Journal of Global Biosciences
ISSN 2320-1355
Volume 4, Number 5, 2015, pp. 2431-2436
Website: www.mutagens.co.in
E-mail: submit@mutagens.co.in
researchsubmission@hotmail.com

Research Paper

EFFICACY OF NEWER MOLECULES OF INSECTICIDES WHITE GRUB, *Leucopholis lepidophora* INFESTING SUGARCANE IN WESTERN MAHARASHTRA

Pradnya B. Mane and Pandurang B. Mohite

Division of Entomology,
Mahatma Phule Krishi Vidyapeeth,
College of Agriculture, Kolhapur 416006, Maharashtra, India.

Abstract

A field experiment comprising of seven insecticides conducted at farmers field in endemic area of pest in Kolhapur district particularly area nearby riverbank during 2009-2010 The application of newer insecticides was done by drenching and the granules was applied along with dry soil. Soil drenching of imidacloprid 40 % + fipronil 40 % - 80 WG @ 300 g ha^{-1} was found to be most effective treatment for control of white grub followed by clothianidin 50 WDG @ 250 g ha^{-1}, flubendiamide 480 SC @ 400 ml ha^{-1} and rynaxypyr 0.4% G @ 125 g ha^{-1}.

Key words: Imidacloprid, Clothianidin, Flubendiamide, Rynaxypyr, sugarcane.

INTRODUCTION

White grubs are immature stages of scarabid beetles.Different species of white grubs in recent years destroy the crop seriously in different sugarcane tracts in the country .They are highly polyphagus pest. The detailed biology, description and management of twelve most economically important species viz, *Holotrichia consanguinea* Blanch., *H. Serrata* (F.), *H. reynaudi* Blanch.,*H. longipennis* Blanch., *H. seticollis* Mose, *H. nilgirla* Arrow, *Brahmina* (*Holotrichia*) *coriacea* Hope, *Leucopholis lepidophora* Blanch, *L. burmeistri* Blanch., *L. coneophora* Burm., *Anomala dimidiate* Hope, *Maladera insanabilis,* which appeared in severe form in different parts of the country reported by Yadava and Sharma (1995). *Leucopholis lepidophora* Blanchard reported as a serious pest of arecanut in Malnad district of Karnataka by Veeresh *et al.* (1982). This pest consider threat to sugarcane cultivation in parts of Kolhapur and Sangli districts (Adsule and Patil, 1990).The incidence of *Leucopholis* reduces 40 per cent germination of the cane and causes 40 to 60 per cent reduction in cane yield and 78 units reduction in sugar recovery in heavily infested sugarcane fields. The losses to the extent of 100 per cent were also reported by Patil and Hapse (1991).

The grubs are subterranean having complex life cycle and actively feed on living roots,therefore the control of this pest becomes difficult. 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). Development of high level of resistancce to the white grub there is necessity of implementation of alternative options, such as the performance of new group of insecticides which change insect plant environment interaction with specific and novel mode of action, less hazardous eco-friendly and compatible with eco-friendly pest management programmes. Now a days large number of newer insecticidal formulation in form

of ready mixture individual are also available in market. Attempt was therefore been made to test its efficacy white grub in sugarcane crop.

MATERIAL AND METHODS

Field experiment was conducted at farmers field in endemic area of pest in Kolhapur Maharashtra, India. region during 2009-10 to study the efficacy of newer molecules of insecticides against white grub in sugarcane crop.

The experiment was laid out in randomized block design with eight treatments and three Replications the plot size was 5×5m^2 and plant spacing was 90×90cm the crop was raised following the recommended agronomic practices except plant protection measures. The application of newer insecticides was done by drenching and the granules was applied along with dry soil or sand in equal proportions at the time of planting. Second drenching were carried out at the time of earthing up *i.e.* 75 days after planting. The observations of field experiment was recorded 5 spots with 1 m^2 area per plot was selected randomly and number of damaged clumps was counted at 30,45,60 and 75 days after planting. The number of white grubs m^{-2} after the harvesting of sugarcane were also recorded. The clump mortality data and number of grubs present per m^2 area in soil at harvesting were angularly transformed and subjected to analysis of variance.

