Product: Waxflower, Geraldton wax
Botanical name: *Chamelaucium uncinatum*
Cultivar: ‘Purple Pride’
Waxflower is the most significant commercial native cut flower and Australia's leading export cut flower. It is now in the top 20 flowers in terms of volume sold in Europe.

The name waxflower encompasses Geraldton wax (Chamelaucium uncinatum), other Chamelaucium species and Chamelaucium hybrids.

The distinguishing feature of waxflower is the large masses of 5-petalled flowers ranging in diameter from 9 to 26 mm and in colour from white to mauve or maroon, with a nectar-filled central hypanthium (the floral structure consisting of the bases of the sepals, petals and stamens fused together) ranging in colour from lemon to mauve or maroon.

Waxflower is popular because of its unique colours and flower forms. The various cultivars (now numbering over 100) and species offer a wide range of colours and flower forms over a long flowering season (May to November).

More recently, wider hybrid waxflowers have been developed. Many are feature flowers in their own right, in contrast to the longer-established cultivars, which are used as feature fillers. These new hybrids also have excellent vase life.

Waxflower can also be marketed in bud when the buds are showing colour and measure about 5 mm across. Several cultivars are especially grown for the bud market; e.g. ‘Lemon Drops’, which has buds with yellow awns (horns).

Waxflower has been used as a cut flower since the 1940s (in California), and was introduced into Israel in the 1970s and Australia in the 1980s. It is now widely grown in many countries, including South Africa, Chile and Peru.

Waxflower is endemic to the south-west of WA. The best areas for growing waxflower are those with a Mediterranean climate and free-draining sandy soils, but it requires summer irrigation.

Most selections of waxflower will not tolerate severe frost, which can render the crop unmarketable owing to damage to both flowers and growing tips, or kill the plants completely.

Most waxflowers are sensitive to ethylene, which causes flower drop, rendering the product unsaleable. ‘Purple Pride’ is highly susceptible to such damage. Stems can lose up to 85% of their flowers if exposed to ethylene.

Sources of ethylene include engine exhaust fumes, ripening fruit and vegetables stored with the flowers, and waxflowers themselves, especially if they are stressed or diseased (e.g. infected with botrytis).

Anti-ethylene treatments during postharvest processing are effective at reducing flower loss.

‘Purple Pride’, an early to mid-season cultivar, is the most widely grown waxflower. It is a floriferous hybrid with medium-sized flowers in shades of purple with a central white ring. It has a reasonable vase life and little tip growth past the flowers. In Israel it is known as ‘Violet’. ‘Eclipse’ looks very similar.

Flowering season:
June to October, depending on locality.

Typical vase life:
7–12 days. Export can greatly reduce the vase life, especially if flowers heat during transport, the product dries out or transport takes too long.

Other products to which this specification can be generally applied:
Geraldton wax (Chamelaucium uncinatum, C. axillare and C. floriferum).

Common cultivars:
Hybrids of C. uncinatum × C. floriferum, including ‘Lady Stephanie’, ‘Snowflake’ (or ‘Wanneroo White’) and ‘Variegated Blush’

Hybrids of C. uncinatum × C. micranthum, including ‘Plum White’, ‘Moonstar’, ‘Supernova’, ‘Sweet Georgia’ and ‘White Fire’

Intergeneric hybrids of Chamelaucium × Verticordia, such as ‘Eric John’ and ‘Southern Stars’
Product: Waxflower, Geraldton wax

STAGES OF OPENING

Stage 1
Immature stage – few flowers open: unacceptable to markets

Stage 2
Early stage – 5%–50% of flowers open: preferred by only a few markets, e.g. for export

Stage 3
Ready to market (earliest stage) – 50% of flowers open: suitable for export and domestic markets

COMMON DEFECTS

Common defects to avoid at market entry:
- Flower or petal drop
- Shrivelled, wilted or damaged flowers (due to mechanical damage, insect feeding or disease)
- Brown marks on petals due to botrytis
- Overmature flowers
- Damaged foliage (tip burn, gall wasp nodules, disease damage, wilting)
- Poor-quality foliage (yellow or wilted)
- Excessive tip growth beyond flowers
- Bent stems

Fungal infection on leaves and stems (suspected Alternaria leaf spot) – discard (avoid by using appropriate fungicide treatments before harvest)

Postharvest botrytis infection of flowers – use appropriate fungicide treatments before and after harvest

Fungal disease on leaves (powdery mildew and suspected Alternaria leaf spot) – use appropriate fungicide treatments before harvest

Excessive tip growth (‘grow-through’) – discard

Bent stem – discard

Grow-through and poor flower set – discard

Overmature flowers – do not market
The stages shown apply to the product at market entry. Pay attention to the weather, time of year, and mode and duration of transport, because the flowers will continue to open during transport. You must consult with your target market to ensure that the flowers arrive at the desired stage.

