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# Assessment Of Chemical Control Of Pest Chilo Partellus With Insecticide Carbofuran In Corn Field

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**ABSTRACT**

Maize is high yielding, easy to process, readily digested, and costs less in comparison to other cereals. It is also a versatile crop, allowing it to grow across a range of agroecological zones. Maize is essentially a warm weather or kharif crop and as such is largely dependent upon the rains. There are three distinct seasons for the cultivation of Maize the main season is kharif; whereas its cultivation during rabi in Peninsular India and Bihar, and in spring in northern India is done. Higher yields have been recorded in the rabi and spring crops. The higher yields are primarily due to better water management and a lower incidence of disease and pests. In India Maize crop is being attacked by about 139 species of insect pests with varying degree of damage. However, only about a dozen are quite serious. Among them some important lepidopteran stem borers seriously limit potentially attainable Maize yields by infesting the crop throughout its growth, from seedling stage to maturity.

## INTRODUCTION

Maize requires fertile, deep and well-drained soils. Although, it can be grown on any type of soil, ranging from deep heavy clays to light-sandy ones, it is best adapted to well drain sandy loam to silty loam soils. It is, however, necessary that the pH of the soil does not deviate from the range of 7.5 to 8.5. Over 85 per cent of the Maize acreage is sown under rain-fed conditions during the monsoon when over 80 per cent of the annual rainfall is received. The alluvial soils of Uttar Pradesh, Bihar and Punjab are very suitable for growing Maize crop. Maize is among the world's three most important cereal crops, the other two being Wheat and Rice. It possesses great genetic diversity and grown in a wide range of environments, from the equator to about 50 north latitude and 420 south latitude and as high as 3800 meters above sea level.

The factors that limit Maize production are also diverse, some of the most important being insects and closely related organisms such as mites. From the high valleys of the tropics and subtropics to the tropical lowlands and temperate regions, these pests can infest Maize at any stage of crop development and attack any part of the plant, often causing severe damage.

Seventeen species in two families (Pyralidae and Noctuidae) have been found to attack Maize in various parts of Africa. However, Chilo partellus (Swinhoe), Chilo orichalcociliellus (Strand), Busseola fusca (Fuller), Sesamia calamistis (Hampson), and Eldana saccharina (Walker) are of great importance. The yield losses caused by stem borers to Maize vary widely in different regions and range from 25-40% according to the pest population density and phenological stage of the crop at infestation (Khan et al., 1997). Among them Maize stem borer, Chilo partellus (Swinhoe) (Pyralidae: Lepidoptera) is most dominant contributing 90-95 per cent of the total damage in kharif season (Muhammad and Khawaja, 2002). The pest is very important and common in East Africa, the Indian subcontinent and the Far East, but not in West Africa.

Though, the pest problem can be controlled successfully with the modern available chemicals, still the control of this disease in our country is not up to the mark, probably due to ever increasing cost and unavailability of these chemical toxicants. If our entomologists wish to increase the yield of crop per hectare of Maize there is a strong need to investigate the cheaper and easy methods for controlling pest population.

**MATERIALS AND METHODS**

The scientific methodology is essential for accuracy and success of any investigation as it directly influences the validity and relevance of the finding. In this investigation these were therefore used thoughtfully. The idea of materials used and the method followed in this investigation during the course of study are described in this chapter.

**EXPERIMENT SITE:** The field experiments were conducted during July to October in the year 2018 and 2019 in the farmer's field at Etah district of western Uttar Pradesh. This Research site is within the semi arid zone of Uttar Pradesh and Rajasthan located at 26.2 North and 76.9 East latitude.

**CLIMATE:** Maize is essentially a warm weather or kharif crop and as such is largely dependent upon the rains. There are three distinct seasons for the cultivation of Maize: the main season is kharif; whereas its cultivation during rabi in Peninsular India and Bihar, and in spring in northern India is done. Higher yields have been recorded in the rabi and spring crops. The higher yields are primarily due to better water management and a lower incidence of disease and pests. In most parts of India, Maize during kharif is sown with the break of monsoon. It is sown in early March in north-eastern hills, in April to early May in north-western hills, in May-June in Peninsular India, in the end of June to mid-July in the Indo-Gangetic Plains.