RESULT AND DISCUSSION

Looking to the demand of extension workers, State Department of Agriculture and quarries from the farmers for the new insecticides, the experiment describe here in was undertaken.

Efficacy of newer molecules of insecticides against white grub under field condition after first drenching.

In a field experiment during 2010-2011 cropping season the efficacy of newer insecticides against white grub were evaluated. The results of the experiments are presented in Table1.Treatments were given during first week of February. The population of white grub in experimental plots did not differ significantly indicating the uniformity in the distribution of pest in the field and number of grub population m^{-2} area ranged from 8 to 10.66.

30 days after treatment

First application of newer insecticides were carried out at the time of sugarcane planting. The mortality of sugarcane clump was not observed within 30 days after treatment.

45 days after treatment

Observations recorded 45 days after treatment indicated that all the treatments were found significantly superior over untreated control. The treatment imidacloprid 40 % + fipronil 40 % - 80 WG @ 300 g ha^{-1} was significantly superior over all other treatments The mortality of the plants varies from 2.22 to 8.89 per cent as compared to 14.44 per cent in untreated control.

60 days after treatment

In treatment imidacloprid 40 % + fipronil 40 % - 80 WG @ 300 g ha^{-1} found significantly superior over all other treatments and recorded 3.33 per cent plant mortality however it was on par with treatment clothianidin 50 WDG @ 250 g ha^{-1}, flubendiamide 480 SC @ 400 ml ha^{-1} Recorded 4.44 an 5.56 per cent plant mortality was recorded, respectively. In untreated control 16.67 per cent plant mortality was observed. The mortality of plants varies from 3.33 to 11.11 per cent.

75 days after treatment

All the treatments proved significantly superior to untreated check. The treatment imidacloprid 40 %+ fipronil 40 % 80 WG @ 300 g ha^{-1} recorded 4.44 per cent plant mortality which followed same trend as that of earlier observation interval and noticed significantly superior over all other treatments .

Efficacy of newer molecules of insecticides against white grub under field condition after second drenching.

Treatment were imposed after first earthing up in sugarcane plot which was carried out 75 days after planting. Thus second drenching was carried out 75 days after planting and the observations were recorded 30, 45, 60, 75 days of treatments and presented in Table 2

Table1: Efficacy of newer molecules of insecticides against white grub as soil drenching in sugarcane at time of 1st drenching.

Treatment No.	Name of Insecticide	Dose a.i. ha^{-1}	Per cent plant mortality Days after 1st Drenching		
			45DAT	60DAT	75DAT
T_1	Rynaxypyr (E 2Y45) 0.4%G	125 g	5.56 (13.49)	6.67 (15.00)	7.78 (16.15)
T_2	Clothianidin 50 WDG	250 g	3.33 (10.47)	4.44 (11.98)	5.56 (13.49)
T_3	Imidacloprid+ Fipronil 40% +40%-80WG	300 g	2.22 (6.98)	3.33 (10.47)	4.44 (11.98)
T_4	Flubendiamide (Fame)480 SC	400 ml	4.44 (11.94)	5.56 (13.49)	6.67 (14.64)
T_5	Imidacloprid 200 SL	175 ml	6.67 (14.67)	7.78 (16.15)	8.89 (17.29)
T_6	Fipronil 5% SC	175 ml	7.78 (15.00)	8.89 (17.29)	10.00 (18.44)
T_7	Chlorpyriphos 20 EC	1000ml	8.89 (17.29)	11.11 (20.40)	13.33 (21.32)
T_8	Untreated control	-	14.44 (22.30)	16.67 (24.12)	18.89 (25.75)
	SE±	-	1.76	1.43	1.68
	CD at 5%	-	3.78	3.06	3.60

(Figures in parentheses are arcsin transformation)

Table 2 : Efficacy of newer molecules of insecticides against white grub as soil drenching in sugarcane at time of 2nd drenching.

