Development and Fecundity of *Sitobion avenae* (F.) (Hom.: Aphididae) on Some Wheat Cultivars in Laboratory Conditions

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Abstract: Nymphal development time and fecundity of *Sitobion avenae* (F.) were determined on nine widespread wheat varieties cultivated in Tekirdağ Region in Turkey. Tests were carried out in controlled environment chambers (25 ± 1°C, 65 ± 5 % R.H. and 16:8 light and dark cycles). Developmental time ranged from 5.75 ± 0.25 to 7.20 ± 0.20 day. Fecundity was found the highest (12.87 ± 1.50) on cv. Sana. Cv. MV-17, cv. Miryana, cv. Pehlivan and cv. Saraybosna were found particular resistant wheat varieties against *S. avenae*.

Key words: Insecta, fecundity, developmental time, wheat, host resistance

Introduction

Aphids are major agricultural pests and cause reduction in crop yield by direct feeding damage and by transmission of viruses. The wheat aphids and their natural enemies were determined by previous researches in Tekirdağ (Özder and Toros, 1999a,b). English grain aphid *Sitobion avenae* (F.) was found the most common species on the wheat in this region. It is also known as the wide spread aphid over the world (Dean, 1974; Kiechefer, 1975; Kolbe and Linke, 1974; Markkula, 1980; Robinson and Hau, 1963). Biology and effect of wheat varieties on main life parameters of *Sitobion avenae* have been studied separately (Araya et al., 1987; Celli et al., 1997; Di Pietro and Alik, 1987; Dixon, 1973; Dixon, 1995; JunXiang et al., 1999; Leszczynski et al., 1995; Markkula and Myllymaki, 1963; Markkula and Roukkia, 1972; Thelme and Heimbach, 1986; Watt, 1978; Watt and Dixon, 1981). The nymphal development duration, longevity and fecundity are the most important indices identifying the resistance of wheat varieties (JunXiang et al., 1999). In addition to the quantification of the impact of resistance varieties on the aimed pest is important for the effective use of plant resistance as a part of management strategy.

This research was conducted at Agricultural Faculty of Tekirdağ to determine the effects of wheat varieties on *S. avenae* development and fecundity using nine wheat varieties on *S. avenae* and determining particular resistant wheat varieties for Tekirdağ Region of Turkey.

*S. avenae* adults were obtained from wheat cultivar Kate-A-1 in the field of the Faculty. *S. avenae* was cultured as a stock culture on each wheat variety in laboratory conditions after they collected from the field. Kate-A-1, Miryana, Pehlivan, Flamura 86, MV-17, Saraybosna, Sana, Primorretz, Pehlivan are the most widespread cultivated *Triticum aestivum* varieties in Tekirdağ. The experiments were conducted on this wheat varieties at 25 ± 1°C, 65 ± 5 % R.H. and 16:8 light and dark cycle. Each wheat variety was grown up individually in 10 cm diameter plastic pots. In order to determine nymphal development newly born nymph were settled individually on two plant leaves of each wheat variety. Afterwards, they nymph was observed daily for molting and survivoship. The presence of exuviae was used to determine molting. Daily reproduction per adult and adult mortality were recorded every day after they reached adult stage still they died. There were 36 replicates for each wheat variety and each traits.

For the analysis of nymphal development all of the data were normalized by arcsine (x+1) transformation (square-root transformed). Development data (each stadium) and fecundity were analyzed separately by one way analysis of variance (ANOVA) and comparisons were made using Duncan’s Multiple Range tests (SAS Institute, 1987). Wheat varieties had significant effects on total nymphal development period, preoviposition period and the mean nymph number of reproduction of *S. avenae* (P<0.05).

There were no significant differences in 1, 2 and 3 nymphal development period among the wheat varieties. But 4 nymphal period was found the shortest on cv. Primorretz. Total nymphal developmental time of *S. avenae* was shortest on cv. Pehlivan (5.75 ± 0.25) and cv. Primorretz (5.80 ± 0.20). The maximum nymph developmental time were found on cv. Saraybosna (7.20 ± 0.20). Mean nymph number were found the highest on cv. Sana (12.87 ± 1.50). The lowest nymph number was found on Pehlivan.

