

**INCIDENCE OF BANANA BUNCHY TOP DISEASE
IN WEST JAVA, INDONESIA**

**LUAS SERANGAN PENYAKIT BUNCHY TOP PISANG
DI JAWA BARAT, INDONESIA**

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INTISARI

Penyakit Bunchy Top adalah penyakit virus yang secara ekonomis paling penting pada tanaman pisang. Penyakit ini tersebar luas di Asia dan Pasifik Selatan. Di Indonesia, penyakit pertama kali dilaporkan pada tahun 1979 di Kabupaten Bandung, Jawa Barat dan sekarang tersebar luas di beberapa daerah pertanaman. Pengamatan luas serangan penyakit dilakukan di lima wilayah pertanaman pisang terbesar dengan luas serangan penyakit bervariasi dari 0 - 38,6%. Kebanyakan, kultivar-kultivar lokal yang tumbuh terserang dengan tingkat intensitas yang bervariasi. Kultivar-kultivar yang terinfeksi diantaranya adalah Muli, Nangka, Raja, Kepok, dan Ambon. Berdasarkan uji ELISA diketahui bahwa virus Bunchy Top merupakan penyebab penyakit dan menunjang kerentanan relatif pada kultivar-kultivar yang diamati. Kebanyakan petani tidak menaruh perhatian pada penyakit ini dan cenderung memelihara tanaman terinfeksi. Beberapa petani memotong batang semu terinfeksi, tetapi tidak sampai pada pangkal batang, sehingga menyebabkan penyakit terus berkembang ke tanaman-tanaman yang baru.

Kata kunci: luas serangan, penyakit Bunchy Top, Jawa Barat

ABSTRACT

Banana Bunchy Top Disease (BBTD) is the most economically important virus disease of bananas. The disease is widespread in Asia and South Pacific regions. In Indonesia, it was first reported in 1979 in the regency of Bandung in West Java, and now becoming widespread in several growing areas. A survey on disease incidence was conducted in five main banana growing districts in the provinces of West Java and Banten. BBTD was prevalent in four of five main banana growing districts with disease incidence varied from 0 to 38.6%. Most of the local cultivars grown was infected with various level of intensity. Cultivars Muli, Nangka, Raja, Kepok and Ambon were among the cultivars infected. ELISA confirmed that banana bunchy top virus is the causal pathogen and showed the relative susceptibility of the cultivars. Most of growers was not aware of the disease and tended to keep the infected banana. Some growers cut the infected pseudostem, but did not uproot the stem, allowing the disease to develop into the new plantings.

Key words: incidence, Banana Bunchy Top Disease, West Java

INTRODUCTION

Banana serves as one of the basic food crops in Indonesia. It is ground predominantly in gardens and smallholding.

The fruit can be produced all year around, thus providing a steady income for farmers. Indonesia is one of banana growers with export of 55,000 MT/year (Lehmann-Danzinger, 2003). Banana bunchy top

disease (BBTD) is the most economically important virus disease of bananas including abaca (*Musa* spp.). The disease is widespread in Asia and South Pacific, also in Australia and Africa, although no reports from South America and Caribbean (Burns *et al.*, 1995). In Indonesia, it was first reported in 1979 (Muharam, 1980) in the regency of Bandung in West Java and now becoming widespread in several growing areas (Hutagalung *et al.*, 1981). Yield reduction up to 85% occurred in Fiji in 1895 and up to 70% in Australia in 1925 (Dale, 1987). Yield losses have not been quantified in Indonesia. All species belong to genus *Musa* are susceptible to the disease, with various degree of susceptibility depending on the cultivar.

