Entomology

Bio efficacy of different insecticides against sorghum stem borer (*Chilo partellus*)

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Abstract

A field experiment was carried out with the title Management of insect pest of sorghum in *kharif* season. In *Kharif* season 2018-2019 and 2019-2020 at Sorghum Research Station, VNMKV Parbhani (MS) India. managementof shoot pests of sorghum Randomized Block Design (RBD) with seven treatments and three replications were used. In management of shoot pests different IPM components used for stem bore dead hearts 45th DAE significantly lowest per cent of dead hearts were recorded in the treatment T_5 [Furrow application of carbofuron 3g @ 20 kg/ha + whorl application of carbofuron 3g @ 8 kg/ha at 35 Days after emergence] (4.56%) which was at par with T_2 [Seed treatment with imidacloprid @ 3g ai/kg seed+ whorl application of carbofuron 3g @8kg/ha at 35 Days after emergence] (4.67%). *Kharif* 2018-19 and 2019-20.

Keywords: bio-efficacy of insecticides, *Chilo partellus*, *Helicoverpa armigera*, parbhani (MS)

Introduction

Sorghum [*Sorghum bicolor* (L.) Moench] is an important cereal crop in India popularly known as 'Jawar' or 'Great millet'. It is most likely originated in East Central Africa and it was acquainted with India from East Africa in the year 1500 BC. The benefit of this cereal crop is that it can be cultivated in both *Kharif* and *Rabi* season. Sorghum is important feed and food crop in the world and utilized as fodder to feed millions of animals providing milk and meat for human being. Sorghum is nutritious its fodder contains in excess of 50 percent digestible nutrients with 8 percent protein, 2.5 percent fat and 45 percent nitrogen free concentrate. Maharashtra is foremost sorghum growing states in the country with an area, production, productivity of jowar was 2.23 million ha, 1.61 million tonnes and 720 kg ha^{-1}, respectively (Anonymous 2019) [1]. Several reasons have been attributed for the low grain and fodder yield of sorghum. Among them insect pests ravage is one of the principal factors. Insect pests continue to compete with humans for the sorghum crop and knowledge of both old and new pests has accumulated at a faster rate in recent years as the crop has received increasing attention. About 150 insect species have been recorded on sorghum including in both field as well as store condition. Out of which 31 species are economically important. In Maharashtra about 18 important insect pests have been recorded on sorghum crop. Though many pests have been reported on sorghum crop in Maharashtra very few have economic status. The major being sorghum shoot fly, *Atherigona soccata* Rondani, stem borer, *Chilo partellus* Swinhoe, sorghum shoot bug, *Perigrinus maidis* Ashmead, earhed bug, *Calocoris angustatus* Lethir, army worm, *Mythimna separate* Walker, midge fly, *Contarinia sorghicola* Coquillette, sorghum aphid, *Melanaphis sacchari* Zehntner, earhead hairy caterpillar, *Euproctis subnotata* Walkerand Ear head worm *Helicoverpa armigera* Hubner (Reddy and Davies, 1979) [4].

The shoot fly, *Atherigona soccata* gets attracted from second to seventh leaf period of seedling and placed cigar shaped white eggs singly on the lower surface of the leaves. The maggot of shoot fly after hatching, crawl to the plant whorl and then cut the growing point/tissue and then feed on decaying leaf tissues. As a result, central shoot become pale yellow and subsequently dead hearts forms. The tillers may be formed in about two-week-old seedlings but they may also get damaged. The losses due to shoot fly alone were to the tune of 22.11 to 83.94 per cent (Jotwani and Sukhani, 1971; Mote *et. al*., 1981 and 1982).

Materials and Methods

Stem borer (*Chilo partellus*)

Dead heartcount

The dead hearts caused by stem borer was recorded from total plants at 45th days after emergence in each of the plot and per cent dead heart was calculated using Abbott's (1925) formula:

$$\text{Dead hearts (\%)} = \frac{\text{No. of plants with dead hearts in a plot}}{\text{Total no. of plants in the plot}} \times 100$$

Result and Discussion

Stem borer dead hearts at 45th days after emergence 2018-19

The per cent dead hearts ranged between 4.28 to 18.04 on 45th days after emergence. Significantly lowest per cent of dead hearts were recorded in the treatment T_5 [Furrow application of carbofuron 3g @ 20 kg/ha + whorl application of carbofuron 3g @ 8 kg/ha at 35 Days after emergence] (4.28%) which was found statistically at par with treatment T_6 [Furrow application

of carbofuron 3g @ 20 kg/ha+ spray of Novaluron 10 % at 35 Days after emergence] (7.31%). The next best treatment was T_2 [Seed treatment with imidacloprid @ 3g ai/kg seed+ whorl application of carbofuron 3g @8kg /ha at 35 Days after emergence] (4.33%), T_4 [Seed treatment with imidacloprid @ 3g ai/kg seed+ *Bacillus thuringiensis*20 ml/10 lit. of water at 35 Days after emergence] (8.70%) and T_3 [Seed treatment with imidacloprid @ 3g ai /kg seed + spray of Neem seed kernel extract 5% at 35 DAE] (11.17 %). Significantly highest per cent of dead hearts were recorded in the treatment T_7 untreated control (18.04%) which was statistically at par with T_1 [Seed treatment with imidacloprid @ 3g ai/kg seed] (14.28%).

