Part IV. Other Organisms

Parasitic Flowering Plants

Alectra vogelii

Alectra vogelii Benth. (Scrophulariaceae) is a root parasite of peanut and several other leguminous crop plants. It has been reported in various countries in Africa (Angola, Burkina Faso, Malawi, Mozambique, Nigeria, Swaziland, Zambia, and Zimbabwe). A high disease incidence (about 90%) has been reported in Burkina Faso and Malawi. *A. picta* Hemsl. parasitizes peanut in glasshouse experiments.

A mature plant of *A. vogelii* reaches a height of about 0.5 m with stems branching out at the base (Plate 188). Flowers are a prominent lemon yellow with horseshoe-shaped stigmata. Roots are orange and poorly developed. The connection between the parasite and the peanut roots can be seen by carefully removing the soil in the root zone (Plate 189).

Parasitized peanut plants become stunted, and yields are reduced. The potential pod yield loss has been estimated at about 40% in Nigeria.

Striga spp.

More than 60 species of *Striga* (Scrophulariaceae) have been reported as parasites of several cereal and leguminous crop plants. *S. hermontheca* Benth. has been reported on peanut in West Africa and *S. gesnarioides* (Willd.) Vatke (witchweeds) on peanut in Mozambique and on *Arachis repens* in Nigeria.

S. hermontheca is a cross-pollinated species with wide variation in plant type and floral morphology. It is an annual, erect herb reaching a height of about 0.5 m (Plate 190). Leaves are green and 20–60 mm long. Flowers are sessile, irregular, and bright pink. The calyx is distinctly five ribbed, and the corolla tube, 11–17 mm long, bends characteristically at an angle immediately over the tip of the calyx. Bracteoles are 2–3 mm wide. The fruits (capsules) contain vast numbers of minute seed.

S. gesnarioides is an annual, erect herb reaching a height of about 0.15 m (Plate 191). Leaves are scalelike, rarely exceed-

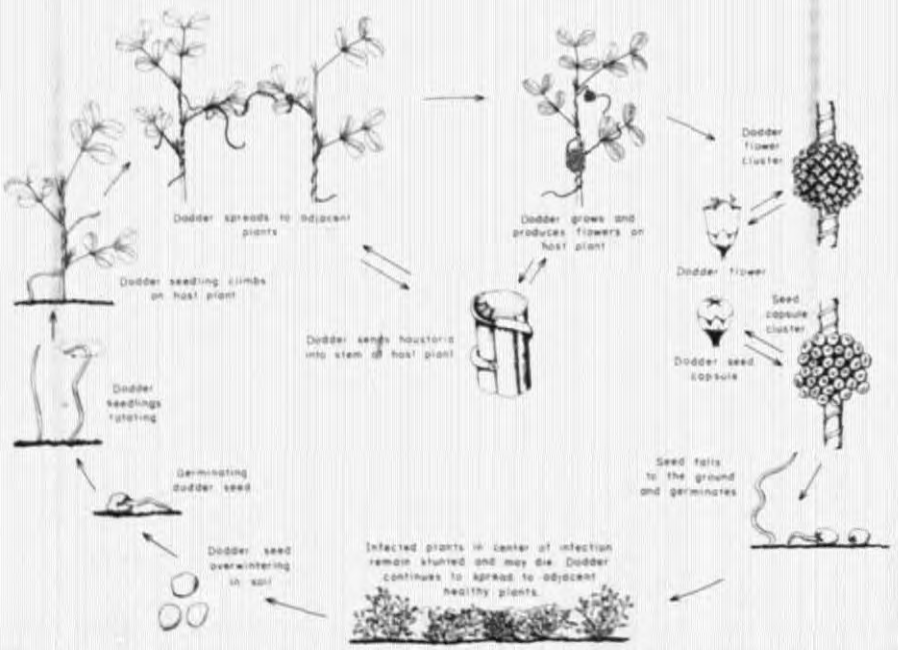

Fig. 77. Life cycle of dodder. (Modified and reprinted, by permission, from G. N. Agrios, 1978, Plant Pathology, 2nd ed., Academic Press, New York. Prepared by Nancy Browning)

ing 5 mm in length. Compact branches arise from ground level. The plant forms a large haustorium (feeding structure) with the host root, unlike *S. hermonthecu*. Flowers are irregular and vary greatly in size and color but are usually creamy white, bluish, or pink.

