

# Sandersonia Production

Sandersonia Technical Bulletin S01/14



## INTRODUCTION

### 1. Background

This beautiful, delicate, long lasting flower with a proven vase life of 2 - 3 weeks is a profitable income earner for cut flower and tuber growers.

*Sandersonia aurantiaca* is a genus of a single species and is clearly identifiable by its clear orange bell-shaped flowers which branch off a wiry green leafy stem. Its natural habitat occurs in moist grassland with high rainfall in the summer growing season and low winter rainfall when the plant is naturally dormant. *Sandersonia* is tolerant to a range of temperature and light conditions and is successfully grown both indoors and outdoors in many temperate and subtropical climates.

### 2. Propagation

*Sandersonia* is propagated from seed and grows into a small round or fork shaped tuber - see Figure 1.

Seed germination can be difficult, often taking two years to achieve, due to the very tough exterior coating and deep dormancy mechanism. Seed must be stratified for a successful strike.

First season seed grown tubers are generally too light (<2-3g) to produce marketable flowers in their first growing cycle. They are replanted in the following Spring to produce flowering sized tubers (>5g). The original tuber dies and produces a new tuber from each of the two growing tip - see Figure 2.

### 3. The tuber

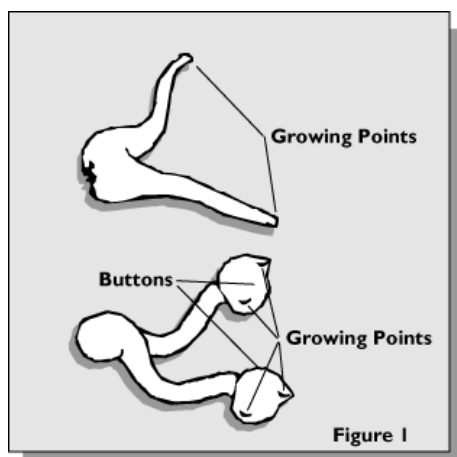
Commercial flowers can be produced from 3-5g tubers however heavier stock produces taller stems and more bells (more than 8-12 bells). Many growers divide larger flowering tubers in half prior to planting. This helps force both growing tips.

Uncut tubers can tend to have a dominant growing point, the other germinating at a later stage. This secondary point often results in an uneconomic flower and smaller daughter tuber.

If the flower stem is left until maturity and not cut, the new tuber can be significantly heavier than the original mother tuber (i.e. a 1g tuber can easily produce a 5-7g tuber in one growing cycle). Conversely, after cutting flowers, the resulting tubers are invariably smaller.

### 4. The flower

*Sandersonia* will produce flowers from as small as 1-2g tubers, however most commercial flower growers use a minimum of 5-7g tubers. Larger 7-10g tubers will often produce premium grade branching stems of 80+cm.



Flowers can be cut when the lower 3-4 bells have coloured up, the immature upper green bells continuing to develop in size and colour in the vase - refer #29.

Seed is set after flower maturation, each bell producing 50-70 seeds. Pollination and seed-set will not successfully occur in a greenhouse or enclosed shade structure.

### 5. Growth habit

Tubers are planted in Spring and normally germinate within 2-3 weeks, providing ground temperatures are warm (>16°C). If planting in cooler conditions, pre-germination is recommended - refer #18. In optimum conditions flowering will occur within 45-60 days of emergence. On completion of flowering, the tuber requires at least 30 days of maturation before lifting. *Sandersonia* tubers have a natural dormancy period of at least 12 weeks. This is normally broken by cool storage - refer #35.

If 'growing on' for large tubers a common problem is the production of secondary granddaughter tubers ('marbles' or 'buttons') - see figure 1. If producing tubers for sale, this is not desirable as the button can easily break at harvest, rendering the broken tip non viable - refer #26. The full growing cycle takes an average of 20 - 25 weeks, longer in cool conditions.

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### 6. Environmental requirements

*Sandersonia* grows best in warm soil conditions (18-24°C), with protection from wind, heavy rain and harsh sun. Research shows that excessive

temperature (30°C) will reduce growth and may distort flower stems.

Hot summer conditions will shorten the growing cycle (45 days) but internodal length of the stem is reduced, resulting in short stems. A minimum of 60 days to harvest is optimum.

If growing flowers in late Winter or early Spring then green housing is essential to maintain soil temperatures above 16°C. As light and temperature levels naturally increase during mid Summer, shading may be required. Avoid extreme conditions which may cause stress, resulting in calloused and/or stained tubers - refer #27.

### 7. Flowers or tubers?

Decide on your marketing objective - flowers or tubers - well before planting. Each product has its own requirements; however most growers do both, often in separate areas.

