Hortus
Plant Propagation from Cuttings
A Guide to Using Plant Rooting Hormones by Foliar and Basal Methods

Special Edition
This book includes the label for Hortus IBA Water Soluble Salts®

Hortus USA Corp.
Propagation of plants from cuttings is the most popular way to produce cloned copies of the stock plant. Natural substances from the leaves of plants stimulate root formation. Some cuttings can produce roots with their own substances. Most cuttings require additional stimulation. In the 1930’s the natural root forming substance and its bio- simulators were identified, they are called ‘rooting hormones’. The most used rooting hormone, IBA, is the active ingredient in Hortus IBA Water Soluble Salts and Rhizopon AA products.

This book gives essential information on stock plant preparation, selection and timing of taking cuttings, rooting hormone products and five methods of application. All are important to produce successful new roots and superior new plants.

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Hortus IBA Water Soluble Salts & Rhizopon AA are products of

Hortus USA Corp.
support@hortus.com
rooting-hormones.com

Mobile Device Website: m.hortus.com

Hortus IBA Water Soluble Salts and Rhizopon AA Plant Rooting Products are available from your favorite horticultural suppliers.

For distributor purchasing and distributor referral
contact master distributor:

Phytotronics 314-770-0717 sales@phytotronics.com
Products Used to Make Rooting Solutions
Hortus IBA Water Soluble Salts and Rhizopon AA Water Soluble Tablets are used to make fresh Rooting Solutions. Mix in ordinary water. Use by Basal and all Foliar Methods.

**Hortus IBA Water Soluble Salts® (20%)**
- Active Ingredient: Indole-3-butyric acid (IBA) 20%
- Measure Hortus IBA Water Soluble Salts using a scale then mix into ordinary water.
- Hortus IBA Water Soluble Salts are water soluble to over 100,000 ppm IBA, remain in solution at any concentration, and are buffered close to neutral.
- For foliar methods, Hortus IBA Water Soluble Salts Rooting Solutions are specially formulated to allow entry through open stomata into the plant’s vascular system.
- **Hortus IBA Water Soluble Salts are used by any method and rate where technical IBA and K-IBA and pre-mix rooting products are used.**

**Rhizopon® AA Water Soluble Tablets**
- Active Ingredient: Indole-3-butyric acid (IBA) 20%
- Count Rhizopon AA Water Soluble Tablets then mix into ordinary water.
- Rhizopon AA Water Soluble Tablets are water soluble to 1000 ppm IBA.
- Rhizopon AA Water Soluble Tablets are useful when a scale is not available to measure and to mix small amounts of Rooting Solution or low rates.
Products Used by the Basal Dry Dip Method
Rhizopon AA #1, #2 and #3 Dry Dip Rooting Hormones are always ready to use. Use by the Basal Dry Dip Method.

**Rhizopon® AA #1 (0.1)**
- Active Ingredient 0.1% Indole-3-butyric acid (IBA)
- **Color identified Pink Color Powder.**
- Use on easy to root cuttings.

**Rhizopon® AA #2 (0.3)**
- Active Ingredient 0.3% Indole-3-butyric acid (IBA)
- **Color identified Green Color Powder.**
- An intermediate all purpose product.
- Use on easy to more difficult to root cuttings.

**Rhizopon® AA #3 (0.8)**
- Active Ingredient 0.8% Indole-3-butyric acid (IBA)
- **Color identified White Color Powder.**
- Use on more difficult to root cuttings.
Foliar Methods

Use Hortus IBA Water Soluble Salts and Rhizopon AA Water Soluble Tablets to Make Rooting Solutions

SPRAY DRIP DOWN METHOD
• Stick cuttings.
• Spray the Rooting Solution onto leaves until drip down.

TOTAL IMMERSE METHOD
• Total immerse the cuttings a few seconds in the Rooting Solution.
• Drain.
• Stick cuttings.

Basal Methods

BASAL QUICK DIP METHOD
• Immerse basal end of cuttings a few seconds in the Rooting Solution.
• Stick cuttings.

BASAL LONG SOAK METHOD
• Immerse basal end of cuttings a few hours in the Rooting Solution.
• Stick cuttings.

Use Rhizopon AA #1, #2 and #3 Dry Dip Rooting Hormones

DRY DIP METHOD
• Dip basal end of cuttings in the Rhizopon AA rooting powder.
• Stick cuttings.
Questions you want to ask before reading this book

About the Products

How much Hortus IBA Water Soluble Salts do I need?

- To make a Rooting Solution, for one gallon at 1000 ppm you need 19 grams of Hortus IBA Water Soluble Salts.
- By the Basal Long Soak and Basal Quick Dip Methods one gallon of Rooting Solution can treat many thousand cuttings.
- By the Spray Drip Down Method one gallon of Rooting Solution can treat 175-225 square feet of propagation trays.
- Annual cuttings require 100 ppm or less. You need 1.9 grams of Hortus IBA Water Soluble Salts per gallon.

Can I make a concentrated stock mix?

Rooting Solutions made with Hortus IBA Water Soluble Salts can be made to 100,000 ppm IBA using ordinary water. Growers can make up concentrated Rooting Solutions in the production office. The concentrated Rooting Solution can be added to the production tank in the work area then add water to bring the solution to full rate.

What is the keeping life of a Hortus IBA Water Soluble Salts Rooting Solution?

- An un-used Rooting Solution can be used for several days after make-up if you store it at normal room temperature and light. Solutions made for the Spray Drip Down Method are un-used until sprayed. See page 16 for notes.
- The Total Immerse, Basal Long Soak and Basal Quick Dip Methods use the Rooting Solution on each treated plant lot. Dispose used Rooting Solutions between production lots to avoid cross contamination.

What is the keeping life of dry Hortus IBA Water Soluble Salts, Rhizopon AA Water Soluble Tablets and un-used Rhizopon AA dry powder rooting hormones?

Un-used, dry, in the original container, sealed, and at room temperature, the products will retain close to their full potency for many years. Refrigeration is not required. Do allow them to become damp or wet. See page 16 for notes.
What is the cost of Hortus IBA Water Soluble Salts compared with so called ‘pre-mix’ rooting products? How is Hortus IBA Water Soluble Salts different from a pre-mix?

- Hortus IBA Water Soluble Salts cost about 1/3 to 1/5 the price of ‘pre-mix’ rooting solutions.
- A gallon of Hortus IBA Water Soluble Salts Rooting Solution, at 100 ppm IBA, costs about 65¢; a gallon at 10,000 ppm IBA cost about $65. (The same ‘premix’ IBA rate costs over $210!)
- Hortus IBA Water Soluble Salts can be shipped by ordinary means. ‘Pre-mix’ rooting solutions can incur ‘hazardous shipping charges’.
- Hortus IBA Water Soluble Salts Rooting Solutions are made by the grower using ordinary water; the Rooting Solutions can never cause solvent toxicity. Alcohol based ‘pre-mix’ rooting solutions may cause alcohol toxicity to the cuttings especially at high concentrations.

What is the difference between Hortus IBA Water Soluble Salts or Rhizopon AA Water Soluble Tablets and technical IBA/KIBA?

- Hortus IBA Water Soluble Salts and Rhizopon AA Water Soluble Tablets are both registered by the US EPA for ‘sale and use’ by plant growers. Technical IBA/K-IBA are not US EPA registered for use by plant growers.

**Hortus IBA Water Soluble Salts and Rhizopon AA Water Soluble Tablets replace technical IBA/K-IBA for use in plant growing!**

- Hortus IBA Water Soluble Salts and Rhizopon AA Water Soluble Tablets are soluble in ordinary water. Technical IBA is only soluble in active solvents that can cause plant fatality and ‘burns’.
- Hortus IBA Water Soluble Salts can be dissolved in water to over 100,000 ppm IBA and Rhizopon AA Water Soluble Tablets to 1000 ppm IBA; they will remain in solution indefinitely. Technical K-IKA can only be dissolved in water to about 10,000 ppm IBA and drops out of solution.
- Hortus IBA Water Soluble Salts and Rhizopon AA Water Soluble Tablets have US EPA labels for foliar and basal methods. They are specially formulated for these methods.
What is the WPS re-entry interval (REI) for Hortus IBA Water Soluble Salts and Rhizopon AA products?

Hortus IBA Water Soluble Salts and all Rhizopon AA products have US EPA labels with ZERO hour REI.

How do I select Hortus IBA Water Soluble Salts or Rhizopon AA Water Soluble Tablets?

Both products are used in both foliar and basal methods.

- **Hortus IBA Water Soluble Salts:**
  - Soluble in water to over 100,000 ppm IBA.
  - Measured using a scale.
  - Cost effective for commercial growers.

- **Rhizopon AA Water Soluble Tablets:**
  - Soluble in water to 1000 ppm IBA.
  - Measured by counting tablets. Counting is useful where a scale is not available.
  - Useful when growers require low concentrations or small liquid volumes.
  - Economical for small commercial users or consumer users.

About the Rooting Solution Methods

Why would I want to use ‘Foliar’ compared to ‘Basal’ Rooting Solution methods?

Foliar methods are used on leafy plants in the growing season. Basal methods are used all year. Foliar methods treat cuttings uniformly. Basal Quick Dip Method may have variable treatment. Foliar methods use less labor then Quick Dip.

**When can I turn on misters after treating by the Spray Drip Down Method?**

Growers usually wait 30-45 minutes or until the Rooting Solution dries on the leaves.

Do I need special equipment to do foliar methods?

Most growers use standard spray equipment such as backpack sprayers, hydraulic sprayers, or hand sprayers. Boom sprayers can be used, but, they might require too much trouble to set up for one time use. Production greenhouses and nurseries where spray is done regularly have made custom spray carts to meet needs.
About the Dry Dip Rooting Hormones & Comparison with Rooting Solutions

How many cuttings can be treated using Rhizopon AA dry powders?

One pound of Rhizopon AA dry powder rooting hormones can treat about 30,000 cuttings.

Is there a difference in rooting between using ‘Rooting Solutions’ or ‘dry powder rooting hormones’?

To be honest, makers who offer one type of product or another will say their product is the best. Growers always say some plants root better with Rooting Solutions or rooting powders. This is based upon the variety, time of the year, maturity of the cuttings and quality of the stock plants. In the US many growers prefer Rooting Solution methods. In Europe the growers prefer Dry Dip powder rooting hormones.

