EFFECT OF NUTRIENTS ON SPORE GERMINATION AND GERM-TUBE GROWTH OF *PENICILLIUM EXPANSUM* IN SOIL

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Abstract

Penicillium expansum spores germination, germ-tube growth and microcylic conidiation occur in unsterilized soil after the addition of nutrients, in the form of malt extract broth, indicating that nutrient deficiency might be one factor determining spore germination.

Introduction

Penicillium expansum Link ex.S.F. Gray spores did not germinate in unsterilized soil and it was considered that one factor might be the shortage of nutrients in soil (Zardari, 1984). According to Hsu and Lockwood (1971), natural soils contain little or no detectable carbohydrates and fungal spores incubated directly on such soils fail to germinate. This inhibition of spore germination can often be annulled by the addition of nutrients (Lockwood, 1964).

Dobbs and Hinson (1953) observed that the spores of *Penicillium frequentans* would germinate in soil if the soil was moistened with dilute solutions of glucose plus inorganic salts. Tousoun *et al.* (1960) showed that the germination of *Fusarium solani* f.sp. *phaseoli* in soil was accelerated by the application of glucose. Jackson (1960) reported that the germination of *Penicillium citrinum* conidia on agar discs over soil increased with increasing concentrations of certain monosaccharides in the agar discs. Dobbs *et al.* (1960) reported that glucose by itself or when incorporated with mineral salts gave similar results. They also reported that different soils varied widely in the degree to which the addition of glucose could overcome mycostasis. Thus beech wood soil supported some germination with the addition of a 0.1% (w/v) of glucose but a garden soil required a 4% (w/v) solution before there was any effect. Ayanru and Green (1974) observed that sclerotia of *Macrophomina phaseolina* germinated abnormally on the surfaces

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of soils but normal germination occurred when the soil was amended with certain sugars, amino acids, organic acids and their hyphae then colonized the soil surface.

In the following experiments a similar approach, the addition of nutrients to the soil, has been adopted to determine if a shortage of nutrients could be responsible for the failure of *P. expansum* in natural soil.

Materials and methods

Seven sterile 15.2cm pots were each filled with 400g of sieved soil, which had been previously air-dried to approximately 5% moisture content. Each pot was then saturated with 500ml of a malt-extract medium at one or other of the following concentrations: 1/8, 1/2 normal strength, normal strength and 2x, 3x, 4x normal strength.

The amended soils were left for about 2-3h in the pots to allow excess medium to drain away and then emptied out onto a sterilized polythene bag and dried at room temperature using a fan to assist drying. After drying to about 20% moisture content the siols were placed in plastic petri-dishes. A spore smear slide of *P. expansum* Link ex.S.F. Gray (CMI 39761) was then buried in each dish and after incubating for 24h at 23° C the slides were removed. They were examined, after stainting with lactophenol cotton-blue. This experimental was repeated twice.

Results and Discussion

The results of both experiments are given in Figs. 1-2, and 3. The percentage germination and the lengths of germ-tube produced increased in both experiments in response to increasing nutrient levels (Figs.1 & 2). Many germ-tubes developed microcyclic conidia (Plate 1) and their percentage increased in both experiments up to about 3x normal strength, but above this concentration more vegetative mycelium was produced with fewer conidiophores (Fig.3).

Germ-tubes developing microcyclic conidia were never observed to branch and only a single phialide with a short chain of conidia was formed at their tips (Plate 1). The percentage of the germ- tubes with or without phialides in which the protoplasm was undergoing lysis was very variable and there was no obvious relationship with nutrient levels.

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Plate 1. Photomicrograph of germinated conidium of *P. expansum* with microcyclic conidia at the tip of a germ-tube in malt-extract supplemented soil.

Boosalis (1960) made similar observations in work with Helminthosporium sativum. He found that the addition of potato dextrose broth stimulated conidial germination up to 75% and that approximately 50% of the germinated spores produced unbranched germ-tubes bearing single viable conidia.

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