



# Lisianthus Cut Flowers

## Cultural Information

[www.highsun.com.au](http://www.highsun.com.au) Ph: 1300 137 584 Fax: 1800 644 015

Available as Plugs & Seed

### Family:

Gentianaceae

### Genus:

Eustoma

### Species:

grandiflorum

### Common Names:

Lisianthus, Prairie Gentian, Texan Bluebell

### History:

Although it is found in desert areas, it is not a true desert plant. In its native habitat, Lisianthus is found growing along riverbeds and low areas where it always has access to fresh water. In mid summer, when the rain is less frequent, native Lisianthus plants push down deep roots into the soil to access fresh water. Therefore, the root system is the key to producing Lisianthus.

In the 1970's Japanese seed breeding companies first produced open pollinated varieties and in 1982 the first F1 varieties were released. Recently in 1996 the first 100% double variety was made available on the international market.

The popularity of Lisianthus as a cutflower worldwide has increased dramatically over the last decade. The American, European and Japanese markets have been dominated with the single varieties, unlike Australia where consumers demand the double flowered varieties as they resemble rose blooms and their vase life is longer than roses.

### The Growing Environment:

Lisianthus may be produced in open fields, in low-tech greenhouses that simply protect the plants from wind and rain or in climate-controlled greenhouses. For best results, grow Lisianthus with a minimum temperature above 15°C. Crop quality is greatest if the daytime high temperature is less than 25°C, although plants will tolerate much higher temperatures.

While open-field production is possible, most growers in moderate climates grow Lisianthus in open-sided greenhouses. These greenhouses provide protection from rainstorms that can devastate a crop in flower. Production in full sun can result in 60% shorter stems than the same varieties grown in greenhouses or in outdoor shade houses.

In regions that require heating, successful Lisianthus production requires both space heating and soil-surface heating. Attempting to produce cut flower Lisianthus with only one of the two methods will mean a guaranteed crop failure. Space heating heats the air around the crop and

can be done with forced air heaters or finned heating pipes suspended above the crop.

Soil-surface heating requires a hot water boiler system. The water should circulate over the surface of the beds in 2-cm tubes. Water temperature should be no higher than 40°C. Use a circulating pump that will provide a complete circuit of water in six minutes. Under cooler environmental conditions, ground bed-heating systems are recommended from April through September. Soil temperature should not drop below 15°C.

### Soil Conditions:

The pH should be neutral to mildly acid ( 6.5 - 7: water extract).

Moderate to high levels of organic matter are required. In Japan, for their high-density crops, a base fertiliser of an 8:3.5:6.5 compound fertiliser is applied at 5kg/100 square metres. Good levels of phosphorous and potassium are recommended for flower size and stem strength.

### Bed Preparation:

Bed preparation prior to planting is the most important part of Lisianthus production. First, test the soil. Lisianthus grows best with a pH between 6.3 and 7.0, higher than many other cut flower crops. Lisianthus also grows best with high calcium levels and adequate phosphorous. Adjust the pH and add calcium and phosphorous prior to planting. Generally, optimum pre-plant preparation includes spading and rototilling the ground beds at least once a year, prior to soil pasteurisation. Be sure bed preparation loosens any hardpan that forms below the planting bed.

Lisianthus is very susceptible to soil borne diseases. New ground beds may not require treatment, but beds known to be infected should be treated to eliminate disease. Growers report success with both steam sterilisation and methyl bromide. Biological control is also being tested. Some growers form beds prior to treatment, while others wait until after pasteurisation. Disinfect all equipment used in bed preparation or planting to prevent reintroducing diseases.

Once the ground beds have been pasteurised, drip irrigation, soil heating and support netting should be arranged. Highest quality stems are produced using two layers of support netting. Generally, netting with 15 cm x 15 cm or 15 cm x 20 cm spacing is used in cut flower Lisianthus production.

### Growing Systems and Scheduling:

With protected cropping, transplanting in June - October will give the best results. After establishment the plants may "sit" until the soil warms up when they will grow very quickly to flower in late November – December.