Growing for cut flowers will result in tubers much smaller than those planted. Do not cut flowers with defects (e.g. bent or broken stems, other physical damage etc). These are best left to grow on into larger tubers suitable for export or later cut flower production.

### 8. Soil or growing media

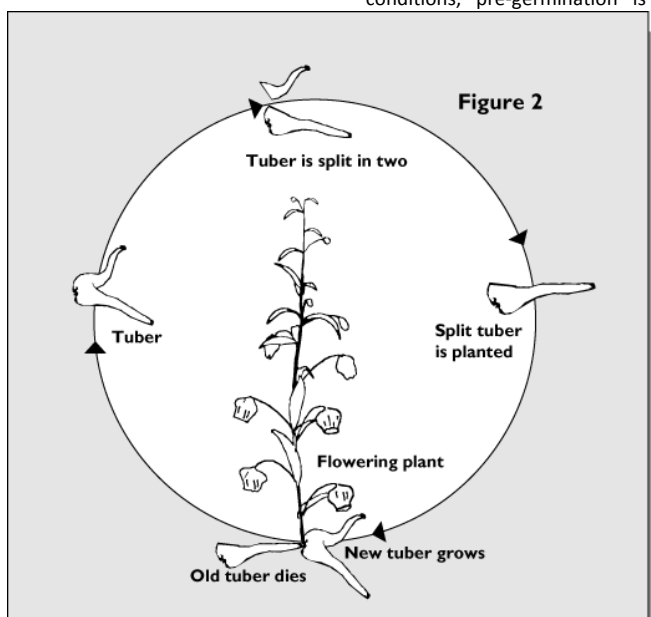
Natural soil, provided it is fertile and free draining, is the most commonly used growing medium. Check the previous use of the area, including crops grown, pre-emergent chemicals used, and the fertilizer regime.

Continued intensive use of natural soil, without regular inputs of organic matter and balanced fertilizers will result in poor production. Toxic salt levels can rise and soil texture will become 'concrete' like.

A crop rotation programme with a rest period every third year is important. A fallow crop of annual rye or lupin can help soil fertility.

Growing media - a combination of composted bark, peat, and vermiculite with a pre-mixed base fertilizer works well, giving greater flexibility in planting, lifting and growing operations.

Media is placed in bins (eg. L600mm x W400mm x D120mm) or beds with built up sides (150mm). Fresh media does not generally need sterilization but MUST be completely renewed prior to each growing cycle. Do not over fertilize as stress may occur - refer #27.



## 9. Outdoor tuber production

Select a sheltered site that is warm and sunny through the major proportion of the day. A gentle slope can assist drainage in periods of heavy rain. Ensure rows run down the slope so surface water can get away.

Overhead shade may be required during mid Summer and side shelter erected for wind protection.

It is preferable that the planted area is sited close to shed facilities. Plan a large enough area to take future production with the proviso, if using natural soil, that crop rotation is preferable.

## 10. Greenhouse flower production

Sandersonia flowers are invariably grown within a greenhouse structure to achieve good quality blooms and allow crop scheduling. High light transmission in dull winter conditions is essential - keep greenhouse film or glass clean.

Shade cloth or tinted plastic is often required during Summer to keep ground temperatures down and increase stem length. Good ventilation is critical for high growth and disease prevention.

## 11. Tuber stock

All tubers should have a minimum 12 weeks cool storage at 4°C prior to pre-germination - refer #18 and planting.

Tubers in storage should be checked weekly and any diseased tubers e.g. blue *penicillium* or other moulds or rot should be immediately discarded.

Heavy scarring close to the tip may also lead to bad germination or further disease. Cracks/fissures in the tuber may also allow entry of disease.

## CROP PREPARATION

### 12. Soil test and fertiliser

Test soil at least three months prior to planting (Autumn is best). If required, a base dressing can be applied, to adjust pH to 5.5 - 6.0 and nutrient levels (P-K-Mg-Ca) into balance.

Addition of calcium (Lime/Dolomite) prior to Winter is essential on most New Zealand soils. Gypsum is used to increase calcium without increasing pH (1 -2 kg /100m<sup>2</sup>).

Add further fertilizer at planting e.g. controlled release prills: **Triabon**<sup>®</sup> (16 -3 -10 +Mg+5) at 4kg/100m<sup>2</sup> or **Agroblen**<sup>™</sup> Brown (15-3.9-9.1 +Mg) at 4kg /100m<sup>2</sup>.

When using bark based media, add 3 month **Osmocote**<sup>®</sup> (3.5kg/m<sup>3</sup>) and Dolomite/Gypsum.

