



First Report of Economic Injury Due to the Spiraling Whitefly (Hemiptera: Aleyrodidae) on Pepper in Indonesia

Authors: Nasruddin, Andi, and Stocks, Ian C.

Source: Florida Entomologist, 97(3) : 1255-1259

Published By: Florida Entomological Society

URL: <https://doi.org/10.1653/024.097.0337>

BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

FIRST REPORT OF ECONOMIC INJURY DUE TO THE SPIRALING WHITEFLY (HEMIPTERA: ALEYRODIDAE) ON PEPPER IN INDONESIA

ANDI NASRUDDIN^{1,*} AND IAN C. STOCKS²¹Department of Plant Pests and Diseases, Faculty of Agriculture, Hasanuddin University, Makassar, South Sulawesi 90245, Indonesia²Division of Plant Industry, Florida Department of Agriculture and Consumer Services, Gainesville, FL 32614-7100, USA

*Corresponding author; E-mail: andinasruddin@yahoo.com

The spiraling whitefly, *Aleurodicus dispersus* Russell (Hemiptera: Aleyrodidae), is a polyphagous species native to Caribbean Region and Central America. The insect has spread westward across the Pacific and reached Southeast Asia. In South America, the whitefly has also been reported in Brazil, Ecuador, and Peru (Waterhouse & Norris 1989). The insect has progressively spread throughout the Pacific and numerous Afrotropical countries (Akinlosotu et al. 1993; Legg et al. 2003; Mware 2010), and countries of the Philippines, India, Bangladesh, and China in Asia (Yu et al. 2007). The first discovery of spiraling whitefly in Indonesia was made in 1989 in Java (Kajita et al. 1991).

Both nymphal and adult whiteflies can directly damage plants by depleting plant sap, which causes premature defoliation, stunted growth, and potentially death of the plant when the population is high. It can also inflict indirect damage to plant by promoting the growth of sooty mold and producing waxy, hair-like filaments that can diminish plant photosynthetic efficiency and aesthetic value. In addition, this species of whitefly is capable of transmitting plant viral diseases in a persistent manner (Berlinger 1986; Costa 1969). *Aleurodicus dispersus* has been reported as a vector of cassava brown streak virus (CBSV), a Begomovirus, in Kenya (Mware 2010).

The spiraling whitefly has a wide host range, encompassing 481 species, 295 genera, and 90 families of plant in India (Srinivasa 2000). The insect was capable of significantly reducing pepper crop yields in screen house in Nigeria (Pitan 2003) and in the field in Kerala, India (Beevi & Lyla 2001). In Indonesia, *A. dispersus* was reported attacking 22 plant species in 14 families, including ornamentals, shade and fruit trees in Java (Kajita et al 1991). The spiraling whitefly was also found on cassava, papaya, pepper, banana, hibiscus, and ficus in West Java (Gniffke 2011). A low population of the spiraling whitefly was reported on sweet pepper (*Capsicum annuum* L.) in West Java (Yuliani et al. 2005). However, none of those reports mentioned population outbreaks causing serious injury to pepper crops in Indonesia.

During a survey conducted in Sep 2012 in the District of Pinrang (S 3° 43' 37" E 119° 42' 12") South Sulawesi Province of Indonesia for entomopathogenic fungi associated with insect pests of pepper, we found serious crop damages due to heavy whitefly infestations. The lower leaf surfaces were fully covered with developing whiteflies and waxy filaments produced by the immature stages. The leaves were cupped upwards and covered with sooty mold (Fig. 1). Surveyed farmers stated that the insect had caused damage to their crops since 2011. When we revisited the field in Feb 2013, new pepper crops were also heavily infested by the whitefly. On unsprayed plants, the numbers of adult whiteflies per plant were 79.7 ± 11.7 , 228.2 ± 14.6 (Figs. 2 and 3), and 339.9 ± 32.5 (mean \pm SE, $n = 5$) for 6 Mar, 13 Mar, and 20 Mar, respectively. To achieve and maintain suppression, pepper growers apply insecticides 2–3 times a week, and use combinations of up to five insecticides in a spray tank. The field survey also revealed that an average of 70% of plants in 5 pepper plantations ($n = 100$) in Pinrang showed distinct symptoms of pepper yellow leaf curl Indonesia virus (PepYLCIV), a Begomovirus. Sample leaves expressing symptoms were sent to Agdia, Inc. (Elkhart, Indiana, USA) for molecular detection, which confirmed that the samples were positive for PepYLCIV infection. Pepper yellow leaf curl Indonesia virus is a devastating disease of pepper in Indonesia. During the visits, we also found that populations of *Bemisia tabaci* (Gennadius), a known vector of PepYLCIV (Sharma et al. 2000), were very low.

