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GRAU

(Continued from page 19)

fective filter, absorbing rainfall, preventing erosion, yielding life-giving oxygen. Runoff is minimized as is silting of streams and reservoirs. Aerial-borne toxins are trapped and nullified. The chemicals that the golf course superintendent applies to keep pests in check are absorbed by the mat of turf which limits the movement of materials toward water courses, lakes and ponds. By contrast, erosion from farmlands carries everything, good and bad, to foul our water sources. We cannot overlook the cooling effect of turf. Transpiration from the countless green grass blades helps to maintain more uniform climatic conditions.

This is an "off-the-cuff" evaluation. I don't have scientific data. Hopefully readers will write in and add to this incomplete coverage.

So far as we know, no one exercises greater care in the use of dangerous chemicals and in the disposal of empty containers than the golf course superintendent. This, in itself, is a plus for the turfgrass profession.

Q—*Recently we rebuilt a putting green using native sandy soil which is known to drain very well. After the green settled we noticed a depression that held water. It was especially noticeable this past winter when the soil was frozen. What can you suggest as a remedy for this situation?*

(Vermont)

A—The low place held water this winter because the soil was frozen. With well-drained sandy soil you should have no problem when spring comes. If water stands longer than you would like to have it, try punching holes with a tubular-tine fork. This should let the surface water drain down quickly. If the problem still persists you may be forced to lift the sod, fill the depression with the same sandy soil that is in the green, and replace the sod. □

by Dr. James B. Beard

TURFGRASS RESEARCH REVIEW

Rate of evapotranspiration from turf

Turfgrass evapotranspiration. *R. Tovey, J. S. Spencer and D. C. Muckel. 1969. Agronomy Journal. 61:863-867. (from the University of Nevada, Reno, Nev. 89507).*

The lysimeter technique was utilized to measure the rate of evapotranspiration from two types of turf grown on two different soil textures. The two types of turfgrass were (a) a cool season turf composed primarily of Kentucky bluegrass and red fescue and (b) two varieties (Tifway and Tifgreen) of the warm season species, bermudagrass. Cutting height, mowing frequency, fertilization and pest control were typical of the cultural practices used to maintain Kentucky bluegrass-red fescue and bermudagrass sods, respectively, under Nevada conditions. The two soil textures were a loam and a sandy loam. The irrigation treatments were (a) twice weekly, (b) a seven day interval and (c) a 10 day interval. The total amount of water applied in each case was equivalent to two inches a week. Each irrigation and soil treatment was replicated three times.

Measurements taken included (a) amount of water draining through the lysimeter, (b) amount of water applied and (c) total quantity of water lost by evapotranspiration from the turf. The latter measurement was compared with the pan evaporation rate and net radiation measurements. Visual ratings of shoot density and color of turf were also taken.

Based on the turfgrass density and color ratings, twice weekly irrigations maintained excellent turfgrass quality throughout the growing season including the hot, dry periods. A seven day irrigation interval produced a good quality Kentucky bluegrass-red fescue turf when grown on the loam soil, but was not adequate for the sandy loam soil. A 10 day irrigation interval resulted in thinning of the Kentucky bluegrass-red fescue turf and the invasion of weedy species. Irrigation at a seven day interval was adequate for maintenance of a high quality bermudagrass turf on both the loam and sandy loam soils. The favorable turfgrass responses to the various irrigation frequencies were only achieved when sufficient water was applied to bring the soil root zone to field capacity at each irrigation.

The rate of evapotranspiration was positively correlated with the rate of pan evaporation and net radiation. Basically, the rate of evapotranspiration from irrigated turfs which have an adequate supply of available soil moisture is governed primarily by the amount of radiant energy received. The rate of evapotranspiration from the turfs grown in Nevada ranged from a 0.13 to 0.16 inch a day during the high temperature periods of midsummer.

Examination of the root distribution of the cool season species showed the majority of the roots in the upper six to eight inches of the soil profile with some roots extending down to 12 inches. The warm season bermudagrass varieties had a considerably deeper rooting capability.

The authors stress that these results were obtained under controlled experimental conditions in Reno, Nev., and that this should be taken into consideration when utilizing this information in the design of irrigation systems.

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Comments: Evapotranspiration is defined as the combined loss of water from the soil by evaporation and by transpiration from the turf growing on the soil. Transpiration accounts for most of the water loss by evapotranspiration from turfgrass areas. The transpiration rate of a turf will vary seasonally, diurnally and even from hour to hour. As shown in this study, the evapotranspiration rate is typically highest in midsummer. On a diurnal basis, evapotranspiration is normally at a maximum at or slightly after midday, when the light intensity is highest.

Factors affecting the transpiration rate include (a) duration of daylight, (b) temperature, (c) atmospheric vapor pressure, (d) wind movement, (e) rate of water absorption by the turfgrass roots and (f) the soil moisture content. High temperatures, long daylengths, low atmospheric water vapor contents and high wind velocities are environmental factors which can increase the rate of turfgrass evapotranspiration.

