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SUN GRO HORTICULTURE

THE SUN GRO'er

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Welcome!

Welcome to another edition of the Sun Gro'er newsletter. Since our last newsletter, Sun Gro has now taken on the Multicote® line of controlled release fertilizers. The official announcement regarding this is included in the newsletter. Because of this and the addition of the Metro-Mix line, the Eastern Region has added a new Technical Specialist, Willie Faber. Willie comes to us from Yoder Brothers, where he worked on technical issues and product information for the Yoder products. He also has worked for the extension service through The Ohio State University. Willie will be working with our sales people in Michigan, Indiana, Kentucky, Ohio, West Virginia and western Pennsylvania. We welcome Willie and look forward to his input on future newsletters.

In addition to the press release regarding the Multicote® deal, this newsletter will also have an article on some uses of Multicote and an article by Kathryn Louis on growing of tissue culture plants. We also have a contact list for all of the Sun Gro Technical Specialists and Customer Resources.

-Daniel Jacques

Using Multicote® to Supplement Your Standard Fertilizer Program

Most greenhouse crops can effectively be grown with either a water soluble fertilizer regimen or through the use of controlled release fertilizers. In general, growers tend to use a water soluble program because they feel they have better control over fertilizer needs of the crop (they can easily reduce or increase fertilizer as needed). For many crops, such as bedding plants in standard flats, the water soluble regimen is the better way to go because small cells do not readily lend themselves to even distribution of a controlled release fertilizer. However, with the advent of the larger cell packs, such as Jumbo Packs and the 2¼ " liners, controlled release fertilizers can be successfully used for general bedding plant production.

When plants are grown in single larger containers (planters, hanging baskets, large pots, etc.), a combination of controlled release fertilizers and a water soluble fertilizer may be the better option. An example of this is with spring crops, where a heavily fertilized crop like Scaevola is grown in containers in the same house with bedding plants and New Guinea impatiens, which are lightly fertilized in comparison. Ideally, heavily fertilized crops should be kept totally separate from lightly fertilized crops to make it easier to modify the feed. However, this is not practical in this day and age when growers produce a multitude of crops with varying fertilizer needs in the same house. The answer might be to add a low rate of a controlled release fertilizer such as Multicote® 15-7-15 Extra to the more heavily fertilized crop. In this way, the water soluble fertilizer providing supplemental fertilizer for the more heavily fertilized crops. This fertilizer can be topdressed or incorporated. Follow label directions for topdressing. Incorporation rates will be discussed later in this article.

Another use of controlled release fertilizers is for those crops that are grown outdoors for part or all of the production period, like garden mums, bedding plants in larger containers (Jumbo Packs, 4-inch or larger pots, etc.) and perennials. It is difficult to keep these crops well fed especially in times of heavy rains. The controlled release fertilizer can help maintain adequate fertility levels to keep the crop growing well. When used alone, controlled release fertilizers are used at the higher labeled rates.

Supplemental water soluble fertilizer can also be used at rates of 100 ppm N (lighter feeders) to 200 or 300 ppm N (heavier feeders) in these crops. If a grower plans on using supplemental water soluble fertilizer, rates of controlled release fertilizer should not exceed the medium rate for garden mums or the low rate for perennials. Rates of Multicote®15-7-15 Extra are dependent on the release rate selected. The four-month product will have low, medium and high incorporation rates of 4, 7, and 10 pounds per cubic yard. The six month product will have low, medium and high incorporation rates of 5, 8 and 11 pounds per cubic yard.

As with all controlled release fertilizers, it is best to trial these methods if you have never used them in order to determine which program will work best in your specific situation. If you use the proper controlled release fertilizer at the rate that best fits your crop and growing methods, it can be a labor saver and even improve your overall crop.

-Daniel Jacques

How Using the Correct Soilless Media Will Help Your Success with Tissue Culture Propagation

Tissue culture (also called "in vitro culture" or "micro-propagation") is one method of cloning plants. In many ways, it is similar to the clonal propagation of plants by cuttings. In each method, part of the plant is removed from a stock plant and (after a multiplication stage in the case of tissue culture) placed in a rooting environment and then acclimated to the real world.

Major differences between the two processes are that tissue culture includes a multiplication stage and secondly much of the process is done under sterile (or aseptic) conditions. Additionally, inside the culture jar, light level are low and humidity is high, which results in stems, leaves and roots that are quite different from a standard cutting that is propagated in a greenhouse. These differences require extra care in the rooting and acclimation stages when compared to normal cutting propagation.

Basics. To begin the tissue culture process, a part of the plant, often a shoot tip or leaf, is cut from the stock plant. This piece of tissue is called an explant (excised plant part). The explant is surface disinfested, using bleach or fungicides, rinsed and placed on sterilized media that is essentially a weak fertilizer solution with sugar. Usually agar is added to make the solution into gel.

