EFFECT OF DIFFERENT PLANTING DATES OF MAIZE ON INFESTATION OF MAIZE STEM BORER CHILO PARTELLUS (SWINHOE) PYRALIDAE: LEPIDOPTERA

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ABSTRACT

Studies on the effect of different planting dates of maize against the infestation of maize stem borer (Chilo partellus) were carried out at Agricultural Research Institute (ARI) Tarnab, Peshawar in June 2003. The results revealed that minimum percent infestation (1.39) was recorded in plots sown in the 3rd week of July while the highest (4.82) was recorded in the plots sown in 2nd week of July. The moderate infestation was recorded in the plots of 3rd and last weeks of June. Cobs weight data (per m²) showed that maximum yield was recorded in plots sown on 20th June and 8th July with cobs weight of 0.297 and 0.259 Kg respectively, while the minimum yield was recorded in plots sown in the last week of June and July where yield was 0.159 and 0.168 Kg, respectively. These values were significantly different from each other as well as from the other plots. Thousand grain weight observations were maximum (280.0) and 263.8gm respectively in plots sown on 20th and 26th June and minimum yield of 166.3 and 135.0gm respectively, was observed in plots sown in the 3rd and 4th weeks of July. The current study suggests that the percent infestation of maize stem borer can be minimized by sowing the crop in mid July.

Key Words: Maize, infestation, maize stem borer, planting dates.

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INTRODUCTION

In Pakistan, maize is increasingly gaining an important position in crop husbandry because of its higher yield potential and short growth duration. It contributes about 4.6% of the total food grain production in the country. It is a rich source of food and fodder. Maize is also used in industries for manufacture of corn sugar, corn oil, corn protein, corn-flacks and corn syrup etc (MINFAL, 2009). The yield of maize crop is adversely affected due to insect pests, diseases, weeds, nematodes and birds etc. The grain losses range from 10-15% due to insect pests alone (Jaipal and Dass, 1993). To achieve higher yield of maize crop, proper plant protection measures should be undertaken to prevent losses due to insect pests. The major insect pests that attack maize crop include maize aphis, cutworms, stem/shoot fly, root worm and stem borer. Among these pests, maize stem borer Chilo partellus Swinhoe is the most serious pest (Kumar et al., 1993). The young larvae first feed on leaves making a few shot holes and then bore their way downwards through the central whorl, reaching the growing point of the maize plant. As the whorl opens more shot holes become visible, indicating an earlier attack and the plant also shows dead hearts (Atwal, 1976).

The average yield of maize in Pakistan is very low as compared to other countries of the world (Rehman et al. 1986; MINFAL, 2009). Several factors such as disease severity and environmental fluctuations are responsible for this. Among these factors insect pests are very important. Of all the cereal crops maize is most severely damaged by a wide range of insect pests (Kumar, 1992). Maize stem borer, Chilo partellus, (Swinhoe) pyralidae: Lepidoptera, ranks amongst the most destructive pests of maize in Pakistan (Chaudhry 1983). According to Rehman et al. (1986) in a conservative estimate 20 to 30 percent of the crop is destroyed by the stem borer while Latif et al. (1960) reported that C. partellus damaged 85% of the maize crop in Pakistan.

Performance of maize at successive planting dates has been studied for many years (Seshu-Reddy and Sum, 1991). In all these investigations, early planting produced highest grain yield than late sown crop but more elaborated study is needed, particularly in the agro-ecological conditions of Peshawar valley to confirm the previous results. In order to obtain maximum production, maize crop must be sown at proper time. Once the peak infestation timing is determined, control measures could be applied accordingly.

Keeping in view the importance of maize crop and the severity of damage caused by maize stem borer the present experiment was conducted with the following objectives.
1. To find out a proper sowing date for the maize crop in Peshawar valley.
2. To find out the link between the sowing date and infestation so as to avoid damage from maize stem borer.
3. To achieve maximum yield.

MATERIALS AND METHODS

An experiment entitled "Effect of different sowing dates on maize stem borer infestation" was conducted at Agricultural Research Institute (ARI) Tarnab, Peshawar during 2003. The major cultivated maize variety Azam was obtained from the Directorate of Oilseeds, Agricultural Research Institute, Tarnab. The seeds for experiment were sown in rows. The row-to-row and plant-to-plant distance were kept as 75cm and 25cm, respectively. Plot size for each treatment was 5 × 6.3m². A Buffer zone of one meter wide was kept between the plots to isolate them from one another. Observations were made on the damages of plant (dead hearts caused by the presence of stem borer). First observation was made 20 days after sowing. Data were recorded for 10 consecutive weeks. Average number of 10 damaged plants from central rows in each replication were recorded and converted into percentages.