**Disclaimer:** "Significant variations in seed, variety and crop performance, in results and in crop outcomes may occur depending upon geographic location, climate, soil type, soil conditions, cultural and management practices and other growth and development factors. Any cultural and descriptive information or other advice, recommendation, information, assistance or service provided by Highsun Express is intended as a general guide only and should not be relied upon and is provided without liability or responsibility (including for negligence) on the part of Highsun Express. It is recommended that in all cases a small scale trial production is undertaken in order to test local conditions and circumstances that may affect the crop."



# Lisianthus Cut Flowers

## Cultural Information cont...

[www.highsun.com.au](http://www.highsun.com.au) Ph: 1300 137 584 Fax: 1800 644 015

Available as Plugs & Seed

Under field conditions transplanting when the weather warms appreciably is recommended. This produces the first flowers from November to January.

The crop should be treated as an annual although it can be a short lived perennial.

If transplanted in December - January a first cut can be taken in the autumn and the plants cut to 3 nodes above the ground and covered with straw to over winter. The Spring cut could then be taken at the earliest and would probably be in September - October depending on soil temperatures. The cost of over wintering and a noted drop in quality in Australian conditions could rule this option out.

### Transplanting:

Transplant seedlings when they are young and actively growing, (around the 4th-6th true leaf stage) in order to avoid stem rot, take care not to bury the plants too deep. Setting the plugs a little "high" in the flower bed will help to guard against rhizoctonia. To ensure a healthy start, maintain high relative humidity for 10 days after transplanting and do not let the soil dry out.

### Watering:

Lisianthus irrigation requires careful attention. Excessive irrigation increases plant susceptibility to soil-borne fungal pathogens. On the other hand, drought stress can cause premature flower initiation resulting in short, weak stems. Generally, the lower the light and temperature, the less water the plants require.

Most growers establish the crop with overhead irrigation, then switch to drip irrigation after roots are established in the beds. Lisianthus also responds positively to overhead irrigation during periods of high heat and light. Increasing humidity in the greenhouse with an early afternoon overhead irrigation can increase stem length in regions with high heat and light. Avoid high humidity and overhead irrigation after buds have formed however, since botrytis can develop.

### Spacing:

Ideal plant density is a function of available light. Outdoor light that averages above 65,000 lux at midday is considered high light; between 32,000 to 65,000 lux is moderate and less than 32,000 lux is low light intensity. Typical planting density for singles is 84 plants/m<sup>2</sup>, plant doubles at 64 plants/m<sup>2</sup>.

Non-pelleted Lisianthus seeds are very small (19,000 seeds per gram), and seedling growth is slow. For these reasons, most Lisianthus growers purchase plug seedlings from a specialist propagator. To ensure supply, contact

Highsun Express Plugs well in advance of scheduled planting date—usually four to five months.

Transplant the seedlings before they become root-bound. Any growth restriction in the seedling stage will result in decreased stem quality of the mature plant. Do not damage roots during transplanting. Damaged roots can result in poor growth, delayed maturity or even plants that fail to grow. Seedlings planted more deeply than they were growing in the plug tray are prone to disease.

### Lighting:

Lisianthus growth, crop time and flower quality are affected by light intensity and daylength; response varies per variety. Highest plant quality results from plants grown with the maximum amount of light. In regions with low light intensity, supplemental high-intensity lighting may be necessary to produce a quality crop.

Lisianthus growers debate the effect of daylength modification. Those who have experimented with it feel that under low light conditions, supplemental lighting encourages stem elongation and flower initiation. Growers report that solid set or cyclic lighting, day extension or night interruption have all resulted in high quality Lisianthus. In general, growers have experienced good results with 16-hour daylengths. Dutch growers use HID lighting, while growers in California have had success using one row of 150-watt incandescent lights spaced 3m apart for each 4.5m wide greenhouse section.

