SUSCEPTIBILITY OF THREE SOYBEAN VARIETIES TO INFESTATION BY CERTAIN SUCKING INSECTS UNDER FIELD CONDITIONS OF KAΦR El SHEIKH GOVERNORATE EGYPT

EL-KHOULY A.S.1, R.M. SALEM2, M.M. METWALLY1, H.A. HELAL1 AND A.B. EL-MEZAIESEN2

1 Faculty of Agriculture, Al-Azhar University, Cairo, Egypt.
2 Plant Protection Research Institute, Agricultural Research Centre, Dokki, Egypt.

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Abstract

Three varieties of soybean namely, Cutter, Crawford and Clark were tested for infestation by certain sucking insects: Aphis spp, Empoasca spp., Thrips tabaci (L.) and Bemisia tabaci (Genn.) in an attempt to seek for less susceptible varieties to these insect pests. Also, the effect of some climatic factors (temperature, relative humidity and wind velocity) on these insects was determined. The study was carried out at Sakha Agric. Res. Station Farm during 1993 season. The results indicated that the three tested varieties received high populations of aphids, low ones of thrips and relatively moderate numbers of jassids and whiteflies. Variety Clark harboured, significantly, the highest number of the considered insects, while Crawford received the lowest number. The three climatic factors correlated insignificantly with T.tabaci, but positively with temperature and negatively with relative humidity and wind velocity in all tested varieties. Temperature, relative humidity and wind velocity jointly affected, by 0.4913, 0.4852 and 0.4265 of variability, thrips populations on Crawford, Cutter and Clark, respectively. Total of Aphis spp., Empoasca spp. and T.tabaci correlated insignificantly and negatively with the three climatic factors. Temperature, relative humidity and wind velocity collectively influenced by 0.8264, 0.8140 and 0.8235 of variability, the total populations of these insects on Crawford, Cutter and Clark, respectively.

Thus, Crawford variety could be recommended to be cultivated at Kafr El-Sheikh Governorate since it was relatively less susceptible to the sucking insects infestation as an agricultural method in the Integra-

INTRODUCTION

Recently, soybean, Glycine max (L.) has become the most important leguminous crop in Egypt as a source of protein and fat, in addition to several vitamins and some essential elements. In the field, soybean is subjected to attack by different injurious insect pests, among which are the sucking insects; T.tabaci, Empoasca spp., B.tabaci and aphids (El-Kafi et al., 1974; Hamed, 1977; Shaheen, 1977; Awadalla et
These sucking insects cause serious injury to the plants by sucking plant juices, secrete honeydew on which a sooty mold grows or by acting as vectors of several important soybean viruses (Goodman and Nene, 1976; Ross, 1977; Granada, 1979). The insecticidal control of these insects causes environmental pollution, serious harmful side effects to human, domestic animals, the natural enemies and resistance of pests to many pesticides. Thus, there is a tendency toward insect pest management to emphasize the alternative non-chemical methods of control (Dent, 1991).

The present study aims to: 1. Evaluate the susceptibility of three soybean varieties to infestation by the above mentioned sucking insects, 2. Investigate the effect of temperature, relative humidity and wind velocity on these insects in the field.

MATERIALS AND METHODS

The present experiment was conducted during 1993 season at the Experimental Farm of Sakha Agric. Res. Station. The experimental area was divided into plots, each of 42 m². The varieties involved in this study were Cutter, Crawford and Clark. The three varieties were planted in mid-May, 1993 in complete randomized blocks with four replicates for each variety. The regular agricultural practices were followed without any insecticidal treatments throughout the growing season of soybean.

