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All information given is intended for general guideline only and may have to be adjusted to meet individual needs. Cultural details are based on the research stations in Japan and Muramaki Seed shall not take responsibilities along with crop damage or loss related to the information shown herein. Application of recommended growth regulators and chemicals are subject to appropriate regulations under the governmental or municipal rule. Always follow manufacturer’s label instructions. Testing a few plants prior to treating the entire crop is best.

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Culture Guideline
Brassica(Flowering Kale) *Brassica oleracea*
Cutflower Series and varieties

**Young Plant Operation**

**Stage 1 (sowing stage) - Approximately 3 to 4 days**

Temperature: 20 - 23 °C
Sowing and Soil: Single sowing recommended and use a well drained and disease free medium.

pH and EC: pH 5.5 - 6.2, EC 0.75 mmhos/cm

Humidity and Soil Moisture: RH 95%+. Adequately moist soil but do not saturate.

Light: No needed for germination stage - cover seeds lightly

**Stage 2 - 1 to 2 weeks <cotyledon emergence>**

Temperature: Day = 15 - 21 °C  Night = 13 - 15 °C

Light: Up to 2,500 f.c. (27,000 lux) as far as temperature is in proper range

Fertilizer: 100 ppm (N)

Soil Moisture: Slightly dry

**Stage 3 - Approximately 2 weeks <True-leaf development>**

Temperature: Day = 15 - 21 °C  Night = 13 - 15 °C

Light: Up to 2,500 f.c. (27,000 lux) as far as temperature is in proper range

Fertilizer: 100 - 150 ppm (N)

Soil Moisture: Slightly dry

**Stage 4 - 7 to 10 days <Hardening stage>**

Temperature: Day = 15 - 21 °C  Night = 10 - 13 °C

Light: Up to 5,000 f.c. (54,000 lux) as far as temperature is in proper range

Fertilizer: 100 - 150 ppm (N)

Soil Moisture: Normal to slightly dry

**NOTE:**

- 288 to 405 size tray recommended.
- Maintain a soil pH of 5.8 to 6.2 and EC in lower than 1.2 the overall period for young plant production.
- Avoid temperatures below 10 °C and above 24 °C in young plant production time; especially earlier stages.
- Apply a nitrate form fertilizer with low phosphorus - do not use ammonium form.
Growing Management

Soil
Prepare a well drained and disease free medium. A moderate initial nutrient suggested with pH range 5.8 to 6.5. Young plants do not like dry stress especially in start-up time. Careful not to allow plugs to dry out immediately after transplant.

Planting Density
Recommended to plant 10 x 10 cm. apart to clean lower leaves and promote stems thinner. Carefully do not damage the roots at transplanting. A humid deficit (G/M3) must be within moderate range as actual temperature.

Irrigation
Recommend overhead irrigation after transplant, then switch to basal supply 2 to 3 weeks later. Keep the media moist. Allow the media to dry slightly between watering strokes.

Fertilizer
After rooted, apply 150 ppm of nitrate form fertilizer with low phosphorus every other irrigation. Maintain EC at about 1.0 to 1.5 mS/cm (1:2 extraction) and pH at 5.8 to 6.5. Continue fertilizing until harvest. Avoid excessive moisture and fertilization and maintain less(50 to 100 ppm(N)/ EC 0.75 mmhos/cm) several days before lowering the temperature(refer to “Temperature” below). NOTE: Too much moisture and fertilizer promotes delaying leaves coloring and leads to out of the balance in top and bottom.

Light Level
Plants must be grown under 3,000 - 5,000 f.c. (33,000 – 54,000 lux).

Temperatures
Day temperature: 15 - 22 °C
Night temperature: 10 - 15 °C
Control temperature in proper range until the desired height, then keep night temperature below 13 °C to tone up color on the leaves. The color becomes more intense under the temperature comes below 9 °C.

Supporting Net
Support nets will be helpful - enough with one layer.

Pinch
No pinching needed.