How are Rhizopon AA dry powder rooting hormones different from other brand dry powder rooting products?

Rhizopon AA #1, #2 and #3 are made with high loft talc resulting in uniform coverage of the treated cutting. The powders are color coded to identify the product: Rhizopon AA#1 is pink, Rhizopon AA#2 is green and Rhizopon AA#3 is white. Color coding helps the production workers to pick and use the proper product. All production lots are laboratory tested to assure they have uniform mix and meet the required concentration.

Why do I need to use rooting hormones when I propagate ‘easy-to-root’ cuttings?

The use of rooting hormones is NOT a waste of time; cuttings will rapidly produce high root mass and uniform roots!
Hortus IBA
Water Soluble Salts
Water Soluble to Over 100,000 ppm IBA
ROOTING SOLUTIONS MADE USING ORDINARY WATER

Rhizopon AA
Water Soluble Tablets
Pre-measured - Count and Mix

Rhizopon AA
Dry Powder Rooting Hormones
The Most Popular Concentrations
READY TO USE DRY POWDER ROOTING HORMONES
NATURAL ROOTING HORMONES are produced in the LEAVES of plants.

Rooting Hormones are applied to leaves using WATER based ROOTING SOLUTIONS. The Hormones enter the plant through open stomata.

Water is the natural carrier for Rooting Hormones.

Mass Flow moves the Natural and Applied Rooting Hormones to the BASAL END of the cutting. The Basal End is a sink point.

ROOTS are induced to form at the Basal End by action of the Natural and Applied Rooting Hormones.
# Methods to Propagate Plants from Cuttings

## Cutting Types and Methods

<table>
<thead>
<tr>
<th>USE ON TYPE OF CUTTINGS</th>
<th>Dry Dip</th>
<th>Spray Drip Down</th>
<th>Basal Quick Dip</th>
<th>Total Immerse</th>
<th>Basal Long Soak</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LEAFY CUTTINGS</strong></td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
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<tr>
<td>• Ornamental plants</td>
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<tr>
<td>• Herbaceous plants</td>
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<tr>
<td><em>In the Growing Season</em></td>
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<tr>
<td><strong>LEAFLESS CUTTINGS</strong></td>
<td>✔️</td>
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<td>✔️</td>
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<td>✔️</td>
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<tr>
<td>• Ornamental plants</td>
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<tr>
<td>• Herbaceous plants</td>
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<tr>
<td><em>All Year Including Winter Cuttings</em></td>
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<tr>
<td><strong>EASY-TO-ROOT</strong></td>
<td>✔️</td>
<td></td>
<td>✔️</td>
<td></td>
<td>✔️</td>
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<tr>
<td><strong>HARD-TO-ROOT</strong></td>
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<tr>
<td><em>In the Winter</em></td>
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</tbody>
</table>
# Basal and Foliar Methods

<table>
<thead>
<tr>
<th>METHOD</th>
<th>PRODUCT TYPE</th>
<th>PRODUCT</th>
</tr>
</thead>
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<tr>
<td><strong>BASAL METHODS</strong></td>
<td>DRY DIP METHOD</td>
<td><strong>Dry Dip Powder</strong></td>
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<tr>
<td></td>
<td></td>
<td>Dip basal end in rooting powder then stick.</td>
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<tr>
<td></td>
<td></td>
<td><em>Powers stay on cuttings a long time.</em></td>
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<tr>
<td></td>
<td></td>
<td><strong>RHIZOPON AA #1, #2 &amp; #3</strong></td>
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<tr>
<td></td>
<td></td>
<td>Dry Powder Rooting Hormones</td>
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<tr>
<td></td>
<td></td>
<td><em>Use dry &gt; not used to make rooting solutions</em></td>
</tr>
<tr>
<td><strong>BASAL QUICK DIP METHOD</strong></td>
<td><strong>Rooting Solution</strong></td>
<td>Dip basal end in rooting solution then stick.</td>
</tr>
<tr>
<td><strong>BASAL LONG SOAK METHOD</strong></td>
<td><strong>Rooting Solution</strong></td>
<td>Dip basal end of cuttings in rooting solution about 12 to 48 hours (nominal) then stick.</td>
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<tr>
<td><strong>FOLIAR METHODS</strong></td>
<td>SPRAY Drip Down METHOD</td>
<td><strong>Rooting Solution</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stick then spray leaves of cuttings with rooting solution until the solution drips down.</td>
</tr>
<tr>
<td></td>
<td>TOTAL IMMERSE METHOD</td>
<td><strong>Rooting Solution</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Totally immerse cuttings in rooting solution then stick.</td>
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<tr>
<td></td>
<td></td>
<td><strong>HORTUS IBA WATER SOLUBLE SALTS</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>or</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>RHIZOPON AA WATER SOLUBLE TABLETS</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Use to make rooting solutions</em></td>
</tr>
</tbody>
</table>
Using Rooting Solutions made with Hortus IBA Water Soluble Salts

PREPARING A ROOTING SOLUTION

- **Weigh** the required amount of Hortus IBA Water Soluble Salts. **Measure by weight not volume** (*no scoops*).
- **Use tap water** at about 65-90°F; measure less then the final volume of water. See page 16 for notes.
- **Do not dissolve Hortus IBA Water Soluble Salts in liquids other than water.**
- **Mix:** dissolve Hortus IBA Water Soluble Salts in water.
- **Add water** to the mixing container to bring the Rooting Solution to the final volume.
- **Apply the solution** by the selected method.
- **After use,** dispose of the solution as described in the ‘Storage and Disposal’ statements on the label. See page 55, inside back cover.

AVOID CROSS CONTAMINATION OF SOLUTIONS

- For the Total Immerse, Basal Quick Dip and Basal Long Soak Methods dispose of Rooting Solutions between plant lots to avoid cross contamination.
- Using the Spray Drip Down Method the Rooting Solution is used one time and there is no cross-contamination. Solutions can be used completely. See page 16 for notes.

STOCK SOLUTIONS

Hortus IBA Water Soluble Salts mixed in water to make stock Rooting Solutions can be made in any concentration up to 100,000 ppm IBA!

METRIC SYSTEM

Use the metric system when calculating the ppm IBA for Hortus IBA Water Soluble Salts Rooting Solutions. The system allows for easy calculation of liquid volume to concentration.

WETTING AGENTS

Rooting Solutions made with Hortus IBA Water Soluble Salts are specially formulated to have a low surface tension needed for foliar methods. Additional wetting agents are not recommended.
# Rooting Solution Rate Chart:
**Hortus IBA Water Soluble Salts**

To make 100 ppm IBA dissolve 0.5 grams in 1 liter water

<table>
<thead>
<tr>
<th>Parts per million IBA (ppm IBA)</th>
<th>Hortus IBA Water Soluble Salts</th>
<th>gms/liter water</th>
<th>gms/gallon water (1 gal = 3.8 liter)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 ppm IBA</td>
<td></td>
<td>0.25 grams</td>
<td>.95 grams</td>
</tr>
<tr>
<td>100</td>
<td></td>
<td>0.5</td>
<td>1.9</td>
</tr>
<tr>
<td>200</td>
<td></td>
<td>1.0</td>
<td>3.8</td>
</tr>
<tr>
<td>250</td>
<td></td>
<td>1.25</td>
<td>4.7</td>
</tr>
<tr>
<td>300</td>
<td></td>
<td>1.5</td>
<td>5.7</td>
</tr>
<tr>
<td>400</td>
<td></td>
<td>2.0</td>
<td>7.6</td>
</tr>
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<td>500</td>
<td></td>
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<td>9.5</td>
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<tr>
<td>600</td>
<td></td>
<td>3.0</td>
<td>11.3</td>
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<td>700</td>
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<td>3.5</td>
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</tr>
<tr>
<td>5000</td>
<td></td>
<td>25.0</td>
<td>95</td>
</tr>
<tr>
<td>10,000</td>
<td></td>
<td>50.0</td>
<td>190</td>
</tr>
<tr>
<td><strong>MAKE ANY RATE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100,000</td>
<td></td>
<td>500</td>
<td>1900</td>
</tr>
</tbody>
</table>
Using Rooting Solutions made with Rhizopon AA Water Soluble Tablets

- **Count** the required amount of Rhizopon AA Water Soluble Tablets as shown in the chart below. For example: to make 100 ppm IBA dissolve 2 Rhizopon AA Water Soluble Tablets in one liter of water.
- **Use tap water** at about 65-90F; The higher temperature improves ability of the Tablets to dissolve. Measure less then the final volume of water. **Do not dissolve Rhizopon AA Water Soluble Tablets in liquids other than water. See page 16 for notes.**
- **Mix:** dissolve Rhizopon AA Water Soluble Tablets in the water. A small amount of undissolved particles in the solution is normal and does not affect results. If precipitation occurs with tap water then dissolve in distilled, demineralized, or filtered water. **Add water** to the mixing container to bring the solution to the final volume.
- **Apply the solution** by the selected method.
- **After use,** dispose of the solution as described in the 'Storage and Disposal' statements on the label. **See page 55, inside back cover (same as Hortus IBA Water Soluble Salts).**
- **Avoid cross contamination of solutions.** For the Total Immers Method and basal methods, dispose of solutions between plant lots to avoid cross contamination. Using the Spray Drip Down Method the solution is used one time and there is no cross-contamination.

