REPÚBLICA DE MOÇAMBIQUE
Ministério da Agricultura e Segurança Alimentar
Direcção Nacional de Agricultura e Silvicultura

Information, Guidelines and Procedures for Banana Producers

Banana Bunchy Top Virus

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Disclaimer: All prevention guidelines in this document are to be used as recommendations only and are not intended to dictate producers about banana production on their farms. No person should fail to comply with any additional regulations that may be relevant and which are not mentioned in this document. The author of this document, consulted persons and the Government of Mozambique will not assume liability for any outcomes as a result of following the guidelines reflected in this document.

Definitions

Authorities	Authority granted by the Minister and/or the Department of Agriculture in the national, provincial and local sphere of government
Best practices	Procedures that are generally accepted as effective and correct
Contaminated	Anything that has been in touch with the Banana Bunchy Top Virus fungus
Controlling	Taking steps and implementing measures to control the Banana Bunchy Top Virus
Detection and detecting	Noticing or discovering symptoms of Banana Bunchy Top Virus in banana plants
Disinfectant	A disinfection solution, prepared as described by the manufacturer, used to sanitize vehicles and footwear
Eradicated or eradication	Getting completely rid Banana Bunchy Top Virus in banana plants in Mozambique
Export and exportation	Transportation of bananas or related products from Mozambique to any place outside the country
Guidelines	Information intended to advise banana producers on how to best prevent and contain infection with Banana Bunchy Top Virus
Import and importation	Transportation of bananas or related products from any place outside the country to Mozambique
Infested	Areas or properties that are confirmed to be contaminated with the Banana Bunchy Top Virus

Inspection	Examination of the banana plants with the purpose of finding symptoms of the Banana Bunchy Top Virus in banana plants.
National Phytosanitary Authority (NPA)	A public officer who is authorized by the National Plant Protection organization (NPPO) and accredited for the signing of phytosanitary certificates
Pest	Any species, strain or biotype of plant, animal or pathogenic agent injurious to plants or plant products
Phytosanitary action	An official operation, such as inspection, testing, surveillance or treatment, undertaken to implement phytosanitary measures
Plant and planting materials	Any living plant and parts of it, including seeds and germplasm
Prevention and preventing	Actions taken in order to avoid infection of banana plants with Banana Bunchy Top Virus
Producers	Commercial banana farmers
Quarantine and quarantine area	Official confinement of regulated articles for observation and research or for further inspection, testing and/ or treatment
Quarantine pest	A pest with high potential economic importance to the area, that has not previously been present or not widely spread and is therefore officially controlled and contained
Regulated and regulations	Official rules or laws applicable to identified quarantine pests
Reporting obligations	The legal obligation to report any banana plants or other materials that are suspected of being infected with Banana Bunchy Top Virus
Surveillance	Carefully watching and monitoring banana plants for the symptoms of Banana Bunchy Top Virus

Content

About this Document

This document aims to provide banana producers with relevant information regarding prevention, detection and reporting obligations for the Banana Bunchy Top Virus in Mozambique which was identified in June 2016 in the districts of Chókwè and Guijá in Gaza Province.

It contains best practices and guidelines to minimise the risk of the spread of the Banana Bunchy Top Virus and holds practical information regarding the detections of the disease. Furthermore, it lists the steps to follow to report any suspicious plants to the correct authorities.

About the Banana Bunchy Top Virus

The Banana Bunchy Top Virus (BBTV) is a viral disease that causes Banana Bunchy Top Disease in banana plants. The name refers to the “bunchy” top leaves of a banana plant, which is a clear and characteristic symptom of banana plants being affected with the virus. Banana plants that are infected by the virus rarely produce banana or produce stunted bunches.

This virus can be transmitted through two ways:

- Infected sucker plant material
- Banana aphids (*Pentalonia nigronervosa*)

All banana varieties are hosts to the disease, but symptoms may be different between varieties. Alternative hosts include Canna, Heliconia and Strelitzia.

Regular inspection of banana plants for symptoms is important in order to ensure timely detection of the virus. Infected plants should be destructed by injecting a pesticide solution into the banana plant that attracts and kills the aphids.