To monitor the population of aphids, weekly samples of ten plants of each variety from each replicate were taken at random and the total number of aphids (nymphs and adults) was counted and recorded. For assessment of the population of B. tabaci (nymph), T. tabaci and Empoasca spp. (all forms), ten leaves were weekly picked up from each replicate at random from the three leaves of the plant and the numbers of each insect species were counted on the whole leaves. To reveal significance between the mean number of each insect on the three tested varieties, Duncan's multiple range test (1955) at 5% level was used. Daily mean temperature, relative humidity and wind velocity during the inspection period were obtained from the Meteorological Department at Sakha Research Station. Daily means of these climatic factors during the preceding week of sampling date were used to calculate the determination coefficient (R²) according to Fisher (1950) for these insects at different climatic factors.
RESULTS AND DISCUSSION

1. Susceptibility of three soybean varieties to infestation by sucking insects

Data presented in Table 1 show the numbers of sucking insects and their means during the inspection period on the three soybean varieties. Generally, the obtained results indicated that the three varieties harboured high populations of aphids, low ones of thrips, and relatively a moderate numbers of jassids and whiteflies. As for aphids, Aphis spp., the initial infestation began to appear on 2nd August with means of 10, 15 and 20 aphids/10 plants for Crawford, Cutter and Clark varieties, respectively. The population increased sharply to reach its peak on 6th September with respective means of 2856, 3064 and 3224. The populations then decreased gradually until the end of the season. Crawford significantly harboured the lowest number of aphids (659.62/10 plants), while Clark harboured the highest one (762.76). Cutter harboured 707.59/10 plants.

Regarding jassids, Empoasca spp., the population appeared one week after whitefly appearance. The population peaked twice, the first occurred on 26th July with means of 40, 48.5 and 61 insects/10 leaves for Crawford, Cutter and Clark, respectively. The population fluctuated to reach the second peak which took place on 30th August with respective means of 101, 118.5 and 135 jassids/10 leaves. Then the population declined gradually till the end of the season. Clark was significantly the highest infested variety with jassids (61.12/10 leaves), while Crawford was the lowest infested one (40.74/10 leaves). Cutter had 50.43/10 leaves.

The thrips, T. tabaci, infestation occurred early in the season on 14th June with means of 32, 38 and 45 insects/10 leaves, then the population increased gradually to reach its peak on 5th July with means of 89, 114 and 135 insects/10 leaves for Crawford, Cutter and Clark, respectively. After that date the population decreased and completely disappeared by 26th July in all tested varieties.

Considering whitefly, B. tabaci, the initial infestation started in large numbers; 100, 109 and 102 nymphs/10 leaves for Crawford, Cutter and Clark, respectively. The population increased gradually to reach its first peak on 2nd August with respective means of 211, 220 and 234 nymphs/10 leaves. After that date, the population fluctuated forming the second peak by 16th August with means of 191, 203 and 223. Whitefly population decreased gradually on Clark variety till the end of the season, while it reached a third peak of 194 and 202 nymphs/10 leaves (on 30th
Table 1. *Mean numbers of certain sucking insects on three soybean varieties under field conditions at Sakha region, Kafr El-Sheikh Governorate during 1993 season.

<table>
<thead>
<tr>
<th>Sampling date</th>
<th>Aphis spp.</th>
<th>Empoasca spp</th>
<th>Thrips tabaci</th>
<th>Bemisia tabaci</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Crawford</td>
<td>Cutter</td>
<td>Clark</td>
<td>Crawford</td>
</tr>
<tr>
<td>June 7</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>14</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>21</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>28</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Jul. 5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>12</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>19</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>26</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Aug. 2</td>
<td>10</td>
<td>15</td>
<td>20</td>
<td>38.5</td>
</tr>
<tr>
<td>9</td>
<td>149</td>
<td>184</td>
<td>222</td>
<td>60</td>
</tr>
<tr>
<td>16</td>
<td>224.5</td>
<td>261</td>
<td>295</td>
<td>38</td>
</tr>
<tr>
<td>23</td>
<td>272.5</td>
<td>335</td>
<td>370</td>
<td>95.5</td>
</tr>
<tr>
<td>30</td>
<td>1556</td>
<td>1646</td>
<td>1789</td>
<td>101</td>
</tr>
<tr>
<td>Sept. 6</td>
<td>2856</td>
<td>3024</td>
<td>3524</td>
<td>89</td>
</tr>
<tr>
<td>13</td>
<td>2651</td>
<td>2867</td>
<td>2999</td>
<td>81.5</td>
</tr>
<tr>
<td>20</td>
<td>1911</td>
<td>1985</td>
<td>2170</td>
<td>69</td>
</tr>
<tr>
<td>27</td>
<td>1587</td>
<td>1672</td>
<td>1878</td>
<td>60</td>
</tr>
<tr>
<td>Total</td>
<td>11217</td>
<td>12029</td>
<td>12967</td>
<td>692.5</td>
</tr>
<tr>
<td>Mean</td>
<td>659.82c</td>
<td>707.59b</td>
<td>762.76a</td>
<td>40.74c</td>
</tr>
</tbody>
</table>

