MOWING AND CULTIVATION EFFECTS ON PESTS

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For the purpose of this discussion, the pests will include weeds, diseases, nematodes, and insects.

MOWING EFFECTS ON PESTS

Mowing has a number of dimensions which must be considered in relation to the effects on pests. Specifically they include cutting height, mowing frequency, mowing pattern, mower type, and clipping disposition.

Cutting Height Effects: The preferred cutting heights for the commonly used cool season turfgrasses are shown in Table 1. These suggested cutting height ranges represent a compromise between (1) a high cutting height which gives the best overall turfgrass health and vigor and (2) a lower level desired for ornamental and recreational uses. As the cutting height is lowered from the optimum for a given species there are morphological and anatomical changes in the turfgrass as well as modifications in the turfgrass environment. Specifically, the lower cutting height will result in a weakened turf due to reduced leaf area available for light capture and conversion to carbohydrates to support root and shoot growth. As a result of this weakened condition the turf is more prone to invasion by many common low-growing turfgrass weeds as well as increased proneness to disease, nematode, and insect injury. In addition, the recuperative potential from pest injury is less due to reduced carbohydrate reserves at the low cutting heights.

A second effect of a lower cutting height occurs if there is a significant reduction in the turfgrass density. A thin turf increases the likelihood that light can penetrate to the soil surface where weed seed germination and seedling growth are enhanced. Weedy species that are known to require light for establishment from seed include crabgrass, goosegrass, and annual bluegrass.

The third aspect of lower cutting heights relates specifically to disease problems and is an additional effect to that resulting from the weakened turf. Studies have shown that there is an increased susceptibility to leafspot, brown patch, dollar spot, rust, Typhula blight, and Fusarium patch as the cutting height is lowered from the optimum. There are two reported exceptions to this. Excessively high cutting heights (well above the optimum) that result in a mat of leaves laying over during the winter period create a more favorable environment for the development of Typhula blight and Fusarium patch. Thus, in the case of these two species either excessively long or excessively short cutting heights can increase the proneness to disease development compared to the intermediate, optimum cutting heights suggested in Table 1.

Mowing Frequency: The general rule of thumb so far as mowing frequency is concerned is to remove no more than 40% of the leaf area at any one mowing. Thus,

Table 1. Preferred cutting heights for the commonly used cool-season turfgrasses.

Relative cutting height	Cutting height (inches)	Turfgrass species
Very close	0.2 - 0.5	creeping bentgrass
Close	0.5 - 1.0	colonial bentgrass annual bluegrass
Medium	1.0 - 2.0	red fescue chewings fescue Kentucky bluegrass perennial ryegrass
High	1.5 - 3.0	tall fescue

(from "Turfgrass: Science and Culture" by James Beard)

the shorter the cutting height, the greater the mowing frequency. There are exceptions to this rule such as greens where daily mowing is dictated due to the surface requirements of the specific game involved. Turfs that are scalped due to relatively infrequent mowing will be seriously weakened and thus prone to more serious injury by diseases, nematodes, and insects. In addition, ideal conditions are provided for the invasion of weedy species due to the lack of competition from the existing, scalped turf.

At the other extreme, is excessively frequent mowing. In this case, a weakened turf results which is more prone to weed invasion and to disease, nematode, and insect injury. However, the degree of weakening is not as significant as is the case for lower cutting height effects described in the previous section. A second factor in excessively frequent mowing is a greater likelihood of disseminating turfgrass pests on the mowing equipment. Dissemination occurs in the form of weed seeds as well as on soil or grass clippings that are contaminated with diseases, nematodes, or insects. The third significant factor associated with excessively frequent mowing involves a longer period of time when mower wounds and resulting exudations are present. Many disease causing fungi occurring on turfgrass require free water on the leaves for spore germination and penetration through the wound tip into the leaf where fungal invasion and eventual disease development occur. Accordingly, disease development is more likely to occur where excessively frequent mowing and the resultant mower wounds and exudations exist.

Mowing Pattern Effects: Mowing pattern is probably less significant than the previous two factors discussed but at times can affect the dissemination of turfgrass pests. One of the more frequently observed evidences of this situation involves the disease, Pythium blight. Mowing during periods when this disease causing organism is active results in disease development occurring in association with the direction of the most recent mower pattern.

Mower Type and Adjustment Effects: The potential opportunity for disease causing organisms to invade through mower wounds with assistance from the associated leaf exudates is more likely to occur with certain mower types as when improperly adjusted or unsharpened mowers are utilized. Reel type mowers cause less damage at the wound site than rotarys. The basic reason for increased disease development when mower wounds are more severe is the same as previously discussed under the mowing frequency heading.

Clipping Removal Effects: Clipping removal can have both positive and negative effects on turfgrass pests. From a beneficial standpoint clipping removal is desirable in that weed seeds are removed which could otherwise function in future weed invasions. Similarly, the potential for disease development is reduced where clippings are removed. In this case, fungal structures are removed with the clippings which would otherwise serve as a source of inoculum for the introduction of certain disease-causing organisms, such as leafspot. In addition, the removal of clippings eliminates a source of saprophytic energy which can be important for certain disease causing fungi, such as Pythium blight and brown patch. Dead clippings in the turf provide a source of

energy on which these disease-causing organisms survive until the environment is favorable for the organism. This situation results in a much greater inoculum available for rapid disease development on the living turfgrass tissues when a favorable environment occurs.

From the negative standpoint, the removal of clippings also removes both nutrients and a source of organic matter which, if not properly corrected through fertilization practices, could result in a weakened turf that is more prone to weed invasion as well as to disease, nematode, and insect injury.

CULTIVATION EFFECTS ON PESTS

Cultivation: Cultivation is defined as involving mechanical methods of selectively tilling an established turf without destroying the sod characteristics. The specific types of cultivation include coring, grooving, slicing, forking, spiking, and shattering. Cultivation practices have both negative and positive effects.

Beneficial Effects: Cultivation of compacted soils results in improved soil aeration and internal soil water movement. As a result, turfgrass health and vigor is enhanced which in turn reduces proneness to weed invasion, particularly knotweed, as well as being less susceptible to disease, nematode, and insect injury. A second associated positive effect involves the improved infiltration of water into the soil. This in turn reduces the occurrence of excessively wet soil surface conditions that are particularly favorable for disease development, especially Pythium blight and brown patch.

Detrimental Effects: Cultivation can serve as a means of disseminating turfgrass pests, particularly on contaminated soil. Thus, it is important to thoroughly clean and possibly even sterilize the equipment when transporting it from infected turfgrass soils to noninfested sites. A second consideration in cultivation is that it produces openings in the turf that are potential sites for the invasion of turfgrass weeds. In this case, the timing of cultivation is particularly important. It should be scheduled to avoid periods of optimum weed seed germination, particularly those more difficult to control species such as annual bluegrass and creeping bentgrass.

SUMMARY

This discussion demonstrates how mowing and cultivation can substantially affect the proneness of turfgrasses to weed invasion as well as disease, nematode, and insect injury. Too frequently we tend to think of turfgrass pests in terms of only chemical control and fail to recognize that the particular cultural practices utilized as well as the timing of the cultural practices employed can be just as important or more important in affecting the potential severity of pest problems.