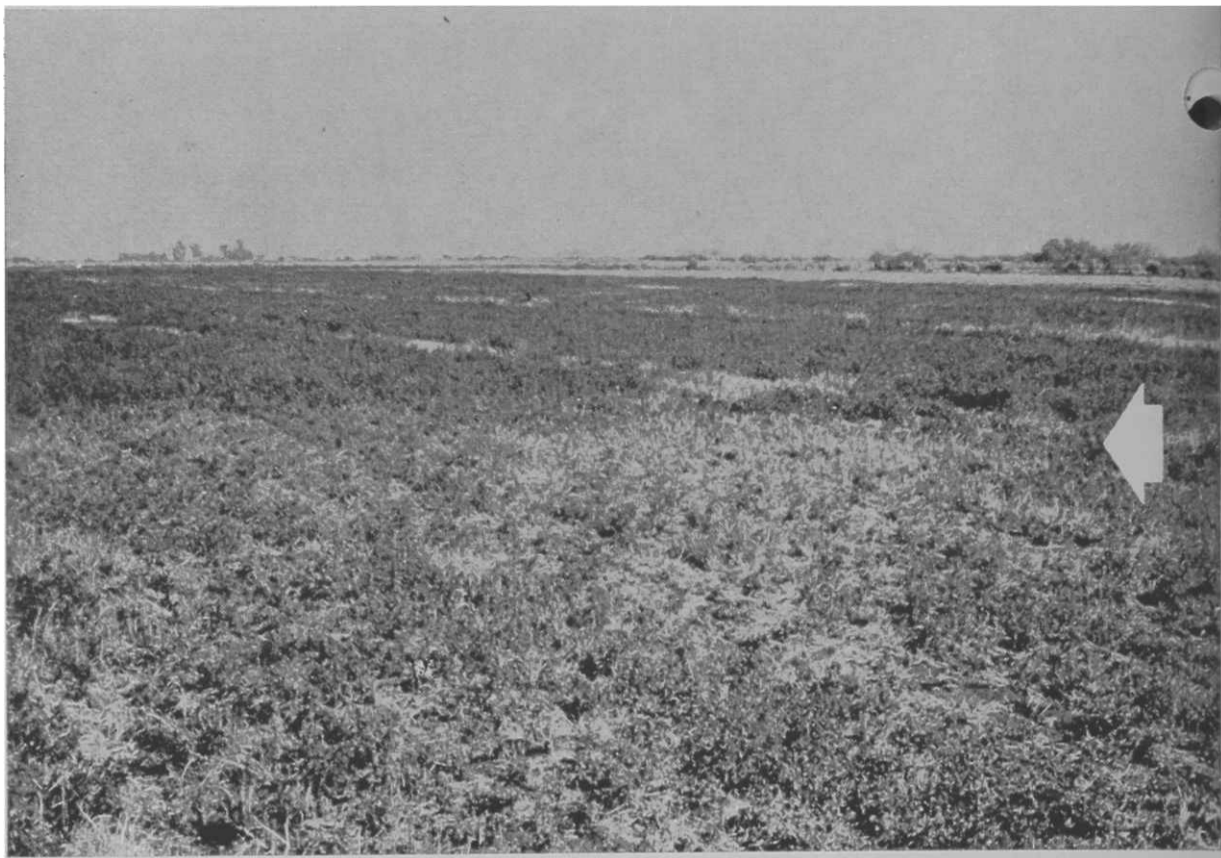


The alfalfa stand in the near border in the field shot at right shows stand decline due to Root Rot of alfalfa. The alfalfa in background, behind the arrow, is healthy.



