



SAKATA®

Lisianthus Cut Flower
Production Tutorial

Specialty Cut Flowers Products / Diversity



- Specialty cut flower of diverse species offers unique products and opportunities.
- More risk but also more profit.
- The market is looking for a greater variety of genera.

SYLLABUS



1. **Lisianthus a commercial opportunity**
2. Natural habitat
3. Young Plant Production
3. Bed preparation
4. Plug transplanting
5. Watering
6. General cultural aspects
7. Key points and diseases
8. Finishing Strategies and postharvest
9. Lisianthus Voyage Series

Lisianthus: A Native American

Eustoma grandiflorum



Mariachi Series

- Lisianthus flowers offer a simple beauty with great sophistication!
- Highly popular due to its long vase life (2-3 weeks), great variety of colors (including blue), and unique flower forms.

Lisianthus Variety Selection



Lisianthus characteristics

Flowering Season	Group 1	Group 2	Group 3
Summer	Good	Best	Good
Fall	No	Maybe*	Best
Winter	Best	Maybe*	No
Spring	Best	Maybe*	No

**depends on the weather so risky*

Lisianthus classification

- Flower petal; Single / Double
- Flower size; Large / Small
- Flower shape; Rose / Camellia etc.
- Flower colors; Pink, Blue, White etc.
- Branch type; Standard / Spray
- Earliness; Group 1 - 3

- Let's check the table of classification!

Lisianthus classification

Series	Flower Petal	Flower size	Flower shape / Branch type	Earliness Group
Echo	Double	Large	Standard / Standard	1
Mariachi	Double	Large	Camellia / Standard	2
Mariachi Grande	Double	Large	Camellia / Standard	3
Voyage 2	Double	Large	Fringed / Standard	2
Excalibur	Double	Medium	Standard / Standard	2
Rosita 1	Double	Medium	Rose shape / Spray	1
Rosita 2	Double	Medium	Rose shape / Spray	2
Rosita 3	Double	Medium	Rose shape / Spray	3
Rosanne 1	Double	Medium	Semi-fringed / Standard	1
Rosanne 2	Double	Medium	Semi-fringed / Standard	2
Wonderous	Single	Medium	Semi-fringed / Standard	1
Doublini	Double	Small	Rose shape / Spray	1

LISIANTHUS | SEED

Series Summary

Echo

F1 EUSTOMA GRANDIFLORUM | 

- Group 1/Standard Double Flower
- 7 vibrant colors
- The world's first 100% all double, large-flowered Lisianthus
- Plants are strong and easily support the large flowers



LISIANTHUS | SEED

Series Summary

Mariachi

F1 EUSTOMA GRANDIFLORUM |



shutterstock.com · 1125570389

- Group 2/Standard Double Flower
- Extra-double, large camelia-like bloom in 10 colors
- 2 – 2.75 inch rose-shaped flowers with thick petals
- Mariachi Grande White is Group 3



LISIANTHUS | SEED

Series Summary

Voyage 2

F1 EUSTOMA GRANDIFLORUM | 

- Large, fringed, gorgeous flowers
- Strong petals withstand the rigors of shipping!
- Great, top-flowering habit
- Available in 8 unique, sought-after colors!



Voyage White

Lisianthus | Seed

New Series!

Voyage 2



Deep Rose

It's in our nature.

LISIANTHUS | SEED

New Series!

Voyage 2



Champagne



Blue



Green



Light Apricot



Pink



White



Yellow

LISIANTHUS | SEED

At-a-Glance

Voyage 2

MINIMUM GERM: 85%
SEED FORM: Pelleted
CROP TIME: Spring to
Mid-Summer
22 – 24 Weeks
STEM LENGTH: 24 – 36"
SPACING: 4 x 6"
COLORS / MIXES: 8 / 0



Voyage Pink

Lisianthus | Seed

3 New Colors!

Rosita® 3

Green
Lavender
Red



It's in our nature.

Lisianthus | Seed

2 Improved Colors!

Rosita[®] 3

Blue Improved
Pink Improved



It's in our nature.

Series Summary

Rosita® 3

LISIANTHUS | CUT FLOWERS

- Group 3 / Spray Double Flowers
- Thick petals, top flowering and strong stems—easy transport
- Excellent vase life with abundant usable buds



It's in our nature.

LISIANTHUS | SEED

New & Improved Colors!
Rosita 2

Loaded with beautiful
rose-shaped flowers



LISIANTHUS | SEED

New & Improved Colors!

Rosita 2

Green Improved
Blue Flash
Pink Flash
Sapphire



Green Improved

LISIANTHUS | SEED

Rosita 2



Blue Splash



Pink Splash



Sapphire

LISIANTHUS | SEED

Series Summary

Rosita 2

F1 EUSTOMA GRANDIFLORUM | 

- Group 2/Spray Double Flower
- Suitable for spring and early summer flowering
- Loaded with more usable buds and medium-sized, rose-shaped flowers
- Thick petals, top flowering and strong stems make for easy transport without botrytis problems
- Now includes thirteen colors



At-a-Glance Rosita 2

MINIMUM GERM: 80%
SEED FORM: Pelleted
CROP TIME: Spring to Mid-Summer
22 – 24 Weeks
STEM LENGTH: 36 – 48"
SPACING: 4 x 6"
COLORS / MIXES: 13 / 0



Apricot



Blue



Blue Flash



Blue Picotee



Green



Hot Lips



Purple



Sapphire



White



Yellow



Jade



Pink



Pink Flash

Series Summary
Rosita 1

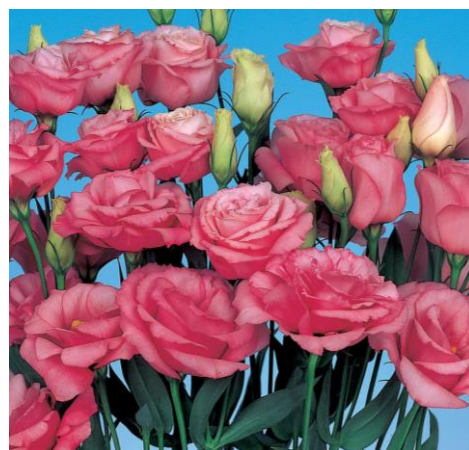
F1 EUSTOMA GRANDIFLORUM | 

- Group 1/Spray Double Flower
- Suitable for winter to spring flowering
- Loaded with more usable buds and medium-sized, rose-shaped flowers
- Thick petals, top flowering and strong stems make for easy transport without botrytis problems
- Now includes thirteen colors

