Black pod rot of groundnut (Arachis hypogaea) caused by Chalara elegans

Fig. 1. Chalara elegans (Thielaviopsis basicola), the causal agent of black pod rot of groundnut.

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Peanut (Arachis hypogaea L.) is an important protein crop planted on approximately 150 000 ha in South Africa. The groundnut pods, being borne underground, are particularly susceptible to various soilborne fungal pathogens, including the black hull fungus Chalara elegans Nag Raj & Kendrick (Fig. 1). Black pod rot or black hull (Fig. 2) results in severe pod and kernel damage of groundnut in South Africa (10,13), and was first isolated from groundnuts in this country by Jooste in 1979 (7). In South Africa the disease is observed mainly on pods of groundnuts plants, but may also occur on the roots (10). The disease reduces both yield and kernel quality thereby reducing the value of groundnut consignments (16).

Fig. 2. Symptoms of black pod rot of groundnut caused by C. elegans.

Impact of black pod rot

In the early 1980's, groundnut production in the Vaalharts area of the Northern Cape Province was severely affected by black pod rot. Yield was reduced in this area from 25000 metric tons in 1982 to 8000 in 1987 (5,15). In this region groundnuts are grown under flood irrigation on sandy soils with the commercial cultivar Sellie being grown almost exclusively at that time. This cultivar is extremely susceptible to the disease. The release of the resistant cultivar Harts saved the groundnut industry (15). However, because of testa colour, this cultivar is not commercially ideal.

Symptoms and infection

In both pod and root infections the plant tissue has a black discolouration due to the mass of dark brown chlamydospores (Fig. 3) imbedded in the infected plant tissue (9). Infection by the fungus then causes the pods and other subterranean parts of the plant to rot. Symptoms occur on roots and pods of mature, as well as on roots of immature groundnut plants (8).

Factors influencing disease

The growth of the pathogen in vitro is strongly affected by temperature and pH (10). The optimum temperature for infection varies from host to host, but was indicated as being between 20 and 25°C for groundnuts (12). A pH between 4.9 and 5.5 was found to be optimal for the growth of the fungus (1). It has also been observed that spore formation decreases with an increase in pH in vitro (11).

However, disease in the field was found to increase at pH above 5.5, and decrease at pH values lower than 5.5 (1,11).

Fig. 3. Chlamydospore of C. elegans.

The fungal population

The fungus is seed- and soilborne and isolates from South Africa have been shown to be more virulent than those from the United States (10), where the disease does not cause significant losses to the groundnut industry. Recent work has shown that there is a level of diversity within the South African population of the fungus (4). Isolates from groundnut and chicory were found to be clonal, and different from each other in this study. These results suggest, therefore, that the pathogen was introduced into South Africa (4).

Breeding for resistance

The use of disease resistant groundnut cultivars is the only means of controlling the disease (10). Varieties showing resistance or tolerance to the disease have, in the past, been used successfully to control the disease (5,6,14). Historically only the cultivar Harts, released in 1988 (15), had resistance to the disease. Since the release of Harts, another variety with partial resistance, Kwarts (3), was released. Since the release of Kwarts, the groundnut-breeding program has continued to address the problem of black pod rot of groundnut (2). Consequently, various new commercially suitable varieties with improved resistance to black pod rot have been developed and new sources of resistance identified (2). Recent work has shown that no less than 17 cultivars and advanced breeding lines exist in the groundnut-breeding program with a higher degree of resistance than Harts (2). Since it appears that black pod rot of groundnut may once again threaten the groundnut industry in South Africa, new resistant varieties will play a significant role in the management of the disease. The work currently in progress is aimed at identifying suitable groundnut varieties with resistance to this disease.

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