A REVIEW OF THE DISEASES OF TURMERIC

Turmeric (*Curcuma longa*), an important rhizomatous herb, is chiefly grown for spices in the Indo-Malaysian region. In Pakistan, the crop covers an area of about 1938 ha (Weather and Crop Report, 1977). This is expected to increase in the future. A review of the diseases of turmeric is as follows:

Occurrence and description. Ishaque and Talukdar (1967) recorded *Colletotrichum curcumae* on the twigs of *Curcuma longa*.

Pavgi and Upadhyay (1968) described some parasitic fungi on turmeric: *Taphrina maculans*, *Colletotrichum capsici*, *Phyllostictaz ingeberi*, *Myrothecium roridum* and the new spp. *Phaerobillarda curcumae* Pavgi and Upadhyay and *Cercospora curcumae-longae* P. and U. from Deoria and Gorakhpura districts of India.

Ahmed and Kulkarni (1968) isolated *T. maculans*, from yellowish necrotic lesions on turmeric leaves, by inverting pieces of diseased tissues over cleared and acidified potato dextrose agar, turmeric leaf decoction agar and by streaking ascospore or conidial suspension, incubating at 20°C.

Sholto (1973) while briefly reviewing the cultivation and production of turmeric crop, mentioned rust and anthracnose as its important diseases.

Saikia and Roy (1975) recorded *Corticium sasakii*, for the first time, causing leaf blight of turmeric. The strain of the fungal pathogen was the same as that inducing the leaf and sheath blight of rice.

Persglove (1975) described *T. maculans* as the most serious disease of turmeric producing a profuse deep-yellow spotting and drying up of the leaves. *C. capsici* was found to cause greenish white spots with brown margins where as *Pythium graminicolum* was responsible for rhizome and root rot disease.

Damage. Niar and Ramakrishnan (1973) studied the effect of *Colletotrichum* leaf spot disease of turmeric on the yield and quality of rhizomes. Infection by *C. capsici* reduced dry rhizome yield by 62.7% whereas the percentage oil and cumin yields were slightly increased.

Histopathology. Pavgi and Upadhyay (1967) studied the development of haustorium in *T. maculans*. The blastospores germinating on turmeric leaves were found to develop sub-cuticular hyphae that penetrate the epidermal cell with aseptate pegs, branching and forming cystolith-like haustoria. The latter occur frequently in the hypodermis and mesophyll. Contact with the host cell protoplasm was associated with the layering of the colloidal membranous sheath separating the organel from the protoplasm.

Kulkarni and Ahmed (1968) described the three stages of the development of the leaf spot disease (*T. maculans*), already recognised, on the basis of the histology of field and laboratory infections.

Parasitism. Niar and Ramakrishnan (1973) studied the production of toxic metabolites by *C. capsici* and its role in leaf spot disease of turmeric. The metabolites obtained from the mycelium were endotoxin and those from culture filtrate as exotoxin. Necrosis appeared within 4 hours of treating pricked turmeric leaves with the toxin solution. The necrotic area expanded and a yellow halo was formed within 24 hours. The central necrotic area in these spots was greenish-grey compared with the deepgrey- necrotic area formed by infection with *C. capsici*. It also lacked the reddish margin, the characteristic of the latter.

Niar and Ramakrishnan (1974) studied the effect of infection by *C. capsici* and toxin treatment on the permeability changes of turmeric leaves. A toxin produced by *C. capsici* altered cell permeability at very low concentrations leading to leakage of water soluble constituents. Its possible involvement in the pathogenic process was also discussed.

Niar and Ramakrishnan (1975) recorded observations on the respiratory and enzymatic changes in the *Colletotrichum* inected leaf of turmeric (*C. capsici*).

Epiphytology. Upadhyay and Pavgi (1967) found that early appearance and incidence of leaf spot disease of turmeric caused by *T. maculans* was greatly increased by the abundance of inoculum in the soil and further enhanced by warm and humid weather.

Upadhyay and Pavgi (1967) showed that *T. maculans* persists, during summer, by means of ascogenous cells on leaf debris and desiccated ascospores and blastospores on soil and amongst fallen leaves.

Ahmed and Kulkarni (1968) studied the factors effecting the perpetuation and transmission of the disease caused by *T. maculans*. The pathogen was found to persist as ascospores and conidia, causing primary infection, occurring on the lower leaves in October and November at R.H. 80% and 21 to 23°C temperature. Secondary infection depended on the availability of abundant inoculum, periodically produced under cool and humid conditions. Plant debris and rhizomes of the previously infected crop and soil from turmeric fields did not serve as a primary source of infection.

Genetics and Cytology. Upadhyay and Pavgi (1967/studied comparative resistance of turmeric varieties and *Curcuma amata* to *T. maculans*, the incitant of a leaf spot disease. A variant turmeric clone, selected from a local susceptible variety, remained immune for three cropping seasons and gave a higher yield.

Patil and Moniz (1973) tested the comparative resistance of turmeric cultivars against two isolates of the fungus *C. capsicit*, he cause of a leaf blotch disease. None of

the 19 cultivars was completely resistant where as TS-2, TS-4, TS-79, TS-83 and TS-88 were least susceptible.

Sakai and Singh (1974) described 'cytosome' bodies as an addition to the cytoplasmic organelles of *T. maculans*, appearing in the cytoplasm of turmeric with leaf spot.

Control. Dakshinamurti et al (1966) carried out field trials on the fungicidal control of turmeric leaf spot caused by *C. capsici.* Spraying with Flit 406 (Captan) and Dithane Z-78, at monthly intervals during September to December, was able to control the disease adequately.

Nirwan et al (1972) tested the effectiveness of some fungicides against leaf spot caused by *T. maculans.* Zineb at 0.1% controlled the disease and was superior to five other products including copper compounds and antibiotics.

Reddy and Rao (1973) controlled storage rot in seed rhizomes of turmeric caused by *Sclerotium* (*Corticium*) *rolfsii* by treating the seed with Ceresan wet.

Upadhyay and Pavgi (1974) found Dithane Z-78 at 0.35% most effective in reducing disease incidence to a considerable extent while 0.45% hexaferb increased the rhizome yield.

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