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Effect of pH and Temperature on the Nematode Destroying Fungus, *Paecilomyces lilacinus*

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ABSTRACT

The growth of *Paecilomyces lilacinus* (in buffered and unbuffered medium) in a pH range of 5-9; and its survival upon exposure to high temperatures (40-50°C for 0-10 days) was studied in Potato Dextrose Broth *in vitro*. *P. lilacinus* had the tendency to alter the initial pH (acidic or basic) towards neutrality. The fungus could grow at all pH levels. However, growth was better in unbuffered medium. *P. lilacinus* can survive exposure to 40°C for 10 days, 45°C for 6 days and 50°C for 24h. However, the resumption of normal growth at 28 ± 1°C was delayed.

Key Words : *Paecilomyces lilacinus,* pH, temperature

Paecilomyces lilacinus (Thom.) Samson has recently been found to be a promising biocontrol agent for various phytonematodes (Jatala *et al.,* 1979). The potential of this fungus in controlling nematodes has been experimentally proved and demonstrated in different countries (Jatala *et al.,* 1980, 1981; Jatala, 1985), and efforts are afoot towards its mass propagation (Cabanillas *et al.,* 1989).

Temperature and pH are considered vital for the growth and survival of micro-organisms. In earlier studies (Villanueva and Davide, 1984), as well as in preliminary studies conducted in our laboratory, *P. lilacinus* has been found to grow within a temperature range of 15-35°C, optimum being 30°C. However, in many parts of India, there are drastic fluctuations in the atmospheric temperature (0-48°C). *P. lilacinus* has been reported to grow in a pH range of 3-11, 7.5 being optimum (Villanueva and Davide, 1984). However, in these studies, unbuffered media were used, and it is presumed by us that the fungus has the inherent capability to modify the ambient pH in its micro-environment towards neutrality which is optimum for its growth and sporulation, and thus the initial pH *per se* may not be playing important role.

Considering these factors, studies were undertaken with the expectation that if *P. lilacinus* is introduced in our agro-climatic environment, it can resist the buffering action of the soil pH, and survive when exposed to extremes of high temperature.

MATERIALS AND METHODS

Effect of pH

Two sets of Potato Dextrose Broth were prepared, each with initial pH 5,6,7,8 and 9. In one set (unbuffered), the pH was adjusted in HCL/NaOH; while in the second set (buffered), O.1 M citrate buffer (for pH 5 and 6) and 0.1 M Tris buffer (for pH 7,8,9) were used. The experiment was conducted in 250 ml Erlenmeyer flasks, each containing 100 ml of the medium with desired pH level. A loop-full of *P. lilacinus* (Peru isolate) spore suspension was inoculated to each flask, which were incubated at 28±1°C in dark. Observations were taken on dry mycelium weight and final pH of the growth medium, after one and two weeks. There were six replicates for each treatment.

Effect of Temperature

The experiment was conducted in 10mm dia. test tubes each containing 10 ml of Potato Dextrose Broth. Batches of 15 tubes were inoculated with *P. lilacinus* (as above) and exposed to 40, 45 and 50°C in an incubator for 0,1,2,3,4,6,8 and 10 days. After the desired exposure times, all the tubes were transferred to 28± 1°C in an incubator, and the fungus growth monitored till 21 days.

RESULTS AND DISCUSSION

Effect of pH

In the buffered medium, at initial pH 5 and 6, the final pH stabilised around 6 after two weeks, while at 7,8 and 9 initial pH levels, it changed to around 7.5. In the unbuffered medium, irrespective of the initial pH level, the final pH after 2 weeks of growth stabilised around 7.6 (Fig.1A).

The fungus growth in unbuffered medium as revealed by the dry mycelium weight, was

