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

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Received: January 08th, 2024 / Accepted: March 20th, 2024

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), Amrasca 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 desease, 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

DOI: https://doi.org/10.21107/agrovigor.v17i1.24965

Agrovigor: Jurnal Agroekoteknologi
http://journal.trunojoyo.ac.id/agrovigor
ISSN: 1979-5777 (*Print*), 2477-0353 (*Online*)

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:

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:

Disease Severity (KP) = $\frac{\sum_{i=1}^{n}(\text{ni vi})}{N \times Z} \times 100\%$

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%.

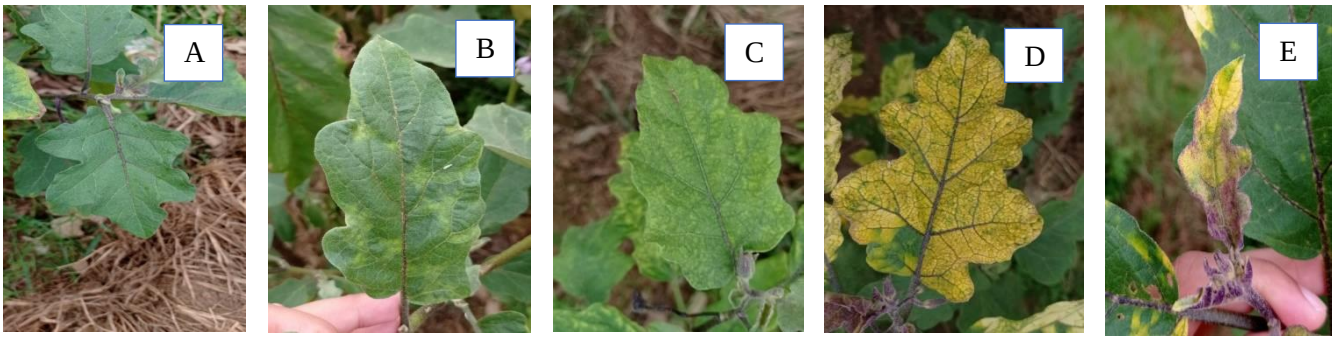

Figure 1. Symptoms of yellow leaf virus in eggplant plants found in the field (A) healthy plants, (B) yellow spots around the leaf bone (C) veins netted in yellow (vein clearing), concave, and wrinkled with a light mosaic or yellow color, (D) young leaves or shoots are bright yellow, and some are yellow mixed with green, (E) Sunken and wrinkled leaves are smaller and thicker

Table 1. Incidence and Severity of Yellow Leaf Virus Disease in Eggplants (%)

District	Incidence of the disease	Disease of the severity
Kuranji	70	43,94
Pauh	70	15,91
Batang Anai	50	33,61
Sitoga	90	42,45

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

District	*Amrasca devastans*	*Bemisia tabaci*	*Aphids gosypii*	*Thrips* sp	*Paracoccus* sp
Kuranji	361	5846	0	176	43
Pauh	285	147	0	59	0
Batang Anai	870	252	34	44	0
Sitoga	1199	398	0	76	0

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 plants 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.*

ACKNOWLEDGMENTS

Thanks to Andalas University for the assistance of SKIM Research for Beginner Lecturers of Andalas University in 2023

REFERENCES

Abadi, A. L. (2003). *Plant Disease Science 3*. Bayu Media. Hapless.

Agustin, Z. (2022). Mealybugs (Hemiptera: Pseudococcidae) on Cassava (*Manihot esculenta* Crantz) in Padang City. Thesis Unand.

Anugerah, A, A, C. (2023). Species Diversity of Whitefly on Pineapple Plants (*Ananas comosus* L.) in Central Lampung Regency and Blitar Regency. IPB Thesis.

Apriliyanto E &; Setiawan BH. (2018). Intensity of Pest Infestation on Different Types of Eggplant and Its Effects on Yield. *Agrotech Res J.* 3(1), 8-12

Arbeta YW, Hartono S, Sulandari S. (2018). Identification of the virus that causes jaundice in eggplant in the Special Region of Yogyakarta and Central Java. UGM Thesis. https://etd.repository.ugm.ac.id/penelitian/detail/165201#:~:text=Hasil%20survei%20lapangan%20menunjukkan%20bahwa,berkisar%20antara%2026%2D82%25.

Arsi, Lailaturrahmi, SHK Suparman, Hamidson H, Pujiastuti Y, Gunawan B, Pratama R, Umayah A. (2022). Inventory of Species and Intensity of Eggplant Plant Pest Attack (*Solanum melongena* L.) in Two Technical Culture Systems in Agam Regency, West Sumatra. *Journal of Agriculture* 33(2), 126-137.

Arsi, Abdindra GG, SHK Suparman, Gunawan B. (2021). The Effect of Cultivation Techniques on Disease Attacks on Eggplant Ronggo (*Solanum melongena* L.) in Gunung Cahya Village, Buay Ravan District, South Ogan Komering Ulu District. *Journal of Planta Symbiosa*, 3 (2), 27-39.