The Banana Aphid (*Pentalonia nigronervosa*)

Detection

Timely detection and correct identification of Banana Bunchy Top Virus symptoms is extremely important in order to limit the spread and impact this disease can have.

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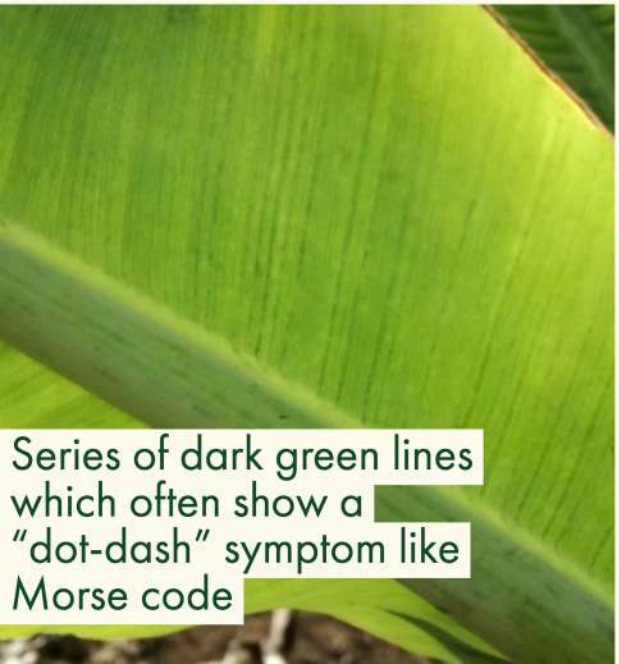
Banana Bunchy Top Virus Symptoms

Dwarfism and yellowing of the leaf edges

"Hooks" or dark green "L"- shaped lines where leaf veins enter the midrib



Series of dark green lines which often show a "dot-dash" symptom like Morse code

The 'bunchy top' in adult plants

Diagnostics and Quarantine

Surveys are being conducted to record the spread of BBTV and to establish domestic quarantine measures in the Gaza Province. At the same time, all commercial producers are obliged to mark and report any suspicious plant they find on their farm to the authorities immediately.

Once the National Plant Protection Organisation (NPPO) has been informed about suspicious plants it will arrange for an inspector to visit the farm. The inspector will take samples from the reported plants and will assess if precautionary measures are required (including imposing quarantine) to prevent the disease from spreading.

Once the samples are collected and tested in the laboratory and confirm the presence of The Banana Bunchy Top Virus, the results will be communicated to the producer and a destruction and controlment plan will be developed by the National Phytosanitary Authority (NPA). Quarantine will be imposed to limit the damage caused by the disease and information regarding the outbreak will be shared with all relevant stakeholders as soon as possible.

Guidelines for Preventing and Controlling BBTV

The following guidelines aim to help producers to prevent and control the spread of the Banana Bunchy Top Virus. As each farm is unique, the implementation of these measures may be different from farm to farm.

Awareness

Awareness posters and brochures with information around what the disease is, how it is spread and how to identify it can help communities surrounding your farm to take actions not to bring the disease to your farm. It can also help them identifying the disease in their own banana plants and facilitate early detection.

Information brochures

Find information brochures it in the annex of this document (in Portuguese) covering what the Banana Bunchy Top Virus is, and how to detect and prevent it.

Community events help strengthen the relationship with the communities and offers a great platform to share information about the importance of prevention measures and early detection.

Destruction of Infected Plants

Once an infected plant is identified and marked, it should be destroyed as soon as possible. *NOTE*: *immediate and violent removal of an infected plant may cause dispersal of BBTV-carrying aphids before they ingest any insecticide.*

Recommended steps for destruction of infected plants:

