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Studies on caulicolous and ramicolous fungi of Karnataka - IV

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The present papper describes and illustrates the morphological characters of five caulicolous and ramicolous fungi from Karnataka viz., *Chaetomium globosum, Diatrypeela sp., Lecanidion sp., Diplodia sp., Torula herbarum* (Pers.) on jack (*Artocarpus heterophyllus Lamk).* Among the above mentioned fungi *Chaetomium globosum, Diatrypella citricola, Diplodia mutila,* are new host record from India and *Lecanidion atratum* are new report from either South India or Karnataka.

Key words : New host record, India, Caulicolous and Ramicolous fungi, *Chaetomium globosum, Diatrypella sp., Lecanidion sp., Diplodia sp., Torula herbarum* (Pers.)

INTRODUCTION

Artocarpus heterophyllus Lamk [= *A.integrifolia* auct. (non. L.f.)] popularly known as 'Jack tree' belongs to the family Moraceae. A large evergreen tree probably indigenous to western ghats, now cultivated throughout India, Assam being the largest producer of fruits. Also grows widely in southern states viz., Andhra Pradesh, Karnataka, Kerala and Tamil Nadu. Fruits and seeds are used as vegetable and bark is used for tanning. Heart wood is valuable timber and also yellow dye. Timber is used for high class furnitures, musical instruments etc.

In Karnataka the estimate of actual area under this crop is not available. It is rarely grown in plantations, but preferred very much in homesteads and as a shade tree or as a mixed crop.

According to Singh *et al.* (1983), the largest area under jack fruit in India is in Assam, where the area is about 8000 ha. In Bihar the area is approximately 4000 ha. Among species of *Artocarpus* which occur in India, *Artocarpus chaplasia* Roxb., *A. hirsutus* Lamk., and *A. lakoocha* Roxb., are important timber yielding trees. However, *Artocarpus heterophyllus* is mainly grown for edible fruits of commercial importance.

MATERIALS AND METHODS

Study of caulicolous and ramicolous fungi infesting cashew, eucalyptus, jack and jamun was carried in the Department of Plant Pathology, University of Agricultural Sciences, G.K.V.K., Bangalore - 560065.

During the course of mycological survey the fungi infesting dead twigs and branches were collected in jack fruit tree at and around Bangalore and Mysore regions. Infested materials were collected from forest of Gandhi Krishi Vignana Kendra (G.K.V.K.), University of Agricultural Sciences, Bangalore, Main Research Station (M.R.S.), Hebbal, Lalbagh garden, Bangalore, Manasagan-gothri Campus, Mysore and Agricultural Research Station (A.R.S.), Mudigere. At the time of survey, fruiting bodies induced by fungi on infested materials were noted and the samples were brought to the laboratory for further studies. Before isolating, first the materials were cut into 6-7 cm bits, rinsed with water, air-dried and placed them in a moist chamber.

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Conditional or ascomatal features were studied under a stereo-binocular microscope. Materials for examination with a compound microscope were prepared by mounting pycnidia or ascomata or condial materials in lactophenol. Whenever the spores were hyaline, they were stained with dilute cotton blue for examination. Fungi were isolated from the infested twigs and branches of cashew, eucalyptus, jack and jamun obtained at and around Bangalore and Mysore regions of Karnataka. There are number of methods in vogue for isolating a given fungus but the usual method for isolation like single spore isolation technique for coelomycetous, hyphomycetous and ascomycetous fungi was followed as per Booth (1971). An ascoma was scooped from the infested twigs and cultured for isolation of ascomycetous fungi. They were prepared by soaking them in sterile water for 3 hours, air dried and placed it in inverted petriplates containing potato dextrose agar. Ascoma usually discharged ascospores upwards on to the agar within 24 hours. Masses of ascospores were used to start colonies, which were then transferred to PDA slants and incubated at room temperature (Glawe and Rogers, 1982).

