

**Banana bunchy top virus (BBTV)**   简体中文

**System:** Terrestrial

正體中文

Kingdom	Phylum	Class	Order	Family
Virus				Circoviridae

**Common name** BBTV (English), bunchy top (English), bunchy top virus (English), banana bunchy top disease (BBTD) (English), laufetiti (Samoan, American Samoa), abaca bunchy top virus (English)

**Synonym** *Ana bunchy top virus BBTV*

**Similar species** *Coconut foliar decay virus (CFDV)*, *Subterranean clover stunt virus (SCSV)*

**Summary** Banana bunchy top virus (BBTV) is a deadly pathogen which affects many areas of the world-wide banana industry. Infected banana plants produce increasingly smaller leaves on shorter petioles giving the plants a bunched appearance. Fruits may be distorted and plants become sterile before the whole mat (rhizome) eventually dies. The international spread of BBTV is primarily through infected planting materials.



[view this species on IUCN Red List](#)

## Species Description

Ferreira *et al.* (2001) describes the onset of BBTV: "The first symptoms consist of darker green streaks on the lower portion of the midrib, and later on the secondary veins of the leaf. Removing the 'white fuzz' or wax covering the midrib makes it easier to see the streaking clearly. Streaks consist of a series of 'dots' and short lines, often referred to as 'morse code' streaking. As infection progresses, streak symptoms become evident on the leaf blade. When fruit is produced, some of the banana hands may have distorted and twisted fruit. Keikis or suckers that develop after infection are usually severely stunted, resulting in leaves 'bunched' at the top of the stem. Leaves are usually short, stiff, erect and more narrow than normal. Leaves display marginal yellowing or chlorosis and necrosis or burning."

Symptoms are also described in detail by Thomas and Caruana (2000). The dot-dash symptoms and the dark green "hooks" seen as the streaks enter the petiole are most characteristic and are best viewed from the underside in transmitted light. A virus characterised by small (18 to 20 nm), isometric particles and a multi-component ssDNA genome has been purified from infected plants (Thomas and Caruana, 2000).

## Lifecycle Stages

The Cooperative Extension Service (1997) states that, "Banana bunchy top virus is spread by the banana aphid, which acquires the virus after at least four (but usually about 18) hours of feeding on an infected plant. The aphid can retain the virus through its adult life, for a period of 15-20 days. During this time, the aphid can transmit the virus to a healthy banana plant by feeding on it, possibly for as little as 15 minutes but more typically for about two hours."

To become infective, the aphids require a feeding period of at least 4 hours or more on diseased host plants. To transmit the virus, infective aphids require a minimum feeding period of 15 minutes on susceptible plants, though efficiency of transmission increases with longer feeds (1.5 to 2 hours) (Hu *et al.* 1996, Magee 1940). Magee's experiments indicated that an average of about 25 days incubation is necessary for the development of banana bunchy top symptoms. He also found that young, newly infected plantlets are a better source of virus than adult plants and that nymphs are more effective vectors than mature aphids.

## Habitat Description

BBTV occurs in *Musa* (including banana, abaca, plantain and ornamental bananas) and *Ensete* in the family Musaceae. Although there are some reports of monocot hosts in related families, evidence is conflicting, and Musaceae are generally considered the only hosts (reviewed by Thomas and Caruana, 2000).

BBTV is transmitted by the aphid vector *Pentalonia nigronervosa* (Magee, 1927). The aphid spreads the virus through its feeding behaviour on susceptible species.

## General Impacts

BBTV is a destructive pathogen in many banana-cultivating areas of the world (Su *et al.* 2003). The Hawaii's Department of Agriculture (1999) describes the affect of the virus stating, "Infected banana plants are stunted and produce small, deformed fruits. In advanced stages of the disease, plants do not produce any fruit. Infected banana plants are useless and serve only as a source of the virus. A tiny insect called the banana aphid spreads the disease by carrying the virus to healthy plants after feeding on infected plants." Banana-production is usually unprofitable in areas severely affected by BBTV, though disease incidence may be low in adjacent sites.

