Natural Turf Management Part I

By Don Arenberg

For more than 50 years, to meet the needs of turfgrass managers, universities and manufacturing companies have continually developed more effective "killers" as targeted pests developed immunities to older products. The newer products have yielded dramatic results that tended to meet the immediate needs of turf managers and players.

Unfortunately, many of these products have sparked public concern regarding the use of pesticides and potentially toxic chemicals. The result, integrated pest management (IPM), has created new pest controls with new demands and economies.

IPM does not mean that pesticides, fertilizers and other chemicals are not to be used — only that they need to be applied more selectively. With such use, they will produce superior results.

A consultant to turfgrass professionals since 1956, I began with my staff many years ago a research project that has continually expanded. Our goal was to pinpoint a chemical or combination of chemicals causing specific problems. We especially focused on recurring problems to turfgrass that received frequent applications of pesticides and fertilizers. We designed a complex, multiplotted project using every pesticide and fertilizer formulation individually and in various combinations with varying soils, climates, turfgrasses and management approaches.

After three years of detailed processing, we could not find any products or their combinations to be the cause of any *specific* pests or turf degradation. However, we did notice some trends. For instance, fertilizer applications produced improved visual leaf growth of the grass, but roots' and rhizomes' depth or density did not increase.

Also, weed killers killed the specific weeds named on the labels, while fungicides and insecticides killed the targeted diseases and insects.

However, it was obvious, under close observation, that a plant's response within the soil changed; also soil characteristics and processes changed over several years with continual application of these products singularly and in combination.

Accumulated Negative Results

Out of these trends came the following negative characteristics.

• Turfgrass plots receiving high-salt fertilizers and synthetic, non-natural pesticide ingredients had fewer beneficial soil microorganisms, and their count diminished with each application. Within three years of four to seven applications (one pound N/application), the majority of specific microbes associated with the growth of healthy turfgrass no longer existed. The salt content increased while the original soil aggregates disintegrated, organic matter content decreased, and the soil became more compact.

•Initially, multi-reaction combination products — including weed-and-feed fertilizers, fertilizers with insecticides or fungicides, and the like — yielded at times slightly different soil and plant root/rhizome reactions than what the individual pesticide or fertilizer produced. Over a period of several years' usage, the turfgrass became thinner, and the root systems all grew on or within 1/4 to 1/2 inch of the soil surface.

•In all synthetic-application plots, the turfgrass response was characteristically similar after four or more applications. Root tips turned brown, and the roots died thereafter within a period of five to 11 days. Roots that did not die became thinner, having less nutrient and water-holding capacity. Rhizomes and stolons became fewer, and grass density decreased accordingly. The addition of fertilizers did not improve these conditions.

•In synthetic-application plots, microorganisms associated with healthy, aggressive turfgrass growth decreased while the anaerobic forms increased. Anaerobic microorganisms are often associated with soil becoming progressively compact and more toxic with fewer essential ion exchanges and other vital reactions.

•As these negative conditions continued, the treated grass plots became increasingly plagued with diseases, insects and weeds while the grass required more frequent and greater quantities of water to remain active in warm weather. The grass in treated plots turned dormant sooner and remained dormant longer during summer droughts and winter seasons. As the treated grass became progressively weaker as the essential microbes were completely eliminated, many of the grass plants within these plots died and did not recover from summer adversities.

Lessons From Prairie Grass

From our research, the most striking trend we noticed was the change of microbial activity within soil receiving synthetic fertilizer and pesticide treatments. Generally, each type of chemical caused specific soil reactions that usually resulted in microorganism responses. Most responses were negative for the growth of the turf and the health of the soil. This made us want to know more about how diseases, insects and weeds become aggressive problems in human-managed turfgrass.

Modifying our research project, we focused on prairies, where natural grasses are the dominant plants. Prairie grass grows more aggressively every year, choking out other plants such as "weeds." Neither do insects nor diseases become so strong or dominant as to weaken and eliminate the grasses. The object of the research was to learn how the grass nature grows achieves such strength. The following are some of the basics we've noticed.

•No two soils are alike. They vary from place to place and are under constant change. Soils — the "life blood" of plants — supply support ingredients necessary to sustain plant and microbial growth.

•No two plants are alike. Each plant requires its own special nutrients, soil, soil microbes, weather, water and other conditions for growth. When these conditions are optimal, the plant will become

intensely strong and become the dominant plant within an area.

•Soil microorganisms (bacteria, fungi, yeasts, molds, viruses, algae and other species) are beneficial forms of life. Each individual microbial species carries out specific functions and reactions within the soil. Some microbes decompose dead matter to form organic material used by the soil and plants. Other microorganisms react with different enzymes, hormones and organic agents that release "tied-up" nutrients from the soil and from dead matter. Other microbial forms react with nutrient elements to form absorbable organic combinations, which build immune and defense systems within the plant. Specialized microbes are able to release agents to kill and prevent certain pathogens (natural disease control) and to reduce weed-seed germination and insect-egg hatching (natural weed and insect controls).

•Microorganisms differ in their requirements, as do plants. Some, the aerobic forms, require the presence of free oxygen in the soil, whereas the anaerobic forms cannot live when there is free oxygen. Anaerobic forms can live only under tight, heavy, soggy soil conditions. They are usually associated with poor grass growth. When they are present in large numbers, they release methane and carbon monoxide gases. These gases, which are toxic to the essential soil microbes and grass roots, cause the soil to lose its productivity and structure necessary for the growth of grass.

•Each species of plant requires its own group of specialized soil microorganisms. When the entire microbial group is present, the plant becomes almost totally immune to disease and insect attacks. The specialized microbes prevent aggressive attacks of pests, and the grass's immunity and defense systems work most effectively to ward off disease and quickly heal wounds. When all microbes are present and performing naturally, nutrients are released within the soil at a rate required by the plant, thereby reducing the need to apply quantities of fertilizers and other materials.

Optimum Maintenance

Whenever turf managers notice weeds, insects, diseases, bare/thin areas, poor color and so forth, they must remember that these are *symptoms* of a problem. The application of pesticides kills the pest(s) but does not prevent it from recurring. This approach attacks the symptom, but does nothing about the *cause*.

As we venture more deeply into nature and her workings during this six-part series, we'll see that a specific disease, weed or other problem is not the cause of grass weakening and dying, but is a symptom of unfavorable conditions that are ideal for the development of problems. The discovery of the cause and the implementation of techniques to eliminate it will provide the healthiest turfgrass. ❑

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