The disease is caused by banana bunchy top virus (BBTV), an 18–20 nm isometric virus, has a multicomponent genome consisting of at least six components of circular ssDNA ranging in size between 1018–1111 nucleotides (Burns *et al.*, 1995). BBTV is transmitted by the banana aphid *Pentalonia nigronervosa* in a persistent manner and also through infected plant suckers, but is not sap transmissible (Dale, 1987). BBTD causes yellowing of leaf margins and the presence of dark green streaks on the petioles, pseudostem, and leaf lamina. The leaves become progressively dwarfed, more upright and bunched at the apex of the plant. Depending on when the plant becomes infected, it may produce no fruit or the bunch may not emerge from the pseudostem (Dale, 1987; Semangun, 1989).

There are three main control measures for preventing virus infections in a banana plantation, (1) removal of the virus reservoir, (2) prevention of plant-to-plant spread of virus, (3) the use of virus-free plants (Dale, 1987; Semangun, 1989). So far, unfortunately there is no report on the resistance of banana varieties against BBTV worldwide (Dale, 1987). The use of resistant banana is one of

the versatile methods to control BBTV. This paper reports results of survey of BBTD in banana plantings in West Java. West Java is the highest producer of banana in Indonesia (Satuhu & Supriyadi, 1999).

MATERIALS AND METHODS

Distribution. Surveys were conducted in five major banana growing districts in the province of West Java, namely Pandeglang, Bogor (including Kotamadya Bogor), Cianjur, Subang, and Sumedang. Banana plantations in most of sub districts of the five districts of West Java were inspected. Observations were done on plants showing typical symptoms of yellowing of leaf margins and the presence of dark green streaks on the petioles, pseudostem, and leaf lamina, dwarfing of the leaves, more upright and bunching at the apex of the plant (bunchy top). Plants were systematically randomly sampled on several sub districts within each district to determine the disease incidence and to observe cultivars of banana which are infected. The BBTV vectors, *P. nigronervosa*, were collected from infected banana and from taro plants nearby.

Viral detection. The presence of virus in infected banana plants of various cultivars was detected using double antibody sandwich ELISA (DAS-ELISA) with a kit from Agdia (Clark & Adams, 1977). Samples were prepared from laminae and midribs of diseased and healthy plants by grinding with extraction buffer. In all tests, negative and positive controls were included. Readings were taken at 405 nm with ELISA reader (BIO Rad, model 550). The relative concentrations of BBTV among samples of cultivars shown by the absorbance of ELISA will be used to predict the relative susceptibility among the banana cultivars.

RESULTS AND DISCUSSION

Banana bunchy top disease was prevalent in all districts except Pandeglang. The disease was easy to find in the field, especially when young plants were infected. The infected plants become dwarfed, more upright and bunched at the apex of the plant with the lamina become chlorosis. When infection

occurs on older plants, only new leaves were affected. Distribution of the disease in five districts of West Java varied from even, such as in District of Bogor, to restricted, such as in District of Pandeglang (Figure 1). Disease incidence ranged from 0% to 38.6%, averaging 16.6, 8.1, 5.8, 24.6, and 17.1 in Bogor, Cianjur, Pandeglang, Subang, & Sumedang, respectively (Table 1).

Table 1. Incidence of banana bunchy top disease in five districts of West Java

District	Sub District	Disease Incidence (%)
Bogor	Tenjo	7.2
	Bojong Gede	8.9
	Cariu	16.0
	Cijeruk	8.9
	Leuwiliang	0.0
	North Bogor	20.6
	East Bogor	31.5
	South Bogor	18.5
	Tanah Sareal	26.4
	West Bogor	20.0
Cianjur	Central Bogor	24.7
	Cikalong Kulon	0.7
	Cibeber	10.0
	Ciranjang	18.7
	Tanggeung	11.3
Pandeglang	Cidaun	0.0
	Saketi	29.2
	Sumur	0.0
	Cadasari	0.0
	Munjul	0.0
Subang	Panimbang	0.0
	Pabuaran	23.4
	Kalijati	24.2
	Jalan Cagak	36.8
	Tanjung Siang	38.6
Sumedang	Compreng	0.0
	Surian	14.0
	Cimalaka	16.3
	Tomo	16.8
	Wado	16.3
	Sukasari	22.2