Stem borer dead hearts at 45th days after emergence 2019-20

The per cent dead hearts ranged between 4.84 to 19.57 on 45th days after emergence. Significantly lowest per cent of dead hearts were recorded in the treatment T_5 [Furrow application of carbofuron 3g @ 20 kg/ha + whorl application of carbofuron 3g @ 8 kg/ha at 35 Days after emergence] (4.84%) which was at par with treatment T_2 [Seed treatment with imidacloprid @ 3g ai/kg seed + whorl application of carbofuron 3g @ 8kg/ha at 35 Days after emergence] (5.01%). The next best treatment was T_4 [Seed treatment with imidacloprid @ 3g ai/kg seed+ *Bacillus thuringiensis*20 ml/10 lit. of water at 35 Days after emergence] (7.18%) and T_6 [Furrow application of carbofuron 3g @ 20 kg/ha+ spray of Novaluron 10 % at 35 Days after emergence] (8.77%) and treatment T_3 [Seed treatment with imidacloprid @ 3g ai/kg seed+ spray of neem seed kernel extract 5% at 35 Days after emergence] (9.62 %). Significantly highest per cent of dead hearts were recorded in the treatment T_7 untreated control (19.57%) which was at par with T_1 [ST with imidacloprid @ 3g ai/kg seed] (13.51%).

Stem borer dead hearts at 45th days after emergence 2018-19 and 2019-20 pooled Data

The per cent dead hearts ranged between 4.56 to 18.80 on 45th days after emergence. Significantly lowest per cent of dead hearts were recorded in the treatment T_5 [Furrow application of carbofuron 3g @ 20 kg/ha+ whorl application of carbofuron 3g @ 8 kg/ha at 35 Days after emmergence] (4.56%) which was statistically at par with T_2 [Seed treatment with imidacloprid @ 3g ai/kg seed+ whorl application of carbofuron 3g @8kg/ha at 35 Days after emergence] (4.67%). The next best treatment was T_4 [Seed treatment with imidacloprid @ 3g ai/kg seed+ *Bacillus thuringiensis* 20 ml/10 lit. of water at 35 DAE] (7.94%), T_6 [Furrow application of carbofuron 3g @ 20 kg/ha+ spray of Novaluron 10 % at 35 Days after emergence] (8.04%), T_3 [Seed treatment with imidacloprid @ 3g ai/kg seed+ spray of Neem seed kernel extract 5% at 35 Days after emergence] (10.40 %) and T_1 [seed treatment with imidacloprid @ 3g ai/kg seed] (13.89%). The next significantly highest per cent of dead hearts were recorded in the treatment T_7 untreated control (18.80%).

Table 1: Bio efficacy of different IPM components against major insect pests of sorghum and their effect on grain and fodder yield in *kharif* 2018, 2019 and pooled data

Treatment No	Treatment Details	% SB DH at 45 DAE 2018	% SB DH at 45 DAE 2019	% SB DH at 45 DAE 2018 and 2019 (Pooled Datat)
1	ST with Imidacloprid @3 gmai/kg seed	14.28 (22.09)	13.51 (21.49)	13.89 (21.87)
2	ST with Imidacloprid @3 gmai/kg seed + WA carbofuron 3g @ 8 kg /ha at 35 DAE	4.33 (11.92)	5.01 (12.70)	4.67 (12.39)
3	ST with Imidacloprid @3 gmai/kg seed+ Spray of NSKE 5% at 35 DAE	11.17 (19.50)	9.62 (17.84)	10.40 (18.77)
4	ST with Imidacloprid @3 gmai/kg seed + Bt. 20 ml/ 10 lit. of water at 35 DAE	8.70 (16.97)	7.18 (15.42)	7.94 (16.33)
5	FA of Carbofuron 3g @ 20 kg/ha+ WA of carbofuron 3 g @ 8 kg/ha at 35 DAE	4.28 (11.92)	4.84 (12.38)	4.56 (12.25)
6	FA of Carbofuron 3g @ 20 kg/ha+ Spray of Novaluron10% at 35 DAE	7.31 (15.61)	8.77 (16.98)	8.04 (16.45)
7	Untreated Control	18.04 (24.89)	19.57 (26.22)	18.80 (25.62)
SE		2.02	1.83	1.14
CD		4.45	4.03	2.51
CV		14.08	12.76	7.91

Figures in parentheses are angular transformed value, SFDH= Shoot fly Dead Hearts, SBDH= Stem Borer Dead Hearts, EW= Earhead Worm

Summery and Conclusion

Kharif-2018-19 significantly lowest per cent of dead hearts were recorded in the treatment T_5 [Furrow application of carbofuron 3g @ 20 kg/ha+ whorl application of carbofuron 3g @ 8 kg/ha at 35 Days after emergence] (4.28%) which was found statistically at par with treatment T_6 [Furrow application of carbofuron 3g @ 20 kg/ha+ spray of Novaluron 10 % at 35 Days after emergence] (7.31%).*Kharif*-2019-20 significantly lowest per cent of dead hearts were recorded in the treatment T_5 [Furrow application of carbofuron 3g @ 20 kg/ha + whorl application of carbofuron 3g @ 8 kg/ha at 35 Days after emergence] (4.84%) which was at par with treatment T_2 [Seed treatment with imidacloprid @ 3g ai/kg seed+ whorl application of carbofuron 3g @ 8kg/ha at 35 Days after emergence] (5.01%).

Pooled data *kharif*-2018-19- 2019-20 significantly lowest per cent of dead hearts were recorded in the treatment T_5 [Furrow application of carbofuron 3g @ 20 kg/ha + whorl application of carbofuron 3g @ 8 kg/ha at 35 Days after emmergence] (4.56%) followed by T_2 [Seed treatment with imidacloprid @ 3g ai/kg seed+ whorl application of carbofuron 3g @8kg/ha at 35 Days after emergence] (4.67%) which was at par with each other.

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