

# Cool chain management for cut flowers

*The price of a cut flower is determined by its quality at point of sale, not at harvest. To reduce the risk of flowers losing their value, the temperature factor must be carefully considered.*

By Jeroen van der Hulst

**A**ny form of reduction in cut flower quality after harvest up until their arrival in the market lowers the potential price for the grower. At the same time, it is a period when flowers can be subjected to severe maltreatment in the form of grading, bunching, packing, storage, transport and unpacking. Transportation conditions, particularly, can lead to quality problems, e.g. damaged flowers, bent stems, uneven opening and botrytis, with the temperature often being the most important factor for optimum quality control.

## Frequent problems

Just by looking around at roses moving through an auction,

common quality problems seen in bunches, which have been in transport or storage for two or three days, are uneven ripening, some bent stems, botrytis and damaged flowers. Quality controllers at the flower auctions put a remark on these flowers when they are sold. A minor quality remark will lead to a decrease in price of 5-10%. Two minor remarks, or one major remark, can lead to a decrease in price of 20-50%.

What can this mean to the grower? As an example, the average price for 50 cm sweetheart roses, Frisco, is €0.10 per stem. The turnover for a lot of 10,000 first quality stems can be €1000. The net return for



*The transport of cut flowers must be managed carefully to reduce the risk of quality problems at the point of sale.*

the farm is €500, supposing that the cost for transport, unpacking and auction commission is €500. When a lot is sold with a quality remark 'uneven flowering' or 'few bent stems', the price automatically drops 10%, resulting in a turnover of €900. Hence, one minor quality problem quickly changes the grower's earnings and two minor, or one major, quality remark can sometimes even lead to a negative return over production cost.

## Temperature related

High temperatures are not always the reason for the common quality problems. Bent stems, for example, mainly result from horizontal trans-

port, while botrytis is caused from the germination and infection with botrytis spores. Typical of situations involving living organisms, however, higher temperatures will tend to encourage these problems to develop faster.

Most flower shipments arriv-

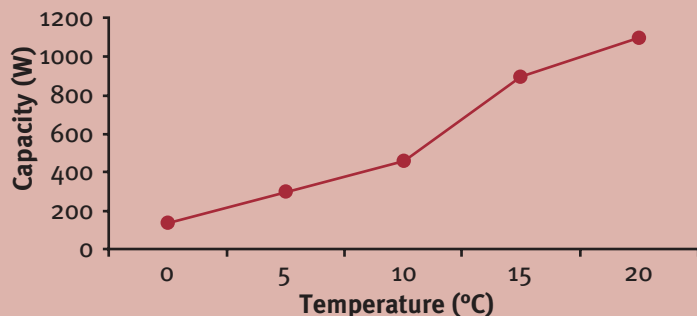


*Bent stems in rose bunches are a common quality problem.*

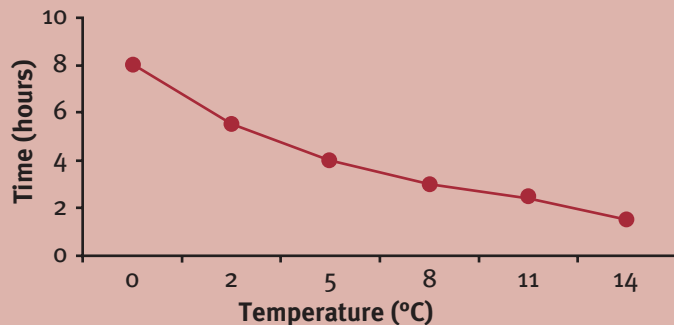


*Uneven flowering receives a price penalty.*

**Figure 1. Heat production per 1000kg of flowers.**

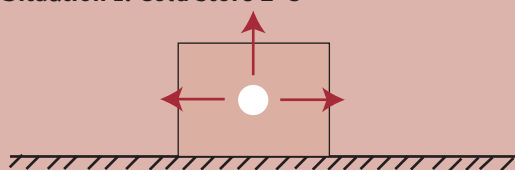


**Figure 3. Time taken to increase by 1°C.**



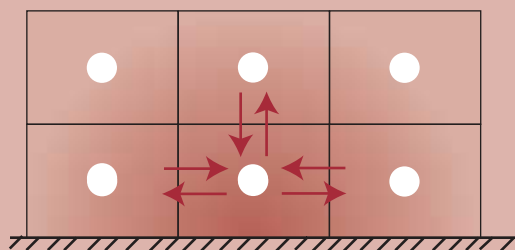
**Figure 2. Heat dissipation varies in storage situations.**

**Situation 1: Cold store 2°C**



Note: A single box in a cold store can release its own heat into the surrounding cold air.

**Situation 2: Cold store 2°C**



Note: A number of closely packed boxes insulate each other and the heat produced naturally by the flowers steadily raises the temperature.

ing in the Netherlands from Ecuador or Kenya arrive at 10-15°C. Temperatures can occasionally be somewhat higher, between 15-20°C or even above. Flowers arriving at temperatures between 15-20°C are usually subject to one or more of the aforementioned quality

remarks. At temperatures above 20°C, the foliage of the flowers can easily turn brown - leaving the flowers with no value at all.

**Reasons obvious**

There are the obvious reasons for temperature increases in

flowers. It can simply be due to incorrect temperature settings in cold stores, or warm conditions during transport in the aeroplanes. Perhaps there are high temperatures when loading and unloading of the trucks or aeroplanes takes place. The flowers may also be packed, distributed or unpacked in areas that are too warm.

Meanwhile, consideration should also be given to the heat produced by the flowers themselves. Flowers are living organisms and breathe oxygen and burn their carbohydrate reserves to stay alive. This process generates heat as a waste product (Figure 1). Generally, the amount of heat generated by a single bunch or a single box of flowers is very small; the cold air in a cold store easily absorbs it. However, stacked flower boxes, for example on aircraft pallets insulate each other. The boxes in the middle give off their heat to the surrounding boxes, which return their own heat to the boxes in the middle (Figure 2). This leads to a steady increase in temperature.

The rate of heat production

by the flowers also increases at higher temperatures. Flowers at 10°C produce twice the amount of heat compared to flowers at 5°C. This means that the increase in temperature of cut flowers positioned inside an aircraft pallet is nearly twice as fast at 10°C compared to 5°C (Figure 3).

**Improvement targets**

Knowing the reason for the increase in temperatures provides the opportunity for improvement, where every link in the cool chain has to be prepared to take responsibility for optimising the conditions under which the cut flowers are kept. Some suggestions are:

- Every link in the chain should maintain the same temperature.
- Growers should deliver the flowers to the airport as cool as possible.
- Handling agents should prevent any rise in temperature.
- Airlines must cool the flowers during transport.
- Importers and auctions should break down aircraft pallets upon arrival. ■