- Spray the entire plant with a contact insecticide to kill any aphids which are lodged around the base or inside leaf axils. Spray all neighbouring plants for extra safety.
- Inject the pseudostem near the base with about 10 ml of a solution of 1:1 *Glifosate and Imidacloplrid.* A hole can be drilled with a screwdriver in the stem angled downwards, and the Roundup poured into this hole to make it more effective.
- The dying plant will slowly turn yellow which may attract more aphids, thus inject the plant with a systemic insecticide like Imidachloprid (*Confidor* or its generic equivalent) to kill any aphids that still feed on the dying infected plant. The Roundup and insecticide can be injected/applied simultaneously. Then the following solution can be used: 1 liter of herbicide (Roundup) in 10 liters of water, then add 100 ml of Imidachloprid and inject 30 ml into the base of each infected plant.
- Remove the dead plant completely, including roots and suckers and burn or bury the plant material far away from the plantation. Make sure that all soft “water suckers” are removed since these preferentially attract aphids. If this is not practical, then the dead plant must be chopped in small pieces to facilitate drying out by the sun as quickly as possible.
- Replace the missing plant as soon as possible by selecting an extra sucker on a neighbouring healthy plant.

Planting Materials

As no resistant banana variety has been found yet and the disease can spread through planting materials, ensure you only use certified tissue culture bananas from a reputable source as planting material. Documentation of such reputable source of plants should be kept as proof so it can be shown whenever requested by a government official.

✓ Successful treatment of tissue culture planting material has been recorded from a farmer in Zambia and can be used as a guideline to treat plants in the nursery and to prevent spreading the disease[1].

- All tissue culture plants should be treated once planted out in the nursery with 1ml of Imidachlopid 350 SC per plant. This can be applied by mixing 80ml product/20 liter water and apply 250 ml solution per plant.

- Straight after planting out in the field, plants must be treated with 2ml of Imidachlopid 350 SC per plant. This can be applied by mixing 160ml product/20 liter water and apply 250 ml solution per plant.

Photo: Altus Viljoen

Banana plants in nursery.

[1] Based on procedures implemented by Mr.Gerry Carbin, in Chirundu, Zambia and documented by Elize Jooste (ARC)

Reduction of Aphid Population

To reduce the aphid population within the plantation you can spray the entire plantation every two weeks with a soft insecticide (e.g. Cypermethrin, Malathion or Allice) to avoid damage to natural predators. Do not spray the entire canopy but target the main stem and leaf axils. Most of the aphids are located at the base of the plant, and inside the axils where the leaf petioles join the stem. On a small farm, best results are found when a power sprayer is used instead of a knapsack, to get better penetration and aphid control.

Successful treatment of ratoon plantations has been recorded by a farmer in Zambia and can be used as a guideline to control the aphid population[1]:

All ratoon fields should be treated with 4 applications per year 2ml per matt of Imidachlopid 350 SC:

- Irrigated fields 80ml product/20 liter water and apply 500ml drench per matt.
- Dry land fields 40ml product/20 liter water Imidachlopid 350 SC formulation with a minimum of 1 liters drench per matt.

All applications of solutions must be applied to the soil, and not on trash, followed by an irrigation cycle.

Desuckering is of critical importance in trying to keep potential aphid colony numbers down, this needs to be strictly done with only the follow-on sucker being left. All other suckers need to be strictly controlled, especially water suckers should be removed.

[1] Based on procedures implemented by Mr.Gerry Carbin, in Chirundu, Zambia and documented by Elize Jooste (ARC)

Surveillance

Surveillance officers (scouts) should be trained to do spot checks, identify and report suspected plants across the farm. The scouting for Banana Bunchy Top Virus symptoms should be incorporated in other scouting activities and regularly checked.

Farms not yet affected in low-risk areas should perform surveillance activities two to three times a year. Un-infected farms in high risk areas should increase the frequency of surveillance of their banana plants to every two weeks.

Scouts being trained to identify BBTV symptoms.

Reporting Regulations

The Banana Bunchy Top Virus has been identified as a quarantine pest in Mozambique by the Department of Agriculture. Therefore, all persons **must clearly mark and report plants** that show symptoms or are in any other way suspected of being infected by The Banana Bunchy Top Virus in a previously uninfested field. Marking can be done by using flagging tape or spray paint.

Report any suspected plants or items to:

Departamento de Sanidade Vegetal - MASA

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Email: Dep.Sanidade.Masa@gmail.com

Additional Regulations

To prevent the movement of The Banana Bunchy Top Virus inside Mozambique, the National Phytosanitary Authority (NPA) has instituted domestic quarantine measures in Mozambique. The transport of products in contravention to quarantine regulations will be apprehended and destroyed at the site, and all incurred expenses will be under the responsibility of the proprietor.