Treatment	Name of Insecticide	Dose a.i.ha^{-1}	Per cent plant mortality Days after 2nd Drenching		
			30DAT	45DAT	60DAT
T_1	Rynaxypyr (E 2Y45) 0.4%G	125 g	8.89 (17.29)	11.11 (19.42)	12.22 (20.41)
T_2	Clothianidin 50 WDG	250 g	6.67 (15.00)	8.89 (17.29)	10.00 (18.28)
T_3	Imidacloprid+ Fipronil40%+40%-80WG	300 g	5.56 (13.49)	7.78 (16.15)	8.89 (17.29)
T_4	Flubendiamide (Fame)480 SC	400 ml	7.78 (16.15)	10.00 (18.27)	11.11 (19.42)
T_5	Imidacloprid 200 SL	175 ml	10.00 (18.44)	12.22 (20.41)	15.56 (23.21)
T_6	Fipronil 5% SC	175 ml	13.33 (19.26)	16.67 (24.02)	18.89 (25.75)
T_7	Chlorpyriphos	1000ml	15.56	18.89	20.00

	20 EC		(23.21)	(25.75)	(26.51)
T_8	Untreated control	-	21.11 (27.33)	25.56 (30.36)	28.89 (32.51)
	SE±	-	1.45	1.48	1.50
	CD at 5%	-	3.12	3.19	3.21

(Figures in parentheses are arcsin transformation)

30 days after treatment

Observations recorded 30 days after second application of insecticides indicated that all the treatments found significantly superior over untreated control. The treatment imidacloprid 40 % + fipronil 40 % - 80 WG @ 300 g ha^{-1} was significantly superior over all other treatments (5.56%) in reducing mortality of plants and was on par with treatment clothianidin 50 WDG @ 250 g ha^{-1} (6.67%) and flubendiamide 480 SC @ 400 ml ha^{-1} (7.78%). The mortality of the plants varies from 5.56 to 15.56 per cent as compared to 21.11 per cent in untreated control.

45 days after treatment

Significant reduction in plant mortality was registered in the treatment imidacloprid 40 % + fipronil 40% - 80 WG @ 300 g ha^{-1} (7.78%) and found superior over untreated control in reducing plant mortality and was on par with treatments clothianidin 50 WDG @ 250 g ha^{-1} and flubendiamide 480 SC @ 400 ml ha^{-1} where 8.89 and 10.00 per cent plant mortality was recorded, respectively. The mortality of plants varies from 7.78 to 18.89 per cent as compared with 25.56 per cent plant mortality in untreated control.

60 days after treatment

The observations recorded 60 days after second application recorded plant mortality varies from 8.89 to 20.00 per cent as compared to 28.89 per cent in untreated control. All the treatments found significantly superior over untreated control. Again the treatment imidacloprid 40 % + fipronil 40 % - 80 WG @ 300 g ha^{-1} found consistently superior (8.89%) in reducing mortality of plants which was on par with treatment clothianidin 50 WDG @ 250 g ha^{-1} (10.00%) and flubendiamide 480 SC @ 400 ml ha^{-1} (11.11%).The treatment rynaxypyr 0.4 G @ 125 g ha^{-1} (12.22%), imidacloprid 200 SL @ 175 ml ha^{-1} (15.56%), fipronil 50% SC @ 175 ml ha^{-1} (18.89%), chlorpyriphos 20 EC @ 1000 ml ha^{-1} (20.00%) were next in order of efficacy.

75 days after treatment

The grub undergo pupal stage in month of July. Therefore no any damage of plant was observed at 75 days after drenching.

Efficacy of newer molecules of insecticides against number of white grubs m^{-2} at the time of harvesting.

The number of white grubs m^{-2} were found after sugarcane harvesting are presented in Table 3.

Table3 : Efficacy of newer molecules of insecticides as soil drenching in sugarcane and number of white grubs m^{-2} at the time of harvesting.

Treatment No.	Name of Insecticide	Dose a.i. ha^{-1}	Average number of grubs m^{-2} at time of harvest.
T_1	Rynaxypyr 0.4G (E 2Y45)	125 g	3.67 (2.04)
T_2	Clothianidin 50WDG	250 g	3.00 (1.87)
T_3	Imdacloprid+ Fipronil 40%+40%-80WG	300 g	2.67 (1.77)
T_4	Flubendiamide (Fame) 480 SC	400 ml	3.33 (1.95)

T_5	Imidacloprid 200SL	175 ml	4.00 (2.12)
T_6	Fipronil 5% SC	175 ml	4.33 (2.19)
T_7	Chlorpyriphos 20EC	1000 ml	4.67 (2.27)
T_8	Untreated Control	-	9.33 (3.13)
	SE ±	-	0.089
	CD at 5%	-	0.191

Figures in parenthesis are $\sqrt{X + 0.5}$ arcsin transformation.

