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Management of shoot fly and stem borer on pearl millet crop

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ABSTRACT

A field experiment was conducted for management of shoot fly, *Atherigona aproximata*, Malloch and stem borer, *Chilo partellus* Swinhoe in pearl millet crop between 2006-07 to 2010-11 at Millet Research Station, Junagadh Agricultural University, Jamnagar. The results indicated that farmers of North Saurashtra Agro-climatic zone growing bajra crop are advised to apply two sprays of profenophos 0.05 per cent or fenobucarb 0.1 per cent at 20 and 40 days after germination for the control of shoot fly and stem borer infesting bajra crop.

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INTRODUCTION

Pearl millet [Pennisetum glaucum (L.) R. Br.] is an important cereal crop generally cultivated under arid and semi arid region and it is found to be attacked by 116 insect pests. More than 100 insect pest species have been reported to be associated with bajra based cropping system (Kishore and Solomon, 1989). Out of these, shoot fly and stem borer are comparatively more serious pests attacking at vegetative as well as at ear head stages of the crop. Incidence of stem borer was noticed 15 days of germination of the crop and gradually increased to its peak at 77 days after germination of the crop (Raghvani *et al*., 2008) Losses in yield of bajra crop due to shoot fly estimated to the tune of 23.3 to 36.5 per cent in grain and 37.55 per cent in fodder, while the estimated losses in bajra yield due to stem borer is 20 to 60 per cent (Kishore, 1996). Very limited work is found in the literature for the management of shoot fly and stem borer. Hence the research work for the management of both these pests was under taken.

MATERIAL AND METHODS

The experiment was conducted in Randomized Block Design with seven treatments including control replicated thrice at main Millet Research Station, Junagadh Agricultural University, Jamnagar during *Kharif* 2007-08 to 2009-10. The pearl millet variety GHB-558 was sown at 60 cm distance for this purpose. The gross plot size was 5.0× 3.6 M (6 rows) and net plot size was 4.0× 2.4 M (4 rows). Granular application of insecticides was given initially at the time of sowing in the furrow, while foliar application was given at 15 DAG and 40 DAG. At vegetative stage, observations were recorded from 25 randomly selected plants by counting healthy and damaged tillers and thus, per cent dead heart was worked out for shoot fly. For stem borer, plants showing parallel holes due to stem borer larva in the leaves were considered as damaged plant and per cent damaged plant was calculated by observing 25 randomly selected plants. At ear head stage, numbers of ear heads showing shoot fly and stem borer damage were recorded separately from randomly selected 25 ear heads in each treatment and thus per cent ear head damage was worked out. Grain and fodder yield was recorded from net plot area at harvest and data thus, obtained was analyzed statistically and economics of the treatments was worked out (Panse and Sukhatme, 1989; Hanson (1961);

Huffaker and Gutierrez (1991); Nadarajan and Gunasekaran (2005); Sharma (1998) and Srivastava (1996)).

RESULTS AND DISCUSSION

Year wise as well as pooled results of shoot fly infestation at vegetative and at ear head stage are presented in Table 1 indicated that during *Kharif* 2007 results were found non significant. While during *Kharif* 2008, *Kharif* 2009 as well as in pooled difference was found significant. In pooled data, endosulfan 0.07 per cent recorded significantly the least incidence of shoot fly (5.73 %) at vegetative stage. How ever, it was statistically at par with almost all the treatments except azadirachtin 0.0005 per cent. At ear head stage, shoot fly incidence during all the three years and in pooled results were found significant. In pooled, endosulfan 0.07 per cent recorded the least incidence. However, remaining all the insecticides were found statistically at par in their effectiveness.

Data presented in Table 2 indicated that difference in per cent plant damage due to stem borer at vegetative stage was found significant during all the three seasons and in pooled. In pooled data, carbofuran 3G @ 0.75 kg. ai/ha recorded the least per cent plant damage (7.61 %) at vegetative stage. However, it was at par with all the insecticidal treatments. At ear head stage, carbofuran 3G @ 0.75 kg. ai/ha found more effective which recorded the least incidence (3.80 %). However, it was at par with almost all the insecticidal treatments except azadirachtin 0.0005 per cent.

Data presented in Table 3 indicated that difference in yield of bajra grain was found significant during all the three seasons as well as in pooled. In pooled data, results showed that endosulfan 0.07 per cent recorded significantly the highest grain yield (1901 kg./ha). However, it was statistically at par with fenobucarb 0.1 per cent (1852 kg./ha) and profenophos 0.05 per cent (1768 kg./ha). Azadirachtin 0.0005 per cent recorded the lowest grain yield *i.e.* 1481 kg./ha and thus found least effective. In case of fodder yield, results during all the three seasons as well as in pooled were found non-significant. The cost benefit ratio (Table 4) indicated that the endosulfan 0.07 per cent recorded the highest CBR (1 : 9.08), which was closely followed by profenophos 0.05 per cent (1 : 7.26) and fenobucarb 0.1 per cent (1 : 6.54).

