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Management of the white grub *Holotrichia consanguinea* infesting groundnut by chemical insecticides

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Abstract
The present experiment that conducted during kharif 2023 at Rainfed agriculture research farm, Department of Entomology, Bundelkhand University Jhansi was worked out with nine treatments and three replications under randomized block design, where two time chemical insecticides were applied by soil drenching method in groundnut crop field against White grub *Holotrichia consanguinea* infestation and data were collected before and after every application of treatment that resulted Imidacloprid 17.8% SL was found best effective among all treatments to control the plant mortality of the groundnut crop followed by Chlorantraniliprole 18.5% EC and Chloropyriphos20%EC, and maximum yield and C:B ratio, 18.69 Qt/hac pod yield and 1:1.61 was obtained under Imidacloprid 17.8% SL treated plot followed by the Chlorantraniliprole 18.5% EC and Chloropyriphos20%EC that were produced 17.89 Qt/hac and 16.25qt/hac pod yield respectively, and remain all treatments were significantly effective over control (untreated plot).

Keywords: *Holotrichia consanguinea*, imidacloprid, chlorantraniliprole, chloropyriphos

1. Introduction
The groundnut or peanut is one of the important legume crops of tropical and semiarid tropical countries, where it provides a major source of edible oil and vegetable protein. Groundnut kernels contain 47-53% oil and 25-36% protein. The crop is cultivated between 40ºN to 40ºS of the equator. Groundnut is a self-pollinated crop whereby flowers are produced above ground and, after fertilization, pegs move towards the soil, and seed-containing pods are formed and developed underneath the soil. (Prashad an Upadhyay 2010) [11]. And the groundnut also has essential vitamins. Groundnuts also contribute to improving soil fertility via biological nitrogen fixation and organic matter returns to the soil and its haulms provide valuable feed for livestock especially during the long dry season (Tanzubil 2016) [13].
The avoidable yield loss due to major insect pests of groundnut was recorded to the tune of 48.57% in pod and 42.11% in fodder in untreated control plot. The data on yield in protected plots revealed that 94.45% additional yield in pod and 72.74% additional yield in fodder could be realized over unprotected plots (Dabhade 2012) [5]. The presence of one grub/m2 may cause 80-100 percent plant mortality. Kapadia *et al*., (2006) studied that in India out of 171 species of white grub, 12 are of major importance and 14 are of major importance. Raodeo *et al*. (1976) [12] reported that the adult collection and insecticidal applications are the major tactics of management followed against all the white grub species. 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 3rdinstar. (Patel *et al* 2020) [9].

2. Methods and Materials
The present experiment was carried out during kharif season of 2023, conducted at Rainfed agriculture research farm, Department of Entomology, Bundelkhand University Jhansi. In present investigation nine treatments including control were used to find chemical control measures to management of the white grub in groundnut crop.

The seeds of the groundnut verity GAUG- 10 were sowed in field at spacing of 30×10 cm in total 27 plots which were three times replicated. The required intercultural operations were done in cropping period anf the application of the treatments was carried out with soil drenching method in groundnut against white grub infestation.

3. Observation

The observation for efficacy of insecticides against the whit grub were collected based on the mortality of the plants causing by the white grub infestation on root, the data of plant mortality was collected at before and after the soil drenching of treatments the data after the soil drenching were collected at 7 days, 14 days and 21 days after the treatments and evaluated how much mortality percent were minimized by individual treatment in all three replications. Based on the pooled mean data and mean data of the plant mortality before application confined which treatment was superior to control white grub infestation on groundnut crop. the data of the plant mortality per plot was calculated by this formula;

$$\%\text{plant mortality} = \frac{(\text{No. of dead plant by infestation of white grub infestation})}{\text{Total no. of plant in plot}} \text{x}100$$

4. Result and discussion

4.1 Efficacy of treatments

The data were collected before spray reveled in table 1 the mean plant mortality before spray ranged between 13.27-15.70 and after the drenching of treatments the polled data presented the minimum mortality 8.21% was found under the Imidacloprid mean it was found best effective after the first application of treatments followed by Chlorantraniliprole (9.42% plant mortality) and Chloropyriphos (10.72% plant mortality) per plot. Where the less effective treatment was Dicofal. The order of the effectiveness of treatments was in following order; Imidacloprid 17.8% SL > Chlorantraniliprole 18.5% EC > Chloropyriphos 20%EC > Thiamethoxam 20%WDG > Flubenidamide 480 EC > Cartap haydrochloride 5%G > Dicofal 18.5%EC.

The data collected before second application (soil drenching) of the treatments plant morality percentage was 9.98 to 24.12% and after the application of treatments the best effective treatments that found minimum plant mortality was Imidacloprid (3.70% plant mortality) followed by Chlorantraniliprole (5.05% plant mortality) and Chloropyriphos (6.06% plant mortality) where Thiamethoxam was also effective to control plant mortality caused by white grub in groundnut. And where the control (untreated plot) showed 29.41% plant mortality of groundnut. The order of the effectiveness of treatments was in following order; Imidacloprid 17.8% SL > Chlorantraniliprole 18.5% EC > Chloropyriphos 20% EC > Thiamethoxam 20% WDG > Flubenidamide 480 EC > Cartap haydrochloride 5% G > Dicofal 18.5% EC.