Common Disease and Insects
Protections with fungicide and pesticide; particularly Aphids, Thrips, Caterpillars, Downy Mildew, Botrytis, are required. Each grower must check with best advisor to control diseases and insects with appropriate measures.
Culture Guideline
Delphinium *Delphinium chinensis*
Energy Series, Fashion Series and Totty Tall Sky

Young Plant Operation

**Stage 1 (sowing stage) - Approximately 10 days**
Temperature: 19 - 22 °C
Sowing and Soil: Single sowing recommended and use a well drained and disease free medium.
pH and EC: pH 5.8 - 6.3, EC 0.75 mmhos/cm
Humidity and Soil Moisture: RH 95%+. Adequately moist soil but do not saturate.
Light: No needed for germination stage - cover seeds

**Stage 2 - Approximately 2 weeks <cotyledon emergence>**
Temperature: 18 - 20 °C
Light: 2,000 - 2,500 f.c. (22,000 - 27,000 lux)
Fertilizer: 100 ppm (N)
Soil Moisture: Normal - do not saturate young plants

**Stage 3 - Approximately 2 weeks <True-leaf development>**
Temperature: 18 - 20 °C
Light: 2,000 - 2,500 f.c. (22,000 - 27,000 lux)
Fertilizer: 100 - 150 ppm (N)
Soil Moisture: Slightly dry

**Stage 4 - 1 to 2 weeks <Hardening stage>**
Temperature: 15 - 18 °C
Light: 4,000 - 5,000 f.c. (43,000 - 27,000 lux)
Fertilizer: 100 - 150 ppm (N)
Soil Moisture: Slightly dry

**NOTE:**
- 200 to 288-cell trays are available but recommend 200 or similar size.
- Maintain pH of lower than 6.5 and EC between 0.7 and 1.2 from stage 2 thru 4..
- Do not use ammonium-form fertilizers
**Growing Management**

**Soil**
Prepare a well-drained and disease-free medium. A moderate initial nutrient suggested with pH range 5.8 to 6.5. Young plants do not like dry stress especially in start-up time. Careful not to allow plugs to dry out immediately after transplant.

**Planting Density**
40 to 64 plants per sq. meters. – keep spacing 12 to 15 cm. Carefully do not damage the roots at transplanting.

**Fertilizer**
After rooted, apply 100 - 200 ppm of low ammonium fertilizer every other irrigation. Maintain the soil pH at 5.8 to 6.5 and EC lower than 1.0 mS/cm. Do not allow nutrient shortage to young plants, as it can seriously affect behavior of growth and then bud initiation.

**Irrigation**
Water plants consistently. Do not direct overhead watering as susceptible to aerial disease.

**Light Level**
In greenhouse operation, supplemental light works well for delphinium. When shorter than 12 hours (later than mid September around 35 °N of northern hemisphere), 4 hours of light extension (starting from 4:30 PM) will be effective to promote flowering earlier with uniformity. This is just an example, so grower must research the timing on the location.

**Temperatures**
Day temperature: 17 - 20 °C (autumn transplant)
Night temperature: 12 - 15 °C (autumn transplant)

**Supporting Net**
Support nets help the growing operation. Grower can choose single or multi-layer depending on traits of varieties.

**Common Disease and Insects**
Protection with fungicide and pesticide required. Disease issues on the whole happens along with stresses in growing management or surroundings, so keeping appropriate growing conditions leads to diminishing chance to be infected. Each grower must check with best advisor to control diseases and insects with appropriate measures.
**Culture Guideline**

**Eustoma(Lisianthus)** *Eustoma grandiflorum*

**F1 Double Flowering Series and Varieties**

**Young Plant Operation**

**Stage 1 (sowing stage) - Approximately 2 weeks**

Temperature: 20 - 22 °C (lower than 24 °C)

Sowing and Soil: Single pellet sowing recommended and use a well drained and disease free medium.

pH and EC: pH 6.5 - 6.0, EC 0.7 mmhos/cm

Humidity and Soil Moisture: RH 95%+. Adequately moist soil but do not saturate.

Light: No seed cover - germination requires light of 100 - 300 f.c. (1,000 - 3,000 lux)

**Stage 2 - 1 to 2 weeks <cotyledon emergence>**

Once cotyledon emerges, seedlings must be moved to a location in appropriate air-circulation.