### Fertility:

Lisianthus grows best with high fertility levels in the soil. Some growers broadcast a 3 month slow-release fertiliser over the soil surface immediately after transplant. Other growers begin liquid fertilisation immediately following transplant. In general, nitrogen should be predominantly in the nitrate form; potassium should be equal to nitrogen. Feed with liquid fertiliser at 200 ppm N and K at every irrigation or every other irrigation. Use supplemental calcium during production unless the soil has a high calcium content; calcium nitrate may be used as one component of the fertiliser solution to provide calcium.

### Flowering:

During periods of high light and warm temperatures, a light shade on the greenhouse roof is recommended to avoid fading the flowers. Stems are usually harvested when one or more flowers are open. There is a longer period of time between the opening of the first and second flower than from the opening of the second and third flower. Therefore, some growers remove the first flower and sell it for small bud vases and then harvest the stems when the second and third flowers open.

**Disclaimer:** "Significant variations in seed, variety and crop performance, in results and in crop outcomes may occur depending upon geographic location, climate, soil type, soil conditions, cultural and management practices and other growth and development factors. Any cultural and descriptive information or other advice, recommendation, information, assistance or service provided by Highsun Express is intended as a general guide only and should not be relied upon and is provided without liability or responsibility (including for negligence) on the part of Highsun Express. It is recommended that in all cases a small scale trial production is undertaken in order to test local conditions and circumstances that may affect the crop."



# Lisianthus Cut Flowers

## Cultural Information cont...

[www.highsun.com.au](http://www.highsun.com.au) Ph: 1300 137 584 Fax: 1800 644 015

Available as Plugs & Seed

### Harvest:

Lisianthus are not known to be sensitive to ethylene. However, pulsing with 10% sucrose for 24 hours after harvest increases vase life. If possible, flowers should be harvested in the mornings, when it is cool. Remove field heat by transferring harvested bunches to coolers to optimise postharvest life. Do not ship flowers that have not had field heat removed.

### Crop Timing:

Crop cycle from transplant to harvest is related to variety and environment. In general, Lisianthus production requires up to 15 weeks under low light and temperatures, but can be as fast as 12 weeks with high light and optimum temperature. While stem quality is highest at lower temperatures, crop time will be longer.

### Variety Selection:

Varietal selections are divided between single- and double-flowering Lisianthus. In general, the European and Japanese cut flower markets prefer single-flowering Lisianthus, while the United States market has tended towards double-flowering varieties.

Colour preferences also differ between markets. The most important colour in Europe is dark blue, while in Japan the white with blue rim bicolor dominates the market.

Other colours include rose-pink, white, purple, blue blush, pink blush, bicolor pink, yellow, ivory and various pastel shades.

To date, most Lisianthus breeding has focused on introduction of new colours and flower forms.

Breeders are developing Lisianthus to address some of the production difficulties in existing varieties. As with Antirrhinum, breeding for year-round production is a focus. New varieties have been introduced with better seedling vigour, stem quality (stem length and calliper), crop time, flowering uniformity and resistance to rosetting and disease.

### Insects:

Lisianthus are not particularly susceptible to insects, but can be attacked by aphids, leaf miner, lepidopterous larvae, thrips or whitefly. Fungus gnat larvae can be a problem in seedling production. A good scouting effort that includes walking all benches (especially the ends) can prevent surprises. Initiating a spray program as soon as the problem occurs will usually eliminate the pest quickly; controlling a major outbreak can be quite difficult.

### Diseases:

Claude Hope, the world-renowned plant breeder, said Lisianthus are susceptible to all known plant diseases, plus a few others. As with insect control, it is imperative that growers scout all their Lisianthus beds regularly to find infections before they become severe.

**Botrytis:** common with high humidity, causes flower and leafspots can cause a tan stem canker that can kill the plant.

**Fusarium:** common in contaminated soil; can cause root, crown or stem rot or vascular wilt. Root rot causes soft, brown to black roots. Handling or splashing of soil spreads the disease. Sanitation is the best control. Vascular wilt is more severe in conditions of high temperature, high ammonium, low calcium and low boron. Fusarium first affects the vascular system then eventually grows through to the surface of the stem. The first symptom is plant wilt, although bleached foliage is also seen.