### Rooting Solution Rate Conversion Chart:

<table>
<thead>
<tr>
<th>Parts per million IBA (ppm IBA)</th>
<th>Rhizopon AA Water Soluble Tablets per liter water</th>
<th>Hortus IBA Water Soluble Salts gms/liter water</th>
<th>gms/gallon water (1 gal = 3.8 liter)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 ppm</td>
<td>1 tablet</td>
<td>0.25 grams</td>
<td>0.95 grams</td>
</tr>
<tr>
<td>100</td>
<td>2</td>
<td>0.5</td>
<td>1.9</td>
</tr>
<tr>
<td>200</td>
<td>4</td>
<td>1.0</td>
<td>3.8</td>
</tr>
<tr>
<td>300</td>
<td>6</td>
<td>1.5</td>
<td>5.7</td>
</tr>
<tr>
<td>400</td>
<td>8</td>
<td>2.0</td>
<td>7.6</td>
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<td>500</td>
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<tr>
<td>900</td>
<td>18</td>
<td>4.5</td>
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</tr>
<tr>
<td>1,000</td>
<td>20</td>
<td>5.0</td>
<td>19</td>
</tr>
</tbody>
</table>
Handling Dry Products & Rooting Solutions

STORAGE OF DRY PRODUCTS

- Rhizopon AA #1, #2 & #3 Dry Dip Rooting Hormones, Hortus IBA Water Soluble Salts and Rhizopon AA Water Soluble Tablets are provided dry. Store dry products at room temperature. They do not require refrigeration. The dry products will be fully active for many years.
- Hortus IBA Water Soluble Salts and Rhizopon AA Water Soluble Tablets are sensitive to humidity. Store them dry to avoid caking and difficulty to dissolve.
- **Store the dry products in their original sealable containers with labels.**

ROOTING SOLUTION WATER QUALITY

- Ordinary tap water usually used to make Rooting Solutions.
- If the Rooting Solution is clear, having a small amount of particles, then the active ingredient is in solution and ready to use.
- Hard, well or pond water may reduce solubility; in those cases use another source such as filtered or demineralized water.

AVOID CONTAMINATION OF SOLUTIONS

- The **Spray Drip Down Method** uses the Rooting Solution one time. The Rooting Solution cannot be contaminated by the dragging-in of organic materials. *For storage see below.*
- The **Basal Quick Dip, Total Immerse, and Basal Long Soak Methods** use the Rooting Solution by having the plant material dipped into them. To avoid cross-contamination, use fresh Rooting Solutions between production lots.
- **Dispose the used Rooting Solutions at the end of the production day. Do not store used solutions.**

DISPOSAL

- See page 55, inside back cover, same as Hortus IBA Water Soluble Salts.

STORAGE OF UN-USED ROOTING SOLUTIONS:

Stock and production Rooting Solutions made with Hortus IBA Water Soluble Salts and Rhizopon AA Water Soluble Tablets maintain full potency for several days when kept in a closed container, at room temperature, and normal light.

*For safety, label the Rooting Solution container.*
Overview of Foliar Methods

- The Foliar Spray Drip Down and Total Immerse Methods are used on cuttings that are leafy in the growing season.
- Foliar methods are not used on dormant or leafless cuttings.
- Rooting Solutions are applied to the leaves of cuttings.
- Foliar methods use Rooting Solutions that are made using water only, applied by spray onto foliage or totally immerse.
- For foliar methods only use Rooting Solutions made with water and Hortus IBA Water Soluble Salts or Rhizopon AA Water Soluble Tablets.
- Never use other ‘Rooting Solutions’ made with active solvents since they will dehydrate and kill plant cells.

ROOTING PRODUCTS USED
To make Rooting Solutions:
- Hortus IBA Water Soluble Salts.
- Rhizopon AA Water Soluble Tablets.

MODE OF ACTION
Water-based Rooting Solutions are applied to leaves of cuttings. The Rooting Solutions enter the plant through stomata, the minute openings in the leaf. The stomata allow entry into the plant of gases and liquids such as the Rooting Solution. After entry into the vascular system of the plant, the rooting hormones in the Rooting Solution move by mass flow to the basal end of the cuttings. Plants store rooting hormones at the basal end where they are slow released to induce roots.

<table>
<thead>
<tr>
<th>METHODS</th>
<th>PRODUCTS TO USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL IMMERSE METHOD</td>
<td>Use Rooting Solutions made with Hortus IBA Water Soluble Salts or Rhizopon AA Water Soluble Tablets</td>
</tr>
<tr>
<td>SPRAY DIP DOWN METHOD</td>
<td></td>
</tr>
</tbody>
</table>

The selection of a method, either the Spray Drip Down or Total Immerse Method, usually depends upon the number of cuttings in a lot. Large homogenous lots may be easier to treat by the Total Immerse Method. Many small lot sizes may be easier to treat by the Spray Drip Down Method.
USE A SECOND FOLIAR TREATMENT

- Overcome slow root development
- Improve transplanting of rooted cuttings.
- Level the production crop.
- Improve roots of cuttings which were already treated by any method, either rooted or un-rooted.

Stimulate rooting by using the Spray Drip Down Method with one or two weekly additional applications. Use Hortus IBA Water Soluble Salts at 80-200 ppm or the initial foliar rate.

STOCK PLANT PREPARATION FOR FOLIAR METHODS

The stock plants must be adequately fertilized and kept in light during the days before the cuttings are taken. These factors allow the plant to store carbohydrates necessary for root formation.

ADJUSTING THE FOLIAR RATE

- Use as low a rate as possible to achieve rooting.
- When root formation is slow in formation trial at a higher rate.
- When foliar methods produce leaf spotting, leaf curl, or leaf drop it may be caused by inadequate stock plant preparation or too high a rate.

SCIENTIFIC GROUNDWORK ON FOLIAR APPLIED IBA ROOTING HORMONES

Foliar applied rooting hormones on the leaves of cuttings had positive rooting results when used by Thimann & Went (1937). Dr. Fred T. Davies (co-author of ‘Plant Propagation Principles and Practices’) did successful plant rooting trials using foliar applied IBA in aqueous solution. Dr. Davies’ landmark studies, published in 1980-2, detailed the physiology of rooting of the cuttings.

Thimann & Went. Phytohormones. 1937
The Spray Drip Down Method

Using the Spray Drip Down Method you stick the cuttings into trays or any other way into media. You spray the Rooting Solution onto the leaves of the cuttings until there is a drip down. You wait about 45 minutes or until the solution dries on the leaves, then turn on your misters.

The Spray Drip Down Method can be used on any lot size. The solution is used one time. There can be no cross contamination of the Rooting Solution between plant lots.

The Spray Drip Down Method has low labor cost. Workers who do sticking do not apply rooting products and do not need PPE. Spraying, performed by a trained operator, assures that the plant cuttings receive a uniform application of the Rooting Solutions. The time for spraying is only a few minutes.

EQUIPMENT

Use a hand, backpack or power sprayer. These sprayers give uniform flow over a directed area. Overhead boom sprayers may be used however setup time may not be cost effective. Do not use proportional solution mixers; they might not give uniform Rooting Solution quality and distribution.

ROOTING PRODUCTS USED

To make Rooting Solutions:
- Hortus IBA Water Soluble Salts.
- Rhizopon AA Water Soluble Tablets.
HOW TO USE THE SPRAY DRIP DOWN METHOD

STICKING & SEPARATION OF LOTS BY RATE
• Stick the un-treated cuttings in the media.
• Keep the cuttings hydrated by keeping misters on.
• It is useful to separate the plants into rooting solution rate groups. Plants with the same solution rate can be treated at the same time.

ROOTING SOLUTION
• For foliar methods, only use Rooting Solutions made with Hortus IBA Water Soluble Salts or Rhizopon AA Water Soluble Tablets. The aqueous solutions are specially formulated to allow entry into the plant’s vascular system.

TREATMENT
• Spraying should be done the same day of sticking or soon after.
• Spraying should be done when the stomata in the leaves are open. If the propagation area is hot, do spraying at cool times, such as early mornings.
• Turn off the misters.
• Spray the Rooting Solution onto leaves until the liquid drips down. If the leaves are wet from misters at the time of spraying, use an excess of Rooting Solution to overcome dilution of the solution.
• To assure adequate treatment, apply enough solution to both the top and bottom of the leaves.

SPRAY RATE
• Use about one gallon of rooting solution per 175 to 225 square foot of cuttings.

MISTERS
• After application of the Rooting Solution wait at until the solution dries, about 3/4 hour, before turning misters on.

UN-USED ROOTING SOLUTIONS
• Un-used Rooting Solutions in the production tank or concentrate container can be stored at room temperature for several days without losing potency.
• For safety, label the Rooting Solution container.
Custom Built Cart Used to Apply Rooting Solutions by the Spray Drip Down Method
The Total Immerse Method

Using the **Total Immerse Method**, you total immerse dip the cuttings in the Rooting Solution for a few second then drain. You can stick at any time.

The Total Immerse Method can be used for large homogeneous lots of plants or small lots. Since you will drag in biologicals from the cuttings into the solution, you should change the Rooting Solution frequently so that you do not cross contaminate production lots. Total Immerse is useful for large leaf cuttings and cuttings whose leaves have stomata on the bottom of the leaf where spray drip down is difficult to use.

The Total Immerse Method uses simple equipment for treatment, a tank and a basket. Uniform treatment is done on large batches of cuttings is done in a few seconds. Since all cuttings are submerged in the Rooting Solution every cutting is treated. After treatment the cuttings can be stored in a plastic bag and stuck later.

**EQUIPMENT**
Use a solution tank. A dipping basket is useful.

**ROOTING PRODUCTS**
To make Rooting Solutions:
- Hortus IBA Water Soluble Salts.
- Rhizopon AA Water Soluble Tablets

**HOW TO USE THE TOTAL IMMERSE METHOD**
- Total Immerse the cuttings, using a basket, into the Rooting Solution for a few seconds. Drain.
- Stick the treated cuttings in the media, or put in plastic bags and store until sticking or planting out.
- Turn on misters as required.
- After treatment discard used Rooting Solution.
Overview of Basal Methods

- The Basal Quick Dip, Basal Long Soak and Basal Dry Dip Methods are used on
  - leafy cuttings in the growing season or dormant
  - leafless cuttings
  - dormant cuttings
- Basal methods can be used all year.
- Rooting Solutions or rooting hormone powders are applied to the basal end of cuttings.

ROOTING PRODUCTS USED

Dry Dip Rooting Hormones
- Rhizopon AA #1, #2 and #3.

To make Rooting Solutions:
- Hortus IBA Water Soluble Salts.
- Rhizopon AA Water Soluble Tablets.

MODE OF ACTION

Rooting Solutions or dry powder rooting hormones are applied to the basal end of the cuttings. The rooting hormones absorbed into the plant’s vascular system where they are stored; they are slow released by the plant to induce root formation.