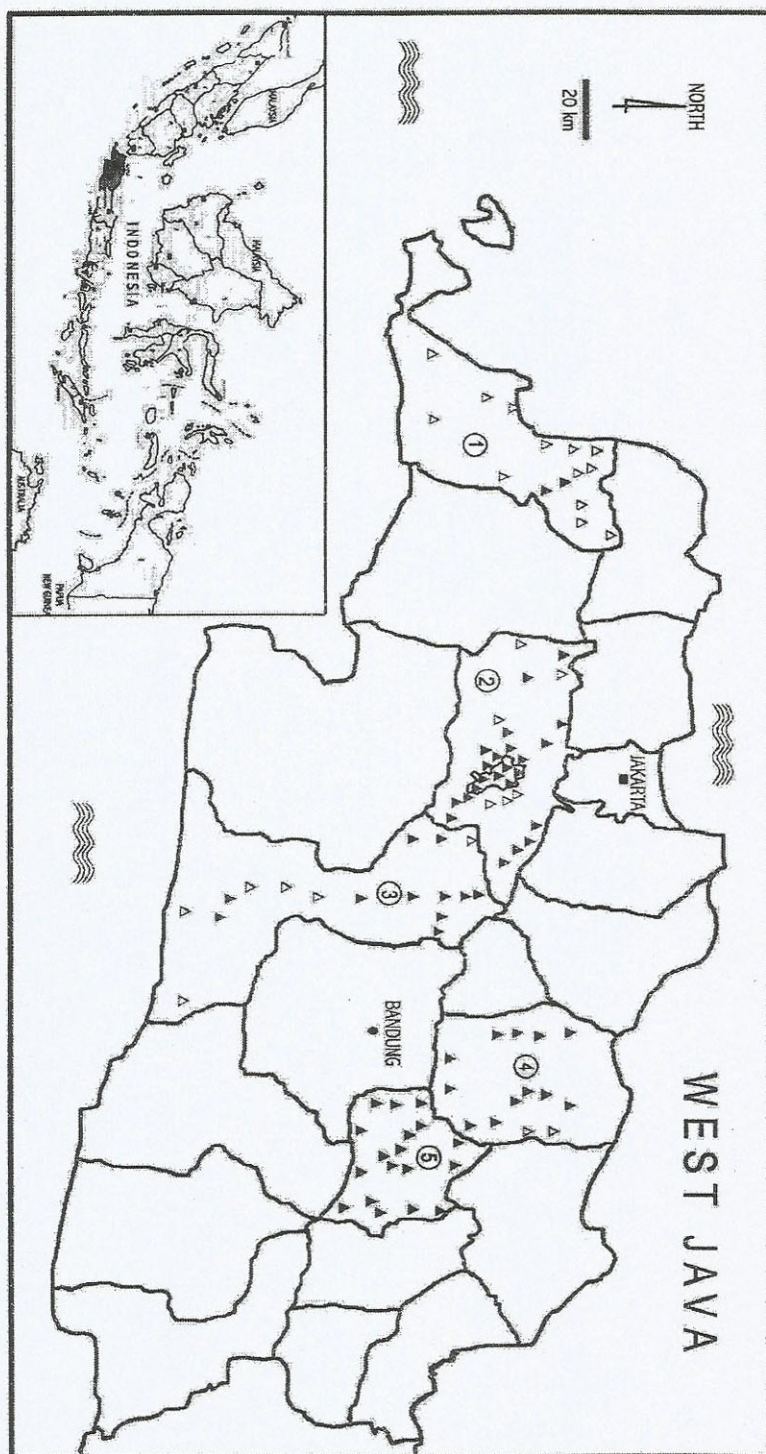


Figure 1. Location of five districts surveyed in the province of West Java, Indonesia; Pandeglang (1), Bogor (2), Cianjur (3), Subang (4), and Sumedang (5). (▲) Infested and (△) not infested with BRTV.

