up to 2 m to suit a variety of purposes.

First or second year seedlings are usually used for the rootstocks. Seed of most species should be sown as soon as ripe in the open ground or in deep boxes. Cover seed 1 to 2 cm with sand. If seed has dried out soak it in warm water for several hours, then mix with moist peatmoss, place in a tight plastic bag, and store in the bottom of a refrigerator for 6 to 10 weeks. Inspect each week and plant immediately if any sign of germination is seen. Some species, such as *A. griseum*, may take two or even three years to germinate but the majority come up quite well in the first spring if picked and planted immediately.

THE IMPORTANCE OF THE ENVIRONMENT IN GROWING AFRICAN VIOLETS

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African violets are one of the most specialized of ornamental crops. They are easily propagated from seed or leaf cuttings. Fully matured leaves from the outside of flower stalks are preferred for propagation. Adventitious buds are rapidly formed and develop into plantlets.

African violets are not a difficult crop to grow if you understand them and their conditions. The important environmental considerations are as follows:

Light. The emphasis is on light intensity rather than daylength. The optimum solar radiant flux density is 1100 ft. candles. Extensive yellowing occurs in the foliage of African violets which are exposed to radiant energy levels above 1200 ft. candles. This is due to chlorophyll destruction by the radiant energy. Light intensty above 1100 ft. candles reduces the number of flowers per plant in some cultivars. More commonly, the initiation of flowers by African violets is seriously limited at radiant flux densities below 300 ft. candles. A radiant flux of 100 ft. candles for 12 hours per day is enough to produce satisfactory plants with good formation and foliage color, but is insufficient for appreciable flower production.

With sunlight the optimum radiant flux for both vegetative growth and flowering is 1100 ft. candles for a minimum of 7 hours per day. However, radiant energy from "daylight" fluorescent lamps at 500 ft. candles for 12 to 18 hours a day produces a better growth and more flowers than a higher solar radiant flux. The uniform radiant flux that can be maintained for long periods is responsible for this difference in plant response.

Temperature. African violets grow best and flower most profusely when the night temperature is 20 to 30°C (68 to 73°F) and the day temperature is 14°C (57°F). Growth is vigorous even at a day temperature of 10°C (50°F) if the nights are warm. This thermoperiodic behavior of the African violet is very unusual, considering that night temperatures higher than day temperatures do not occur naturally anywhere in the world. African violets are also atypical in that they have a higher optimum radiant flux density at lower temperatures, whereas most plants respond to an increase in temperature with a higher radiant energy requirement. The optimum irradiance for growing African violets with light from electric lamps is 500 ft. candles at 23 to 26°C (73 to 79°F) and 1000 ft. candles at 14°C (57°F). High temperatures may cause dropping of immature flowers. It may also cause blasting of buds or small flowers of poor quality.

Water. Water applied to the leaves of African violets may cause the development of white or cream colored spots, streaks or rings on the upper surface. This physiological problem, commonly referred to as "Ring Spot" occurs when a difference of 17°C (30°F) between the leaf temperature and the water temperature exists. The presence of water on the surface of the leaf is not a factor in the development of "Ring Spot". Any substance that is 17°C warmer or colder than the leaf will cause spotting. An ice-cube wrapped in plastic and held against the leaf will produce spots that are identical to those that occur when the foliage is sprinkled with cold water. If the temperature of the water used to irrigate African violets is similar to the leaf temperatures, it may be applied to the leaves without concern about "Ring Spot", provided account is made for the evaporative cooling of the water if the humidity is too low.

The presence of water moving into the palisade cells that are warmer or colder than adjacent leaf cells causes the cells to collapse. Chlorophyll is destroyed and the cells turn white or yellowish-brown. The best indicator we have to tell us whether a plant has too much or too little water is the plant itself. Unfortunately, however, by the time the plant shows symptoms of either too much or too little water, much harm has come to the plant.

If we are to realize optimum plant growth one must look at watering systems such as capillary sand irrigation, constant water-level systems, capillary mats and the tube irrigation systems. Basically, soil contains three types of water . . . bound, available and free.

Bound water is that which surrounds, in a thin film, the soil particles. It is so tightly held that the plant roots cannot extract it.

Available water is most important to plants. It is not held tightly like bound water, but it will not move out freely as free water. It is held in the small pores of the soil by capillary forces.

