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MANAGEMENT OF BAJARA EAR HEAD WORM, *HELICOVERPA ARMIGERA* HUBNER UNDER NORTH GUJARAT CONDITIONS

N. N. CHAUHAN, F. K. CHAUDHARY AND R. F. CHAUDHARY*

Krishi Vigyan Kendra, Sardarkrishinagar Dantiwada Agricultural University, DEESA - 385 535 Di. Banaskantha, Gujarat, India ID : fk_43@yahoo.co.in MO : +91 94281 37542
* Associate Professor, College of Agriculture, Navsari Agricultural University, Waghai Di. Dang, Gujarat

ABSTRACT

A field experiment was conducted for management of ear head worm on pear millet at Nadotra village near Sardarkrushinagar Dantiwada Agricultural University campus, Saradrkrushinagar, Dist. Banaskantha (Gujarat) during summer, 2011. Out of seven chemical and two botanical insecticides tested, two sprays of endosulfan 0.07% + dichlorvos 0.05% or spinosad 73g a.i./ha or indoxacarb 50g a.i./ha or profenophos 0.05% at weekly interval starting from the formation of the ear head proved highly effective to manage ear head worm population on summer grown pearl millet crop in North Gujarat.

Key words : Pearl millet, earhead worn, management.

INTRODUCTION

In India, pearl millet is the fourth most important food grain crop after rice, wheat and sorghum. As an arid and semi-arid crop, it is the component of dry land eco-system which receives rainfall between 15 and 175 cm per annum. The share of pearl millet in total food grain production of the country is to the tune of 10.7 per cent. Traditionally, it is used as porridge but, now a days, bakery products like cakes, muffins, cookies and biscuits are baked with pearl millet flour. In Gujarat, it occupied an area of 7.03 lakh hectares having 9.61 lakh tons production with 1370 kg / ha productivity as *kharif* crop (Anon., 2009) while, in summer it occupied 1.74 lakh hectares having 4261 tons production with 2440 kg / ha productivity (Anon., 2010). Pearl millet is attacked by a number of insect pests, *viz.,* ear head worm, *Helicoverpa armigera* Hubner; hairy caterpillar, *Amsacta moorei*; army worm, *Cirphis unipuncta*; borer, *Chilo zonellus*; blister beetle, *Psalydolytta ruficolis*; shoot fly, *Atherigona socata* M.; Surface grasshopper, *Chrotogonus brachypterous* B. and White grub, *Holotrichia consanguinea* B. (Patel and Patel, 1970). Farmers of this area do not adopt management tactics in bajara crop as the crop has no serious pests.

Over the past five years, the pearl millet ear head worm, *H. aremigera* has become a regular pest of the summer sown crop area of Banaskantha district of north Gujarat. Adoption of *Bt*. cotton varieties in large area of the state could have diverted the pest towards other available hosts for its existence. Considerable research work has been carried out by various scientists pertaining to this international pest on its preferred host, like pulses, oil seeds, fruit and vegetables, but scanty information is available on pearl millet. Therefore the present investigation was carried out to develop suitable pest management strategies.

MATERALS AND METHODS

The crop was raised during summer, 2011 following the normal recommended cultivation practices except plant protection. Treatments *viz.*, endosulfan 0.07 %, quinalphos 0.05%, spinosad 73g a.i./ha, dichlorovos 0.05%, indoxacarb 50g a.i./ha, profenophos 0.05%, endosulfan 0.07% + dichlorovos 0.05%, NSKE 5% and neem oil 1500 ppm 0.05% were tested in Randomized Block Design with three replications on farmer's field at village Nadotra, Ta. Dantiwada, Di. Banaskantha, Gujarat. Uniform plant stand was maintained in all the experimental plots. The crop was sprayed twice at weekly interval starting from ear head emergence with the help of knapsack sprayer (ASPEE HI-TECH) provided with hollow cone nozzle. The sprayer was washed thoroughly prior to the application of subsequent treatments. The observations on number of ear head worm per ear head were recorded from net plot on five randomly selected ear heads one day before and 3 and 7 days after application of each treatment. Per cent increase in yield over control and avoidable losses were calculated applying formula suggested by Khosla (1977). The data, obtained were subjected to statistical analysis for drawing meaningful conclusion.

RESULTS AND DISCUSSION

Larval population

Before spray. Results (Table 1) reveal that there was non-significant difference in incidence of pearl millet ear head worm in various treatments recorded before imposing insecticidal treatments that indicated homogenous population in the experimental area.

After first spray. The treatment differences were significant three days after first spray with regard to larval population in pearl millet. The treatment of endosulfan + dichlorvos registered the lowest larval population (0.73 larva / ear head); however, it was at par with the treatment of spinosad (1.11 larvae / ear head). The larval population in rest of treatment varied from 1.19 to 1.81 larvae/ ear head, while control recorded the highest population (1.90 larvae/ ear head). Seven days after the first spray, significantly low larval population in the treatment of endosulfan + dichlorvos (0.66 larva / ear head) was recorded, however, it was at par with spinosad, indoxacarb and profenophos. The larval population in these treatments varied from 0.92 to 0.99 larva / ear head. The rest of treatments had lower larval population which ranged between 1.06 and 1.66 larvae/ear head. The untreated crop recorded maximum (2.32 larvae/ear head) ear head worm population.