Samples of adults, pupae, and nymphs of the whitefly collected from pepper crops in Padang Loang, Pinrang, South Sulawesi of Indonesia were sent to the Florida Department of Agriculture and Consumer Services, Division of Plant Industry (FDACS-DPI) for identification process. The specimens were identified as *A. dispersus* and a voucher of slide-mounted specimens of the whitefly is deposited in the Florida State Collection of Arthropods (FSCA), at FDACS-DPI. To the best of our knowledge, this is the first record of *A. dispersus* presence in the province and of serious



Fig. 1. Lower surface of pepper leaf (*Capsicum annuum*) covered with whiteflies and wax filaments and exudates. The affected leaves were upwardly cupped. Leaves, petioles, and stems were entirely covered with sooty mold.

pepper damage caused by the whitefly in Indonesia. Given its wide host range and dispersal capability, concern has been raised that this insect may become a serious pest on many important crops across Indonesian islands and in neighboring countries.

In a survey conducted during the rainy season in other parts of the Province of South Sulawesi, the spiraling whitefly was also found on pepper in residential yards in Balocci, Pangkep District (S 4° 53' 54" E 119° 42' 29") on 2 Mar 2013 and Sabangparu, Wajo District (S 4° 14' 09" E 120° 00' 43") on 12 Jun 2013. Although the populations in both locations were much lower than in Pinrang, it has a potential to cause serious damage to pepper when the plant is widely planted during the dry season.

We thank M. Said Baco, Ahwiyah Ekawati Said, and Jumardi for the technical assistance. The study was partly funded by the Directorate General of Higher Education, Ministry of Education and Culture, Republic of Indonesia; Project # 80/UN4-LK.26/2012. This research was approved by the Florida Department of Agriculture and

Consumer Services, Division of Plant Industry for publication as contribution # 1259.

SUMMARY

A pest survey and subsequent identification confirmed the presence of the spiraling whitefly, *Aleurodicus dispersus* Russell (Hemiptera: Aleyrodidae), in Pinrang District, South Sulawesi Province of Indonesia. This is the first report of the insect in the province and population outbreaks resulting in serious damage to pepper, *Capsicum annuum* L. (Solanaceae), in Indonesia. In our subsequent survey, *A. dispersus* was found on pepper in 2 other districts of the province, Pangkep and Wajo. Given its wide host range and dispersal capability, the insect poses a serious threat to pepper in Indonesia. Pepper growers at the survey site applied mixtures of insecticides 2–3 times per week to suppress the pest. Their insecticide choices and application frequencies were based on their own experience in controlling other pests. They urgently need information on effective measures to control this new pest. Therefore,



Fig. 2. Whitefly infestation of unsprayed *Capsicum annum* plants on 13 Mar 2013 in Padang Loang, Pinrang, South Sulawesi, Indonesia



Fig. 3. Adults of the spiraling whitefly on the lower surface of a pepper (*Capsicum annuum*) leaf.

a study on field and laboratory evaluations of selected insecticides against the spiraling whitefly has been completed recently and the results will be published in a separate paper. Surveys for potential biological control agents, such as parasitoid wasps and entomopathogenic fungi, are also underway. Furthermore, given the following phenomena: the presence of high population of *A. dispersus* concomitant with the high incidence of PepYLCIV, a Begomovirus; low population of its known vector, *B. tabaci*; and the ability of *A. dispersus* to transmit a Begomovirus, CBSV in Africa; it is imperative to conduct a study to determine the capability of the spiraling whitefly in transmitting the PepYLCIV in South Sulawesi.

Key Words: *Aleurodicus dispersus*, *Capsicum annuum*, insecticides, survey

RESUMEN

Un sondeo de plagas y su identificación posterior confirmaron la presencia de la moscablanca gigante, *Aleurodicus dispersus* Russell (Hemiptera: Aleyrodidae), en Pinrang Distrito, South Sulawesi, Indonesia. Este es el primer informe

del insecto en la provincia y de sus brotes poblacionales que causó severos daños a la pimienta, el *Capsicum annuum* L. (Solanaceae), en Indonesia. En un sondeo posterior, *A. dispersus* fue encontrada en la pimienta en 2 otros distritos de la provincia, Pangkep y Wajo. Dada su ampliorango de hospederos y capacidad de dispersión, el insecto es una seria amenaza para la pimienta en Indonesia. Los productores de pimienta en las áreas evaluadas aplican mezclas de insecticidas de 2-3 veces a la semana para eliminar la plaga. Sus opciones y frecuencias de aplicación de insecticidas se basan en su propia experiencia en el control de otras plagas. Estos productos necesitan urgentemente información sobre medidas eficaces para manejar esta nueva plaga. Por lo tanto, un estudio de evaluaciones de insecticidas seleccionados de campo y de laboratorio contra la mosca blanca gigante está en marcha.