Free water is held in the larger open spaces or larger pores of the soil and is free to move by drainage. It is therefore important to have a mix with a high water potential and good drainage.

Soil. A desirable potting mix for African violets requires a total pore space of 70%, consisting of 35% air-space and 35% water-retention space. The volume, shape and drainage of the pot will affect this ratio.

The ingredients shown in Tables 1 and 2 were selected as being satisfactory.

Table 1. Potting mix ingredients for African violets and their characteristics.

	Total Pore Space	Water Retention Space	Air Space
Sphagnum peat moss	84%	59%	25%
Rice husks (moist)	73	3	70
Sawdust ready mix (4 parts sawdust, 3 parts pinebark, 3 parts sand)	45	38	7

Our mix consisted of 2 parts sawdust, 1 part rice hulls and 1 part peat, giving a total pore space of 67%, a water-retention space of 33% and an air space of 34%.

Table 2. Nutrients added to mix (per m^3).

500 g potassium nitrate	250 g iron sulphate
1 kg lime	100 g Esmanel
3 kg dolomite lime	500 g single super phosphate
1.25 kg blood and bone	

After potting, liquid fertilizer is applied through the watering system. To 200 l water are added 20 kg potassium nitrate, 10 kg ammonium nitrate, 10 kg diammonium phosphate and 300 g "Librel" (iron chelates). This gives a solution with 21.2% total nitrogen (9.7% as ammonia and 11.5% as nitrate nitrogen); 5.9% phosphates and 19.3% potassium. This solution is then diluted 1:300 in a G.E.W.A. System and gives a final ratio of 140 ppm nitrates, 40 ppp phosphates, and 130 ppm potassium.

Pests and Diseases.

Cyclamen Mite attacks the young tender growth of the crown, distorting the plant, causing growth in general to be dwarfed. Plant hairiness is more pronounced and leaves tend to be quite brittle and to cup upwards.

Treatment — Plictran or Temik when infestation evident; plants are generally beyond sale at this stage.

Broad Mite causes the foliage to curl down more than usual, with a general look of debility. No noticeable increase in hairiness.

Treatment — Plictran, Temik.

Nematodes — cause loss of vigour and general debility; foliage loses its good green to become pale and dull; outer leaves droop. Young leaves emerge already damaged. Flowers are few. Roots have knots or sizeable pulpy enlargements.

Treatment — Nemacur, Temik.

Foliage Mealy Bug — cause plants to look dusty. Flower stems and leaves have a greyish webby appearance. Deep in the crown and on the underside of the leaf, cottony clusters are visible.

Treatment — Insectigas, Temik.

Soil Mealy Bug — cause a plant to look wilted as with Crown Rot or Root Rot; dull appearance of leaves, and plant becomes small in centre.

Treatment — Nemacur, Temik.

Thrips — cause whitish spots, blotches and dead looking areas along the edges of the flower petals. There will be malformation and premature fall of blooms and buds.

Treatment – Insectigas, Temik.

Botrytis — infects dead or dying plant parts; e.g. dropped or damaged flower petals, and spreads to cover the infected area with a woolly grey growth. The fungus is common and is airborne.

Treatment — Rovral, Benlate.

Powdery Mildew — causes white to greyish spots on the surface of the host plant part, which ultimately become brown with black spots.

Treatment — Benlate, Daconil.

Crown Rot — causes rotting of the growing point of the plant, and has symptoms similar to cyclamen mite.

Treatment — Terrazole.

All of the above insects can be controlled by Insectigas, although it may be necessary to use Temik if an infestation is already present.

CAPILLARY WATERING

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In discussing capillary watering it is first necessary to see how it fits in with the different classes of water. Soil moisture has been classified into three categories (3) as illustrated in Figure 1.

