

- Farmers and the general public are also encouraged to comply with regulation R.110 of 27 January 1984 of the Agricultural Pests Act, 1983 (Act No.36 of 1983) which prohibits the movement of infected plants or planting material from one area to another without authorisation.

Economic impact

Banana bunchy top disease is the most serious virus disease of banana worldwide. Diseased plants rarely produce fruit and when they do, the fruit is stunted and twisted.

While BBTv certainly has a huge impact on the industrial scale of banana production, it can also be devastating to subsistence farmers who depend on their crop to feed their families and provide income. Small farmers will often lose the uphill battle of fighting against BBTv in their crop. Once established, it is very difficult to eradicate and manage the disease. The difficulty of eradication is perpetuated by a number of reasons:

- the disease is caused by a vector-transmitted virus
- all bananas are susceptible to the disease and no resistant varieties have been bred or made commercially available;
- the control methods are quite demanding, including chemical treatment for the aphid vectors, removal of all infected tissue (i.e. roughing), quarantining plants and monitoring alternate vector feeding sites.

Legislative and policy implications

In terms of the Agricultural Pests Act, 1983 (Act No.36 of 1983) no person shall import into the Republic any plants or plant products without the authority of a permit.

BBTV is a quarantine pest for South Africa (SA) and is regulated in terms of the Agricultural Pests Act 1983 (Act No. 36 of 1983) and associated regulations. These include Control Measures R.110 of 27 January 1984, as amended. In terms of the APA and R.110, it is important that any suspected occurrence or occurrence of the BBTv in a pest free area is reported to the DALRRD executive officer of the APA. Furthermore, the executive officer should issue an official order prescribing measures to be complied with by a user of land. Order is issued in terms of section 7 of the APA to quarantine an area.

References

- Banana industry biosecurity guideline. Department of Agriculture and Fisheries, Biosecurity Queensland. https://www.daf.qld.gov.au/_data/assets/pdf_file/0003/378471/Banana_Industry_Biosecurity_Guideline.pdf accessed on 25 July 2016.
- Banana bunchy top diseases in Hawaii, College of Tropical Agriculture and Human Resources. Available online at http://www.ctahr.hawaii.edu/bbtd/aphid_control.asp accessed on 25 June 2016.
- CABI 2016, Banana bunchy top virus. Available online at <http://www.cabi.org/isc/datasheet/8161> accessed on 25 June 2016.
- Ferreira, Stephen A., Eduardo E. Trujillo, and Desmond Y. Ogata. Banana Bunchy Top Virus. N.p.: College of Tropical Agriculture and Human Resources, 1997. N. pag. University of Hawaii at Manoa.
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- Harish, S., M. Kavino, N. Kumar, D. Saravanakumar, and K. Soorianathasundaram, R. Samiyappan. "Biohardening with Plant Growth Promoting Rhizosphere and Endophytic bacteria induces systemic resistance against Banana Bunchy Top Virus." *Applied Soil Ecology* 39 (2008): 187-200. University of Hawaii at Manoa
- Jooste, A.E.C., Wessels, N. and van der Merwe, M., 2016. First Report of Banana bunchy top virus in Banana (*Musa* spp.) from South Africa. *Plant Disease* 100, 1251.

Contact details:

To report occurrence or suspected occurrence of the pest contact:

Directorate: Plant Health
Division: Early Warning Systems
Tel: 012 319 6384/6104
Email: JanHendrikV@dalrrd.gov.za

For awareness and promotion enquiries contact:

Directorate: Food Import & Export Standards
Division: Plant Health Promotion
Tel: 012 319 6295/6475/6198
Email: Info.sps@dalrrd.gov.za

Contact details for ARC laboratory:

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Division: Crop Protection, Plant Pathology,
Tel: 013 753 7128
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Banana bunchy top virus (BBTV)



agriculture, land reform
& rural development

Department:
Agriculture, Land Reform and Rural Development
REPUBLIC OF SOUTH AFRICA



What is banana bunchy top virus (BBTV)?

