

Guidelines for the post-harvest handling of cut tulips

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Effective handling of cut flowers from harvest through to despatch is a critical part of maintaining the quality of the product grown and supplied to customers, and ultimately the end consumer. This factsheet contains information on key areas of good practice for the post-harvest handling of cut tulips.

Background

Flower quality is at its optimum at harvest and will quickly deteriorate thereafter unless the flowers are correctly handled. It is therefore important to manage the rate of deterioration and preserve quality for as long as possible after harvesting.

As end consumer demands are increasing, the majority of retailers are now giving their customers guarantees

for the life of the purchased product. Also, in an increasingly competitive industry, being able to purchase consistently good quality cut flowers is a key factor for retailers when deciding which suppliers to procure product from each season.

The production of UK grown cut flowers provides growers with the principle advantage over their competitors of being able to deliver product in a relatively short lead time without

the additional transport costs associated with imported products.

In the UK cut tulips are in the main grown indoors, but there are outdoor grown crops too. The outdoor grown product, in particular, is subject to changeable weather conditions. All flowers require a high level of post-harvest handling to maintain the quality throughout the supply chain.

In the process of post-harvest handling it is therefore important to



1 Tulips growing in water culture

be aware of all factors that can lead to loss of product quality and how to minimise these.

For detailed guidelines on general post-harvest handling of cut flowers please refer to HDC Factsheet 24/05. The key action points from Factsheet

24/05 are listed below, together with guidelines for effective post-harvesting handling of cut tulips. Please note that although both factsheets address post-harvest handling issues, it is important that the varieties of tulip being grown, the bulb size planted, and the methods

of growing (ie water, soil, peat etc) and what temperature the tulips are forced at, are taken into consideration as these factors can also affect the end vase life of the cut tulips.



2 Tulips approaching the point of harvest

The post-harvest handling process

There are four clear steps involved in the post-harvest process

1. The process flow chart
2. Identifying the potential hazards and risks
3. Identifying the Critical Control Points
4. Controlling the Critical Control Points

At all stages remember to keep it simple and the principles and tools of HACCP (Hazard Analysis Critical Control Point) will help you through the process.

Please refer to HDC Factsheet 24/05 for more detailed information on each step.

- Begin by drawing up a clear post-harvest process flow chart (Diagrams 1 and 2). Keep it simple but consider each step in the process, capturing

the main activities. Please note the process flow charts shown for the cut tulips are examples only of what is possible. Different growers will have different requirements in order to meet customer demands and therefore the process flow examples should be used as a guide for the grower to create their own bespoke document.

- The next step is to identify the potential hazards and risks throughout all the post-harvest activities. Remember to consider physical, microbial and/or chemical risks that may affect the cut flower quality after harvesting and throughout the post-harvest handling process.
- Using the process flow chart, decide which of the identified hazards/risks

are critical to the quality of the cut flowers, this will establish the Critical Control Points (CCP).

- Once identified, decide on what control or preventative measures can be put in place to eliminate or reduce occurrence to an acceptable level at each CCP. For each CCP decide on the critical limits, control or preventative measures, monitoring procedures, corrective actions and verification requirements.

Diagram 1 Example of a process flow chart for cut tulips

This process flow chart shows the simpler process for handling cut tulips, where a grower is simply harvesting, grading and supplying the raw material to a packer.

