Comparative Biology of Sorghum Stem Borer, *Chilo partellus* (Swinhoe) (Lepidoptera: Pyralidae) on Different Sorghum Genotypes/Cultivars

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ABSTRACT

Laboratory experiment was conducted to study the comparative biology of *C. partellus* on 10 different genotypes/cultivars of sorghum at Department of Agricultural Entomology, N. M. College of Agriculture, Navsari Agricultural University, Navsari, Gujarat during the September–November 2003 under laboratory conditions. The sorghum genotypes were sown at Sorghum Research Station, Navsari Agricultural University, Navsari which were used during comparative biology study of *C. partellus*. In comparative biology study, the larval length and weight as well pupal length and weight were recorded maximum on susceptible genotypes (DJ 6514 and GJ 40) and minimum on resistant genotypes (IS 18551 and IS 2205), while the larval and pupal period was recorded as minimum on susceptible genotype (DJ 6514 and GJ 40) and it was prolonged on resistant genotypes (IS 18551 and IS 2205). The larval longevity was maxim when the larvae were reared on leaf whorl of respective genotypes/cultivars.

**Key words** Comparative biology, sorghum genotypes, *Chilo partellus*

Spotted stem borer *Chilo partellus* (Swinhoe) is the major important destructive lepidopterous pest of maize and sorghum in many countries in Asia and Africa (Chatterji, *et al.*, 1969; Seshu Reddy, 1989). It is native to the India sub-continent, but has spread from India to Africa is resulting in the displacement of indigenous stem borers (Kfir, 1990; Overholt, *et al.*, 1994). In India *C. partellus* causes great yield losses up to 40 % in forage sorghum (Singh, 1997). The percent damage or population build up occurs more on preferred or susceptible variety/cultivar, while the resistant variety/cultivar generally less damaged/preferred by the pest. In present experiment, 10 different genotypes/cultivars were tested for recording the general growth and development of sorghum stem borer *Chilo partellus* under laboratory conditions to study comparative biology of *C. partellus* and its response to different sorghum genotypes/cultivars to work out the resistance or susceptibility status of these genotypes.

**MATERIALS AND METHODS**

To raise the initial culture of *C. partellus* in the laboratory of Department of Agricultural Entomology, N. M. College of Agriculture, Navsari, large number of *C. partellus* larvae were collected from sorghum field of college farm during September-2003. The collected larvae were reared under laboratory condition individually in plastic bottle (5.0 x 4.5cm) on fresh tender pieces of sorghum stem. Every day sufficient amount of fresh pieces of tender stem were provided to *C. partellus* larvae after removing the excreta and partially eaten stem pieces from the plastic bottles, till the larvae attends pre-pupal stage. Pupa were kept in separate plastic bottles for adult emergence. Newly emerged adults from pupa were carefully released in oviposition jar (20 x 15 cm) which was prepared by covering inner wall and bottom of glass jar with paper and fresh sorghum leaves were kept in jar for egg laying of *C. partellus*. The adults were provided with 5 % sugar solution dipped cotton swab as a food source. The open end of the oviposition jar was covered with muslin cloth and tied rubber bands to avoid escape of adults. The egg masses on sorghum leaves and paper laid by *C. partellus* female were carefully collected and transferred in hatching jar (20 x 15 cm). Hatching jar was prepared by filling the glass jar ½ capacity with sand and desired quantity of water added to maintain inside humidity. The egg masses laid on paper and leaves were kept in petridish with tender portion of leaves. Such prepared petridish along with egg masses kept on moist sand surface in hatching jar and the open end of jar was closed with finely perforated polythene with pin holes.

Newly hatched 15 *C. partellus* larvae were released in the leaf whorl of the respective genotype of sorghum (GJ-36, GJ-38, GJ-40, CSV-15, SR-833, SR-770, SR-2458, IS-2205, IS-18551 and DJ-5614) kept in separate properly labeled plastic bottles. Three days later, the leaf whorls were dissected and surviving larvae were counted and transferred to fresh leaf whorl of respective genotypes/cultivars. *C. partellus* larvae were reared on leaf whorls up to 6-8 days and thereafter they were reared on stem pieces. The sufficient amount of fresh pieces of tender stem were provided to *C. partellus* larvae after removing excreta and partially eaten stem pieces from
plastic bottles, till the larvae attend pre-pupal stage. Pupa were kept in plastic bottles for adult emergence and after emergence the adults were reared by providing 5 % sugar solution dipped cotton swab as a food source till there death.