Table 1: Nymphal development period and mean of nymph number of *Sitobion avenae* on different wheat varieties

<table>
<thead>
<tr>
<th>Wheat varieties</th>
<th>1st nymph (days)</th>
<th>2nd nymph (days)</th>
<th>3rd nymph (days)</th>
<th>4th nymph (days)</th>
<th>Total nymph (days)</th>
<th>Preoviposition (days)</th>
<th>Mean nymph number</th>
</tr>
</thead>
<tbody>
<tr>
<td>MV-17</td>
<td>1.20 ± 0.45</td>
<td>1.40 ± 0.55</td>
<td>1.80 ± 0.45</td>
<td>2.40 ± 0.65</td>
<td>7.00 ± 0.31c</td>
<td>1.75 ± 0.50</td>
<td>5.25 ± 2.06</td>
</tr>
<tr>
<td>Proctor</td>
<td>1.50 ± 0.58</td>
<td>1.25 ± 0.60</td>
<td>2.00 ± 0.00</td>
<td>2.25 ± 0.50</td>
<td>7.00 ± 0.40</td>
<td>2.33 ± 0.58</td>
<td>4.33 ± 1.53</td>
</tr>
<tr>
<td>Miryana</td>
<td>1.50 ± 0.65</td>
<td>1.40 ± 0.55</td>
<td>1.80 ± 0.45</td>
<td>2.20 ± 0.45</td>
<td>7.00 ± 0.31</td>
<td>2.50 ± 0.58</td>
<td>5.50 ± 3.11</td>
</tr>
<tr>
<td>Kate-A-1</td>
<td>1.20 ± 0.45</td>
<td>1.40 ± 0.45</td>
<td>1.60 ± 0.55</td>
<td>2.40 ± 0.65</td>
<td>6.60 ± 0.24</td>
<td>1.33 ± 0.58</td>
<td>5.00 ± 1.00</td>
</tr>
<tr>
<td>Primorretz</td>
<td>1.20 ± 0.45</td>
<td>1.20 ± 0.45</td>
<td>1.60 ± 0.55</td>
<td>1.40 ± 0.85</td>
<td>5.80 ± 0.55</td>
<td>2.75 ± 1.26</td>
<td>3.50 ± 1.00</td>
</tr>
<tr>
<td>Flamura-86</td>
<td>1.00 ± 0.01c</td>
<td>1.60 ± 0.55</td>
<td>1.80 ± 0.645</td>
<td>2.40 ± 0.65</td>
<td>8.80 ± 0.37</td>
<td>1.33 ± 0.58</td>
<td>4.67 ± 0.58</td>
</tr>
<tr>
<td>Saraybosna</td>
<td>1.60 ± 0.89</td>
<td>1.40 ± 0.55</td>
<td>1.80 ± 0.45</td>
<td>2.00 ± 0.82</td>
<td>7.20 ± 0.20</td>
<td>3.67 ± 0.58</td>
<td>4.33 ± 0.58</td>
</tr>
<tr>
<td>Pehlivan</td>
<td>1.00 ± 0.00</td>
<td>1.50 ± 0.58</td>
<td>1.25 ± 0.50</td>
<td>2.00 ± 0.82</td>
<td>5.75 ± 0.25</td>
<td>1.80 ± 0.58</td>
<td>4.50 ± 1.29</td>
</tr>
<tr>
<td>Sana</td>
<td>1.60 ± 0.89</td>
<td>1.40 ± 0.55</td>
<td>1.80 ± 0.45</td>
<td>2.20 ± 0.45</td>
<td>7.00 ± 0.31c</td>
<td>1.75 ± 0.50</td>
<td>5.25 ± 2.06</td>
</tr>
</tbody>
</table>

1 Within columns, mean followed by the same letter do not differ significantly P<0.05. * Figures are means ± S.E.; in parentheses, the range of minimal and maximal values.

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Nihal Özder: Insecta, fecundity, developmental time, wheat, host resistance

(6.60 ± 1.55) for S. avenae. The shortest preoviposition period was found on Flamura 85 (1.33-0.58) and Kete-A-1 (1.33-0.58). There were no significant differences on oviposition period among the wheat varieties (Table 1). Hasn't been found any literature on the developmental time and fecundity of S. avenae for the wheat species studied in this research. The total nymphal development time values of these aphids was similar to what has been reported for these species (Simon et al., 1991). The mean total fecundity in this study was lower than others research (Dean, 1974; Markkula and Myllymaki, 1963). But they also obtained sometimes very different values in his studies (Dean, 1974). Fecundity of S. avenae are dependent on aphid-plant genotype and between the aphid-plant interactions, differences of clones and vegetative parts of plant where aphids placed on it (Dixon, 1987; Giancoli et al., 1987; Griffiths and Watten, 1977; Love, 1980; Radchenko, 1987; Soroka and Mackay, 1991). It is also concluded that S. avenae reproducted more faster on ears than leaves (Acreman and Dixon, 1989; Vereijken, 1979). The differences in the value in this study may be happened due to species of wheat cultivar, rearing techniques, the plant of plant where this study was conducted, aphid-plant interactions and clonal factor. As a result of this investigation, cv. MV-17, cv. Miyana, cv. Pehlivanic and cv. Saraybosna were found resistant varieties against S. avenae. Moreover cv. MV-17 and cv. Pehlivanic were found resistant wheat varieties against R. padii among the same wheat varieties in the Thrace Region ( Özder, 1989; Özder and Bayhan, 1998). Antibiosis to S. avenae was observed in cultivar Regina between five winter wheat cultivars under greenhouse conditions (Havlíková, 1995).

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References