The Changes of Damage Rate by Peach Pyralid Moth, *Dichocrocis punctiferalis* (Lepidoptera: Pyralidae) in Chestnut Orchards from 1995 to 2010 Year

Chong-Kyu Lee*

Department of Forest Resources, Gyeongnam National University of Science and Technology, Jinju 660-758, Korea

ABSTRACT: The damage rates of peach pyralid moth (*Dichocrocis punctiferalis*), which damages the chestnut fruits, were investigated annually from 1995 to 2010 according to year, region, and maturity. The damage rate by *D. punctiferalis* was the highest (34.5%) in 1998 and was the lowest (17.9%) in 2000. The pattern of the damage rate showed a repeating three-year cycle. There was a negative correlation (-0.6261*) between rainfall and damage rate. There was a positive correlation (0.5826*) between temperature and damage rate. The average damage rate of all surveyed regions was 22.2%. Of the surveyed areas, Hapcheon had the highest at 27% and Hamyang had the lowest at 15.0%. The damage rate of chestnut fruit depending on the maturity was 26.1% in an early maturing cultivar (Dantaek), and 19.3% and 21.1% in a late maturing cultivar (Eungi) and a medium maturing cultivar (Chukpa), respectively.

Key words: Chestnut tree *Dichocrocis punctiferalis*, Damage rate, Danteck, Chukpa, Eungi

The peach pyralid moth, *Dichocrocis punctiferalis*, reduces the income of farms and is persistent in chestnut fruits production. Therefore, we analyzed the change of damage rate caused by peach pyralid moth for 16 years.

The peach pyralid moth causes severe damage to chestnut, peach, apple, persimmon, and apricot in Korea and Japan (Choi, 1998; Konno et al., 1981). The peach pyralid moth has been found in Korea, Japan, China, India, and Australia in areas where chestnuts are cultivated (Needlay et al., 1983). The host plants of this insect pest belong to 44 species in 17 families (Shinkaji, 1969). In Korea, the peach pyralid moth is trivoltine in chestnut orchards and the 2nd generation caused the most serious damage to chestnut orchards (Choi et al., 2004; 2006). Analysis of damage rate can be useful for chestnut fruit insect pest control. These patterns will help predict peach pyralid moth damage rate and provide a solution for insect pest control. Chestnut farms have suffered considerable losses annually from the peach pyralid moth. Its damage rate reduces the productivity, corresponding to about four billion wons (Forest, 2010).
This study was carried out to investigate damage rate from 1995 to 2010 in chestnut orchards. The purpose of this study is to provide useful guidelines for management and cultivation of chestnut orchards to effectively control peach pyralid moth in chestnut orchards.

Materials and Methods

This study was conducted in areas where chestnut trees are cultivated and where the peach pyralid moth, *D. punctiferalis*, damages the fruits. The surveyed areas were chestnut orchards in 6 counties and 12 myeon (Table 1) located in Kyeongsangnam-do province. The area of each orchard was 5 ha in all survey sites. Kyeongsangnam-do province is one of the major chestnut fruit producing districts and is responsible for about 50% of the domestic total output (Forest, 2010). The chestnut trees in survey sites were 20-years old and there were 200 trees per ha.

The survey of the peach pyralid moth damage rate was carried out from 1995 to 2010. To investigate damage rate, the number of chestnut fruits were 500EA was repeated three times. Chestnut fruits collected random at chestnut orchards fall. Damage rates were calculated as percentage of damaged fruits of the collected chestnut fruits. They were also calculated according to area and by cultivar.

Data were analyzed by one-way analysis of variance (ANOVA) to determine the significance of damage rate change. ANOVA were executed using in SAS (SAS Institude, 2001). Means were compared by Turkey’s test.

### Table 1. Survey sites of *Dichrocis punctiferalis* in chestnut orchards

<table>
<thead>
<tr>
<th>County</th>
<th>Survey sites(coordinate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jinju city</td>
<td>Micheon-myeon Obang(N35°58′58″ E128°05′01″)</td>
</tr>
<tr>
<td></td>
<td>Ibansung-myeon Dacheon(N35°08′58″ E128°19′03″)</td>
</tr>
<tr>
<td>Sacheon city</td>
<td>Gonneong-myeon Sansa(N35°05′47″ E127°56′20″)</td>
</tr>
<tr>
<td></td>
<td>Gonyang-myeon Jyojang(N35°04′20″ E127°51′31″)</td>
</tr>
<tr>
<td>Hadong-gun</td>
<td>Bookcheon-myeon Banghowna(N35°05′58″ E127°20′39″)</td>
</tr>
<tr>
<td></td>
<td>Yangbo-myeon Gamdagn(N35°04′47″ E127°49′33″)</td>
</tr>
<tr>
<td>Sancheong-gun</td>
<td>Sinan-myeon Hajong(N35°20′12″ E127°52′33″)</td>
</tr>
<tr>
<td></td>
<td>Sindung-myeon More(N35°23′43″ E127°58′41″)</td>
</tr>
<tr>
<td>Hamyang-gun</td>
<td>Soodong-myeon Howsan(N35°30′47″E127°48′27″)</td>
</tr>
<tr>
<td></td>
<td>Hamyang-myeon Jukgok(N35°31′42″E127°40′12″)</td>
</tr>
<tr>
<td>Hanpcheon-gun</td>
<td>Gahoe-myeon Oewesa(N35°01′14″E128°58′31″)</td>
</tr>
<tr>
<td></td>
<td>Samga-myeon Yonghung(N35°25′16″E128°04′35″)</td>
</tr>
</tbody>
</table>
Table 2. Damage rate of *Dichocrocis punctiferalis* by year in chestnut orchards