**Curvularia:** can cause light tan spots on Lisianthus foliage and flowers. Unfortunately, this fungal disease develops fastest at the moderate temperature (24°C) best for Lisianthus growth.

**Pythium:** common in contaminated soil. This fungus causes a root rot that results in the outer root surface separating from the inner portion. Slight infections result in decreased plant growth; severe infections result in wilt and plant death.

**Rhizoctonia:** a soil-borne fungus that can cause a crown rot, often soon after planting.

**Peronospora (downy mildew):** causes light brown or grey-white powdery growth beginning on the undersides of leaves.

**Tomato Spotted Wilt Virus/Impatiens Necrotic Wilt Virus (TSWV/INSV):** causes chlorotic mottling of the foliage and necrotic regions on the stem; spread by thrips.

**Bean Yellow Mosaic Virus (BYMV):** results in leaf curl, chlorosis or flower break; spread by aphids.

**Tobacco Mosaic Virus (TMV):** causes mottling of the foliage. It is spread by contact with the virus, not insects. Tobacco products, such as cigarettes, can contain the virus, which is easily transmitted on workers' hands.

**Tomato Yellow Leaf Curl Virus (TYLCV):** causes distorted growth, cup-shaped leaves, swelling of veins on the undersides of the leaves and lack of flowering; can be spread by *Bemisia tabaci*, the Sweet Potato Whitefly.

All virus produce more severe symptoms when present in combination.



# Lisianthus Cut Flowers

## Cultural Information cont...

[www.highsun.com.au](http://www.highsun.com.au) Ph: 1300 137 584 Fax: 1800 644 015

Available as Plugs & Seed

### **Nutrient toxicity/deficiency:**

Lisianthus nutrition can be summed up in three important points:

- maintain high pH (relative to most crops), from 6.3 to 7.0;
- maintain high calcium levels in the substrate, and
- keep all nutrients high in the substrate.

The most serious nutritional problem with Lisianthus is a general lack of major nutrients. The only symptom of this deficiency is reduced growth, which is not readily apparent unless well-fertilised plants are grown for comparison. Symptoms such as foliar chlorosis do not appear until growth has already been limited. For this reason, routine substrate analysis and fertiliser applications are necessary.

Calcium deficiency can cause tip burn of young foliage, bud abortion and poor stem strength. Calcium deficiency can occur even with adequate calcium levels in the soil if the air is very humid, preventing translocation of calcium in the plant. Foliar applications of calcium fertilisers may be needed.

Low pH can result in poor growth and weak stems. Zinc toxicity appears as symptoms of interveinal chlorosis progressing to bleached foliage; it is also more common with low pH.

### **Rosetting:**

Rosetted plants have a cluster of leaves with very short internodes on the stem. The most common cause of rosetting is high temperatures sometime during young plant production.

Night temperatures over 21°C or extreme day temperatures over 36°C can initiate rosetting.

Highsun takes precautionary steps to eliminate the chance of this occurring. Firstly, all seedlings are grown at altitude where 21°C is seldom seen and greenhouses are cooled to well below 36°C.

Susceptibility to rosetting varies by variety and can be affected by conditions during seed production. Plants that exhibit rosetting can be induced to grow through applications of gibberellic acids. Identify if rosetted plants are present three to four weeks after transplanting, then begin gibberellic applications as necessary. Growers have experimented with rates from 10 to 200 ppm, with one or two spray applications.

Growers must verify if such an application conforms to label, local and national laws. Although rosetted plants will usually begin to grow eventually, the stem quality is often reduced, time to flower is unacceptably long and the results are unacceptable for commercial production.

Rosetting can also occur in return crops during summer with temperatures over 36°C in the greenhouse. This rosetting can be induced on plants with stems elongating to form flowers in extreme cases.