*Mean numbers of certain sucking insects on three soybean varieties under field conditions at Sakha region, Kafr El-Sheikh Governorate during 1993 season.
August) on Crawford and Cutter, respectively. Crawford significantly received the lowest numbers of whitefly nymphs (105.23/10 leaves), while Cutter harboured 111.46/10 leaves. On the other hand, Clark variety was the highest infested one (116.52/10 leaves). Generally, it is of interest that variety Clark harboured significantly the highest numbers of the considered insects, while Crawford received the lowest ones. The obtained results were in agreement with the findings of Hoda and Doss (1984) who found the Clark variety was susceptible to whitefly, while Crawford was harbouring the lowest insect populations. Also, Hamed (1977) and Bachateley (1984) found that Clark variety was the most favourable host to B. tabaci. Metcalf and William (1975) explained the reasons of plant resistance to insects and mentioned that this phenomenon generally attributes to certain morphological and biochemical characteristics of plants which affect the behaviour and/or the metabolism of insects. Robins and Daugherty (1969) found that glabrous varieties of soybean had both the highest numbers of leafhoppers and highest ovipositional rates, while the dense pubescent varieties had the lowest numbers and lowest incidence of oviposition.

2. Effect of some climatic factors on the population density of T. tabaci

The results in Table 2 indicate that the population of T. tabaci infested the three tested soybean varieties in the period from 7th June until 19th July was not affected significantly by temperature, relative humidity and wind velocity. Mean temperature correlated positively and insignificant with thrips while, relative humidity and wind velocity correlated negatively and insignificant with this insect. The three considered factors jointly affected, by 0.4913, 0.4852 and 0.4265 of variability, thrips population on Crawford, Cutter and Clark, respectively.

3. Effect of some climatic factors on the total population densities of Aphis spp., Empoasca spp. and B. tabaci

Data presented in Table 3 show that the total populations of aphids, jassids and whiteflies infested Crawford, Cutter and Clark varieties in the coincident period starting from 2nd August through 27th September was affected highly significant and negative by wind velocity (B=-2705.6087, -2642.9510 and -3031.3707) and significantly and negative by temperature (B=-795.8967, -848.5497 and
Table 2. Simple correlation (r), regression coefficient (B) and determination coefficient (R2) between some climatic factors and population density of T.tabaci, infesting three soybean varieties during 1993 season.

<table>
<thead>
<tr>
<th>Varieties</th>
<th>Climatic factors</th>
<th>(r)</th>
<th>(B)</th>
<th>(R2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crawford</td>
<td>Mean temperature (°C)</td>
<td>0.5559</td>
<td>-4.8044</td>
<td>0.4913</td>
</tr>
<tr>
<td></td>
<td>Mean relative humidity (%)</td>
<td>-0.4367</td>
<td>-5.5580</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mean wind velocity (km/h)</td>
<td>-0.4978</td>
<td>-16.0181</td>
<td></td>
</tr>
<tr>
<td>Cutter</td>
<td>Mean temperature (°C)</td>
<td>0.5459</td>
<td>-7.2231</td>
<td>0.4852</td>
</tr>
<tr>
<td></td>
<td>Mean relative humidity (%)</td>
<td>-0.4279</td>
<td>-7.9794</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mean wind velocity (km/h)</td>
<td>-0.4991</td>
<td>-19.8804</td>
<td></td>
</tr>
<tr>
<td>Clark</td>
<td>Mean temperature (°C)</td>
<td>0.5057</td>
<td>-8.7095</td>
<td>0.4265</td>
</tr>
<tr>
<td></td>
<td>Mean relative humidity (%)</td>
<td>-0.4062</td>
<td>-8.4465</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mean wind velocity (km/h)</td>
<td>-0.4625</td>
<td>-20.7300</td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Simple correlation (r), regression coefficient (B) and determination coefficient (R2) between some climatic factors and the total populations of Aphis spp., Empoasca spp. and B.tabaci infesting three soybean varieties during 1993 season.

