Coleoptera. White grub are hidden enemies of field crops because much of their life cycle is subterranean and remain unnoticed even after complete destruction of a healthy crop. In India out of 171 species of white grub, 12 are of major importance and 14 are of major importance for Gujarat state (Kapadia *et al.* 2006) ^[1]. Adult collection and insecticidal applications are the major tactics of management followed against all the white grub species (Veeresh, 1974 and Raodeo *et al.* 1976) ^[8, 4]. Yield reduction occurs because larvae kill plants in the seedling stage and impair pod production by weakening the plants. White grubs also damage pods causing direct yield losses. Maximum damage occurs when the grubs are in 3rd instar. It is known fact that this pest showed certain levels of behavioural resistance to different class of insecticides, successful control of this pest is very difficult. So, modified to the application methods of insecticides, and tested different methods and insecticides against white grub in Groundnut crop.

Research methodology: Field experiments were conducted in endemic area of Junagadh District at Oil Seed Research Station, Manavadar. Study about the efficacy of insecticides against white grub, *H. consanguinea* infesting groundnut during 2017.

Treatment Details

Treatments	Common name	Method of Application	Dose g or ml.a.i.ha ⁻¹	g or ml formulation per ha
T ₁	Chlorpyrifos 20EC	Seed treatment (ST)	800	4000 ml
T ₂	Chlorpyrifos 20EC	Drenching (D)	800	4000 ml
T ₃	Chlorpyrifos 20EC	Chemigation (C)	800	4000 ml
T ₄	Chlorpyrifos 20EC	Broadcasting (B)	800	4000 ml
T ₅	Clothianidin 50WDG	Seed treatment (ST)	125	250 g
T ₆	Clothianidin 50WDG	Drenching (D)	125	250 g
T ₇	Clothianidin 50WDG	Chemigation (C)	125	250 g
T ₈	Clothianidin 50WDG	Broadcasting (B)	125	250 g
T ₉	Untreated control	-	-	-

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The experiment design for Randomized Block Design with nine treatments and three replications, the plot size was 5.0m x 3.6m and plant spacing was 60×10cm. The crop was raised following the recommended agronomic practices except plant protection measures. The application of different insecticides was done by given below methods:

Seed Treatment

In this method recommended dose of pesticides were used for the seed dressing. It was mixed thoroughly with hands after wearing hand gloves. Treated seeds were allowed to dry on the plastic sheet at least for 3 to 4 hours under the shade and treated seeds were used for sowing within few hours.

Drenching Method

In this method recommended dose of pesticide were applied with the help of knapsack sprayer. Nozzle of sprayer was relaxed and pesticide was drenched near root zone.

Chemigation Method

In this method recommended dose of pesticide were applied with the irrigation water near to the root zone of the crop in the furrow.

Broadcasting

In this method recommended dose of pesticide were mix with the sand particles and applied in the crop in the furrow by hand in broadcasting manner and after that light irrigation was applied.

The experiment observations are recorded total number of plants and plants damaged by white grub were recorded at 30, 45, 60, 75 and 90 days after germination. The damaged plant

was removed after each count. From these data, per cent plant mortality due to White grub was calculated. White grub population were recorded from one square meter are in each plot by digging soil up to 50 cm deep. The data thus obtained was analysed by $\sqrt{x+0.5}$ transformation statistical methods.

Result and Discussion: The plant mortality due to white grub in different insecticidal treatment was significantly low as compared to untreated plots at 30, 45, 60, 75 and 90 days after germination (DAG). Result thus, obtained are presented in (Table-1).

30 days after germination

Observations recorded 30 days after germination indicated that all the treatments were found significantly superior over untreated control. The treatment of clothianidin 50% WDG (Seed Treatment-ST) @ 250 gm per ha (5.74%) was significantly superior over all other treatments and at par with chlorpyriphos 20% EC (ST) @ 4000 ml per (7.41%). The mortality of the plants varies from 5.74 to 20.33 per cent as compared to 30.42 per cent in untreated control.

45 days after germination

In treatment clothianidin 50% WDG (Seed Treatment- ST) @ 250 gm per ha was found significantly superior over all other treatments and recorded 6.87 per cent plant mortality however, it was at par with treatment of chlorpyriphos 20% EC (ST) @ 4000 ml per were 7.64 per cent plant mortality. In untreated control 31.83 per cent plant mortality was observed. The mortality of plants varied from 6.87 to 25.85 per cent of treatments.