Multiplication stage. The next step is the multiplication process. The main types of multiplication are somatic embryogenesis[1], adventitious shoot development[2] and axillary bud enhancement[3]. Somatic embryogenesis is a specialized process and is not covered in this article.

Note: Photos are © 1994 Minn vitro, Inc. Used with permission

During the multiplication stage to form new shoots, PGRs (plant growth regulators or plant hormones) are used to manipulate cells into forming multiple shoots. The PGRs most often used are cytokinins for shoot development and auxins for callus formation. The exact ratio and type of the PGRs have been researched and varies based on genus and species.

Rooting and PGRs. Eventually the shoots that develop are removed from their protected home and need to be rooted and acclimated to the environment outside the culture jar. The use of PGRs in culture can have a residual affect during the rooting process. Rooting can be poor, if high levels of cytokinins are used during the culture cycle just prior to taking the micro-cuttings. High levels of auxins can cause excessive callus formation and also limit effective rooting. Micro-cuttings from some genera will root well in vitro or ex vitro, with or without an auxin treatment.

Roots. Another factor that effects the ex vitro rooting is the belief that in vitro developed roots are fully functional. In general, roots that form in culture are not functional outside the culture environment and will often die and decay, which provides a food source for pathogens. Very small root initials (root nubs) that develop in vitro will usually develop into functioning roots.

Leaf tissue. At the same time that the micro-cutting is struggling to produce roots it must also deal with developing functional stem and leaf tissue. One of the first challenges for the stem and leaves is preventing water loss that can result in rapid and irreversible desiccation due to the following physiological conditions.

1. Shoots that form in vitro often have a poorly developed waxy cuticle layer due to the high relative humidity in the culture jar, so there is almost no physical barrier to water loss on the outside.
2. Stomata are often "stuck open" for the first few days allowing moisture to readily escape and dry air to move in.
3. Large mesophyll air spaces in the leaf allow space for the dry air.
4. Water uptake by the root is non existent (if no roots) or poor with root initials that often have poor vascular connections between the root initials and the leaves.

Photosynthesis. Another challenge for the stem/plantlet is to become photosynthetically active again. The low light level and low CO_2 concentration in the culture jar are not adequate for

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[1]Somatic embryogeneis is the development of an embryo using plant cells instead of the normal process of embryo development from flowers.
[2]Adventitious bud development is when a bud is formed from any non bud plant part such as leaves, stem, roots, etc.
[3]Axillary buds are pre-formed buds in the leaf axil; the place where the leaf or stem joins the stem is called the leaf axil.

(Continued from page 2)
photosynthesis, so sugar (the product of photosynthesis) is added during the culture cycle. Additionally in vitro developed leaves have smaller and fewer palisade cells so ex vitro photosynthesis is limited. Ex vitro photosynthesis and plant survival requires that new leaves develop during the rooting and acclimation phases.

Temperature and humidity. The environmental requirements during rooting and acclimation vary among genera, but some similar requirements are necessary in all cases. Misting the micro-cutting while sticking is critical and the rooting chamber requires high humidity. It is not necessary to bench stick the micro-cuttings. Often the rooting chamber is not in a greenhouse, but in an interior room. Micro-cuttings can be stuck into plug trays, covered with a dome and placed under lights with an extended photoperiod.

Once roots are established and new growth begins, the domes are removed and the plantlets are moved to the greenhouse in a manner that is similar to seed propagation.

If mist beds are used for rooting, they should be tented with poly or the micro-cuttings should be covered with micro pore fabric. Extended photoperiod is often helpful during rooting. In all cases air temperature must be monitored and kept below 80° F (26° C), which requires the use of shade cloth and cooling systems if rooting is done in a greenhouse. The use of poly domes directly on plug trays in greenhouse rooting beds should not be done because the air temperature can increase dramatically in a short time under a dome.

Rooting medium. Many different rooting media can be used successfully, such as peat, perlite, vermiculite, peatlite mixes, peat sponges, rockwool, floral foam and other synthetic media. A media that is pH adjusted for your particular genus with low nutrients, good air and water capacity will work. Peat lite mixes developed for seedlings and plugs such as Sunshine #3/LG3 or Sunshine #5/LP5 are commonly used due to their physical and chemical properties. If more drainage is required, simply mixing in more Sunshine Perlite will be helpful. It is important to keep the nutrition levels low during the rooting phase. As plants develop functioning roots, more fertilizer can be added.

Media prep for rooting. Pasteurizing your rooting medium is recommended, although not always practical. However considering the high cost of the micro-cutting and that the rooting conditions are favorable to pathogen development, it is a good idea to figure out a way to do this. Monitoring of the rooting process is critical to limiting disease problems and correcting problems early is critical.

Transplanting. After successful rooting and acclimation, the plantlets will need to be transplanted into individual pots using the best media available. For foliage and indoor plants we recommend Sunshine #1/LC1, SB200, Metro Mix 360, for woodies Sunshine SB400, PX-2, Metro Mix 510 will work well.