Spring Maize is sown in late January to the end Rabi Maize is generally sown in Bihar, Andhra Pradesh, Tamil Nadu and Karnataka in the end of October to mid-November. Maize however, requires considerable moisture and warmth from germination to flowering. The ideal temperature for germination is 21° C and for growth 32°C. 50-75 cms of well-distributed rainfall is conducive to growth. It can be successfully grown where the night temperature does not go below 15.6$^{o}$C. It cannot withstand frost at any stage of its

growth. In India, its cultivation extends from the hot arid plains of Rajasthan and Gujarat to the wet hill of Assam and Bengal (receiving over 400 cm of rainfall).

**SOIL COMPOSITION:** Maize requires fertile, deep and well-drained soils. Although, it can be grown on any type of soil, ranging from deep heavy clays to light-sandy ones, it is best adapted to well drain sandy loam to silty loam soils. It is, however, necessary that the pH of the soil does not deviate from the range 7.5 to 8.5. Over 85 per cent of the Maize acreage is sown under rain-fed conditions during the monsoon when over 80 per cent of the annual rainfall is received. The alluvial soils of Uttar Pradesh, Bihar and Punjab are very suitable for growing Maize crop. Maize is able to tolerate a wide range of soil reaction. It grows well in soil having pH range between 5.5 and 8.0 the Physiochemical characteristic of the soil samples were analyzed during experimental period.

**DESIGN OF EXPERIMENT:** For the study of the biology of the insect species pots were used which were covered by transparent cloth. On the other hand the control measure experiment was conducted in small plots on the field. Net plot size was 2m x 3m, number of rows per plot -10, number of dibbles per plot 200, spacing between row 20 cm, spacing within row 15 cm, number of treatment -2, number of replication-3.

**MATERIAL FOR EXPERIMENT:** For the purpose of the study of the stem borer, the cloth covered pots were used in which the Maize crop was planted for different observation in the laboratory. The observation were made by the help of hand lens and binocular microscope to identify the larvae of the insect, minimum and maximum temperature were recorded by using the thermometer and hygroscopic meter for humidity was also used. For the control of experiments, systemic insecticides were used in the experiment.

**FIELD OPERATIONS**

**Sowing:** The sowing was carried out in all five ploughed plots. It was done during the year 2018-2019 in the last week of August. The row spacing in plant was kept 20 cm in case of each experiment. Timely irrigation and weeding were done after sowing and also when it was necessary in this experiment.

**Application of insecticides :** All the insecticides were applied at different levels on pre-emergence of larvae. The infestation was observed approximately after 30 to 35 days to plant.

**PROCEDURE:** The procedure was adopted to perform the experiment by irrigating solution of insecticides. The insecticides required for the present investigation were of different grades. The solutions were prepared in 1000 L of water by dissolving the requisite amounts of the insecticides. All the different solution was kept in container in dark and cool place. After sometime the insecticide were applied onto plants uniformly and the infestation against pest was noted. The existing infestation was noted to be reduced considerably. Each concentration of insecticides was applied in different sets of

plant. The last or the 5th set of plants showed complete resistance against pests the observation were taken after each application of the insecticides.

**RESULTS AND DISCUSSION**

During application four trials were made comparing with control, two hundred plants of Zea mays were tagged for each trial. The solution was mixed in 1000 litres of water for application. This insecticide was applied after 40 percent infestation occurred in each bed. The treatments were applied periodically on fortnight intervals with three replications. The first set of 200 plants of Maize crop was irrigated with 0.05 percent Carbofuran. The second set of 0.5 percent, third set with 1.5 percent and the fourth set with 2.0 percent. The control set of 200 plants was not treated with Carbofuran.

