

Effect of Temperature and Relative Humidity on the Population Dynamics of Some Insect Pests of Maize

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Abstract

These studies were carried out Entomological Research Area, Department of Agricultural Entomology, University of Agriculture Faisalabad during 2004-2005 on four varieties of Maize (Neelam, Akbar, Sultan and Sadaf). The results show that the population of leaf hoper was found highest at temperature of 36.5°C and relative humidity at 68%. The lowest population was observed at the temperature of 31.5°C and relative humidity at 75%. The population of jassid was found highest at the temperature of 36°C with relative humidity at 68% and lowest population was found at 35°C relative humidity at 70%. The infestation of *Chilo partellus* was found highest at the temperature of 32.5°C relative humidity at 68% and lowest infestation of *chilo partellus* found at the temperature of 32.5°C relative humidity at 50%. The overall results of current research work showed that the relative humidity and temperature significantly effect on the population of insect pests of maize.

Key words: *Zea mays*, relative humidity, temperature, insect pest

Introduction

In Pakistan, maize occupies third position after wheat and rice and 98% of this is grown in Punjab and NWFP, where it fit in crop rotation quite flexibly. Maize is an important cereal crop growing on an area of 935,500 hectares with annual production of 1737 tones (Anonymous, 2004). In Punjab, maize crop is grown successfully in two seasons (spring and autumn) on an area of 411.4 thousand hectares. Spring crop is grown almost with hybrid seed on an area of 70.2 thousand hectares, while share of hybrid seeds in autumn crop grown on 341.2 thousand hectares is 102.4 thousand hectares, which is about 30% of total area under maize (Anonymous, 2004).

Low production of maize in Pakistan is attributed to many reasons. The one reason of low production is the attacks of various insect pests. The damage due to insect pest complex depends upon their population trends in the field which, in turn, rely

upon their dynamically of the physical factors of their immediate environment (Isard, 2004). A thorough understanding of the exact relationship between the change in environmental factors and those in the pest population may not only help anticipate the pest losses to the crop, but also help avoid them through some well timed pest control measure (Aasman, 2001). Abiotic factors like temperature and relative humidity play a vital role in the development of insect pests fluctuation of these causes variation in the population present study was designed to investigate the effect of temperature and relative humidity on population of some insect pests of maize in unsprayed condition. Keeping in view the scenario regarding pest attack on maize crop the presented study was planned to investigate the effect of temperature and relative humidity on some insect pest of maize varieties.

Materials and Methods

The experiment was conducted at Entomological Research Area, Department of Agricultural Entomology, University of Agriculture, Faisalabad during 2004-2005. The experiment was laid out in randomized complete block design (RCBD) on four varieties of maize viz., Neelam, Akbar, Sultan, Sadaf having three replications. Plant to plant distance was 9 inch and row to row distance was 2 feet. Thus the experiment was spread over a plot of about 1/16 of an acre and research acre was divided with 12 plots.

The plots were surveyed weekly for the presence of the pests from July to September, 2004. However, the data on the pests population after their becoming active on 04-08-04 were collected by selecting plants / plots at random and by taking visual count of the insect pests up to 25-09-04, when they had virtually vanished from the field. The data of infestation of stem borer collected by selecting 10 plants in each plots and count the population of leaf hoper, jassid and aphid by selecting 5 plants / plots.

Similarly, the data on different physical factors like, temperature and relative humidity obtained from the meteorological observatory of University of Agriculture, Faisalabad. The data thus obtained subjected to standard statistical analysis, so that to determine the effect of temperature and relative humidity on the population dynamics of some insect pests of maize under unsprayed conditions.

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Ahmed, 1988, the impact of physical factor on the population dynamics of insect pest complex of

"Sunheri" maize, Bull. Of Etnomol, Univ. of Agric. Faisalabad.