The experiment was conducted using completely randomized design with three replications. Following observations on comparative biology of stem borer were recorded.

RESULTS AND DISCUSSION

Influence of ten different sorghum genotypes/cultivars on life cycle and different stages of stem borer *C. partellus* was studied in detail and the results obtained are presented in Table 1. The results of mean larval length revealed that the length of larvae reared on genotype DJ 6541, a susceptible check was significantly higher than all other tested genotypes/cultivars.

The minimum larval weight was recorded in the larvae reared on IS 2205 (0.156 g) which was at par with IS 18551 (0.157 g), GJ 38 (0.161 g) and CSV 15 (0.179 g) and it was followed by SR 2458 (0.182 g) and SR 833 (0.184 g). The highest larval weight (0.226 g), was recorded in the case of larvae reared on DJ 6514, a susceptible check which was found at par with GJ 40 (0.214 g), GJ 36 (0.210 g) and SR 770 (0.202 g) which were found to be more preferred by *C. partellus* as compared to the genotypes which show resistance reaction against the pest *C. partellus*.

The total larval period recorded as maximum when the larvae were reared on IS 18551 (22.44 days) which was found as at par with GJ 40 (22.00 days), IS 2205 (21.93 days), SR 770 (21.66 days), CSV 15 (21.63 days) and GJ 38 (21.63 days). The significantly lower larval period was recorded when the larvae reared on the susceptible genotype DJ 6514 (16.71 days).

The significantly highest larval mortality (Fig. 1) was recorded in resistant genotype IS 18551 (55.55%), which was followed by IS 2205 (49.51%), CSV 15 (48.55%), SR 770 (46.27%), SR 2458 (44.44%) and GJ 40 (44.44%). The lowest larval mortality was observed in susceptible genotype DJ 6514 (27.77%).

The maximum pupal length was recorded of larvae reared on IS 18551 (11.80 mm) and it was at par with IS 2205 (12.50 mm), SR 2458 (12.70 mm) and GJ 38 (12.70 mm). The other genotypes in the order of merits were GJ 36 (14.40 mm) and SR 770 (14.40 mm). The maximum pupal length was recorded in DJ 6514 (16.00 mm). Singh and Verma, 1988 also found the maximum pupal length in susceptible genotype HC 136 (12.85 mm) and ICSV 1 (13.15 mm) and minimum pupal length in resistant genotypes, IS 5469 (10.20 mm) and IS 2205 (10.80 mm), respectively. Sankpal, 1994 also revealed that the minimum pupal length in resistant genotypes, IS 18551 (13.3 mm) and IS 2205 (14.10 mm), while maximum pupal length in susceptible genotype CSH1 (17.00 mm).

Significantly lowest pupal weight was recorded when the larvae were reared on IS 2205 (0.062 g), followed by IS 18551 (0.073 g), GJ 38 (0.082 g) and GJ 40 (0.088 g). The pupal weight when reared on SR 2458 (0.095 g), CSV 15 (0.098 g), SR 833 (0.100 g), GJ 36 (0.103 g) and SR 770 (0.104 g) were

Table 1. Influence of resistant and susceptible genotypes on different stages of *C. partellus*

