# Comparative efficacy of certain chemicals against Maize stem borer (*Chilo partellus*) in Allahabad Region

**Devanapalli Vamsi krishna* and Dr. Ashwani Kumar**

**Abstract -** A field experiment was conducted during *kharif* season of 2017-18 at Central Research Feild, Department of Entomology, SHUATS, Allahabad, (U.P) to study the "Efficacy of certain chemicals against Maize stem borer (*Chilo partellus*) in Allahabad Region". All the seven treatments Spinosad (4.14%), followed by Chlorpyriphos 50% EC+ Cypermethrin5 %EC (7.14%), Deltamethrin 2.8 EC (8.83%), Cypermethrin 25 EC (9.52%), Imidacloprid 200 SL (10.71%), Dichlorvos 76 EC (12.90%) and then the treatment Dimethoate 30EC (13.09%) was least effective reduced the infestation as compared to the untreated control. Among the treatments studied, the best and most economical treatment was T5 Spinosad (1:1.59) followed by T1 Chlorpyrifos 50%EC+ Cypermethrin 5%EC (1:1.52), T7 Deltamethrin 2.8EC (1:1.41) and T2 Cypermethrin 25%EC (1:1.36), T3 Imidacloprid 17.8SL (1:1.17), T6 Dichlorvos 76EC (1:1.11), T4 Dimethoate 30EC (1:1.07) as compared to T8 Control(1:1.04).

**Key words**: Maize stem borer, *Chilo partellus*, Spinosad, Cypermethrin, Cost: benefit ratio, Insecticides, efficacy.

## INTRODUCTION

Maize (*Zea mays* L.) has become a staple food in many parts of the world, with total production surpassing that of wheat or rice. It is an important staple food crop in Asia and Africa. . Maize occupies a pride place among cereal crops in India and due to its high yield potential called the queen of cereals (Handbook of agriculture, ICAR). It is the most important crop in the world after wheat and rice. India stands 4th in world's maize production. It is cultivated on nearly 150 m ha in about 160 countries having wider diversity of soil, climate, biodiversity and management practices that contributes 36 % (782 m t) in the global grain production. No other cereal is being used in as many ways as maize. Maize grain has elevated nutritive value as it contains about 72% starch, 10% protein, 4.8% oil, 5.8% fiber and 3% sugar. At present, out of the total maize produced, 55% is used for food purpose, about 14% for live stock, 18 % for poultry feed, 12 % for starch and one per cent as seed.

In Uttar Pradesh, it is grown in an area 8.47 lakh hectare with a production of 11.17 lakh tons and the productivity was 1326 kg/ha in 2016-17 (Anonymous, 2016). The stem borers initially damage by feeding on the leaf tissues, followed by tunneling and feeding within the stem and sometimes the maize cobs. Infestation by *C. partellus* on maize starts with oviposition on the leaves and *S. inferens* lays in between the leaf sheath and stem of the plant. After hatching, the first instars move into the leaf whorls where they feed and develop on the bases of the leaves, causing lesions. The late third or early-fourth instars bore into the stem, feeding on tissues and making tunnels. When the infestation is severe, the larvae, either in the leaf whorl or in the stem, can cut through the meristematic tissues; the central leaves dry up to produce the 'dead heart' symptom, resulting in the death of the plant (Groote, 2002). Before pupation, they make exit holes on stem and pupate and adults will emerge. It also feeds at flowering stage interfering in pollination and also feeds within the cob and prone to secondary infection.

The main limiting factor for lowering the productivity of maize is the pest and disease problems among which Lepidoptera insect pest especially maize stem borer *Chilo partellus* (Swinhoe) (Singh and Sharma, 2009) are the most destructive ones. Almost 75% damage of the crop occurs due to attack of maize stem borer.