<table>
<thead>
<tr>
<th>METHODS</th>
<th>PRODUCTS TO USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>BASAL QUICK DIP METHOD</td>
<td>Use Rooting Solutions made with Hortus IBA Water Soluble Salts or Rhizopon AA Water Soluble Tablets</td>
</tr>
<tr>
<td>BASAL LONG SOAK METHOD</td>
<td></td>
</tr>
<tr>
<td>DRY DIP METHOD</td>
<td>Use Rhizopon AA #1, #2, or #3 Dry Dip Rooting Hormones</td>
</tr>
</tbody>
</table>

The selection of a method, either Dry Dip or by Rooting Solution, usually depends upon the plant variety. Many plants have successful rooting with Dry Dip methods and/or Rooting Solution methods.
The Quick Dip Method

Using the **Basal Quick Dip Method** you can propagate plants from cuttings from easy to difficult to root. You dip the basal end of the cuttings into the Rooting Solution for about five seconds then stick.

### USE ON MANY TYPES OF PLANT CUTTINGS

<table>
<thead>
<tr>
<th>In the Growing Season</th>
<th>Leafy cuttings: Tropical plants. Annual and perennial plants. Woody ornamental plants. Forestry plants.</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Year</td>
<td>Leafy and leafless cuttings: Tropical plants. Annual and perennial plants. Woody ornamental plants. Forestry plants.</td>
</tr>
<tr>
<td>Winter Dormant Cuttings</td>
<td>Leafless cuttings: Woody ornamental plants. Forestry plants.</td>
</tr>
<tr>
<td>All Year</td>
<td>Leafy &amp; leafless cuttings: Hard-to-root cuttings.</td>
</tr>
</tbody>
</table>

### EQUIPMENT
Dispense Rooting Solutions into small cups.

### ROOTING PRODUCTS USED
To make Rooting Solutions:
- **Hortus IBA Water Soluble Salts.**
- **Rhizopon AA Water Soluble Tablets**

### HOW TO USE THE BASAL QUICK DIP METHOD
- Wound woody cuttings by making a 3/4 inch slit at the side of the basal end is optional. Herbaceous cuttings are not wounded.
- Immerse the basal end of the cuttings about 3/4-1 inch into the Rooting Solution for about five seconds.
- Stick the treated cuttings in the media, or put in plastic bags and store until sticking or planting out.
- Turn on misters as required.
- After treatment discard the used Rooting Solution.
The Basal Long Soak Method

Using the Basal Long Soak Method you can propagate plants from cuttings that are difficult to root. It is also used on easier to root cuttings. Both hard to woody plant cuttings and herbaceous cuttings benefit. Low Rooting Solution rates are used. Basal Long Soak eliminates high rates by the Quick Dip Method rates or Dry Dip rooting powders.

<table>
<thead>
<tr>
<th>In the growing season</th>
<th>Leafy cuttings: annuals, perennials, ornamental and forestry plants.</th>
</tr>
</thead>
<tbody>
<tr>
<td>All year</td>
<td>Ornamental and forestry plants.</td>
</tr>
<tr>
<td>Winter dormant cuttings</td>
<td>Ornamental and forestry plants.</td>
</tr>
</tbody>
</table>

**EQUIPMENT**
Use a tank.

**ROOTING PRODUCTS USED**
To make Rooting Solutions:
- Hortus IBA Water Soluble Salts.
- Rhizopon AA Water Soluble Tablets.

**HOW TO USE THE BASAL LONG SOAK METHOD**
- Wounding of woody cuttings is optional. Herbaceous cuttings are not wounded.
- Bundle cuttings so they are erect in the tank.
- Immerse the basal end of the cuttings about 3/4-1 inch into the Rooting Solution. *(See photo page 26)*
- Soak about 12-48 hours.
- Stick the treated cuttings in the media, or put in plastic bags and store until sticking or planting out.
- Turn on misters as required.
- After treatment discard the used Rooting Solution.
USE THE BASAL LONG SOAK METHOD TO IMPROVE ROOTING OF HARD-TO-ROOT CUTTINGS

When propagating plants from cuttings, if roots do not form, some growers unsuccessfully apply plant rooting hormones at high concentrations. They may use rates above 5000 ppm IBA and perhaps get variable results. If alcohol based Rooting Solutions are used they will cause burns and plant mortality.

SOLUTION

Use the basal long soak method to replace other high concentration methods.

High plant rooting hormone concentrations may inhibit root formation. For difficult to root cuttings, the Basal Long Soak Method can successfully replace the Basal Quick Dip or Dry Dip Methods. The Basal Long Soak Method uses very low concentrations of Rooting Solution.

MODE OF ACTION

Using the Basal Long Soak Method, cuttings slowly absorb the Rooting Solution. The plant stores the plant rooting hormones at the basal end where it slow releases them for root formation.

TIMING

The Basal Long Soak Method is used all year on all types of cuttings. Used in the fall, cuttings can be kept in cold storage and planted out in the spring. They can also be treated before planting.

Bundle cuttings, then immerse basal end 3/4-1 inch into the Rooting Solution for 12-48 hours, then plant or store.

The Basal Long Soak Method is as important as ever! Developed in the 1930’s, the Basal Long Soak Method was one of the first successful ways growers used rooting hormones to propagate plants from cuttings.
The Dry Dip Method

Using the Dry Dip Method you can propagate plants from cuttings from easy to difficult to root. Rhizopon AA #1, #2 and #3 rooting powders are used. When treating cuttings with different rate needs, simply switch powders. Color coding assures that the proper product is used.

USE ON MANY TYPES OF PLANT CUTTINGS

<table>
<thead>
<tr>
<th>In the growing season.</th>
<th>Leafy cuttings: annuals, perennials, woody ornamental and forestry plants.</th>
</tr>
</thead>
<tbody>
<tr>
<td>All year.</td>
<td>Tropical plants annuals, perennials, woody ornamental and forestry plants.</td>
</tr>
<tr>
<td>Winter dormant cuttings.</td>
<td>Woody ornamental and forestry plants.</td>
</tr>
<tr>
<td>All year.</td>
<td>Hard to root cuttings.</td>
</tr>
</tbody>
</table>

THE METHOD

EQUIPMENT
Rooting powers are taken from the stock container and put into small cups.

ROOTING PRODUCTS USED
Dry Dip Rooting Hormones:
- **Rhizopon AA #1 (0.1% IBA) is PINK color** for easier to root cuttings
- **Rhizopon AA #2 (0.3% IBA) is GREEN color** for root many types of cuttings
- **Rhizopon AA #3 (0.8% IBA) is WHITE color.** for more difficult to root cuttings
HOW TO USE THE DRY DIP METHOD

- Take off a small portion of the powder for your immediate use. Do not contaminate the stock container by returning used portion to the container.
- Take plant cuttings, usually 4-6 inch stem cuttings, from the current year’s growth.
- Wound woody cuttings by making a 3/4 inch slit at the side of the basal end is optional. Herbaceous cuttings are not wounded.
- Dip the basal end of the cuttings 3/4-1 inch into the Rhizopon AA powder. Tap off the excess powder.
- Avoid contact between the powder and foliage and other over ground parts of the stem. A small amount of powder on the leaves will not affect the quality of the rooting.
- Stick the treated cuttings in the media, or put in plastic bags and store until sticking or planting out. A dribble hole is useful to allow entry of the cutting into the media without pushing off the rooting powder.
- Turn on misters as required.
- After treatment discard used rooting powder.
Trial Rates: Foliar Methods
Total Immerse Method
Spray Drip Down Method

A wide solution trial rate range is indicated for the Total Immerse and Spray Drip Down Methods. Your ideal rates will vary according to specific plant variety, season, quality of the cuttings, and local growing conditions. Prior to large scale production, test a few plants at several rates within the range. If foliar application causes phytotoxicity, try basal applications and/or decrease rates. Use the lowest rate to produce the desired effect.

**TYPICAL SPRAY LIQUID USE**

**Spray Drip Down Method: 175-225 sq. ft./gallon**

Trial rates are *ppm* IBA using Hortus IBA Water Soluble Salts or Rhizopon AA Water Soluble Tablets (see conversion chart pg.15)

<table>
<thead>
<tr>
<th>CUTTING TYPES</th>
<th>Hortus IBA Water Soluble Salts (<em>ppm</em> IBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annuals, perennials, chrysanthemum</td>
<td>80-250</td>
</tr>
<tr>
<td>Herbaceous and hard to root perennial plant cuttings</td>
<td>250-1500</td>
</tr>
<tr>
<td>Woody ornamental cuttings</td>
<td>300-1500</td>
</tr>
</tbody>
</table>

Plant cuttings vary in quality. Trial rates shown are from specific lots under the grower’s particular faculty and environmental controls. Your growing facility and plant lots are different; always perform your own trials for your plants and facility.
### Trial Rates: Woody Ornamental Plants Propagated by Spray Drip Down or Total Immerse Methods

**Trial rates are ppm IBA using Hortus IBA Water Soluble Salts**

or Rhizopon AA Water Soluble Tablets (see conversion chart pg.15)

<table>
<thead>
<tr>
<th>Plant</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acer</td>
<td>1000-1500</td>
</tr>
<tr>
<td>Cotoneaster</td>
<td>500-750</td>
</tr>
<tr>
<td>Diervilla, paniculata</td>
<td>500-750</td>
</tr>
<tr>
<td>Hydrangea</td>
<td>500-750</td>
</tr>
<tr>
<td>Juniperus, horizontalis</td>
<td>1000-1500</td>
</tr>
<tr>
<td>Physocarpus, opulifolius</td>
<td>1000-1500</td>
</tr>
<tr>
<td>Rosa, varieties</td>
<td>1000-1500</td>
</tr>
<tr>
<td>Rhus</td>
<td>500-750</td>
</tr>
<tr>
<td>Spirea, Japonica</td>
<td>500-750</td>
</tr>
<tr>
<td>Syringa</td>
<td>500-750</td>
</tr>
<tr>
<td>Thuja</td>
<td>1500-2000</td>
</tr>
<tr>
<td>Viburnum</td>
<td>1000-1500</td>
</tr>
<tr>
<td>Weigela</td>
<td>1000-1500</td>
</tr>
</tbody>
</table>

### Trial Rates: Annual Plants Propagated by Spray Drip Down or Total Immerse Methods

**Trial rates are ppm IBA using Hortus IBA Water Soluble Salts**

or Rhizopon AA Water Soluble Tablets (see conversion chart pg.15)