Table 1: Study on different insecticide application methods against white grub in groundnut

Sr. No.	Treatment	g or ml formulation per ha	Plant Mortality (%)					Average Number of Grub/m ²
			30 DAG*	45 DAG	60 DAG	75 DAG	90 DAG	
1	Chlorpyriphos 20% EC ST	4000	1.66** (7.41)	1.77 (7.64)	2.11 (8.35)	2.33 (8.79)	2.39 (8.88)	0.86*** (0.88)
2	Chlorpyriphos 20% EC D	4000	7.75 (16.16)	10.66 (19.05)	10.74 (19.13)	11.51 (19.83)	13.11 (25.66)	1.14 (1.17)
3	Chlorpyriphos 20% EC C	4000	10.66 (19.06)	14.65 (22.51)	15.28 (23.01)	16.98 (24.33)	18.42 (25.42)	1.34 (1.39)
4	Chlorpyriphos 20% EC B	4000	12.07 (20.33)	19.02 (25.85)	19.66 (26.32)	20.55 (26.52)	20.27 (26.96)	1.77 (1.78)
5	Clothianidin 50% WDG ST	250	1.00 (5.74)	1.43 (6.87)	1.48 (6.99)	1.94 (8.00)	2.19 (8.51)	0.71 (0.71)
6	Clothianidin 50% WDG D	250	5.82 (13.96)	8.86 (17.32)	9.29 (17.74)	9.50 (17.95)	9.60 (18.50)	1.04 (1.05)
7	Clothianidin 50% WDG C	250	9.70 (18.14)	10.99 (19.36)	11.09 (19.45)	12.76 (20.93)	15.58 (23.25)	1.25 (1.29)
8	Clothianidin 50% WDG B	250	11.27 (19.61)	14.94 (22.74)	17.80 (24.96)	18.20 (25.25)	19.97 (26.55)	1.68 (1.68)
9	Control	-	25.64 (30.42)	27.81 (31.83)	29.57 (32.94)	30.68 (33.63)	32.28 (34.62)	1.95 (1.96)
	S. Em. ±		1.31	1.37	1.52	1.53	1.00	0.10
	C.D. at 5%		3.92	4.11	4.55	4.58	2.99	0.30
	C.V. %		10.40	11.51	13.21	13.76	10.32	15.37

Note: *DAG = Days after germination, ST: Seed treatment, D: Drenching, C: Chemigation, B: Broadcasting

** Arcsine percentage transformed value,

*** $\sqrt{X + 0.5}$ transformed values, Figures in Parentheses are original value

60 days after germination

The results revealed that treatment of clothianidin 50% WDG (ST) @ 250 gm per ha was found most effective treatment recording minimum plant mortality (6.99%) and it was at par with chlorpyriphos 20% EC (ST) @ 4000 ml per ha (8.35%). In untreated control 32.94 per cent plant mortality was observed.

75 days after germination

The seed treatment of clothianidin 50% WDG (ST) @ 250 gm per ha recorded (8.00%) plant mortality and it was at par with chlorpyriphos 20% EC (ST) @ 4000 ml per ha (8.79%). All

the treatments proved significantly superior to untreated check (33.63%).

90 days after germination

Seed treatment of clothianidin 50% WDG (ST) @ 250 gm per ha was found significantly superior over all other treatments and it was at par with chlorpyriphos 20% EC (ST) @ 4000 ml per ha. The mortality of the plants varies from 8.51 to 26.96 per cent as compared to 34.62 per cent in untreated control.

Grub population

The results presented in (Table-1) revealed that the grub population in all the treated plots was significantly lower than

untreated control (1.96 grubs/m²). It was lowest in clothianidin 50% WDG (ST) @ 250 gm per ha (0.71 grubs/m²) and it was at par with chlorpyrifos 20% EC (ST) @ 4000 ml per ha (0.88 grubs/m²). Thus, the results obtained in present study corroborate the finding earlier workers, Srivastava (1986) [6].

Pod Yield

The results further indicated (Table-2) that seed treatment with clothianidin 50% WDG (ST) @ 250 gm per ha proved most effective by achieving the maximum pod yield (1944 kg/ha), although it was at par with chlorpyrifos 20% EC (ST) @ 4000 ml per ha (1806 kg/ha), clothianidin 50% WDG (D) @ 250 gm per ha (1701 kg/ha) and chlorpyrifos 20% EC (D) @ 4000 ml per ha (1632 kg/ha). While moderately yield found in clothianidin 50% WDG (C) @ 250 gm per ha (1597 kg/ha) and it was at par with chlorpyrifos 20% EC (C) @ 4000 ml per ha (1493 kg/ha) and clothianidin 50% WDG (B) @ 250 gm per ha (1389 kg/ha). Minimum yield observed in chlorpyrifos 20% EC (B) @ 4000 ml per ha (1285 kg/ha). It was also evident that the clothianidin 50% WDG (ST) @ 250 gm per ha, was significantly superior to chlorpyrifos 20% EC (B) @ 4000 ml per ha (1285 kg/ha).

Dry fodder yield

The dry fodder yield (Table-2) was recorded significantly higher in all the insecticidal treatments methods as compared to control plots (4451 kg/ha). The highest dry fodder yield

was recorded in clothianidin 50% WDG (ST) @ 250 gm per ha (6347 kg/ha) and it was at par with chlorpyrifos 20% EC (ST) @ 4000 ml per ha (6201 kg/ha), clothianidin 50% WDG (D) @ 250 gm per ha (6056 kg/ha) and chlorpyrifos 20% EC (D) @ 4000 ml per ha (5910 kg/ha). The clothianidin 50% WDG (C) @ 250 gm per ha (5764 kg/ha) and it was at par with chlorpyrifos 20% EC (C) @ 4000 ml per ha (5472 kg/ha), clothianidin 50% WDG (B) @ 250 gm per ha (5521 kg/ha) were moderately can be observed. The chlorpyrifos 20% EC (B) @ 4000 ml per ha (5326 kg/ha) lowest yield can be observed.

