

Some Fungi Isolated from Alkaline Soils of Uttar Pradesh, India

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Acres of land around Varanasi and other areas of Uttar Pradesh are covered with an alkaline soil. The soil is generally silt and covered with a whitish grey deposit of alkaline salts of Na, K, Ca and Mg etc. These (soils) are known as 'Usar' soils. The pH value of the soil leachate ranges between 8.5 and 11. The scant surface vegetation of the rainy season mostly consists of some resistant grassy weeds such as *Cynodon dactylon* Pers., *Ipomoea carnosia* Br. and a few other grasses. Relatively little is known about the fungal flora of the 'usar' soils (Rai and Mukherji, 1961). Some interesting fungi isolated from these soils around Varanasi are described here. Tolerance of these fungous species to such a high alkalinity of the soil is very interesting.

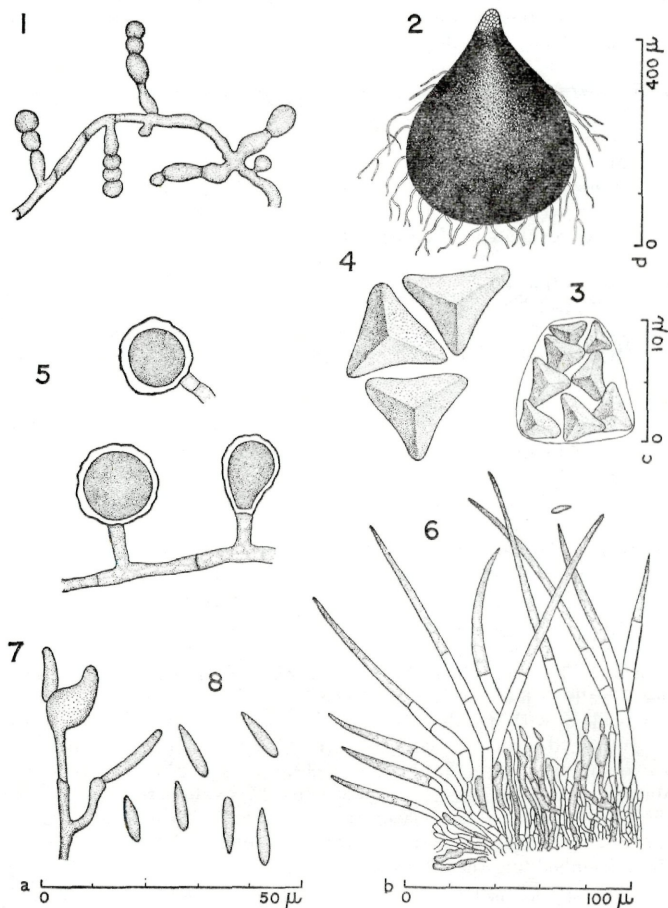
A soil sample of a 15 cm deep profile was scooped out with a sterile spatula and stored in sterile Erlenmayer flasks. The fungous isolations were made by dilution plate method on peptone dextrose agar (KH₂ PO₄ 1 g, MgSO₄ 0.5 g, peptone 5 g, dextrose 10 g, agar agar 20 g and dist. water 1000 ml; rose bengal 1: 30,000 parts/and streptomycin 30 µg/ml added aseptically after autoclaving). 1g: 1000 ml soil suspension in sterile dist. water was spread uniformly on the plated medium and the plates incubated for 2—3 days at 25—26° C. Individual colonies of the fungi were transferred onto potato dextrose agar slants (pH 6.0). Duplicate cultures have been deposited with The Centralbureau voor Schimmelcultures, Baarn, Netherlands and The Commonwealth Mycological Institute, Kew, England.

1. *Isaria cretacea* v. Beyma in Zbl. Bakt. 91: 345—355, 1935.

Isolated from soil in Varanasi, U. P. on 16 February, 1968. Leg. M. P. Haware. (IMI 135426).

The fungus readily grows over potato dextrose agar developing a pale yellow mycelial colony producing long, slender, snow-white, simple to palmately brnached synnemata in 20—25 days of incubation; they measure 2.5—3 cm × 0.5—0.8 mm and profusely bear the conidia acrogenously. The fungus closely resembles *Isaria cretacea* in its morphology and organization of synnemata, to which species it is referred. The species has not so far been reported from India and this report constitutes the first report of its occurrence here.

2. *Cephalosporium acremonium* Corda in Icon. Fung. III, p. 11.
1839. Saccardo, Sylloge Fungorum 4: 56, 1886.



Figs. 1–4. Conidiophore, conidia, perithecium, ascus and ascospores of *Microascus trigonosporus*; — Fig. 5. Conidiophore and conidia of *Humicola indica*; — Figs. 6–8. Sporodochium, conidiophore and conidia of *Myrothecium roridum* var. *apiculatum*.

Isolated from soil in Varanasi, U. P. on 26 February, 1968.
Leg. M. P. Haware. (IMI 135431).

The fungus is widely distributed as a soil inhabitant in various locations in the world including India (Subramanian, 1952; Suka-pure and Thirumalachar, 1966). This collection reports its occurrence in a distinct ecological situation.

3. *Scopulariopsis brevicaulis* (Saccardo) Bainier in Bull. Soc. Myc., France 23: 98, 1907.

Isolated from soil in Varanasi, U. P. on 26 February, 1968.
Leg. M. P. Haware. (IMI 135432).

