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Abstract
The results on cardamom shoot and capsule borer indicated that the peak population was recorded in the
month of second fortnight of May on both M-1 and M-2 varieties of cardamom (per cent shoot damage of
24.93 and 26.06, respectively). Whereas, the peak infestation on capsules was recorded in the month of
November on both M-1 and M-2 varieties of cardamom (15.0 and 15.80, respectively). The correlation
studies indicated that there was a significant positive correlation with relative humidity & rain fall with
per cent shoot damage in M-1 and M-2 varieties of cardamom.

Keywords: Cardamom shoot and capsule borer, Conogethes punctiferalis, Temperature, Relative
Humidity

Introduction
Cardamom, Elettaria cardamomum Maton commonly known as “Queen of spices”, belongs to
the family Zingiberaceae. It is indigenous to southern states of India and Sri Lanka. At present
cardamom crop is facing many distinct problems apart from the natural calamities such as
heavy/low rainfall, resulting in lower yield. Among the abiotic and biotic factors affecting the
yield and quality of cardamom shoots and capsules, the damage caused by biotic factors viz.,
insect pests are considered as a major constraint for its successful cultivation and pose greater
threat to cardamom production in Karnataka. Among the insect pests recorded on cardamom,
the shoot and capsule borer is considered to be an important pest causing damage to the
cardamom shoot/suckers as well as capsules. An estimated loss due to Cardamom shoot and
capsule borer may goes up to 35-40%. Keeping the above points in view, the present
investigations have been conducted to see the Seasonal incidence of cardamom shoot and
capsule borer on cardamom varieties viz., M-1 and M-2 (M=Mudigere).

Material & Methods
The experiment was conducted at Zonal Agriculture and Horticulture Research Station
(ZAHRS), Mudigere during 2015-16. Mudigere is located in hilly area with on average annual
rainfall of 2400mm. In order to study the seasonal incidence of Cardamom Shoot and Capsule
Borer (CSCB), Conogethes punctiferalis Guenee observations were recorded in cardamom
plantation. In the experimental area except plant protection measures all the agronomic
practices were followed as per the package of practices. Further, twenty five cardamom
clumps were selected randomly in an 0.5ac area of M 1 & M 2 varieties to record the incidence
C. punctiferalis in cardamom. Further, observations on the per cent shoot and capsules damage
due to Cardamom shoot and capsule borer were recorded at fortnightly intervals from January
2015 to December 2015. The per cent shoot and capsule damage due to shoot and fruit borer
was calculated by using the formula as follows.

\[
% \text{ shoot damage} = \frac{\text{Total no. of infested shoots}}{\text{Total no. of shoots observed}} \times 100
\]
Further, per cent capsule damage was calculated by

\[
\% \text{ capsule damage} = \frac{\text{Total no. of infested capsules} \times 100}{\text{Total no. of capsules observed}}
\]

After calculating the per cent shoot and capsule damage, the data obtained were correlated with weather parameters like, temperature (°C), relative humidity (%), rainfall (mm) and sunshine hours (lux.).

**Results & Discussion**

Results on Cardamom shoot and capsule borer revealed that the infestations occurred throughout the year; however their peak infestation varied from season to season. The borer exhibited two peaks infestations i.e. first peak during May-June on shoots and on capsules during October-November on both the varieties (M1 & M2). The per cent shoot infestation on M-1 variety was ranged from 5.20 to 24.2% and 1.93 to 15.00% on capsules. Similarly, on M2 variety of cardamom the per cent infestation ranged from 4.6 to 26.06% on shoots and 1.06 to 15.80 on capsules (Table 1). There was no much variations were recorded with regard to per cent infestation on M1 and M2 varieties of Cardamom. Infestation of capsules was observed from May to November in both the varieties of Cardamom. However, the peak per cent infestation was noticed during the first fortnight of November.

Further, the correlation studies indicated that, there was a significant and positive correlation was obtained between per cent shoot and capsule damage with per cent relative humidity (r = 0.509, r = 0.624, respectively). Further, there was negative correlation of temperature on shoot infestation (r = - 0.129 and r = - 0.0402 on M1 & M2 varieties, respectively), but positively correlated on capsules (r = 0.089 and r = 0.075). Whereas, Positive correlation of per cent shoot and capsule damage with rainfall (r = 0.432 and r = 0.0544, respectively).