LISIANTHUS | SEED

At-a-Glance Rosita 1

MINIMUM GERM: 80%
SEED FORM: Pelleted
CROP TIME: Winter to Spring
22 – 24 Weeks
STEM LENGTH: 36 – 48"
SPACING: 4 x 6"
COLORS / MIXES: 4 / 0



LISIANTHUS | SEED

Series Summary

Doublini

F1 EUSTOMA GRANDIFLORUM | 

- Group 1/Spray Double Flower
- 1.5-2 inch / 3-4 cm extra small, rose-shaped flowers—new concept!
- Eye-catching element in flower bouquets
- Numerous branches per stem



LISIANTHUS | SEED

At-a-Glance

Doublini

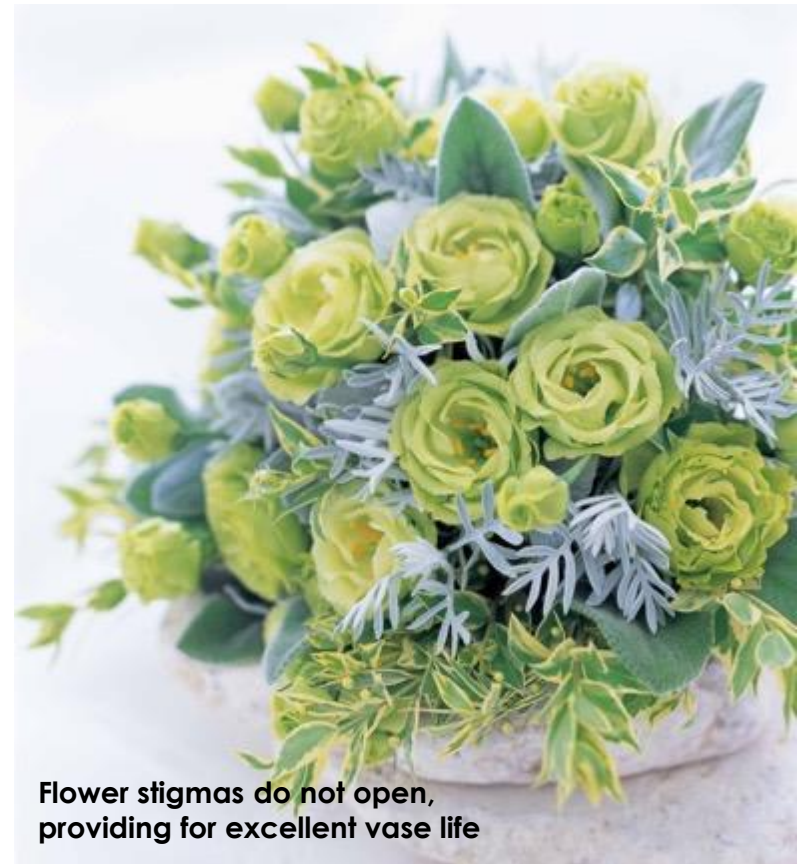
MINIMUM GERM: 80%
SEED FORM: Pelleted
CROP TIME: Spring to Mid-Summer
22 – 24 Weeks
STEM LENGTH: 26 – 34"
SPACING: 4 x 6"
COLORS / MIXES: 3 / 0



Rosanne I

F1 LISIANTHUS GRANDIFLORUM | ©

- Group 1 / Standard Double
- Unique colors and patterns with more usable buds
- Thick flower petals reduce botrytis problems and hold up well in shipping



Flower stigmas do not open,
providing for excellent vase life

Rosanne I Black Pearl

A totally unique purple color—
there is nothing
like it on
the market!



Black Pearl

Rosanne I

MINIMUM GERM: 85%
SEED FORM: Pelleted
CROP TIME: Spring to Mid-Summer 22 – 24 Weeks
STEM LENGTH: 36 – 48"
SPACING: 4 x 6
COLORS / MIXES: 3 / 0



Rosanne II

MINIMUM GERM:	85%
SEED FORM:	Pelleted
CROP TIME:	Spring to Mid-Summer 22 – 24 Weeks
STEM LENGTH:	36 – 48"
SPACING:	4 x 6
COLORS / MIXES:	1 / 0

Rosanne II

F1 LISIANTHUS GRANDIFLORUM | **C**

- Group 2 / Standard Double
- Strong flowers hold up in shipping
- Long vase life

B = Bedding **C** = Cut Flower **P** = Potted Crop



Deep Brown

Rosanne II Deep Brown

New **Deep Brown** is a trendy lavender brown color that adds a unique element to floral arrangements