Banana bunchy top virus (BBTV) is a plant pathogenic virus of the family Nanoviridae that is known to infect banana plants. The disease, referred to as Banana bunchy top disease (BBTD), gets its name from the bunchy appearance of infected plants. Infected plants cannot recover, so unless plants are destroyed, they will serve as a source for viral particles that can be transmitted from plant to plant by the banana aphid, *Pentalonia nigronervosa*.

BBTV in SA and global distribution

The virus is widespread in Southeast Asia and the South Pacific, and is present in parts of India and Africa. In South Africa it was reported for the first time in July 2015 in a banana plantation near Hibberdene on the South Coast of KwaZulu-Natal province (Jooste et al., 2016)

How to identify symptoms associated with BBTV

Banana bunchy top disease (BBTD) is named after one of the most characteristic symptoms of an advanced infection, when the leaves become progressively dwarfed, upright and bunched at the top of the plant, with wavy and chlorotic margins that tend to turn necrotic (see picture below).



Typical dwarfed, upright growth and bunched at the top (Photo: E. Jooste)

The symptoms are most severe and distinctive when the infection arises from the transmission from an infected mother plant to her suckers. These plants are typically stunted (under 1 m) and rarely produce fruit. Banana plants infected with BBTD will produce only small bunches of fruit, or no fruits at all.

In aphid-inoculated plants, symptoms usually appear in the second leaf to emerge after inoculation and consist of a few dark-green streaks or dots on the minor veins on the lower portion of the lamina. The streaks form 'hooks' as they enter the midrib and are

best seen from the underside of the leaf in transmitted light. The 'dot-dash' symptoms can sometimes also be seen on the petiole. The following leaf may display whitish streaks along the secondary veins when it is still rolled. These streaks become dark green as the leaf unfurls (see picture below). Successive leaves become smaller, both in length and in width of the lamina, and often have chlorotic, upturned margins. The leaves become dry and brittle and stand more erect than normal giving the plant a rosetted and 'bunchy top' appearance.



Dark green streaks and chlorosis on leaves (Photo: E. Jooste)

Host range

BBTV is a known viral disease of *Musaceae* (banana, plantain and wild relatives).

Diagnostic detection of BBTV

Banana bunchy top disease can be diagnosed by identifying the typical symptoms described above. Leaves from suspicious plants should be submitted for virus testing to the ARC laboratory (see contact details below). When sampling banana leaves for testing of BBTV, select the third leaf from the plant, not counting the youngest unfurled cigar leaf and cut a section from the centre of the leaf including the midrib, submit the leaf lamina and midrib together for testing.

How BBTV is transmitted from one plant to another

- The virus is spread by the banana aphid (*Pentalonia nigronervosa*), which can acquire the virus after a feeding period of about a 4 to 18-hours and can retain the virus throughout its adult life. During this time, an aphid can transmit the disease after feeding for about two hours on a healthy plant. Since heliconia and flowering ginger are known hosts of the banana aphid, it is possible for virus "infected" aphids to move from infected banana plants to heliconia or flowering ginger (or both). Therefore, when shipping or moving these plants between countries during trade, precautions should be taken to make

sure that they are free of the banana aphid.



Banana aphid colony in leaf sheath (left) (Photo: E. Jooste) and *Pentalonia nigronervosa* winged aphid showing dark veins (right) (Photo: N. Wessels)

- The virus can also be spread through infected propagating material.

How to control or manage BBTV

- Plant only healthy suckers
- Avoid moving planting material from affected regions
- Inspect your field regularly for symptoms. Early identification is critical to controlling the spread of BBTV
- Treat banana aphids with a registered chemical to stop them from spreading the virus from infected to healthy banana plants and then destroy infected plants. Do not destroy the infected banana plants first as banana aphids will fly off to healthy plants and spread the virus.
- Any regrowth that occurs from infected plants should be immediately destroyed.
- All banana plants within five meters of the infested banana plant should be treated.
- Infection levels can also be reduced by regular inspections and prompt removal of infected plants, detashing (removal of dead leaves hanging down the plant), use of clean planting material and varietal mixtures, and opening new fields as far away as possible from existing plantations.
- There is no cure for BBTV. Regular inspections to detect and remove infected plants, and replanting with virus-indexed tissue -culture plantlets, which have been screened in a lab and certified 'virus-free', are the basis for good management.