Indian Journal of Entomology 85(2): 462-464 (2023) DoI. No.: 10.55446/IJE.2022.430

MANAGEMENT OF *CHILO PARTELLUS* SWINHOE AND *STENACHROIA ELONGELLA* HAMPSON IN MIDHILLS OF MEGHALAYA

Sandip Patra*, Rachna Pande[1], Rumki H. Ch. Sangma, Pankaj Baiswar and Bijoya Bhattacharjee

ICAR Research Complex for NEH Region, Umiam 793103, Meghalaya, India
[1]ICAR-Central Institute for Cotton Research, Nagpur 440010, Maharashtra, India
*Email: sandippatra47@gmail.com (corresponding author)

ABSTRACT

A field experiment was conducted at the ICAR Research Complex for NEH Region, Umiam, Meghalaya to evaluate nine pesticides applied in two phenological stages of maize (variety Vijay composite) against stem borer *Chilo partellus* (Swinhoe), and cob borer *Stenachroia elongella* Hampson. Deadheart due to stem borer recorded after 30 and 45 days after emergence and cob borer infestation recorded during harvesting of cobs revealed that flubendiamide was superior with 80.09% reduction in infestation of deadheart and 80.38% reduction of cob borer over untreated control. Similarly, among the biopesticides, *Bacillus thuringiensis* was effective against both the pests.

Key words: Maize, Meghalaya, *Chilo partellus*, *Stenachroia elongella*, flubendiamide, spinosad, *Bacillus thuringiensis*, neem oil, fipronil

Maize is the third most important cereal crops in India after rice and wheat, and it can be grown in all crop seasons (Kumar et al., 2014). Maize is cultivated in 9.2 m ha with production of 28.75 mt in India (Rakshit et al., 2019). Maize is the second most important cereal crop of Meghalaya with productivity of 2150 kg/ ha (Babu et al., 2019), and productivity is very low due to insect pest problems. Maize is attacked by 139 species of insect pests with varying degree of damage; though, few are only most destructive (Sarup et al., 1987; Siddiqui and Marwaha, 1993). In Meghalaya, stem borer (*Chilo partellus* Swinhoe) and cob borer (*Stenachroia elongella* Hampson) are the most important, with deadhearts up to 33.33 and 18.88%, respectively (Patra et al., 2013a). Yield loss due to stem borer was estimated between 24.3-36.3% (Bhanukiran and Panwar, 2000) and 13.45-15.67% in Meghalaya (Patra et al., 2013b), while cob damage due to cob borer ranged from 6.5 to 11.95% (Patra et al., 2013b) and 5 to 39% (Shylesha, 1996). The cob borer is difficult to manage with insecticides, due to problems like resistance, residue and adverse effects on non-target organisms. This necessitates alternative safe and ecofriendly IPM practices, and hence the present study to evaluate some pesticides against stem borer and cob borer in maize under mid hills of Meghalaya.

MATERIALS AND METHODS

A field experiment was conducted at the Entomology Research Farm, ICAR Research Complex for NEH Region, Umiam, Meghalaya, during 2010-11 with variety Vijay composite. The crop was sown during mid April in randomized block design (RBD) with four replications, in 3x 4 m plots with spacing of 60 cm (R-R) × 30cm (P-P). Recommended management practices were followed except plant protection measures. Neem oil 0.03EC (3 ml/ l), karanjin 2EC (2 ml/ l), annonin 1EC (2 ml/ l), *Beauveria bassiana* (*Bb*) (5 g/ l), *Bacillus thuringiensis* (*Bt*) (2 g/ l) spinosad 45SC (0.75 ml/ l), flubendiamide 480SC (0.3 ml/ l), clothianidin 50WDG (0.25 g/ l) and fipronil 5SC (1 ml/ l) were applied when infestation of *C.partellus* was noticed and second spraying was applied at the time of silking stage for *S. elongella*. Deadheart due to *C. partellus* was recorded after 30 and 45 days after emergence and *S. elongella* was recorded during harvesting. Yield data were recorded separately for each replication. The mean data were subjected to ANOVA after angular transformation.