Another method was used for isolating the ascomycetous fungi which is as follows : Scoop out an ascoma from the infested twigs or branches and transferred aseptically on to the centre of petriplates containing PDA. The plates were incubated at room temperature. After four days of incubation ascoma germinated and produced colonies, which were then transferred to the edge of PDA slants and sterilized *Typha* leaf bits. Cultures were incubated at room temperature. Since, some fungi do not form readily fruiting bodies in PDA, *Typha australis* Schum and Thonn (= *Typha angustata* Bory and Chaub.) leaf bit inoculation technique (Ponnappa, 1970) was adopted to obtain fruiting bodies for study. Mature leaf bits of *T. australis* were cut to a length of about 5 cm and one end was covered entirely with moist absorbant cotton. Later these leaf bits were inserted into test tubes and sterilized at 15 p.s.i. for 15 minutes. Such leaf bits were inoculated using pure cultures and incubated at room temperature.

Spot inoculation technique was adopted (Ponnappa, 1970) for confirming Koch's postulates. Healthy leaves of cashew, eucalyptus, jack and jamun were surface sterilized in a solution of 1: 1000 nercuric chloride, washed in sterile water and inoculated with pycnidiospore suspension obtained by crushing the pycnidia or ascopores from ascoma or with conidia through wound or injured, uninjured and control were covered by a polyethylene bags for three days and absorbant wet cotton was provided inside to create humidity throughout the period of test. Afterwards the polyethylene bags were removed and inoculated sets were transferred to glasshouse for observation of symptoms. Observations were taken at tegular intervals for infection for a period of 15 days.

The cultural characters of all the fungi isolated from the above mentioned hosts were studied on PDA. Aliquot of 20 ml of PDA was poured into 90 mm diameter petriplates. A five mm disc of mycelial mat cut from the periphery of a four-day-old cultures were used for inoculation. The disc was placed topsy-turvy at the centre of the petriplate by means of a sterilized inoculation needle. After inoculation, the plates were incubated at 26 ± 1°C for five days. Three replications were maintained for each fungus. The maximum colony diameter was recorded for each plate from the different days and the cultural characters for all fungi of PDA were recorded. Differences in topography type of margin, colour and consistency were recorded. The spores of all the fungi taken from one-month-old-culture grown on sterilized *Typha* leaf bits were mounted in water on a clean slide. Spores were thoroughly mixed with water, so that a uniform spread was obtained, and then a fresh clean coverslip was placed over it. One hundred spores without any bias, of each of the fungi were measured under high power calibrated ocular micrometer. Camera lucida drawings were made under high power and or oil immersion for all the fungi. The average size of the spores of all the fungi was then determined. The size of the fruiting bodies and conidiophores were also neasured separately.

The specimens studied were deposited in the MYSP Herbarium in Plant Pathology Department, Agricultural College, University of Agricultural Sciences, G.K.V.K., Bangalore and also a few were deposited at CMI, Kew, London. The accession

numbers were given along with the descriptions.

RESULTS AND DISCUSSION

Chaetomium globosum Kunze ex Fries, Saccardo, Syll Fung., 1 : 222, 1882. Fig. 1

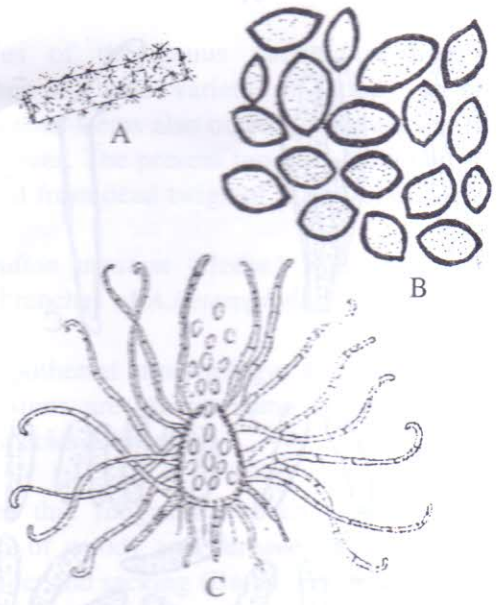

Fig. 1 : *Chaetomium globosum*, A. habitat ; B. Conidia (x 1000) ; C. perithecium (x 100)

Habitat

On dead branches of *Artocarpus heterophyllus*, Hebbal, 22.12.987; Lalbagh, Leg. S. S. madhukeshwara and C. Govindaraju, U.A.S., Bangalore Herb. MYSP 2041 Det. K. M. Ponnappa and P. F. Cannon.