Weekly application of foliar feed is beneficial for stem and tuber growth. Water soluble NPK fertilizers (**Nitrosol**<sup>®</sup>, **Peters**<sup>®</sup> **Professional** or **Nutrifol**<sup>®</sup>) can be used.

High nitrogen formulas are suitable for the early stages of growth, with adjustment to a high potassium mix as flower formation occurs. This is important in a greenhouse situation as excess nitrogen will cause weak floppy stems, decrease vase life as well as reducing the storage life of the dormant tuber.

Do not over fertilize. Ensure that only a small, controlled amount of N is available at tuberization (after flowering). Excess N can stimulate the 'buttoning' process - refer #26. High salts can contribute to callousing - #27.

### 13. Sterilisation

Soil fumigation or as an alternative, an integrated organic approach (composts and friendly bacteria), is advisable and should occur prior to every planting. This will help eliminate soil borne pathogens - rhizoctonia, fusarium, pythium, sclerotia rolfsii and pests such as nematodes and grass grub - all can cause major tuber losses.

Steam as a soil sterilant is now more commonly used, and is environmentally safe. It kills most pathogens and weeds when correctly applied. Steam should be applied at 80°C.

If employing chemicals, a mixture of 70% **Methyl Bromide** (MB) / 30% **Chloropicrin** as an injected gas (500kg/ha) also gives effective pathogen control as well as killing most weeds (not clover or mallow).

Alternatives (e.g. **Basamid**<sup>®</sup>) are used successfully but their efficacy is dependent on application methods and the strength of active ingredient relative to media or soil type.

Soil temperature should be above 10°C and just moist for successful sterilization (to kill germinating weed seed). Penetration of gas is reduced in dry or waterlogged conditions. 7 days after application, lift covers, and 7 days later, cultivate soil to release residual gas. A minimum total aeration time of 21 days is recommended.

Use a 'cress test' if in doubt (germinate cress or radish seed in a sample of the soil to check for gas - if they germinate the soil is clear).

**Methyl Bromide** (now outlawed in many countries) on its own has limited action against fungal pathogens, especially after repeated crops.

Other fumigants like **Basamid**<sup>®</sup> are used but efficacy depends on application methods and the strength of active ingredient relative to different soil types.

## 14. Shelter and shade

If growing outdoors, a sheltered environment is vital. Use natural shelter and supplement with perimeter and overhead shade cloth. Root prune natural shelterbelts annually. Windbreak should be 50% porosity, with a shade factor appropriate to conditions (30-50%).

Shade can help elongate flower stems and is beneficial in very hot conditions reducing soil temperature, evaporation rate, and water usage. Remove shade in cool conditions as it can reduce temperatures and plant performance.

## 15. Irrigation

Irrigation is essential, either overhead sprinklers if growing-on tubers, or ground level drippers for cut flower production. Keep soil moist from planting to flowering. Reduce water when bells fade and go brown, ensuring soil does not dry out before lifting.

Overhead sprinklers (40 psi) must be closely spaced to get good coverage, especially outdoors to allow for wind drift. Ground level drippers (e.g. **T-Tape**) or spray type emitters have the advantage of keeping foliage dry and reducing risk of botrytis. Ensure enough trickle lines are laid across the beds so that all plants receive sufficient water.

## 16. Cultivation

Soil should be well cultivated prior to fumigation. Form 1m wide raised beds (200mm high) with 40-50cm walkways between rows.

If using a mechanical lifter, make sure the beds have appropriate width and sufficient headland space for turning machinery (at least 3m).

An ASA Lift model LB3 with a 28mm rubber encased web is proven for lifting larger grade tubers >2-3g).

## 17. Crop support

Good crop support (e.g. **Floranet**) is required as weight of foliage will cause plants to fall over, especially at full flower (this will be accentuated by wind and rain).

## PLANTING

### 18. Pre-germination

This will assist rapid, uniform shoot emergence in cooler climates or winter planting. Place tubers in a warm environment for a minimum of 4-7 days. If dividing tubers - refer #21.

Remove lids from storage containers and replace with net or shade cloth. Cover with moist media (vermiculite or potting mix) and hold at 22-25°C. Inspect tubers daily, remove any rot and re-moisten covering (not the tubers). Take care not to overheat and 'cook' the tubers.

Tuber tips will begin to swell at 7-10 days. Plant these germinating tubers immediately (prior to root formation) and return remainder to warm room.

Repeat every 2-3 days until all tubers are planted.

### 19. Planting timing

Timing depends on the target market for either flowers or tubers. There is a twelve month market for tubers which spans both the Northern and Southern Hemispheres.