4.2 Yield and C:B ratio

he data of the yield and C:B ratio revealed that the maximum yield and 18.69 Qt/hac pod yield and 1:1.61 was obtained from the Imidacloprid 17.8% SL treated plot followed by the Chlorantraniliprole 18.5% EC and Chloropyriphos20%EC that were produced 17.89 Qt/hac and 16.25qt/hac pod yield repectively and 1:1.38 and 1:1.21 C:B ratio, reamin all treatments were found more yield compared to untreatred plot that produced 9.09 Qt/hac pod yield.

Table 1: Effect of treatment on plant mortality percent caused by white grub in groundnut after first treatment application

T. No.	Treatments	Doses	Mean Plant mortality%				Pooled Mean
			Before	7DAD	14 DAD	21DAD	
T_1	Emamactin benzoate 5%WG	250gm/hac	13.27	11.42	13.16	15.51	13.37
T_2	Chlorantraniliprole 18.5% EC	150ml/hac	13.47	7.47	9.69	11.10	9.42
T_3	Chloropyriphos20%EC	4liter/hac	14.04	9.03	10.58	12.54	10.72
T_4	Thiamethoxam 20%WDG	150gm/hac	14.43	9.54	12.04	14.24	11.94
T_5	Flubenidamide 480 EC	600ml/hac	13.96	10.30	12.85	13.27	12.14
T_6	Cartap haydrochloride 5%G	8kg/hac	13.68	10.99	13.51	15.23	13.24
T_7	Dicofal 18.5%EC	1liter/hac	15.70	13.27	14.67	16.62	14.85
T_8	Imidacloprid 17.8% SL	360ml/hac	13.07	6.64	8.00	9.98	8.21
T_9	Control	------	15.61	19.03	21.72	24.12	21.63
C.D.			1.715	1.188	1.078	1.009	0.766
SE(m)			0.567	0.393	0.356	0.334	0.253

Table 2: Effect of treatment on plant mortality percent caused by white grub in groundnut after second treatment application

T. No.	Treatments	Doses	Mean Plant mortality%				Pooled Mean
			Before	7DAD	14 DAD	21DAD	
T_1	Emamactin benzoate 5%WG	250gm/hac	15.51	12.47	13.56	15.36	13.80
T_2	Chlorantraniliprole 18.5% EC	150ml/hac	11.10	3.75	5.10	6.30	5.05
T_3	Chloropyriphos20%EC	4liter/hac	12.54	5.16	5.97	7.05	6.06
T_4	Thiamethoxam 20%WDG	150gm/hac	14.24	6.30	7.04	8.87	7.40
T_5	Flubenidamide 480 EC	600ml/hac	13.27	9.07	10.23	11.96	10.42
T_6	Cartap haydrochloride 5%G	8kg/hac	15.23	11.67	13.24	15.08	13.33
T_7	Dicofal 18.5%EC	1liter/hac	16.62	13.76	16.40	17.59	15.92
T_8	Imidacloprid 17.8% SL	360ml/hac	9.98	2.84	3.97	4.30	3.70
T_9	Control	------	24.12	27.80	29.04	31.39	29.41
C.D.			1.009	1.377	1.421	1.018	0.803
SE(m)			0.334	0.455	0.470	0.337	0.266

Table 3: Economics of cultivation and yields

T. no.	Treatments	Yield Qt/h	Dry fodder yield Qt/hac	Gross income Pod + dry matter	Common cost (Rs)	Treatment cost (Rs)	Total cost (Rs)	Net Income (Rs)	C:B ratio
T_1	Emamactin benzoate 5%WG	12.88	19.11	84217	44350	2400	46750	37467	1:0.80
T_2	Chlorantraniliprole 18.5% EC	17.89	26.31	116812	44350	4800	49150	67662	1:1.38
T_3	Chloropyriphos 20%EC	16.25	26.01	107582	44350	4400	48750	58832	1:1.21
T_4	Thiamethoxam 20%WDG	14.36	25.21	96627	44350	1650	46000	50627	1:1.10
T_5	Flubenidamide 480 EC	13.86	22.01	91637	44350	22200	66550	25087	1:0.38
T_6	Cartap haydrochloride 5%G	13.21	20.36	86907	44350	3440	47790	39117	1:0.82
T_7	Dicofal 18.5%EC	10.31	20.11	70782	44350	2200	46550	24232	1:0.52
T_8	Imidacloprid 17.8% SL	18.69	27.32	121919	44350	2352	46702	75217	1:1.61
T_9	Control	9.09	15.24	60663	44350		44350	16313	1:0.37

Rate of groundnut pod- 5500 Rs/quintal
Rate of dry fodder- 700 Rs/quintal

5. Conclusion

The following experiment resulted that the Imidacloprid 17.8% SL was found superior to control the plant mortality of the groundnut crop caused by white grub which followed by Chlorantraniliprole 18.5% EC and Chloropyriphos20%EC, these treatments also give higher yield and C:B ration than other treatments, where remain all treatments were significantly effective over control (untreated plot).

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