USDA Foreign Agricultural Service
GAIN Report
Global Agricultural Information Network

Voluntary - Public

Date: 8/19/2010
GAIN Report Number:

Senegal

Post: Dakar

A mango disease new to Senegal and discovered last year threatens disaster for mango production

Report Categories:

Agricultural Situation

Sanitary/Phytosanitary/Food Safety

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Report Highlights:
In 2009, a mango disease was detected for the first time in Senegal, caused by four species of fungi under the scientific category *Fusarium spp.* Three have been identified, but the fourth remains unknown and under investigation. This disease, reportedly called *Mango Malformation Disease* (MMD), was discovered in southern Senegal and represents the first time it has been detected in West Africa. MMD alone can reportedly cause losses of up to 98 per cent of mango production within three years, an even greater threat than the already problematic fruit fly. Immediate action is needed to control and eradicate the disease by combating widespread contamination in Senegal, not to mention other West African countries.

Background
Post paid a visit to Dr. Lamine Senghor who runs the *Laboratory of Plant Pathology* at the Ministry of Agriculture's *Direction de la Protection des Vegetaux* (*Crop Protection Directorate* or "DPV"). Senghor is researching a disease that affects mango trees to verify its various pathogens or fungi. *Mango Malformation Disease* (MMD) was detected in 2009 in the south of Senegal, specifically in the Kolda, Sedhiou and Ziguinchor regions.

There are three identified fungus species: *F. mangiferae*, *F. suglutinans* and *F. sterilihyphosum.* The fourth has never been identified and reported, but is similar to *F. sterilihyphosum* in outward appearance. Research is being conducted to identify this new specie of the fungus *Fusarium spp.* All species have been localized in the south of Senegal. Egypt and South Africa are the only other African countries to have detected the presence of *Fusarium spp*. with losses up to 98 percent of the production in Egypt before its control.

How it's spread
The disease is normally spread long distances by infected seedlings or grafting buds. Locally, infested parts spread the disease to the entire tree or orchard. Flowers, seedlings, branches and leaves and older trees show symptoms of MMD where fungus develops spores (a primary source of infection) especially during the rainy season. Spores are spread by mango mites or by the wind to infect other trees and orchards.

Impact of damage
The fungus *Fusarium spp*. causes:

- Malformation of flowers that prevent fruit from setting by transforming flowers into leaves. (Fig. 1)
- Malformation on seedlings and even on big trees, causing distortion of the apical buds and mummification. (Fig. 2)

Symptoms can be found on improved varieties (such as the *Keith* and *Kent* varieties) as well as local ones. (Fig. 3 and 4)

Within three years, the disease could practically decimate mango production in Senegal, not to mention the probability of affecting the West African region which is already under attack of fruit fly species such as: *Bactrocera invadens, B. dorsalis, Ceratitis cosyra* and *C. capitata*.

How it impacts trade
Senegal is a big mango exporting country, mainly *Keith* and *Kent* varieties, mostly to the United States and Europe. In 2009/10, Senegal produced 197,000 tons of fruit. Of this, mango production comprises half or 100,000 tons per year worth $30.0 million in country wholesale. To provide an idea of export quantities and sales in selected West African countries (where Post could obtain data), note the following::

West African Countries – Exports of Mangos
Quantity (MT) and Sales (US$millions)
2008 vs. 2009

	2008 MT	$millions	2009 MT	$millions
Senegal	7,164 1/	$5.9	6,650 1/	$4.8
Cote d'Ivoire	12,949 1/	7.2	14,000 1/	6.4
Mali	6,000 2/	6.9	… data not available…	
Burkina Faso	2,500 2/	2.9	… data not available…	
Gambia	(not a mango exporter)			
Guinea	(not a mango exporter)			
Total	**28,613**	**$22.9**		

1/ Global Trade Atlas
2/ *World Bank* study dated January 2009

What's been done
The DPV obtained funding to identify only - but not to take action to combat the disease - from the *International Institute of Tropical Agriculture* **(**IITA**)** of Ibadan and from the *U.S. Department of Agriculture* (USDA) through the *International Plant Diagnostic Network* (IPDN) for the control of pests in West Africa. It also secured support from the *Agricultural Services and Producer Organizations Program* (PSAOP) in Senegal, whereby, DPV's plant pathologist traveled to Nigeria to use lab facilities to help identify fungi.

Since April 2009 after discovering the disease, DPV conducted surveys across the country to gain a clearer idea of the affected areas; follow the progression of the disease progression from 2009 to 2010; and make contacts with local technical services, authorities and farmers. The problem is parties await further action such as mass awareness and sanitation campaigns, but this requires funding. Reports have been sent to local technical services and authorities after surveys for update on the situation

Governmental action has been tepid:

- DPV had officially proposed to the Ministry of Agriculture that it implement quarantine measures, but it has not reportedly been done yet. Transportation needs to be suspended of any mango materials such as seedling and grafting buds from South Casamance to other parts of the country.
- Sanitary measures such as pruning, cutting and incinerating infected parts and if needed, treating with fungicides, has not been done on a wide scale basis.
- Farmers have been told, but there have not been any launching of vigorous awareness campaigns to educate and sensitize administrative authorities, technicians and farmers on the deadly impact

this disease can have on livelihoods. Nurseries should be discouraged from being established in orchards, especially when they are affected by malformation (this practice is common in the Casamance southern part of the country, the only, severely affected area). The best way to avoid the disease is to establish new plantings with pathogen-free nursery stock. Scion material should never be taken from an affected orchard, and any affected plants that are observed in the nursery should be removed and destroyed. Therefore, producers need to stop using grafting materials or make sure that they are from disease free sources.