This insecticide translocate into the various parts of the plants after 4 to 8 hours of irrigation. It is evident from the results given in (Table-1,2) and (Fig. 1,2) that stemborer shows a remarkable reduction in percentage of infested plants in comparison to the control one treatment was most effective within 4 to 8 hours after application. The Carbofuran solution of 2.0 percent, control 90 percent infestation of larvae. Some larvae, may have completed their development and emerge out into adults during, the time of treatment. The other application with rates of 0.05 percent, 0.5 percent and 1.5 percent solution were also effective and bring 17 percent, 24 percent and 41 percent larval mortality respectively.

The experiment for the control of Maize Chilo partellus were conducted similar to 2018 and 2019. The infestation of stem borer Chilo partellus, (Swinhoe) started in the last week of July. The infestation gradually increased with the decrease in temperature and increase in humidity. The control operations were made when 42 percent, 75 percent 96 percent infestation occurred in the plants. The infestation increases with the decrease in temperature and increase in humidity. The control operations started with different concentrations of insecticides, when 42 percent infestation was observed (Table-1,2 and Fig-1,2). The treatments of different concentrations with insecticide were given fortnightly on infested plants. Mortality of larvae were recorded after each treatment of insecticide. The effect of translocations of Carbofuran was best observed after 24-30 hours after treatment.

Table – 1: The rate of mortality of larvae on Zea mays (Linn.) on applying Carbofuran with periodic interval of 15 days (2018).

| **MEAN OF 100 OBSERVATION** | | | | | |
|---|---|---|---|---|---|
| **Name of Insecticide** | **Treatment (%)** | **Number of Replications** | **Percentage of Mortality** | | |
| | | | **45 days 04-09-2018** | **60 days 20-09-2018** | **75 days 04-10-2018** |
| Carbofuran | 0.05 | 3 | 3 | 7 | 17 |
| | 0.05 | 3 | 3 | 8 | 24 |
| | 1.5 | 3 | 8 | 25 | 41 |

| | | | | | |
|---|---|---|---|---|---|
| | 2.0 | 3 | 11 | 46 | 90 |
| Rate of Infestation in Untreated Plants (Control) | | | 42 | 76 | 96 |

Fig. – 1 : The rate of mortality of larvae on Zea mays (Linn.) on applying Carbofuran with periodic interval of 15 days (2018).

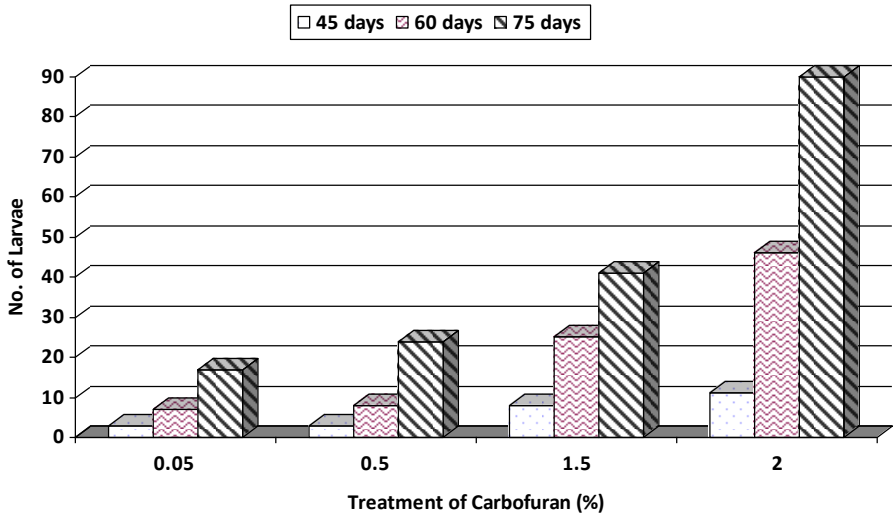
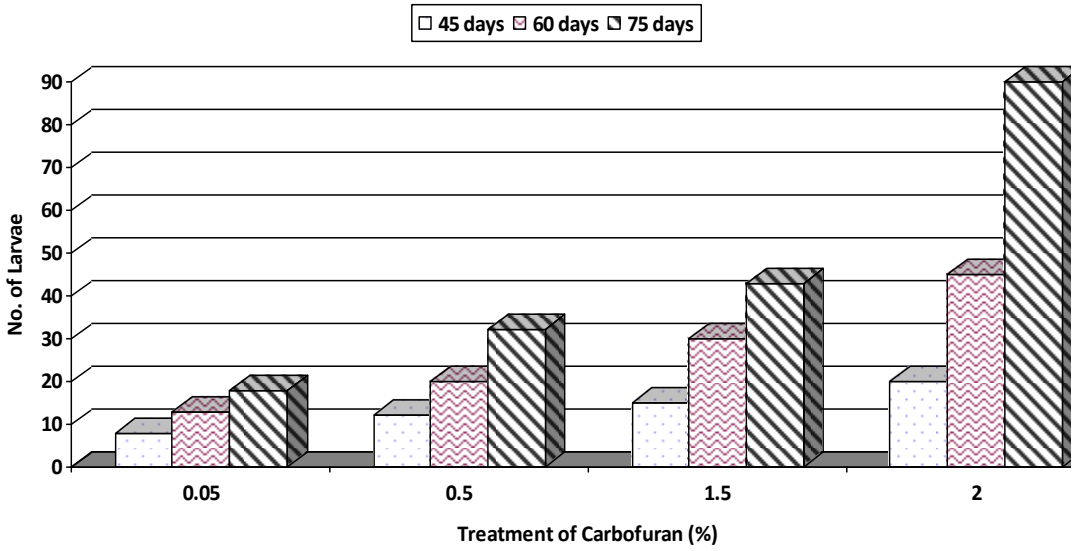



