

GROWTH RESPONSE OF SIX THERMOPHILIC FUNGI AT DIFFERENT INCUBATION TEMPERATURES

BY

K. R. ANEJA, NEELAM DHAMI AND VEENA

Department of Botany, Kurukshetra University, Kurukshetra 132 119, India.

Growth response of six thermophilic fungi isolated from the aerospora of Kurukshetra and faecal matter of rats and guinea pigs were studied at different incubation temperatures ranging from 15°C to 65°C. The growth rates of different fungi varied from 0.28–0.97 mm/h at their optimum temperatures. *Chaetomium thermophile* and *Rhizomucor pusillus* were the fastest growing fungi. Excepting *Aspergillus fumigatus* which was found to be a thermotolerant fungus, rest all i. e. *R. pusillus*, *C. thermophile*, *Chrysosporium tropicum*, *Malbranchea cinnamomea* and *Humicola insolens* were found to be true thermophilic in nature.

Key words : Growth, Thermophilic Fungi.

INTRODUCTION

Temperature is one of the important factor which influences various life processes and life forms. There is a certain range of temperatures in which the life processes can continue. Thermophilic fungi are characterized by their growth optima at elevated temperatures. According to Cooney and Emerson (1964), thermophilic fungi are those which can grow between 20°-50°C and above, their optimum temperature for growth is between 40°-50°C. Thus to justify their thermophilic nature it is necessary to test their temperature limits of growth. Keeping in view this fact the present investigation was undertaken.

MATERIALS AND METHODS

Six fungal isolates, *Aspergillus fumigatus* Frese., *Rhizomucor pusillus* (Lindt.) Schipper (*Mucor pusillus*), *Chrysosporium tropicum* Carmichael., *Malbranchea cinnamomea* (Lib.) van Oorschot and de Hoog (*M. pulchella* var. *sulfurea*), *Chaetomium thermophile* La Touche, and *Humicola insolens* Cooney and Emerson, were isolated from the air (inside and outside of an animal house) of Kurukshetra and faecal matter of rats and guinea pigs. These fungi were studied for their response to different temperatures. Medium used for testing the growth response was yeast starch agar (YpSs) medium (Emerson, 1941).

Mycelial discs of 8 mm diameter were used as inoculum, which were cut from the periphery of 3-4 days old, actively growing colony. Five replicates/incubation

temperature/fungus were used. The incubation temperatures were 15°C, 25°C, 35°C, 45°C, 55°C and 65°C. For the temperatures above 35°C petri dishes were placed in polyethylene bags and a beaker of sterilized distilled water was also placed in the polyethylene bag to avoid dessication. The bags were open twice daily to aerate the cultures. This arrangement was made to make up for the water loss at high temperatures. Observations were recorded after 12 h interval. Growth response was recorded in terms of colony diameter and the rate of growth of each fungus was calculated following Singh and Sandhu (1982), which is as follows :

$$\text{Growth rate} = \frac{\text{Average diameter of the colony in mm}}{\text{Total incubation time (h)}}$$

RESULTS AND DISCUSSION

A perusal of the Figure 1 shows that no growth was recorded in any of the six test fungi, viz. *Rhizomucor pusillus*, *Chrysosporium tropicum*, *Malbranchea cinnamomea*,

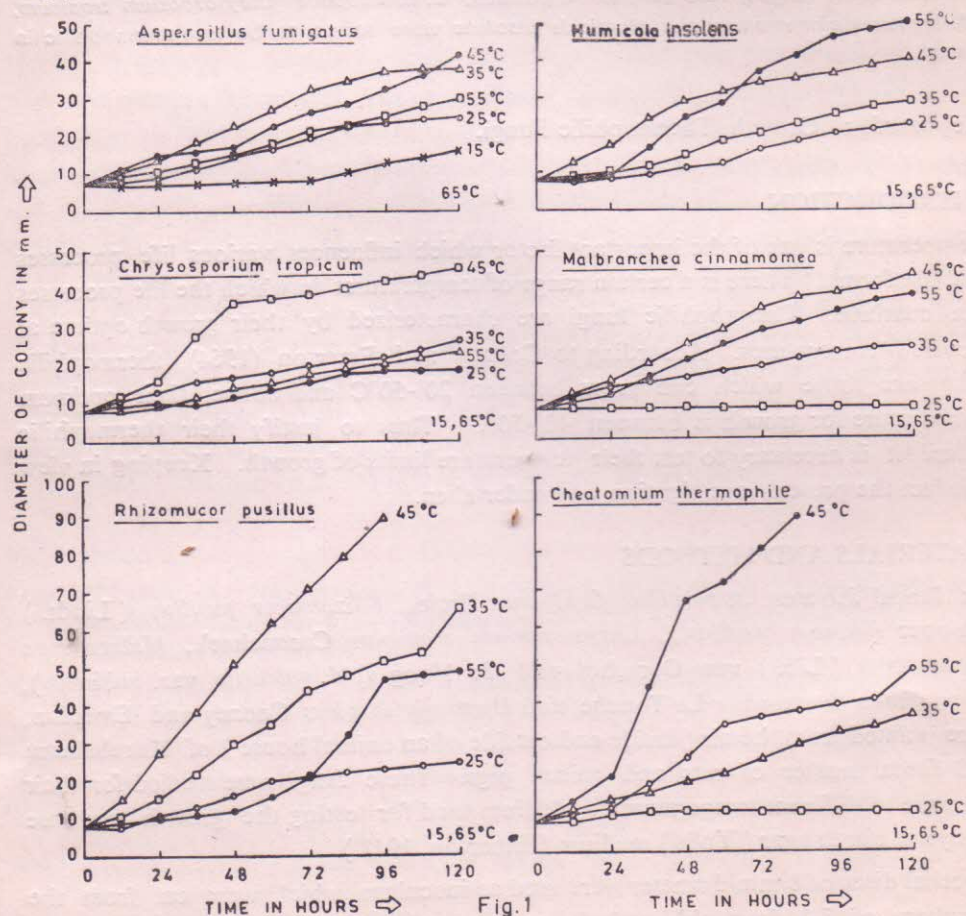


Fig. 1. Growth response of six thermophilous fungi at different temperatures.