<table>
<thead>
<tr>
<th>Plant</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pelargonium geranium sp. like “Balcon”</td>
<td>50-100</td>
</tr>
<tr>
<td>Pelargonium zonale</td>
<td>200-300</td>
</tr>
<tr>
<td>Pelargonium peltatum</td>
<td>300-400</td>
</tr>
<tr>
<td>Impatient New Guinea</td>
<td>15-50</td>
</tr>
<tr>
<td>Fuchsia</td>
<td>15-50</td>
</tr>
<tr>
<td>Petunia sp.</td>
<td>150-200</td>
</tr>
<tr>
<td>some colors</td>
<td>200-300</td>
</tr>
<tr>
<td>Osteospermum</td>
<td>150-200</td>
</tr>
<tr>
<td>Verbena</td>
<td>200-300</td>
</tr>
<tr>
<td>Poinsettia</td>
<td>25-100</td>
</tr>
</tbody>
</table>
## Trial Rates: Perennial Plants Propagated by Spray Drip Down or Total Immerse Methods

**Trial rates are ppm IBA using Hortus IBA Water Soluble Salts**
or Rhizopon AA Water Soluble Tablets (see conversion chart pg.15)

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Rate (ppm)</th>
<th>Plant Name</th>
<th>Rate (ppm)</th>
<th>Plant Name</th>
<th>Rate (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abutilon</td>
<td>750</td>
<td>Erodium</td>
<td>750</td>
<td>Origanum</td>
<td>500-750</td>
</tr>
<tr>
<td>Achillea</td>
<td>up to 1000</td>
<td>Dark Eyes</td>
<td>750</td>
<td>Paxistima</td>
<td>1000</td>
</tr>
<tr>
<td>Actinidia Arctic Beauty</td>
<td>1000</td>
<td>Erysimum</td>
<td>750</td>
<td>Penstemon</td>
<td>500</td>
</tr>
<tr>
<td>Ajuga</td>
<td>up to 1000</td>
<td>Escallonia Comp</td>
<td>500</td>
<td>Persicaria up to 1000</td>
<td></td>
</tr>
<tr>
<td>Amsonia</td>
<td>1500</td>
<td>Euphorbia</td>
<td>1000</td>
<td>Phlox</td>
<td>1000</td>
</tr>
<tr>
<td>Anisodonotea Tara’s</td>
<td>500</td>
<td>Gaillardia</td>
<td>750</td>
<td>Phygelius</td>
<td>750</td>
</tr>
<tr>
<td>Antennaria</td>
<td>up to 750</td>
<td>Galium</td>
<td>500</td>
<td>Poinsettia 500-1000</td>
<td></td>
</tr>
<tr>
<td>Antennaria</td>
<td>up to 750</td>
<td>SweetWoodruff</td>
<td>1500</td>
<td>Polemonium</td>
<td></td>
</tr>
<tr>
<td>Anthemis</td>
<td>1000</td>
<td>Geranium</td>
<td>1000</td>
<td>Bressingham purple</td>
<td></td>
</tr>
<tr>
<td>Arabis Variegata</td>
<td>500</td>
<td>Geum Rivale</td>
<td>1000</td>
<td>Prunella Loveli. 750</td>
<td></td>
</tr>
<tr>
<td>Arctostaphylos</td>
<td>500</td>
<td>Gypsophila</td>
<td>1000</td>
<td>Rosmarinus</td>
<td>500</td>
</tr>
<tr>
<td>Armeria</td>
<td>1000</td>
<td>Viette’sDwarf</td>
<td>1000</td>
<td>Rudbeckia</td>
<td>750</td>
</tr>
<tr>
<td>Artemisia up to 500</td>
<td>1000</td>
<td>Hedera</td>
<td>1000</td>
<td>Ruellia</td>
<td>1000</td>
</tr>
<tr>
<td>Baptisia</td>
<td>3500</td>
<td>Helianthem</td>
<td>2000</td>
<td>Santolina</td>
<td>500</td>
</tr>
<tr>
<td>Basil Kasar</td>
<td>500</td>
<td>Helianthus</td>
<td>1000</td>
<td>Saponaria</td>
<td>1000</td>
</tr>
<tr>
<td>Buddleia</td>
<td>1000</td>
<td>Helichrysum 500-1000</td>
<td>1000</td>
<td>Saxifraga</td>
<td>750</td>
</tr>
<tr>
<td>Calamintha Var.</td>
<td>500</td>
<td>Heliopsis</td>
<td>1000</td>
<td>Scabiosa</td>
<td>1000</td>
</tr>
<tr>
<td>Callicarpa</td>
<td>500</td>
<td>Hypericum</td>
<td>1000</td>
<td>Silene</td>
<td>500</td>
</tr>
<tr>
<td>Campanula 500-1000</td>
<td>1000</td>
<td>Hyssop PinkDel.</td>
<td>500</td>
<td>Solly Boddy’sCh. 750</td>
<td></td>
</tr>
<tr>
<td>Caryopteris</td>
<td>1000</td>
<td>Iberis</td>
<td>1000</td>
<td>Spilanthes</td>
<td>500</td>
</tr>
<tr>
<td>Ceanothus</td>
<td>500</td>
<td>Itea Little Henry</td>
<td>1000</td>
<td>Spiraea</td>
<td>1000</td>
</tr>
<tr>
<td>Ceratostigma</td>
<td>1500</td>
<td>Kerria</td>
<td>1000</td>
<td>Spiraea Gold Flame,</td>
<td></td>
</tr>
<tr>
<td>Chrysanthemum 500-1000</td>
<td></td>
<td>Lamiastrium</td>
<td>1000</td>
<td>Magic Carpet, Neon</td>
<td></td>
</tr>
<tr>
<td>Chrysochogonum</td>
<td>750</td>
<td>Herman Pride</td>
<td>1000</td>
<td>Flash</td>
<td>4000</td>
</tr>
<tr>
<td>Cistus</td>
<td>750</td>
<td>Lamium up to 1000</td>
<td>1000</td>
<td>Stachys</td>
<td>1000</td>
</tr>
<tr>
<td>Clematis</td>
<td>1000</td>
<td>Lavandula</td>
<td>1000</td>
<td>Stevia</td>
<td></td>
</tr>
<tr>
<td>Clethra</td>
<td>1000</td>
<td>Leptospermum</td>
<td>500</td>
<td>rebaudiana</td>
<td>500</td>
</tr>
<tr>
<td>Coleonema</td>
<td>750</td>
<td>Linaria</td>
<td>1000</td>
<td>Teucrium</td>
<td>1000</td>
</tr>
<tr>
<td>Convolvulus</td>
<td>750</td>
<td>Lithodora</td>
<td>2000</td>
<td>Verbascum</td>
<td>1000</td>
</tr>
<tr>
<td>Coreopsis 500-1000</td>
<td>1000</td>
<td>Lonicera</td>
<td>1000</td>
<td>Verbenae</td>
<td>750</td>
</tr>
<tr>
<td>Correa</td>
<td>500</td>
<td>Lychnis</td>
<td>1000</td>
<td>Vinca</td>
<td>1000</td>
</tr>
<tr>
<td>Cosmos</td>
<td>1000</td>
<td>Marjoram</td>
<td>1000</td>
<td>Viola</td>
<td>1500</td>
</tr>
<tr>
<td>Cotoneaster</td>
<td>500</td>
<td>Compactum</td>
<td>500</td>
<td>Vitex</td>
<td>1000</td>
</tr>
<tr>
<td>Coral Beauty</td>
<td>500</td>
<td>Melissa up to 500</td>
<td>1000</td>
<td>Waldsteinia</td>
<td>1000</td>
</tr>
<tr>
<td>Delosperma</td>
<td>1000</td>
<td>Mentha</td>
<td>500</td>
<td>Weigela</td>
<td>1000</td>
</tr>
<tr>
<td>Erigeron 750-1000</td>
<td>500</td>
<td>Nepeta</td>
<td>500</td>
<td>Westringia</td>
<td>750</td>
</tr>
</tbody>
</table>
Trial Rates: Basal Quick Dip Method

Make Rooting Solutions using Hortus IBA Water Soluble Salts or Rhizopon AA Water Soluble Tablets. Use the trial rate charts as a starting point.
Use on cuttings in the growing season and winter dormant cuttings.
• Immerse basal end of cuttings approximately 1" in Rooting Solution a few seconds.
• Stick immediately or store.

Trial rates are ppm IBA using Hortus IBA Water Soluble Salts or Rhizopon AA Water Soluble Tablets (see conversion chart pg.15)

<table>
<thead>
<tr>
<th>CUTTING TYPES</th>
<th>Hortus IBA Water Soluble Salts (ppm IBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annuals, soft perennial, tender cuttings from ornamental plants, tropical house plants</td>
<td>80-200</td>
</tr>
<tr>
<td>Herbaceous, perennials, pot rose cuttings</td>
<td>150-1500</td>
</tr>
<tr>
<td>Difficult to root herbaceous, perennials, tropical house plant cuttings</td>
<td>500-1500</td>
</tr>
<tr>
<td>Softwood cuttings</td>
<td>500-1500</td>
</tr>
<tr>
<td>Hardwood cuttings</td>
<td>500-2000</td>
</tr>
<tr>
<td>Difficult to root hardwood cuttings</td>
<td>2000-10,000</td>
</tr>
</tbody>
</table>

SEE THE NOTE BELOW

Some cuttings are hard-to-root. This may be caused by the condition of the cuttings, the maturity of the cuttings, or the timing when cuttings are taken. Some growers ‘think’ the answer is to use a high rooting hormones rate. They usually get in-consistent rooting or no roots at all.

A better answer is to use the Basal Long Soak Method. Even though low rates are used, the cuttings have more Rooting Hormone stored at the basal end so that rooting is successful.
Trial Rates: Basal Long Soak Method

Make Rooting Solutions using Hortus IBA Water Soluble Salts or Rhizopon AA Water Soluble Tablets. Use the trial rate charts as a starting point.
Use on cuttings in the growing season and winter dormant cuttings.
- Immerse basal end of cuttings approximately 1" in Rooting Solution for 12 to 48 hours.
- Stick immediately or store.