Looking to the effectiveness of insecticides, all the

Table 1 : Incidence of shoot fly per cent in pearl millet (2007-2009)

Sr. No.	Treatments	Per cent shoot fly incidence at vegetative stage				Per cent shoot fly incidence at ear head stage			
		2007	2008	2009	Pooled	2007	2008	2009	Pooled
1.	Carbofuran 3G 0.75 kg ai/ha furrow	9.88*	21.91*	18.67*	16.82*	10.35*	17.52*	12.72*	13.53*
	application	(2.94)	(13.93)	(10.24)	(8.48)	(3.23)	(9.06)	(4.85)	(5.56)
2.	Fipronil 0.3GR 0.1 kg ai/ha. furrow	9.50	25.15	18.14	17.60	11.30	19.42	11.99	14.23
	application	(2.72)	(18.04)	(9.60)	(9.14)	(3.84)	(11.04)	(4.31)	(6.04)
3.	Azadirachtin 1500 ppm 0.0005 %	9.95	28.09	20.26	19.43	10.98	19.46	12.79	14.41
		(2.98)	(22.15)	(11.99)	(11.06)	(3.63)	(11.10)	(4.90)	(6.19)
4.	Profenophos 50EC 0.05 %	10.20	17.89	18.06	15.38	10.86	20.53	11.98	14.46
		(3.13)	(9.43)	(9.61)	(7.04)	(3.56)	(12.30)	(4.31)	(6.24)
5.	Fenobucarb 0.10 %	9.89	17.29	17.09	14.78	10.31	20.14	11.44	13.96
		(2.99)	(8.83)	(8.64)	(6.49)	(3.20)	(11.85)	(3.94)	(5.82)
6.	Endosulfan 35 EC 0.07 %	9.36	14.86	17.33	13.85	12.52	15.69	10.94	13.04
		(2.95)	(6.57)	(8.87)	(5.73)	(4.70)	(7.29)	(3.60)	(5.09)
7.	Untreated – control	13.92	32.53	23.57	23.34	16.12	24.60	15.33	18.68
		(5.79)	(28.91)	(15.99)	(15.70)	(7.71)	(17.32)	(6.99)	(10.25)
	S.E. ± for Treat	0.92	1.22	1.22	1.68	1.11	1.16	0.72	0.64
	S.E. ± for Year	--	--	--	0.43	--	--	--	0.38
	S.E. ± Y × T	--	--	--	1.13	--	--	--	1.02
	C.D. (P=0.05) for Treat	NS	3.77	3.76	5.17	3.41	3.59	2.23	1.81
	C.D. (P=0.05) for Year	--	--	--	--	--	--	--	--
	C.D. (P=0.05) for Y×T	--	--	--	3.24	--	--	--	--
	C.V. (%)	15.26	9.41	11.12	11.30	16.30	10.27	9.99	12.04

* indicates arcsine transformed values, Figures in parenthesis are retransformed values; NS = Non-significant

Table 3 : Statement showing year wise and pooled grain yield, fodder yield (2007-2009)

Sr. No.	Treatments	Grain yield (kg./ha)				Fodder yield (Kg./ha)			
		2007	2008	2009	Pooled	2007	2008	2009	Pooled
1.	Carbofuran 3G 0.75 kg ai/ha	1554	1858	1511	1641	3906	3437	3646	3552
2.	Fipronil 0.3GR 0 .1 kg ai/ha.	1787	2075	1181	1681	5122	3959	3195	4092
3.	Azadirachtin 1500 ppm 0. 0005 %	1493	1962	990	1481	4254	3542	3403	3733
4.	Profenophos50EC 0.05 %	1684	2144	1476	1768	4948	3993	2743	3895
5.	Fenobucarb 50EC 0.10 %	1788	2292	1476	1852	4427	3958	2676	3687
6.	Endosulfan 35 EC 0.07 %	1823	2214	1667	1901	5035	3646	2917	3866
7.	Untreated–control	1343	1745	841	1310	3733	3229	2465	3142
	S.E. for Treat	102.07	103.86	101.64	63.60	498.13	273.07	296.57	219.75
	S.E. for Year	--	--	--	38.75	--	--	--	138.83
	S.E. Y×T	--	--	--	102.53	--	--	--	367.32
	C.D. (P = 0.05) for Treat	314.55	320.04	313.20	180.98	NS	NS	NS	NS
	C.D. (P = 0.05) for Year	--	--	--	--	--	--	--	--
	C.D. (P = 0.05) for Y × T	--	--	--	NS	--	--	--	NS
	C.V. (%)	10.79	8.81	13.48	10.69	19.22	12.85	17.09	17.15