The experiments were laid out in a randomized complete block design with seven treatments, each replicated four times. Data were analyzed using F-test and Duncan Multiple Range Test (DMR) test for means separation.

Sowing dates

1. = 20 June
2. = 26 June
3. = 02 July
4. = 08 July
5. = 15 July
6. = 21 July
7. = 27 July

Data of infestation were recorded on weekly basis. Following observations were recorded.

1. Number of plants having shot hole (stem borer infested) sown on different dates.
2. Yield of maize plots, sown on different dates.

Number of infested plants per plot was converted into percentage. Yield data were recorded using various yield components; cobs weight per m² (kg), grain weight per square m, and thousand grain mass (TGM) in grams.

RESULTS AND DISCUSSION

Maize crop was sown on different dates from mid June to last week of July to check the minimum infestation time of maize stem borer (Chilo partellus). The results recorded on this pest in terms of percent infestation are given in Table-I while yield data of this crop are given in Table-II. Data were recorded on weekly basis.

Table-I  Mean percent infestation of maize stem borer on different dates.

<table>
<thead>
<tr>
<th>Planting dates</th>
<th>Percent infestation after week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>31.7.03</td>
</tr>
<tr>
<td>20.6.03</td>
<td>1.50 a</td>
</tr>
<tr>
<td>26.6.03</td>
<td>1.75 a</td>
</tr>
<tr>
<td>02.7.03</td>
<td>1.25 a</td>
</tr>
<tr>
<td>08.7.03</td>
<td>1.75 a</td>
</tr>
<tr>
<td>15.7.03</td>
<td>*</td>
</tr>
<tr>
<td>21.7.03</td>
<td>*</td>
</tr>
<tr>
<td>27.7.03</td>
<td>*</td>
</tr>
</tbody>
</table>

Infestation

The first data were taken on 31 July 2003, which revealed that there was no significant difference (P≤0.05) in percent infestation of plots among all the sowing times. Percent infestation recorded in these days was 1.5, 1.75, 1.25 and 1.75 on sowing dates of 20th, 26th June, 2nd and 8th July, respectively. The second week data on 7th August revealed that maximum infestation was recorded in plots sown on 8th July followed by 2nd July with percent infestation of 5.0 and 4.0, respectively which were non significant from each other (P≤0.05). The percent infestation in plots sown on 20th and 26th June was 2.7 and 2.5 which were statistically non significant from each other but significantly different (P≤0.05) from the late sown plots.

Third week data 15th August showed that the minimum infestation was recorded in plots sown on 15th July, which was significantly different (P≤0.05) from the rest of the treatment plots where recorded percent
infestation was 3.5, 3.0, 5.0 and 5.25 sown on 20th, 26th June, 2nd and 8th July respectively. Data recorded on 4th week, 22 August revealed that minimum infestation was recorded in plots sown on 21 July with infestation of 0.5% that is significantly different from the other sowing dates. Percent infestation of 3.75, 5.00 and 5.25 was recorded in plots sown on 20 June, 2 and 8 July respectively while infestation in plots sown on 26 June and 15 July was 3.25 and 0.75%, respectively. These last two values were non-significant to each other but were significantly different (P≤0.05) from all the other treatments.

Observation on 5th week showed that minimum percent infestation of 1.0 was recorded in plots sown on 21st July followed by 1.25 and 1.75% infestation in plots sown on 27th and 15th July. These values were statistically non significant (P≥0.05) to each other but significantly different from 21st July. Maximum percent infestation was recorded in plots sown on 8th and 2nd July with values of 5.25 and 5.0 %. These were non-significant (P≤0.05) to each other but significantly different from the other plots. A medium infestation of 3.25 and 3.75% was recorded in plots sown on 26th and 20th June. These values were non-significant (P≥0.05) from each other but significantly different (P≤0.05) from the other plots.

Findings of the 6th week indicated that maximum percent infestation of 5.0 and 5.25 were recorded in plots sown on 2nd and 8th July respectively followed by plots sown on 20th, 26th June and 15th July with percent infestation of 3.75, 3.25 and 2.5 respectively. These figures were non-significantly different from each other but were significantly different from the data recorded in plots sown on 2nd and 8th July. The minimum infestation was recorded in plots sown on 21st and 27th July that were 1.0 and 1.5%. During 7th week, the maximum infestation was found in plots sown on 8th July followed by on 2nd July, 20th and 26th June with percent infestation of 5.25, 5.00, 4.5 and 3.75, respectively. While the minimum infestation was recorded in plots sown on 21st July followed by on 27th and 15th July with infestation of 1.50, 2.00 and 2.50% respectively, all these figures were statistically different from each other.

