Selecting the Cuttings

Ivy stock plants in Holland

SELECT THE BEST POSSIBLE STOCK PLANTS

The best stock plants produce the best cuttings used for propagation. During each growing cycle, growers must select plants that exhibit the best growth characteristics; these are selected as 'stock plants'. 'Off-shore' cuttings are from selected and maintained stock plants. The same selection process can be done at one's own growing facility.

JUVENILE CUTTINGS

Cuttings taken from the juvenile parts of many plants can better produce roots compared to older parts. Shoots at the tops of the plant are physiologically older *(more mature)* than the shoots at the bottom of the plant *(more juvenile)*. The top shoots have the characteristics of the more mature parts of the plant from which they originate. **Juvenile cuttings require lower plant rooting hormone rates compared to the 'older' cuttings.**

To maintain juvenility, annual and perennial cuttings should be taken from young stock plants. These stock plants, often a half year old, are used to produce the next generation stock plants from current cuttings. For woody plants 'hedging' can be done.

THE 'BEST' TIME TO TAKE CUTTINGS

Some plants, especially those which go dormant, have different rooting ability at different times of the year. Timing of a few weeks in taking of cuttings may have success or failure. After maturing to a certain age, often years, cuttings taken from certain plants may not be able to produce roots.

TYPICAL TIMING TO TAKE CUTTINGS

- **Herbaceous cuttings from greenhouse crops, annual and tropical plants: anytime.**
- **Deciduous and evergreen plant cuttings: early summer through early fall.**
- **Dormant hardwood cuttings: fall or winter.**

PREPARATION AND CARE OF CUTTINGS

Before taking cuttings, stock plants must be provided with good light and fertilization. This will boost stored carbohydrates used to feed the newly formed roots.

- **Herbaceous** plant cuttings should be treated and stuck soon after being taken. To prevent heat damage, in hot climates cuttings are put in coolers soon after being cut. Perennial and annual cutting suppliers may have offshore stock plant nurseries. When shipped, cuttings from these nurseries are kept chilled during transit using special cartons that protect the cuttings from temperature variation. The cuttings are packed in plastic bags to assure continued hydration. Shipping time is kept short, assuring prompt arrival at the rooting facility. Certain plants do not ship well; to assure propagation success, those stock plants should be grown near the rooting faculty.
- Winter **woody cuttings** taken in the fall can be treated with rooting hormones, kept in plastic, stored in cold storage, then planted-out in the spring.
- Growers usually take plant shoot cuttings from plant growth of the current growing season. Generally, thin cuttings will root more easily than thick cuttings. No one cutting type is useful to propagate all plants.

TYPES OF CUTTINGS

STEM CUTTINGS

'Stem cuttings' are the out-growing stems, mature sprouts or tip cuttings. Growers may take many types of stem cuttings.

- **SOFTWOOD & HERBACEOUS CUTTINGS:** these are the fast growing soft tips of stems, usually taken in the spring. Herbaceous cuttings, sometimes called 'tip cuttings' or 'shoot cuttings', are taken from the young soft tips of stems.

  Softwood and Herbaceous cuttings have many variations. Cuttings taken from annuals, herbaceous perennials, tropical plants and house plants are easier to propagate from cuttings than more hardened cuttings.

When using 'herbaceous' cuttings for foliar applied Rooting Solutions, other types of 'herbaceous' cuttings can be used:

- *tender annual cuttings*
- *tender perennial cuttings*
- *hardy perennial cuttings*
- *tender woody cuttings*

- **HARDWOOD CUTTINGS:** these are taken from the fully mature stems of deciduous shrubs and trees. Stock plants for these cuttings require careful selection and preparation before growers take the cuttings. Pruning of the stock plants allow them to produce new growth early in the growing season. The new growth can produce roots. Growers take these cuttings at the end of the growing season or during the dormant season.
- **GREENWOOD CUTTINGS:** these are the soft tips or stems after the spring growth has slowed. The stem is harder and woodier than the soft wood cutting.
- **SEMI-RIPE CUTTINGS:** these are taken during the late summer after the annual growth has slowed. The stem is harder than softwood or green wood cuttings.
- **HARDWOOD CUTTINGS:** these are taken from dormant fully mature stems, usually from the current year's growth.

SCION CUTTINGS

'Scion cuttings' are dormant 'ligneous' woody twigs.

EYE CUTTINGS

'Eye cuttings' are pieces of foliated or defoliated stalks with one or more eyes.

ROOT CUTTINGS

'Root cuttings' are parts of the root, usually annual. Growers take these from certain plants which have the capacity to regenerate stems from root parts.

LEAF CUTTINGS

'Leaf cuttings' are parts of the leaf. New roots develop at the base or veins of the cutting. Dry powder rooting hormones are usually used to treat these cuttings.