## Management Info

There are no resistant varieties of banana plant known. The Cooperative Extension Service (1997) believes that the most important methods to control BBTV involve, "killing the aphid vector (disease carrier) and roguing (removing and destroying) infected banana plants. By killing the aphids on the banana plant, dispersal of virus-carrying aphids to nearby, healthy banana plants is avoided. Since the only host of BBTV is banana, roguing infected trees reduces spread of the virus by reducing the opportunity for aphids to aquire the virus or for people to obtain and transport infected suckers or planting material."

The Cooperative Extension Service gives detailed instructions for controlling BBTV at home and in a commercial setting. Please refer to [Cooperative Extension Service, 1997](#). Brooks (2000) also offers detailed step-by-step instructions to homeowners and commercial growers for the eradication of BBTV. Please refer to [Brooks, 2000](#). For details on chemical, physical, biological control options, please see [management information](#).

**Principal source:** Cooperative Extension Service. 1997. Banana Bunchy Top Virus. College of Tropical Agriculutre and Human Resources, University of Hawai'i at Manoa.

[Hawai'i Department of Agriculture, 1999. Plant Pest Control: Banana Bunchy Top Virus](#)

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## BIBLIOGRAPHY

29 references found for **Banana bunchy top virus (BBTV)**

### Management information

[ABC Radio Australia. 2004. HAWAII: Virus jeopardises multi-million dollar banana industry. ABC Radio Interview conducted by H. F. Tay.](#)

**Summary:** Available from: <http://www.abc.net.au/ra/pacbeat/stories/s1091695.htm> [Accessed 09 November 2004]

Abdel-Aziz, N. A., A. M. Abdel-Salam, H. N. Soliman, and S. M. El-Saghir. 1998. Heat and chemotherapeutic agents as tools for elimination of two banana virus(es). *Egyptian Journal of Phytopathology*. 26(1):13-28.

Cooperative Extension Service. 1997. *Banana Bunchy Top Virus*. College of Tropical Agriculture and Human Resources, University of Hawaii at Manoa.

[Ferreira, S. A., E. E. Trujillo, and D. Y. Ogata. 2001. Bunchy Top Disease of Bananas. Hawaii Institute of Tropical Agriculture and Human Resources, University of Hawaii at Manoa. Commodity Fact Sheet Ban-4\(A\) Fruit.](#)

**Summary:** Available from: [http://www.kpfc.com/news/detail.asp?NEWS\\_ID=5](http://www.kpfc.com/news/detail.asp?NEWS_ID=5) [Accessed 09 November 2004]

Gee II, David E., pers. comm. 2006. Wildlife Biologist, Guam Division of Aquatic & Wildlife Resources and Guam team member of the Pacific Invasives Learning Network (PILN).

[Hawaii Dept of Agriculture. 1999. Plant Pest Control: Banana Bunchy Top Virus. Hawaii Department of Agriculture, Plant Pest Control Branch, Chemical/Mechanical Section.](#)

**Summary:** Available from: [http://www.hawaiiag.org/hdoa/pi\\_ppc\\_cm\\_bbt.htm](http://www.hawaiiag.org/hdoa/pi_ppc_cm_bbt.htm) [Accessed 09 November 2004]

Hu J. S., Wang M., Sether D., Xie W., Leonhardt K. W., 1996. Use of polymerase chain reaction (PCR) to study transmission of banana bunchy top virus by the banana aphid (*Pentalonia nigronervosa*). *Annals of Applied Biology* 128, 55-64.

Kiritani, K., and H. J. Su. 1999. Papaya ring spot, banana bunchy top, and citrus greening in the Asia and Pacific Region: Occurrence and control strategy. *JARQ-Japan Agricultural Research Quarterly*. 33(1):23-30.

Magee C. J. P., 1940. Transmission studies on the banana bunchy-top virus. *The Journal of the Australian Institute of Agricultural Science* 6, 109-110.

Magnaye, L. V. and R. V. Valmayor. UNDATED. BBTV, CMV and other viruses affecting banana in Asia and the Pacific.

Manickam, K., S. Doraiswamy, T. Ganapathy, and R. Rabindran. 2002. Early detection of banana bunchy top virus in India using polymerase chain reaction. *Acta Phytopathologica et Entomologica Hungarica*. 37(1-3):9-16.

Thomas J. E., Smith M. K., Kessling A. F., Hamill S. D., 1995. Inconsistent transmission of banana bunchy top virus in micropropagated bananas and its implication for germplasm screening. *Australian Journal of Agricultural Research* 46, 663-671.