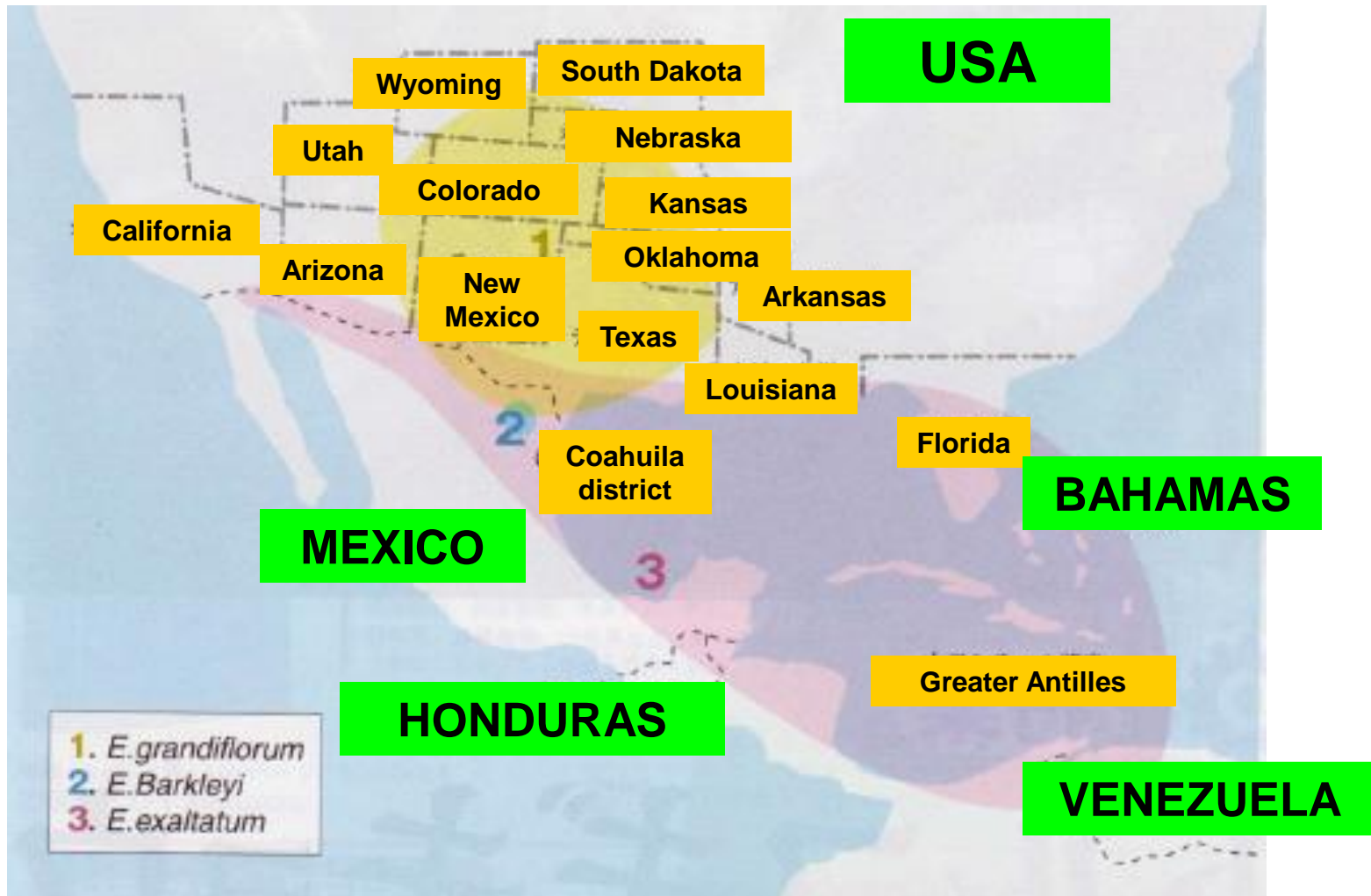


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Habitat Natural



Native Habitat

- Native to northern Mexico, Texas and Colorado, grows in dry climate near water. Soil surface is dry but the roots have access to water below the surface.