Temperature: 20 - 22 °C

Light: 1,000 - 2,500 f.c. (10,000 - 27,000 lux)

Fertilizer: 100 - 150 ppm (N)

Soil Moisture: Slightly wet - do not saturate young plants

**Stage 3 - 4 to 5 weeks <True-leaf development>**

Temperature: 15 - 20 °C

Light: 1,000 - 2,500 f.c. (10,000 - 27,000 lux)

Fertilizer: 150 ppm (N)

Soil Moisture: Slightly wet - do not saturate young plants

**Stage 4 - Approximately 1 week <Hardening stage>**

Temperature: 15 - 18 °C

Light: 2,500 - 5,000 f.c. (27,000 - 54,000 lux)

Fertilizer: 200 ppm (N)

Soil Moisture: Normal – keep drier than former stages

**NOTE:**

- 406-cell tray or similar size recommended.
- Maintain soil pH between 6.5 and 7.0 and EC at lower than 0.7 mmhos/cm.
- Adequate moisture needed to dissolve pelleted material in germination stage.
- Relative humidity must be reduced down to 70% in stage 2 and then maintained in the following stages.
- Do not allow high night temperature, exceeding 22°C (72°F), in the stage 2 to avoid induction of resetting.
- Eustoma young plants must be produced under optimal light levels. Low light conditions with high humid raise up chance for disease infection.
- Do not use ammonium-form fertilizers.
- Transplant needs to be done without delay at timing of 6 to 8 true leaves. Any plants with rootbound can not recover to normal growth.
Growing Management

Soil
Prepare a well drained and disease free medium. A moderate initial nutrient suggested with pH range 6.5 to 7.2. Careful not to allow plugs to dry out immediately after transplant.

Planting Density
64 to 72 plants per sq. meters. - keep 12 to 15 cm. apart. Carefully do not damage the roots at transplanting. Plants must be within a moderate humid deficit(G/M3) range in the facility operation.

Fertilizer
Apply every other irrigation with calcium nitrate-based fertilizer at 100-200 ppm. Maintain EC between 1.0 and 1.5 mmhos/cm. Quit fertilizer applications as buds become visible. Note: high salt levels will delay flowering and can induce to rosetting.

Irrigation
Begin with overhead irrigation, then switch to drip irrigation 2 to 3 weeks gone after transplanted. Keep the media moist but not too wet; allow drying slightly between strokes of watering. Eustoma grows slowly at first, so requires little water. Do not allow the soil to completely dry when plants are in flower.

Light Level
4,000 - 6,000 fc (40,000 - 60,000 lux) is optimal. Higher light promotes high bud count and good flower development. During winter operation, when daylength is shorter than 12 hrs. supplemental light can availably work.

Temperatures
Day temperature: 20 - 24 °C  Night temperature: 16 - 18 °C
Cooler temperature in growing will enhance stem length and caliper but require longer production time, while higher temparture during the first four weeks after transplant can induce rosetting.

Supporting Net
Support wires of one or two layers 10 x 15 cm. are recommended.

Common Disease and Insects
Protections with fungicide and pesticide; Carefully sprayed - aphids, thrips, leaf miners, whitefly, and then Botrytis, Fusarium, Rhizoctonia, Tospo Viruses required. Disease issues on the whole happens along with stresses in growing management or surroundings, so keeping appropriate growing conditions leads to diminishing chance to be infected. Each grower must check with best advisor to control diseases and insects with appropriate measures.

Post Harvest
After harvested, place cutflowers in fresh water. Using the preservative is recommended. Do not ship flowers until their field heat removed.