Chaetomium globosum on potato dextrose agar colonies were effuse, dull white to green, with irregular margin, thin, wavy, perithecia superficial, dark greenish black to brownish black, sub-globose to oval 576-640 (608) × 486-576 (530) µm in size and provided with a circular ostiole. They are attached to the substratum by light brown rhizoid like hyphae and are clothed with hairs laterally and terminally. The terminal hairs are diffusely aggregated around the upper half of the perithecium. They are light green or grayish, finely roughned or coarsed, septate, slender less than 200 µm width at the middle, flexuous below, undulate above with often extend beyond the spore mass. The lateral hairs are straight, slightly light coloured, not constricted at septa, about 3 µm wide near the base with often curved tips. Asci are clavate with narrow stalk, thick walled, octosporous, quickly evanescent, ascospores are irregularly biseriate in asci, one-celled, olivaceous brown, smooth, thickwalled usually lemon shaped, distinctly apiculate at both the ends 8.0-11.0 (9.5) × 6.5 -8.5 (7.5) µm in dimensions. They are extruded in a long cirrhus which is supported by the surrounding terminal hairs.

Disease caused by diatrypaceous fungi are typically found on dead of declining hosts. Parasitic or saprobic on many trees. The present collection of fungi *Diatrype* sp., *Diatrypella* sp. and *Diatrypella indica* were isolated from dead twigs and branches of trees such as jamun, jack and cashew respectively.

Remarks

The species of the genus *Chaetomium* kunze ex Fries very common and ubipuitous, saprophytes on dung and decaying vegetable of all kinds throughout the year.

Chaetomium globosum has a wide host range very common and ubiquitous. Lodha (1964) reported this fungus on cowdung from Rajasthan. Srivastava (1964) recorded same species in *Luffa acutangula* Roxb., from U.P., on leaves of *Cirnum asiaticum* L. from Bihar (Prasad *et al.*, 1966); from seeds of *Trachyspermum amni* (L.) Spraguel., *Coriandrum sativum* L., *Cuminum cyminum* L., etc., from different parts of India (Swarup and Mathur, 1972); Sharma *et al.*, (1984) reported that soft rot of *Ziziphus jujuba* (L.) Lam. Non Mill. caused by C. *globosum* from Agra. This is, therefore, a new record of *Chaetomium globosum* on *Anacardium occidentale, Artocarpus heterophyllus* and *Syzygium cumini* from India.

***Diatrypella* sp.** Fig. 2

Habitat

On dead stems of *A.heterophyllus;* A.R.S., Mudigere; 18.2.1988; Leg. C. S.S. Madhukeshwara

and C. Govindaraju, U.A.S., Bangalore Herb. MYSP 2045 Det. K.M. Ponnappa.

Diatrypella sp on PDA colonies white, rather felty with little aerial growth. Ascomata erumpent through the bark of the dead twig, innumberable protruding ostiles; grayish perithecia 384-512 (448) µm in diameter ; asci unnitunicate, yellow, cylindric to clavate with a long stalk, 73-103 (83.0) × 11.5-15.0 (13.5) µm many spored (polysporus) ; paraphyses present hyaline, filiform; ascospores, slightly curved, hyaline, pale yellow in mass allantoid, single celled, irregularly polyseriate, measuring 6.0-7.0 (6.5) × 1.5-2.5 (2.0) µm in dimension.