Native Habitat



Native Habitat

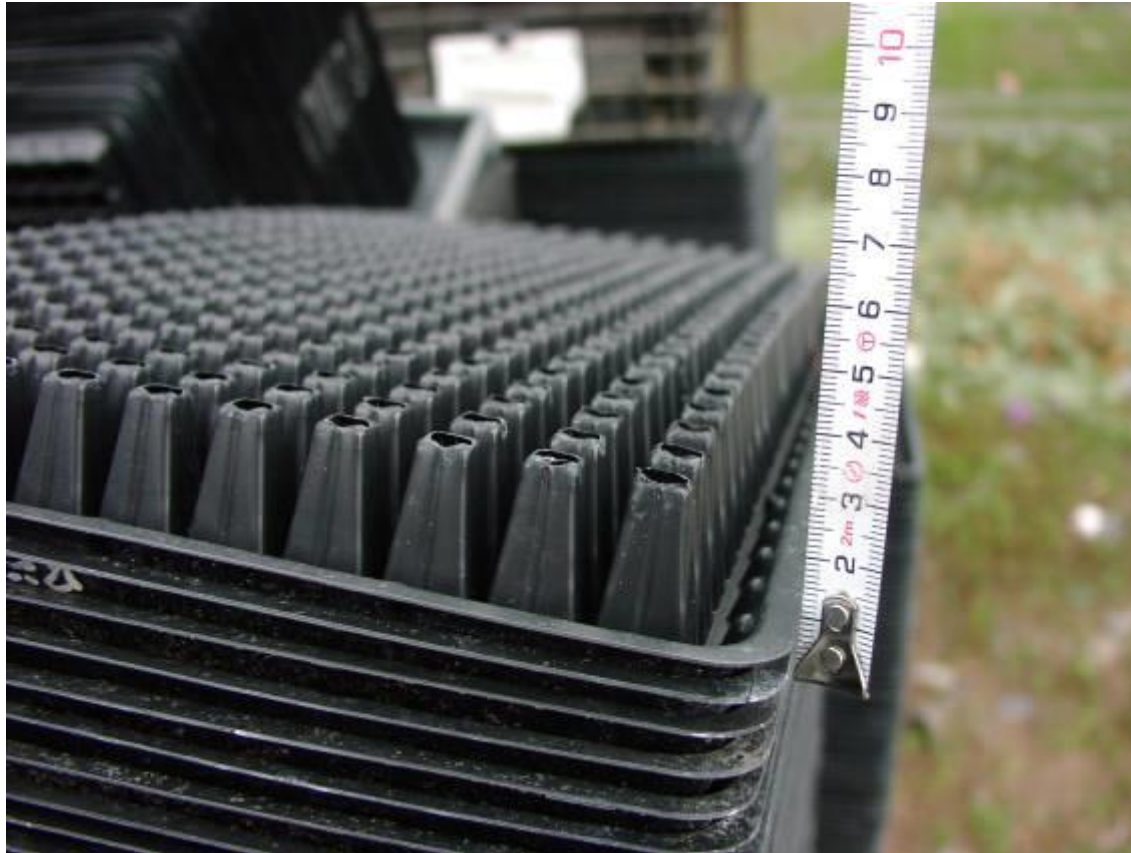


SYLLABUS



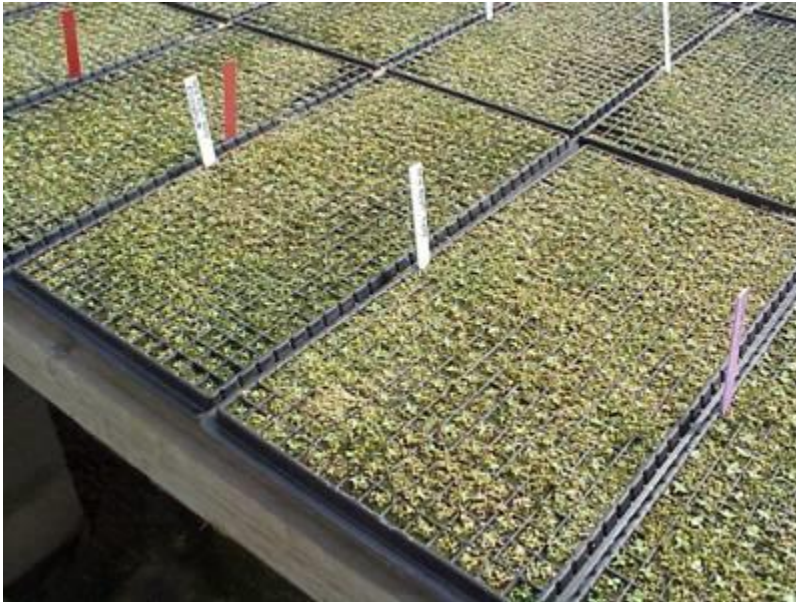
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Stage One: Days 1-14



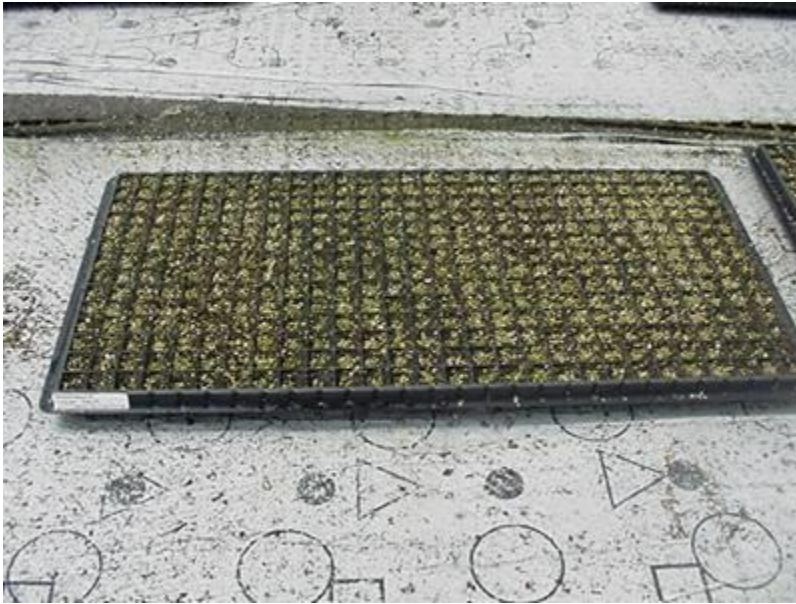
- The deeper, the better regarding the plug hole due to the tap roots.

Stage One: Days 1-14



- Ideal cell size 392.
- Sow pelleted seed into a well drained media high in organic matter and lightly cover, if necessary, to maintain sufficient moisture.
- Provide sufficient moisture to break the pellet.
- pH 6.0-6.5
- Optimum temperature is 68-71°F/20-21°C.

Stage One: Days 1-14



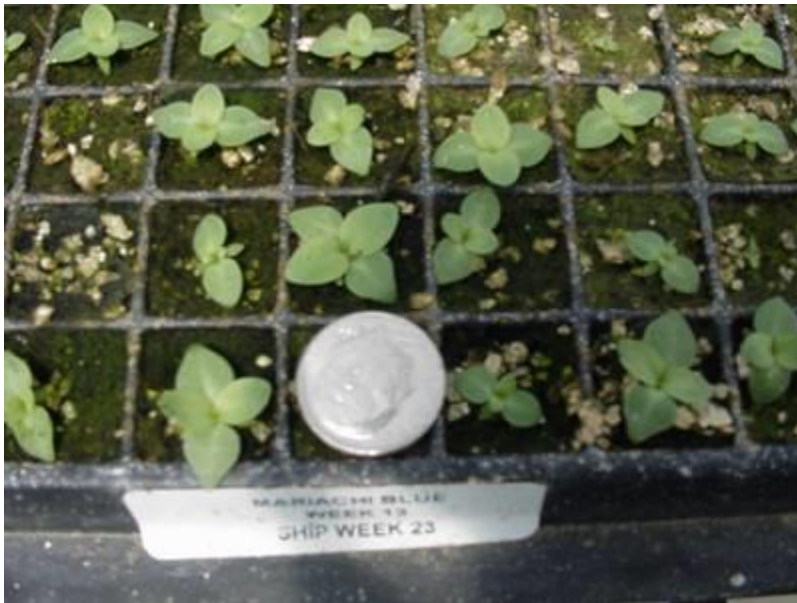
- Lisianthus seed requires light to germinate (up to 2,500 foot candles / 27,000 lux).
- If using a germination chamber, provide a minimum of 100-300 foot candles.
- Capillary watering mimics the native habitat and provides uniform moisture and uniform germination.

Stage Two: Days 15-21



- After germination is complete, place plugs in a greenhouse with high light (2,500-3,000 foot candles / 27,000-32,000 lux), good air circulation and a temperature between 60-68°F/ 15-20°C.
- Fertilize lightly with 100-150 ppm N from a well balanced Calcium Nitrate based formulation.

Stage Three: Days 22-56



- Lisianthus plugs grow slowly at first and it is necessary to avoid exposing the seedlings to stress.
- High or low temperatures during the first 30 days after germination is the main concern.
- Avoid temperatures over 75°F/ 24°C and under 45°F/7°C.

Stage Three: Days 22-56



- Avoid stressing the plugs with low light levels and excessive dry conditions that also promote dormancy (rosette).
- Excessive moisture will invite disease.
- Feed with 150 ppm N to maintain EC levels at 0.7-1.0 mmhos (2:1 dilution).

Stage Three: Days 22-56



- The plugs are approaching the transplant stage.
- Provide the highest light possible within the optimum temperature range of 60-68°F/ 15-20°C.
- pH 6.0-6.5 and EC level between 0.7 and 1.0 mmhos.

Stage Four: Days 57-60



- Plugs have 2 pairs of leaves and are ready to be transplanted into cut flower beds.
- Delaying transplanting will result in poor rooting, delayed flowering and shorter flower stems.

