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Research Article

Efficacy of thiamethoxam 30 FS against maize stem borers

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ABSTRACT

A field experiment was conducted at Maize Research Centre, ARI, Rajendranagar, Hyderabad during *Kharif* 2009 and *Rabi* 2009-10 to evaluate the different doses of Thiamethoxam30FS as seed treatment chemical for controlling maize stem borers, *Chilo partellus* Swinhoe and *Sesamia inferens* Walker. Among the doses tested, higher dose of thiamethoxam 30FS (8ml/kg) proved superior resulting in 0.38 per cent dead hearts during *Kharif* and 6.43 per cent dead hearts during *Rabi* compared to 0.79 per cent and 14.76 per cent in untreated check. Thiamethoxam30FS @ 8ml/kg resulted in higher grain yield of 5.4t/ha during *Rabi*. Phytotoxic effects like necrosis, vein clearing, epinasty etc. were not observed even at the highest dose of 16 ml/kg.

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INTRODUCTION

In India, maize ranks fifth in total area, fourth in production and third in productivity. Around 250 species of insect and mite species attack maize in field and storage conditions (Mathur, 1991). Among them, spotted stem borer, *Chilo partellus* (Swinhoe) is the most serious one during *Kharif* season causing 26.7-80.4 per cent yield losses in different agroclimatic regions of India (Panwar, 2005). Annual loss of 11.05 crores in *Rabi* is due to *Sesamia inferens* Walker (Siddiqui and Marwaha,1993). Effectiveness of Endosulfan 35 EC spray and whorl application of Carbofuran 3G for controlling stem borers was reported by Sajjan (983). However, no information on new molecules is available. One of the new molecules, Thiamethoxam is a neonicotinoid, systemic in action, mimic of acetylcholine, binding to Ach receptor site and damaging the insects nervous system resulting in death of the insect. Application of insecticide is independent of weather and amount of active ingredient used per unit area is less in case of seed treatment. Since stem borers attack maize in early whorl stage seed treatment would be effective upto initial 30 days age of the crop. Therefore, the present investigation was carried out during 2009 at Maize Research Centre, Hyderabad to evaluate the bio-efficacy of Thiamethoxam 30 FS as seed treatment against stem borers and its phytotoxic effect on maize plant.

MATERIALS AND METHODS

Field experiments were conducted at Maize Research Centre, ARI, Rajendranagar, Hyderabad for two seasons during *Kharif* 2009 and *Rabi* 2009-2010 in a randomized block design to assess the bio-efficacy of Thiamethoxam 30 FS on maize stem borers. Chemical was supplied by M/s Syngenta India Limited, Mumbai-20 under the trade name of Cruiser 30 FS. The experiment comprised of 7 treatments and 3 replications. DHM-117 seeds treated with five doses of Thiamethoxam 30 FS @ 3 ml/kg, 5 ml/kg, 7 ml/kg, 8 ml/kg and 16 ml/kg, Imidacloprid 600 FS @5 ml/kg and one untreated check were sown on 8.7.2009 during *Kharif* and on 26.11.2009 during *Rabi*. Each plot of size 24 sqm comprised of 7 rows of 4 m length. The seed treatment with 16.0 ml/kg was considered only for phytotoxicity but not for bio-efficacy study.

Infestation of stem borer was recorded from 10 randomly selected plants in each plot. Phytotoxicity symptoms like leaf injury, wilting, vein clearing, necrosis, epinasty and hyponasty on maize plants were observed on one, three, five, seven and ten days after germination. Maize grain yield was recorded at the time of harvest and expressed as tons per ha at 15 per cent moisture. Data were subjected to two way analysis after arc sin transformation for per cent values as suggested by (Gomez and Gomez, 1976).