Stage 4
Ready to market (later stage) – 50%–70% of flowers open: prime stage for domestic markets

Stage 5
Mature stage – 70%–90% of flowers open: suitable for immediate use

Stage 6
Overmature stage – petals curling inwards and turning blackish-purple: unaccepted by many markets

Flower development: stages of opening from bud to overmature flower

Sparsely flowering stem, not well balanced – discard
Poor-quality foliage on right – discard stems with poor-quality foliage
Gall wasp damage – discard (magnified leaf)
Insect webbing in stem tip – discard
Insect casing on stem – do not market
### Flowers

<table>
<thead>
<tr>
<th>Appearance</th>
<th>Flower colour clear and uniformly purple with a narrow white ring close to petal attachment to hypanthium. True-to-type of the cultivar ‘Purple Pride’. Not dull blackish-purple (especially hypanthium) and lacking a white centre (typical of overmature flowers). No wilting. No flower drop.</th>
</tr>
</thead>
<tbody>
<tr>
<td>When to harvest</td>
<td>When 5%–50% of flowers are open, depending on market requirements. The domestic market generally requires more flowers to be open (around 50%). Avoid harvesting when flowers are wet.</td>
</tr>
<tr>
<td>Damage</td>
<td>&lt;5% of flowers deformed or damaged (including mechanical damage, shrivelling of petal margins and discoloured petals).</td>
</tr>
<tr>
<td>Contamination</td>
<td>Product free of grit and soil, weeds or weed seeds, living or dead insects, and signs of insects or spiders, such as webbing.</td>
</tr>
<tr>
<td>Pests and diseases</td>
<td>No insects, insect damage or disease.</td>
</tr>
</tbody>
</table>

### LEAVES

<table>
<thead>
<tr>
<th>Appearance</th>
<th>Fresh, crisp appearance, with no signs of leaf burn or water stress. Uniform green; no yellowing. No leaf drop.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Damage</td>
<td>&lt;5% of leaves damaged. Minimum evidence of pests, such as webbing, and disease. Other blemish &lt;5%. Free of visible chemical residues.</td>
</tr>
</tbody>
</table>

### STEMS

| Appearance | Straight, uniform and strong enough to support blooms. No discoloration from fungal attack. Up to 7 mm in diameter; avoid thicker stems. Bend <15°. Neatly cut end. No obvious grow-past, where the shoots at the stem tip grow through the flowers: maximum 3 cm soft tip growth beyond flowers (soft tips will wilt after harvest). Leaves are not usually stripped from the lower stems – check customer requirements. |

### Recommended Handling at Harvest

During harvest, minimise drying out and exposure to heat. It is better to harvest early in the day, as long as the stems are not wet (which can encourage botrytis). Transport promptly to a cool, shaded packing shed. Handle stems carefully, as petals fall off easily.

### Grading and Bunching

<table>
<thead>
<tr>
<th>Grading</th>
<th>Reject any contaminated stems. Sort stems according to flower maturity, length and thickness.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stem length</td>
<td>50–80 cm (measure from base to the top flower).</td>
</tr>
<tr>
<td>Bunching</td>
<td>The number of stems per bunch varies, and is determined by their length and by market and buyer requirements. Presentation is important. Stay consistent for the grade and make all bunches the same. Use 2 ties, 1 near base (3 cm from bottom) and another 12 cm from the base. Two ties make it easier to pack. Especially for export, stems should be approximately the same diameter with a bunch, with the ends aligned.</td>
</tr>
<tr>
<td>Stem length</td>
<td>Different markets require different bunches – broadly:</td>
</tr>
<tr>
<td>Stem length (cm)</td>
<td>Av. no. of stems per bunch</td>
</tr>
<tr>
<td>80</td>
<td>5</td>
</tr>
<tr>
<td>60–70</td>
<td>5–10 (350–400 g, depending on customer requirements)</td>
</tr>
<tr>
<td>50</td>
<td>10–15</td>
</tr>
<tr>
<td>Sleeves</td>
<td>Avoid sleeves, which increase humidity and favour botrytis.</td>
</tr>
</tbody>
</table>

### Holding and Storage

**Cooling**

Effective cooling soon after harvest is important to retaining quality and maximising vase life. There are two options:

- **Cool, process, cool** – for example, remove field heat by cooling flowers immediately on entry into shed to 10 °C in buckets of solution, process flowers (bunch, grade), and then cool to 2–4 °C by either forced-air cooling (if boxed) or holding overnight in a cool room.
- **Process within 1 hour of cutting, and then cool to 2–4 °C by either forced-air cooling for 20–30 minutes (if boxed) or holding overnight in a cool room (if in buckets).**

Forced-air cooling of packed flowers is ideal for large volumes of product.

**Temperature and humidity**

If necessary, store in postharvest solution (see ‘Hydration’ below) at 2–4 °C for no more than 5 days, and preferably much less.