BBTV is transmitted through infected seedlings or through the vectors *P. nigronervosa*. During the survey, the vector was found only once at the Village of Sindangbarang, Sub district Bogor Barat, Kotamadya Bogor. The insects were found in diseased banana in very small number. However, none of the insect was found in taro. Taro is an alternative host for the aphid although it is not able to build colony on taro. Hu *et al.* (1996) and Geering and Thomas (1997) reported that hosts other than *Musa* spp. probably do not play a role as reservoirs of BBTV.

Most of banana cultivars grown was infected. Cultivars which were commonly infected included Muli, Nangka, Raja, Kepok, and Ambon (Table 2). ELISA confirmed that all the samples collected from the field were infected with BBTV. Cultivar Muli showed the highest absorbance value, whereas cultivar Susu showed the lowest (Table 3). This indicates the relative susceptibility of the cultivars. There is no relation between genome type and susceptibility to the disease, even though cultivars belong to genomes AA and AAA were highly susceptible in Australia (Thomas & Iskra-Caruana, 1999).

Table 2. Cultivars of infected banana in five districts of West Java

Cultivar	Number of infected mats				
	Bogor	Cianjur	Pandeglang	Subang	Sumedang
Muli	4	7	15	78	116
Nangka	36	21	27	10	88
Raja	31	31	4	0	6
Ambon	31	0	2	0	11
Emas	1	0	0	0	0
Susu	10	0	0	0	0
Kepok	37	2	0	0	43
Uli	2	0	0	0	0
Siem	1	0	0	0	0
Tanduk	0	0	0	0	1

Table 3. Relative susceptibility of cultivars of banana as shown by the amount of virus particles

Cultivar	Type	Genome	Absorbance ^a	Susceptibility ^c
Muli	dessert	AA	0.513	HS
Nangka	cooking	AAB	0.179	S
Raja	dessert /cooking	AAB	0.362	HS
Ambon	dessert	AAA	0.203	S
Emas	dessert	AA	0.199	S
Susu	dessert	AA	0.003	S
Kepok	dessert/cooking	ABB	0.209	S
Uli	cooking	AA	0.214	S
Siem	cooking	ABB	nd ^b	
Tanduk	cooking	AAB	0.193	S

^aValues are means of 5 measures, ^bnd = not done, ^cS = susceptible, HS = highly susceptible.

The disease is likely to have been present in the area for some time, but was unnoticed, as it can remain latent in the plant for a considerable time. Most growers were not familiar with the disease, except in the district of Sumedang where the banana plantation were well maintained, despite the high incidence of the disease. It was only noticed when the disease was well distributed throughout the area causing heavy losses. Growers tended to keep the infected banana. Some growers cut the infected pseudostem, but did not uproot the stem, allowing the disease to develop into the new plantings. Only small number of growers was aware of the disease and uprooted the infected stem to control the disease, especially in area with intensive production. This lack of knowledge may cause serious impact in the rapid distribution of the disease, as the distribution of diseased suckers, combined with aphid activity, might have played an important role in dissemination of the disease. Disease dissemination through infested suckers could happen in a long distance as grower high mobility in this modern era with a good access in transportation.

Control measures such as regular inspection of the plantations to locate infected plants, followed by cutting and burning the infected plants has been recommended in Australia (Dale, 1987). Also, strict quarantine should be implicated to prevent the movement of infected suckers within the areas. If this is not going to be achieved, it is possible the banana crop may be completely eliminated from the area unless the measures suggested are practiced.

ACKNOWLEDGEMENTS

The author wishes to thank Mrs Yuni Retnosari and Mr Anis Rahmani for technical assistance. The research was funded by Integrated Merit Research Grant (RUT 9, LIPI).

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