

Management of white grub, *Holotrichia longipennis* Blanch through post-sown soil application of insecticides in upland rice

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ABSTRACT

White grubs are a major production constraint in upland rice production in North-Western Himalayas. Field experiment was carried out to evaluate five insecticides viz., chlorpyrifos 20 EC, quinalphos 25 EC, lindane 20 EC, imidacloprid 200 SL and lambda cyhalothrin 5 EC as post-sown soil application in furrows against the white grub, *Holotrichia longipennis* Blanch damaging upland rice in Uttarakhand hills. Imidacloprid 200 SL @ 80.0 g a.i. ha⁻¹ was found to be most effective by registering lowest cumulative plant mortality (3.14%) and grub populations (2.0 grubs pit⁻¹). Highest benefit cost ratio (6.72) was obtained in the treatment of imidacloprid 200 SL (60g a.i. ha⁻¹).

Key words: upland rice, white grub, *Holotrichia longipennis*, insecticide, management

Rice plays a distinct role in the food and nutritional security of tribal, backward and hilly areas of Uttarakhand. It is grown mainly direct seeded rainfed upland and irrigated transplanted rice. The current rice growing area in the state is about 2.8 lakh hectares and production is 5,700 t. In the hills, 89 per cent of the rice area is rainfed, half of which is in the hills and the rest in the plains. The total production in the plains is almost two and half times the production in the hills. There is a wide gap between the productivity under hill area (1.26 t ha⁻¹) and the plains (2.76 t ha⁻¹) (Mani, 2013). The main reasons for a wide difference in productivity are fragile environments coupled with non-availability of inputs, poor socio-economic condition of the farmers and the adoption of available high yielding varieties and production technologies. Besides, insect pests are also a serious threat to the rainfed upland rice by attacking every part of the plant at all the growth stages. White grub is the potential threat in upland rice (Litsinger *et al.*, 2002, Mishra, 2008). Out of 42 species of white grub, *Holotrichia longipennis* Blanch. is the predominant species in Uttarakhand causing 43.12 per cent damage to upland rice (Mohapatra and Karnatak, 2009). Keeping in view

of the above, field experiment was carried out to evaluate the efficacy of chemical insecticides as post-sown soil application against white grub, *H. longipennis* damaging upland rice in Uttarakhand hills.

The field experiment was conducted at the Government Research Farm, Gwaldam, Chamoli in randomized block design with four replications. The rice cv. PRR-2 was sown in May under rainfed condition in the plot size of 5 x 5 m². Recommended package of practices were followed to raise the upland rice. Insecticides viz., chlorpyrifos 20EC, quinalphos 25EC, lindane 20EC, imidacloprid 200SL and lambda cyhalothrin 5EC were evaluated to assess the efficacy against the white grub, *H. longipennis* damaging upland rice along with untreated control. For the application of the insecticides, 50 kg of dried, well pulverized soil was thoroughly mixed with required quantity of insecticides and applied in the standing crop of upland rice near the root zone in first week of July under optimum soil moisture conditions in rainfed areas which is the appropriate time since the first instar grubs were present in the soil and this stage is highly susceptible for insecticides. The pre-treatment population of plants was recorded from each plot one

Table 1. Field evaluation of insecticides against white grub, *Holotrichia longipennis* as post-sown soil application in standing crop of upland rice (Var. PRR-2)