Fusarium disease



- Fusarium is a soil borne disease. Use clean trays and soil.
- Never allow hose ends to touch the greenhouse floor.
- Only remedy is to discard infected seedlings.

Disease



- Fusarium infected plug showing the characteristic golden brown spores.

Rosetting - Plug Stage



Normal Leaf



Rosetted Plug
Boat-Shaped Leaf

Rosetting-Cut flower bed



- Induced dormancy (resting stage) often expresses itself after plugs are transplanted into cut flower beds.
- Induced by stress conditions.
- Nature's way to ensure the survival of the species.

Temperature influence on rosetting following germination

Trial #	Weeks	Flamenco Purple	Piccolo 1 Yellow
1	1-4 at 68°F	0 %	1 %
2	1-3 at 68°F; 4 at 82°F	4 %	2 %
3	1 & 2 at 68°F; 3 at 82°F 4 at 68 °F	5 %	1 %
4	1 at 68°F; 2 at 82°F 3 & 4 at 68°	3 %	2 %
5	1 at 82°F; 2-4 at 68°F	50 %	28 %
6	1 & 2 at 68°F; 3 & 4 at 82°F	7 %	0 %
7	1 & 4 at 68°F; 2 & 3 at 82°F	3 %	4 %
8	1 & 2 at 82°F; 3 & 4 at 68°F	44 %	37 %
9	1 at 68°F; 2-4 at 82°F	10 %	7 %
10	1-3 at 82°F; 4 at 68°F	60 %	35 %
11	1-4 at 82°F	40 %	40%

Transplant actively growing plugs!



- Avoid planting over grown plugs.
- Transplanting at the 4th true leaf stage is best; especially under long day conditions.
- Optimum plugs have straight roots ready to form a deep tap root system.

Root bound plugs



- Older plugs that are root bound or checked have a more difficult transition from the plug tray to the cut flower bed.
- Older plugs flower later on shorter stems.

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Bed Preparation



- Cut flower beds should be high in organic matter and free of pathogens.
- Cultivate to a depth of 18 inches (45 cm.).
- Optimum pH is 6.8 - 7.2 in order to supply adequate calcium levels.

Bed Preparation



- Preparation of the Lisianthus cut flower bed similar to one used to grow color callas, with high porosity (for example 50% rice hulls evenly mixed and a height of 1 foot), allows for good root development and thus makes cultivation easier, allows for the soil to dry and improves the flower quality.

Bed Preparation

Good drainage and aeration



In heavy soils (high clay content) that lacks organic matter and large pore spaces, it is necessary to raise the cut flower bed to improve drainage and increase aeration in order to optimize root development. Raising the bed increases the force of gravity for a more aerated soil.

Bed Preparation - sterilization



- Greenhouse beds that are steam sterilized between crops allow for successive Lisianthus production, but crop rotation is periodically recommended to lower disease pressure.
- The principle of crop rotation is important.

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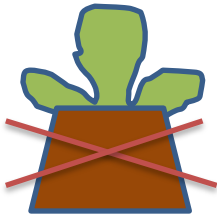


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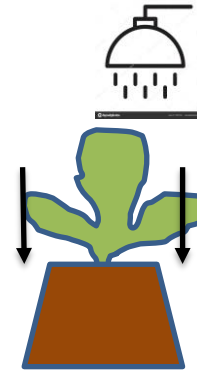
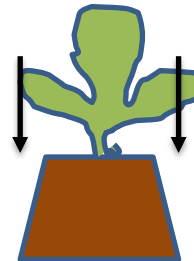
Receiving your plugs

Transplant at the “Surface” level

1. **TRASPLANT PROMPTLY:** When the plugs arrive, unpack and place away from heat, direct sun or extreme cold. Check the moisture level and water if necessary.
2. Keep in mind that the plants need to develop their roots in the best soil possible. Be sure among other things to:
 - ✓ Have a porous soil that does not easily compact (for example incorporate rice hulls up to 30-50% of the content)
 - ✓ Ensure a pathogen free soil. Disinfect the soil if needed.
 - ✓ Have a uniform soil structure. Check to see if there are rocks or parts that are “clumpy”
 - ✓ Check the pH and apply fertilizer at the start.
3. **DO NOT BURY THE NECK/STEMS:**
Possibly the most common error!



Transplant inappropriate



Transplant to ensure a good start; superficial, “a little outside”, with later watering to settle the plug

After receiving your plugs *Transplant at the “Surface” Level*



TRANSPLANT AT THE SURFACE (AVOID BURYING THE NECKS):

The “root ball” of the plug should **be seen** after transplanting.

- ❖ In no case “hill up” the plant. This slows plant development and quickly results in fungus infections on the stem.

Root bound plugs



- Older plugs that are root bound or checked have a more difficult transition from the plug tray to the cut flower bed.
- Older plugs flower later on shorter stems.

Plug Age Study

Aged plugs
flower later on
shorter stems



Transplant Spacing



- It is necessary to provide adequate distance for proper development.
- Plant density is determined by light intensity and quality. In general, space 8 plants per square foot (85 per square meter).
- Transplant plugs slightly high to avoid stem rot.

Cutflower bed design



- Placing the plants in two lines with a space between rows improves air circulation.
- Less problems with botrytis, which is the most common *Lisianthus* disease.

Soil temperature



- Soil temperature is critical to proper development.
- Maintain a minimum of 55°F/ 13°C and a maximum of 72°F/23°C.
- The use of black plastic for winter and reflective or white plastic in summer is an option in areas where soil temperatures are difficult to control.

Flower Support



- A minimum of two layers of netting is recommended to support the 3-4 foot (90-120 cm.) long stems.

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Culture After Planting



- Maintain high humidity for 10 days after transplanting and reduce light levels to minimize stress.

Watering practices



- Overhead watering with a hose and water breaker is recommended for the first two weeks following transplant.
- Automatic irrigation can be used once sufficient root penetration is present.
- Nevertheless, some growers prefer to use hand watering for the entire cultivation in order to space out the watering up to finish.

Irrigation lines



- It is best to bury irrigation tube to at least 4 inches. Imitates the native habit.
- A dry surface keeps away disease.
- pH: preferably alkaline at 6.8 to 7.2.

Cultivation Technology - 4 weeks from transplant



- Avoid keeping the soil continuously wet.
- Allow the soil to dry between watering or fertilizing.

