



## HAWAII COOPERATIVE EXTENSION SERVICE

College of Tropical Agriculture and Human Resources

University of Hawaii

GENERAL HOME GARDEN SERIES No. 36

### CARE FOR YOUR GARDEN—WATER PROPERLY

**Wade W. McCall, Soil Management Specialist**

Water is essential for plant growth. It supplies the hydrogen and oxygen needed for carbohydrate formation in the plant. It also moves mineral nutrients from the soil into the plant and then to the part of the plant where they are needed. Water is necessary for the transpiration process, which cools the plant. In addition, water maintains the turgidity of the plant and prevents drought stress.

Garden plants grow vigorously only when their roots are supplied with adequate moisture. Although roots should be kept moist, the soil around them should not be too wet, because too much water excludes oxygen that is vital for the proper growth and function of the roots.

#### **How Much Water Is Needed**

Watering to the full depth of the roots is best. This means that the water should percolate 8 to 12 inches into the soil for most garden plants. Some of the larger, deeper rooted plants, such as tomatoes, may require wetting 12 to 18 inches into the soil. The amount of water required, how quickly the water can be applied, and how long the water must be applied depend upon the texture, structure, and permeability of the soil. Water moves quickly in sandy soils, moderately in a properly prepared soil (loamy), and slowly in clay or compacted soils. Many of the clay soils in Hawaii have water movement properties that resemble those of sand.

To determine how far water percolates into your soil, apply water as you usually do. The next day, dig down to determine how far the water has percolated. If you watered for a half hour and the water percolated 6 inches, then you must water for an hour, or twice as long at the same rate, to have the water percolate to the 12-inch depth.

The soil should be uniform in nature to insure uniform water movement. If there are layers of different textures, they will form barriers to water movement. This causes one layer to be too wet and another to be too dry. If one layer is too wet, oxygen

is excluded and root growth is poor, resulting in poor plant growth and restricted yields. If one layer is too dry, poor root growth results. Careful soil preparation before planting is essential to prevent problems of this nature.

Water should be applied at the rate at which the soil can absorb it without runoff. Applying at a greater rate will result in wasted water and may result in soil erosion. To determine the rate that the soil will absorb water requires an infiltrometer, which is expensive and time consuming. There is a simple device that will give an approximate rate of infiltration. Get a No. 10 can (such as a 96-oz. institutional-size can of peas) with top and bottom removed. Place this in the soil so that about 3 inches remain above ground. Place a No. 303 can (such as a 15-oz. can of fruit cocktail), also with top and bottom removed, into the soil in the center of the No. 10 can, so that about 2½ inches remain above ground level. Wet the entire area inside both cans by filling them to the top with water. Allow this water to drain into the soil. Fill both cans again and determine how long it takes for the water from the smaller can to move into the soil. The number of inches of water that moves into the soil from the small can in a given length of time is the infiltration rate of the soil. The information from this test plus the information from the percolation test will indicate how much water should be applied and how quickly it can be applied.

#### **How Often to Water**

Water is lost by evaporation from the soil surface and by transpiration from the leaves of plants. Evaporation from the soil can be greatly reduced by using mulch. Transpiration from leaves depends upon air temperature, relative humidity, sunlight, and wind velocity.

A tensiometer or similar device may be used to determine when water should be applied. If tensiometers or other devices are unavailable, an easy

check can be made by opening a small hole in the soil using a shovel, trowel, soil sampling tube, or similar device. Feel with your fingers to determine if the soil is moist (not wet) 1 inch below the surface. If it is moist, wait a couple of days and check again; if it is dry, water again for the usual amount of time as determined above.

### **How to Water**

Water may be applied by sprinklers, drip irrigation, flooding, or various attachments on the end of a garden hose. The water should be applied gently so that the soil can absorb it as quickly as it is applied. If applied too quickly or with too much force, it may loosen the fine surface particles, which will then seal channels into the soil and greatly reduce the subsequent rate at which the water can enter the soil. These fine particles may also wash away in the runoff water, contributing to erosion. Because they hold most of the plant nutrients, this will increase the need for fertilizer.

A high pressure sprayer or nozzle on the end of a hose is the least desirable method of applying water. The force of the water breaks soil particles loose and seals the soil. Few of us have the patience to stand in one place long enough to apply sufficient water for plant needs by this means.

Sprinklers work well; however, care should be taken so that the water is not applied more quickly than the soil can absorb it. Proper distribution of the water is often a problem with sprinklers, especially in windy areas, although at night, with less wind, distribution may be adequate. Because fungus diseases are encouraged when plant foliage remains moist for 6 hours or more, sprinkling and other methods that wet the foliage are best done in the morning when the leaves dry more rapidly.

Surface or subsurface drip irrigation is considered the most efficient method of applying water. Plastic tubing of different designs, with openings at each plant, places the water where it is most needed. It is not affected by wind and can be easily applied at the proper rate for soil absorption.

Hoses may be used with soaker or "bubbler" attachments to prevent scouring or gouging of the soil. Hoses may be used without these attachments if the water is run slowly enough for the soil to absorb it as quickly as applied.

Sufficient water should be applied to wet the soil to the proper depth. Frequent but light applications of water encourage the undesirable development of a mass of fine feeder roots at the surface of the soil. Concentrated at the surface, they are easily injured by cultivation, burned by fertilizers, and injured by drought when this layer dries out.