TABLE I

General features of new male sterile cultures in pearl millet

Female/cyto-plasmic base	Downy mildew infection (%) in		Frequency of male sterile cultures	Agronomic features of new male sterile lines
	Female base	Donors*		
Tif. 23 A	100%	Nil	1	135–140 cm tall; 20–25 cm long, compact ears; tillers 8–12 per plant; and 50% flowering in 50–55 days in contrast to 120 cm height; 15–20 cm ear length; 4–5 tillers and 50–58 days of flowering of Tif. 23 A. Downy mildew absent for the last three years under field conditions.
Tif. 23 D_2A	100%	Nil	12	70–95 cm tall; 20–30 cm long, compact ears with flushy stigmatic emergence; 7–10 tillers; and 45–60 days of flowering as compared with 75–80 cm height; 15–20 cm long ears; 5–6 tillers and 52–58 days of flowering of Tif. 23 A. No downy mildew seen under field conditions for the three successive years.
J 126 D_2A	1–2%	Nil	13	130–140 cm tall; 40–45 cm long and compact ears; 4–6 tillers and 50–58 days of flowering in comparison with 135 cm height; 30–35 cm long but lax ears; 3–4 tillers and 65–68 days of flowering of J 126 D_2A. Downy mildew absent but ergot present. Nine cultures have yellow endosperm.

* Donors were employed only once in crossing with female base during I BC phase.

only 26 lines were finally marked for testing their combining ability for yield and its components. General features of these male sterile lines are presented in Table I.

In order to evaluate the breeding values of these lines, 11 of them were crossed with two potential inbred testers, namely, DC 1011 and DC 1021, in our breeding stocks. Testing of these lines under artificial epiphytotic conditions for disease reaction is also in progress.

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1. Maunder, A. B., In: *Sorghum in Seventies* (Eds. N. G. P. Rao and L. R. House), Oxford and IBH Publishing Co., New Delhi, 1972, p. 60.

AMYLASE PRODUCTION BY *SYNCEPHALASTRUM* SPECIES

MICROBIAL production of amylase has been known for a long time and various mesophilic[1–3] as well as thermophilic fungi[4] have been known to produce amylase. *Aspergillus oryzae*, *A. niger* and *Rhizopus* sp. are even exploited industrially for the production of amylase[5]. Among the members of Mucorales, only *Mucor* and *Rhizopus* species have been reported to produce amylase. However, there are no reports of production of amylase by *Syncephalastrum* sp.[6,7], a relatively less common member of Mucorales.

This communication reports some of the growth characteristics and amylase production by *Syncephalastrum* sp.

During routine isolations from the soil, a species of *Syncephalastrum* was isolated and maintained on potato-dextrose-agar by serial transfer. It was allowed to sporulate and the spore suspension was prepared

in sterile distilled water to a final count of 2×10^8 spores/ml. This suspension was used for studies on growth and amylase production.

The spore suspension (2 ml) was inoculated in Czapeck-Dox medium with individual carbon sources and incubated at $30 \pm 2°$ C for a number of days. It was found that the growth was poor on this medium and hence for subsequent experiments yeast extract (0·5%) was added. The individual carbon sources used were starch, sucrose, glucose, fructose and carboxy-methyl cellulose. The growth in submerged culture continued till 8 days and 5 days with starch (3%) and sucrose (3%) as sole carbon sources respectively. The pH of the medium also dropped during the growth and became normal (pH 5·2) in the later phase of the growth, indicating the production of organic acids during growth and their subsequent re-utilization. The identification of the organic acids is in progress.

Amylase production by *Syncephalastrum* sp. was studied in submerged culture with starch and sucrose as carbon sources. The culture filtrate was used as a source of crude enzyme. The dinitro salycilic acid method (DNSA) was used for the determination of amylase activity[8]. From the results obtained it was found that the amylase production by *Syncephalastrum* sp. continued till eight days with starch as sole carbon source. However, it was found that when sucrose was used as sole carbon source the enzyme production continued only for two days, with a maximum of 38·3 Units/flask. The maximum production of amylase with starch as sole carbon source was achieved on 6th day of growth (520 Units/flask). The enzyme activity steadily increased from the first day till the 7th day and then decreased significantly on the 8th day. These results suggest the inducible production of amylase, though some constitutive production cannot be overruled.

Although the appearance of amylase in the young cultures filtrates of this fungus is only *prima facie* evidence regarding extracellularity, it suggests that this amylase may be true extracellular enzyme. Similar results were obtained by Somkutti and Babel[9] with *Mucor fusillum* lipase. Further work regarding the conditions of induction of this enzyme is in progress. During the production of amylase the pH of the medium also decreased from pH 5·8 to 4·2. suggesting the production of organic acids.

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1. Corman, J. and Tsuchiya, H. M., *Cereal Chem.*, 1951, **28**, 280.
2. Pool, E. L. and Underkofler, L. A., *J. Agri. Food Chem.*, 1953, **1**, 87.
3. Windish, W. W. and Mhatre, N. S., *Advances in Appl. Microbiol.*, Ed. Umbreit, W. W., Academic Press, New York, 1965, **7**, 273.
4. Mangalam, S., Subramanyan, A. and Gopalkrishnan, K. S., *Curr. Sci.*, 1977, **46**, 16.
5. Prescott, S. C. and Dunn, C. G., *Industrial Microbiology*, McGraw-Hill, New York, 1958, p. 674.
6. Cochrane, V. W., *Physiology of Fungi*, John Wiley and Sons, New York, 1958, p. 110.
7. Ainsworth, C. G. and Sussman, A. S., *The Fungi*, Academic Press, New York, 1965, **1**, 487.
8. *Manual on Amylase*, Sarabhai Research Centre, Baroda.
9. Somkutti, G. A. ond Babel, F. J., *Applied Microbiology*, 1968, **16**, 617.

FUNGISTASIS DUE TO VOLATILE INHIBITORS PRODUCED BY SOME *PENICILLIUM* SPECIES

It is well known that all living things elaborate volatiles at the normal temperatures of their environments. Through several compilations of the extractions of volatiles from various sources have appeared[4,6,7,13]. Only limited studies have been made with regard to their possible significance in the realm of microbial ecology. One such sphere of microbial ecology is that of soil fungistasis in which, the term 'fungistasis' was coined[3] to explain the phenomenon of the viability of fungal propagules in the soil which was affected even in the realm of conditions which were otherwise favourable for the germination of spores. Recent years have seen the reports of workers[1,5,8] who explained the widespread presence of volatile inhibitors amongst various groups of microorganisms and their significant role in maintaining soil fungistasis. Workers from our laboratory[9,11,12] have reported that many fungi, especially the species of *Aspergillus* and *Penicillium* can produce substantial amounts of volatile inhibitors which can cause fungistasis in soil.

The present study deals with the effect of volatiles produced by 5 selected species of *Penicillium*, viz., *P. janthinellum*, *P. canescens*, *P. expansum*, *P. granulatum* and *P. duclauxi*, against a set of pathogenic and saprophytic fungi in relation to (*a*) spore germination, (*b*) culture growth and (*c*) mycelial weight.

The study of the effect of volatiles produced by penicillia on spore germination of test fungi was followed