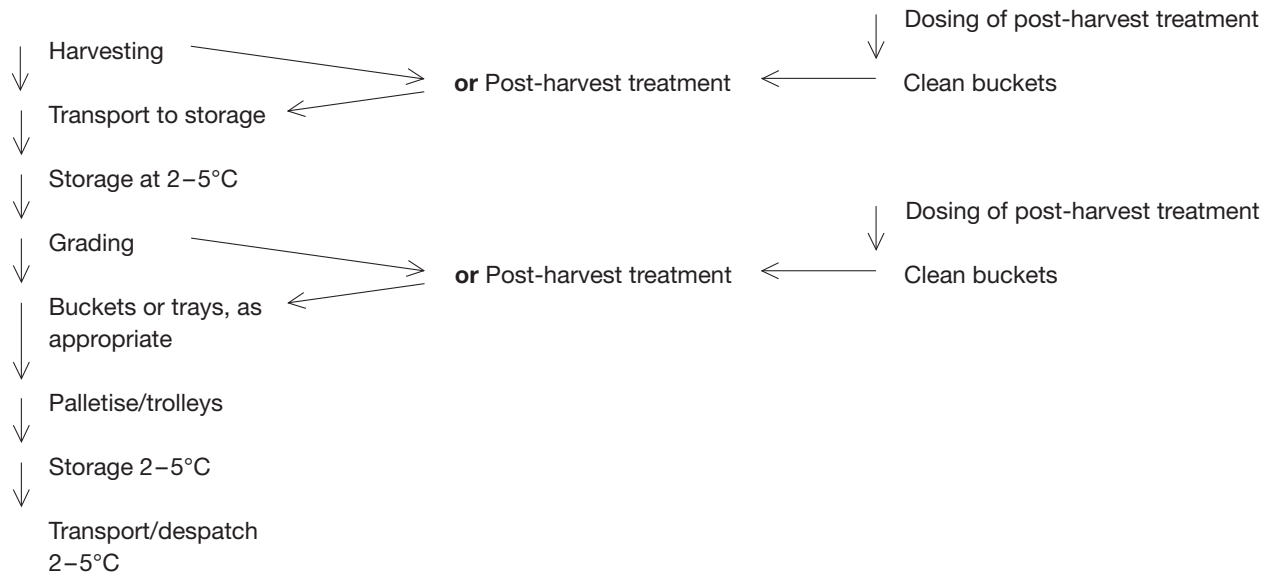
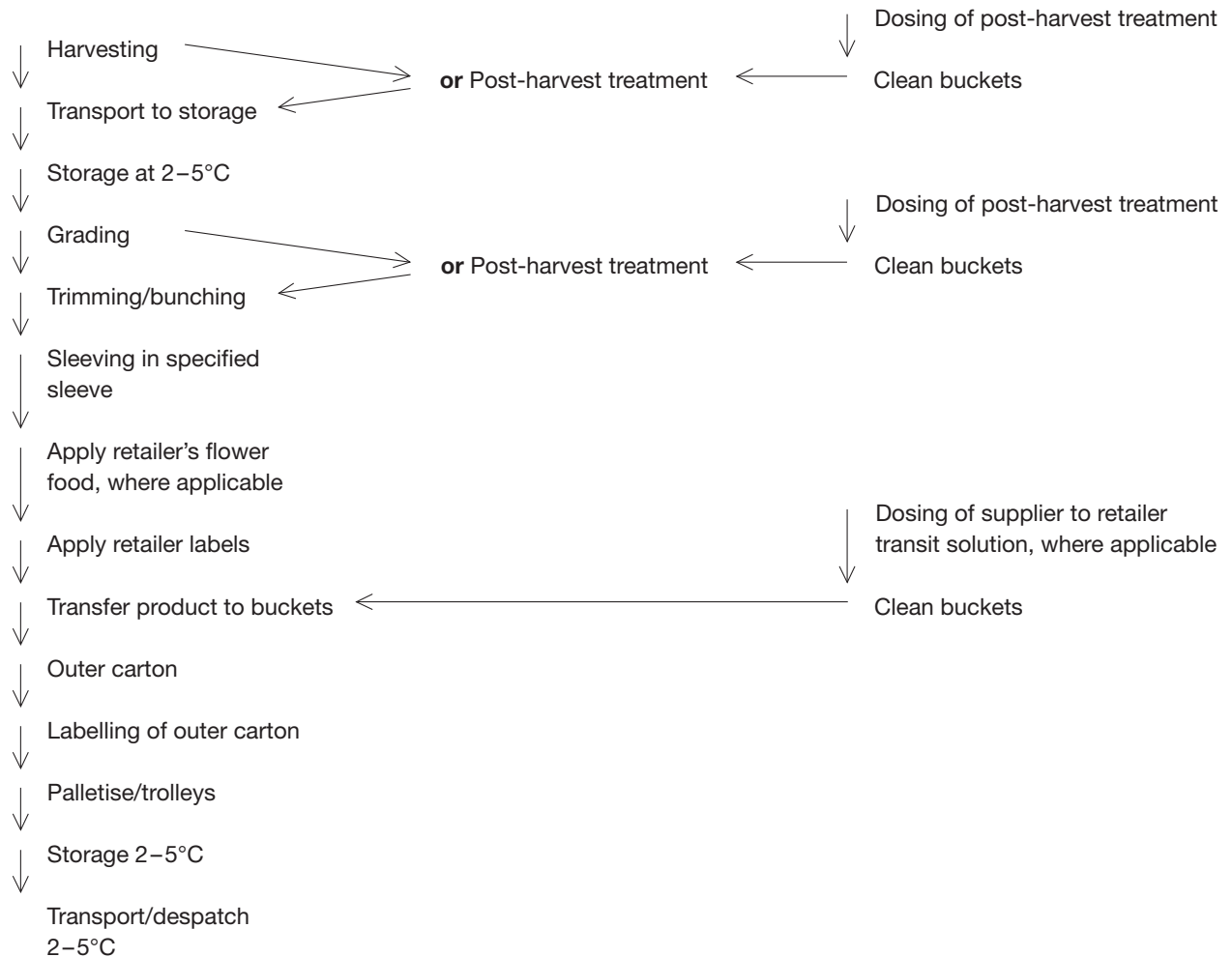