Alfalfa is grown on approximately 20 percent of the irrigated crop land in Arizona. Approximately 1.2 million tons of hay were produced in 1970. Winter-dormant varieties are grown successfully at elevations above 4,000 feet. At lower elevations, where non-dormant varieties are predominately grown, the major problem is stand and yield decline. Although growers and researchers have observed premature thinning of alfalfa stands for many years in southern Arizona, the basic causes of decline are not fully understood. In most low elevation plantings, low yields occur three to five years after stand establishment. In many areas, especially in Yuma County, fields are renovated and reseeded annually. Although a number of factors are undoubtedly involved in stand survival such as fertilization, cutting frequency, soil compaction, irrigation practices and insect problems, recent studies indicate that root rot caused by the soil fungus *Phytophthora megasperma* (Drechs.) is a major contributing factor to stand and yield decline.

Studies during the past year in Arizona have shown that this disease is widespread throughout the major alfalfa producing areas in the state and is common in the Salt River Valley, Pinal County, Mohawk-Wellton, Yuma, Parker, Safford, Taylor, Snowflake and Benson areas and in the Sulfur Springs Valley in Cochise County. The disease had previously been thought to be of minor importance but presently is known to be a major factor contributing to stand decline. Isolates of the fungus have been readily recovered from diseased feeder roots and tap roots of the major varieties of alfalfa grown in Arizona. In many fields it is estimated that over 75 percent of the plants are diseased. Since symptoms of the disease somewhat overlap those caused by *Phymatotrichum omnivorum* (Shear) Dug. (Texas Root Rot) this may have been a factor in previously overlooking *Phytophthora* root rot as a significant disease of alfalfa in Arizona.

Phytophthora root rot of alfalfa was described as a new disease in California in 1954. Presently, this disease is thought to be the most common and most serious disease of alfalfa in California. The disease is also known to occur in Australia, Canada, and in the state of Minnesota, Mississippi, Ohio, Illinois, Iowa, Nebraska, Wisconsin, and South Dakota.

SYMPTOMS. The first symptom of the disease consists of stunting, leaf yellowing and overall wilting of the plant. The most dramatic symptom is a rotting and collapse of the main tap root. Affected plants may die rapidly or recover temporarily if environmental factors are not favorable for disease development. In the low elevation areas of Arizona, the disease is most commonly seen during fall, winter, and spring. The disease may affect a few plants in the field or, in severe cases, cause complete stand failure. Normally, plant death occurs

in an irregular pattern in the field. The fungus may invade and cause death of lateral roots which reduces plant vigor. In greenhouse studies in Tucson, growth of alfalfa seedlings in infested soil has been reduced by approximately 50 percent after one month when compared with growth of seedlings in non-infested soil.