The following constitutes a contravention of the phytosanitary act:

- The possession, selling, transportation or distribution of quarantined products;
- The assault, intimidation, threatening or obstruction of duties of Phytosanitary Inspectors;
- Non-compliance of instructions defined in the phytosanitary import license;
- Introduction of quarantine products through entry points other than those declared;
- Export and import of product without the fulfilment of phytosanitary conditions;
- Failure to comply with measures established to export products from the quarantined premise;
- Refusal to allow Phytosanitary Inspectors access to quarantined areas for the monitoring, inspection or collection of samples;
- Removal of stamps from packages containing products subject to control;
- False declarations made to obtain phytosanitary documents; and
- Alteration, forging, disfiguration or destruction of any phytosanitary documents.

All further regulations can be found in the *Regulation of Phytosanitary Inspection and Plant Quarantine* on www.masa.gov.mz/agricultura/sanidade-vegetal.

For more information:

www.masa.gov.mz/agricultura/sanidade-vegetal

ANNEX

3 dicas importantes sobre o BBTV

Como prevenir o vírus de topo em leque da bananeira?

- Não transporte plântulas ou socas de bananaeiras de uma zona infectada pela doença para zonas livres da doença.
- Caso queira importar plântulas ou socas de outros países é obrigatório solicitar autorização antecipadamente ao Departamento de Sanidade Vegetal, da Licença Fitossanitária de Importação.
- Usar SEMPRE variedades que apresentam alguma resistência/tolerância à doença.
  Exemplo: *variedades tradicionais locais*

DIRECÇÃO NACIONAL DA AGRICULTURA E SILVICULTURA
DEPARTAMENTO DE SANIDADE VEGETAL

O que fazer com as plantas contaminadas?

- Sempre que encontrar sintomas típicos da doença, informe imediatamente ao extensionista ou as Autoridades da Agricultura locais.
- Confirmados os sintomas, injecte imediatamente o Roundup e um insecticida sem movimentar a planta. Só depois da planta morta é que se deve abater e queimar.
- Não movimente as plantas infectadas e injectadas sem que estejam completamente mortas. Só depois da planta morta é que deve abater e queimar.
- Não transporte plântulas ou socas de bananaeiras de uma zona infectada pela doença para zonas livres da doença.

E-MAIL: dep.sanidade.masa@gmail.com

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E SEGURANÇA ALIMENTAR
DIRECÇÃO NACIONAL DA AGRICULTURA E SILVICULTURA
DEPARTAMENTO DE SANIDADE VEGETAL

VAMOS TODOS COMBATER!

O VÍRUS DO TOPO EM LEQUE DA BANANEIRA

denominado também por **BBTV**

O QUE É O BBTV?

- É uma doença infecciosa causada por um vírus denominado Bunchy Top.
- Constitui uma ameaça à cultura Banana em Moçambique e presentemente, ocorre somente nos distritos de Chókwè e Guijá na província de Gaza.
- O uso de Plantulas/socas livres da doença é a medida mais eficaz para o controlo do BBTV!

APOIADO POR: TECHNOSERVE USDA BananaMoz

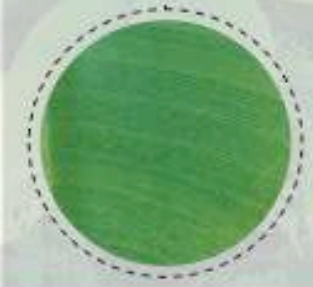
5 SINTOMAS TÍPICOS DO BBTV

As plantas infectadas manifestam sintomas de nanismo, que incluem enrolamento e amarelamento das margens/bordas das folhas.

Os afídeos preferem se alimentar das folhas jovens e sob bainhas foliares. É importante baixar a folha para ver a colónia de afídeos. Os afídeos tem uma relação simbiótica com as formigas.

Aparecem riscas verde-escuras na nervura, pecíolo e flores.

Os vasos do limbo foliar em forma de "J ou anzol" perto da nervura principal, pontos e traços.



Folhas erectas, extreitas, amarelas e atrofiadas