

Reducing Chemicals: five easy steps to identify turfgrass problems and solve them using a minimum of chemicals

The use of pesticides (fungicides, insecticides, & herbicides) in the maintenance of golf course turfgrass can be minimized by using these five steps.

1. Choose the right grass

Turfgrass species differ in their susceptibility to diseases, to insects, and to invasion by weeds. At Singapore, seashore paspalum (*Paspalum vaginatum*) will have the most disease pressure, bermudagrass (*Cynodon* spp.) will have a moderate amount of disease, and zoysiagrass (*Zoysia* spp.) will have almost no disease. Consequently, it is sometimes necessary to apply fungicides to seashore paspalum turfgrass to maintain acceptable playing quality; it is almost never necessary to apply fungicides to zoysiagrass turf in a tropical climate.

Bermudagrass tends to be invaded by more weeds than does seashore paspalum or zoysiagrass. In order to keep bermudagrass free of weeds, more fertilizer must be applied and usually some herbicides will be required as well. Insect pests can damage all major turfgrass species but damage is especially obvious on seashore paspalum and more insecticides may be required to control insect damage on seashore paspalum.

For tees, fairways, and roughs at Singapore, zoysiagrass is likely to provide the most consistent turfgrass quality throughout the year with the lowest chemical requirement.

2. Create a healthy growing environment

Healthy turfgrass plants can grow vigorously; plants that are actively growing are generally more resistant to diseases, can recover from disease or insect damage more rapidly, and will produce a dense sward that slows weed invasion. Healthy turfgrass plants require fewer pesticides. For turfgrass to grow well, there must be adequate light, water, and air. Obviously, turfgrass does not grow on the forest floor -- there is too much shade there. Do not expect to have good turfgrass quality in shaded conditions. Assuming that we have turf in an open area with adequate light, it is very important to maintain adequate air space in the soil. Grass roots require oxygen for respiration; in water-saturated soils, the low oxygen levels cause stress on the turfgrass, which may lead to outbreaks of disease. Organic matter in the soil holds a large amount of water in small pores; the management of soil organic matter is critical in the maintenance of healthy turfgrass and in the creation of firm playing surfaces.

In general, core aeration should be done a minimum of two times each year, with at least 10% of the green surface area removed by aerification each year, and all the aerification holes should be filled with clean sand, free of organic matter. Soil moisture content should be maintained at between 10 to 25%, by volume, and soil air space should be maintained at between 25 to 40%, by volume. Each year, about 0.012 m³ sand topdressing should be applied to each square meter of putting green surface. These practices will help to maintain adequate aeration porosity.

3. Apply an optimum amount of fertilizer

Some turfgrass diseases, such as dollar spot, are more severe on under-fertilized turfgrass. Slow-growing turfgrass is also slow to recover from traffic, divots, disease damage, or insect damage, making it more susceptible to weed invasion. It is important to fertilize properly to maintain a steady growth rate of the turf and to keep the turf healthy. An additional advantage of healthy turfgrass is a green color that appeals to many golfing customers.

The amount of phosphorus and potassium to apply to turfgrass can be determined by a soil nutrient analysis. The most important mineral nutrient to apply is nitrogen. In general, about three grams of nitrogen per square meter per month is a good starting point for fertilizer applications, and the exact amount of fertilizer necessary to achieve good playing conditions can be adjusted up or down based on turfgrass performance. Weather, turfgrass species, soil conditions, and other environmental factors will all have an effect on the nutrient requirement of a turfgrass stand. In most situations, applying nitrogen, phosphorus, and potassium in an 8:1:4 ratio will produce healthy turfgrass with a minimum of inputs, and the nitrogen rate can be adjusted based on site conditions and turfgrass response.

4. Mow with a plan

After choosing the right grass, creating a healthy growing environment, and fertilizing properly, the grass will grow well, and must be mowed to create a suitable playing surface for golf. Mowing is a critical maintenance activity that, perhaps more than any other, influences the appearance of the golf course and can play an important role in minimizing pesticide use.

I suggest thinking about four important components of a mowing plan. First, make sure the mower blades are sharp and well-adjusted. There is nothing that damages turf more than cutting it with maladjusted mowers and dull blades. In addition to the unsightly effects of a poor-quality cut, shredded leaf blades and a damaged turfgrass canopy make the plants more susceptible to disease outbreaks and reduce stand vigor. Second, mow at an appropriate height of cut. Turfgrass requires light to grow, light is absorbed through the leaves, and if too many leaves are removed by close mowing, the grass will become stressed and susceptible to insect damage, disease outbreaks, or weed invasion. Third, mow at an appropriate frequency. Try not to remove more than one-third of the leaf blade at each mowing. When grass is allowed to grow and then is mowed infrequently, the turf is stressed by removal of too much of the leaf tissue at one time. Fourth, when mowing, create a striping pattern that enhances the appearance of your golf course. There are many different mowing patterns that can be used to enhance the appearance of your grass and that can hide some weeds and minor insect or disease damage; making the grass look better through a careful mowing plan can reduce pesticide inputs by making turfgrass problems invisible.

5. Use chemicals with care

Sometimes pesticides must be used, and if they are used, it is essential to apply them properly so that control of the pest is achieved. Always read the pesticide label and follow it carefully. Be aware of the mode of action of the pesticide that is being applied, and of the life cycle of the target pest. Use appropriate application equipment, the right spray volume, and the right spray droplet size so that the pesticide will have the desired effect.

Misapplication of pesticides will not control the desired pest and can lead to repeated application of chemicals in an attempt to stop a disease, control a weed, or control an insect. The importance of proper application of pesticides cannot be overstated. By studying the pest and the pesticide options, it is possible to control turfgrass pests with a minimum of chemical use.