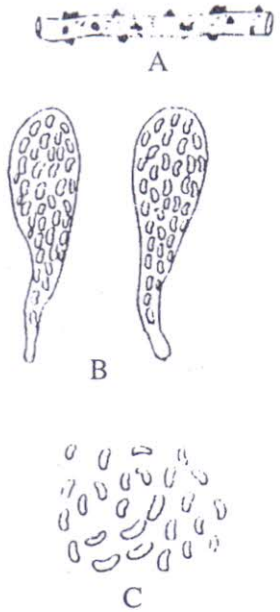

Fig. 2 : *Diatrypella sp.*, A, habitat ; B, asci (x 400) ; C, ascospores (x 400)

Remarks

The morphology, colonies character on PDA, asci and ascospores dimensions closely agree with *Diatrypella citricola* Ell. and Ev.

Earlier Ramachandra Rao (1965) reported *Diatrypella azaliae* Ramanchandra Rao and Deshpande on dried stems of *Azalia indica* L., from Tamil Nadu. Later Panwar *et al.*, (1974) recorded *D. citricola* on dead twigs of *Lantana* sp. from Rajasthan, and also Rizwi (1977) observed the same species on *Lantana camera* from Bihar. Glawe and Rogers (1982) observed cultures and anamorphs and described six spp. of *Diatrype and Diatrypella* from U.S.A. There is no record of *D. citricola* on *Artocarpus heterophyllus.* This is a new host record to India.

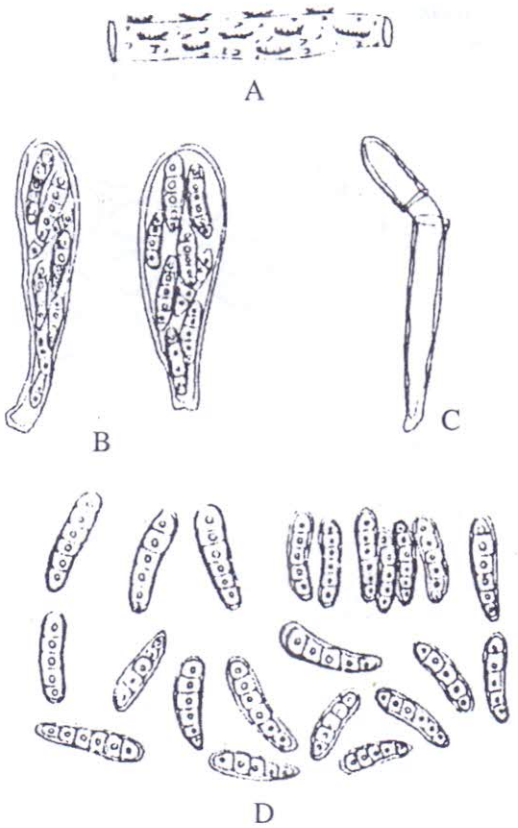

Fig. 3 : *Lecanidion* sp., A, habitat ; B, asci (x 400) ; C, bitunicate ascus ; D, ascospores (x 400)

Lecanidion sp. Fig. 3

Habitat

On dead branches of *A. heterophyllus ;* Mudigere, 18.2.1988 ; Leg. S. S. Madhukeswara and C. S. S. Madhukeshwara and C. Govindaraju, U. A. S., Bangalore Herb. MYSP 2044 & Harb. IMI 325655 Det. A Sivanesan

Apothecia superficial, sessile, scattered upon dead branches, saucershaped, smooth, black, disc flat, or typically patelliform or accasionally elliptical with an elevated margin 576-960 (768) × 384-704 (504) µm in dimension ; asci clavate, short stipitate, thick-walled, bitunicate, 64.5-95.o (80.0) µm in length and 11.5-15.0 (13.0) µm in width, octosporous ; ascospores irregularly biseriate, thick-walled, clavate with blunt apex and gradually

tapering below, often slightly curved, hyaline, 5-6 septate with distinct oil globules, 19.0-30.5 (24.5) × 1-3.8 (2.4) µm in dimension ; paraphyses numerous, filiform septate, branched at the tip extending above the asci.