A spread of production timing is desirable. 'Ready to plant' tubers are in shortest supply from January-March.

Target flower production to market requirements. If planting in the cooler winter period (for Spring harvest), flowering can take up to 120 days from planting. This will reduce to 50 days in warm Spring/Summer conditions.

If growing for tubers, the early market requires stock to be lifted from October to December.

In New Zealand, growers plant early (May-July) and in a greenhouse (pre-germination is essential - refer #18. For Autumn sale of tubers, plant outdoors in early Spring.

### 20. Planting spacing

The following tuber spacing per square meter is recommended.

Grade	per m <sup>2</sup>	Containers
<1 g	200 gm	45 - 50 g
1-3g	180-200	45 tubers
3-7g	150	30-35 tubers
7-15g	80-100	20-25 tubers

Suggested bin size: L600mm x W400mm x D120mm (40 containers / m<sup>3</sup> of media).

Some growers increase these densities by up to 50% in good growing conditions. 'In ground' spacing is for whole tubers with 2 tips. Up to double the quantity applies where tubers are divided - refer #3.

## 21. Planting

In warm soil conditions (>18°C), remove tubers from cool store several days before planting. If dividing tubers, snap or cut just prior to planting, dry off and briefly dip in **Terraclor**<sup>®</sup> (3g/l) or **Octave** (1g/l) plus a wetting agent, **Nufilm**<sup>®</sup> (0.5g/l) solution.

**Fungiflor**<sup>®</sup> is a very effective but more expensive alternative and can be combined with **Octave**<sup>®</sup>. The latter are both effective against penicillium.

Allow tubers to dry and seal before pre-germination and planting.

Plant by spreading tips evenly over the surface and cover with 50mm of soil or media. An alternative is to plant the tuber vertically, growing point in the soil, and cut surface above ground level.

## 22. Weed Control

Soil sterilization with will control many weeds. Sandersonia are susceptible to many pre-emergent herbicides, and great care must be taken in their use. If small seedling weeds appear soon after planting, apply one application of **Preglone**. This should only be applied within 2 weeks after planting, prior to shoot emergence.

Take care with **Roundup**<sup>®</sup> or **Glyphosate** at any stage after planting. Covering beds with a mulch of untreated pine sawdust will help retain moisture, reduce soil heat and weed germination. Dirt splash on flowers is also eliminated.

## PESTS AND DISEASES

### 23. Insect control

Thrips are the main insect pest. **Mavrik**<sup>®</sup> is the most commonly used insecticide as it is broad spectrum and systemic. Alternate on a 7-10 day rotation during the growth to flowering stage with one of the following: **Averte**<sup>®</sup>, **Decis**<sup>®</sup>, **Folidol M50**<sup>®</sup>. Thorough spray penetration is required to eliminate thrips, moths and other insects which can get up into the bells.

Grass grub larvae can also cause tuber damage (chewing) in the latter stages of growth. Application of **Diazinon**<sup>®</sup> prills during the growing season can be helpful against grass grub etc.

Caterpillars, slugs and snails are easily controlled by **Mesuroil**<sup>®</sup> prills or ICI slug and snail bait, applied at shoot emergence.

### 24. Fungus control - tubers

Rhizoctonia is the major fungal disease, causing die back at the tuber growing tip and eventual rot. Leaves wither followed by the collapse of the stem. This can largely be avoided by planting clean stock into fumigated soil, dipping tubers in fungicide prior to planting (refer #21), and 2 or 3 drenches of **Terraclor**<sup>®</sup> (5g/l) during growth if disease is evident.

An alternative is BT a mixture of **Benlate**<sup>®</sup> and **Thiram**<sup>®</sup> (0.6g, 0.6g, /2-4 l water per m<sup>2</sup>). **Rizolex**<sup>®</sup> worked into the soil at planting is also effective.

Pythium may attack Sandersonia especially outdoors. It is controlled by addition of **Aliette**<sup>®</sup> (1g/l) or **Apron**<sup>®</sup> (1.25g/l) to the BT.

Fusarium stem wilt can also attack Sandersonia (often in badly ventilated green-houses) resulting in breakdown of the stem at ground level. Apply the drench programme as above. Fusarium oxysporum is controlled by **Orthocide**<sup>®</sup>80W (**Captan**).

Sclerotia rolfsii invades growing tubers causing soft rot, often after flowering.

Watch for white mycelium filled with small brown fruiting bodies - often found under dead litter - regular close observation for these is essential. Drench as above.

