'Lanai Spirit Mix' verbena combo basket grown with proper PGR, light and fertility. (All photos/ tables: Syngenta Flowers)

Propagating and Finishing Seven Common Vegetative Annuals

The A to Z for growing some of your most popular crops.

BY HARVEY LANG

There are several factors to consider when propagating vegetative annual cuttings. These include media selection, sanitation, unboxing and sticking guidelines, mist requirements, temperature and light levels, fertilizer rate and type, pinching and growth regulation and disease prevention/control. While a whole article could be written just on propagating vegetative annuals, I'll list a few of the most important guidelines that should be followed in all propagation situations. These include:

Preparation and organization. Growers should have a plan and be prepared for handling unrooted cuttings (URCs). Labor, bench space and cooler requirements should be addressed before shipments arrive. The propagation supervisor should quickly inspect cuttings as the boxes are opened and address quality issues to their supplier/broker immediately. If possible, open the boxes and place them in a cooler until they can be stuck. Some species are chilling sensitive and should not be stored below 48° F. See Table 1.

Sanitation. There is a saying in the propagation world to "start clean and stay clean." The propagation area, including walkways, entrance areas and benches should be sanitized using appropriate and approved disinfectants before the cuttings arrive.

Table 1. Sticking Priority – Vegetative URCs

1 = Highest Priority 5 = Lowest Priority

Red Highlighted = No Storage < 48°F

Species	Priority	Species	Priority	Species	Priority
Geranium Zonal	1	Anagalis	3	Asteriscus	5
Americana	1A	Bacopa sutera	3	Centradenia	5
Rocky Mountain	1B	Calibrachoa	3	Chrysanthemum	5
Classic	1C	Coleus	3	Coreopsis	5
Tango	1D	New Guinea Impatiens	3	Dipladenia	5
Geranium Exotic	1	Penta	3	Dorotheanthus	5
Geranium Interspecific	1	Petunia	3	Gaillardia	5
Calliope	1A	Salvia farinacea	3	Gaura	5
Caliente	1B	Salvia hybrida	3	Goodenia	5
Geranium Ivy	1	Salvia patens	3	Lysimachia	5
Euphorbia	1	Sanvitalia	3		
Heliotrope	1	Snapdragon	3		
Ipomoea	1	Torenia	3		
Lantana	1	Verbena	3		
Dahlia	2	Achillea	4		
Diascia	2	Ageratum	4		
Helichrysum	2	Angelonia	4		
Impatiens - Double	2	Argaranthemum	4		
Impatiens - Trailing	2	Aster	4		
Lavendula	2	Bidens	4		
Lobelia	2	Bracteantha	4		
Nemesia	2	Cuphea	4		
Osteospermum	2	Penstemon	4		
Vinca	2	Scaevola	4		

Disinfectant contact time is critical, with longer times typically being more effective. Foot baths or mats containing disinfectant should be placed at each entry to the propagation area and the disinfectant should be changed and refreshed frequently. Workers in the propagation area should follow good sanitation protocols. Proper sanitation provides insurance against major diseases that can affect various annuals.

The main diseases to be concerned about from a sanitation perspective are 1) root-rotting fungal pathogens, like Pythium, Phytophthora, Thielaviopsis, and Rhizoctonia; 2) viruses such as Tobacco Mosaic (TMV) and Tomato Mosaic (ToMV) that are spread by mechanical means; and 3) bacteria such as Xanthomonas (Xhp, Xap) and Ralstonia (Rs) which are spread by moisture and mechanical means. Preventing TMV and ToMV on solanaceous crops, such as petunia and calibrachoa, is critical and proper sanitation with appropriate disinfectant agents is key. A listing of specific sanitation controls can be acquired from any vegetative annual supplier.