RESULTS AND DISCUSSION

Efficacy of treatments against *C. partellus* presented in Table 1 reveal that during season I, the least deadhearts (3.14%) were found in flubendiamide 480SC treated plots which was statistically at par with spinosad 45SC (3.32%) and fipronil 5SC (4.98%). Among the biopesticides, neem oil 0.03EC led to minimum deadheart (6.39%) which was closely at par with *B. thuringiensis* (6.45%) and *B. bassiana* (6.80%) while in untreated control it was 11.44%. Similar pattern of efficacy was observed in season II. Mean of two years data revealed that flubendiamide 480SC was the best (2.58% deadheart and 80.09% reduction) which was statistically at par with spinosad 45SC (2.73% deadheart) with 78.95% reduction over untreated control (12.95%); *B. thuringiensis* (5.53%) was also effective followed by neem oil 0.03EC. Against *S. elongella*, during season I, the least infestation was in spinosad 45SC treated plots (2.72%) which was at par with flubendiamide 480SC (2.75%), clothianidin 50WDG (4.17%) and fipronil 5SC (4.28%); *B. thuringiensis* (4.71%) was the best

Table 1. Efficacy of pesticides against *C.partellus* and *S. elongella* in maize

Treatments	Dose (ml or g/ l)	% deadhearts due to *C. partellus**			Reduction over control (%)	Maize grain yield* (t/ ha)		% increase in yield over control	
		Season II	Season II	Mean		Season I	Season II	Season I	Season II
Neem oil 0.03EC	3.0	6.39 (15.76)	5.45 (14.68)	5.92 (15.24)	54.30	2.76	2.62	28.37	24.20
Karanjin 2EC	2.0	8.68 (18.01)	6.79 (16.14)	7.73 (17.16)	40.27	2.58	2.52	20.00	19.34
Annonin 1EC	2.0	9.06 (18.47)	6.21 (15.51)	7.63 (17.07)	41.04	2.61	2.59	21.40	23.01
Beauveria bassiana	5.0	6.80 (16.18)	6.87 (16.23)	6.83 (16.22)	47.23	2.65	2.68	23.26	26.93
Bacillus thuringiensis	2.0	6.45 (15.78)	4.61 (13.54)	5.53 (14.79)	57.29	2.79	2.67	29.77	26.81
Spinosad 45SC	0.75	3.32 (11.91)	2.13 (10.09)	2.73 (11.08)	78.95	3.05	2.98	41.86	41.40
Flubendiamide 480SC	0.30	3.14 (11.61)	2.02 (9.96)	2.58 (10.85)	80.09	3.14	3.02	46.05	43.30
Clothianindin 50WDG	0.25	5.72 (14.98)	3.23 (11.79)	4.47 (13.49)	65.46	2.81	2.76	30.70	31.08
Fipronil 5SC	1.0	4.98 (14.14)	3.72 (12.48)	4.35 (13.36)	66.41	2.86	2.79	33.02	32.15
Control	-	11.44 (20.53)	14.45 (23.12)	12.95 (21.87)	-	2.15	2.11	-	-
SE. m (±)	-	0.8	0.74	0.53	-	0.14	0.10	-	-
CD (p=0.05)	-	2.33	2.15	1.54	-	0.41	0.28	-	-