NOTE:
• In summer production plants should be appropriately shaded.
• General habit for each variety can be referred to page 15 - 16, or see the international catalog about the details.
**Culture Guideline**

Lilium *Lilium formolongo*

Raizan Series and F1 Collection

**Young Plant Operation**

**Stage 1 (germination stage) - Approximately 4 weeks**

Temperature: 20 °C (Keep below 25 °C, as high temperature significantly inhibites germination)

Optimum temperature varies by variety as below:
- Raizan Herald: 18 to 20°C
- Raizan #1, #2, #2 Select and #3: 15 to 20°C
- F1 Julius, F1 Augusta and F1 Vega: 20°C

Sowing and Soil: Single sowing recommended and use a well drained and disease free medium.

pH and EC: pH 6.0 - 6.5, EC 0.5 mmhos/cm

Humidity and Soil Moisture: RH 95%+. Adequately moist soil but do not saturate.

Light: No needed for germination stage - cover seeds lightly to keep moisture

**Stage 2 - 3 to 4 weeks <cotyledon emergence>**

Temperature: Day = 18 - 21 °C Night = 15 °C

Light: Up to 2,500 f.c. (27,000 lux)

Fertilizer: 50 ppm (N)

Soil Moisture: Slightly wet

**Stage 3 - 2 to 3 weeks <True-leaf development>**

Temperature: Day = 18 - 21 °C Night = 15 °C

Light: Up to 5,400 f.c. (27,000 lux)

Fertilizer: 100 - 150 ppm (N)

Soil Moisture: Slightly wet

**Stage 4 - 2 to 3 weeks <Hardening stage>**

Temperature: Day = 18 - 21 °C Night = 15 °C

Light: Up to 10,000 f.c. (108,000 lux)

Fertilizer: 100 - 150 ppm (N)

Soil Moisture: Normal to slightly wet

**NOTE:**

- 200 to 288-cell tray recommended - do not use smaller sized tray.
- When sow in warm season such as early summer, cool treatment will help germination better - after sowing place the trays into a condition of 5 to 10 °C with high relative humid for three weeks.
- Seedlings are very susceptive to botrytis, so fungicide treatment must be applied 2 weeks after germination.
- Raizan Series and F1 Collection, *lilium formolongo*, are suitable for the cropping schedule to sow late December to January, and to harvest early or mid August (in similar climate zone to Japan).
**Growing Management**

**Soil**
Prepare a well drained and disease free medium. A moderate initial nutrient suggested with pH range 6.0 to 6.5. Careful not to allow seedlings to dry out immediately after transplant.

**Transplant**
Careful not to allow seedlings to dry out after transplant and not damage the roots at transplanting. Avoid planting seedlings too deep as it causes delay to grow or disease like damping-off. Keep top surface of the rhizome bulb at the same level as the soil surface. Once planted, quickly water the seedlings enough.

**Planting Density**
Recommended to plant 12 x 12 cm or 15 x 15cm apart depending on stem caliper or plant structure - F1 varieties tend to be thinner.

**Irrigation**
Plants must be adequately watered until rooted well. When drying occasionally irrigate the soil. Water required with plant growth and bud initiation, so control the soil in the condition water shortage doesn’t occur. On the other hand, carefully monitor drainage in the soil, especially in rainy season. Grower needs to build fungicide program before rainy season, as plants may be more susceptible to botrytis under high temperature, humid and cloudy.

**Fertilizer**
After rooted, apply 150 to 200 ppm once a week or every other irrigation. Maintain EC at about 1.0 to 1.5 mS/cm. Plants grow well as far as organized in the proper temperature range and enough light level. If slow to grow under cloudy weather in the monsoon the fertilization must be kept from applying, or taken longer intervals. Continue fertilizing until harvest.

**Light Level**
10,000 f.c. (108,000 lux) or more will be optimum. When sunburn occurs on leaves or flowers, simple shade-canopy may be helpful during the mid summer.

**Temperatures**
- Day temperature: 20 - 25 °C
- Night temperature: 15 - 18 °C
Avoid extremely high temperature as this could cause non-bolting.

**Supporting Net**
Supporting nets will be helpful to manage harvesting. Two rows are better but even one row may work enough as lilium has hard stem.

