Study of Yellow Leaf Virus Disease on Eggplant (*Solanum melongena* L.) in West Sumatra

Lailatun Najmi1*, Silvia Permata Sari2, Yaherwandi3

1-3 Program study of Plant Protection, Department of Plant Protection, Faculty of Agriculture, Universitas Andalas, Padang, Indonesia

* Correspondent Authors: E-mail: lailatunnajmi@agr.unand.ac.id

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**ABSTRACT**

Yellow leaf virus disease accompanied by vector insect attacks was the main cause of the current decline in eggplant production. Yellow leaf virus disease spreads more quickly due to the influence of insect vectors. The research aims to determine the type of insect vector that spreads yellow leaf virus disease, the incidence and severity of yellow leaf virus disease on eggplants in West Sumatra. This research method uses a survey method for five months in 2023. The sample was taken diagonally with five observation points. At each point, five plant samples were taken randomly. Observations were carried out three times at four locations representing the centers of eggplant production areas in West Sumatra, namely in Kuranji District, Pauh District, Batang Anai District, and Sitoga District. The results of the observations found five types of vector insects with their population numbers, are *Bemisia tabaci* (5846 individuals), *Amarsca devastans* (1199 individuals), *Thrips sp* (176 individuals), *Paracoccus sp* (43 individuals), and *Aphids gosypii* (34 individuals). The incidence of the disease reached 90% with the severity of the disease being 42.45% in Sitoga District. And the highest disease severity was 43.94% in Kuranji District with an incidence of the disease 70%. This research is useful in implementing strategies to control yellow leaf virus disease by determining the threshold for the influence of the number of vector insect populations in increasing the spread of incidence and severity of yellow leaf virus disease in eggplants.

**Keywords**: Disease incidence, Disease severity, yellow leaf virus disease, insect vector

**INTRODUCTION**

Eggplant (*Solanum melongena* L.) is currently a lucrative crop in the agricultural sector in the people of West Sumatra. This is marked by the increasing productive land of eggplants in the past year. Eggplant production can be disrupted by several factors, including pest attacks and plant diseases. Insect vector attacks and jaundice on eggplants simultaneously have an impact on slow plant growth, decreased productivity and even crop failure and plant death. Vector insects play the role of carriers of disease pathogens. Vector insects can infect plants when sucking food juices.

Reports of vector insects as carriers of disease in eggplants include Morales and Anderson (2001) reported whitefly (*Bemisia tabaci*) as a leaf-sucking pest that has a role in spreading and transmitting Gemini virus in the field. While the disease reported to increase recently in eggplants is the attack of yellow virus pathogens. Where the severity of the disease reaches 100%. The spread of the disease by this virus is mostly spread by insects phytophage. For this reason, the purpose of this study is an inventory of what vector insects play a role in the spread of yellow virus in eggplants and what is the intensity and severity of this yellow virus disease in the field.

**RESEARCH METHODS**

**Time and Place**

The survey and monitoring will be carried out in May – September 2023 in four locations representing two eggplant production centers in West Sumatra, namely in Kuranji District, Pauh District, Batang Anai District, and Sitoga District.

**Sample Determination**

The sample determination is taken diagonally with five observation points (plots). Observations were made three times, conducted in four sub-districts in West Sumatra. The total number of sample plants observed was 100 plants. The age of eggplant planting observed between 2-9 weeks.

**Symptoms of Viral Diseases**

Observed and documented plants that show symptoms of different viral attacks. Observation is carried out by identifying symptoms that indicate a virus attack using scoring. Symptoms of eggplants infected with the gemini virus according to Taufik (2020) have yellow spots, wrinkled leaves, stunted fruits and only one fruit is produced in one tree. This also shows the same symptoms in Yogyakarta (DIY) and Central Java variations of symptoms found in the...
form of bright yellowing leaves, chlorosis, mosaic, curly, wrinkled and stunted (Arbeta, 2018).

**Incidence and Severity of Viral Diseases in Eggplant Plants**

Disease incidence is a measure of the severity or severity of plant damage by a disease, either in populations or individual plants (Abadi, 2003). The calculation of the incidence of viral diseases in eggplant plants is calculated using the formula:

\[
\text{Incidence of Disease (IP)} = \frac{n}{N} \times 100\%
\]

- \(IP\) = incidence of disease (%)
- \(n\) = number of plants showing symptoms of the disease
- \(N\) = total number of plants observed

Disease severity is the proportion of plant areas damaged or subjected to disease symptoms due to pathogen attack in one plant (Abadi, 2003). The severity of the disease is calculated using the formula:

\[
\text{Disease Severity (KP)} = \frac{\sum_{i=1}^{n} (n_i \times v_i)}{n \times Z} \times 100\%
\]

- \(KP\) = disease severity (%)
- \(n\) = number of plants observed indicates a specific score
- \(v\) = score for eggplant plants
- \(N\) = highest score value
- \(Z\) = total number of eggplants

**Type and Population Insect Vectors**

Observations were made by counting insect populations on sample plants, especially whitefly (Bemisia tabaci), thrips (Thrips sp), aphids (Aphids gosypii), mealybug (Paracoccus sp), and leafhopper (Amrasca devastans). Then vector insects are caught manually and put in 70% alcohol. The vector insects obtained were then identified using related journals, such as for leafhopper identification using Fletcher (2009), Thrips Subagyo (2014), Utami (2012), and Mound (1998). Whitefly was identified using a journal from Nurulalia (2018), and aphids by Maharani (2018). Whitebugs were identified using journals such as Hariyanto (2020), Yulianto (2015), Ramadhani (2018), Anugerah (2023) and Agustin (2022).