Cultivation Technology - 8 weeks from transplant



- As the crop matures, reduce moisture to promote a deep and healthy root system.
- Plants with a strong root system are better able to withstand stress conditions.
- High salts (> 1.8 mmhos) delay flowering. Stop fertilizing 4 weeks prior to flowering.

Proper development



- Internodes should lengthen as the crop matures.
- This is a good indicator that the crop is being grown properly.

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Fertilization



- Maintain EC levels between 1.0 to 1.3 mmhos. (2:1 dilution).
- Calcium nitrate-based fertilizers suppress disease, especially fusarium, and promote strong healthy plants.

Flower Initiation



- The plants are sensitive to flower initiation when they have three pairs of leaves.
- In order to initiate flowers the night temperature must be above 61°F/16°C).
- Long days >14 hours greatly accelerates the crop cycle and hastens flowering.

Flower initiation delay



- In late spring and early fall growers struggle with adequate stem length.
- Treating plugs with short days (< 9 hours) or keeping the night temperature below 61°F/16°C during the seedling stage will delay pre-mature flower bud initiation.
- Good option for more advanced plugs (128 cell tray) grown for field transplanting.

Flowering response



Rosita Pink

- Lisianthus flowers in response to temperature, light quality and photoperiod.
- Temperature is the factor that most influences crop development.
- Long days (>14 hours), higher light quality and warmer temperatures all accelerate flowering.

Light levels



- High light intensity promotes high bud count and good flower development.
- Shade to increase stem length in areas with excessive light, if the roots have not lengthened.
- The use of long days (> 14 hours) accelerates the production cycle.

Day length Extension



- The use of long days accelerates the production cycle, concentrates the flowering window and reduces the harvest time; especially under short day conditions (< 12 hours).

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Poor root development (checked plugs)



- Failure to develop a healthy root system will cause tip burn or death when plants are subjected to high stress.

Healthy root development



- The key to success with Lisianthus is to establish a healthy root system.



Tip Burn



- Tip burn often occurs under stress conditions.
- Often seen in spring when high light follows a dark period with sudden temperature and humidity fluctuations.
- Often related to poor root development from delayed transplanting, overly wet or dry soil, high salt levels or diseases.

Rosetting-Cut flower bed



- Induced dormancy (resting stage with no internode stretching) often expresses itself after plugs are transplanted into cut flower beds.
- Induced by stress conditions (high temperature) in the plug stage.
- Nature's way to ensure the survival of the species.

Rosette – Cut flower bed



One of the biggest problems for Lisianthus growers.

Rosetting - Plug Stage



Normal plug



Rosetted plug that fails to sprout.

Calcium / boron deficiency



- Stunted plants with chlorotic leaves may signal low calcium/boron levels.
- A spray of CaBy (calcium sucrose and sodium borate) at 32 fluid ounces/100 gallons applied weekly will correct the problem as well as adjusting the fertilizer levels to supply sufficient levels of calcium and boron.

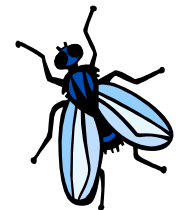
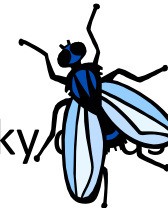
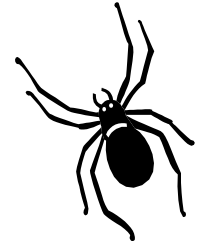
Flower Burn



- A combination of high light and temperature can scorch flower petals.
- Keep the temperature below 75°F/24°C and light levels below 3,500 foot candles / 37,000 lux.

Insects

- Thrips
 - Vectors of INSV, petal damage, scatter pollen.
- Worms
 - Cut worms watch lighting at night.
- Leaf Miners, White Fly
 - Watch for visible mines.
 - Use I.P.M., monitor with blue and yellow sticky traps.



Disease - *Fusarium*



Fusarium avenaceum

- *Fusarium avenaceum* (*Gibberella avenacea*) is a fungal pathogen that primarily attacks the crown and stems of lisianthus, but may also rot the taproot and large feeder roots near the soil line.
- The first above-ground symptom is a gradual loss of green coloration in leaves, which is followed by tan leaf flecks, browning of leaf veins and a tan discoloration of entire leaves. Wilting and a brown stem rot occur as the disease progresses, and infected plants rapidly die. Orange spore masses form on the bases of rotted stems and are diagnostically very important.
- Starting with healthy plugs, good sanitation, prompt removal of infected plants, steam sterilization and crop rotation all work together in minimizing this disease.

Disease - Fusarium



- A fungus that persists in the soil.
- The plants are more susceptible at the start (transplant) and at the end when they are beginning to flower.
- Never allow the end of the watering hose to touch the greenhouse floor.

Disease - Botrytis



- Excess moisture, cool temperatures and **lack of ventilation.**

Disease



Mildew

- Main cause is **lack of ventilation**, excess air humidity and excess fertilizer; especially high nitrogen.
- **Powdery Mildew** (*Sphaerotheca* sp.)
White to grey, talcum powder-like fungal spores appear mostly on the upper leaf surface. Control with Morestan/Forstan.
- **Downy Mildew** (*Peronospora* sp.)
White sporulation mostly appears on the underside of the leaf. More related to phytophthora so chemicals that treat phytophthora also are effective against downy mildew. Control with Maneb (Manzate ditahne M-22) and Amobcam.

Disease



- INSV (impatiens necrotic spot virus) is one of the most common viruses that affect Lisianthus.
- Symptoms include down turned tips, stunted growth, clustered terminal leaves. In advanced infections small brown spots appear on the terminal leaves.
- Once infected, there are no chemical controls.
- Control fungus gnats and rogue out infected plants to prevent and limit damage.

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Finishing Strategies



- As flower color begins to show reduce the light level* to prevent the loss of flower color.

*1,500 to 2,000 foot candles
16,000 – 22,000 lux

Finishing Strategies



Harvest when two or more flowers are open!



Post Harvest Care



- After cutting, place stems in tepid water (68°F/20°C) and place in a cool shady place for rehydration.
- Store in a refrigerator (39°F/4°C) and treat with floral preservative.
- The use of floral preservatives with sucrose after cutting increases vase life by 40-50% and promotes a deeper flower color for unopened flowers.