Pyrenochaeta terrestris is a soil borne fungus which has shown up in soils over the last 2-3 years. It causes blemishing on the tuber which can render it unsaleable and may be a source of re-infestation of the soil/ media in the following growing cycle. It is difficult to control in the soil - the best method appears to be resting the affected areas for 2-3 years. Suspect tubers should be dipped in **Orthocide**<sup>®</sup>80W (**Captan**).

### 25. Fungus control - flowers

Botrytis is characterized by brown or grey spotting on leaves and flower bells, and occurs in cool, damp, humid conditions (avoid overhead irrigation). Blackened leaf tips can often indicate tissue breakdown and render the plant susceptible to fungal attack.

Remove all dead decaying material from greenhouse between crops. A preventative spray program using one of **Taratek**<sup>®</sup>, **Bravo**<sup>®</sup>, **Euparen**<sup>®</sup>, or at flowering, **Benlate**<sup>®</sup> or **Rovral**<sup>™</sup> (label rates) is advisable until flowering is complete. Avoid chemical residue on flowers prior to harvest (e.g. **Bravo**<sup>®</sup>).

### 26. Controlling 'buttons'

'Buttons' or secondary growth on the tips of the tubers can be a major problem - see figure 1, and is generally caused by high temperatures.

The new tuber forms from early flowering and 'buttons' can start forming 3-4 weeks after this. If uncut and left alone, the flower stem will continue to lengthen and produce new growth after flower maturity.

Tubers from cut flower production or in cold climates seldom have 'buttons'. 'Buttons' can be effectively controlled by reducing heat (shade) and by topping plants after flowering.

Monitor button formation by regularly digging a few tubers every 2-3 days. 'Buttons' form in a 7-10 day period so vigilance is essential. At first sign, cut the stem to ground level to halt further development.

## 27. Growing management

Observe the crop daily. Water requirements change with the season, and must be monitored accordingly. Ensure plants are free of competition - weeds, pests, and diseases - right until lifting. Monitor fertiliser requirements through the season as additional applications may be necessary.

Do not allow stress of any kind during growth (eg. hot conditions, excess fertilizer etc) as this can result in scarred or calloused tubers, which will invariably reduce profitability. Cool with shade in hot conditions.

## 28. Natural growing methods

A strong healthy plant is the best defence against soft rot diseases.

Friendly soil micro-organisms have been successfully used to encourage healthy root growth and discourage population of potentially damaging soil pathogens. Using an integrated approach using the following products has proved successful in producing healthy crops, minimising losses and drastically decreasing costs and time of applying fungicide drenches.

- **SC 27TM** - soil conditioner composed of friendly bacteria.
- **Trichoflow**<sup>®</sup> - Trichoderma bacteria.
- Well aged compost or 'compost tea'.
- **Humic Acid** to break down organic matter in the soil prior to planting.
- Use an integrated nutrition programme using **Agrichem**<sup>®</sup> products.

There are numerous such products available in different countries. These products should be trailed over 2-3 years prior to full implementation.

## HARVESTING FLOWERS

### 29. Timing of harvest

Timing will depend on proximity to the market. If 2-3 day transit is required (e.g. export) stems are harvested when the three lowest flowers are fully open and showing strong orange colour. The next bloom should be partly open and the next showing some colour. In the case of a short freight period blooms can be much more mature with at least 75% of bells showing colour. Remove the lowest bell if pollinated and past maturity. Retain at least two leaves on the stem at cutting to ensure further tuber sizing.

### 30. Picking and pulsing

Irrigate prior to harvest to ensure stems are turgid. Harvest in cool conditions, cutting stem on an angle to maximise water uptake. Place stems in clean water at ambient temperature for a minimum of 2 hours. Stems should then be cool stored at 6-8°C for at least 4-6 hours prior to packing. They must be cool stored post packing and for at least 2 hours prior to dispatch to help maintain vase life.

### 31. Packing

Sandersonia flower stems are normally bunched in fives. Some growers place stems in **Flos**<sup>®</sup> sachets prior to packing to minimize stress and dehydration during transit to market, however this can add extra cost (two sachets per five stems). Other growers prefer to ship dry and have achieved successful results. If using **Flos**<sup>®</sup> ensure sachets are carefully handled as leakage will blacken flower leaves.

Plastic sleeves for protection may be used but are not absolutely necessary. Fumigate with **Floragas**<sup>®</sup> or a permethrin aerosol prior to boxing. Fumigation at port of entry in an offshore market is expensive and tough on the product, so should be avoided.

Carton size is dependent on market requirements. An average of 50 stems (50cm+) is sufficient to fill a two piece carton (L1000mm x W300mm x D75mm). Overfilling can crush flowers and diminish returns.

For more detail and pictures please refer to [www.bloomz.co.nz](http://www.bloomz.co.nz)

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