Net incremental cost benefit ratio

Further, it could be seen from the results that the highest NICBR was recorded in the clothianidin 50% WDG (ST) @ 250 gm per ha (1:2.42) and chlorpyrifos 20% EC (ST) @ 4000 ml per ha (1:2.37). The lowest NICBR (1:1.83) was obtained in the treatment of chlorpyrifos 20% EC (B) @ 4000 ml per ha.

Conclusion

It could be proved from the results that the seed treatment of the clothianidin 50% WDG (ST) @ 250 gm per ha was highest NICBR. Among the different application method, seed treatment found most effective for management of soil pest (white grub) this type study was supported Reddy (2000) [5], Srivastava *et al.* (1986) [6], Suthar (1994) [7], Patel *et al.* (1995) [3], Kumar *et al.* (2008) [2] and Yadav (2017) [9].

Table 2: Economics of different insecticides and insecticides methods evaluated against white grub

Sr. No.	Treatment	Cost of Cultivation (Rs/ha)			Average Yield (kg/h)		Gross return			Net profit (Rs/ha)	ICBR
		Cost of insecticides	Common cultivation practices	Total (Rs/ha)	Pod	Dry fodder	Pod	Dry fodder	Total		
1	Chlorpyrifos 20% EC ST	1380	50000	51380	1806	6201	72222	49611	121834	70454	1:2.37
2	Chlorpyrifos 20% EC D	1380	50000	51380	1632	5910	65278	47278	112556	61176	1:2.18
3	Chlorpyrifos 20% EC C	1380	50000	51380	1493	5472	59722	43778	103500	52120	1:2.01
4	Chlorpyrifos 20% EC B	1380	50000	51380	1285	5326	51389	42611	94000	42620	1:1.83
5	Clothianidin 50% WDG ST	3180	50000	53180	1944	6347	77778	50778	128556	75376	1:2.42
6	Clothianidin 50% WDG D	3180	50000	53180	1701	6056	68056	48445	116500	63320	1:2.19
7	Clothianidin 50% WDG C	3180	50000	53180	1597	5764	63889	46111	110000	56820	1:2.07
8	Clothianidin 50% WDG B	3180	50000	53180	1389	5521	55556	44167	99722	46542	1:1.88
9	Control		50000	50000	1076	4451	43056	35610	78666	28666	1:1.57

Note: Rs. 50000/- was calculated as cost of production common agronomic practices.

Labour Charge: Rs.200/Day

Price of groundnut pod: Rs. 40/kg.

Price of dry fodder: Rs. 8/kg.

Price of insecticides:

Clothianidin 50% WDG: Rs. 600/50gm

Chlorpyrifos 20% EC: Rs. 300/1litre

ST: Seed treatment

D: Drenching

C: Chemigation

B: Broadcasting

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References

1. Kapadia MN, Butani PG, Beria NN. Annual Research Report, Department of Entomology, JAU, Junagadh, 2006, 65.
2. Kumar B, Verma RA, Singh S. Integrated pest management in groundnut. Agrobios Newsletter. 2008; 7(5):53-54.
3. Patel GM, Patel JI, Patel PK, Patel BR, Patel RL, Patel RK *et al.* Chemical control of white grub *Holotrichia consanguinea* Blanch. In groundnut through seed

treatment and soil application. Pest Management and Economic Zoology. 1995; 3(1):13-16.

4. Raodeo AK, Deshapande SV, Deshpande AD, Puri SN, Bilapate. A large scale campaign for the control of white grub *Holotrichia serrata* F. in Maharashtra state, PANS. 1976; 4:223-228.
5. Reddy ML. Chemical control of root grub (*Holotrichia consanguinea*) on groundnut. Journal Research. Acharya N. G. Ranga Agricultural University. 2000; 28(1&2):82-83.
6. Srivastava BK, Mathur YK, Upadhyay KD, Srivastava SK, Srivastava JP, Anjor A. Control of white grub, *Holotrichia consanguinea* Blanch. In groundnut crop by seed dressing and granular treatment. Association for Advancement of Entomology. 1986; 11(4):235-237.
7. Suthar NB. Efficacy of some chemical and neem based insecticides as seed treatment and soil application for

- controlling white grub (*Holotrichia consanguinea* Blanch.) in groundnut. M.Sc. (Agri.) thesis submitted to Gujarat Agricultural University, Sardarkrushinagar, 1994.
8. Veeresh GK. Root grub control, campaign in Karnataka. White Grubs Newsletter. 1974; 1:17-18.
 9. Yadav AK. Incidence and Management of whitegrub, *Holotrichia consanguinea* Blanch. In semi-Arid Region of Rajasthan in groundnut. Ph.D. Scholar (Entomology) thesis submitted to Sri Karan Narendra Agriculture University, jobner-Jaipur, 2017.