Trial rates are ppm IBA using Hortus IBA Water Soluble Salts or Rhizopon AA Water Soluble Tablets (see conversion chart pg.15)

<table>
<thead>
<tr>
<th>CUTTING TYPES</th>
<th>Hortus IBA Water Soluble Salts (ppm IBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hard to root annuals and perennials</td>
<td>25-100</td>
</tr>
<tr>
<td>Herbaceous cuttings</td>
<td>50-200</td>
</tr>
<tr>
<td>Woody ornamental cuttings, grape, roses</td>
<td>50-400</td>
</tr>
</tbody>
</table>

Typical annual, perennial and other herbaceous plants using the Basal Long Soak Method

Aeonium          Dahlia              Heliotropism
Araucaria        Delphinium         Hydrangea
   (Norfolk Island pine) Dracaena    Phaseolus
Aster            Dipladenia         Pittosporum
Azalea           Gypsophila         Rosa (rose)
Cryptomeria (J. cedar) (baby's breath) Trachelium
Cupressus (cypress) Hedera (ivy)     (throatwort)
Typical hardwood and softwood, difficult to root cuttings using the Basal Long Soak Method

<table>
<thead>
<tr>
<th>Apple (malus) rootstocks</th>
<th>Elaeagnus</th>
<th>Pseudosuga (Douglas fir)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aralia</td>
<td>Ficus (fig)</td>
<td>Rhododendron</td>
</tr>
<tr>
<td>Barberry</td>
<td>Forsythia</td>
<td>Ribes (currant)</td>
</tr>
<tr>
<td>Callicarpa</td>
<td>Halesia (silverbell)</td>
<td>Robinia (false aralia)</td>
</tr>
<tr>
<td>Calocedrus</td>
<td>Holodiscus</td>
<td>Salix (willow)</td>
</tr>
<tr>
<td>Carpinus (hornbeam)</td>
<td>Juniper</td>
<td>Redwood, coastal</td>
</tr>
<tr>
<td>Cephalotaxus</td>
<td>Metasequoia (sequoia)</td>
<td>Taxus (yew)</td>
</tr>
<tr>
<td>(J. plum yew)</td>
<td>Nerium (oleander)</td>
<td>Thea (tea)</td>
</tr>
<tr>
<td>Centaurea (knapweed)</td>
<td>Olive</td>
<td>Theobroma (cacao)</td>
</tr>
<tr>
<td>Chaenomeles</td>
<td>Philadelphus (mock orange)</td>
<td>Thuja</td>
</tr>
<tr>
<td>(J. flowering quince)</td>
<td>Physocarpus (ninebark)</td>
<td>Thujopsis</td>
</tr>
<tr>
<td>Citrus</td>
<td>Picea (spruce)</td>
<td>Torreya</td>
</tr>
<tr>
<td>Corylus (hazel)</td>
<td>Populus (poplar)</td>
<td>Tsuga (hemlock)</td>
</tr>
<tr>
<td>Cryptomeria (J. cedar)</td>
<td>Potentilla (cinefoil)</td>
<td>Ulmus (elm)</td>
</tr>
<tr>
<td>Cupressocyparis (Leyland Cypress)</td>
<td>Prunus (peach rootstocks)</td>
<td>Viburnum</td>
</tr>
<tr>
<td>Cytisus (broom)</td>
<td></td>
<td>Vitis (grape)</td>
</tr>
<tr>
<td>Derris (rubber)</td>
<td></td>
<td>Weigela</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wisteria</td>
</tr>
</tbody>
</table>

Stock plant house in Holland
Trial Rates: Dry Dip Method

**Rhizopon® AA #1**
Active ingredient 0.1% IBA
*Pink Color Powder*
Use on easy to root cuttings.

**Rhizopon® AA #2**
Active ingredient 0.3% IBA
*Green Color Powder*
An intermediate all purpose product.
Use on easy to more difficult to root cuttings

**Rhizopon® AA #3**
Active ingredient 0.8% IBA
*White Color Powder*
Use on more difficult to root cuttings

*Rhizopon AA #1, #2 and #3 Dry Dip Rooting Hormones are not used to make Rooting Solutions.*

**SELECT THE RHIZOPON AA ROOTING POWDER FOR MANY TYPES OF PLANT CUTTINGS**

<table>
<thead>
<tr>
<th>SEASON</th>
<th>CUTTING TYPE</th>
<th>Rhizopon AA Dry Powder</th>
</tr>
</thead>
<tbody>
<tr>
<td>In the growing season</td>
<td>Leafy cuttings: annuals</td>
<td>#1 or #2</td>
</tr>
<tr>
<td></td>
<td>Leafy cuttings: perennials</td>
<td>#1, #2, or #3</td>
</tr>
<tr>
<td></td>
<td>Leafy cuttings: woody ornamental and forestry</td>
<td>#2 or #3</td>
</tr>
<tr>
<td>All year</td>
<td>Tropical plants</td>
<td>#1 or #2</td>
</tr>
<tr>
<td></td>
<td>Annuals</td>
<td>#1 or #2</td>
</tr>
<tr>
<td></td>
<td>Perennials</td>
<td>#1, #2, or #3</td>
</tr>
<tr>
<td></td>
<td>Woody ornamental and forestry plants</td>
<td>#2 or #3</td>
</tr>
<tr>
<td>Winter dormant cuttings</td>
<td>Woody ornamental and forestry plants</td>
<td>#2 or #3</td>
</tr>
<tr>
<td>All year</td>
<td>Hard to root cuttings</td>
<td>#2 or #3</td>
</tr>
</tbody>
</table>

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Trial Rates for plants propagated by the Dry Dip Method using Rhizopon AA #1, #2 and #3

After the plant name is the product number for Rhizopon AA #1, #2 and #3 Dry Dip rooting hormones.

Various rates may be used for species dependent upon the variety, time of the year, condition of the stock plants, facility, environmental factors, and other variables.

*Rhizopon AA #1, #2 and #3 Dry Dip Rooting Hormones are not used to make Rooting Solutions.*

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Rate 1</th>
<th>Rate 2 or 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abelia</td>
<td>#1</td>
<td>Chrysanthemum #2</td>
</tr>
<tr>
<td>Acanthopanax</td>
<td>#3</td>
<td>Cinquefoil #2</td>
</tr>
<tr>
<td>African Violet</td>
<td>#1</td>
<td>Clematis #2 or #3</td>
</tr>
<tr>
<td>Ageratum</td>
<td>#1</td>
<td>Clerodendron #1</td>
</tr>
<tr>
<td>Andromeda</td>
<td>#1</td>
<td>Clockvine #1</td>
</tr>
<tr>
<td>Apple, Malus</td>
<td>#2 or #3</td>
<td>Coleus #1</td>
</tr>
<tr>
<td>Arborvitae</td>
<td>#2 or #3</td>
<td>Cotoneaster #3</td>
</tr>
<tr>
<td>Arbutus</td>
<td>#3</td>
<td>Crab Apple #2 or #3</td>
</tr>
<tr>
<td>Ardisia</td>
<td>#2</td>
<td>Cape Myrtle #1</td>
</tr>
<tr>
<td>Azalea var</td>
<td>#1, #2 or #3</td>
<td>Grassula #1</td>
</tr>
<tr>
<td>Barberry</td>
<td>#1</td>
<td>Croton #1</td>
</tr>
<tr>
<td>Bayberry</td>
<td>#1</td>
<td>Cryptomeria #3</td>
</tr>
<tr>
<td>Beauty Bush</td>
<td>#3</td>
<td>Currant #1</td>
</tr>
<tr>
<td>Beauty Berry</td>
<td>#1</td>
<td>Dahlia #2</td>
</tr>
<tr>
<td>Beech</td>
<td>#2</td>
<td>Daphne #1 or #2</td>
</tr>
<tr>
<td>Begonia</td>
<td>#1</td>
<td>Deutzia #1</td>
</tr>
<tr>
<td>Birch</td>
<td>#3</td>
<td>Dew Berry #1</td>
</tr>
<tr>
<td>Bittersweet</td>
<td>#3</td>
<td>Dogwood #3</td>
</tr>
<tr>
<td>Blackberry</td>
<td>#1</td>
<td>Douglas Fir #3</td>
</tr>
<tr>
<td>Bluebeard</td>
<td>#1</td>
<td>Dove Tree #1</td>
</tr>
<tr>
<td>Blueberry</td>
<td>#1 or #2</td>
<td>Dracaena #1</td>
</tr>
<tr>
<td>Bougainvillea</td>
<td>#3</td>
<td>Dutchman’s Pipe #1</td>
</tr>
<tr>
<td>Boxwood</td>
<td>#3</td>
<td>Elder #1 or #2</td>
</tr>
<tr>
<td>Broom</td>
<td>#1 or #2</td>
<td>Escallonia #2</td>
</tr>
<tr>
<td>Butterfly Bush</td>
<td>#1</td>
<td>False Arborvitae #2</td>
</tr>
<tr>
<td>Camellia</td>
<td>#3</td>
<td>Firethorne #1 or #2</td>
</tr>
<tr>
<td>Candytuft</td>
<td>#1</td>
<td>Flowering Cherry #1</td>
</tr>
<tr>
<td>Carnation</td>
<td>#3</td>
<td>Flowering Quince #3</td>
</tr>
<tr>
<td>Catalpa</td>
<td>#3</td>
<td>Fontanesia #1</td>
</tr>
<tr>
<td>Chaste Tree</td>
<td>#3</td>
<td>Forsythia #1</td>
</tr>
<tr>
<td>Chestnut</td>
<td>#3</td>
<td>Franklinia #2</td>
</tr>
<tr>
<td>Chokeberry</td>
<td>#2 or #3</td>
<td>Fringe Tree #2</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Number</th>
<th>Plant Name</th>
<th>Number</th>
<th>Plant Name</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maple, Japanese</td>
<td>#3</td>
<td>Philodendron</td>
<td>#1</td>
<td>Springscint</td>
<td>#2</td>
</tr>
<tr>
<td>Matrimony Vine</td>
<td>#3</td>
<td>Phlox</td>
<td>#1</td>
<td>Spruce var.</td>
<td>#2</td>
</tr>
<tr>
<td>Melastoma</td>
<td>#1</td>
<td>Photinia</td>
<td>#3</td>
<td>St. Johnswort</td>
<td>#1</td>
</tr>
<tr>
<td>Mock Orange</td>
<td>#1</td>
<td>Pine var.</td>
<td>#2 or #3</td>
<td>Stevia</td>
<td>#1</td>
</tr>
<tr>
<td>Mulberry</td>
<td>#1</td>
<td>Poinsettia</td>
<td>#1</td>
<td>Stewartia</td>
<td>#1</td>
</tr>
<tr>
<td>Ninebark</td>
<td>#3</td>
<td>Poplar</td>
<td>#1</td>
<td>Sweet Leaf</td>
<td>#1</td>
</tr>
<tr>
<td>Norway Spruce</td>
<td>#1</td>
<td>Prickly Pear Cactus</td>
<td>#1</td>
<td>Trumpet Creeper</td>
<td>#1</td>
</tr>
<tr>
<td>Oak</td>
<td>#3</td>
<td>Privet</td>
<td>#3</td>
<td>Tulip Tree</td>
<td>#3</td>
</tr>
<tr>
<td>Oleander</td>
<td>#2</td>
<td>Raspberry</td>
<td>#1</td>
<td>Umbrella Pine</td>
<td>#3</td>
</tr>
<tr>
<td>Olive</td>
<td>#3</td>
<td>Retinospora</td>
<td>#3</td>
<td>Verbena</td>
<td>#1</td>
</tr>
<tr>
<td>Orange, sour</td>
<td>#3</td>
<td>Rhododendron var.#3</td>
<td>#1</td>
<td>Viburnum</td>
<td>#1</td>
</tr>
<tr>
<td>Orlxa</td>
<td>#1</td>
<td>Rose #1, #2 or #3</td>
<td>#1</td>
<td>Waxmyrtle</td>
<td>#1</td>
</tr>
<tr>
<td>Osage Orange</td>
<td>#1</td>
<td>Russian Olive</td>
<td>#3</td>
<td>Weigela</td>
<td>#1</td>
</tr>
<tr>
<td>Osmanthus</td>
<td>#2</td>
<td>Sage</td>
<td>#1</td>
<td>Willow</td>
<td>#1</td>
</tr>
<tr>
<td>Pachysandra #2 or #3</td>
<td></td>
<td>Sequoia</td>
<td>#2</td>
<td>Wintergreen</td>
<td>#2</td>
</tr>
<tr>
<td>Pea Shrub</td>
<td>#1</td>
<td>Snapdragon</td>
<td>#1</td>
<td>Wisteria</td>
<td>#2</td>
</tr>
<tr>
<td>Pear rootstocks</td>
<td>#3</td>
<td>Snow Berry</td>
<td>#1</td>
<td>Witch Hazel</td>
<td>#2</td>
</tr>
<tr>
<td>Pecan</td>
<td>#3</td>
<td>Sourwood</td>
<td>#3</td>
<td>Yellow Wood</td>
<td>#2</td>
</tr>
<tr>
<td>Penstemon</td>
<td>#1</td>
<td>Speedwell</td>
<td>#1</td>
<td>Yew var.</td>
<td>#3</td>
</tr>
<tr>
<td>Periwinkle</td>
<td>#2</td>
<td>Spiraea</td>
<td>#1</td>
<td>Zelkova</td>
<td>#2</td>
</tr>
<tr>
<td>Petunia</td>
<td>#2 or #3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Trial Rates using Rhizopon AA Water Soluble Tablets

