Entomology

Bio efficacy of different insecticides against sorghum shoot fly dead hearts

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Received 7 Sep 2022; Accepted 21 Oct 2022; Published 2 Nov 2022

Abstract

A field experiment was conducted with the title Management of insect pest of sorghum in *kharif* season. In *Kharif* season 2018 and 2019 at Sorghum Research Station, VNMKV Parbhani (MS) India. Management of 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 against shoot fly dead hearts at 28 DAE Pooled data *kharif* 2018-19 and 2019-20, all the treatments significantly at par with each other except untreated control. Significantly minimum per cent of dead hearts were recorded in the treatment T_4 [Seed treatment with imidacloprid @ 3g ai/kg seed+ *Bacillus thuringiensis* 20 ml/10 lit. of water at 35 DAE] (8.61 %) and all the treatments are statistically at par with each other except untreated control.

Keywords: bio-efficacy of insecticides, sorghum pest, sorghum shoot fly

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 per cent digestible nutrients with 8 per cent protein, 2.5 per cent fat and 45 per cent 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). 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 a large number of 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* Walker and Ear head worm *Helicoverpa armigera* Hubner (Reddy and Davies, 1979) [2].

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, crowl 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) [3-5].

Materials and Methods

Observations were recorded for shoot fly, stem borer and ear head worm in each plot and replication on following basis.

Shoot fly (*Atherigona soccata*)

The dead heart caused by shoot fly was counted at 14th, 21st and 28th days after emergence from total number of plant and per cent dead heart was calculated by using Abbott's (1925) formula:

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

Result and Discussion

Shoot fly dead hearts at 28th days after emergence-2018-19. All the treatments were found significantly superior for shoot fly dead hearts @ 28 DAE over untreated control. On 28th days after emergence the per cent dead hearts recorded ranged

between 9.65 to 47.40. Significantly minimum per cent of dead hearts were recorded in the treatment T_5 [Furrow application of Carbofuran 3% G @ 20 kg/ha + whorl application of carbofuron 3g @ 8 kg/ha at 35 Days after emergence] (9.65%) while rest of the treatments (except T_7 untreated control) found statistically at par with T_4 [Seed treatment with Imidacloprid @ 3g ai/kg seed + *Bacillus thuringiensis* 20 ml/10 Lit. of water at 35 date] (10.03%), T_2 [Seed treatment with imidacloprid @3 gm ai/kg seed + Whorl application carbofuron 3g @ 8 kg/ha at 35 Days after emergence] (12.17%), T_3 [Seed treatment with imidacloprid @ 3g ai/kg seed+ spray of Neem seed kernel extract 5% at 35 DAE] (12.25%), T_1 [Seed treatment with imidacloprid @ 3g ai/kg seed] (13.67%) and T_6 [Furrow application of carbofuron 3g @ 20 kg/ha+ spray of Novaluron 10 % at 35 Days after emergence] (13.76%). The treatment significantly highest 47.40 per cent of shoot fly dead hearts were recorded in the treatment T_7 untreated control.

Shoot fly dead hearts at 28th days after emergence-2019-20. All the treatments were found significantly superior for shoot fly dead hearts @ 28 DAE as compared to untreated control. On 28th days after emergence the per cent dead hearts recorded ranged between 7.19 to 25.52. Significantly minimum per cent of dead hearts were recorded in the treatment T_4 [Seed treatment with imidacloprid @ 3g ai /kg seed+ *Bacillus thuringiensis* 20 ml/10 lit. of water at 35 Days after emergence] (7.19%), while all remaining treatments except T_7 untreated control found at par with T_5 [Furrow application of Carbofuran 3% G @ 20 kg/ha + whorl application of carbofuron 3g @ 8 kg/ha at 35 Days after emergence] (8.05%), T_2 [Seed treatment with imidacloprid @3 gm ai/kg seed + Whorl application carbofuron 3g @ 8 kg/ha at 35 Days after emergence] (8.17%), T_3 [Seed treatment with imidacloprid @ 3g ai/kg seed+ spray of Neem seed kernel extract 5% at 35 DAE] (8.52%), T_1 [Seed treatment with imidacloprid @ 3g ai/kg seed] (9.17 %) and T_6 [Furrow application of carbofuron 3g @ 20 kg/ha+ spray of Novaluron 10 % at 35 Days after emergence] (9.54 %). Significantly highest 25.52 per cent of shoot fly dead hearts were recorded in the treatment T_7 untreated control.

