

## Short Communication

# Field survey of postharvest handling of cut flowers produced in the Up country of Sri Lanka for the local market

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## ABSTRACT

Cut flowers produced for the local market come mainly from the Up-country region of Sri Lanka. Using a questionnaire, a field survey was carried out to find out information on aspects of postharvest handling and postharvest losses in Up-country produced cut flowers supplied to the local market. Forty-seven personnel involved in the cut flower handling chain in and around Nuwara Eliya town, Ragala, Bandarawela and Kandy were interviewed. A variety of postharvest problems related to Up-country cut flower production were identified. Inadequate knowledge on proper pre- and postharvest handling methods among the majority of farmers and sellers contributed largely to considerable postharvest losses in cut flowers.

**Key words:** postharvest, packaging, transport, maturity

## INTRODUCTION

Since the beginning of floriculture in the 1970s largely for the export of cut flowers and live plants (Dhanasekera, 1998), the cut flower industry in Sri Lanka has faced both pre- and postharvest problems in both export and local markets. Under the cool climatic conditions prevailing in the Up-country, temperate cut flowers such as alstroemeria (*Alstroemeria sp.*), arum lilies (*Zantedeschia aethiopica*), daisies (*Chrysanthemum frutescens*), gerbera (*Gerbera sp.*), roses (*Rosa sp.*), baby's breath (*Gypsophila sp.*), super daisies (*Chrysanthemum sp.*), statice (*Limonium sinuatum*), Madonna lilies (*Lilium candidum*) and golden rods (*Solidago sp.*) are grown successfully in small and medium scale flower nurseries in Nuwara Eliya, Sita Eliya, Hawa Eliya, Boralanda, Black pool and Ragala areas. Few cut flower types, especially arum lily is found in the wild in marshy lands at Ambewela and Top-pass area.

As the day temperature in the Up country ranges from 12–20 °C and the relative humidity from 75–95% (Department of Meteorology, Sri Lanka, Statistics, 2006), harvested flowers could be kept without special postharvest treatment up until they are loaded for transportation. As a result, cut flower producers

rarely practice correct postharvest techniques during handling and transport leading to postharvest losses. A survey was carried out to gather information on current postharvest handling practices of cut flowers produced in selected areas of the Up country region.

## MATERIALS AND METHODS

The survey was carried out from November 2005–April 2006, and included 47 personnel involved in cut flower production in Sita Eliya, Hawa Eliya and Black pool area and a fewer number of producers in Ragala and Bandarawela areas. Wholesale/retail and 'retail only' shop owners scattered in Nuwara Eliya and Kandy were also interviewed.

Field visits were made to nurseries, packing stations, wholesale/retail shops and 'retail-only' shops. Information on postharvest practices was gathered using a questionnaire which included producers' name, location, items produced, demand for each item, including harvesting details, mode of transport from field to pack house, cooling conditions adopted, packing house operations, storage conditions, packaging, postharvest losses due to diseases and damages, special postharvest treatments,

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preventive measures for rejection, mode and conditions for long distance transport, quality and shelf life of each item.

## RESULTS

Fifty three percent of the total number of personnel surveyed provided information on the postharvest handling chain while 81% provided information on harvesting.

### Harvesting

Data were collected on three main aspects during harvest; (i) harvesting maturity, (ii) harvesting time and (iii) harvesting technique. Harvesting is done by either out-collectors or growers. Collectors harvest flowers from small-scale growers while large-scale growers use their employees to harvest flowers for regular orders by customers. It was evident that harvesting of flowers at proper maturity stage was done mainly through experience and sufficient consideration was not given for the time of harvest within the day. However, early morning harvesting (between 6.00-9.00 a.m.) was evident with relatively high valued flowers like rose and gerbera.

### Harvesting technique

Most cut flowers are harvested manually and some including roses are harvested using simple tools like secateurs or knives. Alstroemeria, arum lilies, daisies and gerbera are harvested by pulling out from the bottom end of the stalk. Gerberas are harvested mostly by twisting the stem off near the point of attachment to the rhizome. Flower pickers in the Up-country never use a disinfectant to clean the harvesting tools in the field.

### Postharvest practices

Postharvest practices include transport of cut flowers from field to pack-house, pack-house operations (trimming, sorting and grading, postharvest treatments, packaging), storage and long distance transport. It was found that the flowers are sorted and selected by the pickers even at the time of harvest, to minimize rejection at the florists' level. At small-scale cultivations the cut end of flower stems are washed just after harvest in the field using tap water, well water or water obtained from nearby streams. Flower stalks are washed by holding the cut end of the stalk in running water. However, sufficient care is not taken during cleaning and washing and about 5–6% rejected

in the field in the case of alstroemeria, rose, daisy and gerbera.

In harvested alstroemeria, arum lilies and daisies, the cut ends are exposed to air during transportation to the pack-house. About 15%-20% of large scale growers harvest roses and gerbera into buckets with tap water and transport them to the pack house. The pack house for small-scale growers is usually the retail or wholesale shop located in town. They transport the harvest by motor-bicycles, small trucks or by bus as tight bundles of mixture of flowers, with cut ends exposed to the air.

