MONITORING MEDIUM NUTRIENT LEVELS DURING PROPAGATION

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The use of controlled release fertilizers, water soluble and dry fertilizers, and fertilizers applied through the mist during propagation have been shown to promote root and shoot growth in various woody plant species (2,3,4,5,6,7). Booze-Daniels *et al.* (1) have also demonstrated that fertilization during propagation of *Ilex crenata* 'Helleri', before the appearance of roots is of little practical value. However, the longer after roots appear that fertilization is delayed the smaller the plants will be at a particular date in the future.

Nutrient absorption and subsequent plant growth are related to an adequate supply of nutrients in the medium solution (Figure 1). As the nutrient levels around the root increases up to a certain point, there will be a proportional increase in nutrient uptake and growth. The level of nutrients required for optimal growth is different for different species. However, it has been shown that the level of nutrients required for optimal growth of young seedling or rooted cuttings is basically the same as for much older plants. The

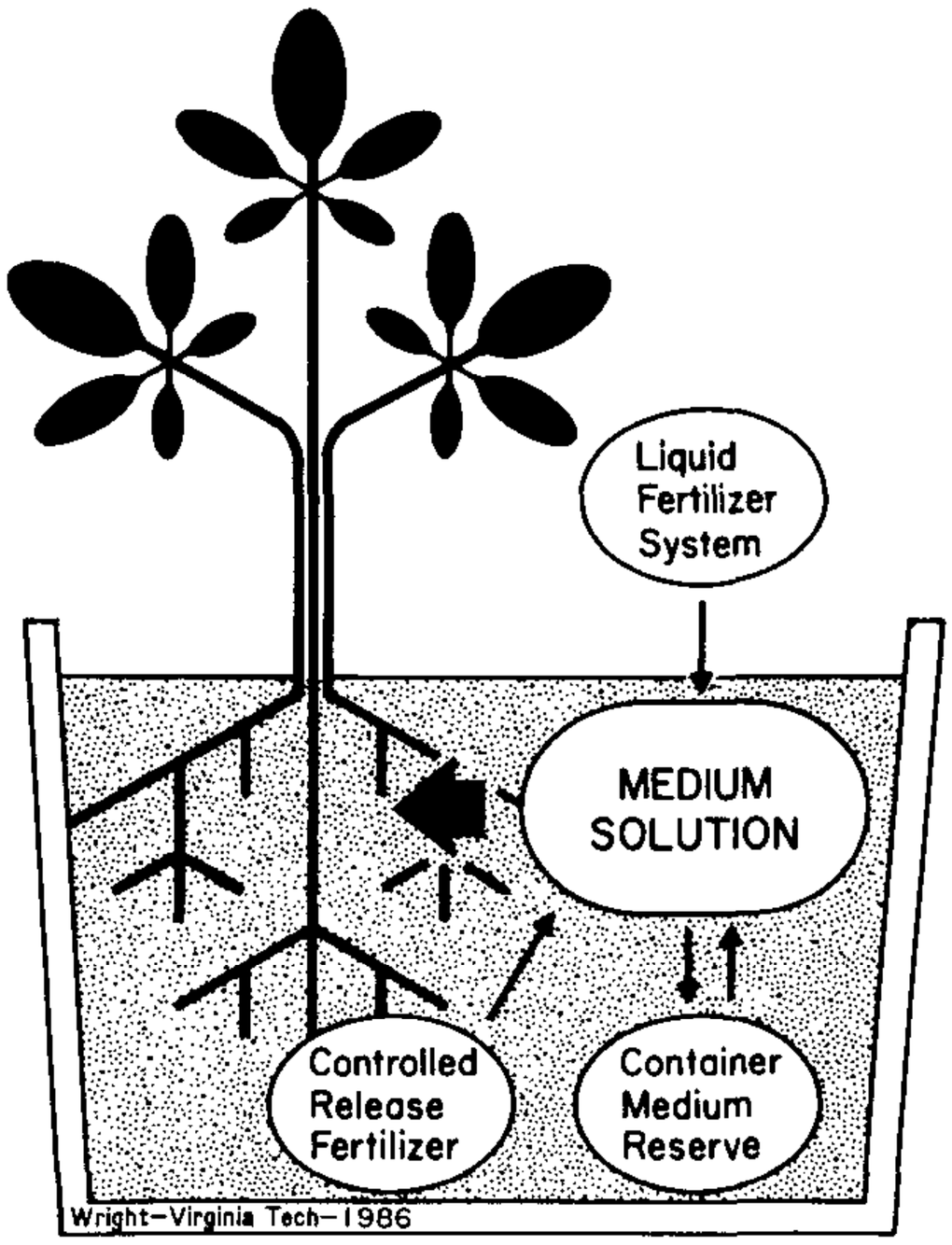

Figure 1. Illustration of the interrelationship between the plant, medium solution, container medium, and nutrient supply.

increased nutrient demands of larger plants are satisfied by an expanding root system which can absorb more nutrients. Thus the application of fertilizers to newly rooted cutting and to seedlings at the proper rates becomes an important management decision if optimal plant growth is to be expected.

The best way to determine the amount of nutrients available for plant uptake from the container medium is to analyze the medium solution for individual nutrients or soluble salts. The level of soluble salts is related to the total amount of dissolved nutrients in the medium solution but tells nothing about the level of individual nutrients available. Excess nutrients can adversely affect plant growth, both directly and indirectly, through a variety of mechanisms. Low soluble salts levels indicate insufficient levels of nutrients for optimum growth.

Soluble salts levels can be measured with a conductivity meter that costs under $300. By testing for soluble salts on a regular basis one has an idea of the relative level of fertility under which the plants are growing. Adequate nutrient levels depend upon species and the time of year, but soluble salts readings between 0.4 and 1.5 mmhos give optimal growth of most species. During fall and winter when plants are not growing as rapidly, lower levels of soluble salts may be adequate and probably desirable to promote proper cold acclimation (8).