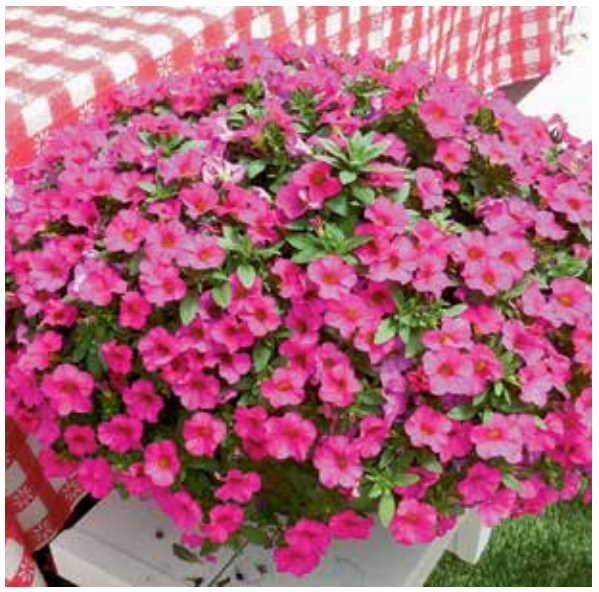
Sticking. Table 1 shows a priority listing of species. Some of the most time-sensitive materials that should be stuck immediately are lantana, ipomoea, euphorbia, heliotrope and zonal geraniums. Most other species, unless they look very dehydrated or weak, can be stuck after these higher priority species. When sticking the cuttings, make sure the cutting label that comes with each bag of cuttings is placed in the propagation tray or strip. These labels contain stock farm information on where the cuttings were taken, the person who cut them, etc. Keeping these labels throughout the propagation process is especially critical when propagating these annuals.

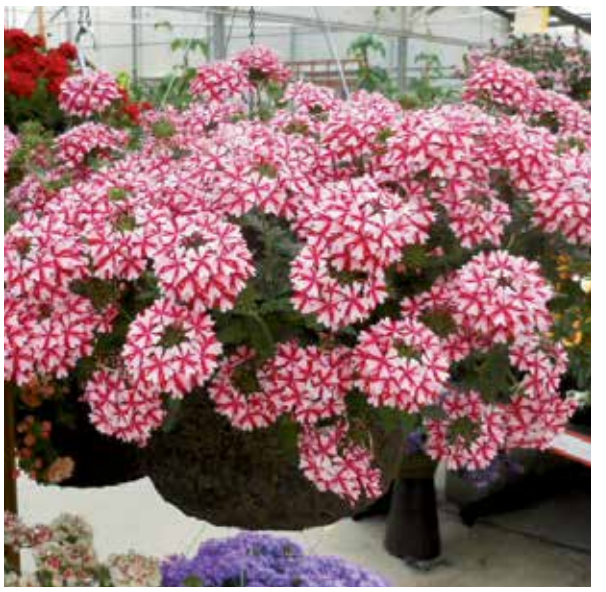
Misting. Applying correct mist levels comes with experience and knowledge of the species being propagated. Table 2 shows a listing of species and their relative rooting speed. Faster rooting species require fewer days of misting than slower rooting species and many times require lower mist volumes. Grouping varieties on the propagation bench by their rooting speed and mist requirements is an important key to success. Bringing in callused cuttings (i.e., Cutting Time species) for the slowest rooting species can help streamline propagation and reduce the need for multiple misting zones.

CROP SPECIFIC FINISHING TIPS

Calibrachoa

- Plants can be grown cool at 55° F average daily temperature (ADT) to help control





Left to right: 'Callie Rose' calibrachoa, 'Techno Heat Upright' lobelia and 'Lanai Candy Cane' verbena, all grown with proper PGR, light and fertility.

growth and improve plant habit. Make sure plants have a good root system before dropping temperatures. Preventative fungicide drenches are highly recommended on this crop.

- Calibrachoa are long-day plants that generally need at least 12 hours of day length to flower. Newer breeding and product lines, however, are being selected for shorter photoperiod flowering responses. Understanding specific photoperiod requirements will help in scheduling these crops.
- Pinch the crop (usually in propagation) to encourage branching. A second pinch can be given for large containers and baskets. Use good sanitation when pinching. Florel (350-500 ppm) or Florel + B-Nine (2,500 ppm) sprays can be used on baskets and longer-term crops early on to improve branching.
- B-Nine (2,500 ppm) or Sumagic (10-20 ppm) sprays work well to control growth. Applying a Bonzi drench at 2-3 ppm about three to four weeks before sale will produce mounding, full plants without significantly affecting flower size or delaying flowering.
- Watch for aphids and scout the plants regularly.
- Keep the pH in the mid-5 range and watch for iron deficiency. Drench with iron chelates (Sprint 330 or 138 at 2-4 oz/100 gal) if needed.
- Calibrachoa are one of the best plants for containers and baskets. Their long-term summer show and range of colors is unmatched. Watch for budworms, which can be a problem in certain areas of North America.