**Common Disease and Insects**
Protections with fungicide and pesticide; particularly Botrytis and Damping-off, are required. Each grower must check with best advisor to control diseases and insects with appropriate measures.
Culture Guideline
Snapdragon *Antirrhinum majus*
Smile Series, Memorial Series

**Young Plant Operation**

**Stage 1 (sowing stage) - Approximately 5 days**

Temperature: 18 - 20 °C

Sowing and Soil: Single sowing recommended and use a well drained and disease free medium.
pH and EC: pH 5.5 - 5.8, EC 0.75 mmhos/cm

Humidity and Soil Moisture: RH 95%+. Adequately moist soil but do not saturate.

Light: No needed for germination stage - cover seeds lightly

**Stage 2 - 1 to 2 weeks <cotyledon emergence>**

Temperature: 15 - 20 °C

Light: 1,000 - 2,500 f.c. (11,000 - 27,000 lux)

Fertilizer: 50 - 100 ppm (N)

Soil Moisture: Slightly wet (repeat a wet and dry cycle)

**Stage 3 - 1 to 2 weeks <True-leaf development>**

Temperature: 15 - 20 °C

Light: 1,000 - 2,500 f.c. (11,000 - 27,000 lux)

Fertilizer: 100 - 150 ppm (N)

Soil Moisture: Slightly wet (repeat a wet and dry cycle)

**Stage 4 - 1 to 2 weeks <Hardening stage>**

Temperature: 14 - 18 °C

Light: 2,500 - 5,000 f.c. (27,000 - 54,000 lux)

Fertilizer: 100 - 150 ppm (N) - When slow to grow apply more frequently

Soil Moisture: Normal

**NOTE:**
- 288 to 512-cell trays are available but recommend 405 or similar size.
- Maintain a soil pH of 5.5 to 6.0. Higher pH(6.0 or more) can induce iron and boron deficiency, so carefully and periodically check soil conditions.
- High EC ratio, excessive moisture or root-bound, accumulates stress on plants, and it results in physical issues like abortion.
- Do not use ammonium-form fertilizers
Growing Management

Soil
Prepare a well drained and disease free medium. A moderate initial nutrient suggested with pH range 5.5 to 6.0. Young plants do not like dry stress especially in start-up time. Careful not to allow plugs to dry out immediately after transplant.

Planting Density
64 to 96 plants per sq. meters. Carefully do not damage the roots at transplanting. Smile Series and Memorial Series are open to flower in low temperature and short daylength conditions. Growers must organize cropping schedule per the trait.

Fertilizer
After rooted, apply 150 - 200 ppm of low ammonium fertilizer every other irrigation. If low phosphorus and calcium in the soil (test needed) then they would be added before planting. Carefully control low fertilizer and irrigation to avoid excessive side shoots. Maintain the soil pH at 5.8 to 6.2 and EC at 1.5 to 2.0 mS/cm.

Light Level
Plants must be under 3,000 f.c. (33,000 lux) as optimum.

Temperatures
Day temperature: 13 - 22 ºC
Night temperature: 10 - 13 ºC

Supporting Net
Support nets are necessary. Those mesh sizes like 10 x 10 (cm) or 15 x 15 (cm) are commonly used. Snapdragon plants grows up to 1 meter above in height, so recommend multi-layers of net depends on occasion.

Common Disease and Insects
Protections with fungicide and pesticide required. Disease issues on the whole happens along with stresses in growing management or surroundings, so keeping appropriate growing conditions leads to diminishing chance to be infected. Each grower must check with best advisor to control diseases and insects with appropriate measures.
**Culture Guideline**

Stock/Matthiola *Matthiola incana*

**Standard Type Series and Varieties**

**Young Plant Operation**

**Stage 1 (sowing stage) - 3 to 4 days**

Temperature: 20 - 22 °C

Sowing and Soil: Multiple sowing (3 to 4 seeds) recommended and use a well drained and disease free medium.

pH and EC: pH 5.5 - 6.5, EC 0.75 mmhos/cm

Humidity and Soil Moisture: RH 95%. Adequately moist soil but do not saturate.