Ballard (1927) [1] who reported that the seasonal change affects the shoot and capsule borer population and appearance of shoot borer infestation on crops in New Guinea. While, Ram et al. (1977) [2] observed C. punctiferalis infesting grapes during December to January which was attributed to availability of matured grape berries. Further, Kang et al. (2004) [3] reported that overwintered generations of C. punctiferalis emerged from May 20 to June 28. The deviation in the present study may be to availability of tender parts and weather parameters.

However, the other abiotic factors with per cent shoot and capsule damage was negatively correlated with M-2 variety of Cardamom and they are not significant. Whereas, in M-2 variety the per cent infestation of shoot damage due to capsule borer was positively correlated with rainfall (r = 0.561). However, the other parameters viz., relative humidity and sunshine hours were positively correlated with per cent shoot damage and they are non significant with each other. The per cent capsule damage was significantly positive correlated (r = 0.500) with per cent relative humidity but negatively correlated with rainfall and sunshine hours (r = -0.028 and r = -0.556).

**Table 1: Per cent infestation by Conogethes punctiferalis on M1 and M2 variety of cardamom during 2015-16**

<table>
<thead>
<tr>
<th>Months</th>
<th>Fortnights</th>
<th>Per cent infestation on M-1 Variety</th>
<th>Per cent infestation on M-2 Variety</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Shoot</td>
<td>Capsule</td>
</tr>
<tr>
<td>January</td>
<td>I</td>
<td>08.93</td>
<td>00.00</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>06.66</td>
<td>00.00</td>
</tr>
<tr>
<td>February</td>
<td>I</td>
<td>06.34</td>
<td>00.00</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>05.40</td>
<td>00.00</td>
</tr>
<tr>
<td>March</td>
<td>I</td>
<td>06.40</td>
<td>00.00</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>06.90</td>
<td>00.00</td>
</tr>
<tr>
<td>April</td>
<td>I</td>
<td>12.20</td>
<td>00.00</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>14.93</td>
<td>00.00</td>
</tr>
<tr>
<td>May</td>
<td>I</td>
<td>21.53</td>
<td>01.93</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>24.93</td>
<td>02.70</td>
</tr>
<tr>
<td>June</td>
<td>I</td>
<td>20.93</td>
<td>03.13</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>16.53</td>
<td>04.46</td>
</tr>
<tr>
<td>July</td>
<td>I</td>
<td>17.40</td>
<td>05.46</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>14.66</td>
<td>06.30</td>
</tr>
<tr>
<td>August</td>
<td>I</td>
<td>12.40</td>
<td>09.40</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>08.06</td>
<td>11.20</td>
</tr>
<tr>
<td>September</td>
<td>I</td>
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<td>II</td>
<td>06.20</td>
<td>13.66</td>
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<tr>
<td>October</td>
<td>I</td>
<td>08.88</td>
<td>14.00</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>09.50</td>
<td>14.30</td>
</tr>
<tr>
<td>November</td>
<td>I</td>
<td>11.06</td>
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</tr>
<tr>
<td></td>
<td>II</td>
<td>13.40</td>
<td>04.50</td>
</tr>
<tr>
<td>December</td>
<td>I</td>
<td>15.13</td>
<td>02.30</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>19.80</td>
<td>00.00</td>
</tr>
</tbody>
</table>

**Table 2: Relation between Cardamoms shoots and capsule incidence (%) and weather parameters during 2015-16**

<table>
<thead>
<tr>
<th>Variety</th>
<th>Parameters</th>
<th>Per cent Infestation</th>
<th>Temperature (°C)</th>
<th>R.H (%)</th>
<th>Rain fall (mm)</th>
<th>Sunshine Hours (lux.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1</td>
<td>Shoot damage %</td>
<td>12.04</td>
<td>-0.1294</td>
<td>0.509</td>
<td>0.432</td>
<td>-0.030</td>
</tr>
<tr>
<td></td>
<td>Capsule damage %</td>
<td>5.42</td>
<td>0.089</td>
<td>0.624</td>
<td>0.054</td>
<td>-0.760</td>
</tr>
<tr>
<td>M2</td>
<td>Shoot damage %</td>
<td>11.68</td>
<td>-0.040</td>
<td>0.385</td>
<td>0.561</td>
<td>0.023</td>
</tr>
<tr>
<td></td>
<td>Capsule damage %</td>
<td>6.33</td>
<td>0.075</td>
<td>0.50</td>
<td>-0.028</td>
<td>-0.556</td>
</tr>
</tbody>
</table>

Note: table value @ 5% =0.462
Fig 1: Per cent shoot and capsule infestation by *Conogethes* on M1 and M2 varieties of Cardamom.

Reference