

Musa Disease Fact Sheet N° 4

BANANA BUNCHY TOP DISEASE

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Banana bunchy top disease (BBTD) is the most serious virus disease of banana and plantain worldwide. Devastating epidemics occurred in Fiji at the turn of the century, in Australia in the 1920s and more recently in the early 1990s in Pakistan. The disease is a major constraint to production in many areas of South-East Asia and the Pacific.

It was first noted in Fiji in 1889, and has subsequently been identified in the Pacific region (including American Samoa, Australia, Guam, Hawaii, Kiribati, Ogosowara-gunto, Tonga, Tuvalu, Wallis Island and Western Samoa), Asia (including China, India, Indonesia, Pakistan, Philippines, Sri Lanka, Taiwan and Viet Nam) and Africa (including Burundi, Congo, Central African Republic, Egypt, Gabon, Rwanda and Zaire). BBTD has not been reported from the Americas but the aphid vector is present.

Abaca bunchy top, a related, possibly identical disease, has been reported in *Musa textilis* (abaca, Manila hemp) from the Philippines.

A virus with small (20nm) isometric particles and a multi-component ssDNA genome (banana bunchy top virus, BBTV) is consistently associated with the disease, but to date transmission experiments with purified particles have failed to show unequivocally that it is the causal agent. The role of dsRNAs, which have also been found in infected plants, in the etiology of BBTD is unknown.

BBTD is transmitted locally in a persistent, circulative manner by the banana aphid (*Pentalonia nigronervosa*). Distribution over long distances occurs by the movement of infected vegetative planting material such as suckers, corms, and tissue-cultured plantlets, BBTD is not soil-borne and is unlikely to be spread on cutting tools.

A range of symptoms can occur in BBTD-affected plants. Infected plants with advanced symptoms have a rosetted appearance with narrow, upright and progressively shorter leaves, giving rise to the common name "bunchy top". The leaf edges often roll upwards and show a marginal yellowing. Dark green streaks are often found on midrib and petiole, extending down into the pseudostem. These streaks are best seen after wiping away the wax. The most diagnostic symptoms are short dark green dots and dashes along the minor leaf veins, which form hooks as they enter the edge of the midrib. This symptom is best seen when the leaf is viewed from the underside, towards the light. Symptoms appear only on leaves formed after infection and the first such leaf may show symptoms only in the basal part of the lamina or on the petiole. Plants infected at an early stage of development rarely produce a bunch, though with later infections a distorted bunch may be formed. In very late infections, the only symptom to occur may be



Symptoms of BBTD on AAA 'Cavendish' planted as an infected sucker (above) or infected during growth (below). Note the bunchy top appearance on the plants caused by the production of progressively shorter, narrower and more erect leaves.



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Dark green dots and dashes, forming hooks as they enter the midrib

dark green streaks on the tips of the flower bracts of the bell.

BBTD can be effectively controlled by the eradication of diseased plants and the use of virus-free planting material. Diseased plants should first be sprayed with power kerosene or insecticide to kill any viruliferous aphids. The whole stool including corm and all associated suckers must then be destroyed by uprooting and chopping into small pieces or by herbicide treatment as the virus will ultimately spread to all parts of the mat. Control must be practised across a whole production area to avoid the rapid re-infection of virus-free planting material.

BBTD has not been eradicated from a country where it occurs, but it has been eliminated from certain banana growing districts in Australia. Here, the disease is kept in check by strict State government legislation which controls the source and movement of planting material, controls the issue of planting permits and



Dark green streaks on the leaf petiole

requires the destruction of plants with symptoms. Banana inspectors are also employed to police these regulations and locate diseased plants. A new ambitious program of eradication is being initiated which is centred on replacing plantations where BBTD regularly occurs with BBTV-free tissue-cultured planting material.

All *Musa* species and cultivars tested so far appear to be susceptible to BBTD, although the incubation period may vary. There is some evidence for the existence of alternative hosts and *Alpinia purpurata*, *Colocasia esculenta* (taro), *Canna indica* (*Canna*) and *Hedychium coronarium* (garland flower) have been implicated. However, these reports need to be confirmed. In addition, reports of latent and mild strains of BBTV in Taiwan, South Africa, Thailand and Malaysia also need confirmation. No plants with typical BBTD symptoms have been seen in the latter three countries.

Isolates of BBTV from around the world are closely related



Dark green streaks on the flower bracts

serologically, although recent information suggests the ssDNA genome exists as two distinct populations. One group is represented by isolates from Australia, Africa, the South Pacific and India and the other by isolates from South-East Asia (Philippines, Taiwan and Viet Nam). BBTV can be detected serologically (by ELISA) and by using nucleic acid probes or polymerase chain reaction (PCR). The highest levels of virus are found in the midrib of the youngest infected leaf.

Indexing of *Musa* derived from tissue culture plantlets at INIBAP Virus Indexing Centers takes place after 3 months and 8-12 months growth in a glasshouse at 25-28°C using monoclonal antibodies available from Agdia®. Care must be taken to ensure that the buffer used for extracting BBTV contains an antioxidant and a blocking agent or false positive reactions may occur.

INIBAP is collaborating with Dr J. E. Thomas, (Plant Protection Unit, Department of Primary Industries, 80 Meiers Road, Indooroopilly, Q4068, Australia) and Dr M-L. Iskra-Caruana (CIRAD-FLHOR, Avenue du Val de Montferrand, BP 5035, 34032 Montpellier Cedex 1, France) in studies to clarify the distribution of BBTD. Your help is needed. INIBAP requests that leaf samples suspected of being affected by BBTD, from areas where the disease has not previously been recorded, be sent by courier to Dr Thomas or Dr Iskra-Caruana wrapped in slightly damp paper towelling or newspaper and sealed in a plastic bag. Collaborators will be notified of the results of tests.