III.1 THE INITIAL STEPS OF THE INFECTION PROCESS IN RHIZOCTONIA SOLANI

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I. INTRODUCTION

This chapter aims to review the initial steps of the infection process and host plant specialization of *Rhizoctonia solani*. A subject that has previously been reviewed by Dodman and Flentje (1970). In this chapter the infection process is defined as the steps in the disease cycle between attachment and tissue colonization (Fig. 1).

![Diagram](image)

**FIGURE 1.** The disease cycle and the infection process of *Rhizoctonia solani*. Initiation of the actual infection process is indicated by two thick arrows.

II. INOCULUM

A plant pathogen has to be present in order to cause disease. The numbers and form in which it is present as well as its nutritional state will influence the outcome of disease. *R. solani*, which does not make vegetative spores, can be present as basidiospore, mycelium or sclerotium. Basidiospores, responsible for a wide range of *Rhizoctonia* leaf diseases (Baker, 1970; see also chapter IV.3), are very fragile and are therefore not suited for long term survival. However, they are an important source of

genetic variation (Papavizas and Ayers, 1965; Flentje et al., 1970; Anderson and Stretton, 1978; Adams, 1988; Julian et al., 1996; Keijer et al., 1996a) and a means of long distance dispersal (see chapter IV.3). Sclerotia, undifferentiated aggregations of thick-walled melanized cells, are the primary survival structures and therefore an important source of inoculum (see chapter IV.4). Sclerotia are formed in soil or on plant residues and have been reported to survive for several years (Sherwood, 1970). Both basidiospores and sclerotia will germinate and form mycelium prior to infection. Besides infection, mycelium also has a role in dispersal and survival; it can rapidly grow through and colonize soil (Papavizas, 1970) and is relatively persistent, especially on colonized debris (Papavizas and Davey, 1962).

III. MYCELIAL GROWTH

Upon germination, that is moisture and temperature dependent (Sherwood, 1970), sclerotia form mycelial threads that can grow toward the plant. When cellophane bags are placed around the roots of plants, hyphal aggregates are formed on the cellophane surface (Kerr, 1956), indicating the attraction of the hyphae by the roots. Similar aggregates are formed on cellophane or membranes of mixed esters of cellulose that are placed over seedlings (Fig. 2). These aggregates should not be confused with infection cushions, because they lack specific characteristics of infection cushion formation such as directed growth and the formation of T-shaped branches. Under various experimental conditions it has been shown that mycelial growth is stimulated by plant exudates (Kerr and Flentje, 1957; Flentje et al., 1963; De Silva and Wood, 1964). The growth stimulation rate correlates with higher amino acids, carbohydrates, phenols and organic acids concentrations present in the exudates of younger plants as compared to older plants (Nour El Dein and Sharkas, 1964; Martinson, 1965; Reddy, 1980). This saprophytic growth stimulation will increase the inoculum density and may consequently influence disease formation. On the other hand, in the interaction between R. solani and cotton it has been found that larger hyphal aggregates are induced by root exudates of resistant plants than by susceptible plants (El Samra et al., 1981). As in other cases it is not resolved whether the growth enhancement is due to enhanced nutrient availability or to the presence of specific inducing components.

FIGURE 2. 
*Rhizoctonia solani* AG 5 hyphal aggregates on a HATF (Millipore) membrane that was placed over total egg-plant seedlings. The hyphae over the stem are stained with trypan blue.