

An outbreak of bacterial wilt on banana in Uganda

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In August 2001, the Mukono district agricultural extension staff reported a previously unknown banana disease with wilt-like symptoms spreading rapidly in the village of Bulyanti, in Uganda. In response, a team of plant pathologists from the National Agricultural Research Organization (NARO) and Mukono District extension workers visited the affected area. Among the farmers visited was Mr Musiitwa, who first reported the disease and whose plantation was the most affected. Several other neighbouring plantations were also visited and disease assessments done. Samples of diseased tissues were collected for isolation and identification of the causal pathogen. Samples were sent to CABI Bioscience in the United Kingdom for further isolation and identification of the causal organism. Farmers and extension workers were asked to report new sightings of the disease. This report summarizes the disease diagnostic activities undertaken and the measures implemented to contain the disease.

The disease

Results from CABI suggested that a bacterium, *Xanthomonas campestris* pv. *musacearum*, was the causal agent. Pathogenicity tests (Koch's postulate) confirmed the disease. This bacterium is known to cause wilt in *Ensete* and in bananas in Ethiopia (Yirgou and Bradbury 1968, 1974).

The disease was observed on both East African highland bananas and exotic (dessert/beer) bananas, but given the prevalence of highland bananas, these were the most affected. In one particular field, the incidence was estimated at 70%, but some of the affected plants had been slashed and uprooted in an attempt to control the disease and it was difficult to identify the symptoms on the uprooted stumps. Despite this, it was evident that the incidence in some of the fields was considerably high.

According to a number of farmers interviewed, the disease was first observed around October 2000 on Mr Musiitwa's plantation. Thereafter, it spread to several plantations in the surrounding areas. The team and farmers

failed to establish how the disease entered the area. It first appeared in a plantation that was over seven years old, suggesting that it had not been transmitted with the planting material. The farmers with the problem indicated that they had gotten their planting materials from local sources. It was not possible to establish the source of the disease from discussions with farmers.

External symptoms

The disease was mostly observed on plants past the maiden sucker stage (although some younger suckers also had symptoms) and recently flowered plants. The major characteristics of the disease are yellowing and complete wilting of the plant starting with the most peripheral leaves, as with fusarium wilt of bananas. However, unlike fusarium wilt, which does not affect East African cultivars, this bacterium affected all banana types. The fruits exhibited discoloration of the pulp when they were sectioned (Figure 1). After wilting, the leaves tend to droop and the plant eventually stops growing and dies.

Secretion of bacterial ooze could also be seen on leaves. Such secretions are absent in the case of fusarium wilt and can be used to distinguish the two diseases on cultivars that are also affected by fusarium wilt (e.g. 'Pisang awak' and 'Gros Michel').

The most commonly observed symptoms are wilting and premature ripening of the bunch, sometimes before it is one month old. In flowered plants, leaves may show wilting symptoms while the bunch is still green, but these bunches eventually ripen and may also wilt.

In heavily affected plants the male bud appears wilted and sometimes discolored (Figure 2). The male bud stalk has yellow discoloration progressing from the base of the male bud towards the bunch. A cream-coloured ooze, typical of many bacterial infections, can be seen in the area closest to the male bud.

Internal symptoms

A pale yellow discoloration was observed in the cross section of the corm of most affected plants. When the pseudostems of affected flowered plants were sectioned,

discoloration was much more apparent in the central stalk that carries the bunch than in the outer leaf sheaths (Figure 3a). A lot of liquid was observed to ooze from the sectioned pseudostems of affected plants, and on leaving the sectioned tissues overnight, the ooze changed into a slimy liquid (Figure 3b).

When fingers from infected bunch were sectioned, they were stained reddish brown. In bananas, this symptom is only caused by bacterial wilt diseases and as such distinguishes this disease from all other banana diseases previously observed in Uganda. The pulp was soft, as when it is ripe, even though the bunch still needed about one and a half months to reach maturity.

Distribution

A survey done in January 2002 revealed that in the Mukono district, the disease was still restricted to a radius of 5 km from the farm where the disease was first identified. Extension workers in the neighbouring areas were asked to be on the lookout for the

disease in other areas. By June 2003, the disease had been reported in more than 15 sub-counties distributed across the districts of Kayunga, Lira, Apac and Kaberamaido – all to the north of Mukono (northern and northeastern Uganda). It is speculated that the disease could have gotten into Mukono from northern Ugandan districts.

