

## NEUROSPORA TETRASPERMA : ITS OCCURRENCE IN INDIAN SOIL AND ITS CELLULOLYTIC ACTIVITY

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*Neurospora tetrasperma*, which is hitherto unrecorded from India, was isolated from the soils of Assam and Meghalaya (India). The isolates were tested for cellulolytic activity by determining their ability to cause strength loss in cambric cotton strips and by their growth on different cellulosic materials. The isolates proved to be cellulolytic in nature.

### INTRODUCTION

With increasing interest in the biological degradation of cellulose, many attempts have been made to find out new cellulolytic fungi. Systematic studies are being carried out in our laboratory to investigate the various cellulolytic fungi present in soils of Assam and Meghalaya regions of India. During the course of these studies *Neurospora tetrasperma* was recovered, which is unrecorded from Indian soil. The fungus was distinguished by the production of large perithecia with long asci having four large ascospores. It was described by Shear and Dodge (1927), although the species of *Neurospora* are widespread in nature in imperfect stage, the perfect stage is isolated rarely from soil. It was isolated from the soils of Georgia (Miller *et al.* 1957) and Honduras (Roger 1963).

In the present studies this fungus was isolated from various soil samples, collected from Assam and Meghalaya (India) and on screening, the isolates showed effective cellulolytic activity, which is hitherto unrecorded.

### MATERIALS AND METHODS

Collection of soil samples from different regions of Assam and Meghalaya, and isolation of soil fungi was made as described earlier by Agarwal (1975). The isolate of *Neurospora* was obtained after steaming the soil and then plating it in petri dish containing potato dextrose agar medium (Warcup 1951). It did not appear in other isolation methods (Agarwal 1975).

The cellulolytic activity was determined by following the method described by Agarwal (1975) and the breaking strength of test strips was determined at a Good Brand breaking testing machine (Annon. 1959). The average breaking strength of inoculated, uninoculated (control) strips was used for calculating percentage loss in strength of cotton cambric test strips. Different cellulosic materials viz., clothing cotton, cordage cotton, gunny bags, bamboo paper, writing paper, cotton fibres and wood were tested by pure culture test (Nigam 1965).

## RESULTS AND DISCUSSION

The soil samples used for isolations showed pH range of 6.7 to 7.2, average moisture content of 7.5 to 25.0 per cent and temperature range of 22 to 33°C. In the present studies, this fungus was recorded from the soil samples of Dibrugarh, Ledo and Tinsukia and one isolate from each locality was taken into consideration for further studies. All the isolates were morphologically similar and their identification was confirmed through the courtesy of the Director, C.M.I., Kew, England. No record of this fungus was found for its occurrence in Indian soils before these studies. The isolate showed typical characters of the species.

Growth on Czapek's dox agar, poor with conidial formation only. Perithecia formed at later stage and at temperature below 25°C. Growth is profuse on potato dextrose agar with early development of perithecia. Culture is deposited at C.M.I., Kew, No. I.M.I. 181708.

All the three isolates were tested for their cellulose-destroying capacity and results indicated that all the isolates of different localities have approximately the same capacity for degradation of cotton cambric cloth, e.g., from Ledo—30.0%, Dibrugarh—28.5%, and Tinsukia—35.7%, when the strips were incubated for 7 days. Thus they showed effective cellulolytic activity.

The growth of fungus on various cellulosic materials, e.g., cotton clothing, cotton fibre, cordage cotton, gunny bags, bamboo paper, writing paper and wood, was studied, and all the tested cellulosic materials were examined visually for qualitative assessment of fungal growth. The results indicated that the growth was profuse only on cotton clothing, cotton fibre and cordage cotton, whereas gunny bags, writing paper, bamboo paper and wood did not support the growth of the fungus. It is, therefore, indicated that the fungus had effective cellulolytic activity only with the cotton cellulose and was capable of bringing out the degradation of cotton materials.

So far much work has been conducted with regard to cellulolytic activity of various fungi, but these aspects have not been studied in case of *Neurospora tetrasperma* (Siu 1951; Agarwal 1970). Studies of soil mycoflora of Assam with special reference to cellulolytic micro-organisms were carried out by various workers (Sahgal *et al.* 1965; Tandon *et al.* 1971) but their work did not indicate the presence of any species of *Neurospora* in the region of Assam and Meghalaya. Nigam *et al.* (1972), who reviewed the fungi responsible for degradation of service materials in India and listed various fungi, which were responsible for degradation of service stores, also did not report the existence of *Neurospora*. During the present investigation, two species of *Neurospora* were isolated, e.g., *N. dodgei* and *N. tetrasperma*, both of which were unrecorded from India. *N. dodgei* was reported earlier by the present authors (1975) and the present paper deals with *N. tetrasperma*. The isolation of *N. tetrasperma* is important because the fungus has effective cellulose-degradation capacity in regions of Assam and Meghalaya (India) against the cotton cellulose.

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#### REFERENCES

- Agarwal, C. P. (1975). Studies on soil mycoflora of eastern tropical regions of Assam and Meghalaya and their role in microbial degradation of cellulose materials. Ph. D. Thesis. Agra University, Agra.
- Agarwal, C. P., and Chauhan, R.K.S. (1975). *Neurospora dodgei* : A new record for India. *Proc. Indian natn. Sci. Acad.*, **B41**, 541-542.
- Agarwal, P. N. (1970). Recent work on microbiological deterioration and its control. *Labdev. J. Sci. Tech.* **B8** (3), 123-130.
- Anonymous, (1959). Method for testing cotton fabrics resistance to attack by micro-organism. Indian Standard Specification No. IS : 1389.
- Miller, J. H., Giddens, J. E., and Foster, A. A. (1957). A survey of fungi of forest and cultivated soils of Georgia. *Mycologia*, **49**, 779-808.
- Nigam, S. S. (1965). Laboratory test methods in microbiology. Issued by D.R.L.(M), Ministry of Defence, Kanpur.
- Nigam, S. S., Agarwal, P. N., and Tandon, R. N. (1972), Fungi responsible for degradation of service materials in India. *Labdev. J. Sci. Tech.*, **B10**, 1-8.
- Roger, D. G. (1963). Further observation on soil fungi in Honduras. *Mycologia*, **55**, 142-150.
- Sahgal, D. D., Gupta, U. S., Nigam, S. S., and Agarwal, P. N. (1965). Microbial deterioration of tentage in hot-humid regions of Assam. *Defence Sci. J.*, **15**, 225-228.
- Shear, C. L., and Dodge, B. O. (1927). Life histories and heterothallisms of the red bread mould fungi of the *Monilia sitophila* Group. *J. Agric. Res.*, **34**, 1019-1042.
- Siu, R. G. H. (1951). 'Microbial Decomposition of Cellulose'. Reinhold Publishing. Co., New York.
- Tandon, G. P., Chatterji, M. G., Nigam, S. S., and Tandon, R. N. (1971). Study of soil microflora from soils of different regions of Assam. D.R.L.(M) Tech. Report No. 38/71.
- Warcup, J. H. (1951). Soil-steaming : A selective method for the isolation of ascomycetes from soil. *Trans. Br. mycol. Soc.*, **34**, 515-518.