Phosphorus fertilization practices and recommendations for turfgrass systems are currently based on arbitrary figures rather than any established minimum requirements. The reason is the scarcity of data on the phosphorus status of turf soils and the lack of information concerning critical phosphorus levels in turfgrass tissue. A common speculation is that turf soils have been overfertilized with phosphate fertilizers, leading to such problems as weediness and high maintenance costs.

Our two-part investigation had two goals: first, the establishment of a data base on phosphorus in California turf soils and, second, a determination of critical tissue phosphorus levels for Kentucky bluegrass, *Poa pratensis* L. In addition, we assessed the contribution of mycorrhizal fungi to the phosphorus nutrition of Kentucky bluegrass. This information may aid in establishing realistic recommendations for the phosphorus fertilization of turfgrass.

depth: 0 to 2.5 cm, 2.5 to 10 cm, and 10 to 30 cm, as measured from the soil surface. Available (sodium bicarbonate extractable) phosphorus was determined for each subsample and the values expressed as ppm phosphorus on an air-dry soil basis. In addition to soil samples, cultural information and observations were recorded for as many sites as possible, including fertilization practices, clippings removal, weediness, and turf quality.

Many soils deficient

Soil phosphorus levels varied considerably among the turf sites sampled. Combined values for the first two subsamples, representing the 0- to 10-cm depth of the soil profile containing 60 to 90 percent of turfgrass roots, ranged from as low as 1.5 ppm to as high as 48.1 ppm phosphorus. Previous research has established that soils with less than 5 ppm sodium bicarbonate extractable phosphorus are deficient for several turfgrass species, while 8 ppm phosphorus or more is adequate for growth. Using these criteria and considering the 0- to 10-cm depth for each site, 24 percent of the soils sampled were deficient in available phosphorus (less than 5 ppm phosphorus), 19 percent were marginal (between 5 and 8 ppm), and 57 percent were adequate (above 8 ppm). In addition, 5 percent of the sites tested contained greater than optimal soil phosphorus levels (above 35 ppm) at 0 to 10 cm. When the depth considered was 0 to 2.5 cm, 17 percent of the sites were excessively high in available phosphorus.

Of the seven soils containing less than 5 ppm phosphorus in the 0- to 2.5-cm subsamples, five were from home lawns. This finding can be attributed to the removal of grass clippings, causing phosphorus depletion in the upper portion of the soil profile. No clippings were removed from any of the other sites sampled in this study.

For most of the sites, phosphorus levels were noticeably higher in the top 0 to 2.5 cm, as compared with those in the 2.5- to 10-cm and 10- to 30-cm layers. Phosphorus appeared to accumulate in the surface 0 to 2.5 cm, possibly because of fertilization and the practice of returning clippings (except as noted for home lawns). Being relatively immobile in the soil, phosphorus tends to remain close to the surface when positioned there either by plant residues or fertilizers.

Weediness

In this study, weediness increased with decreasing soil phosphorus. An average of 6.8 ppm available phosphorus in the top 10 cm (marginally deficient) was found for the sites indicated to be high in weediness. Perhaps at the low phosphorus levels in these soils, weeds were able to compete more successfully and were not as limited by phosphorus as the turfgrass species. This relationship may also, however,