Handling Un-rooted Cuttings

- After taking cuttings, stick as soon as possible.
- USE PLANT ROOTING HORMONES.
- Do inspection.
- Reduce wilting during rooting.
- Maintain the appropriate environmental controls.
- Practice good sanitation.

HANDLING OFF-SHORE UN-ROOTED CUTTINGS

After receiving cuttings from off-shore sources, open all boxes immediately. Inspect the un-rooted cuttings for damage, dehydration, heat or freeze damage, breakage or rot. Report any missing items or damaged cuttings to the vendor. Do not allow the boxes to remain in sunny or hot places, or below freezing temperatures. Growers should stick the un-rooted cuttings into pre-moistened, well drained, soil-less media with 5.5- 6.5 *pH.* If it not possible to stick the un-rooted cuttings immediately they can be held for several days in a cooler between 35-45˚F. The cuttings will deteriorate rapidly at warm temperatures.

WOUNDING

- Hardwood cuttings may root better if a 1/2 to 3/4 inch long notch, "wound," is made at the basal end before applying the plant rooting hormone.
- Tropical and other herbaceous cuttings are not 'wounded'.

MEDIA

Stick cuttings as soon as possible after either taking cuttings or receiving off-shore cuttings. Use pre-moistened, well drained, soil-less media with 5.5- 6.5 *pH.* 'Airy' media allows oxygen to stimulate root growth. *See page 45 for notes.*

STICKING DEPTH

Stick the cuttings just deep enough that the medium anchors them. Thin cutting may be stuck 1/4-1/2 inch deep.

TRAY SIZE AND DIRECT STICKING

Tray sizes range from 36 to 128 cell. Larger cells are used for cuttings scheduled to remain in the starting tray longer. Un-rooted cuttings can also direct stick in the finishing container or sometimes beds.

Rooting Solutions, Rooting Powders and Methods

Hortus IBA Water Soluble Salts & Rhizopon AA rooting hormones are applied to cuttings *from 'easy-to-root' to 'difficult-to-root'.* Treated cuttings quickly form new uniform roots, strong root mass and homogenous propagation crops.

For detailed information see the following pages:

SOLUTION METHODS & CUTTING TYPES	Hortus IBA Water Soluble Salts (ppm IBA)
TOTAL IMMERSE & SPRAY DRIP DOWN METHODS	Trial rates
Annual, perennials, chrysanthemum	80-250
Herbaceous and hard to root perennial plant cuttings	250-1500
Woody ornamental cuttings	300-1500
BASAL QUICK DIP METHOD	Trial rates
Annuals, soft perennial, tender cuttings from ornamental plants, tropical house plants	80-200
Herbaceous, perennials, pot rose cuttings	150-1500
Difficult to root herbaceous, perennials, tropical house plants	500-1500
Softwood cuttings	500-1500
Hardwood cuttings	500-2000
Difficult to root hardwood cuttings *(See note page 32)*	2000-10,000
BASAL LONG SOAK METHOD	Trial rates
Hard to root annuals and perennials	25-100
Herbaceous cuttings	50-200
Woody ornamental cuttings, grape, roses	50-400
DRY DIP METHOD & CUTTING TYPES	Rhizopon AA #1, #2, #3
In the Growing Season	Trial rates
Leafy cuttings: annuals	#1 or #2
Leafy cuttings: perennials	#1, #2, or #3
Leafy cuttings: woody ornamental and forestry	#2 or #3
All Year	
Tropical plants	#1 or #2
Annuals	#1 or #2
Perennials	#1, #2, or #3
Woody ornamental and forestry plants, hard to root cuttings	#2 or #3
Winter dormant cuttings	#2 or #3

Control of the Growing Area

Raising selected stock plants under controlled conditions is important. When growers give their stock plants proper care, the plants will produce the best cuttings. *'Just taking'* cuttings from random *'field plants'* leads to marginal results. The same way, control of the propagation house is equally important to the propagation of new plants.

Always perform your own trials for your own plants, in your own facility, before doing large scale production.

Inspection of cuttings

INSPECTION

Growers must inspect their crops regularly to observe both intended and undesired results. Records should be kept that include information of the methods, materials, and plants used, and the quality of stock plants and cuttings.

ROOTED CUTTING CARE

Early stage treatment of the cutting crop is essential to produce high quality finished plants. Do not allow the rooted cuttings to become over-rooted, dried-out, crowded or under-fertilized. These situations may reduce plant growth.

PROVIDING THE BEST POSSIBLE CONDITIONS FOR ROOTING

Cuttings given less than optimal rooting conditions will waste energy. The result will be inferior root systems. To produce its own store of carbohydrates a plant needs the raw materials of light, water, carbon dioxide and oxygen.

