OVERWINTERING OF *ALTERNARIA MACROSPORA* IN COTTON DEBRIS

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An epidemic of *Alternaria macrospora* in cotton started 1 month earlier, and developed faster in plots contaminated with *A. macrospora*-infected cotton debris than in debris-free plots. Overwintering of the pathogen in debris was associated with survival of the debris itself. With the exception of debris in dry soil, overwintering was better in debris located on the soil surface than in that buried beneath the surface. Under all conditions it was better in dry than in wet soil and in sterilized than in unsterilized soil. Survival was associated with microbial activity in the soil, was highest in pure sand and decreased progressively in sandy loam, heavy soil and peat. The survival in debris was highest in soil kept at 10°C and decreased progressively at 20, 30 and 40°C. Increasing the soil moisture content reduced survival. Overwintering was better in a cotton field that was not cropped during the winter than in a field sown with wheat between the cotton seasons. The rate of transfer of disease to seedlings from debris buried in soil was low except when debris was in contact with the seed. The main means of disease transfer was by airborne spores produced on debris located on the soil surface. These spores had low infectivity and caused few lesions, but the second generation of spores formed on these lesions was highly infectious.

*KEY WORDS:* Epidemiology; cotton; *Alternaria macrospora*.

INTRODUCTION

*Alternaria macrospora* Zimm. is a relatively little-known pathogen of the high quality cotton *Gossypium barbadense* L. Reports about *A. macrospora* in the field have dealt with its development during the growing season (e.g. 1, 2, 10) and referred to a 25% loss in yield (2). No publication treated the subject of transfer of the pathogen from one season to another. Overseasoning in debris is typical to *Alternaria* pathogens like *A.*

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alternata in tobacco (7), A. brassicae and A. brassicicola in brassicas (3), A. helianthi in sunflower (4) and A. solani in potato and tomato (8). Most of the reports cited concern the success rather than the mechanism of survival and do not describe the transfer of the pathogen to the succeeding crop.

Survival of a pathogen in debris and its transfer to seedlings may be affected by a variety of meteorological, edaphic, cultural and biotic factors. The present paper describes laboratory and field experiments on the effect of some of these factors on overwintering of A. macrospora in cotton.

MATERIALS AND METHODS

Preparation of debris and assessment of survival

All experiments reported in this paper were done with the susceptible cotton cultivar Pima S-5. Debris was collected from a 200-m plot infected in 1985 by A. macrospora on the Bet Dagan Farm. Lesioned stems and twigs, and in one test also petioles and leaves, were selected for uniformity of infection and cut into 10-cm pieces referred to later as pieces of debris (PD). The PD were either spread on the soil surface or buried 5 to 15 cm deep. After exposure to various conditions, the PD were recovered from soil. The survival of A. macrospora was determined by the capacity of the recovered PD to produce spores. Sporulation was induced by a 3-day incubation in a dew chamber at 20°C, with the first day in fluorescent light (120 µE) and the two others in darkness.

Effect of debris on the onset of an epidemic

Six 10 × 10 m plots were established in various parts of a 30-ha field which had never been cropped with cotton. The distance between plots varied from 200 to 300 m. In October 1985, the soil of each of the three plots was mixed with 23 kg of infected debris and left uncultivated during the winter. Three other plots were plowed without the addition of debris. All plots were sown with cotton in late March 1986 and inspected periodically for development of A. macrospora in seedlings.

Effect of soil moisture and microflora on survival

Plastic containers, 50 × 80 cm, were filled with 20 kg of sand, sandy loam, heavy alluvial soil or peat brought from fields never cropped with cotton. Each soil type was either untreated or sterilized for 1 h with steam (Möschle Co. sterilizer, FRG). The containers were exposed outdoors during three rainless months (April, May and June 1986). Some containers were left dry while others were watered at weekly intervals with a total of 39 l/container. One hundred PD were inserted in the soil of each container to a depth of 5–15 cm, and 100 were scattered on the soil surface. Four replicate containers were used for each combination of soil type, sterilization and moisture regime. Microbial activity in selected treatments was determined using a dilution technique according to the