Seasonal incidence of spider mite, *Tetranychus urticae* (Koch.) infesting carnation (*Dianthus caryophyllus* L.) under polyhouse conditions

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**ABSTRACT:** An experiment was conducted during 2011-12 and 2013-14 to investigate the seasonal variations in the incidence of two spotted red spider mite, *Tetranychus urticae* (Koch.) on carnation cv. Solar Cherry under polyhouse conditions. The red spider mite population remained active throughout the crop season under the polyhouse conditions with the peak activities during first week of April. A significant positive correlation exists between spider mite population and average temperature whereas a significant negative correlation existed between mite population and average relative humidity under polyhouse conditions on carnation.

**Keywords:** Carnation, seasonal incidence, *Tetranychus urticae*

**INTRODUCTION**

Carnation (*Dianthus caryophyllus* L.) is one of the most popular cut flowers in the world and the highest economic importance in the floriculture industry. In India, it is covering more than 600 ha of area. While in Gujarat, it is grown in an area of 40 ha with the production of 51 lakh cut flowers accounting Rs. 85 lakh per annum during 2011-12. There are many constraints in growing carnation under polyhouse conditions among which attack of mite pests is very important. Presently the two spotted red spider mite, *Tetranychus urticae* Koch is considered as one of the most important pests associated with the profitable cultivation of carnation under protected cultivation. The mite is known for the ability to develop resistance against acaricides. Therefore, there is an urgent need to understand its seasonal activities under protected conditions, so that timely management practices have been utilized for its effective control. Considering the importance of red spider mite, *T. urticae* the present investigation was therefore undertaken.

**MATERIALS AND METHODS**

The carnation variety Solar Cheery was planted in a raised bed of 200 m² under the polyhouse of AINP on Agricultural Acarology, Department of Entomology, Navsari Agricultural University, Navsari study the seasonal incidence of the red spider mite, *T. urticae* on carnation. Weekly observations were recorded from 25 plants randomly selected. The mite population *i.e.* mobile stages which include both nymphs and adults were observed from the top, middle and bottom leaves of each plant. The leaves from these plants were plucked and brought to the Acarology laboratory for observing the mite population under the stereo-zoom binocular microscope from 2 cm² leaf bit. The mite population was also correlated with abiotic factors of the polyhouse by recording average temperature (°C) and average relative humidity (%). A simple correlation was worked out between the mean mite population and abiotic factors in the polyhouse.

**RESULTS AND DISCUSSION**

During 2011-12, the initial spider mite population on carnation were recorded 3.28 mites per leaf in the 6th Standard Meteorological Week (SMW) (*i.e.* first week of February) and then the spider mite population gradually increased and reached to its peak during 20th SMW (mid of May) with 27.48 mites per leaf, the average temperature and relative humidity during this period was 30.3°C and 44.4%, respectively. The spider mite population remains stable during 20th SMW to 24th SMW ranging 27.01 to 27.48 per leaf. At the time of completion of the carnation in 26th SMW (last week of July) the spider mite population was 25.00 per leaf. So in 2011-12 the peak activities of the mites were recorded between 20th to 24th SMW under the polyhouse conditions. It is observed from the Table-1 that during 2012-13, the initial population of spider mite was 7.60 mites per leaf in 6th SMW and it gradually increased and reached to the peak in 13th SMW (last week of March) with the population of 19.66 mites per leaf. The average temperature and relative humidity during this period was 24.0°C and 53.1%, respectively. The population gradually decreased but ranging 16.20 to 18.86 mites per leaf and
then again it increases with a peak in 19th SMW (i.e. first
week of May) with 20.20 mites per leaf, the average
temperature and relative humidity was 24.6°C and 43.1%,
respectively. The spider mite population then gradually
decreases and at the time of completion of the crop the
mite population was 7.33 per leaf. From the population
data of 2012-13, two distinct peaks were recorded, the
first during 13th SMW and the second was during
19th SMW. In 2013-14, the initial population of spider mite
during 6th SMW was 4.46 mites per leaf, which gradually
increased and reached to the peak i.e. 20.34 mites per
leaf during 14th SMW (first week of April) then the mite
population gradually decreased and at the time of harvest
the mite population was 6.80 per leaf. The average
temperature and relative humidity during peak activities
was 23.1°C and 50.9%, respectively.