### General information

Brooks, F. 2000. *Banana bunchy top virus*. *Pests and Diseases of American Samoa*.

[Brunt, A.A., Crabtree, K., Dallwitz, M.J., Gibbs, A.J., Watson, L. and Zurcher, E.J. 1996. Banana Bunchy Top Virus. Plant Viruses Online: Descriptions and Lists from the VIDE Database. Version: 20th August 1996.](#)

**Summary:** Available from: <http://image.fs.uidaho.edu/videl/descr056.htm> [Accessed 09 November 2004]

Herman, S. R., D. K. Becker, R. M. Harding, and J. L. Dale. 2001. Promoters derived from Banana bunchy top virus-associated components S1 and S2 drive transgene expression in both tobacco and banana. *Plant Cell Reports*. 20(7):642-646.

Horser, C. L., M. Karan, R. M. Harding, and J. L. Dale. 2001. Additional Rep-encoding DNAs associated with banana bunchy top virus. *Archives of Virology*. 146(1):71-86.

Hughes, A. L. 2004. Birth-and-death evolution of protein-coding regions and concerted evolution of non-coding regions in the multi-component genomes of nanoviruses. *Molecular Phylogenetics & Evolution*. 30(2):287-294.

[ICTV \(International Committee on Taxonomy of Viruses\). 2002. Banana Bunchy Top Virus.](#)

**Summary:** Available from: <http://www.ncbi.nlm.nih.gov/ICTVdb/ICTVdb/790p1001.htm> [Accessed 09 November 2004]

Kagy, V., J. E. Thomas, M. Sharman, and F. Mademba-Sy. 2001. First record of banana bunchy top disease in New Caledonia. *Australasian Plant Pathology*. 30(1):71.

Kenyon, L., M. Brown, C. Maritime, and P. Khonje. 1997. First report of banana bunchy top virus in Malawi. *Plant Disease*. 81(9):1096.

Manickam, K., S. Doraiswamy, T. Ganapathy, G. T. Mala, and R. Rabindran. 2001. Characterization and serological detection of Banana bunchy top virus in India. *Zeitschrift Fuer Pflanzenkrankheiten und Pflanzenschutz*. 108(5):490-499.

Niagro, F. D., A. N. Forsthoefel, R. P. Lawther, L. Kamalanthan, B. W. Ritchie, K. S. Latimer, and P. D. Lukert. 1998. Beak and feather disease virus and porcine circovirus genomes: Intermediates between the geminiviruses and plant circoviruses. *Archives of Virology*. 143(9):1723-1744.

[State of Queensland. 2004. Ten things to know about growing bananas in Southern Queensland. The State of Queensland \(Department of Primary Industries and Fisheries\).](#)

**Summary:** Available from: <http://www.dpi.qld.gov.au/horticulture/5201.html> [Accessed 09 November 2004]

Su, H. J., L. Y. Tsao, M. L. Wu, and T. H. Hung. 2003. Biological and molecular categorization of strains of Banana bunchy top virus. *Journal of Phytopathology* 151(5): 290-296.

Sun, D. J., H. Y. Wei, W. Q. Cai, and Y. C. Tian. 2002. Cloning of banana bunchy top virus Chinese Zhangzhou isolate DNA 4 and the promoter activity of its non-coding region. *Acta Botanica Sinica*. 44(8): 941-945.

Wantichakorn, R., R. M. Harding, and J. L. Dale. 2000. Sequence variability in the coat protein gene of two groups of banana bunchy top isolates. *Archives of Virology*. 145(3):593-602.

- Wellings, P. W., P. H. Hart, V. Kami, and D. C. Morneau. 1994. The introduction and establishment of *Aphidius colemani* Viereck (Hym., Aphidiinae) in Tonga. *Journal of Applied Entomology*. 118(4-5):419-428.
- Wu R. Y., Su H. J., 1991. Regeneration of healthy banana plantlets from banana bunchy top virus-infected tissues cultured at high temperature. *Plant Pathology* 40, 4-7.
- Xie, W. S., and J. S. Hu. 1995. Molecular cloning, sequence analysis, and detection of banana bunchy top virus in Hawaii. *Phytopathology*. 85(3):339-347.