<table>
<thead>
<tr>
<th>Varieties</th>
<th>Climatic factors</th>
<th>(r)</th>
<th>(B)</th>
<th>(R2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crawford</td>
<td>Mean temperature (°C)</td>
<td>-0.0270</td>
<td>-795.8967*</td>
<td>0.8264</td>
</tr>
<tr>
<td></td>
<td>Mean relative humidity (%)</td>
<td>-0.2184</td>
<td>-110.6643*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mean wind velocity (km/h)</td>
<td>-0.5653</td>
<td>-2705.6087**</td>
<td></td>
</tr>
<tr>
<td>Cutter</td>
<td>Mean temperature (°C)</td>
<td>-0.0332</td>
<td>-848.5497*</td>
<td>0.8140</td>
</tr>
<tr>
<td></td>
<td>Mean relative humidity (%)</td>
<td>-0.2129</td>
<td>-115.0125</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mean wind velocity (km/h)</td>
<td>-0.5592</td>
<td>-3848.2910**</td>
<td></td>
</tr>
<tr>
<td>Clark</td>
<td>Mean temperature (°C)</td>
<td>-0.0353</td>
<td>-906.6399*</td>
<td>0.8235</td>
</tr>
<tr>
<td></td>
<td>Mean relative humidity (%)</td>
<td>-0.2128</td>
<td>-121.8674</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mean wind velocity (km/h)</td>
<td>-0.56620</td>
<td>-3031.3707**</td>
<td></td>
</tr>
</tbody>
</table>

* = Significant, ** = Highly significant.
906.6598) on Crawford, Cutter and Clark, respectively. On the other hand, relative humidity influenced the total populations of these insects insignificantly and negative on Cutter and Clark varieties (β = 115.0125 and -121.8674) and significantly and negative on Crawford variety (β = 110.6643). Total populations of these sucking insects correlated insignificantly and negative with the three climatic factors. The three climatic factors collectively affected by 0.8264, 0.8140 and 0.8235 of variability, the total populations of aphids, jassids and whiteflies on Crawford, Cutter and Clark, respectively.

From the obtained results, it could be concluded that Clark variety seemed to be the most susceptible to infestation by the mentioned sucking insects while, Crawford looked less susceptible. Also, the climatic factors can play a serious role on population densities of sucking insects. Such results could encourage developing breeding programmes to produce new varieties less susceptible to insect infestation in an attempt to minimize chemical control and pesticide hazards.
REFERENCES


مدى قابلية ثلاثة أنواع من فول الصويا للإصابة ببعض الحشرات الثانوية
الأحسنة تحت الظروف العقلية بمحاكاة كفر الشيخ

عبد الناصر سليمان التولي 1، وصلاح محمد بهي الدين سالم 2، مصطفى محمد متوكل 2
وأحمد هلال 2

1 كلية الزراعة – جامعة الأزهر – القاهرة
2 مجمع بحوث وحماية النباتات – مركز البحوث الزراعية – الدقي

اكتشفت مدى قابلية ثلاثة أنواع من فول الصويا: كفر كاروفرد وكفر كلاك، للإصابة بالحمض والثدي والنشرة البيضاء، وتظهر كملاحظة في البحث عن اكتشاف قابلية للإصابة ببعض الحشرات وكم تصدرت اثنان كأثوب أن درجات الحرارة والرطوبة النسبية وسرعة الرياح على هذه الحشرات. وقد أجريت هذه الدراسة بمراعاة محطة الرياح الزراعية بمنطقة كفر الشيخ في موسم الزارعي 1999 م.


وتضحى تتغير هذه النتائج على تطور برامج الإنتاج، وفترة صد المدة سلبيًا للإصابة باللافتة كوسيلة لتنقير استخدام الأدوية الكيميائية والملحيات.