GILMANIELLA HUMICOLA — A SOIL INHABITING CELLULOLYTIC HYPHOMYCETES

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In connection with screening of cellulolytic saprophytic fungi, active in soil of Assam and Meghalaya, a systematic study was undertaken. Among the various fungi isolated from the soil of these regions, *Gilmaniella humicola* Barron was found to be high cellulose-decomposing organism, which is hitherto unrecorded as active cellulose-destroying fungus.

INTRODUCTION

During the course of study of cellulose-destroying micro-organisms of Assam and Meghalaya regions of India, *Gilmaniella humicola* Barron was recovered. The fungus was distinguished by the production of aleuriospores singly or in group at the apex of short simple or branched inflated conidiophores. It was described by Barron (1964) from the forest soil of Ontario. The fungus is not uncommon in soil and was isolated in Cambridgeshire and Yorkshire in England, in Egypt (Barron 1968) and in Rishikesh (India) (Subramanian and Lodha 1964) as a new coprophilous genus, *Adhogamina ruchira*. In present studies this fungus was isolated from various soil samples, collected from Assam and Meghalaya. The isolate showed very high degree of cellulose decomposition, which was hitherto unrecorded as active cellulose-destroying fungus, and is therefore considered as a strong cellulose decomposer in Assam and Meghalaya soil and also an interesting record of soil inhabiting cellulolytic hyphomycetes.

MATERIALS AND METHODS

Collection of soil samples from different regions of Assam and Meghalaya and isolation of soil fungi was made as described by Chauhan and Agarwal (1974). The cellulose-destroying capacity was determined by cambric cotton test strips following the method described by Agarwal (1974) and after incubation the fungus growth was gently washed off the test strips and they were dried at room temperature. The strips were conditioned at approximately 65 per cent R.H. and 22°C for 48 hr and then broken at a B.S. testing machine to determine their loss in strength. The average breaking strength of incubated, uninoculated (control) strips was used for calculating percentage loss in strength of inoculated test strips. Different cellulosic materials viz. clothing cotton, cordage cotton, cordage sunn, paper pulp, paper liner, bamboo paper, cotton fibres and wood were tested by pure culture test (Nigam 1965).

Results and Discussion

The fungus *Gilmaniella humicola* Barron was found frequently distributed all over the soils of Assam and Meghalaya region. Out of 14 localities, i.e., Arunachal, Bhalukmara, Chapurmukh, Dibrugarh, Dimapur, Gauhati, Jorhat, Ledo, Lumding, Misamari, Rangiya, Shillong, Simulaguri and Tinsukia, this fungus was recorded in soil samples of 8 localities, i.e., Arunachal, Dibrugarh, Gauhati, Ledo, Lumding, Misamari, Shillong and Tinsukia and one isolate from each locality was taken into consideration for further studies. All the 8 isolates were morphologically similar and their identification was confirmed through courtesy of Director, Commonwealth Mycological Institute, Kew, England. The isolates showed the following characters.

Fungus grows rapidly on P.D.A.; colonies whitish to pale in the beginning and later quickly turned to pale brown with conidial production and finally fuscous. Numerous minute water droplets were common on the aerial hyphae, conidia were produced rapidly and abundantly over the entire colony.

Vegetative hyphae hyaline to brown, 1.5–5.0 μ broad, septate. Conidiophore simple and filiform or clavate, sporogenous cell and stalk cell frequently inflated, 5–25.0 μ long and 1.5–3.0 μ broad, hyaline. Conidia borne apically singly or in clusters of up to four, dark brown, smooth, spherical, nonseptate, 7–10 μ in diameter with well-marked apical germ pore.

All the 8 isolates were tested for their cellulose-destroying capacity and the data as presented in Table I, indicate that all the isolates of *Gilmaniella humicola* have approximately the same capacity for degradation of cotton cambric cloth. When the strips were incubated for 7 days and the maximum losses in fabric strength caused by the isolates of *Gilmaniella humicola* was 100 per cent, i.e., complete loss within 7 days and in this way showed effective cellulolytic activity.

The growth of fungus on various cellulosic materials, e.g., cotton clothing, cordage cotton, cordage sunn, bamboo paper, paper liner, paper pulp, cotton fibre and

Table I

Cellulose degradation capacity within 7 days

Place from where the fungus was isolated	Breaking strength* of cambric cotton cloth (in kg)	Percentage loss of cambric cotton cloth
Control	35	—
Arunachal	1.3	96.2
Dibrugarh	0.0	100.0
Gauhati	6.3	82.0
Ledo	0.0	100.0
Lumding	2.8	92.0
Misamari	2.8	92.0
Shillong	0.0	100.0
Tinsukia	1.3	96.2

*Mean of 6 replications.

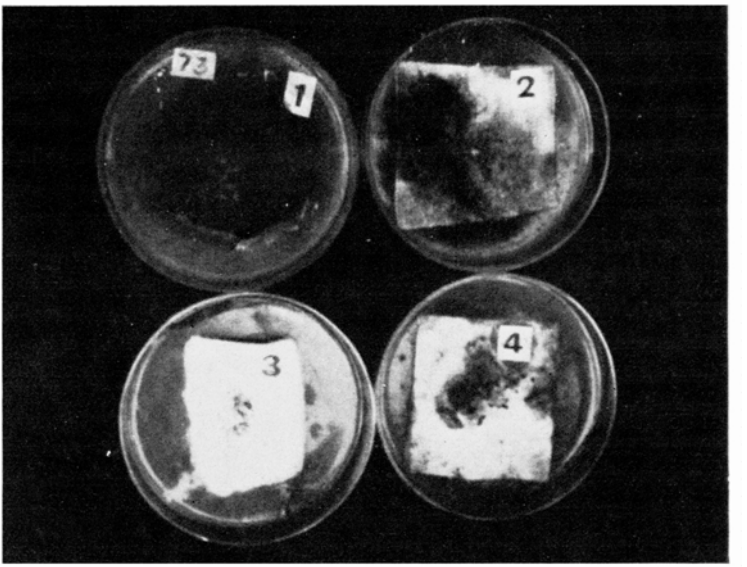

FIG. 1. Fungal growth on different cellulose materials. 1, Pulp; 2, Textile cotton; 3, Cotton fibres; and 4, Bamboo paper.

wood was studied. The results indicated that the growth was profuse on all the materials except cordage sunn and wood. Cordage sunn and wood showed moderate growth of fungus. It is therefore indicated that the fungus had effective cellulolytic activity on cellulosic materials and was capable to cause the degradation of cellulosic materials. (Fig. 1).

So far much work has been conducted with regard to cellulolytic fungi in relation to degradation of cellulosic materials but *Gilmaniella humicola* was not included in the list of cellulolytic fungi (Siu 1951; Greathouse and Wessel 1954; Gascoigne and Gascoigne 1960: Agarwal 1970). Soil microflora of Assam with special reference to cellulolytic microorganisms, was studied by various workers (Sahgal *et al.* 1965; Tandon *et al.* 1971) but their work did not indicate the presence of this fungus in the region of Assam. Nigam *et al.* (1972) who reviewed the fungi responsible for degradation of service materials in India and listed the various fungi which were responsible for degradation of service stores also did not report the existence of fungus *Gilmaniella humicola* Barron. During present investigations *Gilmaniella humicola* was recorded, which plays a very important role in degradation of cellulosic materials, as an active cellulolytic fungus among soil-inhabiting hyphomycetes.

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