Relative Abundance of *Empoasca terminalis* (Homoptera: Cicadellidae), A New Pest of Soybean (*Glycine max* L) in South Sulawesi, Indonesia

Andi Nasruddin

Department of Plant Protection, Faculty of Agriculture, Hasanuddin University, Makassar 90245, Indonesia

INTRODUCTION

*Empoasca* (Distantassuca) *terminalis* Distant (Hemiptera: Cicadellidae: Typhlocybinae) has long been recognized as one of the insects associated with soybean in the Province of South Sulawesi yet it is so far considered a minor pest. However, our survey conducted in 2007 showed that its population reached an outbreak level of more than 10 individuals per leaf and inflicted substantial physiological injury to plants. The outbreak of this pest began in the middle of October 2007 (Markell 2007). Since our survey was the first report of *E. terminalis* outbreak in South Sulawesi, the local economic threshold for this insect has not been established.

Since an outbreak of *E. terminalis* on soybean in South Sulawesi had not been reported previously and very limited information is available about this insect pest in Indonesia, the farmers we interviewed did not know if the damage to their plants was caused by leaffoppers. Therefore, it is the purpose of this study to investigate the relative abundance of the leaffopper and the magnitude of its damage to soybean.

MATERIALS AND METHODS

The study was conducted in farmers’ soybean fields in the Districts of Gowa and Makassar, South Sulawesi, Indonesia, from February to August 2008 in the form of a survey.

Symptom Confirmation

A greenhouse test was conducted to confirm that the symptoms observed in the fields were caused by *E. terminalis*. Adult leaffoppers were collected from the field using a sweep net. Ten pairs of adult leaffoppers were then placed on a three-week-old soybean confined in a 30x30x60 cm (LxWxH) cage. The cage was made of purlin pipe frame, covered with white fine cloth. In this test, five cages were used for plants infested with leaffoppers and five other cages with plants without leaffopper infestation. Symptom development was observed on both infested and noninfested plants weekly.

Relative abundance of *E. terminalis*.

This survey was conducted in soybean fields on dry land during the rainy season (January to April) and in soybean fields on rice paddy during the dry season (May to August). Farmers choose these times of the year for soybean cultivation based on water availability. Three farmers’ soybean fields, about 0.5 ha each, were chosen on each land type to assess the leaffopper population density. For each field, 50 plants were randomly selected throughout the field. On each plant, leaffoppers were counted on two upper leaves, two middle leaves, and two lower leaves. This was to determine the average number of leaffoppers per leaf and the vertical distribution of the insects within the plant. The leaffopper counts were performed once a week, starting two weeks after plant emergence until three weeks before harvest. Air temperature and rainfall data were obtained from the local Agency for Meteorology and Geophysics in Makassar.

RESULTS

Hopperburn symptoms first appear as yellowish patches starting from the distal end of the leaves. The patches then expand towards the petiole along the leaf margins. This is followed by tissue necrosis also starting from the leaf margin areas (Fig. 1). In the advanced damages, crinkling and cupping symptoms on the leaves also occurred before the whole leaf dried out (Fig. 3A).

Fig. 1. Close up pictures of leaffopper’s damage symptoms developed in the greenhouse

Relative Abundance of *E. terminalis*.

The average number of *E. terminalis* on soybean recorded during two consecutive planting seasons, dry and rainy seasons, are presented in Fig. 2. In the dry land, the peak population of leaffopper occurred during the fifth to eighth weeks after plant emergence while in the rice paddy, the peak occurred during the sixth to eighth weeks after emergence. Therefore, the population development patterns in both locations were similar relative to the plant age; however, in general, the population in the dry land was significantly lower than the population in the rice paddy (P > 0.05).

Leaffoppers did not distribute evenly on a plant. About 89% and 84% of the leaffoppers in dry land and rice paddy, respectively, occupied the middle and upper leaves. The numbers of leaffoppers found on the upper and middle leaves were not significantly different from each other (P > 0.05) but significantly different from the number of leaffoppers on the lower leaves (P<0.05) (Table 1).

Table 1. Number of leaffoppers per leaf for upper, middle, and lower leaves in both dry land and rice paddy.

<table>
<thead>
<tr>
<th>Leaf Position</th>
<th>Number of Leaffoppers/Leaf for Each Location</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dryland</td>
</tr>
<tr>
<td>Lower</td>
<td>0.54a</td>
</tr>
<tr>
<td>Middle</td>
<td>1.92b</td>
</tr>
<tr>
<td>Upper</td>
<td>2.5b</td>
</tr>
</tbody>
</table>

DISCUSSION

In both dry and rice paddy types of land, the leaffopper populations built up gradually from low population levels and then reached a peak between the fifth and the eighth weeks and the sixth and eighth weeks after plant emergence for dry land and rice paddy land, respectively. During the course of the survey we did not find any sudden and large increase of adult numbers which would indicate an influx of migrants. This suggested that the populations on both locations began with a limited number of plant individuals either long distance migrants or individuals occurring on alternative hosts within or around the fields. At the peaks, the leaffopper population reached outbreak levels of more than 10 individuals per leaf during the dry season. This was well above the economic injury levels for *E. fabae* on soybean in USA, which are five and nine leaffoppers per plant, respectively, for vegetative and early bloom stages of the plant growth (Markell 2007).

Overall, there was a significant difference between the leaffopper populations in the rainy and the dry planting seasons. The difference seemed to be attributable to the difference in rainfall rates between both seasons. This is similar to the phenomenon reported by Hasanuddin et al. (1997) that rice green leaffopper (*Nephotettix virescens* Distant) population was lower during the rainy season in the dry land and the rice paddy. In the dry season, we found severe injury to the plant, killing about 24% of plants; however, this phenomenon did not occur during the rainy planting season.

More than 80% of leaffopper individuals were found on the middle and upper leaves. Therefore, for scouting, leaf sampling should be directed towards those leaves. For the same reason the use of sweep net aimed at the upper part of plant canopy (Elden & Lambert 1992) should also be appropriate in assessing the relative abundance of the leaffopper.

CONCLUSION

The study results confirmed that *E. terminalis* had the potential to be an important pest on soybean in South Sulawesi with high populations inflicting severe hopperburn symptoms, even killing a high percentage of plants in the fields. This is the first published report of an outbreak of *E. terminalis* causing such significant damage to soybean plants in the province.

ACKNOWLEDGEMENT

I gratefully thank Dr. Murray J. Fletcher, Department of Primary Industries, Orange, NSW, Australia, for identifying the leaffopper specimens. I also thank Muhammad Said Baco for the technical assistance he provided during the course of the study.

REFERENCES


