# YELLOW TUFT (DOWNY MILDEW) ON GOLF TURFS

Noel Jackson
Department of Plant Pathology
University of Rhode Island, Kingston, RI

Since the early 1920's golf superintendents have been aware of a disease symptom on bentgrass turf referred to commonly as yellow tuft. Various causal agents were proposed over the years with nematodes and viruses as the prime candidates, but finally, a fungus was established incontrovertibly as the pathogen involved.

Yellow tuft disease on bentgrass turf is usually evanescent and, though unsightly, seldom serious. Consequently, the problems received only cursory attention. A renewed interest in the disease was prompted in the early seventies by the widespread appearance of yellow tuft on Kentucky bluegrass sod in Rhode Island. In some instances, the symptoms were so severe as to render the sod temporarily unsaleable. A detailed examination of diseases turfgrasses from Rhode Island and elsewhere revealed that the typical symptoms are always associated with a systemic infection of the plants by a downy mildew, Sclerophthora macrospora.

Early symptoms of yellow tuft are often hard to discern. Leaf blades may be thickened or broadened slightly and if unmown, the infected plants may show some degree of stunting. In regularly mown turf this characteristic is masked, and even heavily infected plants may appear normal in color and texture for long periods of time.

Advanced symptoms on bentgrass and red fescue turf appear as small yellow spots 1/4 - 1 inch in diameter; on bluegrass and perennial ryegrass, the spots are larger in the range of 1-3 inches diameter. Each spot is comprised of a dense cluster of yellow shoots due to proliferation of axillary buds at crowns or at the nodes and terminals of creeping stems. Individual shoots making up the tufts form few adventitious roots, and the tufts are easily detached from the turf. Prominent symptoms usually appear in late spring and again in the fall especially if cool, wet weather conditions prevail. Whole tufts may wither and die during hot dry periods or winterkill under prolonged hard frost but commonly a proportion of the many tiller comprising the tuft will survive the stress situation. Further depradation of the tillers may occur due to stripe smut and/or Helminthosporium leaf spot infections. By June of the following year, fall seedings may show well developed yellow tuft symptoms, noticable first in low lying areas subject to previous flooding. The disease spreads outward from the initial infection sites and once established in a turf, yellow tuft will recur indefinitely with varying severity. Although unsightly, there is seldom permanent injury to the turf.

After clearing and suitable staining of the tissues, microscopic examination of turfgrasses showing symptoms of yellow tuft invariably reveals the systemic mycelium of the fungus Sclerophthora macrospora within the crowns, stems and leaves. A few axillary buds may escape the colonizing hyphae emanating from the crown tissue and may produce an occasional healthy tiller free of mycelium. Mycelium does not progress far into roots.

The fungus reproduces asexually by means of sporangia which are produced in large numbers via the stomates of both leaf surfaces and on leaf sheaths. Sporangia have been seen in Rhode Island during the period May to November. Early white, turgid sporangia are present in the early morning whilst leaf surfaces are moist but they collapse to a dirty white residue as the leaves

dry. Given optimum conditions, sporangia mature rapidly each releasing fifty or more motile zoospores.

Zoospores are remarkably chemotactic and respond to low concentrations of sugars, yeast extract and several individual amino acids. Guttation fluid and glutamine are very active stimulants. Imbibed seeds and seeds in the early stages of germination are extremely attractive to the zoospores. The latter congregate in large numbers at the region of the mesocotyl and encyst there. Rapid germination of the spore ensues. The first leaf at the region of the ruptured coleoptile is also an area of attraction to the zoospores and a focus for germ tubes. Germ tubes of widely varying lengths become swollen at the tips and align with the cell walls before penetrating tissues.

Sexual reproduction in Sclerophthora macrospora is accomplished by means of oospores. Large numbers of oospores occur sporadically in Kentucky bluegrass leaves during May and June. Lesser numbers have been seen in bentgrass and bluegrass in late summer and fall. Crabgrass, a common contaminant of turf areas, may develop enormous numbers of oospores in the fall prior to frost. These thick walled resting spores can remain dormant for long periods but, under suitable conditions, they germinate to produce a single sporangium that subsequently releases zoospores.

Sclerophthora macrospora is a well documented and widely distributed unspecialized pathogen causing "crazy top" of corn, "yellow wilt" of rice and "proliferation" disease of sugar cane, small grains and many grasses. All of the cool season turf grasses are susceptible and the disease occurs commonly on St. Augustine grass. Infected weed grasses provide a reservoir of potential inoculum an infected volunteer plants from a previous stand of turf may carry the disease over into new plantings.

The widespread appearance of the disease in bluegrass sod growing areas and the attendant economic losses places the disease into a more serious category warranting control measures. Manipulation of fertility levels and the use of iron sulphate have shown some benefit in masking disease symptoms. Effective control is afforded by the fungicide metalxyl (Subdue) at the rate of 1-2 fl oz per 1000 sq. ft.