**Disinfestation**

(see ‘Common postharvest problems’ below)

Do this before a long (overnight) anti-ethylene pulse or after a short pulse (room temperature).
HOLDING AND STORAGE cont’d

Anti-ethylene treatment
Use a commercial anti-ethylene silver solution, e.g. Chrysal AVB, prepared according to the manufacturer’s instructions (for more details, refer to the Postharvest Manual*). Treat bunches according to the product label (temperature and duration of treatment).

As a general guide, a 450 g bunch needs to take up 10–15 mL of pulsing solution. At 20°C and 50% humidity, this will take about 20 minutes, but can be affected by temperature, humidity and whether or not the foliage is wet. Uptake may be less effective if flowers are poorly hydrated before pulsing.

The length of time waxyflowers are pulsed with anti-ethylene treatments differs with cultivar. Check uptake as described in the Postharvest Manual*.

Do your own trials to optimise the procedure: over-pulsing can have adverse effects (e.g. rapid closing and shrivelling of flowers).

You can also add EthylBloc anti-ethylene sachets to cartons when the flowers are packed (see ‘Packaging’ below).

Postharvest solutions
Postharvest solution: After pulsing, transfer flowers to clean water, preferably with added biocide or a reputable commercial postharvest solution, and cool to 2–4 °C.

Holding solution: Same as the postharvest solution.

Longer-term storage
For longer storage seek professional advice, and test in the market before committing product.

PACKAGING

Pack bunches of similar size (stem number, weight, or thickness) together. Put bunches of similar length together, and ensure all bunches meet this specification.

Pack boxes according to customer requirements. Pack bunches firmly but ‘springy’ so the product will not move and be damaged. But packing too tightly can damage flowers during transit.

Pack bunches head to tail. Use boxes with holes to allow forced-air cooling. Do not line boxes with plastic, as this will increase humidity and the risk of botrytis. Use paper if desired.

Leave ventilation holes open to reduce humidity, ethylene build-up, botrytis growth and flower drop.

If EthylBloc anti-ethylene treatment is required, add the sachets to the cartons according to the manufacturer’s instructions when the flowers are packed (efficacy may vary depending on packing situation).

Cool flowers to 2–4 °C before transport.

LABELLING AND DOCUMENTATION

Label boxes and buckets as recommended in Postharvest Manual* or as required by customer.

Ensure box contents are exactly the same as specified in the documentation and on the end of the box.

TRANSPORT

Refrigerated vehicle, preferably at 2–4 °C, but not 0 °C. Preferably don’t transport with ripening fruit.

COMMON POSTHARVEST PROBLEMS

Refer to Postharvest Manual* for general advice.

Fungal decay in storage due to botrytis (grey mould)
Because waxyflowers infected with botrytis can produce ethylene, effective preharvest management with fungicides is essential, especially within the 2 weeks before harvesting.

Effective management of insect pests before harvest is essential, especially within the 4 weeks before harvesting. Use preharvest insecticide sprays to reduce the pest population at harvest.

Dip flowers that are to be packaged and held for any significant length of time (up to 5 days) in a registered fungicide and insecticide solution with added wetting agent for not less than 1 minute, then dry naturally for 2 hours to ensure thorough disinfection.

Insects (for export)
Fungi such as Pleospora species (sexual forms of Alternaria and Stemphylium) have resulted in quarantine problems in overseas markets such as the USA. The fungi can develop on stems after harvest. They need to be controlled in the plantation before harvest.

Other fungal diseases
Fungi such as Alternaria species (sexual forms of Alternaria and Stemphylium) have resulted in quarantine problems in overseas markets such as the USA. The fungi can develop on stems after harvest. They need to be controlled in the plantation before harvest.

Ethylene sensitivity and anti-ethylene treatment
‘Purple Pride’ is moderately to highly sensitive, and anti-ethylene treatment is required. See information under ‘Anti-ethylene treatment’ above.

Messages for importers and wholesalers

Recut stems and place into fresh water containing a reputable commercial postharvest solution, registered biocide or flower food.

Cool product before marketing or sending on and keep it cool and dry.

Maintain good hygiene and keep containers clean.

Messages for retailers

Recut stems and place into fresh water containing cut-flower food or a registered biocide.

Use clean buckets and containers for displays.

Do not display flowers in areas that are exposed to full sun, draughts, high temperatures or vehicle exhausts, and preferably do not display near fruit and vegetables. Use refrigerated displays if possible.

Tell the customer how to care for the flowers and emphasise the need for cut-flower food in solutions. Give the customer a sachet of cut-flower food to take home.

Messages for consumers

Keep vase filled with the correct solution of cut-flower food. Check daily, as flowers can use a lot of water. If cut-flower food is not used, change the water at least every second day. Always use clean vases and clean water.

Do not display in areas that are exposed to full sun, draughts or high temperatures. Keep as cool as possible without freezing.

SUPPORTING INDUSTRY PARTNER: EAST COAST WILD FLOWERS