Cuscuta campestris

Cuscuta campestris Yunck. (Convolvulaceae) (dodder) is a stem parasite that attacks a wide range of flowering plants. It is a parasite but not an important pest of peanut in the United States. *C. campestris* lacks true roots and leaves and produces a tangle of wiry branches (Plate 192) that coil around the branches of host plants and produce haustoria. The branches are orange to golden yellow and devoid of chlorophyll. Minute, bell-shaped flowers are produced in small clusters. The life cycle of *C. campestris* is outlined in Figure 77.

Selected References

Ramaiah, K. V., Parker, C., Vasudeva Rao, M. J., and Musselman, L. J. 1983. *Striga* identification and control handbook. Int. Crops Res. Inst. Semi-Arid Trop. Bull. 15.

Riches, C. R., Hamilton, K. A., and Parker, C. 1992. Parasitism of grain legumes by *Alectra* species (Scrophulariaceae). Ann. Appl. Biol. 121:361-370.

Subrahmanyam, P., Wongkaew, S., Reddy, D. V. R., Demski, J. W., McDonald, D., Sharma, S. B., and Smith, D. H. 1992. Field diagnosis of groundnut diseases. Int. Crops Res. Inst. Semi-Arid Trop. Bull. 36.

(Prepared by P. Subrahmanyam)

Beneficial Organisms

Mycorrhizae

The peanut root, like roots of most other herbaceous plants, is commonly colonized by vesicular-arbuscular endomycorrhizal fungi (Figs. 78 and 79). Species of the genera *Glomus*, *Gigaspora*, *Scutellospora*, *Sclerocystis*, and *Entrophospora* have been reported to be naturally associated with peanuts. The association is characterized by the formation of arbuscules (haustoriumlike structures) in the roots and of chlamydospores and azygospores (Fig. 80; Plates 193 and 194) in the roots and soil. Sporocarps may also be formed in the soil.

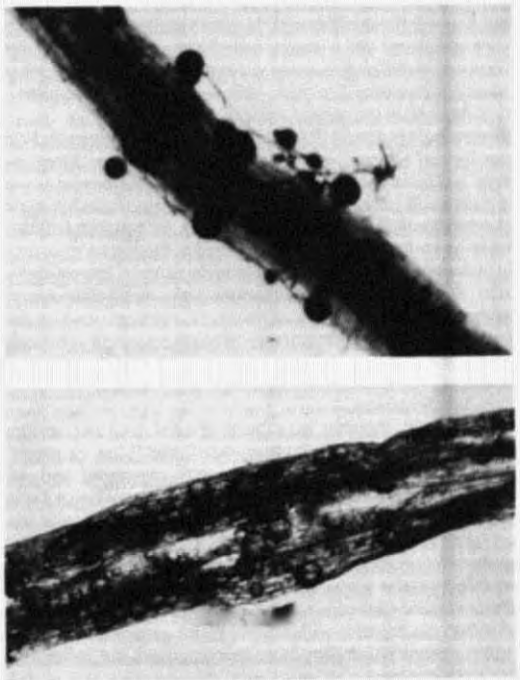

Fig. 78. Vesicular-arbuscular mycorrhizal fungi in peanut roots. (Courtesy M. Yeh)

Most research has focused on the effects of these fungi on growth of inoculated plants in the greenhouse and in sterilized soils. In general, mycorrhizal fungi have a positive effect on peanut growth. Individual species differ significantly in their effectiveness in promoting growth. Growth response may be enhanced by inoculation with mixtures of glomalean fungi and/or *Bradyrhizobium*. Vegetative growth has been enhanced by more than 300% in peanuts inoculated with various species. Some reports indicate increases in seed yield. Other reports indicate no positive response. Experiments have been conducted on the effects of metals, phosphorus, water, pesticides, and other soil microorganisms on the activity of mycorrhizal fungi associated with peanuts.

Progress in research pertaining to endomycorrhizal fungi and their effects on peanuts (and all other plants) has been hampered by the fact that the taxonomy of these glomalean fungi is little understood. Identification of species is difficult. It involves interpretation of spore color, spore size, structure and chemical reactions of cell wall layers, presence or absence of sporocarps, and morphological characteristics of the sporocarps. None of the species can be grown and maintained in pure culture in the laboratory. Cultures must therefore be grown in association with living host roots in the greenhouse and separated from the soil or other growth medium for use as

Fig. 79. Hyphae of a mycorrhizal fungus in a peanut root (note penetration site). (Courtesy D. M. Porter)