Remarks

Species of the genus *Lecanidion* Endle. Are saoribes of wide variety of woody plants and herbaceous stems also on bark and twigs of various forest trees. The present fungus *Lecanidion* sp. was isolated from dead twigs of *A.heterophyllus.*

Lecandion atratum (Hedw.) Endl. isolated from dead branches of *A.heterophyllus.*

The apothecial morphology, asci and ascospores dimensions are almost same compared with the type species *L.atratum.*

Earlier this fungus has been reported on wide variety of woody and herbaceous stems, old rugs, old paper and sacking (Butler, 1940); *L.atratum* was also reported in decorticated wood by Dennis (1968).

There is no record of any *Lecanidion atratum* from South India.

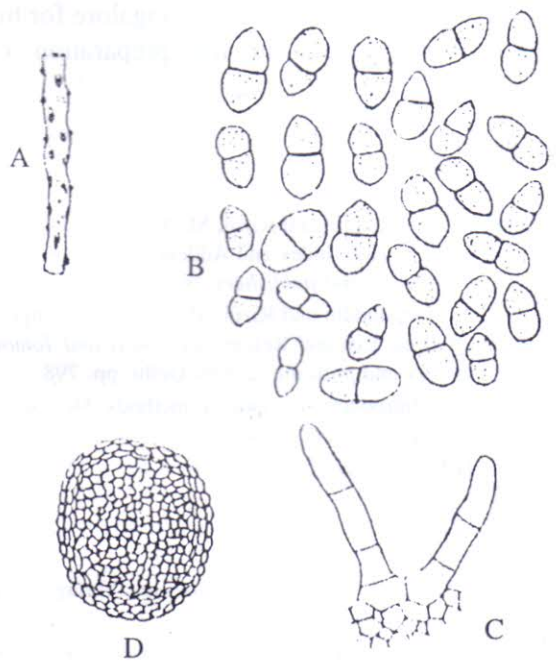

Fig. 4 : *Diplodia* sp., A, habitat ; B, conidia (x 400) ; C, conidiophores (× 400) ; D, conidioma (x 100)

Diplodia mutila Fig. 4

Habitat

On dead barks of *A.heterophyllus;* Manasagangothri Campus, Mysore, 20.2.1988 ; Leg. S. S. Madhukeshwara and C. Govindaraju, U.A.S., Bangalore, Herb. MYSP 2043, Det. K. M. Ponnappa.

Diplodia sp. on PDA mycelium immersed, effuse, thin, dull white to pale brown or green with irregular margin. Reverse of petriplate pale gray Conidiomata pycnidial, numerous, dark brown to black, gregarious, solitary, globose, sub-epidermal, unilocular, thick-walled, usually below the bark, ostiolate 400-450 (425) µm in dimension ; conidiophores simple, straight, septate, 40-50 (45) × 3-5 (4) µm in dimension; conidia at first hyaline and single celled, then dark brown, two celled, constricted at septa, epispore slightly darker, smooth, 16-26.5 (21) × 8.0-11.0 (9.5) µm in dimension.

Remarks

Disease caused by the species of the genus *Diplodia* Fr. occur on stems, twigs, roots and leaves of various trees from different parts of the India.

The present species of *Diplodia* is having smaller pycnidia than the *Diplodia mutila* (Fr.) Mont. upto 600, but conidiophores and conidial dimension are more or less same. This fungus is, therefore, disposed of as *Diplodia mutila,* Teleomorph = *Botryosphaeria stevensii* Shoemaker.

It has also a wide host range, earlier Thakur and Agarawala (1972) reported *Diplodia mutila* on small twigs and branches of apple from Uttar Pradesh, on *Acacia arabica* (Lamk.) Willd., *A. farnesiana* (L.) Wild., *A.modesta* Wall., A. sp., *Fraxinus excelsior* Wall., *Lycopersicon esculentum* wall., *Malus pumila* Mill., *M. sylvestris* L., etc., from France, Eire, Cyprus, New Zealand, Sarawak, Australia, India, pakistan etc (Sutton, 1980). However, *A. heterophyllus* is the new host record for *D. mutila* from India.