<table>
<thead>
<tr>
<th>Year</th>
<th>Damage rate (%)</th>
<th>Precipitation (mm)*</th>
<th>Temperature (℃)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>23.3±4.7</td>
<td>485.1</td>
<td>155.7</td>
</tr>
<tr>
<td>1996</td>
<td>20.8±4.1</td>
<td>599.3</td>
<td>147.6</td>
</tr>
<tr>
<td>1997</td>
<td>16.9±3.0</td>
<td>852.2</td>
<td>157.8</td>
</tr>
<tr>
<td>1998</td>
<td>34.5±6.3</td>
<td>544.2</td>
<td>166.1</td>
</tr>
<tr>
<td>1999</td>
<td>19.2±3.4</td>
<td>1102.4</td>
<td>164.5</td>
</tr>
<tr>
<td>2000</td>
<td>17.9±2.7</td>
<td>988.0</td>
<td>160.8</td>
</tr>
<tr>
<td>2001</td>
<td>27.0±5.5</td>
<td>727.2</td>
<td>165.9</td>
</tr>
<tr>
<td>2002</td>
<td>18.9±3.0</td>
<td>1141.8</td>
<td>158.0</td>
</tr>
<tr>
<td>2003</td>
<td>17.6±2.5</td>
<td>1038.6</td>
<td>153.0</td>
</tr>
<tr>
<td>2004</td>
<td>29.0±6.1</td>
<td>821.0</td>
<td>165.6</td>
</tr>
<tr>
<td>2005</td>
<td>25.0±4.7</td>
<td>684.4</td>
<td>163.8</td>
</tr>
<tr>
<td>2006</td>
<td>20.1±3.7</td>
<td>1006.1</td>
<td>157.5</td>
</tr>
<tr>
<td>2007</td>
<td>22.8±4.2</td>
<td>806.7</td>
<td>168.9</td>
</tr>
<tr>
<td>2008</td>
<td>24.3±5.0</td>
<td>531.6</td>
<td>167.6</td>
</tr>
<tr>
<td>2009</td>
<td>24.6±5.0</td>
<td>346.8</td>
<td>170.1</td>
</tr>
<tr>
<td>2010</td>
<td>21.1±3.6</td>
<td>752.0</td>
<td>155.9</td>
</tr>
</tbody>
</table>

Correlation coefficient r=-0.6261 r=0.5826

Note * Precipitation and temperature afford data to JinJu meteorological observatory data.

Fig. 1. Damage rates of *Dichocrocis punctiferalis* by site in chestnuts orchards.
Different letters above error bar indicates significant differences at 5% level as measured by a Turkey test.

Changes of damage rates in some regions

We investigated the damage rates in chestnut fruits by peach pyralid moth in 6 experimental fields (Table 1). In chestnut tree-growing areas, 500 samples were collected three times per year from 1995 to 2010 and investigated for damage by peach pyralid moth. The average damage rate in all chestnut orchards was 22.2%. Hapcheon had the highest damage at 27.0%, followed by Sancheong (25.6%) and Hadong (25.0%). The damage rate in Jinju and Sacheon were 21.6% and 18.8%, respectively. Hamyang had the lowest damage at 15.0%. These results were similar to previous studies (Kang et al., 1978; Choi, 1993) where an annual loss by peach pyralid moth of 400 ∼ 600 millions at 20% to 30% was reported. It is likely that the similar damage rates are related to timely insect pest control. Aerial pesticide spraying and self-crown spraying at one time emergence peaks of peach pyralid moth were carried out at chestnut fruit harvest at the request of local farmers in Sacheon and Hamyang. The controlled area had significantly lower damage rates than the uncontrolled areas. These results were reported that the control of chestnut insect pests were controlled most effectively by a combination of aerial spraying and self-crown spraying control methods (Lee et al. 1997).

Therefore, the highest damage rate by peach pyralid moth occurred in areas in which insect pests were not controlled in a timely manner. Therefore, it is highly recommended that control is conducted in a timely manner using helicopters at the time of highest emergence of the peach fruit moth.

Change of damage rate depending on maturing cultivar

The damage rates by peach pyralid moth were investigated in different chestnut varieties planted in six experimental chestnut fruit-growing regions (Table 1).

Three varieties of chestnut fruits were collected in Dantaek, Chukpa, and Eungi. Collections occurred three times, 500 fruits per variety were collected each time, and the damage rates by peach pyralid moth were examined (Fig 2). The damage rate of the early maturing cultivar, Dantaek, was the highest at an average of 26.1% in 6 experimental fields. The damage rate of the medium maturing cultivar, Chukpa, was an average of 19.3%. The damage rate of the late maturing cultivar, Eungi, was an average of 21.1%. The damage rates of the medium maturing cultivar (Chukpa) and the late maturing cultivar (Eungi) were lower than the early maturing cultivar (Dantaek).

This result suggest that the damage rate of the medium maturing variety (Chukpa) and the late flowering cultivar (Eungi) is less than the early maturing cultivar (Dantaek) because hatching of peach pyralid moth does not occur well at the highest emergence peak of peach pyralid moth due to its late maturity.
Fig. 2. Damage rate of *Dichocrocis punctiferalis* on different chestnut cultivars. Different letters above error bar indicates significant differences at 5% level as measured by a Turkey test.

**Literature Cited**