To make Rooting Solutions using Rhizopon AA Water Soluble Tablets simply count the tablets and mix in water.

- Mix into ordinary water. Rhizopon AA Water Soluble Tablets are water soluble to 20 tablets/liter (1000 ppm IBA).
- Rhizopon AA Water Soluble Tablets are useful when a scale is not available to measure, and to mix small amounts of Rooting Solution.
- Use the Rooting Solutions by the foliar and basal methods shown in this book.

Trial rates are using Rhizopon AA Water Soluble Tablets

Hortus IBA Water Soluble Salts can be used in all cases where Rhizopon AA Water Soluble Tablets are used. To use Hortus IBA Water Soluble Salts see conversion chart pg.15.

<table>
<thead>
<tr>
<th>BASAL LONG SOAK METHOD</th>
<th>TABLETS/liter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hard to root annual and perennial cuttings</td>
<td>1/2-2</td>
</tr>
<tr>
<td>Herbaceous cuttings</td>
<td>1-4</td>
</tr>
<tr>
<td>Woody ornamental cuttings, grapes, roses</td>
<td>2-8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>QUICK DIP METHOD</th>
<th>TABLETS/liter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual, perennial, tropical plants, chrysanthemums</td>
<td>1-4</td>
</tr>
<tr>
<td>Herbaceous, perennials, pot roses cuttings</td>
<td>3-10</td>
</tr>
<tr>
<td>Softwood, hardwood cuttings. More difficult to root</td>
<td></td>
</tr>
<tr>
<td>herbaceous, perennial, tropical house plant cuttings</td>
<td>10-20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TOTAL IMMERSE &amp; SPRAY DRIP DOWN METHODS</th>
<th>TABLETS/liter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual, perennial, tropical plants, chrysanthemums</td>
<td>1-5</td>
</tr>
<tr>
<td>Herbaceous and hard-to-root perennial cuttings</td>
<td>5-20</td>
</tr>
<tr>
<td>Woody ornamental cuttings</td>
<td>10-20</td>
</tr>
</tbody>
</table>
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.**

Ivy stock plants in Holland
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 facility.

- 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:
- Products 2-3, 13-16
- Methods 17-28
- Rates 29-38 (For Rhizopon AA Water Soluble Tablets see chart pg.15)

<table>
<thead>
<tr>
<th>SOLUTION METHODS &amp; CUTTING TYPES</th>
<th>Hortus IBA Water Soluble Salts (ppm IBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TOTAL IMMERSE &amp; SPRAY DRIP DOWN METHODS</strong></td>
<td>Trial rates</td>
</tr>
<tr>
<td>Annual, perennials, chrysanthemum</td>
<td>80-250</td>
</tr>
<tr>
<td>Herbaceous and hard to root perennial plant cuttings</td>
<td>250-1500</td>
</tr>
<tr>
<td>Woody ornamental cuttings</td>
<td>300-1500</td>
</tr>
<tr>
<td><strong>BASAL QUICK DIP METHOD</strong></td>
<td>Trial rates</td>
</tr>
<tr>
<td>Annuals, soft perennial, tender cuttings from ornamental plants, tropical house plants</td>
<td>80-200</td>
</tr>
<tr>
<td>Herbaceous, perennials, pot rose cuttings</td>
<td>150-1500</td>
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<tr>
<td>Difficult to root herbaceous, perennials, tropical house plants</td>
<td>500-1500</td>
</tr>
<tr>
<td>Softwood cuttings</td>
<td>500-1500</td>
</tr>
<tr>
<td>Hardwood cuttings</td>
<td>500-2000</td>
</tr>
<tr>
<td>Difficult to root hardwood cuttings <em>(See note page 32)</em></td>
<td>2000-10,000</td>
</tr>
<tr>
<td><strong>BASAL LONG SOAK METHOD</strong></td>
<td>Trial rates</td>
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<td>50-200</td>
</tr>
<tr>
<td>Woody ornamental cuttings, grape, roses</td>
<td>50-400</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DRY DIP METHOD &amp; CUTTING TYPES</th>
<th>Rhizopon AA #1, #2, #3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>In the Growing Season</strong></td>
<td>Trial rates</td>
</tr>
<tr>
<td>Leafy cuttings: annuals</td>
<td>#1 or #2</td>
</tr>
<tr>
<td>Leafy cuttings: perennials</td>
<td>#1, #2, or #3</td>
</tr>
<tr>
<td>Leafy cuttings: woody ornamental and forestry</td>
<td>#2 or #3</td>
</tr>
<tr>
<td><strong>All Year</strong></td>
<td></td>
</tr>
<tr>
<td>Tropical plants</td>
<td>#1 or #2</td>
</tr>
<tr>
<td>Annuals</td>
<td>#1 or #2</td>
</tr>
<tr>
<td>Perennials</td>
<td>#1, #2, or #3</td>
</tr>
<tr>
<td>Woody ornamental and forestry plants, hard to root cuttings</td>
<td>#2 or #3</td>
</tr>
<tr>
<td><strong>Winter dormant cuttings</strong></td>
<td>#2 or #3</td>
</tr>
</tbody>
</table>
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**
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 (CO²) IN AIR & OXYGEN IN MEDIA
Photosynthesis is important for cuttings. Photosynthesis requires sufficient carbon dioxide (CO²), light, and water. An advantage of an increased level of CO² 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 CO² level (800-1000 ppm) will form roots better. CO² 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.
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.

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

*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.*
Hortus IBA
Water Soluble Salts®
(20%)

Plant Rooting Hormone

Dissolve Salts in Water to Make Rooting Solutions.
Use by Foliar and Basal Methods on Plants That Can Be
Propagated from Cuttings. Use on Annual, Perennial, and
Woody Ornamental Plant Cuttings.

Ingredients:
Active ingredients
Indole-3-butyric acid 20.0%
Other ingredients 80.0%
Total 100.0%

Registered by
Hortus USA Corp., NY NY 10011
Made in Holland
EPA Reg No. 63310-22
EPA Est No. 63310-HL-001

Net Weight: 2 Pounds, 4 Ounces (1 Kilo)

KEEP OUT OF REACH OF CHILDREN
CAUTION
See Attached Label for First Aid and Precautionary Statements

Use Hortus IBA Water Soluble Salts (20%) to make rooting solutions.
The Salts dissolve easily in water to over 100,000 ppm IBA. Use the
solutions to propagate new plants from cuttings. Treated cuttings
are expected to produce uniform roots all around the basal end.
PRECAUTIONARY STATEMENTS
HAZARDS TO HUMANS AND DOMESTIC ANIMALS.

CAUTION
Causes moderate eye irritation. Harmful if inhaled or absorbed through the skin. Avoid contact with eyes, skin, ingestion or inhalation. Avoid breathing dust (vapor or spray mist). Wash thoroughly with soap and water after handling. Remove contaminated clothing and wash before reuse.

PERSONAL PROTECTIVE EQUIPMENT
Applicators and other handlers must wear: long sleeve shirt, long pants, shoes, socks and waterproof gloves, and for exposure in enclosed areas or outdoors, dust/mist filtering respirator. (MSHA/NIOSH approval number prefix TC-21C) or a NIOSH-approved respirator with any R, P or HE filter.

