ASPERGILLUS FUMIGATUS AND ASPERGILLUS NIGER IN TWO POTTED ORNAMENTAL PLANTS, CACTUS (EPHYPHYLLUM TRUNCATUM) AND CLIVIA (CLIVIA MINIATA). BIOLOGICAL AND EPIDEMIOLOGICAL ASPECTS

F. STAIB, B. TOMPAK, D. THIEL & A. BLISSE

Mycology Unit, Robert Koch Institute, Federal Health Office, Nordufer 20, 1000 Berlin 65, Federal Republic of Germany

Abstract

The presence and growth of Aspergillus fumigatus and Aspergillus niger in the soil of ornamental plants have been demonstrated. The ecological conditions in the soil of such plants as influenced by temperature, humidity, desiccation, fertilization and ventilation obviously influence such fungal growth. The epidemiological significance of these findings is of interest with a view to the present efforts to control aspergillosis in the environment of susceptible persons.

Observations of a preferential growth of certain Aspergillus species in the soil of defined plants under defined conditions raise problems of soil microbiology.

Introduction

For aspergillosis control, habitats and foci of dissemination of the agent in the immediate environment of man are of special interest (12). A recent report has pointed to the importance of the soil in ornamental flower pots kept in the environment of persons susceptible to infections and allergies. Thus e.g. A. fumigatus being the most frequent agent of aspergillosis of the lung was isolated from the soil of flower pots in a lung hospital in about 64% of the pots examined (13).

This finding has raised a number of practical problems from the angle of medical mycology. Thus it would be of interest to know whether A. fumigatus found in the soil of flower pots means a constant presence of its propagules capable of germination and which are the influences of temperature, desiccation, humidity, fertilizers and ventilation.

Since the authors' interest concentrated upon the soil and decaying plant debris as a focus of dissemination for a potential pathogen, the present study has not dealt with problems of soil microbiology and plant physiology (3, 5, 7, 16, 17). The problems are commented in the following by the example of two ornamental plants.

Materials and methods

Plants: The ornamental plants described below had been kept in a lounge for one year before the experiments started. The type of soil used was unknown.

Cactus (Epiphyllum truncatum)

Site: above a radiator at a window facing south.
Temperature: constantly around 38°C.
Watering: irregular.
Fertilization: commercial fertilizer substance plus water (at intervals of 2–3 weeks).

Clivia (Clivia miniata)

Site: in the center of the room.
Temperature: 20-25°C.
Watering: irregular
Fertilization: commercial fertilizer (at intervals of 4 weeks).

Observation period and mycological studies:
December 1977 – April 1978.
Condition of plants: Both plants looked always healthy and wellkept. The aspect of the soil surface did not raise any suspicion (see Figs. 1, 2).

Mycological studies

Examination of soil from flower pots for A. fumigatus and A. niger: Soil was taken from the surface with the aid of
Fig. 1. Cactus (Epiphyllum truncatum) and surface of the soil from which weekly samples were taken for cultural control. From this material, *A. fumigatus* was isolated as sole *Aspergillus* species (see Fig. 3).

Fig. 2. Clivia (Clivia miniata) and surface of the soil from which weekly samples were taken for cultural control. From this material, *A. niger* was isolated as sole *Aspergillus* species (see Fig. 3).

Sterile spoons and distributed over Sabouraud-dextrose agar plates to which streptomycin-sulfate (40 U/ml) and penicillin G (20 U/ml) had been added. The media inoculated in this way were incubated at 37°C. After 2–3 days, isolation of suspect colonies began (see Fig. 3). The aspergilli were identified in accordance with RAPER and FENNELL (8).

Two types of steam-treated commercial earth served as negative controls. Additional culturing experiments:

To enable an examination of the soil of the rhizosphere, the ornamental plants were removed from their pots. To clarify whether obvious fructification or production of propagules of the fungus took place at the soil surface, the cactus was not watered for a fortnight. For sampling, a slight movement of air (approx. 0.5 s.) against Petri dishes holding Sabouraud-dextrose agar was produced (see Fig. 6). Small parts of roots (approx. 2–3 mm in length) were cultured in Sabouraud-dextrose agar on slides in a humid atmosphere at 37°C. To enable an optimal mycelial growth, trenches were cut into the agar so that the root parts were exposed to air and the medium as well. A cover slip was placed over the trench. This arrangement was used to find out about the presence of aspergilli on the roots.

Fig. 3. Left: isolation of *A. fumigatus* in pure culture from the soil of the cactus on Sabouraud-dextrose agar after incubation at 37°C for two days. Right: isolation of *A. niger* from the soil of the clivia under the same conditions (see Figs. 2, 3).

Fig. 4. Isolation of *A. fumigatus* propagules from air stream (sampling period 0.5 s) carrying dry matter from desiccated soil of the cactus (see p. 4).