Table – 2: The rate of mortality of larvae on Zea mays (Linn.) on applying Carbofuran with periodic interval of 15 days (2019).

| **MEAN OF 100 OBSERVATION** | | | | | |
|---|---|---|---|---|---|
| **Name of Insecticide** | **Treatment (%)** | **Number of Replications** | **Percentage of Mortality** | | |
| | | | **45 days 08-09-2018** | **60 days 23-09-2018** | **75 days 08-10-2018** |
| Carbofuran | 0.05 | 3 | 8 | 13 | 18 |
| | .05 | 3 | 12 | 20 | 32 |
| | 1.5 | 3 | 15 | 30 | 43 |
| | 2.0 | 3 | 20 | 45 | 90 |

| | | | | | |
|---|---|---|---|---|---|
| Rate of Infestation in Untreated Plants (Control) | | | 40 | 75 | 96 |

Fig. – 2 : The rate of mortality of larvae on Zea mays (Linn.) on applying Carbofuran with periodic interval of 15 days (2019).




In the present investigation it was found that there was decrease in larval count after pesticide applications in the fields and is in concurrence with the findings of (Mohyuddin and Attique 1978) who observed decrease in number of larvae of Corcyra cephalonica and assigned the reason that the larvae have difficulty during moulting, resulting in their inability to exuviate from the outer covering; thus, leading to mortality and gains further support of (Razdan and Rana, 2002).

In field study pupation was reduced and may be ascribed to the improper transformation of successive stages of larvae to the mature pupae which is supported by Songa et al. (2002) using pesticides against Corcyra cephalonica and Henosepilachna vigintiopunctata. Decrease in pupai count leads to decrease in adult emergence and may be attributed to the death of the test insect inside the puparium and also during moulting. The possible reason for the reduction in number of adults may be suggestive of adverse affect of Carbofuran.

Ballal et al. (1995) observed that males and females lived for an average of 15.07 and 16.61 days during monsoon however the present findings showed maximum average longevity of males and females as 30.30 and 83.30 which may be due to the environmental conditions.