LIGHT

Growers should regulate the propagation house so that the cuttings are not under direct sunlight. The effect of direct sunlight and the resultant heat will cause stress to the cuttings. Light is necessary for photosynthesis. Un-rooted cuttings are not able to engage in much photosynthesis; a small amount of light, 100-125 *um* PAR light, during the rooting process is sufficient. It is important at this stage is to provide a long period of light. A

photo-period of 16-18 hours is adequate. Artificial lights are useful to extend natural daylight hours. Natural lighting or artificial lights may cause a rise in ambient temperature. Growers must control the growing area to avoid high temperatures from light sources.

WATER CONTENT OF THE MEDIA

A plant must have a good root system in order for it to absorb water. Water is crucial while the cuttings begin to form roots. If the substrate that is too dry, the plant will have cell death. Dead cells increase the risk of rot. A very dry substrate encourages callus formation. Although many believe that callus is beneficial for root formation, this is not true. The callus hinders and slows root formation. Growers measure how much moisture in the soil with a tensiometer. For best rooting, the meter should display a reading between moist and wet. Another way is to weigh the trays regularly. By trial, the growers determine if the trays have the proper weight for the "the proper moisture level," then provide water based on these observations.

CARBON DIOXIDE (CO^2) IN AIR & OXYGEN IN MEDIA

Environmentally controlled chrysanthemum propagation house in Holland

Photosynthesis is important for cuttings. Photosynthesis requires sufficient **carbon dioxide** (CO^2), light, and water. An advantage of an increased level of CO^2 in the air is that it reduces the transpiration, loss of water, through the plant. Cuttings in an environment with sufficient light and an increased CO^2 level (800-1000 *ppm*) will form roots better. CO^2 can be controlled using special generators. **Oxygen** is necessary for cell division and crucial for root formation. Growers must stick the cuttings into a substrate that has a structure which is sufficiently open to allow air, containing oxygen, to reach the developing roots. Dense media inhibits oxygen stimulation.

AIR CIRCULATION & TEMPERATURE CONTROL

Good air circulation is necessary when rooting un-rooted cuttings. Shade to approximately 50% light conditions, or as required, to reduce temperature during high heat periods.

TEMPERATURE

Soil Temperature

Soil temperature has a direct influence on the speed of rooting. A soil temperature ranging between 68-77˚F is ideal during the initial rooting stage. After this initial stage, growers can allow the temperature to drop a few degrees.

Air Temperature

To prevent excess transpiration, controlling the temperature is important. To reduce aerial growth, air temperature should be a bit lower than soil temperature. The cuttings should be encouraged to use their energy mainly for developing roots. Above ground growth will come later.

Light and Temperature Relationship

During the winter, when there is a low level of natural light, with no artificial lights, use a lower temperature. For example, cuttings will die if kept at temperatures near 74˚F, short day and low light levels. Rooting activity in the soil will outpace its ability to do photosynthesis induced by the light.

FERTILIZATION

Follow fertilizer label instructions. Growers should fertilize un-rooted cuttings during propagation. Apply a complete N-P-K fertilizer. For many plants, use a fertilizer containing 300 *ppm* of nitrogen approximately two to three times a week. Start on the third day after sticking or when the callus is starting to form. Quality can suffer if the roots become rootbound. Fertilize the cuttings when planting. Apply liquid fertilizer solutions at a rate of 300 to 400 *ppm* immediately after planting.

INSECT AND DISEASE CONTROL

Good cultural practices and clean, well-ventilated growing space are your best defense against disease. Botrytis, the chief fungal threat, thrives in a moist, stagnant environment. Good air circulation and adequate light will reduce its harmful effects. *Apply appropriate fungicides, insecticides, and other control products following label instructions.*

Humidity

Un-rooted cuttings must receive the highest amount of humidity. Temperature influences the ambient humidity. When the first roots appear, the humidity can be lowered; the rooted cuttings can adapt to the surroundings better.

MISTING GUIDELINES

Apply mist immediately and frequently to maintain turgidity and minimize wilting while roots develop. Extended days of high humidity may cause some plant cuttings to form aerial roots.

Typical mist cycle for fast to root annual and perennial cuttings	
1-3 DAYS AFTER STICKING	• Mist during daylight hours in all stages and the night for the first 3-4 days helps keep the cuttings turgid for optimum rooting. • Mist 10 seconds every 5-10 minutes.
4-7 DAYS AFTER STICKING	• Callus is being formed. • Mist 10 seconds every 20 minutes.
8-15 DAYS AFTER STICKING	• Roots are being formed. • Mist 10 seconds every 30 minutes. • Depending upon the plant variety, under ideal conditions, mist can be off 10 days after sticking.
AFTER 14 DAYS	• Fast to root cuttings can be ready to plant.

The Dutch growing system in this photo has controlled humidity by covering the propagation trays with either transparent or translucent plastic. Edges of the trays are sealed so that no air current at the sides affect the cuttings. No misting system is used.