RESULTS AND DISCUSSION

The results obtained from the present investigation have

been discussed in the following sub heads :

Effect of Thiamethoxam 30 FS on maize stem borers:

During *Kharif,* natural infestation of *C.partellus* was low. Lowest per cent (0.77) of infested plants were observed in Thiamethoxam 8 ml/kg and on par with it were Thiamethoxam 7 ml/kg (0.82) and Imidacloprid (0.78). Untreated check contained highest per cent (1.18)of infested plants which was significantly not different from Thiamethoxam 3ml and 5ml/ kg. Dead hearts were significantly more in untreated check (0.79%) and Thiamethoxam 3 ml/kg(0.76%) whereas least in Thiamethoxam 8 ml/kg (0.38%) which was at par with Thiamethoxam 7 ml/kg (0.39%), 5 ml/kg(0.41%) and Imidacloprid (0.4%) (Table 1).

It is evident from the results that with increase in the dosage of the chemical, per cent plant infestation and dead hearts decreased. The higher doses are effective in controlling the stemborer damage. These results are in conformity with that of Maula et al 2010 report that out of 2 concentrations of 0.05 and 0.025 higher doses of Metasystox 25 EC were more effective against mustard aphid at 1, 4 and 7 days after spray both at 50 and 70 DAS. Thiamethoxam protects sugarbeet against aphids and pigmy beetle at 60g than at 30g a.i/100000 seeds. Excellent control of aphids and wireworms in maize without phytotoxic effects was observed in treated plots while damage occurred in untreated plots (Profit *et al.,* 1999).

Seeds treated with four different dosages of Thiamethoxam 30 per cent FS against *Sesamia inferens* during *Rabi* indicated that Thiamethoxam 7 ml/kg was effective in reducing the stem borer incidence recording 14.24 per cent infestation which was significantly not different from Thiamethoxam 8 ml/kg in which 15.42 per cent infestation was observed. Infested plants were highest in untreated check (19.41%) followed by Thiamethoxam 3.0 ml/kg and 5.0 ml.kg. Dead heart formation was least (6.43%) in Imidacloprid. Untreated check recorded 14.76 per cent dead hearts which was significantly different from all the other treatments (Table 1). Effectiveness of Thiamethoxam seed treatment against *Sesamia inferens* is in accordance with the finding of Amalendu *et al.*, 2009 that highest over all mean diminution of thrips population in chillies and consequential yield increase over control (90.1 and 54.3%, respectively) were recorded with Thiamethoxam.

Though the per cent infestation was low in Thiamethoxam 7 ml/kg than Thiamethoxam 8 ml/kg, but dead hearts were more in Thiamethoxam 7 ml/kg than Thiamethoxam 8 ml/kg. Cob formation does not occur in the dead hearts whereas grain yield was not much affected in the plants with leaf injury. Dose dependent efficacy was observed by Anderson *et al.* (2003) in *Spiraea* sp. plants treated with recommended rate (1x) of Thiamethoxam 25 WG in which significant reduction in the grubs of oriental beetle was observed, plants with 2x and 4x had no surviving grubs while untreated plants were heavily infested with the grubs.

Phytotoxic effect of Thiamethoxam 30 FS on maize:

Various doses of Thiamethoxam @ 3.0 ml, 5 ml, 7.0 ml, 8.0 ml and 16.0 ml/kg of seed did not result in any phytotoxic symptoms like leaf injury, wilting, vein clearing, necrosis, epinasty and hyponasty on various parts of maize during 15, 30 and 45 days after germination (Table 2). Hence, it is safe to use the insecticide for the management of stem borers in maize. Similar observations were made by Raetano *et al.* (2003) that Thiamethoxam at 150 and 200g a.i/ha when applied by drenching or spraying did not cause phytotoxicity in tomato leaves. Sunita and Jagginavar (2010) reported that Thiamethoxam was safe to grape with no phytotoxic symptoms.