Table 2. Rooting Speed – Vegetative URCs

URC Relative Rooting Speed – 84-105 Size Tray
H = Rooting Hormone Beneficial/Recommended
(F) Fast = 3 Weeks (Sometimes Less), (M) Medium = 3.5-4 Weeks, (S) Slow = 4.5-5 Weeks

Species	H	Speed	Species	H	Speed	Species	H	Speed
Ageratum		F	Euphorbia		M	Snapdragons		M
Aster		F	Gaillardia		M	Torenia		M
Bacopa sutera		F	Geranium Exotic		M			
Bidens		F	Geranium Interspecific		M	Dorotheanthus		M-S
Chrysanthemum		F	Calliope		M	Gaura	H	M-S
Coleus		F	Caliente		M	Osteospermum	H	M-S
Impatiens - Double		F	Caliente (dark leaf)	H	M-S	Sanvitalia		M-S
Impatiens - Trailing		F	Geranium Zonal		M	Vinca		M-S
New Guinea Impatiens		F	Americana		M			
Petunia		F	Rocky Mountain		M	Anagalis	H	S
Verbena		F	Classic		M	Bracteantha	H	S
			Tango		M	Calibrachoa	H	S
Achillea		M	Ipomoea		M	Dipladenia	H	S
Angelonia		M	Lobelia		M	Geranium Ivy	H	S
Argyranthemum		M	Lysimachia		M	Goodenia	H	S
Asteriscus		M	Nemesia		M	Helichrysum	H	S
Centradenia		M	Penstemon		M	Heliotrope	H	S
Coreopsis		M	Salvia farinacea		M	Lantana	H	S
Cuphea		M	Salvia hybrida		M	Lavendula (very slow)	H	S
Dahlia	H	M	Salvia patens		M	Penta	H	S
Diascia		M				Scaevola	H	S

Lantana

- Lantana needs warm temperature (greater than 70° F ADT) and high light intensity for quality.
- An early pinch is recommended for lantana, either late in propagation or shortly after transplant. Early Florel (350-500 ppm) or Florel + B-Nine (2,500 ppm) sprays can be used on longer-term crops to maintain compactness, improve branching, and delay unwanted early flowering. Experiment with adding Configure (100-150 ppm) to the Florel + B-Nine combo spray for the "trifecta" growth regulation effect on vigorous, trailing lantana types on the market. Know the varieties — many genetics (Bandana and Bandito, for example) are more mounding and compact and need little growth regulation.
- Several plant growth regulators (PGRs) work on lantana including B-Nine (2,500 ppm) + Cycocel (1,000 ppm), Bonzi (15-30 ppm) or Sumagic (10-20 ppm) sprays. Bonzi

drenches work very well at 2-4 ppm three to five weeks before sale to control growth.
- Watch for whiteflies on this crop.
- Lantana are a popular summer crop in the south where consumers are looking for plants that can withstand the extreme heat. Lantanas also attract butterflies, which is a plus for many gardeners. Keep plants fertilized and well-irrigated to prevent flower cycling.

Lobelia

- Make sure you have well-rooted liners before transplanting into baskets and large containers. Weak plugs can sit there and are susceptible to root rot.
- Bright, long days help bring lobelia into bloom quicker, especially on varieties sensitive to photoperiod. Talk to your supplier to find out the best varieties to grow for early sales and holidays.
- Most lobelia do best with at least one pinch. If pinched more than once, PGRs are not needed on many varieties. Use good sanitation when pinching — lobelias are very susceptible to virus spread.
- B-Nine at 1,500-2,500 ppm can be used if needed to keep plants more compact. Bonzi drenches at 0.5-1.0 ppm also work well to control growth.
- Scout for thrips regularly since they can transmit viruses (i.e., Impatiens Necrotic Spot Virus [INSV]) to lobelia.
- Lobelia can be one of the most eye-catching crops in the greenhouse because of their rich blue color and carpet of flowers. With the new "heat" types on the market, lobelia are better able to withstand summer heat.

New Guinea Impatiens

- Not a difficult crop to grow if moderate temperatures (65 68° F ADT) are maintained in the greenhouse. Watch for reduced flower size and quality when temperatures get extremely warm, especially in southern areas. Keep fertility levels on the low end for this species and use high quality irrigation water.
- No pinching is needed. Florel at 200-300 ppm can be used early (even in propagation) to help reduce early flower bud development and to delay flowering (for larger containers).
- Variety selection is important. Use compact, early flowering varieties for small containers and pot-to-pot growing. Use medium and vigorous varieties for baskets and larger containers. With proper variety selection little PGR should be needed.

- Scout regularly for spider mites and thrips and treat accordingly. Be on the lookout for INSV if large populations of thrips are in the greenhouse.
- New Guinea impatiens continue to be popular with consumers because of their large, colorful flowers and contrasting foliage. They do best in afternoon shade areas and where night temperatures stay in the 60s (F).

Always read and follow label instructions. Some products may not be registered for sale or use in all states or counties.