Week 8th shows that the plots sown on 20th June, 2nd and 8th July had no significant difference with percent infestation of 4.5, 5.0 and 4.75 respectively followed by the plots sown on 26th June, 17th and 27th July with percent infestation of 2.75, 2.5 and 2.5 respectively. These values were also non significantly different from each other but were significantly different from the plots sown on 21st July, where minimum infestation was recorded (1.75%) as compare to all other plots.

On 9th week, the maximum percent infestation was recorded in plots sown on 8th July (5.25) followed in plots sown on 2nd July, 20th June and 27th July with infestation of 5.0, 4.5 and 3.0 %. The minimum percent infestation was recorded in plots sown on 21st July this value was significantly different from the other values recorded in different plots. A percent infestation of 2.75 and 2.5 was recorded in plots sown on 26th June and 15th July, respectively.

The last week data shows that the percent infestation recorded in different plots was the same as recorded on 9th week with no difference in infestation. As a whole the average infestation data showed that the highest infestation was recorded in 1st week while the lowest was recorded in 2nd and 3rd week of July.

**YIELD**

Yield data were recorded as cobs weight m⁻² (kg), grain weight m⁻² (kg) and thousand-grain weight (g) as yield contributing traits. The Cobs weight data show that maximum yield was recorded in plots sown on 20th (DMRT). Mean in a column followed by the same letter is not significantly different at (P≤0.05) level of probability. As the crop was planted late (as treatment) no observation was made. * As the crop was planted late (as treatment) no observation was made.
Table-II  Mean Cobs weight, grain weight and 1000-grain weight of each plot sown on different dates.

<table>
<thead>
<tr>
<th>Planting Dates</th>
<th>Cobs weight m(^{-2}) (kg)</th>
<th>Grain weight m(^{-2}) (kg)</th>
<th>1000 grain weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20/6/03</td>
<td>0.297 a</td>
<td>0.221 a</td>
<td>280.00 a</td>
</tr>
<tr>
<td>26/6/03</td>
<td>0.159 b</td>
<td>0.122 b</td>
<td>263.8 ab</td>
</tr>
<tr>
<td>02/7/03</td>
<td>0.233 abc</td>
<td>0.219 a</td>
<td>241.3 bc</td>
</tr>
<tr>
<td>08/7/03</td>
<td>0.259 ab</td>
<td>0.210 a</td>
<td>236.3 bc</td>
</tr>
<tr>
<td>15/7/03</td>
<td>0.183 bc</td>
<td>0.137 b</td>
<td>213.80 c</td>
</tr>
<tr>
<td>21/7/03</td>
<td>0.189 bc</td>
<td>0.128 b</td>
<td>166.30 d</td>
</tr>
<tr>
<td>27/7/03</td>
<td>0.168 c</td>
<td>0.126 b</td>
<td>135.00 d</td>
</tr>
</tbody>
</table>

Means within a column followed by the same letters are not significantly different at P≤0.05 level of significance (DMRT).

The Cobs weight data show that maximum yield was recorded in plots sown on 20\(^{th}\) June with cobs weight of 0.297 while the minimum yield was recorded in plots sown in the last week of June and July. These results are in comparison with the work of Imholte and Carter (1987) where they planted corn on three sowing dates ranging from 26\(^{th}\) April to 6\(^{th}\) June. The early planting resulted in delayed emergence, silking and increased harvest grain moisture. Highest grain yields were generally obtained when planting was completed by early May, while yield declined as planting was delayed.

Widstrom et al. (1984) studied the effect of different planting dates on the forage yield of seven experimental hybrids planted from 1\(^{st}\) June to 1\(^{st}\) August. They concluded that June 1\(^{st}\) planting gave the maximum yield. Allessi and Power (1975) reported that the effect of planting date and population in maize grain yield in 1971 and 1972 was significant. Effect of these variables was independent and interaction was generally non-significant. Delay in planting date after June affected grain much more than dry matter and grain production highly.

CONCLUSION AND RECOMMENDATIONS

We concluded from our experiment that to avoid maize stem borer infestation the crop must be sown in 3\(^{rd}\) week of July especially for Azam variety of maize.

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REFERENCES