Shoot fly dead hearts at 28th days after emergence-2019-20. All the treatments were found significantly superior for shoot fly dead hearts @ 28 DAE as compared to untreated control. On 28th days after emergence the per cent dead hearts recorded ranged between 8.61 to 36.46. Significantly minimum per cent of dead hearts were recorded in the treatment T_4 [Seed treatment with imidacloprid @ 3g ai/kg seed+ *Bacillus thuringiensis* 20 ml/10 lit. of water at 35 DAE] (8.61 %) while all the treatments were found statistically at par with T_5 [Furrow application of carbofuron 3g @ 20 kg/ha + whorl application of carbofuron 3g @ 8 kg/ha at 35 DAE] (8.85%), T_2 [Seed treatment with imidacloprid @3 gm ai/kg seed + Whorl application carbofuron 3g @ 8 kg/ha at 35 Days after emergence] (10.17%), T_3 [Seed treatment with imidacloprid @ 3g ai/kg seed+ spray of Neem seed kernel extract 5% at 35 DAE] (10.38%), T_1 [Seed treatment with imidacloprid @ 3g ai/kg seed] (11.42) and T_6 [Furrow application of carbofuron 3g @ 20 kg/ha + spray of Novaluron 10 % at 35 DAE] (11.65). Highest 36.46 per cent of shoot fly dead hearts were recorded in the treatment T_7 untreated control.

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	% SFDH at 28 DAE 2018	% SFDH at 28 DAE 2019	% SFDH at 28 DAE 2018 and 2019 (Pooled Datat)
1	ST with Imidacloprid @3 gmai/kg seed	13.67 (21.61)	9.17 (17.52)	11.42 (19.71)
2	ST with Imidacloprid @3 gmai/kg seed + WA carbofuron 3g @ 8 kg /ha at 35 DAE	12.17 (20.34)	8.17 (16.4)	10.17 (18.48)
3	ST with Imidacloprid @3 gmai/kg seed+ Spray of NSKE 5% at 35 DAE	12.25 (20.40)	8.52 (16.62)	10.38 (18.76)
4	ST with Imidacloprid @3 gmai/kg seed + Bt. 20 ml/ 10 lit. of water at 35 DAE	10.03 (18.35)	7.19 (15.09)	8.61 (16.91)
5	FA of Carbofuron 3g @ 20 kg/ha+ WA of carbofuron 3 g @ 8 kg/ha at 35 DAE	9.65 (17.94)	8.05 (16.02)	8.85 (17.04)
6	FA of Carbofuron 3g @ 20 kg/ha+ Spray of Novaluron10% at 35 DAE	13.76 (21.62)	9.54 (17.83)	11.65 (19.86)
7	Untreated Control	47.40 (43.48)	25.52 (30.32)	36.46 (37.12)
SE		2.39	2.29	1.80
CD		5.26	5.04	3.98
CV		12.5	15.13	10.48

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

Summery and Conclusion

Significantly minimum per cent of dead hearts was recorded in protected treatment T_1 (Pair No. 13) (15.20%) in *kharif* 2018. In *kharif* 2019 significantly minimum per cent of dead hearts was recorded in protected treatment T_1 (Pair No. 3) (4.10%). In kharif 2018-19 and 2019-20 pooled observation was significantly minimum per cent of dead hearts was recorded in protected treatment T_1 (Pair No. 3) (14.85%).

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