After second spray. All the treatments were significantly superior over control in reducing the larval population after three days from second spray. The lowest larval population was recorded in the treatment of endosulfan + dichlorvos (0.54 larva / ear head), however it was at par with the treatment of spinosad and indoxacarb, where the larval population was 0.73 and 0.92 larva / ear head, respectively. The rest of treatments registered 0.99 to 1.54 larvae / ear head. The untreated plot recorded the highest larval population (2.12 larvae/ear head). The results on seven days after second spray revealed significantly lower incidence in the treatment of endosulfan + dichlorvos (0.60 larva / ear head), however it was at par with the treatment of endosulfan, quinalphos, spinosad, indoxacarb and profenophos where the larval population ranged between 0.67 and 0.92 larva / ear head. Dichlorvos, NSKE and neem oil recorded the larval population between 1.19 and 1.66 larvae / ear head, whereas, untreated crop recorded maximum larval population (2.25 larvae / ear head).

The order of effectiveness of various treatments against pearl millet ear head worm was endosulfan + dichlorvos > spinosad > indoxacarb > quinalphos = profenophos > endosulfan > dichlorvos = neem oil > NSKE. Thus, the combination of endosulfan and dichlorvos proved highly effective to manage the ear head worm in pearl millet. It can be inferred from the overall results that endosulfan + dichlorvos and spinosad and profenophos were effective; whereas, rest of the treatments were more effective than untreated control to reduce the ear head worm population in pearl millet crop.

Table 1. Efficacy of different insecticides against *H. armigera* in pearl millet

Treatments	Mean larval population / ear head				
	Before spray	Days after spray			
		1st spray		2nd spray	
		3	7	3	7
Endosulfan 0.07 %	1.43 (1.54)	1.33(1.27)	1.30(1.19)	1.22(0.99)	1.19(0.92)
Quinalphos 0.05 %	1.38 (1.40)	1.33(1.27)	1.25(1.06)	1.25(1.06)	1.14(0.80)
Spinosad 73g a.i. / ha	1.47 (1.66)	1.27(1.11)	1.19(0.92)	1.11(0.73)	1.08(0.67)
DDVP 0.05 %	1.42 (1.52)	1.40(1.46)	1.35(1.32)	1.25(1.06)	1.30(1.19)
Indoxacarb 50g a.i / ha	1.44 (1.57)	1.30(1.19)	1.22(0.99)	1.19(0.92)	1.13(0.78)
Profenafos 0.05%	1.38 (1.40)	1.33(1.27)	1.22(0.99)	1.30(1.19)	1.14(0.80)
Endosulfan 0.07 % + dichlorvos 0.05 %	1.35 (1.32)	1.11(0.73)	1.08(0.66)	1.02(0.54)	1.05(0.60)
NSKE 5 %	1.53 (1.84)	1.52(1.81)	1.47(1.66)	1.40(1.46)	1.47(1.66)
Neem Oil 1500 ppm	1.47 (1.66)	1.45(1.60)	1.43(1.54)	1.43(1.54)	1.30(1.19)
Control	1.60 (2.06)	1.55(1.90)	1.68(2.32)	1.62(2.12)	1.66(2.25)
S. Em.±	0.06	0.05	1.45	0.06	1.39
C.D. at 5%	NS	0.16	0.15	0.17	0.16
C.V. %	7.24	6.90	6.70	8.14	7.52

Figures in parentheses are retransformed values while outside are x + 0.5 transformed value

Table 2. Yield and avoidable losses in pearl millet

Sr. No.	Treatment	Grain yield (kg/ha)	Increase in yield over control (%)	Avoidable losses (%)
1.	Endosulfan	1575	68.13	33.15
2.	Quinalphos	1861	98.66	21.02
3.	Spinosad	2306	146.14	2.14
4.	Dichlorvos	1638	74.87	30.47
5.	Indoxacarb	2263	141.54	3.97
6.	Profenafos	2081	122.08	11.70
7.	Endosulfan + Dichlorvos	2356	151.53	0.0
8.	NSKE	1235	31.81	47.59
9.	Neem Oil	1240	32.41	47.36
10.	Control	937	00.00	60.24
	S. Em. ±	103		
	C.D. at 5%	307		
	C.V. %	10.26		

Yield

The grain yield of pearl millet in different treatments varied from 1235 to 2356 kg/ha (Table 2). It was maximum in the treatment of endosulfan + dichlorvos (2356kg/ha) and was at par with the treatment of spinosad (2306 kg/ha), indoxacarb (2263 kg/ha)and profenophos (2081 kg/ha) which formed next group of effective treatments. The treatment of quinalphos (1861 kg/ha), dichlorvos (1638 kg/ha) and endosulfan alone (1575 kg/ha) were moderately effective over control. Both the botanicals i.e. neem oil (1240 kg/ha) and NSKE (1235 kg/ha) failed to increase yield of pearl millet significantly over control.

Percent increase in yield and avoidable losses

Per cent increases in pearl millet grain yield over control due to various treatments were worked out on basis of the yield recorded in individual treatments including control (Table 2). The treatment of endosulfan + dichlorvos recorded highest increase in yield over control (151.53 %), which was followed by spinosad (146.53 %), indoxacarb (141.54 %) and profenophos (122.08 %). The rest of treatments increased the yield over control which ranged between 31.81 and 98.66 %. The lowest avoidable loss in pearl millet yield was observed in crop treated with endosulfan + diclorvos followed by spinosad (2.14 %), indoxacarb (3.97 %) and profenophos (11.70 5) however, such loss was highest in untreated plot (60.24 %).

CONCLUSION

It could be concluded that two sprays of endosulfan 0.07% + diclorvos 0.05% or spinosad 73g a.i./ha or indoxacarb 50g a.i./ha or profenophos 0.05% at weekly intervals commencing from ear head emergence were very effective for management of ear head worm on bajara crop. The treatment of quinalphos (0.05%), dichlorvos (0.05%) and endosulfan (0.07%) alone was less effective; while, the application of botanicals (Neem oil 1500 ppm and NSKE 5%) failed to protect the crop from ear head worm damage.

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