Summary. Tissue culture is a relatively new method of commercial propagation. It is used for plants that are difficult to root, are in need of virus clean up or in the case of a new hybrid, where there is a limited number of stock plants for conventional cutting propagation. Common species for tissue culture include orchids, foliage plants, seed potatoes and small fruits. Woody ornamentals, shrubs, fruit trees, forestry trees and angiosperms can also be commercially cloned using tissue culture.

Although tissue culture has advantages as mentioned above and years of research have helped improve the propagators success, the rooting and acclimation process to greenhouse establishment is the most challenging stage; it is also where most losses can occur. However with close attention to environmental, cultural requirements and the use of Sun Gro mixes you will be successful.

-Kathryn Louis

Glossary

agar	A compound added to the tissue culture medium that makes the medium become jelly-like. Usually derived from seaweed or algae. It is usually pronounced with a short 'a'.
aseptic	"without septum (cross walls)" meaning sterile or without micro organisms (fungi, bacteria, etc.)
ex vitro	Outside of the culture environment
in vitro	"under glass"
media vs. medium	Media is plural, medium singular. Media are weak fertilizer solutions with sugar and PGRs.
mesophyll	"middle of leaf" The section of the leaf where photosynthesis occurs, see also palisade cells
palisade cells	The cells within the mesophyll that contain chloroplasts where photosynthesis occurs.

Sun Gro to Become the North American Master Distributor of Haifa Chemicals' Proprietary Multicote Product line

TRADING SYMBOL: Toronto Stock Exchange – GRO.UN

VANCOUVER, BC, June 3, 2005/ -- Sun Gro Horticulture Income Fund today announced that its wholly owned subsidiaries, Sun Gro Horticulture Distribution Inc. and Sun Gro Horticulture Canada Ltd. (Sun Gro), have signed agreements to become the US and Canadian Greenhouse and Nursery Master Distributor of Haifa Chemicals' (Haifa) Multicote product line.

Effective May 20, 2005, the pending agreement provides for Sun Gro to begin taking orders on both existing Multicote formulations and those that were developed by Sun Gro in cooperation with Haifa. Haifa will manufacture these formulations per Sun Gro's specifications at their state-of-the art production facility in Haifa Bay, Israel. The formulations include those for the greenhouse industry and for use in outdoor container production. Within the container production formulations, both flowering and non-flowering plant material formulations will be available. The formulations are available in a selection of longevities that will make the product suitable for use in production throughout North America.

"The addition of the Multicote product line is directly in line with our strategic focus on the professional grower market," said Mitch Weaver, President and CEO of Sun Gro and a Trustee of the Fund. "The addition of this quality brand to our product offerings will strengthen our position in the fertilizer segment of the professional market, expand our sales into the container nursery industry and further solidify our relationship with our key distributors."

Sun Gro's development of these controlled release fertilizer formulations comes after years of research comparing the technologies of all the major suppliers to the industry. The search for a controlled release fertilizer Sun Gro could stand behind came to an end when Sun Gro tested the newest coating technology developed by Haifa. Sales and marketing of the product will be done through Sun Gro's established distribution network and supported by Sun Gro's sales force of over 30 district managers and 6 grower specialists. Richard Benson, who has worked in the controlled release fertilizer industry for more than 30 years, is the new company-wide controlled release fertilizer product manager for Sun Gro.

Jerry Montag, Manager of Haifa Nutri-Tech (HNT) Inc. said the transaction allows HNT to focus on its core competencies. "We are excited about the opportunity to work with Sun Gro. Our new strategic agreement will allow Haifa Nutri-Tech and Sun Gro to work together to make Multicote a well established controlled release fertilizer brand in the North America market."

Haifa Chemicals is a long-established international corporation that produces and markets specialty fertilizers and chemicals for the horticulture industry. Founded in 1966, Haifa has become a world leader renowned for innovative solutions in all its fields of expertise. Company operations now span more than 80 countries across five continents. Haifa was established to turn Israeli natural resources into potassium nitrate, a premium fertilizer with high added value and an essential ingredient in various industries. Being the world's pioneer and largest supplier of potassium nitrate, Haifa has gained production capabilities, application know-how and deep understanding of the marketplace it serves. This has been the solid basis for the development of a complete line of top-quality products. Based in Haifa Bay, Israel, Haifa is wholly owned by US-based Trans Resources Inc.

Sun Gro was founded in 1929 in Vancouver, British Columbia and has grown to become North America's largest producer of sphagnum peat and the largest distributor of peat moss and peat and bark-based growing media to professional plant growers in the US and Canada. The company's Sunshine® brand is widely recognized as the premier growing media brand in the professional sector. The Sun Gro Horticulture Income Fund is a limited purpose, open-ended trust created in March 2002 to acquire and hold the securities of Sun Gro and its subsidiaries. Distributions to the Fund's unit holders are dependent on the performance of Sun Gro.
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