When the fresh flowers reach the pack house, they are transferred into buckets containing water. Trimming of stems is done at the pack house to get a uniform length in a bundle, although it is not done under water. Alstroemeria, daisy, lily and gerbera are trimmed with an ordinary knife to get specified lengths according to customer requirements. Very little attention is paid to sanitation in the pack house including the utensils and tools used. Flowers are trimmed, graded and sorted according to customer-requirement (e.g. alstroemeria with all florets fully opened, half opened or starting to open; arum lilies with closed spadix, slightly opened spadix; daisies with 15–18 inches long stalks, etc.), disease incidence, physical damages, insect attack, etc. Some parts of cut flowers, including unnecessary leaves are removed during sorting if they are not needed in floral arrangements. After the grading procedure, flowers are kept in buckets of tap water until they are packaged for transportation. In the pack house, 2–5% of the harvest is discarded during the above process. After grading, cut flowers are packaged without giving any special postharvest treatment, apparently due to additional cost involved and lack of concern about the quality. However, for roses, cut ends are covered with wet cotton-wool plugs before packaging. Application of floral preservatives (usually as a chemical spray) could be seen only at wholesale + retail shops located away from the Up country areas.

Special cooling systems are not adopted (cold rooms or air conditioned rooms) during the handling of Up-country flowers in the pack house, and flowers are kept exposed to air until they are packed to be transported. This may probably be due to relatively low temperature prevailing in the Up-country. Only about 41% of the personnel involved in the survey took measures to reduce the field heat at the pack house by leaving cut ends of stalk immersed in a bucket of tap water.

Almost all large-scale cut flower producers have their own pack houses located close to the field. Packaging and further storage is done under ambient environment conditions. About 20–25% cut flower producers use corrugated fiberboard (CFB) boxes as the packaging device for long distance transportation of less valued varieties such as alstroemeria, daisy and lily. A variety of cardboard boxes used for other purposes are used to transport less valued varieties. About 70–75% of the total surveyed, use the conventional ‘bamboo-cage’ made up of readily available raw material in the area, as the packaging device for many types of cut flowers. CFB boxes, exclusively designed to transport cut flowers are used by large-scale growers to pack relatively high valued varieties like roses and gerberas. During packaging, about 10–25 flower stems are packed into a small bundle, covered with newspaper and arranged inside the cage by placing Cyprus (*Cupressus* spp.) leaves and newspaper in between. Most often mixture of flowers is packed in a bamboo basket by wholesalers according to customer requirement.

No cold room or air-conditioned room facilities are used for storing of packaged cut flowers until they are transported. The packages are stored inside pack-houses or in the railway station until they are transported by train. The most common mode of transportation is by train. About 17% of large-scale growers use other methods (cooler trucks, air conditioned vehicles under 10–20 °C temperature) as well for high priced cut flowers such as roses and gerberas. No artificial cooling systems are used during transport by train.

#### **Problems encountered during postharvest handling**

Postharvest problems like wilting, discoloration are common to all Up-country cut flowers. These problems are clearly seen at the florists’ level at hot humid destinations in the island such as Colombo, Kandy, Negombo, Chilaw and Kurunegala.

## **DISCUSSION**

Up country cut flower market is dominated by small-scale growers who have land and experience with vegetable cultivation. The average day temperature (12–20 °C) and relative humidity (75–95%) prevailing in the Up country area of Sri Lanka is quite suitable for the growth of majority of temperate cut

flower types and also for the tropical cut flower types like gerbera.

The stage of maturity of cut flowers is very important for their postharvest life (Armitage, 1991). Harvesting maturity greatly depends on customer requirements, duration of transit and the variety/cultivar (Reid, 2004). Although for most of the cut flowers harvesting is recommended in the morning or evening, two main reasons have been identified for deviation from the above recommended times for harvesting; the variation in demand and the insufficient knowledge of producers/pickers on the effect of harvesting time on cut flower longevity. Lack of sanitation practices during harvesting also may lead to free entry of pathogenic microorganisms (bacteria and fungi) into the cut stalk, resulting severe postharvest loss (van Doorn *et al.*, 1995).

Physical damage due to careless handling at all stages from harvest to consumer and lack of cold chain management during storage and transportation could be considered as the major factors contributing to postharvest losses of the Up country produced cut flowers. Packaging of a mixture of cut flowers in a single pack was a common practice among Up country flower producers, which may also lead to fast senescence of ethylene sensitive flowers when they are packed along with ethylene insensitive, but ethylene emitting flowers, a common phenomenon known as ethylene cross contamination (Kader, 1992). Although it is a common practice to use ‘used CFB boxes’ and ‘bamboo-cages’ by small scale producers, their effect on postharvest life of cut flower produce is not yet known.

Currently, there is no proper program in the country to make the flower producing groups aware on cut flower handling. According to the current system in the Up country, the flower producers are not accountable for the quality of flowers that reach their destinations. The above problems highlight the need for a proper mechanism to educate personnel involved in the cut flower industry that includes modern, reliable and cost effective postharvest handling techniques for high quality cut flower production in the Up country of Sri Lanka.

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