Table 1. Date wise infestation of stem borer (*Chilo partellus*) in relation to temperature & Relative Humidity under unsprayed condition

Date	Insect Population	Mean Temperature	Relative Humidity %
25-08-2004	16.5	36.5	68
01-09-2004	31	38	41
08-09-2004	33	42	53
15-09-2004	35	42	61
22-09-2004	45	32.5	50

Table 2. Date wise population of Leaf Hoper in relation to temperature & Relative Humidity under unsprayed condition

Date	Insect Population	Mean Temperature	Relative Humidity %
04-08-2004	0.55	31.5	75
11-08-2004	0.74	33	73
18-08-2004	1.10	35	70
25-08-2004	1.70	36.5	67

Table 3. Date wise population of jassid in relation to temperature & Relative Humidity under unsprayed condition

Date	Insect Population	Mean Temperature	Relative Humidity %
18-08-2004	0.60	35	70
25-08-2004	1.70	36.5	68

Results and Discussion

The present study was designed to monitor the effect of temperature and relative humidity on the population dynamics of some insect pest of maize. The results show that the population of leaf hoper increases with increase in temperature and decrease in relative humidity as the highest population of leaf hopper (mean value = 1.70) at the temperature of 36.5°C and relative humidity at 68% while, the lowest population of the leaf hopper was found (mean value = 0.55) at the temperature of 31.5°C and relative humidity 75%.

These findings were confirmed with the work of Ahmad (1988). The impact of physical factors on the population dynamics of insect pests complex of maize. While on jassid the results of this experiment showed that the population of jassid increases with increase in temperature and vice versa So that temperature and relative humidity highly significant on jassid population the lowest population of jassid was found with mean value of 0.60 at 35°C and relative humidity 70% and the highest population of jassid found (mean value = 1.70) at 36°C and relative humidity 68%. These finding were confirmed Suggetha (2001) he found the optimal conditions of temperature and relative humidity for the population build up of jassid at the temperature 30°C and relative humidity 60.75%.

The *Chilo partellus* is a major pest of maize. The stem borer (*Chilo partellus*) attack on maize, sorghum, sudden grass and some time rice, sugarcane. Oviposition occur in the second half of April on the ventral side of leaf, in batches of about 30-45 eggs each. Eggs hatch in 4-7 days, depending on temperature and humidity which discuss below in findings. Newly hatched larvae feed on the leaves, simultaneously ascending the stem, until the reached the top. On reaching the top, the bore in to the stem and start tunneling downwards the process of feeding. They kill the central shoot, farming 'dead hearts'. The larvae also feed on the tassels and grains. The *Chilo partellus* complete his life cycle in 22-33 days and complete several generations in the year. Full grown larvae hibernate in the maize in October-November, resuming activity towards the end of February and Pupating about the end of March. These finding were confirmed by Farag *et al.* (1992).

The infestation of *Chilo partellus* in this experiment increased with decrease in temperature and relative humidity. The minimum infestation 16% was found at the temperature of 36.5°C and relative humidity 68%. Maximum infestation 45% was found at temperature of 32.5°C and relative humidity 50%.

These findings were confirmed by Panwar (1979), studies *Chilo partellus* infestation on different varieties and a biotic factors and reported that infestation of the *Chilo partellus* increase with decrease in temperature and relative humidity.

The population of aphid increase with decrease in temperature and relative humidity, lowest population was found (mean value 2.273) at temperature of 33°C and relative humidity of 61% and the highest population was found (mean value 2.40) at temperature 32.5°C and relative humidity 50% (Barbiani, 2003). The result of this experiment

were confirmed by Phamdthera *et al.* (1995) they found that the population build up of Aphid was favored by decrease in temperature and relative humidity (Hemerik, 2004). In fact the effect of single abiotic factor i.e. temperature or relative humidity can not be estimated on the population build up of any insect pest because abiotic factors always effect in close combination and the overall results of current research work showed that the relative humidity and temperature significantly effect on the population of insect pests of maize (Sharma, 1997).

Table 4. Date wise population of Aphid in relation to temperature & Relative Humidity under unsprayed condition

Date	Insect Population	Mean Temperature	Relative Humidity %
15-09-2004	2.12	33	61
22-07-2004	2.35	32.5	50

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