According to Yirgou and Bradbury (1974) long distance transmission of the disease is aided through:

- a) Farm tools such as machetes, pangas and pruning knives. Contaminated tools transmit the bacteria through injuries on roots and aerial parts when farming.
- b) Movement of infected plant materials (suckers, bunches, leaves).
- c) Contamination of body parts (hands and feet).
- d) Insects as they look for nectar in flowers.
- e) Animals as they browse from infected to clean plants.
- f) Water when it moves around infected soil.

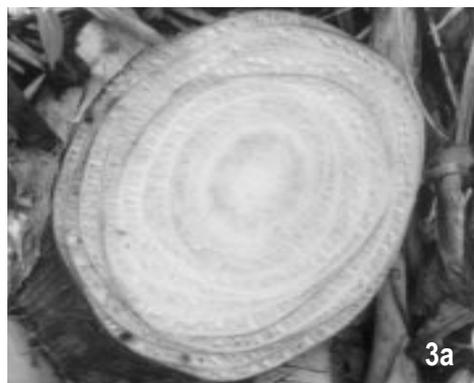


Figure 1. Sectioned fingers of affected bunches.

Figure 2. Cross section of an affected (left) and unaffected (right) male bud.

Figure 3. Internal appearance of a pseudostem: a) pale yellow discoloration, immediately after sectioning, b) characteristic bacterial ooze, three days later.

- g) Rain splash and wind. Rain is believed to aggravate the spread of the disease within a plantation during the rainy season.

Recommendations

It was recommended that general measures be implemented to prevent the spread of this bacterial wilt. They include:

Destroying and disposing of infected plants

The affected plants should be detected early enough and destroyed. Destruction should be complete so as not to allow re-growth.

Disinfecting tools used in managing the plantation

Once the disease is detected in a plantation, tools (pangas, pruning knives/leaf removers etc.) should be disinfected before using them on other plants.

Avoiding planting materials from infected fields

Systemic and soil-borne diseases, such as this banana wilt, are mostly transmitted through diseased planting materials. It is recommended that farmers avoid getting suckers from plantations (areas) where the disease has been sighted. In fact, sucker exchange within the area should be strongly discouraged.

Removing male buds

It is reported that insects also spread the bacteria as they visit banana flowers. It is

recommended to remove the male bud by breaking the supporting peduncle as soon as the last hand of the bunch emerges.

Keeping browsing animals out of infected fields

The animals move the disease from plant to plant as they browse. Farmers are advised to keep them out.

Replacing bananas with another crop

Heavily infected plantations should be replaced with another crop for at least two years.

Quarantine measures

It has been noted that the danger of this disease spreading across the country is very high if measures to contain it are not immediately enforced. Local quarantine measures have been recommended to supplement the disease management measures suggested above. Farmers' awareness of the disease and their full participation in devising/implementing control measures has been adopted to contain of the disease.

References

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Nematodes

Results of a survey on nematodes of *Musa* in household gardens in South Africa and Swaziland

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In South Africa, about 280 000 tons of Cavendish bananas are commercially produced annually on some 16 000 hectares of land. On the cultivation of banana in household gardens in rural areas, however, almost no information exists. Therefore, a preliminary survey was conducted in the main banana growing rural areas of South Africa and neighbouring Swaziland to collect baseline information on the *Musa* varieties grown and the major diseases and pests associated with these bananas. Only the results on nematodes are reported here.

Materials and methods

The survey was conducted from August until October 2000. In South Africa, six areas were visited: Venda in the northern part of the Limpopo province; Bushbuck Ridge in the southern part of the Limpopo province; Komatipoort, Nelspruit and Barberton in Mpumalanga province, northern Kwazulu-Natal; and southern Kwazulu-Natal and the southern part of the Eastern Cape (former Transkei) bordering southern Kwazulu-Natal. In Swaziland, samples were taken in the Lowveld area, which comprises the eastern and southern parts of the country (Figure 1).