## MATERIAL AND METHODS

The experiment was conducted during the *kharif* season 2017 at SHUATS, Central research field, Allahabad, is situated at 25.27$^0$C north latitude 80.50$^0$C East longitude and at an altitude of 98 m above sea level. The climate is typically semi-arid and subtropical. The maximum temperature reaches up to 49$^0$C in summer and drops down to 1.5$^0$C in winter. The site selected was uniform, cultivable with typical sandy loam soil having good drainage. Trial was laid out in a randomized block design consisting of seven different treatments. Each treatment was replicated thrice and maize variety K-25 was used for study. Application of treatments for the management of the *Chilo partellus* was initiated as soon as 5% ETL of infestation

observed in experimental field. Subsequent application was under taken at an interval of 15 days and one application was made during experimental period. The observations were recorded on weekly intervals throughout the cropping season. To assess the incidence of stem borer at weekly intervals the total number of plants and number of infested plants (number of dead hearts and pin holes present on the leaves) was were counted from each plot. The incidence was determined by correlating with weather parameter. Farid et al., (2007).The data were subjected to statistical analysis. The yield per plot was also recorded.

The percentage infestation of the maize stem borer was calculated according to the following equation:

$$\text{Percent infestation} = \frac{\text{Number of infested plants}}{\text{Number of infested plants}} \times 100$$

## RESULTS AND DISCUSSION

Among all the treatments lowest per cent infestation of stem borer was recorded in Spinosad (8.64%), followed by Chlorpyrifosz + Cypermethrin (10.13%), Cypermethrin (11.67%), Deltamethrin (12.29%), Imidacloprid (12.77%), followed by Dimethoate (15.07%). The treatment Dichlorvos (15.34%) was least effective among all treatments. The statistical analysis of data showed that all the treatments are significantly effective. However, significant reduction in infestation was observed in Spinosad when compared to all other treatments.

In the present research work mean infestation of the stem borer is (8.64%) in Spinosad treated plot, similar findings were reported by Neupane *et al.,* (2016) that the lower per cent damage (5.30%) with lowest insect score (1.00) was observed in plot sprayed with Spinosad 45% EC at 0.5 ml/l of water. Ahmad *et al,*.(2002)reported that Spinosad (5.39%) has shown excellent properties of reducing the infestation level of maize stem borer in effective manner.

Mean infestation of Cypermethrin treated plot is (11.67%) similar findings were reported by Siddalingappa *et al.,* (2010) Cypermethrin (10.78%) showed higher efficacy in suppressing the stem borer incidence.

## CONCLUSION

Among the various insecticides evaluated against stem borer, spray revealed that Spinosad 45SC was found to be more effective than other treatments, followed by Chlorpyriphos50% EC+ Cypermethrin 5%EC, Deltamethrin 2.8 EC, Cypermethrin 25 EC, Imidacloprid 200 SL, Dichlorvos 76 EC are next effective treatments and Dimethoate 30EC is recorded as least effective among the chemical treatments but significant and superior over control.

The yields among the treatment were significant. The highest yield was recorded in $T_5$ Spinosad (40.23 q/ha) followed by $T_1$ Chlorpyrifos 50%EC+ Cypermethrin 5%EC (38.60 q/ha), $T_7$ Deltamethrin 2.8EC (35.50 q/ha), $T_2$ Cypermethrin 25%EC (34.10 q/ha), $T_3$ Imidacloprid 17.8SL (29.60 q/ha), $T_6$ Dichlorvos 76EC (28.10 q/ha), $T_4$ Dimethoate 30EC (27.50 q/ha) as compared to $T_8$ Control (25.80 q/ha). When Cost benefit ratio was worked out, interesting result was achieved. Among the treatments studied, the best and most economical treatment was $T_5$ Spinosad (1:1.59) followed by $T_1$Chlorpyrifos 50%EC+ Cypermethrin 5%EC (1:1.52), $T_7$Deltamethrin 2.8EC (1:1.41) and $T_2$ Cypermethrin 25%EC(1:1.36), $T_3$ Imidacloprid 17.8SL (1:1.17), $T_6$ Dichlorvos 76EC (1:1.11), $T_4$ Dimethoate 30EC (1:1.07) as compared to $T_8$ Control(1:1.04).