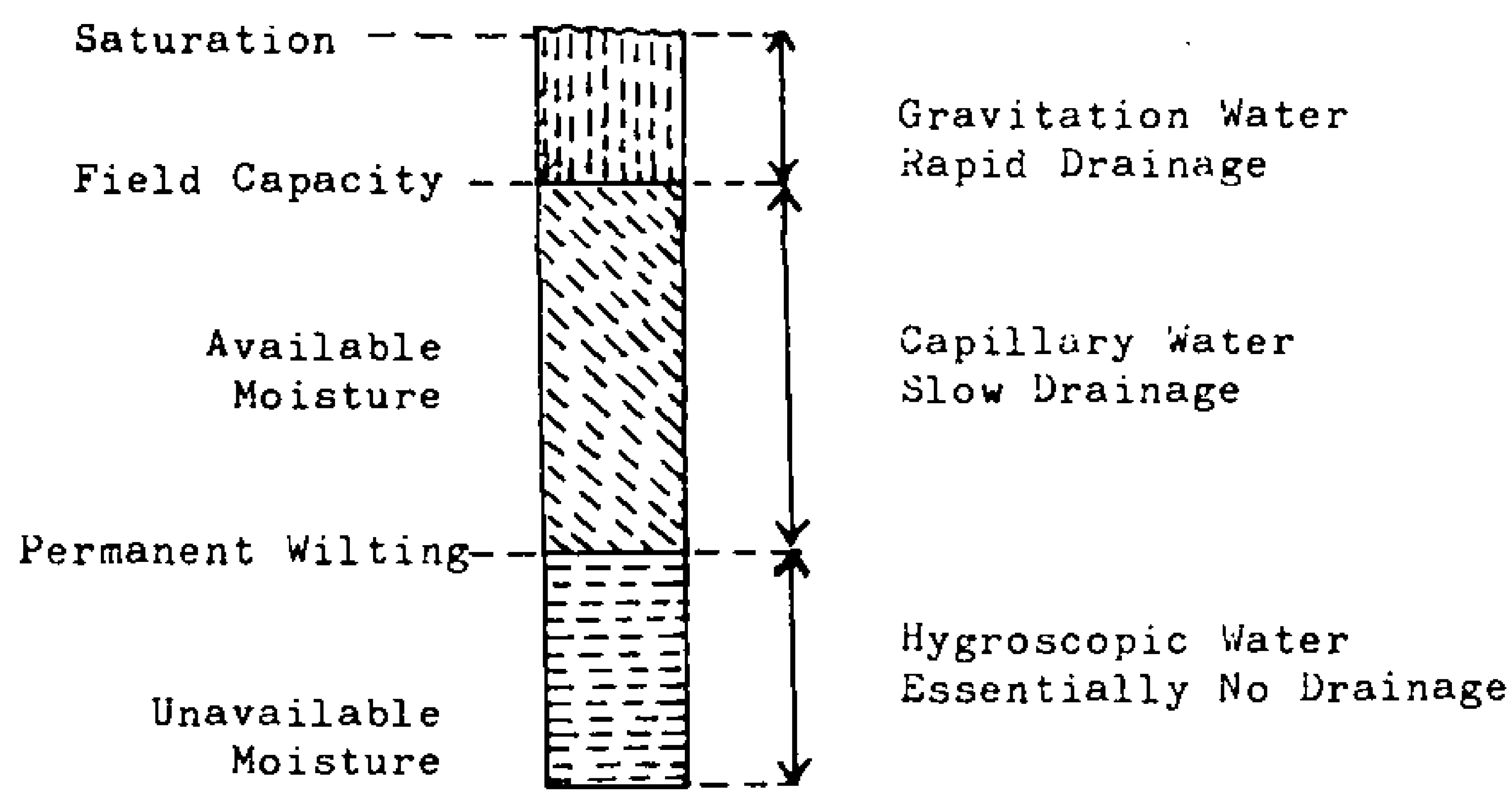

Figure 1. Classification of Soil Moisture. From "Irrigation Principles and Practices" 3rd Ed., Israelson, O.W. and Hansen, V.E. (3).

Excess or gravitational water will rapidly drain from the soil under the forces of gravity. This water lies in between the saturation and the field capacity points.

Available or capillary water is the free water available to the plant, held in the soil by capillary forces and thus drainage is very slow. It lies between the field capacity and the permanent wilting point.

Unavailable or hygroscopic water lies beyond the permanent wilting point. Unavailable water is held too tightly in the soil by the capillary forces and surface tension and is not accessible to the plant roots.

The phenomenon of capillary rise of liquids is a familiar concept. The liquid wets the surface of a capillary tube and due to the pressure difference between the capillary liquid and air, the liquid in the capillary will rise until equilibrium is met. It would be desirable to have capillary or available water constantly and evenly at the plants disposal, and to make use of the phenomenon of capillary rise of water. These features have been incorporated in plant culture systems for many years and is