Van Den Berg et al. (1997) tested fourteen insecticides in spray, dust or granules against Pyralid C. partellus on Sadabahar in Pakistan. In term of yield Furaden (Carbofuran) among granular formulation gave good result. The soil treatment with Carbofuran

granules at 1.0 kg/hr and seed treatment with Carbofuran granules at 3.0 kg/hr were superior to other treatment. Taking into account the effectiveness of the pesticide it has been assessed that Carbofuran is good in controlling this stemborer. However, both of these checked all developmental stages and adult emergence of this stemborer. Thorough evaluation depicts that Carbofuran gave 96 percent success. The infestation in unprotected sorghum plots was 60–62% (Marwaha et al. 1984) tried granular formulation of Carbofuran, Disulphoton, Diazinon and Fanthion at 0.61, 1.50 and 1.75 kg/ha respectively against the Maize stem borer Chilo partellus and concluded that the systemic compound Carbofuran and Disulphoton applied in the furrow were more effective than the non systemic compounds as foliar application.

The effect of the pesticide Carbofuran on Chilo partellus, (Swinhoe) showed that the translocation of pesticide is most effective with the increase in relative humidity. When the temperature decreased and the relative humidity increased there is an increase of toxicity. The toxicity, however, does not increase due to the increase in temperature. The results of the present study are in conformity with those of Srivastava and Mathur (1970) who studied the effect of Dalapon on Johnsongrass and recorded that absorption and translocation increase at high relative humidity but the effect decreases with the increase of temperature. Mohyuddin et al. (1978) found that the translocation of 2, 4-dichloro-prophenoxy acetic acid and Dalapon increased when the plants were maintained under high relative humidity. The pesticide Carbofuran was excellent for the control of the stemborer. Other chemicals like Diazinon, Malathion and Parathion have also been recommended.

Ferdu et al. (2002) studied the toxicity of insecticides against larvae of pea stemborer Ophiomyia phaseoli (Tryon) infesting the vegetable pea, Pisum sativum (linn.) and reported that Diazinon gave poor results than Parathion. Kishore (1986) studied persistence of insecticides in pea and reported that the Sulfoton and Dimifox gave very satisfactory results controlling the Agromyzid pest, phiomyia phaseoli (Tryon.).

**REFERENCES**


1. Ballal, C. R. Kumar, P. and Ramani, S. (1995). Laboratory evaluation, storability and economics of an artificial diet for rearing Chilo partellus (Swinhoe) (Lepidoptera : Pyralidae). J. Entomol. Res., 19: 135-141.
2. Ferdu, A. Demissew, K. and Birhane, A. (2002). Major Insect Pest of Maize and their Management: A Review In: Enhancing the contribution of Maize to food security in Ethopia. Proc. 2nd national Maize Workshop, Addis Ababa, Ethiopia, 12-16.
3. Kishore, P. (1986). Studies on natural enemies of the spotted stem borer Chilo partellus (Swinhoe). Sorghum News L., 29: 65-66.
4. Marwaha, K. K. Siddiqui, K. and Sarup, P. (1984). New Carbofuran and Carbosulphan formulation to control the Maize stalk borer Chilo partellus. J. Entomol. Res., 8:93-97.
5. Mohyuddin, A. L and Attique, M. R. (1978). An assessmet of loss caused by Chilo partellus to Maize in Pakistan. PANS., 24: 11-113.

6. Songa, J. M. Goufa, Z. Overholt, W. A. Zhou, G. F. (2009). Relationship of stem borer damage and plant physical condition to Maize yield in a semi-arid zone of eastern Kenya. Insect Sci. App., 21(3): 243-249.
7. Songa, J. M. Mugo, S. Mulaa, M. Taracha, C. Bergvinson, D. Hoisington, D. and DeGroote, H. (2002). Towards development of environmentally safe, insect resistant Maize varities for food security, Syngenta Symposium, Washington D.C. USA.
8. Srivastava, R. P. and Mathur, S. B. (1970). Histopathological studies on the larvae of Chilo zonellus (Swinhoe) infected by entomogenous fungus, Beauveria densa (Link) Picard. Indian J. Entomol., 32: 87-88.
9. Van Den Berg, I. and Van Der Westhuizen, M. C. (1997). Chilo partellus (Lepidoptera: Pyralidae) moth and larval response to levels of antixenosis and antibiosis in sorghum inbred lines under laboratory conditions. Bull. Ent. Res., 87: 541-545.