The pooled data on seasonal incidence of all three
years were presented in Table 1, showed that the spider
mite remains active on carnation throughout the crop
season with the initial population of 5.11 mites per leaf
in 6th SMW (i.e. second week of February) and then
gradually increased and reached to its peak i.e. 19.97
mites per leaf during 19th SMW (first week of May), then
it gradually decreased. During the peak activities of spider
mite the average temperature and relative humidity was
25.9°C and 44.9 %, respectively. The overall pooled
seasonal mean of mite were 13.78 per leaf. So, from the
present study it can be concluded that the spider mite
remain active throughout the crop season on carnation cv
Solar Cherry under polyhouse in the south Gujarat
conditions with the peak activities during first week of
April (19th SMW). Shah and Shukla (2014) also recorded
similar results under polyhouse conditions on gerbera
where spider mite remains active round the year under
polyhouse conditions with peak population during
31st SMW i.e. last week of July with 12.86 mites per
leaf. Further, Sudhir Kumar and Shelke (2008) reported
that the spider mite population started from 35th SMW
with 1st peak at 42nd SMW and reached up to lowest

### Table 1. Seasonal activity of spider mite, *Tetranychus urticae* on carnation cv *Solar Cheery* under polyhouse conditions

<table>
<thead>
<tr>
<th>St. Met. Week</th>
<th>Year 2011-12</th>
<th>Year 2012-13</th>
<th>Year 2013-14</th>
<th>Pooled data</th>
<th>Mean number of spider mite per leaf (2cm²)</th>
<th>Average Temperature (°C)</th>
<th>Average Relative humidity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>3.28</td>
<td>7.60</td>
<td>4.46</td>
<td>5.11</td>
<td>23.2 (22.5)</td>
<td>22.2 (22.6)</td>
<td>59.0 (55.2)</td>
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<tr>
<td>7</td>
<td>4.12</td>
<td>11.00</td>
<td>7.93</td>
<td>7.68</td>
<td>23.5 (23.0)</td>
<td>23.0 (23.2)</td>
<td>51.5 (54.3)</td>
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<tr>
<td>8</td>
<td>5.23</td>
<td>15.20</td>
<td>10.00</td>
<td>10.14</td>
<td>23.2 (22.7)</td>
<td>22.7 (22.8)</td>
<td>54.5 (53.2)</td>
</tr>
<tr>
<td>9</td>
<td>6.24</td>
<td>16.33</td>
<td>11.53</td>
<td>11.36</td>
<td>24.6 (22.8)</td>
<td>22.9 (23.4)</td>
<td>50.5 (53.5)</td>
</tr>
<tr>
<td>10</td>
<td>7.98</td>
<td>11.46</td>
<td>14.00</td>
<td>11.19</td>
<td>25.6 (22.7)</td>
<td>24.1 (24.1)</td>
<td>46.5 (52.3)</td>
</tr>
<tr>
<td>11</td>
<td>6.54</td>
<td>19.06</td>
<td>19.46</td>
<td>15.02</td>
<td>24.9 (21.8)</td>
<td>21.8 (22.8)</td>
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<td>19.26</td>
<td>18.93</td>
<td>15.87</td>
<td>25.2 (23.0)</td>
<td>22.6 (23.6)</td>
<td>41.0 (51.4)</td>
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<td>13</td>
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<td>19.66</td>
<td>19.40</td>
<td>17.15</td>
<td>27.4 (24.0)</td>
<td>24.4 (25.2)</td>
<td>43.0 (53.1)</td>
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<tr>
<td>14</td>
<td>11.92</td>
<td>18.86</td>
<td>20.34</td>
<td>17.04</td>
<td>26.8 (22.1)</td>
<td>22.1 (23.1)</td>
<td>45.0 (51.5)</td>
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<td>17.46</td>
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<td>23.2 (26.2)</td>
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<td>11.33</td>
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<tr>
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</tbody>
</table>

Spider mite infesting carnation

The population of spider mite was also correlated with the abiotic factors of the polyhouse i.e. average temperature and average relative humidity. Perusal to the data presented in Table-2, showed that during 2011-12 the mite population showed a significant positive correlation with average temperature \( (r=0.857) \), where as a negative correlation with average relative humidity \( (r=-0.525) \), while during 2012-13, it showed a non-significant negative correlation with average temperature \( (r=-0.178) \) and average relative humidity \( (r=0.413) \) while in case of 2013-14, the spider mite population showed a non-significant positive correlation with average temperature \( (r=0.202) \) and a non-significant negative correlated with average relative humidity \( (r=-0.191) \). The three years pooled data of correlation showed a significant positive correlation between spider mite population and average temperature \( (r=0.544) \), while a significant negative correlation exist between spider mite population and average relative humidity \( (r=-0.481) \). So, from the analysis of the pooled data it can be concluded that with the increase in average temperature the spider mite population increases while spider mite population decrease when the average relative humidity increase. Shah and Shukla (2014) reported that spider mite had non-significant negative correlation with minimum, maximum and average temperature, while the average relative humidity at the time of observed had significant positive correlation with mite population. This difference may be due the change of the host plant. The increase in population of the spider mite was found to be significantly correlated with decrease in humidity and non-significantly correlated with increase in maximum temperature, minimum temperature and rainfall exhibited non-significant negative relationship on cassava (Lal, 1982).

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