Diagram 2 Example of a process flow chart for cut tulips

This process flow chart shows the more detailed process for handling cut tulips where the grower is also sleeving and packing the product.



CCPs during the post-harvest handling of cut tulips

Temperature control and management

Good temperature management is fundamental in the post-harvest handling of cut tulips and is one of the most important CCPs. The following guidelines should be considered:

- Cool the cut tulips as rapidly as possible.
- Temperatures from ambient to chill need to be managed carefully.
- Consider pre-cooling to take the field heat out of a product before exposing it to cold store temperatures of 2–5°C, particularly at the end of the main UK cut tulip season, in late spring, when ambient temperatures can be unseasonably high.
- Where possible, harvest in the coolest part of the day.

- Store the cut flowers away from other external sources of ethylene (eg bulbs and vegetables).
- Identify the product post-harvest using traceability tickets, which include the harvest date.
- Ensure good stock rotation in the cold stores.
- Try to avoid moving the chilled cut tulips in and out of cold store. Alternating warm and cold temperatures may cause condensation and can lead to deterioration of quality.
- Tulips can also be susceptible to the effects of botrytis (*B. tulipae* and *B. cinerea*) post-harvest; this can be accelerated by temperature abuse and higher than normal levels of humidity. In addition, some varieties are more prone to attack than others, particularly those whose flower head sit low down in the leaves.
- Botrytis infection (spot/fire) will tend to show itself as small spots on the flower head and leaves (Figure 3);

once allowed to establish during growing this will become worse throughout the post-harvest life.

Water loss

Water loss is a major cause of deterioration of cut flowers post-harvest and should be carefully managed.

- Minimise the water loss from the harvested stems. Rapid water loss will lead to stress and wilting.
- Breezy harvesting conditions outdoors will increase water loss, and should be taken in to account when handling the outdoor grown cut tulips.
- Cut tulips can be harvested and stored dry or placed in a small amount of clean, fresh water or a post-harvest treatment.
- Tulips can be harvested with the bulb left on, which will reduce moisture loss, and stored upright prior to processing.