Treatments	Dose (ml or g/ l)	*S. elongella* infestation* (%)			Reduction over control (%)	Grain damage* (%)			Reduction over control (%)
		Season I	Season II	Mean		Season I	Season II	Mean	
Neem oil 0.03EC	3.0	5.75 (15.03)	7.90 (17.26)	6.82 (16.19)	40.71	3.56 (12.19)	4.90 (14.01)	4.23 (13.16)	36.88
Karanjin 2EC	2.0	6.90 (16.29)	8.35 (17.76)	7.62 (17.07)	33.78	4.39 (13.41)	5.46 (14.65)	4.93 (14.05)	26.46
Annonin 1EC	2.0	7.21 (16.63)	7.96 (17.37)	7.58 (17.02)	34.13	4.77 (13.85)	4.88 (13.98)	4.83 (13.92)	27.99
Beauveria bassiana	5.0	6.48 (15.78)	7.51 (16.93)	6.99 (16.37)	39.26	3.42 (12.06)	4.67 (13.72)	4.04 (12.94)	39.66
Bacillus thuringiensis	2.0	4.71 (13.80)	6.22 (15.55)	5.46 (14.71)	52.52	1.98 (9.92)	3.48 (12.16)	2.73 (11.12)	59.31
Spinosad 45SC	0.75	2.72 (11.07)	2.20 (10.24)	2.46 (10.68)	78.61	1.43 (8.95)	1.85 (9.13)	1.64 (9.21)	75.56
Flubendiamide 480SC	0.30	2.75 (11.13)	1.76 (9.53)	2.26 (10.36)	80.38	1.21 (8.55)	1.12 (8.21)	1.17 (842)	82.59
Clothianindin 50WDG	0.25	4.17 (13.10)	6.71 (16.04)	5.44 (14.65)	52.73	2.44 (10.67)	3.63 (12.42)	3.04 (11.59)	54.66
Fipronil 5SC	1.0	4.28 (13.24)	5.75 (15.01)	5.02 (14.19)	56.42	2.51 (10.75)	2.77 (11.18)	2.64 (10.98)	60.63
Control	-	12.40 (19.56)	10.62 (19.91)	11.51 (20.71)	-	6.88 (16.21)	6.52 (15.90)	6.70 (16.08)	-
SE. m (±)	-	0.64	0.75	0.55	-	0.66	0.86	0.55	-
CD (p=0.05)	-	1.85	2.17	1.59	-	1.92	2.49	1.60	-

Figures in parentheses angular transformed values; *Mean of four replications.

among the biopesticides, at par with neem oil (5.75%) and *B. bassiana* (6.48%). Similar results were obtained in season II. Pooled data of two seasons showed that flubendiamide 480SC was very effective treatment against cob borer with the lowest cob infestation (2.26%) which was closely at par with spinosad 45SC (2.46%) with 80.38 and 78.61% reduction, respectively over untreated control (11.51%). Two seasons data indicated that *B. thuringiensis* was the effective biopesticide. The effect of treatments on grain damage indicate that all the treatments were effective; in season I, the least damage was in flubendiamide 480SC (1.21%), statistically at par with spinosad 45SC (1.43%), *B. thuringiensis* (1.98%), clothianidin 50WDG (2.44%) and fipronil 5SC (2.51%), with similar trend found in season II; two seasons' data showed that flubendiamide 480SC was the most effective. The yield data revealed that maximum yield was obtained with flubendiamide 480SC (3.14 t/ ha), and among the biopesticides *B. thuringiensis* gave maximum yield (Table 1).

Thus, flubendiamide 480SC was very effective against both the pests giving highest grain yield, and spinosad 45SC was also effective. These findings are in agreement with those of Kumar and Alam (2017) and Reddy et al. (2018) on flubendiamide against *C. partellus;* and on spinosad (Ahmed et al., 2002; Neupane et al., 2016; Devananda et al., 2018; Bhandari et al., 2020); effectiveness of fipronil was reported by Iqbal et al. (2017). The biopesticides, neem oil, *B. thuringiensis* and *B. bassiana* were also effective against both pests, which corroborates with the results of Rani et al. (2018) on azadirachtin, *Bt* and *Bb* against *C. partellus*; efficacy of *Bt* is in agreement with the results of Dhaliwal et al. (2018). Sarkar et al. (2015) showed the effectiveness of spinosad, annonin, karanjin, azadirachtin, *Bt* and *Bb* against red cotton bug and fruit borer in okra.

ACKNOWLEDGEMENTS

The authors thank the Director, ICAR Research Complex for North Eastern Hill Region, Umiam, Meghalaya for providing facilities through institute project (Code: IXX04741).

REFERENCES

Ahmed S, Saleem M A, Rauf I. 2002. Field efficacy of some bioinsecticides against maize and jowar stem borer, *Chilo partellus* (Pyralidae: Lepidoptera). International Journal of Agriculture and Biology 4(3): 332-334.

Babu S, Mohapatra K P, Layek J, Firake D M, Kumar A, Behere G T, Kumar B, Prakash N. 2019. Maize production technology in Meghalaya. Technical Bulletin RC-Umiam/IIMR-Maize Project/1. ICAR Research Complex for NEH Region, Umiam, Meghalaya, India.

Bhandari G, Thapa R B, Giri Y P, Manandhar H K, Jha P K. 2020. Field efficacy of eco-friendly management practices against maize stem borers in spring maize at Rampur, Chitwan. Azarian Journal of Agriculture 7(5): 146-155.

Bhanukiran Y, Panwar V P S. 2000. *In vitro*, efficacy of neem products on the larval of maize stalk borer. Annals of Plant Protection Science 8: 240-242.

Devananda K M, Khanpara A V, Vaja A M. 2018. Bio-efficacy of various insecticides against maize stem borer *Chilo partellus* (Swinhoe) Crambidae: Lepidoptera in Junagadh conditions. Journal of Pharmacognosy and Phytochemistry 7(4): 2011-2014.

Dhaliwal A K, Brar D S, Jindal J. 2018. Evaluation of new insecticides against maize stem borer, *Chilo partellus* (Swinhoe). Indian Journal of Entomology 80(3): 975-978.

Iqbal J, Farooq S U, Alqarni A S, Ali H, Zeshan A, Ansari M J. 2017. Management of maize stem borer (*Chilo partellus*) with insecticides of three formulations under field conditions. Indian Journal of Agricultural Sciences 87(12): 1720-1724.

Kumar R, Alam T. 2017. Bio-efficacy of some newer insecticides against maize stem borer, *Chilo partellus* (Swinhoe). Journal of Entomology and Zoology Studies 5(6): 1347-1351.

Kumar S, Kumar P, Bana J K, Shekhar M, Sushil N S, Sinha A K, Asre R, Kappor K S, Sharma O P, Bhagat S, Sehgal M, Boopathi T, Amaresan N, Chattopadhyay C, Satyagopal K, Jeyakumar P. 2014. Integrated pest management package for maize. 44 pp.

Neupane S, Bhandari G, Sharma S D, Yadav S, Subedi S. 2016. Management of stem borer (*Chilo partellus* Swinhoe) in maize using conventional pesticides in Chitwan, Nepal. Journal of Maize Research and Development 2(1): 13-19.

Patra S, Saikia K, Thakur N S A. 2013a. Evaluation of maize hybrids against stem borer (*Chilo partellus* Swinhoe) and cob borer (*Stenachroia elongella* Hampson) in Meghalaya of North-East India. Research on Crops 14(3): 757-761.

Patra S, Rahman Z, Bhumita P, Saikia K, Thakur NS A. 2013b. Study on pest complex and crop damage in maize in medium altitude hill of Meghalaya. The Bioscan 8(3): 825-828.

Rakshit S, Ballal C R, Prasad Y G, Sekhar J C, Soujanya P L, Suby S B, Jat S L, Sivakumar G, Prasad J V. 2019. Fight against fall army worm *Spodoptera frugiperda* (J. E. Smith), ICAR - Indian Institute of Maize Research, Ludhiana. 52 pp.

Rani D S, Sri C N S, Kumar K A, Venkatesh M N. 2018. Economic evaluation and efficacy of various insecticides against maize stem borers. Journal of Pharmacognosy and Phytochemistry 7(3): 15-20.

Reddy M L, Soujanya P L, Sekhar J C, Sreelatha D, Reddy V N. 2018. Efficacy of new insecticide molecules against spotted stem borer *Chilo partellus* (Swinhoe) in maize. International Journal of Plant Protection 11(1): 70-72.

Sarkar S, Patra S, Samanta A. 2015. Evaluation of biopesticides against red cotton bug and fruit borer of okra. The Bioscan 10(2): 601-604.

Sarup P, Siddiqui K H, Marwaha K K. 1987. Trends in maize pest management research in India together with bibliography. Journal of Entomological Research 11(1): 19-68.

Shylesha A N. 1996. Insect pest management in maize. Annual Report 1995-96, ICAR Research Complex for North Eastern Hill Region, Umiam, Meghalaya. pp.18-20.

Siddiqui K H, Marwaha K K. 1993. The vistas of maize entomology in India. Kalyani Publishers, Ludhiana/New Delhi. 184 pp.

(Manuscript Received: October, 2021; Revised: March, 2022;
Accepted: March, 2022; Online Published: April, 2022)
Online First in www.entosocindia.org and indianentomology.org Ref. No. e21221