

Leaf Spot in Ginger Turns Deleterious in Commercial Production

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Ginger is regarded as an inevitable ingredient in various cuisines in China, Japan, India and other South Asian countries. Ginger, which prefers a warm and humid climate, thrives well in heavy lateritic loamy to clayey loam soils.



A manifestation of *Phyllosticta* leaf spot with characteristic papery white centre

Ginger cultivation is predominantly concentrated in India, China, Nigeria, Indonesia, Bangladesh, Thailand, Philippines and Jamaica. India ranks first with respect to production, contributing about 32.75% of world's total production. In India, ginger is commercially cultivated in Kerala, Karnataka, Tamil Nadu, West Bengal, Bihar, Uttar Pradesh, Meghalaya, Sikkim and

Odisha spanning an area of 1,00,270 hectares with production and productivity of 3,97,990 tonnes and 3,969 kg/ha, respectively. Crop loss due to the attack of a broad spectrum of pathogenic microbes, insect pests and nematodes acts as major impediments to ginger cultivation in India and elsewhere. Though soft rot, bacterial wilt and yellows are considered as the major diseases, foliar diseases have received comparatively less attention with respect to disease management perspective. Among the foliar diseases, leaf spot incited by *Phyllosticta zingiberi* and *Colletotrichum zingiberi* are considered as major, which proliferates under favourable weather conditions, resulting in significant reduction of effective photosynthetic leaf area leading to a concomitant reduction in the rhizome yield, if timely management measures are not adopted or deferred.

Phyllosticta leaf spot

Phyllosticta leaf spot initiates as minute oval to elongated spots, especially on the younger leaves. The disease is characterized by the manifestation of prominent discrete spots with typical white papery centres, with brownish margins and surrounded by a faint yellow halo. Subsequently, the spots increase in size and coalesce with adjacent spots thereby expanding the affected area to form large lesions.

Later, the central papery white portion of the spot drops leading to the formation of shot-holes (Fig.1). In the advanced stage of disease

development, the infected leaves become shredded and the crop presents a grey disheveled appearance (Fig.2). During humid weather, conspicuous blackish pin-head size structures are formed on the affected area. In general, the disease is favoured by warm, moist weather conditions. Usually, under field conditions, the disease usually makes its appearance towards the second fortnight of June when the plants are in three to four leaf stage which is the most susceptible growth phase.



Ginger field affected with *Phyllosticta* leaf spot

Weather conditions especially the rainfall pattern, relative humidity (80% to 90%) and temperature (23 to 30°C) prevailing during the crop season adequately favours spread of the disease. Further, during July, the disease

aggravates and spreads faster with an increase in cumulative rainfall. The plants at the age of 6 to 7 months are highly susceptible and leaves that are two weeks old are more vulnerable to the disease.

The intensity of precipitation influences magnitude of pathogen dispersal and consequently the disease severity. Incessant rainfall accompanied by wind exerts an impact on spore-producing structures (pycnidia), resulting in liberation of infective propagules and aids disease spread to greater distances due to splash dispersal. High population density due to

closer planting also provides a conducive microclimate for disease propagation. The pathogen survives in the form of vegetative structures and quiescent propagules in the infected plant debris left after harvesting, Contaminated rhizomes and soil, serve as primary sources of inoculum for the succeeding season.

Colletotrichum Leaf Spot

The foliar symptoms induced by *Colletotrichum* manifests as discrete brownish spots with a greyish centre and apparent yellow halo. As the disease advances, the spots enlarge and coalesce with adjoining spots leading to the formation of large necrotic patches. As the disease progresses, the necrotic central portions may fall leading to the formation of shot-holes (Fig.3). The affected leaves eventually dry, leaving a burnt appearance to the crop (Fig.4). The pathogen survives during the non-cropped season in the infected plant parts or crop debris. The disease spreads under field conditions through the asexual infective propagules favoured by intermittent rainfall and wind currents. High relative humidity and non-judicious application of nitrogenous



Colletotrichum leaf spot characterized by brownish spots surrounded by yellow hallow

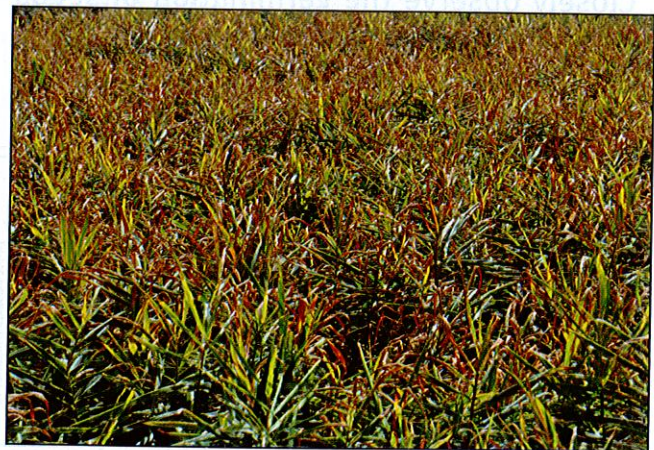
fertilizers pre-disposes the plant to the disease.

Hence, adopt balanced fertilizer application based on standard recommendations.

Management of leaf spot diseases

- Adopting crop rotation with non-hosts reduces the probability of survival of the pathogen during the off-season.
- Adopting strict phyto-sanitation, especially in the endemic regions at the end of cropping season, reduces pathogen population. Since infected plant parts left after harvest serves as sources of inoculum for succeeding season, crop debris should be destroyed preferably by burning.
- The disease severity is found to be higher when ginger is cultivated under exposed conditions. Providing partial shade reduces disease incidence as well as spread. Cultivating annual intercrops that are non-hosts of the pathogen provides an additional income and also reduces disease severity to a considerable extent.
- Application of heavy doses of nitrogenous fertilizers might increase the susceptibility of the plant, thereby aggravating disease severity.

- Adopting spray schedules including recommended fungicides with the appearance of initial symptoms considerably reduces disease spread which may be repeated depending on further spread of the disease. However, care should be taken that the diseases are controlled at the initial stages of development and with minimal fungicide sprays so as to avoid the possible risk of residues in the produce.



General view of ginger field affected with Colletotrichum leaf spot