The observations recorded at the time of sugarcane harvesting indicated that the grub population in all the treated plot was significantly lower than untreated control (9.33 grub m^{-2}). It observed lowest in imidacloprid 40 % + fipronil 40 % - 80 WG @ 300 g ha^{-1} (2.67 grub m^{-2}) found significantly superior to untreated control and was on par with clothianidin 50 WDG @ 250 g ha^{-1} and flubendiamide 480 SC @ 400 ml ha^{-1} where 3.00 and 3.33 grubs m^{-2} were observed, respectively.

Outcome of the present investigation under field condition indicated that Among these newer molecules of insecticides, imidacloprid 40% + fipronil 40%- 80 WG @ 300 g ha^{-1} was emerged as the most effective treatment on the basis of per cent plant mortality and number of white grubs m^{-2} area at the time of sugarcane harvesting, it was followed by clothianidin 50 WDG @ 250 g ha^{-1}, flubendiamide 480 SC @ 400 ml ha^{-1} and rynaxypyr 0.4% G @ 125 g ha^{-1}. The per cent plant mortality in the different treatments at 75 days after first drenching ranged from 4.44 to 13.33 per cent and 18.89 per cent in untreated control. During 60 days after second drenching 8.89 to 20.00 per cent plant mortality was recorded in the different treatments and 28.89 per cent in untreated control.

Present findings are in conformity with Patel *et al*., (2010), they reported that soil drenching of imidacloprid 40 % + fipronil 40%-80 WG @ 187 g ha^{-1} was most effective in groundnut crop for control of white grub. However, similar results obtained in present investigation. Similar findings were also reported by Suthar (1994), Patel *et al.* (1985) and Patel and Patel (2000). However, not much work has been reported on E2Y45 and clothianidin being a new insecticide from the literature reviewed.

BIBLIOGRAPHY

Adsule, V.N. and S.M. Patil 1990. *Leucopholis lepidophora* Bl. A new white grub pest of groundnut in western Maharashtra Groundnut News. pp.-2 : 7.

Patel, B.A., I.S. Patel, P.S. Pateland J.K. Patel 2010. Efficacy of newer insecticidal formulations applied as soil drenching against white grubs and termite in groundnut. Pestology 34(7) :55- 57.

Patel, B.D. and G.M. Patel 2000. Efficacy of new insecticidal formulationsn as seed treatment against white grub in groundnut. GAU Res. J. 25 (2) : 27-33.

Patel, G.M., J.I. Patel, P.K. Patel, B.R. Patel, R.L. Patel, R.K. Patel, P.J. Patel and S.N. Choudhary 1985. Chemical control of white grubs, *Holotrichina consanguinea* Blanch. In groundnut through seed treatment and soil application. Pest Management and Economic Zoology. 3(1) :13-16.

Patil, S. M., V.M. Adsule and V.M. Khaire 1991. Efficacy of some insecticides against the white grub infesting chillies. J. Maharashtra Agric. Uni. 16 (2) : 276 -277.

Raodeo, A.K., S.V. Deshapande, A.D. Deshapande, S.N., Puri and Bilapate 1976. A large scale compaign for the control of white grub *Holotrichia serrata* F. in Maharashtra state, PANS. 4 : 223-228.

Suthar, N.B. 1994. 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 Gujarat Agril. Univ. Sardarkrushinagar.

Veeresh, G.K. (1974). Root grub control, campaign in Karnataka. White grubs Newsletter 1: 17-18.

Veeresh, G.K., M. Vijayendra, N.V.M. Reddy, and C. Rajanna, 1982. Bioecology and management of areca white grubs (*Leucopholis* spp.,) (Coleoptera : Scarabaidae : Melolonthinae). J. Soil. Biol. Ecol., 2 : 78-86

Yadava, C.P.S. and G.K. Sharma 1995. Indian white grubs and their management, Indian Council of Agricultural Research, New Delhi. Tech. Bull. No.2 All India Coordinated Research Project on white grubs. pp. 26.