Torula herbarum (pers.) Link ex S. F. Gray, Nat. *Arr. Br. Pl.,* 1 : 557, 1821. Fig. 5

Habitat

On dead stems of *A.heterophyllus;* Hebbal, 15.2.1988; Leg. S. S. Madhukeshwara and C. Govindaraju, U.A.S., Bangalore. Herb. MYSP. 2166 Det. K. M. Ponnappa.

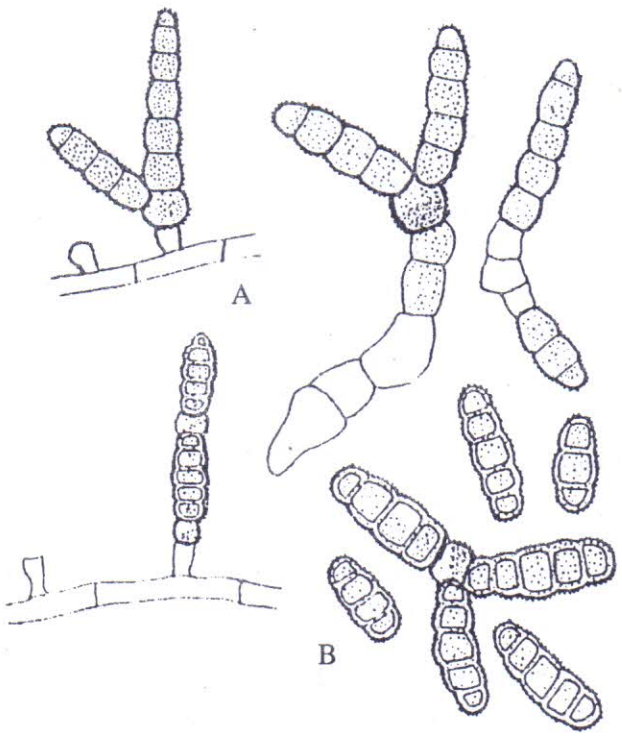

Fig. 5 : *Torula herbarum*, A, conidiophores, conidiogenous cells with developing conidia (× 400) ; B, conidia (x 1000)

Torula herbarum (Pers.) Link ex Fr. Colonies on PDA variable in size, olive when young, black when old, velvety conidiophores micronematous, simple, straight, hyaline to sub-hyaline, verrucose, 2-6 µm ; conidiogenous cell, polyblastic, terminal, determinate, spherical, verrucose 7-8 (7.5) µm dimension ; conidia dry, straight or slightly curved more or less cylindrical rounded at the ends, pale olive to brown, simple or branched chains, verrucose or finely echimulate, 3-10 (mostly 4-5) transverse septa, constricted at septa.

Remarks

Species of the genus *Torula* Persoon ex Fries, are very common on dead herbaceous stems, also found occasionally on leaves, woods old backing etc.

Subramanian (1952) reported *T.herbarum* on dead stems of *Acalypha* sp. From Tamil Nadu; on dead stems of *Barleria* sp. and on dead stem of *Artocarpus integrigolia* L. from Kerala. Srivastava (1964) recorded the same fungus on dried and infected leaves of *Sansevieria macrophylla* Thumb., from U.P. Kamal and Bhargava (1970) observed *T.herbarum f. quaternella* Sacc. from soil from U.P. This fungus is very common on dead herbaceous stems, also found occasionally on leaves, wood, old racking etc., and isolated from air and soil (Ellis, 1971). This is a new record from Karnataka on the same host

The study has revealed new and note worthy fungi from the taxonomic view. (Bilgrami *et al.,* 1981; 1991 and Butler, 1997). The study is helpful to database researchers on biodiversity and further useful in decomposition studies.

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