NS = Non-significant

Table 2 : Incidence stem borer per cent in pearl millet (2007-2009)

Sr. No.	Treatments	Per cent stem borer incidence at vegetative stage				Per cent stem borer incidence at ear head stage			
		2007	2008	2009	Pooled	2007	2008	2009	Pooled
1.	Carbofuran 3G 0.75 kg ai/ha furrow application	17.55*	14.48*	16.00*	16.01*	12.10*	9.92*	9.43*	10.48*
		(9.09)	(6.25)	(7.60)	(7.61)	(4.40)	(2.95)	(2.68)	(3.30)
2.	Fipronil 0.3GR 0.1 kg ai/ha. furrow application	20.06	15.43	15.92	17.14	17.20	11.35	10.83	13.13
		(11.76)	(7.08)	(7.52)	(8.68)	(8.74)	(3.86)	(3.53)	(5.18)
3.	Azadirachtin 1500 ppm 0.0005 %	18.53	16.66	18.85	18.01	15.08	14.42	11.49	13.66
		(10.10)	(8.22)	(10.46)	(9.58)	(6.77)	(6.20)	(3.98)	(5.57)
4.	Profenophos 50EC 0.05 %	20.50	15.49	15.82	17.27	14.78	10.27	10.60	11.88
		(12.28)	(7.14)	(7.43)	(8.81)	(6.51)	(3.18)	(3.39)	(4.23)
5.	Fenobucarb 50 EC 0.10 %	19.27	11.48	15.05	15.27	11.59	12.18	10.91	11.56
		(10.88)	(3.96)	(6.75)	(6.92)	(4.05)	(4.45)	(3.58)	(4.02)
6.	Endosulfan 35 EC 0.07 %	20.91	11.94	15.61	16.15	16.84	9.85	10.49	12.39
		(12.75)	(4.27)	(7.25)	(7.74)	(8.39)	(2.93)	(3.32)	(4.60)
7.	Untreated – control	26.44	21.85	21.25	23.18	20.27	19.58	14.60	18.15
		(19.82)	(13.88)	(13.13)	(15.49)	(12.00)	(11.23)	(6.35)	(9.70)
	S.E. ± for Treat	1.44	0.76	1.30	0.74	1.31	0.73	0.50	0.97
	S.E. ± for Year	--	--	--	0.46	--	--	--	0.35
	S.E. ± Y×T	--	--	--	1.20	--	--	--	0.91
	C.D. (P=0.05) for Treat	4.43	2.34	4.02	2.11	4.03	2.26	1.55	2.98
	C.D. (P=0.05) for Year	--	--	--	--	--	--	--	--
	C.D. (P=0.05) for Y×T	--	--	--	NS	--	--	--	2.62
	C.V. (%)	12.17	8.57	13.35	11.86	14.70	10.17	7.78	12.13

* indicates arcsine transformed values, Figures in parenthesis are retransformed values; NS = Non-significant

Table 4 : Economics of various treatments for the control of bajra shoot fly and stem borer in pearl millet

Sr. No.	Treatments	Qty. of insecticides kg/ lt/ ha	Cost of insecticide Rs./ha	Total management cost Rs./ha	Gross realization Rs./ha	Net realization over control Rs./ha	C.B.R.
1.	Carbofuran 3G 0.75 kg. ai/ha	25 kg	2000/-	2200/-	25020/-	4587/-	1:2.09
2.	Fipronil 0.3GR 0.1 kg. ai/ha	33 kg	2607/-	2807/-	26310/-	5877/-	1:2.09
3.	Azadirachtin 0.0005 %	3.0 L	840/-	1240/-	23372/-	2939/-	1:2.37
4.	Profenophos 50 EC .05 %	0.9 L	513/-	913/-	27059/-	6626/-	1:7.26
5.	Fenobucarb 50 EC 0.10 %	1.8 L	720/-	1120/-	27755/-	7322/-	1:6.54
6.	Endosulfan 35 EC 0.07 %	1.93 L	501/-	901/-	28611/-	8178/-	1:9.08
7.	Untreated-control	--	--	--	20433/-	--	--

insecticides were found statistically equally effective except azadirachtin 0.0005 per cent. Endosulfan 0.07 per cent recorded not only the highest grain yield (1901 kg./ha) but also registered highest CBR value (1 : 9.08). However, the treatment of fenobucarb 0.1 per cent and profenophos 0.05 per cent were found statistically at par in yield and these treatments also recorded comparatively higher CBR values.

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