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Lisianthus Voyage Series Culture Tips



Lisianthus Voyage Series

Lisianthus Voyage series features a beautiful large double fringed flower. The double flower requires additional energy to produce, than other lisianthus.



Lisianthus Voyage Series

Providing optimum culture techniques will provide the full flower formation. Cultural conditions to avoid:

Rosetting - Tip burning - Abnormal flower shape

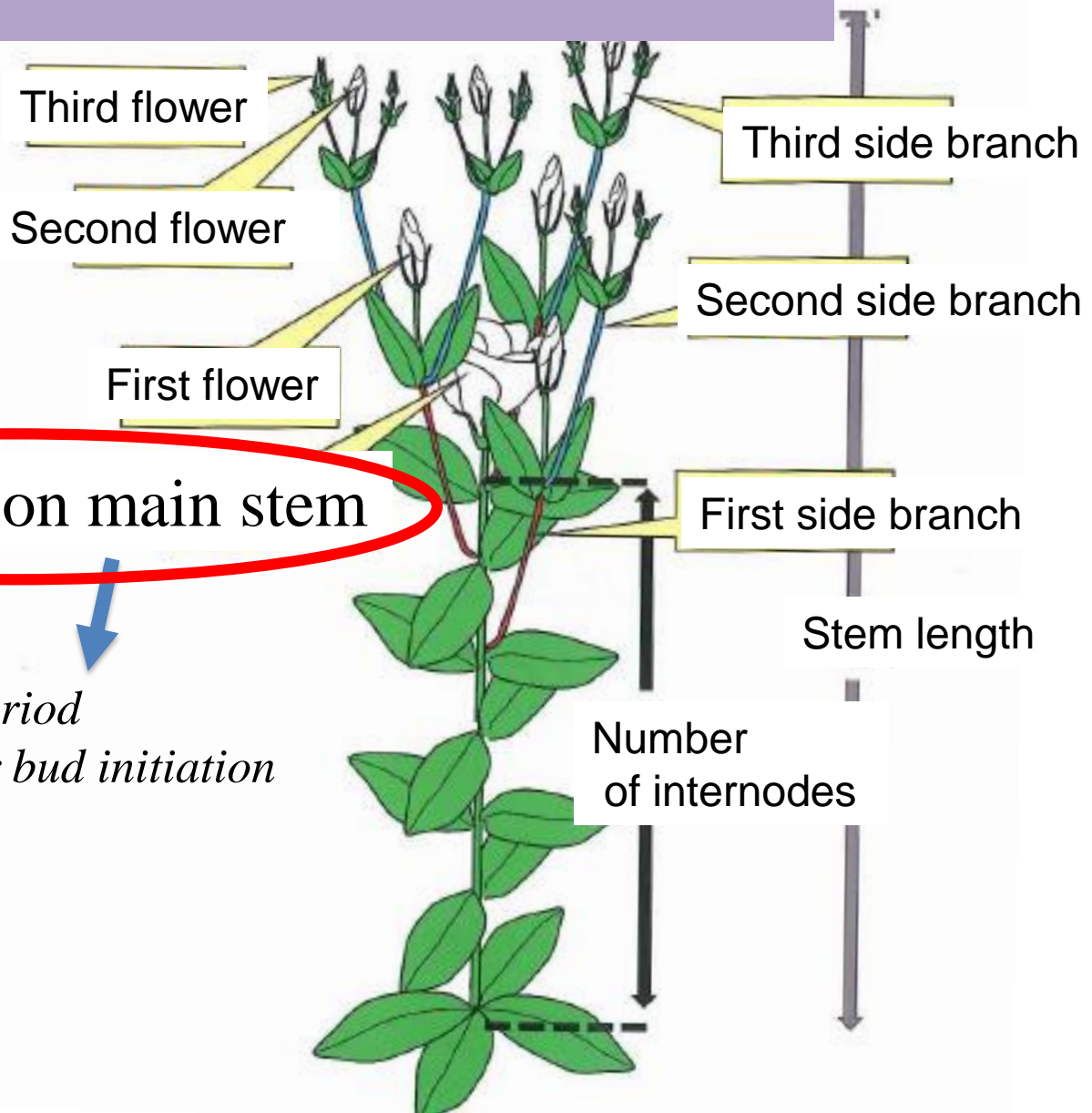


Lisianthus Voyage - Rosetting

- In general, rosetting occurs under extreme conditions:
 - *too warm*
 - *too cold*
 - *too dry*
- Warm mid-day temperatures, (higher than 90°F/30°C), that is not offset by a cool night temperature, (below 60°F/16°C), promotes rosetting.



Lisianthus Voyage Series



First flower on main stem

*For tip burning,
the most sensitive period
is during first flower bud initiation*

Lisianthus Voyage Series - Tip burning

- The most sensitive period is just before flower bud initiation on the main stem.
- At this developmental stage, plants begin absorbing more nutrients from the soil. This, combined with increased transpiration causes salt and moisture to accumulate on the leaf tips. making them more susceptible to burning; especially under conditions of warm temperatures, excess nitrogen and overly wet soil.
- Following cultural recommendations in this PowerPoint will help slow down rapid growth and improve calcium uptake.



Lisianthus Voyage Series - Abnormal flower shape

To produce flowers with fringed petals, maintain the night temperature below 60°F/16°C.

If the night temperature is greater than 73°F/23°C, flowers develop too quickly with lower petal count and fringe.



First flower on main stem with fringe grown under the recommended moderate temperature



First flower on main stem is less fringed grown under the higher temperature

Lisianthus Voyage Recommendations

The following slides summarize the key culture techniques to optimize Voyage 2 flower production.

- ❖ *Irrigation*
- ❖ *Temperature management*
- ❖ *Ventilation*
- ❖ *Fertilization*
- ❖ *Raised Beds*

Lisianthus Voyage Series -Irrigation Recommendation

In general, for cut flower production plants are irrigated frequently at transplanting. Lisianthus requires enough soil moisture before transplanting and plenty of water is required until stem elongation. Then, irrigation frequency is gradually reduced, (larger intervals between irrigations), as the flower buds begin to form.

For Voyage:

Before the first flower bud initiates on the main stem:



Longer interval of irrigation than regular varieties to avoid tip burning from over watering.

After several flowers buds have initiated:

Maintain a shorter interval of irrigation than for regular varieties to avoid malformed flowers from under watering.