Call for action

DPV recommends to the following action:

1. Define cartography of affected areas by the disease after the 2009/10 mango campaign and elaboration of a national quarantine program to control the phenomenon nationally.
2. National campaign action of sanitary measures: Cutting, pruning and incinerating affected material throughout Casamance area. The best time for this would be after harvest - June for local varieties and after August for improved varieties. Typically harvest for local varieties occurs March – August and for improved varieties, from March to August. Pruning after harvests allows them time to grow new shoots.
3. Investigation of affected nursery in the same zone and their destruction with the collaboration of the producers, substantial refunding could be implemented
4. Continue isolation and identification of pathogens associated with this disease and the study of the epidemiology of the disease.
5. Search for mango varieties resistant to *Fusarium spp.*
6. Conduct research to determine effective fungicides able to control the various kinds of *Fusarium spp.* associated with mango malformation.
7. Improve cultural practice by systematic pruning, cutting of trees and cleaning orchards after harvest every year.
8. Regular and annual cleaning during and after production of the infected trees in the field and in the nursery.
9. Awareness campaign to the producers and populations about good practices required to avoid propagation of the disease.
10. Installation of surveillance and early warning system.
11. National seminar with PowerPoint presentation across the country to initiate technicians, producers, local authorities and all the actors of mango production for the ease on any implementation of policy regarding the control measures

The plan of action should cover three years to implement a mechanism of monitoring, control and eradication of the mango disease.

Therefore, it is urgent that Senegal takes immediate measures to control and eradicate this disease in the southern regions. Conventionally, affected terminals and the subtending three nodes should be cut from trees, removed from the field and burned. According to scientific literature detailing the experience of Egypt where *fusarium spp*. was also found, if these measures are practiced for two or three consecutive years, the disease can be reduced to insignificant levels. Thereafter, the disease can be kept in check by removing symptomatic tissues every other year. To do so, more funding is needed for short- and mid-term actions as an urgent program.

Post follow-up

On July 18, 2010, Post met with the Director of the Crop Protection Directorate,
Mrs. Marietou Diawara and the plant pathologist, Dr Lamine Senghor, to determine what was needed, both in terms of immediate as well as three year planning to control the spread of the disease. They stated sanitation measures were most pressing. The best time is after harvest (which ends in June for local varieties and August for improved ones). An awareness campaign was needed to show extension agents and farmers how to recognize the disease; understand its deadly impact; prune their trees; and exercise care with grafting materials.

DPV promised to share with FAS Dakar a detailed three year action plan that will include all necessary activities and detailed budget. The estimated total budget for three years should be around $350,000, including laboratory equipment, workshops to sensitize mango producers, diagnosis of the disease, new plantings with pathogen-free nursery stock, and refunds to farmers who destroy infected material. Post will see where it may lend assistance.

Fig. 1. Typical symptoms of mango malformation caused by *Fusarium spp.*; (left) the inflorescence is quasi transformed into small leaves still green; (right) the final stage of the diseases with mummified *Keith* flowers.
(Source: Crop Protection Directorate (DPV) - Laboratory of Plant Pathology)

Fig. 2. Typical symptoms of mango malformation caused by *Fusarium spp*.on seedlings.
(Left) top buds and twigs died after severe attacks of the pathogen.
(Right), tentative regeneration with dead malformed buds and twigs seedlings
(Source: Crop Protection Directorate (DPV) - Laboratory of Plant Pathology)

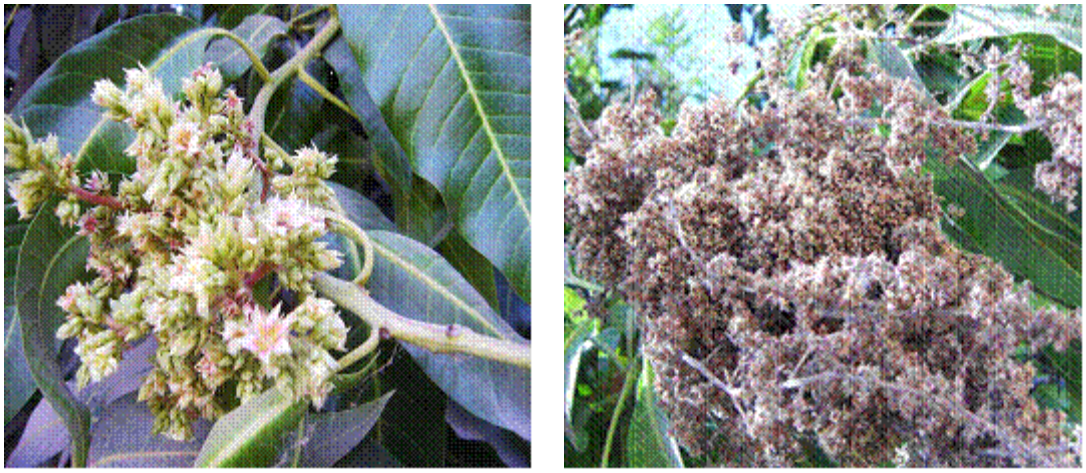

Fig. 3. Typical symptoms of mango malformation caused by *Fusarium spp*. on improved mango variety (known as *Keith* variety). (Left) Primary stage – (Right) advanced stage with mummified flowers.
(Source: Crop Protection Directorate (DPV) - Laboratory of Plant Pathology)

Fig. 4. Typical symptoms of mango malformation showing severity of the disease resulting in only a few mango fruits set.

(Source: Crop Protection Directorate (DPV) - Laboratory of Plant Pathology)