NEW FUNGAL PATHOGENS ASSOCIATED WITH TURMERIC (CURCUMA LONGA L.) IN ORISSA

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The spices and condiment plants have their own merit because of their wide uses and foreign exchange values. India is one of the major producer of spices and condiments in the world. About 63 different spices and condiment plants are grown in India, Out of which only a few of those are being cultivated commercially of the major spices and condiments exported from India, Turmeric (Curcuma longa L.) shares 6.02 percent. (Indian-Journal of Agricultural Science, 1998). The major states of India where these crops are cultivated on commercial basis are Orissa, Kerala, Tamil Nadu, Karnataka, Andhra Pradesh and North Eastern States including Assam, Meghalaya, Manipur, Arunachal Pradesh, Sikkim, and Himachal Pradesh. In Orissa, commercial cultivation of turmeric is being taken up in tribal districts of Koraput, Phulbani and Rayagada. As this crop is grown chiefly under tropical and sub-tropical humid conditions in India, these plants are affected with number of fungal diseases, such as leaf spots, blight, foot rot, and wilt. Reports on occurrence of major diseases in turmeric are leaf spot caused by Colletotrichum ctenioides, anthracnose caused by Taphrina maculans and rhizome rot caused by Pythium aphanidermatum, (Pallarpawar and Ghurdu, 1993; Doohroo and Sharma, 1989).

Diseased specimens of turmeric plant, studied in the present work was collected by the author from the places in and around Bhubaneswar as well as from Phulbani District of Orissa. Most of these specimens were collected during post-rainy season from the month of August-end of October.

Collection and Preservation of Specimens

The specimens were collected and kept in specimen tubes, paper packets and polyethylene bags. A field note on the habitat of the host and the symptoms produced was prepared during the collection. Fresh specimens were photographed and then dried between blotting papers with powdered naphthalene or paradichlorobenzene and pressed in papers. After the specimens properly pressed and dried, they were kept preserved in paper packets along with naphthalene powder and properly accessioned.

Isolation of the Pathogen

The disease causing organisms were isolated into pure cultures by tissue culture method using potato dextrose agar medium (PDA). For this, the diseased specimens were cut into pieces and surface sterilized with 1:1000 HgCl₂ solution for 2-5 minutes and kept over sterilized PDA slants under aseptic condition. The pure culture thus obtained were sub cultured time to time. The different morphological characters of the fungi from the pure cultures were also observed under the microscope and compared with the same fungi obtained from the infected leaves. Identification of these fungus were made up to species level wherever possible by comparing with earlier literatures.

Pathogenicity

The pathogenicity test for some of the diseases was carried out on healthy potted plants. These plants were inoculated with mycelia and spore suspension of respective fungal pathogens grown in 7 day old pure culture. The mycelia and spore suspension was atomized over injured leaves of test plants which were kept in a moist chamber for 24 hours after inoculation. Observations on the development of characteristic symptom on the test plants were taken. Control plants were left in each case and were atomized only by sterile distilled water and kept under identical conditions.
Figure 2 (A) Showing diseases symptom on turmeric leaves (B) Camera Lucida drawing of *Alternaria tenuissima* (C) micro photograph of *Alternaria tenuissima*.

Figure 1 (A) Showing diseases symptom on leaves (B) Camera Lucida drawing of *Colletotrichum curcumiae* (C) micro photograph of *Colletotrichum curcumiae*
Turmeric (*Curcuma longa* Roxb.)

**Colletotrichum curcumae** (Syd.) Butler & Bisby

The leaf spots were characteristic bright orange in color with dark brown concentric rings (1-3 cm) with grey centers. Spots were of variable size appearing more on older leaves. The oblong spots afterwards enlarged and coalesced covering a major portion of the leaf blade. With maturity black dots developed at the greyish spots. Severely infected leaves were found to be dried and withered (Fig.1). Microscopic examination of the infected tissue as well as the pure culture of the pathogen on PDA invariably yielded a species of *Colletotrichum*.

The pathogenicity test was carried out on potted healthy plants with the mycelial and spore suspension (6 × 10⁶ CFU.ml⁻¹) of 7 days old culture. The inoculated plants were kept in moist chamber for 24 hours. After six days of inoculation, typical brownish spots appeared on the inoculated leaves which gradually enlarged to large necrotic patches on the leaves, from which the pathogen was re-isolated.

The mycelium of the fungal pathogen was hyaline, branched, septate and aggregated at places to form stroma with black setae, conidia and conidiophores representing an acervulus typically of the genus "*Colletotrichum*" (Fig. 2 and 3). The conidiophores were hyaline, aseptate, club shaped, bearing conidia singly at the top. The conidia were slightly curved, one end rounded, other bluntly pointed, less granulated with three oil globules, 13.20-23.10mm long and 2.64-4.94mm broad. The setae were dark brown at the base and slightly light brown at upper part, erect to slightly curved, pointed at the apex, measuring 56.10-168.30 x 2.48-4.95mm.

On the basis of morphological as well as cultural characters the pathogen was identified as *Colletotrichum curcumae* (Syd.) Butler & Bisby (Butler and Bisby 1993).

The present species is related to *Colletotrichum capsici* in regularly producing setae, in the host as well as in culture, but it differs from the latter in conidial characters having slightly curved conidia with one end rounded and the other end bluntly pointed and with three oil globules instead of one oil globule. The setae in the present species are bluntly pointed unlike in *C. capsici* where the setae are sharply pointed and conidia are perfectly bent with pointed ends and two oil globules. Moreover, variations among the isolates of *C. curcumae* have been also reported by (Pallarpawar and Ghrudu, 1993). As per the description of these authors the present isolate had similarities with isolate-II as regards conidial and setae characters and absence of formation of setose sclerotia at periphery of colony which were formed in isolate-I of the species. The conidial size in isolate-I was more in comparison to isolate-II.

**(ii) Alternaria tenuissima** (Fries Wettshire)

Microscopic examination of the squash mount of affected host tissue as well as pure culture revealed the presence of a species of *Alternaria*. The cultural characters were abundant aerial mycelia, varying from loose, open, and cottony to close tufted and wooly in appearance, whitish to greyish, greyish to olivaceous, or brown to almost black at the later stage. Microscopic studies revealed the hyphae as hyaline to slightly brownish, septate, 3-6 wide. Conidiophores some what aggregated into tufts or evenly distributed over the colony. Conidiophores simple or rarely branched, erect, olive-brown septate (Septa 5-204mm apart), variably in length (11-112mm), 3-6mm wide, geniculate, often with several scars and slightly swelling terminally; conidia light olive-brown to dark brown, smooth, usually three to five transverse septa and with longitudinal septa in the 2nd and 3rd cells, obclavate with short beaks and sometimes borne in short chains, measuring 20-5 x 9-15mm in size. From the above cultural and morphological characters, the fungal pathogen was identified as *Alternaria tenuissima* (Fries) Wiltshire (Auct.).

**REFERENCES**