Fully fringed large flower requires more water!

Lisianthus Voyage Series - Temperature Management

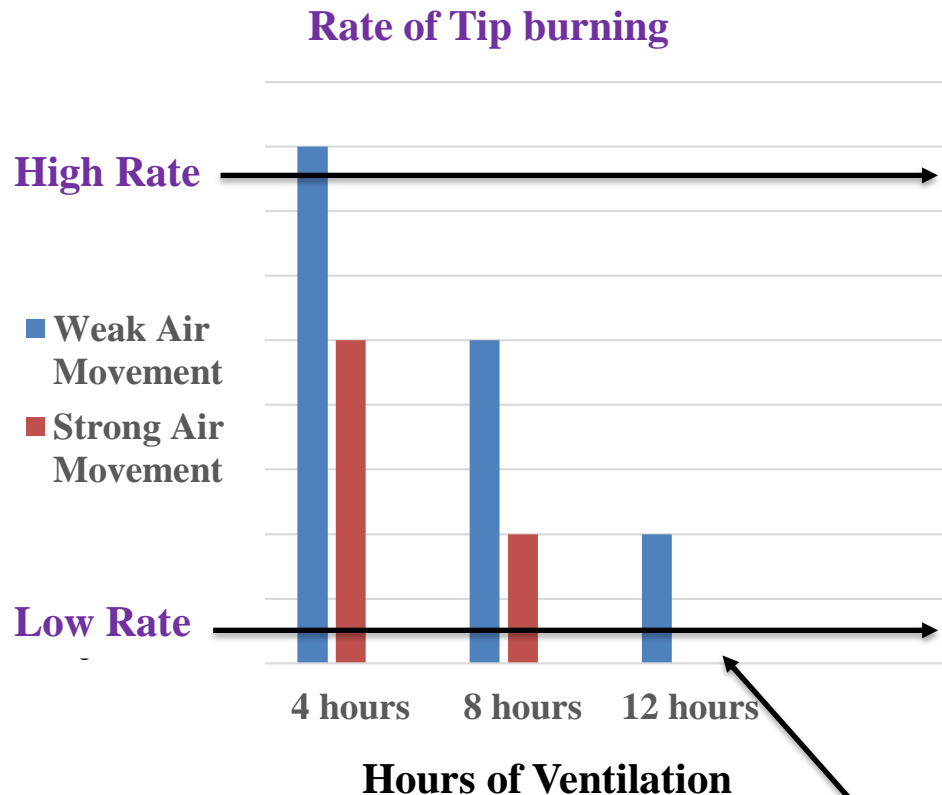
After transplanting:	Day time temperature	Night time temperature
Warm area *	Above 82°F/28°C 	Below 60°F/16°C
Cool area **	Above 82°F/28°C 	Below 50°F/10°C
* Warmer day temperature above 82°F/28°C increases opportunity for rosetting but can be offset by lower night temperature below 60°F/16°C		
** Cooler night temperature below 50°F/10°C also increases opportunity for rosetting but can be offset by higher day time temperature above 82°F/28°C		

Lisianthus Voyage Series - Temperature Management



Open the side vents when the temperature rises above 77°F/25°C to reduce the temperature.

Lisianthus Voyage Series - Ventilation operation



- Strong air movement / ventilation is effective in preventing tip-burning
- It helps to optimize transpiration.
- Ideally, supply strong ventilation at 3.3 – 6.5 feet/second (3-5 miles per hour) for 12 hours in the day time.

12 hours of strong air movement resulted in no tip burning.

Lisianthus Voyage - Ventilation operation



Large ventilation fans also help in reducing the day temperature

Lisianthus Voyage Series - Fertilization recommendation



- Cal/Mag fertilizers are best to promote strong growth. Avoid using ammonium nitrate, which promotes soft growth and makes the leaves more prone to tip burning.
- Target a moderate EC of 1.0 – 1.2 mmhos (2:1 dilution) to maximize calcium uptake and avoid soft growth.

Lisianthus Voyage Series - Fertilization recommendation

- To avoid tip burn, top dress with organic calcium at 700-1,400 ppm, (2cc per plant applied 7-8 times 2-3 days apart) to increase calcium leaf content.
- Foliar sprays of calcium chloride* at 325 – 350 ppm are also effective to increase calcium leaf content.

* *more details on the following slide*

Lisianthus Voyage:

Foliar Application of Calcium

1. Weekly applications should provide sufficient calcium for rapidly expanding tissue.
2. Test a few plants first as damage usually occurs in 3-4 days.
3. Use an approved spreader sticker.
4. Do not apply to open flowers or buds showing color.

Amount of Final Spray Solution	Calcium Chloride Dihydrate $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$	Calcium Chloride Anhydrous CaCl_2
	~ 27% Calcium	~ 39% Calcium
100 gallon	1 lb.	12 oz.
25 gallon	4 oz.	3 oz.
3 gallon	1/2 oz.	3/8 oz.
Approximate ppm calcium in final solution	324 ppm	357 ppm

Amount of Final Spray Solution	Calcium Chloride Dihydrate $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$	Calcium Chloride Anhydrous CaCl_2
	~ 27% Calcium	~ 39% Calcium
500 liters	600 grams	450 grams
100 liters	120 grams	90 grams
10 liters	12 grams	9 grams
Approximate ppm calcium in final solution	324 ppm	357 ppm

Lisianthus Voyage Series - Raised Beds



- In heavy soils (high clay content) that lack organic matter and large pore spaces, it is necessary to raise the level of the flower bed to improve drainage and aeration for optimum root development and calcium absorption/uptake.

Lisianthus Voyage Series: Avoiding Abnormal Flower Color and Formation

Normal flower



Voyage 2 Blue

Green center instead of blue



Normal flower



Voyage 2 Pink

Abnormal flower center formation



- **Voyage 2 Blue and Voyage 2 Pink** are bred for increased heat tolerance, which can keep fringed formation and higher petal count even under warmer growing conditions. In general, the number of petals is reduced under warmer condition. These 2 varieties perform well under the warmer condition. To maintain the full double flower, provide the following conditions:
 - Produce at 64-86°F/18-30°C with long days (greater than 12 hours).
 - Increase irrigation intervals after the flower bud initiation stage.

Lisianthus Voyage Success!

For further information
www.sakataornamentals.com

