Research Article

Bio-Efficacy of Chemical Insecticides and Organic Pesticide for Management of Termites in Wheat

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Abstract

Termites *Microtermes obesi (Holmgren) and Odontotermes obesus (Rambur)* are a major problem in wheat, chickpea and maize crops in the Malwa Plateau zone. It's extremely difficult to manage in rainfed condition. To provide an eco-friendly alternative for termite's management, we conducted location specific trial in the adopted villages of Krishi Vigyan Kendra, Dewas (M.P.) during 2013 and 2014 to find out the bio-efficacy of chemical Insecticides and organic pesticides for effective management of termites. The soil application of neem cake @ 2.5q/ha alongwith seed treatment with chlorpyriphos 20EC@ 6ml/ Kg of seed was found significantly lowest per cent of plants damage due to incidence of termites and maximum germination followed by fipronil 0.3% GR @ 25 kg/ha and chlorpyriphos 20EC@ 6ml/ Kg of seed . Grain yield was significantly higher in treated plots than control. Among the treatments, soil application of neem cake @ 2.5q/ha + chlorpyriphos 20EC@ 6ml/ Kg of seed plot recorded significantly higher grain yield being at par with each other. Moreover, the highest I.C.B.R. was obtained in seed treatment of chlorpyriphos 20EC@ 6ml/ Kg of seed followed by neem cake @ 2.5q/ha + chlorpyriphos 20EC@ 6ml/ Kg of seed and fipronil 0.3% GR @ 25 kg/ha

Keywords: Termites, seed treatments, chlorpyriphos, fipronil, neem cake, wheat

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Introduction

Termites, *Odontotermes obesus (Rambur)and Microtermes obesi* are one of the most destructive polyphagous insect-pests of wheat and difficult to manage in loamy and sandy loam soils [1, 2]. Its attacks throughout the crop growth by feeding on roots or the root zone, the damage caused during seedling stage and near maturity results in yield losses to the tune of 60%. Termite incidence is usually high in light textured soils and the affected plant finally dies. Sharma [3] estimated the termite losses to wheat crop varying from 0 to 15 percent in western Rajasthan. At present, insecticides are the mainstay for termite management strategies in crops and urban areas in India and the world [1, 2]. Termites are extremely difficult to manage, and chemical pesticides are the mainstay for the management of these insect-pests at present [4]. Therefore, an attempt was made to study the bio-efficacy of chemical insecticides and organic pesticide for management of termites in wheat.

Materials and Methods

The field trials were carried out in farmer's field at adopted villages of Krishi Vigyan Kendra, Dewas district of Madhya Pradesh during 2013 and 2014. Four treatments for management of termites were applied as- Treatment 1- soil application of fipronil 0.3% GR @ 25 kg/ha(T_1) ,Treatment 2- soil application of neem cake @ 2.5q/ha along with seed treatment with chlorpyriphos 20EC@ 6ml/ Kg of seed(T_2) , Treatment 3- seed treatment with chlorpyriphos 20EC@ 6ml/ Kg of seed (T_3) and Treatment 4 (Farmer Practices) Farmers were not applied any insecticides as they used as check(T_4). The experiment was conducted at ten farmers in the area of 1000 sq m per farmers. The crop variety Lok-1 was sown in the first half of November and the harvesting was done in the month of March. Standard Appropriate agronomic practices were followed throughout the season to raise a good crop. Observation were recorded on germination percentage sowing after a week, total plant population and affected plants from 2 row of 2 m each selected at random from each replication of a treatment were recorded places on one month days after sowing (DAS) and % damaged plants for each treatment was calculated.. Final yield in q/ha was determined. The data recorded were subjected to statistical analysis using analysis of variance technique (ANOVA) for randomized block design as suggested by Panse and Sukhatme [5].

Results and discussion

On the basis of analyzed data all the treatments had significantly higher germination and low plant damage as compared to control (**Table 1**). The Germination was significantly increased in T_2 (80.70% and 82.39%) followed by T_1 (78.90%and 80.26%), T_3 (75.90%and 77.56%) while it was decreased 73.90% and 75.09% in control (T_4) during both the year, respectively. The minimum plant damage were 2.58% and 3.65% (T_2) followed by 2.91%and 4.83% (T_1), 3.37% and 5.42% (T_3) against maximum 4.37% and 7.25% in control (T_4) at the one month after sowing during 2013-14 and 2014-15, respectively. At the time of harvest, the plant damage due to termites was recorded minimum 3.65% & 3.77% in treatment T_2 followed by 4.83%& 5.32% (T_1) and 5.42%&6.47% (T_3) against maximum 7.25%& 8.03% in control (T_4), respectively during both the years (Table 1). Thus, overall results revealed that the Soil application with neem cake @ 2.5 q/ha alongwith seed treatment with chlorpyriphos@6ml/ Kg of seed (T_2) was most effective in reduced 3.21% plant damage and increased 81.55% germination. The second best treatment among the chemical insecticides was recorded the Soil application of fipronil 0.3% GR @ 25 kg/ha (T_1) with higher germination of 79.58% and least plant damage of 4.05% followed by Seed treatment with chlorpyriphos 20EC @ 6ml/Kg of seed (T_3) of 76.72% and 4.80%, respectively. Similar results obtained by Kumawat [6] used different insecticides to control termites attacking wheat crop and found significant control with chlorpyriphos followed endosulfan. Flpronll 0.3% GR @ 25 kg/ha was found reduce damage and maximum germination reported by Singh *et al.* [7]. Tomar [8] also found fiprinil 0.3% most effective in termite management in wheat. Seed treatment with chlorpyriphos, endosulfan and monocrotophos as effective control measures against termites in chick pea [9, 10]. Jaipal and Singh [11] was recorded that imidacloprid and a neem based biopesticide Amrutguard gave better results for termites control which supported the present study.