Light: No needed for germination stage - cover seeds lightly

**Stage 2 - cotyledon emergence**

Temperature: 15 - 21 °C

Light: 2,500 f.c. (27,000 lux)

Fertilizer: 100 ppm (N)

Soil Moisture: Slightly wet

**Stage 3 - True-leaf development**

Temperature: 15 - 21 °C

Light: 2,500 f.c. (27,000 lux)

Fertilizer: 100 - 150 ppm (N)

Soil Moisture: Slightly wet

**Stage 4 - 1 to 2 weeks <Hardening stage>**

Temperature: 15 - 21 °C

Light: 5,400 f.c. (54,000 lux)

Fertilizer: 100 - 150 ppm (N)

Soil Moisture: Normal - must be drier and milder moist than earlier stages

**<< Tips to Select Double-Flowering Plants >>**

Generally recommend the two processes to select double-flowering plants in cotyledon stage.

1st Action - throw away relatively slower germination plants by 30%.

2nd Action - remove the plants suspected as single-flowering with the following signs in the 70% plants.

<table>
<thead>
<tr>
<th></th>
<th>Size</th>
<th>To Grow</th>
<th>Leaf Form</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Double</strong></td>
<td>Larger</td>
<td>Faster</td>
<td>Oval-like</td>
<td>Light Green</td>
</tr>
<tr>
<td><strong>Single</strong></td>
<td>Smaller</td>
<td>Slower</td>
<td>Round</td>
<td>Dark Green</td>
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</tbody>
</table>

**NOTE:**

- 405-cell or larger sized trays are recommended.
- Maintain a soil pH in lower than 6.5 and EC between 0.7 - 1.2 mmhos/cm.
- Approximately scheduled 4 weeks for young plant production but it will be depending on environmental conditions.
- Do not use ammonium-form fertilizers

Typical comparison between single (L) and double (R)
**Growing Management**

**Soil**
Prepare a well drained and disease free medium. A moderate initial nutrient suggested with pH range 5.8 to 6.5. Young plants do not like dry stress especially in start-up time. Careful not to allow plugs to dry out immediately after transplant.

**Planting Density**
30 to 50 plants per sq. meters. Carefully do not damage the roots at transplanting.

**Fertilizer**
After rooted, apply 150 - 200 ppm of nitrate-form fertilizer with low phosphorus every other irrigation. If low phosphorus and calcium in the soil(test needed) then they would be added before planting. Carefully control low fertilizer and irrigation to avoid excessive side shoots. Maintain the soil pH at 5.8 to 6.5 and EC at 1.5 to 2.0 mS/cm.

**Irrigation**
Recommend overhead-irrigation after transplant, then switch to drip-irrigation 2 to 3 weeks later. Keep the soil moist. Allow the soil to dry slightly between watering strokes.

**Light Level**
No supplemental light needed but must be scheduled in the best daylight season when grown in greenhouse. Matthiola initiates buds and flowers under the condition of shorter than 12 hours in daylength but longer hours will help quicker to harvest.

**Temperatures**
Day temperature: 15 - 22 °C
Night temperature: 8 - 15 °C
A humid deficit (G/M³) must be within moderate range in proportion as actual temperature.

**Supporting Net**
Support nets may be necessary. Size and layer will can be in view of bedding width, efficiency to pinch and other physical parameters.

**Common Disease and Insects**
Crown Rot, Botrytis, Downy Mildew, Thrips, Aphids... must be controlled in the first level attention. Protections with fungicide and pesticide required. Disease issues on the whole happens along with stresses in growing management or surroundings, so keeping appropriate growing conditions leads to diminishing chance to be infected. Each grower must check with best advisor to control diseases and insects with appropriate measures.