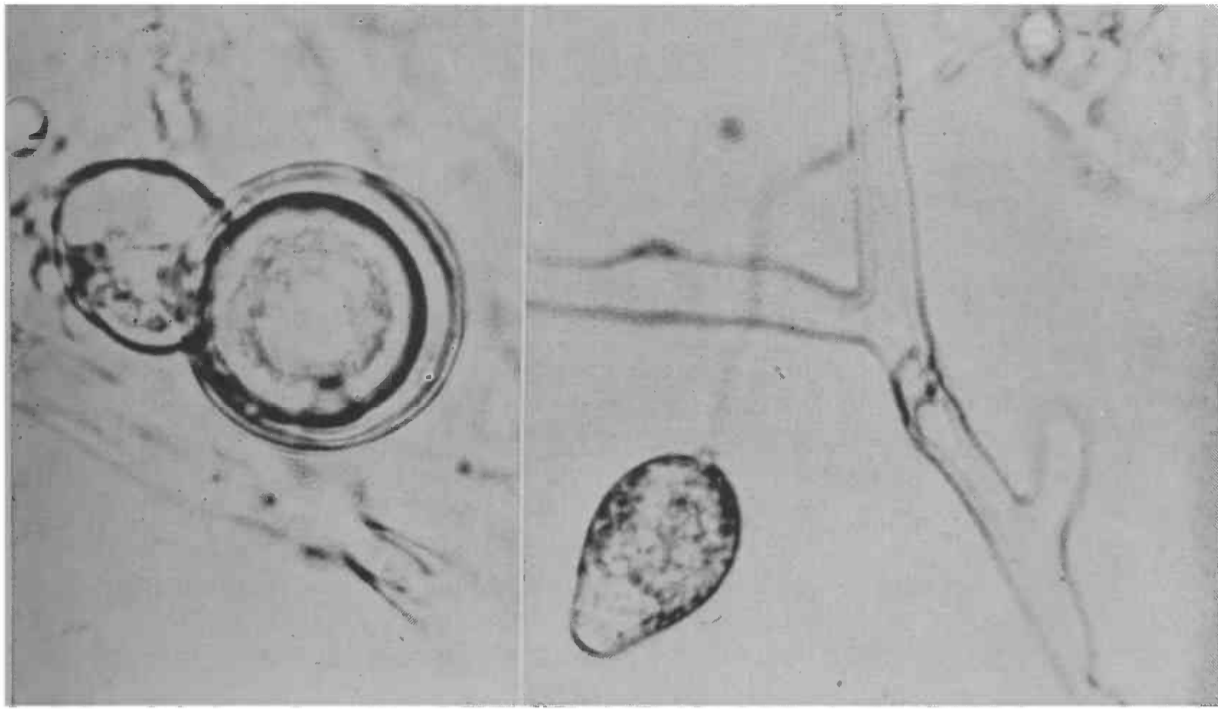
The disease may be confused in the field with root rot of alfalfa caused by the soil fungus *Phymatotrichum omnivorum* (Texas Root Rot) which, although not as common as *Phytophthora* root rot, can be a serious disease in Arizona. The Texas Root Rot fungus causes a similar collapse of the main tap root. This disease, however, occurs only during the summer months and generally is restricted to

*Plant Pathologist, Cooperative Extension Service & Agricultural Experiment Station; Assistant Plant Pathologist, Cooperative Extension Service; Agronomist, Agricultural Experiment Station, respectively.

Phytophthora Root Rot Of Alfalfa:

A Major Factor in Stand Decline

by R. B. Hine, F. A. Gray & M. H. Schonhorst*



somewhat circular patterns in the field as compared with the scattered, irregular pattern of kill with *Phytophthora*.

The Texas Root Rot fungus produces characteristic brown, thread-

The organism causing the root rot in alfalfa is shown above. The object at left is the survival oospore while the sporangium at right produces swimming spores in water.

like structures, known as strands, on the surface of dead tap roots. These structures are large enough to be seen by the unaided eye and are unique to this pathogenic fungus.

Phytophthora Root Rot

CONTROL. CULTURAL PRACTICES. Practices such as fertilization and clipping frequency apparently have little effect on disease incidence or severity of *Phytophthora* root rot on alfalfa. Irrigation length and frequency are, however, a significant factor because *P. megasperma* produces a motile, swimming spore, which is the infective propagule, only in the presence of water. Thus, the disease is aggravated by frequent irrigations of excessive length, particularly in heavy, poorly-drained soils. The disease has been found in light, well-drained soils in Arizona. Apparently, excessive water increased disease incidence in these locations.

No specific studies have been made on the effect of crop rotation on disease incidence or on factors that may be involved in the persistence of the fungus in soil. However, studies with other closely related fungi indicate that *P. megasperma* probably survives indefinitely in field soils in the absence of the host. This fact precludes

The two roots, left and right, are infected by *Phytophthora*. Note the margin between healthy and diseased tissue.

rotation as a practical method of control.

RESISTANT VARIETIES. Since the major varieties of alfalfa presently grown at lower elevations in Arizona and California are susceptible to root rot, the most practical method of control would be the development of resistant varieties. For this reason, a selection program is in progress in Arizona. Varieties with desirable agronomic characteristics are presently being screened in the greenhouse for resistant plants. A seedling assay technique has been developed that eliminates 95 to 98 percent of the population. The survivors in these studies will be propagated and used in the breeding and selection program.