Chaetomium thermophile, and *Humicola insolens* at 65°C and 15°C upto 120 h of observations except *Aspergillus fumigatus* which could grow at 15°C. The rate of growth for *A. fumigatus* lies around 45°C (Figs. 1 and 2) and is in accordance with Singh and Sandhu (1982). Rate of growth for *R. pusillus* at 25°C is 0.14 mm/h, at 35°C it is 0.48 mm/h, at 45°C it is 0.85 mm/h and at 55°C the growth is 0.34 mm/h. Thus the optimum temperature for *R. pusillus* lies around 45°C (Figs. 1 and 2) and is close to Fergus (1964), Evans (1971), Singh and Sandhu (1982) and Aneja and Paul (1987). The growth rate for *H. insolens* is maximum at 55°C i.e. 0.38 mm/h, at 45°C it is 0.28 mm/h, at 35°C it is 0.18 mm/h and at 25°C it is 0.12 mm/h. Thus the optimum temperature for growth of *H. insolens* lies in between 45°C and 55°C. The rate of growth for *C. tropicum* at 25°C is 0.9 mm/h at 35°C it is 3.18 mm/h, at 45°C it is 0.32 mm/h while at 55°C the growth is 0.13 mm/h. Thus the optimum temperature for growth of this fungus lies around 45°C. The rate of growth for *M. cinnamomea* at 35°C is 0.13 mm/h at 45°C it is 0.30 mm/h and 55°C it is 0.25 mm/h while there was no growth at 25°C. Thus for *M. cinnamomea* optimum temperature for growth lies at 45°C which is slightly different than that of Chapman (1974) who reported 35-40° as the optimum temperature for its growth. The rate of growth for *C. thermophile* at 25°C is 0.03 mm/h, at 35°C it is 0.24 mm/h, at 45°C it is 0.97 mm/h while the growth at 55°C is 0.34 mm/h. Thus the optimum temperature for growth of *C. thermophile* lies around 45°C (Figs. 1 and 2) and is close to that recorded by Evans (1971) and Tansey (1971).

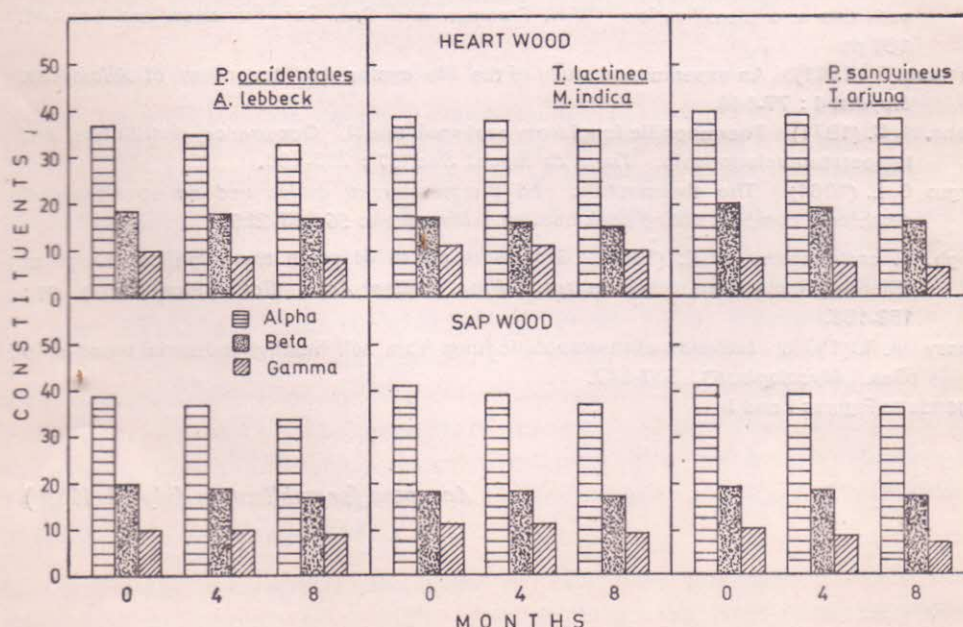


Fig. 2. Growth rate of six thermophilous fungi at different temperatures.

Based on their growth rates, *C. thermophile* and *R. psyllus* are fast growing while *M. cinnamomea*, *A. fumigatus*, *C. tropicum* and *H. insolens* are slow growing thermophilic fungi according to the categorization of Singh and Sandhu (1982).

Based on the growth response shown by the six fungi towards different incubation temperatures, it has been observed that except *A. fumigatus*, all the rest five fungi could grow fairly well at higher temperatures of 35°-55°C and were unable to grow at 15°C, thus fitting well in the category of true thermophilic fungi of Cooney and Emerson (1964) and are, therefore, true thermophiles. *A. fumigatus* which could also grow at 15°C is a thermotolerant fungus. All these fungi can be called thermophilic fungi according to the definition of Evans (1971) since they are able to grow at 45°C.

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Legends to Figures I and II

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