The nutrients in the medium solution for container-grown plants or plants in flats or small propagation pots can be conveniently extracted by the Virginia Tech Extraction Method (VTEM), or more commonly known as the Pour Through Method that was developed and tested at Virginia Tech. It is a simple procedure and, after some adaptation to fit individual grower needs and preferences, has been shown to be an effective technique to monitor container nutrient status and needs.

DESCRIPTION OF THE VTEM

- The container and medium in question are placed on a suitable platform to elevate the container bottom above the surface of the collection vessel. If cuttings are in flats or cell packs, then a whole flat can be used from which to collect leachate. If small pots are used (2 to 4 in.), then enough pots should be placed together in the collection vessel to give a medium volume of about 2 quarts.
- Add sufficient distilled or good quality tap water to the surface of the medium so that about 50 ml of water is accumulated in the collection vessel. The moisture level of the medium should be at or near its water-holding capacity (about 2 hours after irrigation). The moisture level must be similar at the time of each extraction or the moisture level of the medium will influence the level of nutrients extracted. For most media, about 5 minutes is sufficient time for the leachate to drain into the collection vessel. At least 3 containers or

tests should be run from the block of plants in question to obtain a better representation of the level of nutrients or soluble salts for the plants in question.

• The leachate is then poured into a suitable container and is ready for pH, soluble salts, and nutrient analysis. If only soluble salts readings are desired, the leachate can be poured or collected directly into the vial of a portable conductivity meter and discarded after reading.

ADVANTAGES OF VTEM

Other methods of nutrient extraction for soil-less container media involve the addition of water to a volume of medium. Procedures vary from saturating the medium (saturated soil extract method) to adding different amounts of water to a known volume of soil (2:1, 3:1, or 5:1, v/v etc.). All these procedures entail the removal of the medium from the container and subsequent extraction in the laboratory. The advantages of VTEM are: 1) nutrient extraction and soluble salts analysis occurs in the field, 2) the time required for each extraction is short, 3) no medium is actually handled, 4) there is no danger of rupturing slow-release fertilizer particles and causing erroneously high nutrient readings, and 5) no specialized equipment is required for extracting the solution from the medium.

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