The frequency of irrigation will vary with the rate of evapotranspiration and can be influenced significantly by the texture of the soil as illustrated in the above study. Coarser textured soils will require more frequent irrigation because of the lower water holding capacity. However, the total quantity of water applied per irrigation will be less on sandy soils.

Proper frequency of irrigation is particularly important. If water is not applied frequently enough the turf will wilt and damage may result from desiccation or high temperature stress. On the other hand, excessively frequent irrigations which cause waterlogging of the soil will result in a reduction in shoot and root growth plus a decline in the overall vigor and quality of the turf. Over watering is usually more of a problem on golf turfs than under watering.

With water supplies becoming more limited and expensive, it is important to adjust irrigation practices to utilize the water as efficiently as possible in maintaining high quality turfs. An understanding of the evapotranspiration process and the environmental, soil and cultural factors affecting it is quite important to the professional turfmen in planning irrigation systems and executing proper irrigation practices.

Influence of fungus isolate and grass variety on *Sclerotinia* dollar spot development. *H. Cole, J. M. Duich, L. B. Massie and W. C. Barber. 1969. Crop Science. 9(5): 567-570. (from the Pennsylvania Agricultural Experiment Station, University Park, Pa. 16802).*

The relative susceptibility and resistance of Kentucky bluegrass and red fescue varieties to four isolates of dollar spot (*Sclerotinia homoeocarpa* F.T. Bennett) were investigated. The four isolates were obtained from Virginia, Rhode Island, central Pennsylvania and southeastern Pennsylvania. The individual isolates were cultured and inoculations applied to turfs maintained under field plot conditions. Thirty-seven bluegrass varieties and experimental selections which had been maintained at a 1.0 inch cutting height were included in the study along with 18 seeded and vegetatively propagated creeping bentgrass varieties and experimental selections maintained at 0.25 inch.

The turfs were mowed immediately prior to application of the inoculum of the four isolates. Subsequently, a light irrigation was applied for 10 minutes of each daylight hour for four days. This practice insured ideal conditions for penetration and infection of the casual organism. Data taken included the number and severity of dollar spot infection centers developed in the treated areas.

Dollar spot leaf lesions became visible on the bluegrass within two days after inoculation and visible infection centers were evident after five days. In the case of bentgrass, leaf lesions were visible within five days and infection centers appeared within seven to 10 days after inoculation. Temperatures during the bentgrass inoculation experiment were generally cooler than during the bluegrass experiment which contributed to the differential rate of visual injury

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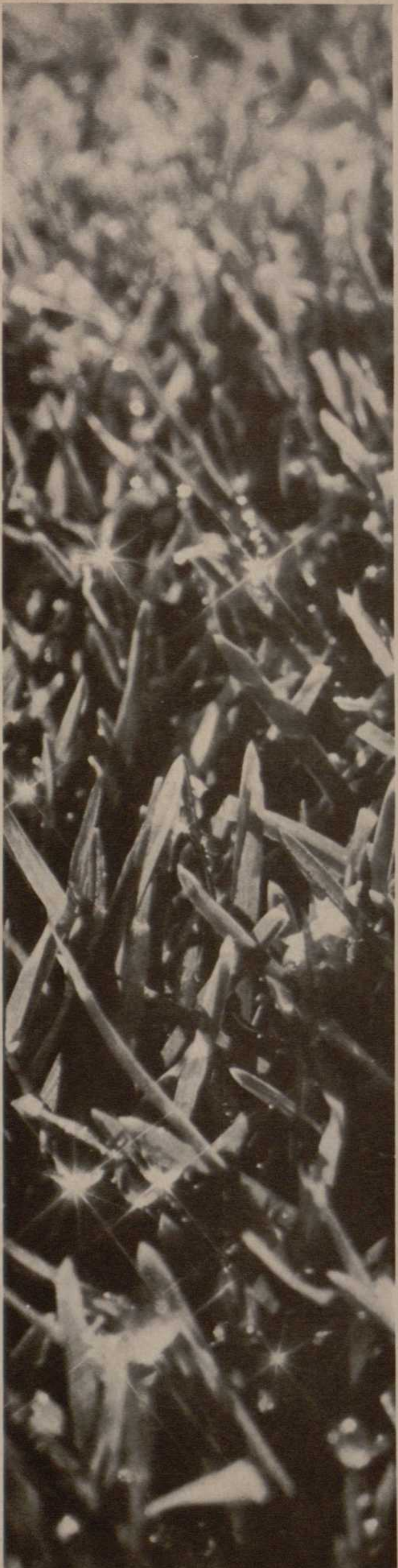

BEARD

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symptom development.