Occurrence of this fungus, though widely distributed elsewhere, has apparently been reported from India on substrates other than the soil. It is prevalent in alkaline soils as well.

4. *Microascus trigonosporus* Emmons and Dodge in Mycologia 23: 317—318, 1931.

Isolated from soil in Varanasi, U. P. on 26 February, 1968.
Leg. M. P. Haware. (IMI 135433). (Figs. 1 to 4).

Growth of the fungus on potato dextrose agar is dull grey, slow becoming light brown to dark brown on aging with the development of conidia and closely dotted, dark blackish ascocarps. The mycelium consists of hyaline, septate hyphae, 1.2—3 μ in diam. Conidiophores arise directly and are erect, unbranched bearing apically a chain of spores or are branched variously bearing conidia over short sterigmata singly or in fascicles. Conidia are formed in catenulations characteristic of *Scopulariopsis*. The conidia are single-celled, ovate to lemon-shaped, smooth measuring usually 4.2—5.5 \times 2.3—3.3 μ .

Perithecia develop in cultures soon after the conidial crops wane out. Initially they appear as scattered, minute black specks. Young perithecia are minute, round, yellowish brown bodies surrounded by a mass of hyphae. Mature ascocarps are globose with carbonaceous black walls in 6 to 8 cell layers, measuring 175—300 μ in diam. They are beaked with papillate ostioles. Mature asci are oval to ovate, irregularly distributed along the periphery of the ascocarp. They are octosporous, 8—12 \times 7—9 μ , deliquescing within the ascocarp. Mature ascospores are triangular, smooth, hyaline to light brown, thickened on one side, measuring 4.5—5.5 \times 3—3.5 μ . They are discharged out of a ruptured ascocarp as a long, light reddish brown cirrus embedding the ascospores in a gelatinous matrix.

The species isolated is very close to *M. trigonosporus* Emmons and Dodge in most of the morphological characters. It was first reported from dermal infection of a human being in Puerto Rico (Emmons and Dodge, 1931) and later reported from seed infections on cereals and legumes from U.S.A. (Whitehead *et al.*, 1948). The ascigerous

stage of the fungus appears relatively sparse in occurrence and the present report adds yet another habitat for the fungus, living as a saprophyte in highly alkaline soils. Its occurrence constitutes a new record for India.

5. *Humicola indica* sp. nov.

Colonies on potato dextrose agar white, turning olive brown on aging. Hyphae septate, hyaline when young, becoming brown on aging, 3–4 μ in diam. Conidiophores short, branched, subcylindrical or little dilated upward bearing a single conidium terminally. Conidia typically globose, pale brown to dark brown with thick, rough walls, measuring 10–18 μ in diam.

Isolated from soil in Varanasi, U. P. on 16 February, 1968. Leg. M. P. Haware. Type (MSP no. 364) (IMI 135430). (Fig. 5).

Caespituli in "potato dextrose agar" primum albidum, postea olivaceum; hyphae septatae, primum hyalinae, postea brunneae, 3–4 μ crassae; conidiophora ramulosa, subcylindracea vel superne leniter incrassata, in apice conidium unicum efficientia; conidia globosa, brunnea vel obscure brunnea, episporio crassiusculo, asperulo, 10–18 μ diam.

Traaen (1914) described the Dematiaceous genus *Humicola* Traaen on the basis of thick-walled aleurisporae and lack of phialides on the conidiophores. Species of the genus have been relatively few, cellulolytic, soil-inhabiting organisms with a preference to alkaline media. The species under study is closely related to *Humicola grisea* Traaen, but differs from it in the larger size of aleurisporae and their rough wall surface in the present isolate. In *H. grisea*, the aleurisporae measure 9–16 μ in diam. Bakshi *et al.* (1956) reported earlier an unidentified species of *Humicola* from the soil of shisham forest in India.

6. *Myrothecium roridum* Tode ex Fries var. *apiculatum* var. nov.

Mycelium on potato dextrose agar profusely branched; hyphae hyaline, septate. Sporodochia formed on surface of the colony, greyish white to pale green in the beginning turning jet black after formation of setae. Sporodochia composed of interwoven hyphae. Conidiophores short, erect, compact in layers, tapering towards the tips and measuring 8–10 \times 2.5–3 μ . Conidia unicellular, smoky grey, cylindrical with apiculate ends and 7–9.5 \times 1.2–2 μ .

Isolated from soil in Varanasi, U. P. on 16 February, 1969. Leg. M. P. Haware. Type (MSP no. 365) (IMI 135427). (Figs. 6 to 8).

Mycelium in "potato dextrose agar" profuse ramosum; hyphae hyalinae, septatae; sporodochia in superficie caespituli orta, primum griseo-albida vel pallide virescentia, postea nigrescentia, ex hyphis convolutis composita; conidiophora brevia, erecta, superne attenuata,

8–10 × 2.5–3 μ ; conidia continua, cylindracea, obscure viridula, utrinque apiculata, 7–9.5 × 1.1–2 μ .

The isolate differs from both *M. roridum* Tode ex Fr. and *M. carmichalii* Grev. in shape and size of conidia. The conidia of our isolate measuring 7–9.5 × 1.2–2 μ show apiculate ends, whereas those of *M. roridum* (5–11 × 1–3 μ) and *M. carmichalii* (8–13 × 1–2 μ) have blunt rounded ends.

Acknowledgement

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