**RESULTS AND DISCUSSION**

**Symptoms of Viral Diseases**

Symptoms of jaundice virus disease in eggplant plants found in the field as shown in figure 1. Assessment of disease symptoms by assessing variations in visual symptoms observed in the field and entering symptom scores (0-4).

- 0 = Asymptomatic plant
- 1 = On young leaves/shoots in the form of yellow spots around the leaf bone
- 2 = Then it develops into vein clearing, concave, and wrinkled leaves with a light mosaic or yellow color.
- 3 = Symptoms continue until almost all young leaves or shoots are bright yellow, and some are yellow mixed with green
- 4 = Sunken and wrinkled leaves are smaller and thicker

**Incidence and Severity of Viral Diseases in Eggplants**

The highest incidence of yellow leaf virus disease in eggplants is found in Sitoga District at 90%. The high incidence of yellow virus disease in eggplants in Sitoga District is because eggplants have entered the generative period and eggplants are directly adjacent to plants from other Solenaceae groups such as chili. The vector insects found in Sitoga sub-district are dominated by Amrasca devastans.

The lowest incidence of yellow virus disease in eggplants of 50% is found in Batang Anai District. This is because eggplants in Batang Anai District are still in the vegetative period and are only 2 weeks old. Vector insects found in Batang Anai District are still relatively low compared to other districts. The highest severity of yellow virus disease was found in Kuranji District and Sitoga District by 43.94% and 42.45%. It is supported by insect vectors Bemisia tabaci and Amrasca devastans. The lowest severity of yellow virus disease was found in Pauh District at 15.91%.

**Figure 1. Symptoms of yellow leaf virus in eggplant plants found in the field**

(A) healthy plants, (B) yellow spots around the leaf bone (C) veins netted in yellow (vein clearing), concave, and wrinkled with a light mosaic or yellow color, (D) young leaves or shoots are bright yellow, and some are yellow mixed with green, (E) Sunken and wrinkled leaves are smaller and thicker
Table 1. Incidence and Severity of Yellow Leaf Virus Disease in Eggplants (%)

<table>
<thead>
<tr>
<th>District</th>
<th>Incidence of the disease</th>
<th>Disease of the severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kuranji</td>
<td>70</td>
<td>43.94</td>
</tr>
<tr>
<td>Pauh</td>
<td>70</td>
<td>15.91</td>
</tr>
<tr>
<td>Batang Anai</td>
<td>50</td>
<td>33.61</td>
</tr>
<tr>
<td>Sitoga</td>
<td>90</td>
<td>42.45</td>
</tr>
</tbody>
</table>

Table 2. Population (individual) on eggplant plants in West Sumatra

<table>
<thead>
<tr>
<th>District</th>
<th>Amrasca devastans</th>
<th>Bemisia tabaci</th>
<th>Aphids gosypii</th>
<th>Thrips sp</th>
<th>Paracoccus sp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kuranji</td>
<td>361</td>
<td>5846</td>
<td>0</td>
<td>176</td>
<td>43</td>
</tr>
<tr>
<td>Pauh</td>
<td>285</td>
<td>147</td>
<td>0</td>
<td>59</td>
<td>0</td>
</tr>
<tr>
<td>Batang Anai</td>
<td>870</td>
<td>252</td>
<td>34</td>
<td>44</td>
<td>0</td>
</tr>
<tr>
<td>Sitoga</td>
<td>1199</td>
<td>398</td>
<td>0</td>
<td>76</td>
<td>0</td>
</tr>
</tbody>
</table>

Type and Population Insect Vectors

There are five types of vector insects found such as *Amrasca devastans*, *Bemisia tabaci*, *Aphids gosypii*, *Thrips sp* and *Paracoccus sp*. The vector that transmits the virus that causes jaundice in eggplant plants is *B. tabaci* (Arbeta, 2018). Information on insect vectors and incidence of jaundice in eggplant plants is useful in the development of effective control strategies.

Symptoms Due to Viral Disease

Symptoms of yellow leaf virus disease in eggplants are almost the same as symptoms of infection with Begomovirus Family Geminiviridae in chili plants. Homology (98-99%) DNA highest with *Tomato Yellow Leafcurl Kanchanaburi Virus* (TYLCVKaV) from Thailand (Arbeta, 2018).

CONCLUSION

The results of the study concluded that the symptoms of jaundice virus disease in eggplant found could not be a definite reference because it needed to be identified serologically using the PCR method. The spread of viral diseases is assisted by vector insects, namely *Bemisia tabaci*, *Amrasca devastans*, *Aphids gosypii*, *Thrips sp* and *Paracoccus sp*.

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