Effect of Thiamethoxam 30 FS on grain yield of maize:

During *Kharif* highest grain yield of maize was recorded in Imidacloprid (4.11 t/ha at 15% moisture) followed by Thiamethoxam 8.0 ml/kg (3.77 t/ha) which were on par with all other dosages of Thiamethoxam. The lowest yield of 3.33 t/ha was recorded in untreated check. During *Rabi*, highest grain yield of 5.4 t/ha was recorded in Thiamethoxam 8.0 ml/kg which

Table 1 : Stem borer infestation as influenced by Thiamethoxam 30 FS

Treatments	Dosage	*Kharif* 2009		*Rabi* 2009-2010	
		Dead hearts (%)	Plant infestation (%)	Dead hearts (%)	Plant infestation (%)
Untreated check	------	0.79	1.18	14.76	19.41
Thiamethoxam 30 FS	3.0 ml/kg	0.76	1.14	10.53	19.02
Thiamethoxam 30 FS	5.0 ml/kg	0.41	1.13	8.49	16.98
Thiamethoxam 30 FS	7.0ml/kg	0.39	0.82	9.16	14.24
Thiamethoxam 30 FS	8.0ml/kg	0.38	0.77	6.43	15.42
Imidacloprid 600FS	5.0ml/kg	0.40	0.78	6.50	15.45
	S.E.±	0.047	0.049	0.495	0.375
	S.E.	0.066	0.069	0.70	0.53
	C.D. (P=0.05)	0.15	0.15	1.55	1.18

Table 2 : Phytotoxicity data on injury of leaf tips, leaf surface, plant wilting, vein clearing, necrosis, epinasty and hyponasty

Sr. No.	Treatments	Dosage	Days after germination				
			1	3	5	7	10
1.	Check	----	0	0	0	0	0
2.	Thiamethoxam 30% FS	8.0 ml/kg	0	0	0	0	0
3.	Thiamethoxam 30% FS	16.0 ml/kg	0	0	0	0	0

Table 3 : Maize grain yield as influenced by Thiamethoxam 30% FS

Treatments	Dosage	Grain gield at 15%moisture (t/ha)	
		Kharif 2009	*Rabi* 2009-10
Untreated Check	----	3.33	3.70
Thiamethoxam 30% FS	3.0 ml/kg	3.37	4.15
Thiamethoxam 30% FS	5.0 ml/kg	3.43	4.73
Thiamethoxam 30% FS	7.0ml/kg	3.57	4.86
Thiamethoxam 30% FS	8.0ml/kg	3.77	5.40
Imidacloprid 600FS	5.0ml/kg	4.11	4.78
	S.E.	0.192	0.137
	SE	0.272	0.194
	C.D. (P=0.05)	NS	0.43

NS=Non-significant

was significantly higher than all other treatments. It was followed by Thiamethoxam 7.0 ml/kg, Imidacloprid and Thiamethoxam 5.0 ml/kg. Lowest grain yield of 3.7 t/ha was obtained in untreated check (Table 3).

Higher grain yield was realized in higher doses of insecticide. It can be attributed to the reason that borer damage was low and plant vigour was good in higher doses compared to lower doses. The yield obtained in all treatments during *Kharif* was at par and such result was reported by McCornack and Ragsdale (2006) that Thiamethoxam seed treatment significantly reduced season long aphid pressure in soybean by 45 to 66.7 per cent. However, it did not significantly increase yield in three out of four location years (2003-2005 in US and Canada) which coincided with low aphid density in untreated plots. Significantly superior yield over untreated check was obtained during *Rabi* and this is in conformity with the report of Anitha and Nandihalli (2009) in okra treated with Thiamethoxam 70WS.

Conclusion:

Seed treatment of maize with Thiamethoxam 30 FS @ 8.0 ml/kg of seeds was found to be effective in reducing the incidence of stem borer besides enhancing the grain yield compared to other dosages tested. Hence, Thiamethoxam 8.0 ml/kg of seeds can be recommended for the management of stem borer. Seed treatment with Thiamethoxam is well suited for modern IPM programme in many cropping systems because of low use rates, flexible application methods, excellent efficacy, long lasting residual activity and favourable safety profile.

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