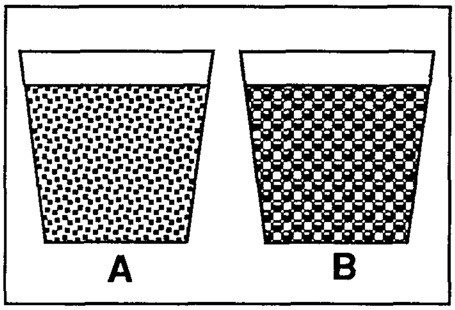

Figure 1. Container A is filled with small particles which fit together to form small pore spaces while the large particles used in container B form many larger pores.

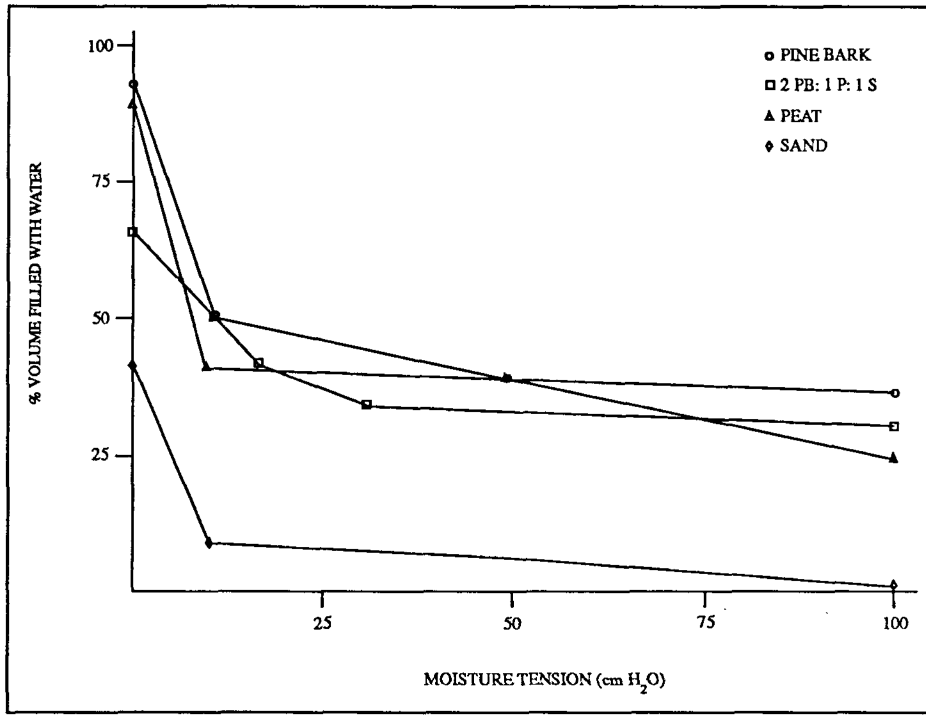

Figure 2. Moisture retained by growth media at various tensions.

the volume of water and air in a container medium at container capacity. Large particles fit together to create large pore spaces (Figure 1). These large pores are generally filled with air at container capacity. When smaller particles are mixed with the larger particles, the volume of large pore space is reduced and the volume of the medium comprised of solids and water after irrigation increases. Thus, the particle size distribution, or the relative volume of each particle size range, determines the water-holding and aeration properties of a container medium.

The internal pore space of a particle obviously differs with the type of particle. A perlite particle essentially has no internal pore space while 40 to 45 percent of a pine bark particle volume is pore space. Much of the intraparticle pore space will be filled with water at container capacity. A portion of the water may be available for plant uptake but a substantial percentage will be unavailable. It has been determined that water in container media held at tensions greater than 100 centimeters of pressure is not readily available to plants.

The amount of water present in a growth medium decreases as tension or suction is placed on the water. By placing varying tensions on the water in a medium, a water release pattern can be developed for that medium. This pattern is usually referred to as the moisture retention curve. Moisture retention curves for various growth media and media components are presented in Figure 2. Note that most of the water in pine bark, peat and sand is held at less than 25 cm of tension. Twenty to 35 percent of the total pore space in a soilless growth medium may be filled with tightly-held water (greater than 100 cm of tension) and is considered to be of little value to container-grown plants.

When a containerized medium is irrigated, there is a layer of nearly saturated medium at the bottom of the container (Figure 3). The thickness of this excessively wet layer depends upon the particle size distribution, which determines the water-holding capacity of the medium. There are no capillary pores to place tension on water at the bottom of the container as one would find at the same depth in a field soil profile; therefore, water in the bottom of a container is held by very small tensions or in some cases may be essentially free water. If the container is tilted, much of this free water would drain from the lowest point of the container. Water above the near saturated medium at the bottom of the container has tension placed on it by the force of gravity. The greater the distance above the near saturated conditions, the greater the tension exerted on the water in that region of the container medium. For example, water between particles in the surface of a 15-centimeter tall container would be held at tensions greater than 15 centimeters. Water between particles held at tensions less than 15

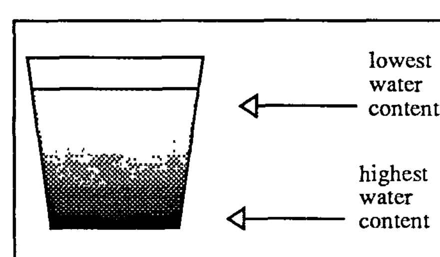

Figure 3. Moisture gradient in container media at container capacity.