Treatment	Dose (g a.i. ha ⁻¹)	Mean % plant mortality (DAT)			Grain yield (t ha ⁻¹)	Grubs pit ⁻¹ ** (cum.)	Net gain over control (₹ ha ⁻¹)	Treatment cost (₹ ha ⁻¹)	B:C ratio
		20	40	60					
Chlorpyrifos 20 EC	800	1.69 (7.45)*	3.15 (10.18)	4.10 (11.68)	1.63	2.3	4653.20 [#]	1116.80	4.16
Quinalphos 25 EC	800	6.78 (15.02)	7.99 (16.32)	9.44 (17.81)	1.33	3.3	3099.60	1160.40	2.67
Lindane 20 EC	800	16.50 (23.96)	18.33 (25.22)	19.89 (26.46)	1.18	9.0	2898.80	606.20	4.78
Imidacloprid 200 SL	60	3.15 (10.18)	4.61 (12.38)	5.33 (13.29)	1.79	2.3	5550.00	825.00	6.72
Imidacloprid 200 SL	80	1.46 (6.88)	2.42 (8.89)	3.14 (10.18)	2.01	2.0	6555.00	1100.00	5.96
Lamda-cyhalothrin 5EC	100	22.23 (28.13)	23.92 (29.26)	25.11 (30.08)	0.84	9.3	1815.00	550.00	3.30
Control	-	66.28 (54.50)	68.22 (55.69)	69.67 (56.80)	0.48	25.3	-	-	-
CD (P<0.05)	-	2.31	2.28	2.23	0.33	-	-	-	-

*Figures in parentheses are the angular transformed values, DAT - Day after treatment
Rate of paddy: Rs. 500.0 q⁻¹

day before the insecticidal treatment. The damaged plants due to white grub were counted thrice, first at 20 days followed by 40 and 60 days after insecticidal treatment, whereas grain yield data, grub population per square meter pit at 60 cm depth were taken at the time of harvesting of crop. A comparative cost analysis of insecticide treatment was done.

It was observed that all the treatments had significant variation in cumulative plant mortality, grain yield and grub population after harvesting of rice. On the basis of average cumulative plant mortality, imidacloprid 200SL @ 80 g a.i. ha⁻¹ was found to be most effective and significantly superior insecticidal treatment over other treatments which registered lowest cumulative plant mortality (3.14%) followed by chlorpyrifos 20EC (800g a.i. ha⁻¹) against the first instar grubs (Table 1). The grain yield ranged from 0.84 to 2.01 t ha⁻¹ in the insecticide treated plots, which was significantly superior to untreated control (0.48 t ha⁻¹). Significantly lowest and highest grub populations were recorded in imidacloprid and lamda-cyhalothrin treated plots with an average of 2.0 and 9.33 grubs pit⁻¹, respectively, while in control it was 25.33 grub pit⁻¹. Similar finding was reported by Bhatnagar *et al.*

(2012), who stated that imidacloprid 17.8 SL is very effective in controlling grub of *Holotrichia consanguinea* in groundnut. Mishra (1995) reported that chlorpyrifos 20EC @ 0.5kg a.i. ha⁻¹ registered maximum protection against white grub in potatoes. Highest marketable tuber yield was recorded in imidacloprid seed treatment (Zaki *et al.*, 2006). Anjana and Bhagat (2005) reported that seed treatment with imidacloprid 70 WS @ 3.5 g a.i. kg⁻¹ seed, chlorpyrifos 20 EC @ 5 g a.i. kg⁻¹ seed, soil application of chlorpyrifos 10G + NICAST (@ 2 kg a.i. ha⁻¹ + 500 kg ha⁻¹, respectively) and chlorpyrifos 10G @ 2 kg a.i. ha⁻¹ resulted in decreased plant mortality in maize due to white grub.

The highest net return (₹ 6,555.00 ha⁻¹) was obtained in the treatment of imidacloprid 200 SL (80g a.i. ha⁻¹) followed by imidacloprid 200 SL (60g a.i. ha⁻¹) where the net return was ₹ 5550.00 ha⁻¹. Highest benefit cost ratio (6.72:1) was obtained in the treatment of imidacloprid 200 SL (60g a.i. ha⁻¹). Based on the experimental findings, it may be concluded that imidacloprid 200SL@ 60g a.i ha⁻¹ is the most effective insecticides in controlling the white grub under field conditions of Uttarakhand.

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