Fungal Leaf Spots in Banana

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Introduction

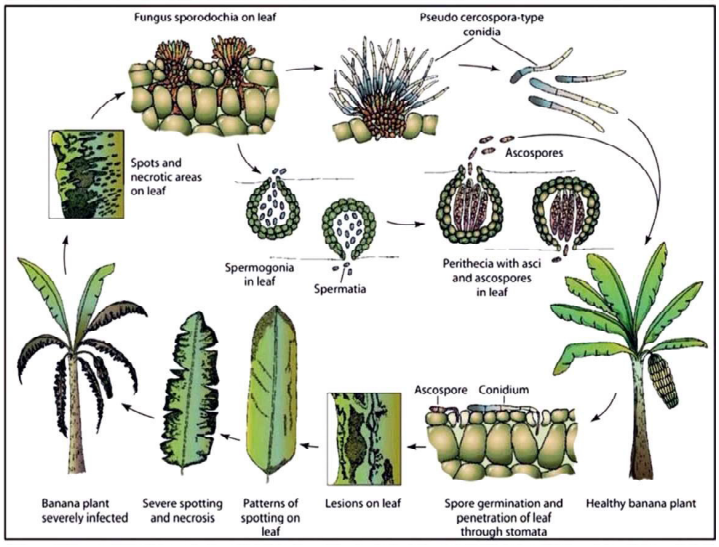
Bananas (*Musa spp*.) are the world's leading fruit crop with 140 million tons of bananas produced annually in subtropical and tropical regions. The fruits are a key staple food in many developing countries and as a source of income for subsistence farmers. It is originated from Indochina and South East Asia (Price, N.S., 1995).

Bananas and plantains are susceptible to several diseases that have been of serious concern to the industry, namely *Fusarium* wilt (Panama disease) caused by *Fusarium oxysporum* f.sp. *cubense* (Maryani *et al.*, 2019), Banana bunchy top virus (*Stainton et al.* 2015) and the Sigatoka leaf spot disease complex (Churchill 2011), which include the most serious leaf spot diseases of banana.

The sigatoka leaf spot disease complex is very destructive to the foliage of banana plants and reduces the photosynthetic area to the plants and causes a yield loss upto 80 percent. Among various *Mycosphaerella* spp., which cause leaf spot disease in banana, *Mycosphaerella fijiensis* (black sigatoka), *M. musicola* (yellow Sigatoka) and *M. eumusae* (septoria leaf spot) are considered as major leaf spot pathogens worldwide. In India, Eumusae leaf spot disease (*Pseudocercospora eumusae anamorph.*) is considered as the most important leaf spot pathogen of commercially grown cultivars of banana (*Thangavelu et al.* 2014).

Epideomology

With black Sigatoka, ascospores and to a certain extent conidia are the propagules by which the fungus is dispersed. Conidia form readily in high humidity, especially if a film of free water is present on leaves. These asexual spores disperse during rain-wash and splashing, causing local spread of the disease. Pseudothecia mature when dead leaf tissues are saturated with water for approximately 48 hours. Ascospores are the primary means of long distance dispersal and are the main means of spreading during extended periods of wet weather. *Mycosphaerella fijiensis* forms relatively few conidia, so ascospores are thought to be more important in



Disease cycle (Agrios, G. N., 2005)

the disease cycle. Sigatoka leaf spot on bananas decreases somewhat during the dry season but otherwise produces more or less continuously repeated cycles of infection. The disease severity is seen more during rainy and winter season, which coincides with advanced vegetative and shooting stages of the crop. It is more prevalent in the states like Tamil Nadu, Kerala, Maharashtra and Karnataka having maximum disease severity of 90-100 percent in cultivars like Grand Naine, Robusta, Nendran (AAB) and Rajapuri (AAB).

Symptomatology

Sigatoka symptoms are characterized by oval to round necrotic lesions, which first appear pale yellow on the lower surface of the leaf (Meredith and Lawrence, 1970). This differentiates it from black Sigatoka at early stages of lesion development. The fungal infection also causes large necrotic lesions on the leaves of banana resulting in loss of photosynthetic capacity, slower filling of fingers, reduced finger size and premature ripening of fruits and finally leading to remarkable yield loss in quantity, reduced quality and marketability of the crop.

Diagnostic symptoms on leaf

Uneven ripening of bananas

Cultural management

Cultural management techniques such as wider plant spacing, better drainage of both water and air, better weed management and removal of severely diseased leaves or portions of them from plants can also be used to obtain some measure of control. Simply removing infected leaves (deleafing) and placing them on the ground can significantly reduce the efficacy of ascospore discharge. The application of urea Phosphorus and Potassium in to infested plant debris on the ground can accelerate decomposition and thus reduce further the available spore inoculum.

Deleafing (a)

Deleafing (b)

Spray schedule

ICAR-NRCB, Trichy, Tamil Nadu recommendations

Days after planting	Qty of chemicals/ liter of water
150 days	Carbendazim 1 g + mineral oil 10 ml
175 days	Propiconazole 1 ml + mineral oil 10 ml
200 days	Carbendazim + Mancozeb combination 1 g + mineral oil 10 ml
225 days	1.4 g of Nativo (Trifloxystrobinn+ tebuconazole)/liter + mineral oil 10 ml
250 days	Propiconazole 1 ml + mineral oil 10 ml
275 days	Carbendazim + Mancozeb combination 1 g + mineral oil 10 ml
300 days	Carbendazim 1 g + mineral oil 10 ml

(R. Thangavelu and N. Marimuthu., 2014)

Conclusion

The symptoms of sigatoka disease complex varied with the cultivar, altitude and season of occurrence. Further investigations on pathogen diversity through intensive survey and identification of resistance sources among Musa spp., to the different pathogens are necessary. Crop losses due to these diseases are very conspicuous and small and marginal farmers cannot afford to control those using pesticides.

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