The four dollar spot isolates varied significantly in severity of disease infection on both the Kentucky bluegrasses and creeping bentgrasses. Substantial variations in relative susceptibility among the varieties of bluegrass and bentgrass were also evident. For example, the dollar spot isolate, which was most virulent on bentgrass, was least virulent on Kentucky bluegrass. Similar pathogenic variations and reversals were evident among the turfgrasses.

In evaluating the relative susceptibility to all four dollar spot isolates, the Kentucky bluegrass varieties Merion, Newport and Pennstar were the most susceptible whereas Delft and Campus were the most resistant.

Comments: During sexual reproduction a given disease causing fungus organism can produce isolates or strains of the fungus which have distinctly different properties in terms of mycelial characteristics, pathogenicity and tolerance to fungicides. Investigations such as the one reported in this study are needed in order to survey the prevalence and severity of isolates of a given fungus so that resistance to the particularly virulent isolates can be incorporated into the new varieties being developed by the turfgrass breeding program.

The variability in virulence among isolates of a disease causing organism is the reason that a given turfgrass variety may appear relatively resistant to a disease in one region. Similarly, a certain fungicide may be effective in controlling the disease in one area but not in another. The reason for this differential response is that the separate regions have distinctly different isolates of the same fungus. Similarly, the optimum temperature and moisture conditions for disease development may vary among the isolates. Variations in isolates of a fungus also exist in a number of other turfgrass diseases including brown patch, rust and stripe smut.

The variability in turfgrass varietal susceptibility, fungicide control and optimum conditions for fungal development which occur from isolate to isolate within a given disease causing organism illustrates the importance of conducting turfgrass research in the various climatic regions throughout the country rather than at one individual site. It is also equally important for the professional turfman to be up-to-date and informed on the latest turfgrass research results at his own state agricultural experiment station. □

Other papers of interest:

1. Composted municipal refuse: Its effect on carbon dioxide, nitrate, fungi, and bacteria in arredondo fine sand. *D. F. Rothwell and C. C. Hortenstine. 1969. Agronomy Journal. 61(6): 837-840. (from the Florida Agricultural Experiment Station, Gainesville, Fla. 32601).*

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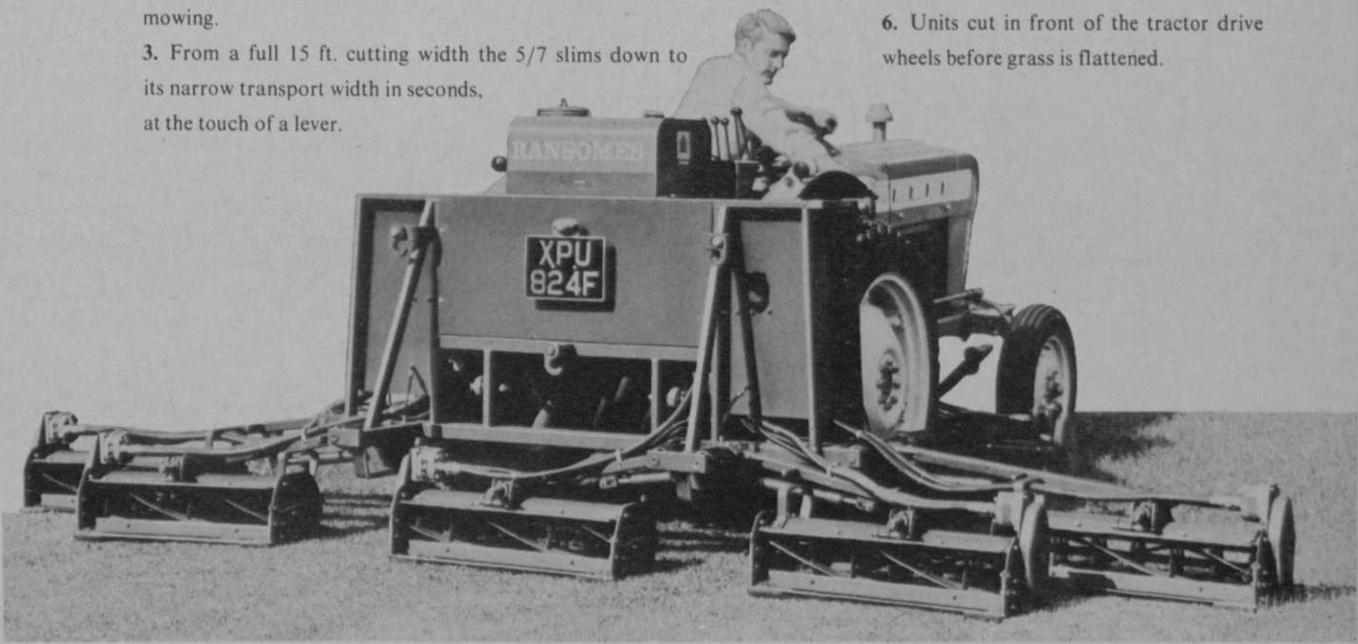

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