Similar findings were reported by Kumar and Kumar (2017) that yield of plot treated with Imidacloprid (25.49 q/ha).

**Efficacies of some chemical insecticides in the management of Maize stem borer *Chilo partellus* (Swinhoe).**

| Sl. No. | Treatments | Per cent infestation | | | | |
|---|---|---|---|---|---|---|
| | | 1 DBS | 3 DAS | 7 DAS | 14 DAS | Mean |
| T1 | Chlorpyriphos 50% EC+ Cypermethrin5 %EC | 16.66 (24.06) | 13.09 (21.16) | 10.71 (19.10) | 7.14 (15.94) | 10.13 (18.60) |
| $T_2$ | Cypermethrin 25 EC | 17.85 (23.09) | 14.28 (22.20) | 11.21 (19.85) | 9.52 (17.90) | 11.67 (19.91) |
| $T_3$ | Imidacloprid 200 SL | 18.84 (24.01) | 15.38 (23.30) | 12.22 (20.10) | 10.71 (19.10) | 12.77 (20.88) |
| $T_4$ | Dimethoate 30EC | 20.23 (26.70) | 17.85 (24.99) | 14.28 (22.20) | 13.09 (21.16) | 15.07 (22.80) |
| $T_5$ | Spinosad 45 SC | 20.55 (26.80) | 12.28 (20.54) | 9.52 (17.90) | 4.14 (12.94) | 8.64 (17.02) |
| $T_6$ | Dichlorvos 76 EC | 19.82 (25.22) | 18.85 (25.99) | 15.28 (23.20) | 12.90 (20.13) | 15.34 (22.99) |
| $T_7$ | Deltamethrin 2.8 EC | 19.04 (25.01) | 15.47 (23.13) | 13.09 (21.16) | 8.33 (16.80) | 12.29 (20.38) |
| $T_8$ | Control | 17.85 (26.51) | 20.23 (26.70) | 21.42 (27.55) | 23.80 (29.18) | 21.81 (27.83) |
| F- test | | NS | S | S | S | S |
| S. Ed. (±) | | 2.46 | 0.71 | 0.43 | 0.36 | 0.50 |
| C. D. (P = 0.05) | | - | 2.15 | 1.67 | 1.12 | 1.64 |

**Figures in parentheses are Arc sin transformed values**

**DBS : Day Before Spray; DAS : Day After Spray**

**Economics of cultivation:**

| S. No: | Treatment | Yield of q/ha | Cost of yield / Rs/q | Total cost of yield | Common cost (Rs) | Treatment cost (Rs) | Total cost (Rs) | C:B ratio |
|---|---|---|---|---|---|---|---|---|
| **01** | **Chlorpyriphos 50% EC+ Cypermethrin5 %EC** | 38.60 | 1300 Rs/q | 50180 | 31948 | **1020** | 32968 | **1:1.52** |
| **02** | **Cypermethrin 25 EC** | 34.10 | 1300Rs/q | 44330 | 31948 | **530** | 32478 | **1:1.36** |
| **03** | **Imidacloprid 200 SL** | 29.60 | 1300Rs/q | 38480 | 31948 | **690** | 32638 | **1:1.17** |
| **04** | **Dimethoate 30EC** | 27.50 | 1300Rs/q | 35750 | 31948 | **1181** | 33129 | **1:1.07** |
| **05** | **Spinosad 45 SC** | 40.23 | 1300Rs/q | 52299 | 31948 | **770** | 32718 | **1:1.59** |
| **06** | **Dichlorvos 76 EC** | 28.10 | 1300Rs/q | 36530 | 31948 | **735** | 32683 | **1:1.11** |
| **07** | **Deltamethrin 2.8 EC** | 35.50 | 1300Rs/q | 46150 | 31948 | **762** | 32710 | **1:1.41** |
| **08** | **Control** | 25.80 | 1300Rs/q | 33540 | 31948 | **0** | 31948 | **1:1.04** |



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