Petunia

- Petunia can be grown cool in early spring to save fuel. Outdoor production is common in many parts of North America. Later spring crops can be grown warmer and kept in check using PGRs. Most petunias are photoperiodic and flower best under long days. However, check with your supplier for photoperiod requirements — many varieties are essentially day neutral.
- Most petunia need to be pinched shortly after transplant to encourage branching, although this is not required on some compact types. Large containers and baskets may be given a second pinch to shape the plant or to control growth. Use good sanitation when pinching — petunias are highly susceptible to virus spread by mechanical means.
- Scout regularly for thrips and INSV.
- Petunia are responsive to several PGRs including B-Nine (2,500-3,500 ppm) and Sumagic (20-30 ppm). Florel (350-500 ppm) or Florel + B-Nine (2,500 ppm) sprays can be used on baskets and longer-term crops to improve branching and will slightly delay flowering. Great-looking, mounding plants are produced by using mid- to late-season Bonzi drenches at 2-4 ppm, the actual rate depending on the vigor and time of the year.
- Like calibrachoa, keep the pH in the mid 5s, watch for iron deficiency, and drench with iron chelates if needed.
- It's hard to beat vegetative trailing petunia for superb color and outstanding summer performance. Vigorous large-flowering varieties are excellent for landscape beds, while small-flowering, less-vigorous types are best used in baskets and combos. Watch for budworms in certain areas of North America.

Scaevola

- Scaevola are best grown with moderate to warm temperatures and high light intensity. They tend to be slow starters so growing too cool early on can lead to purple foliage and long crop times.
- Like many vegetative annuals, plants should be pinched in propagation. A second pinch can be given after transplant for baskets and large containers. Be careful with Florel or Florel + B-Nine sprays on this crop since these can result in significant flower delay and small flowers, respectively.
- Bonzi (15-30 ppm) or Sumagic (5-10 ppm) sprays work best if plants need to be controlled early to mid-season. Bonzi drenches (0.5-1.0 ppm) can also be used to control growth and are good options for mid- and late-season control.
- Scaevola have exceptional outdoor performance, heat tolerance and are generally pest free. They really shine in hot summer climates.

Table 3. Cold Temperature Tolerance by Species

28–29 °F	30–33 °F	34–36 °F	37–45 °F	>45 °F
Calibrachoa	Achillea	Bacopa	Ageratum	Impatiens
Coreopsis	Anagalis	Geraniums - Zonal, Ivy, Hybrid	Angelonia	Ipomoea
Gaillardia	Bidens	Salvia - Patens	Coleus	Heliotrope
Gaura	Argyranthemum	Lobelia	Cuphea	Lantana
Helichrysum	Asteriscus	Scaevola	Dahlia	New Guinea Impatiens
Lavender	Bracteantha		Euphorbia	
Petunia	Diascia		Torenia	
Verbena - Magalana	Dorotheanthus		Dipladenia	
	Nemesia		Centradenia	
	Osteo			
	Penstemon - Phoenix			
	Salvia - Farinaceae, Hybrida			
	Sanvitalia			
	Snapdragons			
	Verbena - Lanai			

Verbena

- Most verbena are fast growers and can be grown under a wide range of temperatures.
- Verbena should be given at least one pinch (ideally during propagation). Vigorous trailing varieties can be given an additional pinch to maximize branching and help keep plants under control. Florel (350-500 ppm) or Florel + B-Nine (2,500 ppm) sprays can be used early on for longer term crops to maintain compactness and improve branching. (Verbenas are the "poster child" for Florel + B-Nine combo sprays.) As with lantana, experiment with adding in Configure (100-150 ppm) to this combo spray above for the trifecta growth regulation effect on vigorous varieties.
- Know the varieties since some are compact and upright. B-Nine (2,500 ppm) or Sumagic (10-20 ppm) sprays are commonly used to control growth. As discussed earlier, Bonzi drenches at 2-3 ppm work great about three to four weeks before sale to produce that desirable full, mounding habit.
- Although not as susceptible as calibrachoa or petunia, verbena can suffer from iron deficiency. Keep the pH below 6.0 and drench with iron chelates as needed.
- Verbena can be attacked by several insects, including thrips, aphids and whiteflies. Powdery mildew can be a problem in both cool and warm wet climates, although susceptibility varies between varieties.
- Verbena are a mainstay of vegetative spring annual production. They work well for gardeners in a wide range of applications, including baskets, upright containers and landscape beds. Keep plants well fertilized and consistently irrigated to prevent flower cycling in the landscape.

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Harvey Lang is customer solutions lead for Syngenta Flowers Home & Garden. He can be reached at harvey.lang@syngenta.com.