Auchernorrhyncha keys. (2023). Avaiable at: https://idtools.dpi.nsw.gov.au/keys/auch/index.html

Balang H. (2021). Identification of Pests and Diseases in Eggplant (*Solanum melongena* L.) Plantations in Negeri Telutih Baru, Tehoru District, Jabupaten, Central Maluku. Thesis of the Biology Education Study Program, Faculty of Teacher Training IAIN Ambon.

Daulay, SA and Sri HH. (2020). Begomovirus Identification and Farmer Perceptions of Eggplant Jaundice. IPB

Thesis. http://repository.ipb.ac.id/handle/123456789/105270

Fletcher, M.J. (2009 and updates). Identification keys and checklists for the leafhoppers, planthoppers and their relatives occurring in Australia and neighbouring areas (Hemiptera: Auchenorrhyncha). https://idtools.dpi.nsw.gov.au/keys/leafhop/index.html

Gaswanto R, Syukur M, Purwoko BS, Hidayat SH. (2015). Mass Transmission Method for Screening Test of Resistance of Mutant Chili to Begomovirus. *J. Hort* 25 (3), 246-256.

Hariyanto H, Nurchayati N, Sufajri A, Kurnia, T, I, D. (2020). Identification of Mealybug Pest Diversity on Cassava Plants in Wongsorejo and Kalipuro Districts. *Biosense*. 3 (1), 1-10

Hasyim A, Setiawati W, Lukman L, Hudayya A. (2009). Insect an Mite Pest on Eggplant Afiel guide for identification and management. AVRDC the world vegetable center.

Hasyim A, Setiawati W. (2016). Whitefly *Bemisia tabaci* Gennadius (Hemiptera: Aleyroidae) Spreader of Yellow Mosaic Virus Disease in Eggplant plants. Holticultural science and technology. Repository.pertanian.go.id

Lubis, M N. (2018). Virus Transmission Through Bemisia Tabaci derived from Solanum betaceum Cav. On some Solanaceae plants in greenhouses. Thesis of the Faculty of Agriculture, Department of Agrotechnology, USU. https://repositori.usu.ac.id/handle/123456789/13088

Maharani, Y. (2018). Species Description and Key Development of Identification of Aphids (Hemiptera: Aphidae) in West Java. IPB Dissertation.

Maharani, Y. Hidayat, P. Rauf A, Maryana, N. (2018). New Record of Aphid Species Subfamily Apidinae (Hemiptera: Aphididae) in West Java, Indonesia. Biodiversitas. Vol. 19 (2), 510-515

Maharani, Y. Hidayat, P. Rauf A, Maryana, N. (2018). Aphids (Hemiptera: Aphididae) on weeds around agricultural land in West Java along with their identification keys. *Indonesian Journal of Entomology*. 15 (2), 74-84.

Morales, F.J., P.K. Anderson. (2001). The emergence and dissemination of whitefly transmitted gemini viruses in Latin America. *Journal of Virology*. 146:415-441.

Mound LA, Kibby G. (1998). Thysanoptera an identification guide Second Edition. Oxon: CAB International. https://digitani.ipb.ac.id/kenapa-tanaman-terung-menguning/.

Mursiana, Aidawati N, Noor GMS. (2018). Ability of Some Rizobacteria in Controlling Jaundice in Eggplant Growth (Solanum melongena L). *Journal of Tropical Plant Protection*, 1 (1), 8-11. http://103.81.100.242/index.php/jpt/article/view/22

Nurulalia, L. Buchori, D. Hidayat P. (2018). Species diversity of whitefly (Hemiptera: Aleyrodidae) in Hoelticultural Plants with Different Altitudes in West Java. Indonesian Journal of Entomology. Vo. 15. No. 3: 143-150.

Ramadhani, N. (2018). Diversity of Plant Lice (Hemiptera: Coccoidea) on Various Plants in Bogor Botanical Garden. IPB Thesis.

Sartiami, D. Sihombing E. R, Balfas, R. (2000). Identification of Whitefly Species (Hemiptera: Pseudococcidae) on Pepper Plants (*Piper ningrum* Linn). Proceedings of National Seminar V. Indonesian Entomological Association.

Siagian, I, U. (2012). Species Diversity of Thrips and Natural Enemies of Rose Plants in Taman Bunga Nusantara, Cianjur Regency, West Java. Thesis. IPB.

Sirait, R. (2018). Virus Transmission Through Whitefly *Bemisia tabaci* from Dutch Eggplant Solanum betaceum Cav. On Some Cucurbitaceae Plants in Greenhouses. Thesis of the Faculty of Agriculture, USU Agrotechnology Study Program. https://repositori.usu.ac.id/handle/123456789/13099

Subagyo, V.N.O. (2014). Identification of Thrips (Insecta: Thysanoptera) Associated with Horticultural Plants in Bogor, Cianjur, and Lembang. Thesis: Graduate School of Bogor Agricultural University, Bogor.

Yulianto, A. H. (2015). Inventory of mealybug species (Hemiptera: Pseudococcidae) on longan fruit from Thailand through Tanjung Perak Port. IPB Thesis.