USER SAFETY RECOMMENDATIONS
Users should: Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet. Remove clothing/PPE immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing. Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

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FIRST AID
Classification of Pesticide: Plant Growth Regulator

If in eyes
- Hold eyes open and rinse slowly with water for 15-20 minutes
- Remove contact lenses, if present after the first 5 minutes then continue rinsing eye
- Call a poison center or a doctor for further treatment or advise

If on skin or clothing
- Take off contaminated clothing
- Rinse skin immediately with plenty of water for 15-20 minutes
- Call a poison center or a doctor for further treatment or advise

If swallowed
- Call a poison center or a doctor for further treatment or advise
- Have person sip water if able to swallow
- Do not induce vomiting unless told to do so by the poison control center or doctor.
- Do not give anything by mouth to an unconscious person

If inhaled
- Move person to fresh air
- If person is not breathing call 911 or an ambulance, then give artificial respiration, preferably by mouth to mouth, if possible
- Call a poison center or a doctor for further treatment or advise

NOTE TO PHYSICIAN: May cause moderate eye irritation which will last a short time. This product does NOT contain any petroleum, caustics or active solvent products

Have the product container or label with you when you call a poison control center or doctor or going for treatment. You may call 800-325-3055 or 314-770-0717, 7:30AM-5PM CST Mon-Fri or the National Pesticide Information Center (NPIC) at 1-800-858-7378

You may also call 800-325-3055 or 314-770-0717 for an MSDS (7:30AM-5PM CST)

ENVIRONMENTAL HAZARDS
For terrestrial uses: Do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water by cleaning of equipment or disposal of equipment wash waters or rinseate.

DIRECTIONS FOR USE
It is a violation of Federal law to use this product in a manner inconsistent with labeling. For any requirements specific to your State or Tribe, consult the State or Tribal agency responsible for pesticide regulation.

AGRICULTURAL USE REQUIREMENTS
Use this product in accordance with its labeling and with the Worker Protection Standard, 40 CFR 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this labeling about personal protective equipment and restricted-entry intervals. The requirements in this box only apply to the uses of this product that are covered by the Workers Protection Standard (WPS). Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application.

THE RESTRICTED-ENTRY INTERVAL (REI) FOR THIS PRODUCT IS "0" HOURS.
RATE DETERMINATION
A wide solution rate range is indicated for this product. Your ideal rates will vary according to specific plant variety, season, quality of the cuttings, and local growing conditions. Prior to large scale production, test a few plants at several rates within the range. If foliar application causes phytotoxicity, try basal applications and/or decrease rates. Use the lowest rate to produce the desired effect.

PREPARING A HORTUS IBA WATER SOLUBLE SALTS® (20%) SOLUTION USING WATER

1) Weigh the required amount of Hortus IBA Water Soluble Salts. Measure by weight not volume.
2) Use tap water at about 65-90F; measure less than the final volume.
3) Mix: dissolve Hortus IBA Water Soluble Salts in the water.
   • If precipitation occurs with tap water then dissolve in distilled, demineralized, or filtered water.
   • Do not dissolve Hortus IBA Water Soluble Salts in solvents other than water.
4) Add water to the mixing container to bring the solution to the final volume.
5) Apply the solution by the selected method.
6) After use, dispose of the solution as described in the ‘Storage and Disposal’ statements on this label.
   • For the Total Immerse and basal methods, dispose of solutions between plant lots to avoid cross contamination.
   • Stock solutions can be made in any concentration, to over 100,000 ppm IBA, using Hortus IBA Water Soluble Salts mixed in water.

AMOUNT OF HORTUS IBA WATER SOLUBLE SALTS® REQUIRED
• Hortus IBA Water Soluble Salts contain 20% IBA.
• 1 gram technical IBA = 5 grams Hortus IBA Water Soluble Salts
• Note: 1 gram = 0.035 ounce

LIQUID VOLUME CONVERSION:

liters to gallon: grams Salts /liter x 3.78 = grams Salts /gallon

LITERS: To get 1000 ppm IBA: dissolve 5 grams of Hortus IBA Water Soluble Salts in water to make 1 LITER
GALLONS: To get 1000 ppm IBA: dissolve 19 grams of Hortus IBA Water Soluble Salts in water to make 1 GALLON
HOW TO MAKE RATES FROM 100 TO 10,000 PPM IBA USING HORTUS IBA WATER SOLUBLE SALTS®

<table>
<thead>
<tr>
<th>ppm IBA</th>
<th>Weight of HORTUS IBA WATER SOLUBLE SALTS</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>grams per liter of water</td>
</tr>
<tr>
<td>100</td>
<td>0.5 grams</td>
</tr>
<tr>
<td>200</td>
<td>1.0</td>
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<tr>
<td>300</td>
<td>1.5</td>
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<tr>
<td>400</td>
<td>2.0</td>
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<tr>
<td>500</td>
<td>2.5</td>
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<tr>
<td>600</td>
<td>3.0</td>
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<tr>
<td>700</td>
<td>3.5</td>
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<td>800</td>
<td>4.0</td>
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<td>900</td>
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<tr>
<td>1,000</td>
<td>5.0</td>
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<tr>
<td>5,000</td>
<td>25.0</td>
</tr>
<tr>
<td>10,000</td>
<td>50.0</td>
</tr>
</tbody>
</table>

PROMOTE ROOTING OF PLANT CUTTINGS
Use to propagate new plants from cutting, from those easy to root to the most difficult to root.

EASY STEPS
• Take plant cuttings, usually stem cuttings.
• For woody cuttings usually wound by making a 3/4” long notch at basal end.
• Apply solutions to plant cuttings by the methods listed below. (Do not apply the dry Salt powder to the plant cuttings.)
• Take care of cuttings as appropriate for the plant variety. Control watering, temperature, humidity, light and other environmental factors. Observe and control external factors such as insects and fungus.
• Use the minimum concentration to achieve results; excess concentration may inhibit root formation.
BASAL METHODS FOR USE ON CUTTINGS IN THE GROWING SEASON AND ON DORMANT WINTER CUTTINGS

BASAL LONG SOAK METHOD
Use on cuttings in the growing season and winter dormant cuttings.
- Immerse basal end of cuttings approximately 1" in solution for 12 to 48 hours.
- Stick immediately or store.
Trial Rates are ppm IBA using Hortus IBA Water Soluble Salts

<table>
<thead>
<tr>
<th></th>
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</thead>
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<td>Hard to root annuals and perennials</td>
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</tr>
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</tr>
<tr>
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QUICK DIP METHOD
Use on cuttings in the growing season and winter dormant cuttings.
- Immerse basal end of cuttings approximately 1" in solution a few seconds.
- Stick immediately or store.
Trial Rates are ppm IBA using Hortus IBA Water Soluble Salts

<table>
<thead>
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<td>Hardwood cuttings</td>
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</tr>
<tr>
<td>Difficult to root hardwood cuttings (Avoid high rates by using the Basal Long Soak Method)</td>
<td>2000-10,000</td>
</tr>
</tbody>
</table>
FOLIAR METHODS FOR USE ON LEAFY CUTTINGS IN THE GROWING SEASON

TOTAL IMMERSE METHOD
Use on leafy cuttings in the growing season
- Total immerse the cuttings in the solution for about 5 seconds. A basket is useful.
- Stick immediately or store.

SPRAY DRIP DOWN METHOD™
Use on leafy cuttings in the growing season
- Stick cuttings.
- Spray the solution on leaves and stems until the solution drips down into media.

TRIAL RATES FOR THE TOTAL IMMERSE AND SPRAY DRIP DOWN METHODS™
Trial Rates are ppm IBA using Hortus IBA Water Soluble Salts

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IMPROVE PLANT GROWTH
Use on rooted plants and leafy plant cuttings in the growing season to develop uniform crops, when propagating plants from cuttings after sticking by any method, or when transplanting.
- Method: Spray Drip Down Method™: Spray the solution onto the leaves of plants until the solution drips down.
- Rates: Use the Spray Drip Down Method™ trial rates listed above. Use the lowest concentration to produce the desired effect.
- Frequency: Weekly or until the required results are achieved.
- Trials: Do small trials prior to doing large scale production.
STORAGE AND DISPOSAL
Do not contaminate water, food, or feed by storage and disposal.

Pesticide Storage
Store in a cool dry place under lock and key. Post as a pesticide area. Always store pesticides in the original container. Store away from food, pet food, feed, seed, fertilizers, and veterinary supplies. Place liquid formulations on lower shelves and dry formulations above.

Pesticide Disposal
To avoid wastes, use all material in this container by application according to label directions. If wastes cannot be avoided, offer remaining product to a waste disposal facility or pesticide disposal program (often such programs are run by state or local governments or by industry).

Container Handling
Nonrefillable container. Do not reuse or refill this container.
Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank. Fill the container ¼ full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times. Then offer for recycling if available, or puncture and dispose of in a sanitary landfill or by incineration. Do not burn unless allowed by state and local ordinances.

WARRANTY
It is warranted that this product conforms to the chemical description on the label thereof and is reasonably fit for purposes stated on such label only when used in accordance with the directions under normal use conditions. It is impossible to eliminate all risks inherently associated with the use of this product. Crop injury, ineffectiveness or other unintended consequences may result because of such factors as weather conditions, presence of other materials, or the manner of application all of which is beyond the control of Rhizopon b.v. or Hortus USA Corp. To the extent consistent with applicable law, Rhizopon or Hortus USA shall not be liable for consequential, special or indirect damages resulting from the use or handling of this product. To the extent consistent with applicable law, all risks shall be assumed by the buyer. Rhizopon or Hortus USA make no warranties of merchantability or fitness for a particular purpose nor other express or implied warranty except as stated above.

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Hortus IBA Water Soluble Salts (20%) are available from your favorite horticultural distributor. For phone support, distributor ordering & referral contact Master Distributor:
PHYTOTRONICS 314-770-0717
sales@phytotronics.com

For Technical Support visit:
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Mobile Device Website:
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Hortus
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A Guide to Using Plant Rooting Hormones by Foliar & Basal Methods

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This book & rooting products are brought to you by Hortus USA
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