Palabras Clave: *Aleurodicus dispersus*, *Capsicum annuum*, insecticidas, sondeo

REFERENCES CITED

- AKINLOSOTU, T. A., JACKAI, L. E. N., NTONIFOR, N. N., HASSAN, A. T., AGYAKWA, C. W., ODEBIYI, J. A., AK-

- INGBOHUNGBE, A. E., AND ROSSEL, H. W. 1993. Spiraling whitefly, *Aleurodicus dispersus*, in Nigeria. *FAO Plant Protection Bulletin*, 41:127-129.
- BEEVI, S. P. AND LYLA, K. R. 2001. Host plant mediated natural parasitism by *Encarsia* spp. (Hymenoptera: Aphelinidae) on spiraling whitefly *Aleurodicus dispersus* Russell (Homoptera: Aleyrodidae). *Proc. Second Nation. Symp. Int. Pest Mgt in Horticultural Ecosystems, New Molecules, Biopesticides, and Env. Bangalore, India*. Pp 208-210.
- BERLINGER, M. J. 1986. Host plant resistance to *Bemisia tabaci*. *Agric. Ecosystems, and Environ.* 17: 69-82.
- COSTA, A. S. 1969. Whiteflies as Vectors *In* K. Maramorosh [ed.], *Viruses Vectors and Vegetation* John Wiley and sons, New York. 111pp.
- GNIFFKE, P. A. 2011. Integrated disease management (IDM) for anthracnose, *Phytophthora* blight, and whitefly-transmitted geminivirus in chili pepper in Indonesia. AVRDC, The World Vegetable Center.
- KAJITA, H., SAMUDRA, I. M., AND NAITO, A. 1991. Discovery of the spiraling whitefly *Aleurodicus dispersus* Russell (Homoptera: Aleyrodidae) from Indonesia, with notes on its host plants and natural enemies. *J. Appl. Entomol. Zool.* 26(3): 397-400.
- LEGG, J., GERLING, D., AND NEUENSCHWANDER, P. 2003. Biological control of whiteflies in Sub-Saharan Africa, pp. 87-100 *In* P. Neuenschwander, C. Borgemeister and J. Langewald [eds.], *Biological Control in IPM Systems in Africa*. CABI Publishing, Oxon, UK.
- MWARE, B., NARLA, R., AMATA, R., OLUBAYO, F., SONGA, J., KYAMANYUA, S., AND ATEKA, E. M. 2010. Efficiency of cassava brown streak virus transmission by two whitefly species in coastal Kenya. *J. Gen. and Mol. Virol.* 1: 40-45.
- PITAN, O. O. R. 2003. Response of two growth stages of pepper to different population densities of the spiraling whitefly, *Aleurodicus dispersus*. *Intl. J. Insect Sci.* 23(2): 115-120.
- SHARMA, P., SAKATA, J., SHIBUYA, Y., AND IKEGAMI, M. 2000. Pepper yellow leaf curl Indonesia virus, a new bipartite begomovirus species that belongs to distinct clade of Old World geminiviruses. Available online, <http://precedings.nature.com/documents/4162/version/1>. Accessed on 10-II-2013.
- SRINIVASA, M. V. 2000. Host plants of the spiraling whitefly, *Aleurodicus dispersus* Russell (Hemiptera: Aleyrodidae). *Pest Mgt. Hort.Ecosys.* 6: 79-105
- WATERHOUSE, D. F., AND NORRIS, K. R. 1989. Biological control: Pacific prospects. Supplement 1. ACIAR, Canberra.
- YU, Y., ZHANG, G. L., PENG, Z. Q., LIU, K., AND FU, Y. G. 2007. The spiraling whitefly, *Aleurodicus dispersus* invaded Hainan island of China. *Chinese Bull. Entomol.* 44: 428-431.
- YULIANI, HIDAYAT, P., AND SARTIAMI, D. 2005. Identifikasi kutu kebul (Hemiptera: Aleyrodidae) dari beberapa tanaman inang dan perkembangan populasinya. *J. Entomol. Ind.* 3(1): 41-49.