Table 1 Effect of chemical insecticides and organic pesticide for management of termites in Wheat

Tr. No.	Details of Treatment(s)	Germination (%)			Plants damage (%)					Grain yield (q/ha)		
					One month after sowing		At the time of harvesting		Pooled mean			
		2013-14	2014-15	Mean	2013-14	2014-15	2013-14	2014-15		2013-14	2014-15	Mean
T_1	Soil application of Fipronil 0.3% GR @ 25 kg/ha	78.90 (62.68)	80.26 (63.67)	79.58 (63.15)	2.91 (9.76)	3.14 (10.09)	4.83 (12.54)	5.32 (13.27)	4.05 (11.58)	40.45	43.92	42.18
T_2	Soil application of neem cake @ 2.5 q/ha along with seed treatment with chlorpyriphos 20 EC @ 6 ml/ Kg of seed	80.70 (63.99)	82.39 (65.28)	81.55 (64.60)	2.58 (9.20)	2.84 (9.59)	3.65 (10.89)	3.77 (11.13)	3.21 (10.28)	41.92	45.97	43.95
T_3	Seed treatment with chlorpyriphos 20EC @ 6ml/ Kg of seed	75.90 (60.63)	77.56 (61.74)	76.72 (61.17)	3.37 (10.56)	3.92 (11.35)	5.42 (13.39)	6.47 (14.68)	4.80 (12.63)	38.60	41.25	39.93
T_4	Control (FP)	73.90 (59.31)	75.09 (60.07)	74.49 (59.67)	4.37 (11.94)	6.68 (14.93)	7.25 (15.47)	8.03 (16.41)	6.58 (14.83)	35.73	39.61	37.67
	SE(m) ±	0.55	0.52	0.45	0.43	0.39	0.64	0.53	0.26	0.89	0.69	-
	CD (p=0.05)	1.12	1.057	0.92	0.87	0.81	1.31	1.08	0.53	1.83	1.41	NS

*Figures in parentheses are arc sine transformed values

All the insecticidal treated plots had significantly higher grain yield than control and varied from 39.93 to 43.95 q/ha as against 37.67 q/ha in control (**Table 2**). The T_2 plot was recorded significantly highest yield (41.92 & 45.97 q/ha) followed by T_1 (40.45 & 43.92 q/ha) and T_3 (38.60 & 41.25 q/ha) during both the years, respectively. Highest additional yield over control was obtained in T_2 (6.19 and 6.36 q/ha) followed by T_1(4.72 and 4.31 q/ha) and lowest in case of T_3 (2.87 and 1.64 q/ha). This is in accordance with Panigrahi [12] was reported that imidacloprid 10 ml/ kg, 7ml/kg; chlorpyriphos 10ml/kg and endosulfan 10 ml/kg seed resulted in significantly lower plant damage and higher grain yield.

The economics of the treatment revealed (Table 2) that the maximum net gain was obtained with treatment T_2 (Rs. 7285 and 7540 per ha) followed by the T_1 (Rs. 7285 and 7540 per ha) and T_3 (Rs. 3825 and 1980 per ha).

Moreover, the highest incremental Cost Benefit Ration (ICBR) was obtained with seed treated with chlorpyriphos (1:8.97 and 1:5.13) followed by neem cake alongwith seed treatment with chlorpyriphos (1:4.64 and 1:4.77) and soil application of fipronil (1:4.29 and 1:3.92) due low cost of protection during both the years, respectively. The above findings are in conformity with the findings of Kumawat [6] reported that seed treatment with chlorpyriphos followed endosulfan has increased yield and C: B ratio.

Table 2 Economics of treatments against management of termites (2013-14 & 2014-15)

Tr. No.	Treatment	Grain yield (q/ha)		Increased yield over control (q/ha)		Additional benefit over control (Rs./ha)		Cost of Treatment (Rs./ha)	Net Gain (Rs./ha)		ICBR	
		2013-14	2014-15	2013-14	2014-15	2013-14	2014-15		2013-14	2014-15	2013-14	2014-15
T_1	Soil application of Fipronil 0.3% GR @ 25 kg/ha	40.45	43.92	4.72	4.31	7080	6465	1650	5430	4815	1:4.29	1:3.92
T_2	Soil application of neem cake @ 2.5 q/ha alongwith seed treatment with chlorpyriphos@ 6 ml/ Kg of seed	41.92	45.97	6.19	6.36	9285	9540	2000	7285	7540	1:4.64	1:4.77
T_3	Seed treatment with chlorpyriphos 20EC @ 6ml/ Kg of seed	38.60	41.25	2.87	1.64	4305	2460	480	3825	1980	1:8.97	1:5.13
T_4	Control (FP)	35.73	39.61	-	-	-	-	-	-	-	-	-

Conclusion

It can be concluded that location specific soil application of neem cake along with seed treatment with chlorpyriphos afforded excellent control of termites infestation in wheat with higher grain yield. It was comparatively safer to natural enemies, soil flora & fauna in wheat. Hence, this treatment may be recommended for the wheat growers in Malwa Plateau Zone.

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