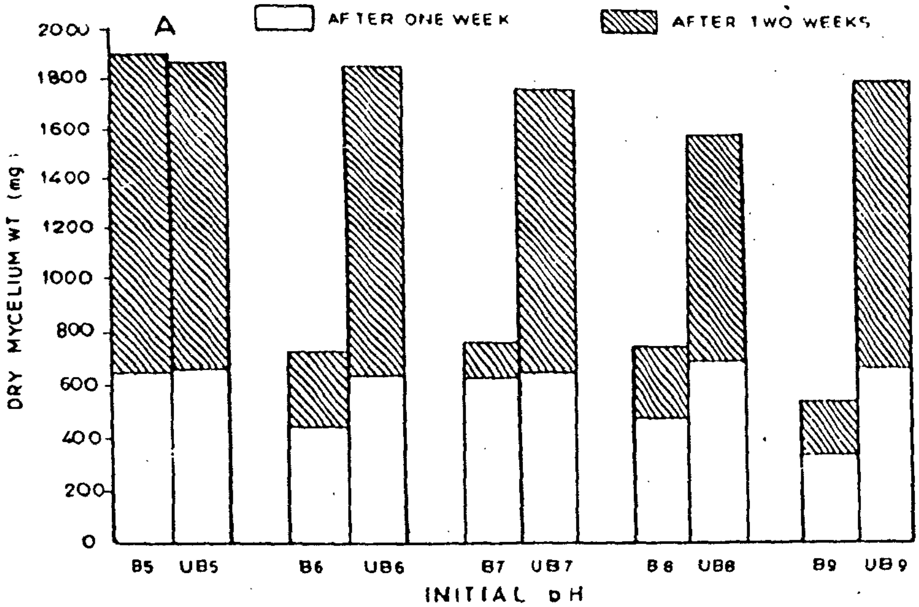

Fig. 1 A. Effect of age on the final pH of Potato Dextrose Broth supporting *Paecilomyces lilacinus*

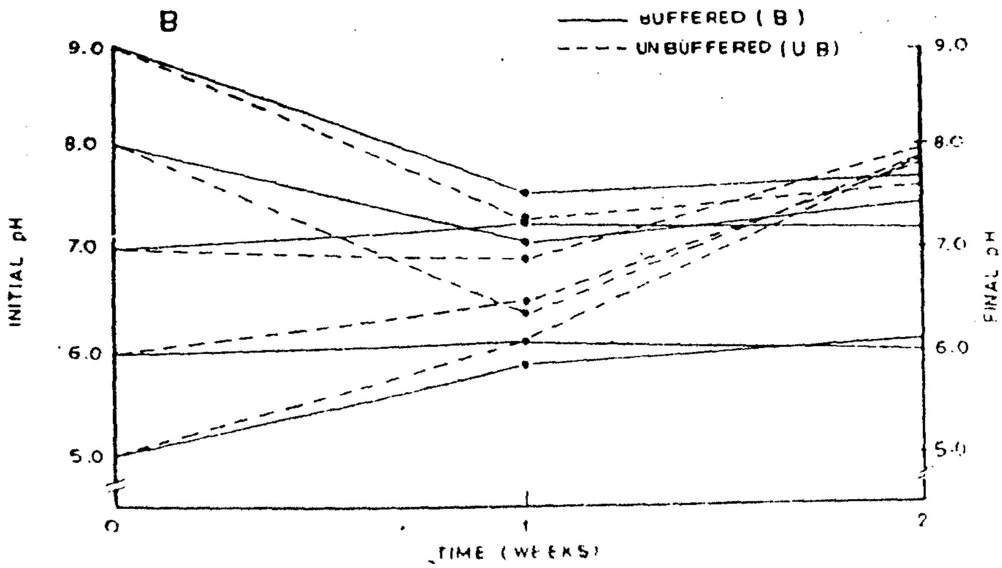

Fig. 1 B. Growth *Paecilomyces lilacinus* on potato dextrose broth at different initial pH levels

more or less same at all pH levels. However, in case of buffered medium (except at pH 5), fungus growth was significantly suppressed compared to the corresponding pH level of the unbuffered medium. No such difference was evident at pH 5 among the two sets. Further, up to one week, the differences in growth between the buffered and unbuffered medium, at all pH levels, were not significant. Drastic reduction in fungus growth in the buffered medium (at pH 6-9) occurred during second week only (Fig.1B).

Thus, it is evident from these results that *P. lilacinus* can alter both the basic as well as acidic pH extremes towards neutrality. This phenomenon, which is achieved presumably through the secretions of metabolites, is vital for the fungus establishment in diverse micro-environmental conditions prevailing in the broadly buffered soil system.

Effect of Temperature

It was observed that exposure to 40°C for 2 days did not adversely affect the subsequent fungal growth. However, longer exposure to this temperature delayed the resumption of normal growth. The fungus could not survive exposure to 45°C for more than 6 days. However, normal growth resumed after 3,5 and 16 days when fungus was exposed for 2,4 and 6 days respectively at 45°C. *P. lilacinus* could not withstand 50°C for more than a day. Thus, *P. lilacinus* can survive and resume normal growth (which may be delayed depending on temperature/exposure time) after continuous exposure to 40°C for 10 days, 45°C for 6 days, and 50°C for one day.

It is concluded from these studies that *P. lilacinus* can grow and establish in a wide pH range, and can survive high temperature extremes prevalent under Indian agro-climatic conditions.

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