and readily available water. Compaction refers to the reduction in container medium volume caused by settling or compression. Compaction can occur as the result of poor potting procedures, breakage of particles, or compaction from the impact of overhead irrigation and/or other cultural practices. Shrinkage occurs as a result of particle degradation. As certain medium particles decompose, they become smaller and fit closer together, thus decreasing the total volume and the volume of air-filled pores after irrigation and drainage. Compaction and shrinkage during the production period should be less than 10 percent, but slightly more may have to be tolerated for plants requiring multiple seasons for production. Intense rainfall and/or irrigation can splash or wash particles from the container, and particles can be lost during removal of weeds, etc. Root volume increases often compensate for losses in growth medium volume.

Chemical properties of container media

Chemical properties commonly measured for container media and media components include pH, soluble salts, cation exchange capacity and the carbon to nitrogen ratio. These properties should be thoroughly examined during the growth medium selection and/or formulation process.

pH

Optimum pH of a container medium differs with plant species but generally a pH between 5.0 and 6.5 is desirable. The pH has a major role in the availability of nutrient ions. In production systems where nutrients are added frequently in forms that are normally absorbed by the plant, the suitable pH range may be much wider than research with field soils would indicate. A pH above 7.5 usually results in chemical binding of micronutrients and a pH below 4.0 could result in toxic concentrations of ions such as aluminum, zinc, or copper. Field soils are limed to maintain the pH above 5.0 or 5.5 to reduce the possibility of such toxicities. However, the level of aluminum in soilless container media is generally too low to cause problems and a pH below 5.0 can be tolerated by many ornamental plants.

Generally, growers should mix the components together in the ratio that yields the desired physical properties, then determine the pH. Amendments to adjust pH such as dolomitic limestone should be added at the suggested rate to small quantities of the medium and allowed to incubate in moist, aerated conditions for a few days before the effect of the amendment is determined. Procedures for determining the pH of a growth medium are presented in Florida Extension Circular 556, Nursery Laboratory Development and Operation.

The pH of some components will change over time. Typically the pH of a pine bark based medium will decrease during the production cycle. However, irrigation with alkaline water can more than offset this tendency. The growth medium pH should be monitored regularly to allow for adjustments. Elemental sulfur, acid-producing fertilizers and dilute acids can be used to decrease pH. Liming material can be applied to increase pH but a change in pH from application of liming materials to the surface of a container medium is generally slow because the effect tends to be concentrated in the upper strata of the medium. For best results, amendments which are slowly soluble and slowest to adjust pH are best incorporated at the time of media preparation.

Soluble salts

Care should be taken to avoid using growth medium components with high soluble salts levels. Components such as sand, small gravel and peat harvested from areas high in soluble salts may not be acceptable for use in container media or may have to be leached before used. Salts in sands and small gravel can be leached by large amounts of water while the material is in a pile or storage bin. Salt levels in peat may be more difficult to reduce by leaching because of the ability of these organic materials to hold many ions. Soluble salts in the range of 2500 to 4000 ppm are considered high for most woody crops and the moderate or suggested range after fertilization is 1000 to 1500 ppm. However, some plants are more sensitive to salt levels than others. For example, the optimum salt level for azaleas is 500 to 700 ppm.

There are three common methods of measuring soluble salts of growth media, including the saturated paste extract, 2 to 1 dilution by volume and a pour-through or Virginia Tech extraction method. A more thorough examination of the measurement and interpretation of soluble salts is provided in Florida Extension Circular 556, Nursery Laboratory Development and Operation.

Cation exchange capacity

The ability of a soil or growth medium to retain nutrients against leaching by irrigation water or rainfall is estimated by measuring the cation exchange capacity (CEC). Most adsorption sites on growth medium particles are negatively charged and attract positively-charged ions. Many nutrients required by plants are positively charged and thus are attracted by these negatively-charged sites. Sands and other low-surface area