

Mixtures of Zoysia and Merion are being established this season for future trial.

"The tall fescues, such as Kentucky-31, have performed well at the taller mowing heights. Their drought resistance and ability to hold good color are desirable characteristics. The coarse texture and bunched growth habit are distinct disadvantages for good turf production."

Workers at UCLA and at Rhode Island have grown mixtures of warm-season and cool-season grasses. While the correct balance of these mixtures is controlled by management and local conditions, it is significant that the effort to grow warm-season and cool-season grasses in permanent combinations has met with success in some areas.

MANAGEMENT

Management involves many practices. One of these practices which is extremely important is that of fertilization. Because of diversity in soils, in climatic conditions, and in species involved, fertilizer tests sometimes are of value only to localized areas. Some of the fertilizer investigations that have been carried on, however, are of such a nature that they can be applied over a wide area. Studies concerned with the nitrogen, phosphorus, and potassium requirements of Bermuda have been carried on for a number of years at Texas A. & M. Findings indicate that Bermudagrass turf responds to as much as 12 pounds of elemental nitrogen per 1,000 square feet per year. Nitrogen fertilization at these rates is considered almost beyond the limits of practicality. Therefore, recommendations have been made whereby nitrogen would be used at a lighter rate. Eight pounds of nitrogen per 1,000 square feet per year has been suggested. Tests showed a rather poor response to both phosphorus and potassium. However, when clippings are removed, and when nitrogen is applied at sufficiently heavy rates to promote rapid vegetative growth, phosphorus and potash will be removed from the soil in rather large quantities. For these reasons fertilizer recommendations have followed a 2-1-1 ratio.

One of the significant advances in fertilizer practice has been the development of urea-formaldehyde materials. These are high nitrogen materials which will release the nitrogen to plants rather slowly. In this respect the materials behave in a manner similar to organic nitrogen carriers. Urea-formaldehyde materials have been tested at numerous stations and results have been reported in appropriate publications. Urea-formaldehyde materials are now commercially available and are in use to a limited extent.

Liquid fertilizer materials are finding a more prominent place in turfgrass fertilization. For many years liquid fertilizers were considerably higher in price and turf users were advised to buy them only when the price was comparable to that paid for conventional type fertilizers. The relatively new practice of marketing the liquid products of ammoniated phosphoric acid has made liquid fertilizers plentiful enough that they compare favorably in many cases with the dry, granular type materials. The fact that liquid fertilizer materials can be used at the same time as fungicides and insecticides makes them much more appealing to many turf growers.

Chelated iron compounds are new products which are finding some use on turfgrass areas. These materials work better on acid than on alkaline soils at the present time. Unfortunately much of the trouble with chlorosis in turfgrasses occurs on alkaline soils. This is a very fertile field for research and it is to be expected that scientists in the field of chemistry will not be long delayed in the development of chelated iron compounds which will be equally effective on alkaline as well as acid soils.

Irrigation is another important phase of management studies. Some of the most important preliminary work on turfgrass irrigation has been done at the University of California at Davis. Studies at this station have called attention to some of the fundamental principles involved in turf irrigation. Among these are the rooting capabilities of grasses in terms of depth; the water intake capacity of the soil; the water storage capacity of the soil; and the water use rate of plants in a particular area. Recommendations based on studies at Davis may be briefly stated in these words: "Water infrequently and water enough." There is a great amount of work to be done in connection with the irrigation of turfgrasses. It is believed that the statement of these principles underlying the practice of irrigation is a significant step in learning to irrigate more effectively and efficiently.

Soil management as a phase of turfgrass management is relatively new. It has been customary to think that there was little one could do in the way of soil management under turf. Aeration, or the cultivation of soil under turf, has become a standard maintenance practice within relatively recent times. The relief of compaction, or the maintenance of good tilth, helps water infiltration, fertilizer penetration, and the diffusion of oxygen in the root zone. As cultivation is important to field crops so is aeration beneficial to turfgrasses.

There have been numerous studies which have made contributions to the building of synthetic soil mixtures for putting green purposes. The studies indicate that clay should fall within the limits of four to eight percent by volume of the total mixture. The peat content should be kept somewhere between 10 and 15 percent, by volume. The remainder of the mixture should be sand. Extremely coarse particles are not necessary in the sand, but the very fine sand and silt fractions should be eliminated if possible. Studies at UCLA indicate that the placing of a sand layer over soil will reduce compaction and will also facilitate water intake.

Thatch control is another phase of management which has received a considerable amount of attention. The principles which contribute to the formation of thatch are being studied and practical means of eliminating thatch are being investigated concurrently. The Rhode Island Experiment Station reports that Piper Velvet bent develops less thatch when topdressed with both lime and compost than when it is untreated or when either of the treatments is left off. The use of vertical mowing machinery has found a place on many golf courses and it is a practical method of eliminating or reducing thatch.

PEST CONTROL

Diseases

Considerable progress has been made in the matter of controlling diseases. Recent studies at the Georgia Coastal Plain Experiment Station have resulted in the positive identification of a disease which attacks ryegrass. This disease is