**NOTE:**
- General habit for each variety can be referred to page 17, or see the international catalog about the details.
Culture Guideline
Stock/Matthiola *Matthiola incana*
Spray Type Series and Varieties

**Young Plant Operation**

**Stage 1 (sowing stage) - 3 to 4 days**
Temperature: 20 - 22 °C
Sowing and Soil: Multiple sowing (3 to 4 seeds) recommended and use a well drained and disease free medium.
pH and EC: pH 5.5 - 6.2, EC 0.75 mmhos/cm
Humidity and Soil Moisture: RH 95%+. Adequately moist soil but do not saturate.
Light: No needed for germination stage - cover seeds lightly

**Stage 2 - cotyledon emergence**
Temperature: 15 - 21 °C
Light: 2,500 f.c. (27,000 lux)
Fertilizer: 100 ppm (N)
Soil Moisture: Slightly wet

**Stage 3 - True-leaf development**
Temperature: 15 - 21 °C
Light: 2,500 f.c. (27,000 lux)
Fertilizer: 100 - 150 ppm (N)
Soil Moisture: Slightly wet

**Stage 4 - 1 to 2 weeks <Hardening stage>**
Temperature: 15 - 21 °C
Light: 5,400 f.c. (54,000 lux)
Fertilizer: 100 - 150 ppm (N)
Soil Moisture: Normal - must be drier and milder moist than earlier stages

<< Tips to Select Double-Flowering Plants >>
Generally recommend the two processes to select double-flowering plants in cotyledon stage.
1st Action - throw away relatively slower germination plants by 30%.
2nd Action - remove the plants suspected as single-flowering with the following signs in the 70% plants.

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<td>Slower</td>
<td>Round</td>
<td>Dark Green</td>
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</tbody>
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**Typical comparison between single(L) and double(R)**

**NOTE:**
- 405-cell or larger sized trays are recommended.
- Maintain a soil pH in lower than 6.2 and EC between 0.7 - 1.2 mmhos/cm.
- Approximately scheduled 4 weeks for young plant production but it will be depending on environmental conditions.
- Do not use ammonium-form fertilizers
Growing Management

Soil
Prepare a well drained and disease free medium. A moderate initial nutrient suggested with pH range 5.8 to 6.5. Young plants do not like dry stress especially in start-up time. Careful not to allow plugs to dry out immediately after transplant.

Planting Density
30 to 50 plants per sq. meters. Carefully do not damage the roots at transplanting.

Fertilizer
After rooted, apply 150 - 200 ppm of nitrate-form fertilizer with low phosphorus every other irrigation. If low phosphorus and calcium in the soil (test needed) then they would be added before planting. Carefully control low fertilizer and irrigation to avoid excessive side shoots. Maintain the soil pH at 5.8 to 6.5 and EC at 1.5 to 2.0 mS/cm.

Irrigation
Recommend overhead-irrigation after transplant, then switch to drip-irrigation 2 to 3 weeks later. Keep the soil moist. Allow the soil to dry slightly between watering strokes.

Light Level
No supplemental light needed but must be scheduled in the best daylight season when grown in greenhouse. Matthiola initiates buds and flowers under the condition of shorter than 12 hours in daylength but longer hours will help quicker to harvest.

Temperatures
Day temperature: 15 - 22 ºC
Night temperature: 8 - 15 ºC
A humid deficit (G/M3) must be within moderate range in proportion as actual temperature.

Supporting Net
Support nets may be necessary. Size and layer will can be in view of bedding width, efficiency to pinch and other physical parameters.

Pinching
Pinch the top flower when starting to tone up it color, while a few buds are opening on basal stems. When pinching, one flower in the lowest must be remained to keep further yield.

Common Disease and Insects
Crown Rot, Botrytis, Downy Mildew, Thrips, Aphids… must be controlled in the first level attention. Protections with fungicide and pesticide required. Disease issues on the whole happens along with stresses in growing management or surroundings, so keeping appropriate growing conditions leads to diminishing chance to be infected. Each grower must check with best advisor to control diseases and insects with appropriate measures.

NOTE:
• General habit for each variety can be referred to page 17, or see the international catalog about the details.
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<thead>
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<th>VARIETY</th>
<th>DOUBLE/ SINGLE</th>
<th>TYPE</th>
<th>COLOR</th>
<th>CENTER COLOR</th>
<th>FLOWER SIZE</th>
<th>FLOWERING WINDOW</th>
<th>PETAL</th>
<th>PLANT HEIGHT</th>
<th>STEM</th>
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<tr>
<td><strong>F1 SORRIER SERIES</strong></td>
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| SPRAY SERIES AND VARIETIES - SELECTABLE |

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