<table>
<thead>
<tr>
<th>Name of genotype/ cultivar</th>
<th>Mean length (mm)</th>
<th>Mean weight (g)</th>
<th>Mean larval period (Days)</th>
<th>Mean length (mm)</th>
<th>Mean weight (g)</th>
<th>Mean pupal period (Days)</th>
<th>Mean pupal female longevity (Days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GJ 36</td>
<td>20.80</td>
<td>0.210</td>
<td>21.20</td>
<td>14.40*</td>
<td>0.103*</td>
<td>8.07*</td>
<td>4.77*</td>
</tr>
<tr>
<td>GJ 38</td>
<td>18.00</td>
<td>0.161</td>
<td>21.63</td>
<td>12.70*</td>
<td>0.082*</td>
<td>7.90*</td>
<td>4.66*</td>
</tr>
<tr>
<td>GJ 40</td>
<td>21.20</td>
<td>0.214</td>
<td>22.00</td>
<td>15.40*</td>
<td>0.088*</td>
<td>6.10*</td>
<td>5.00*</td>
</tr>
<tr>
<td>CSV 15</td>
<td>17.80</td>
<td>0.179</td>
<td>21.63</td>
<td>15.33*</td>
<td>0.098*</td>
<td>7.53*</td>
<td>4.50*</td>
</tr>
<tr>
<td>SR 833</td>
<td>18.30</td>
<td>0.184</td>
<td>21.66</td>
<td>15.20*</td>
<td>0.100*</td>
<td>6.62*</td>
<td>4.83*</td>
</tr>
<tr>
<td>SR 770</td>
<td>20.10</td>
<td>0.202</td>
<td>21.66</td>
<td>14.40*</td>
<td>0.104*</td>
<td>8.10*</td>
<td>4.00*</td>
</tr>
<tr>
<td>SR 2458</td>
<td>18.10</td>
<td>0.182</td>
<td>20.87</td>
<td>12.70*</td>
<td>0.095*</td>
<td>8.17*</td>
<td>3.54*</td>
</tr>
<tr>
<td>IS 2205 (R)</td>
<td>15.50</td>
<td>0.156</td>
<td>21.93</td>
<td>12.50*</td>
<td>0.062*</td>
<td>8.22*</td>
<td>5.20*</td>
</tr>
<tr>
<td>IS 18551 (S)</td>
<td>15.66</td>
<td>0.157</td>
<td>22.44</td>
<td>11.80*</td>
<td>0.073*</td>
<td>8.22*</td>
<td>5.20*</td>
</tr>
<tr>
<td>DJ 6514 (S)</td>
<td>22.40</td>
<td>0.226</td>
<td>16.71</td>
<td>16.00*</td>
<td>0.120*</td>
<td>5.66*</td>
<td>5.20*</td>
</tr>
<tr>
<td>S Em ±</td>
<td>0.340</td>
<td>0.008</td>
<td>0.389</td>
<td>0.323</td>
<td>0.003</td>
<td>0.193</td>
<td>0.110</td>
</tr>
<tr>
<td>C. V. %</td>
<td>1.005</td>
<td>0.024</td>
<td>1.149</td>
<td>0.952</td>
<td>0.010</td>
<td>0.568</td>
<td>0.325</td>
</tr>
</tbody>
</table>

*S*Figures denoted by same letters are not differing statistically from each other.
significantly higher as compared to the other genotypes. However the highest pupal weight was recorded when the larvae were reared on DJ 6514 (0.120 g). These investigations are in conformity with the findings of Singh and Verma, 1988. They also found the maximum pupal weight on susceptible varieties HC 136 and ICSV 1 (86.58 and 87.25 g respectively). Sankpal, 1994 also reported the maximum pupal weight on susceptible variety CSH 1 (0.105 g) and minimum on resistant variety IS 2205 (0.052 g).

Maximum pupal period was recorded when the larvae reared on IS 18551 (8.22 days), which was at par with IS 2205 (8.17 days), SR 2458 (8.10 days), GJ 38 (8.07 days), GJ 36 (8.00 days) and GJ 40 (7.90 days). However the highest pupal period was recorded when the larvae reared on DJ 6514 (5.86 days), a susceptible genotype, which was at par with CSV 15 (6.10 days). Sankpal, 1994 also reported the prolonged pupal period on resistant genotype IS 2205 (5.83 days) and minimum pupal period on susceptible genotype CSH 1 (6.57 days), which confirms the present findings.

Among the various genotypes the minimum female longevity was observed when the larvae reared on IS 18551 (3.54 days), which was followed by IS 2205 (4.00 days) and SR 2458 (4.00 days). The other genotypes recorded the significantly higher adult longevity. However the female longevity was maximized when the larvae were reared on DJ 6514 (5.20 days). Sankpal, 1994 also reported the adult female longevity was maximum on susceptible genotype CSH 1 (4.99 days) and minimum on IS 18551 (3.54 days), which confirms the present findings.

Considering the overall results, it can be stated that, the development of different stages of sorghum stem borer C. partellus, was adversely affected, when it feeds on resistant genotypes like, IS 18551, IS 2205 and CSV 15, which indicating the existence of antibiosis mechanism among these genotypes which makes them prominent source of resistance for Chilo partellus resistance breeding of sorghum.

**LITERATURE CITED**


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