3 Botrytis infection on cut tulip petals

- Some growers have found that cut tulips stored upright, wrapped in paper and placed in buckets with a small amount of water or post-harvest treatment tend to keep better than those laid flat in plastic trays.
- Tulips are geotropic and if stored, dry and flat in trays for any length of time the stems will start to bend upwards, growing away from gravity.
- Refrigeration units in cold stores remove moisture from the air. The ideal relative humidity for cut flowers in storage is 85%–95%.
- Avoid placing the cut tulips directly beneath cold store refrigeration units to reduce their susceptibility to water loss, especially stems stored dry.

Post-harvest treatments

The correct usage of post-harvest treatments may prolong the life of cut tulips. The majority of cut tulip varieties will benefit from a post-harvest treatment.

- The specialist cut tulip treatments that contain natural hormones and growth regulators: prolong vase life; reduce the continued stem elongation seen once the tulip has been harvested and placed into water; reduce leaf yellowing; and maintain the flower petal colour for longer. Table 1 lists available post-harvest treatments for cut tulips.
- Cut tulips placed in mixed bouquets will tend to grow and extend above the other bouquet ingredients if untreated with the specific post-harvest treatments.
- Some end consumers may prefer the more 'natural'/'wild' look that the tulips take on when not treated, this is the choice of the retailer and their end consumer's preferences.
- The best treatment to be used to maximise the life of tulips will depend on which forcing regime they have been produced from.
- Any post-harvest treatment used must be registered for use in the country of application and any destination country.



4 Cut tulips upright, wrapped in buckets (top) and tulips dry, flat in trays (bottom)

- Post-harvest treatments must be dosed correctly.
- The most common method of dosing liquid products is a dosatron, but other products come in the form of tablets, labels and T-bags. Table 2 lists post-harvest treatment measurement devices.
- Dosatrons must be regularly calibrated and maintained to prevent clogging.
- Do not mix old solution with freshly prepared solution.
- Health and safety issues must be considered when handling and storing the products being used.
- Always follow the manufacturer's guidelines.
- Any unused post-harvest treatments must be disposed of correctly, and the manufacturer's guidelines followed.



untreated

Hygiene

Good hygiene control throughout the post-harvest handling process is very important. Each stage in the process should be considered, and a hygiene management plan will help to maintain good practices. The following areas should be considered and are covered in more detail in HDC Factsheet 24/05:

- Harvesting debris
- Containers and harvesting equipment
- Water quality
- Cold stores
- Vermin control
- Staff protection



treated

5 'Monte Carlo' tulips after 7 days in the vase: top placed in water only; bottom placed in cut tulip post-harvest treatment

Table 1 Post-harvest treatments for cut tulips

Post-harvest treatments available	Action of post-harvest treatment required
Floralife H100	Aids rehydration and inhibits bacterial growth
Pokon & Chrysal BVB plus	Reduces leaf yellowing and inhibits stem growth
Vitabric TPT	Reduces leaf yellowing and inhibits stem growth

- The treatments suggested are those recommended by the post-harvest treatment manufacturers
- Where products have been suggested that result in different post-harvest actions it is advised that the grower trial the different solutions in order to obtain the best resulting post-harvest performance
- The product examples listed are not exhaustive and no criticism is implied of products not included

Table 2 Measuring the dose of post-harvest treatments

Product being dosed	Measurement device
Floralife H100	pH strip to confirm the required pH
Pokon & Chrysal BVB plus	<ul style="list-style-type: none"> • For solution TracyFlor FS01 Machine • For T-bag – visual check to confirm presence
Vitabric TPT	Detected using Vitabric tracer detection system

Further information

On how to HACCP

Codex Alimentarius Commission
www.fao.org/es/ESN/food/quality_haccp_en.stm

Codex Alimentarius – Food Hygiene – Basic Texts. 2nd Edition. 2001. ISBN 92-5-104619-0

How to HACCP. A Management Guide. Mike Dillon and Chris Griffith. 3rd Edition. 2001

Post-harvest treatments

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Additional information: