

# CHARACTERIZATION OF POSTHARVEST HANDLING CHAINS OF CUT ORNAMENTALS AT EXPORTER SITES: A CASE STUDY FROM THE WESTERN AND NORTH WESTERN PROVINCES OF SRI LANKA

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## INTRODUCTION

The export-oriented floriculture industry in Sri Lanka earns foreign exchange and generates employment. Sri Lanka earned US\$ 14.8 million worth of foreign exchange by exporting floricultural products in 2011, which is a 9% growth over the year 2010 figure (Anon, 2011). However, Sri Lanka's share in the world market is 0.1% (Anon, 2011). The country's diverse agro-climatic conditions can accommodate a range of tropical, subtropical and temperate species of ornamentals (Niranjan and Gunasena, 2011). However, the failure to meet expected quality standards in cut ornamentals is an obstacle in expanding this profitable industry (Anon, 2012). Insufficient quality management or improper actions at different stages of handling cause a loss of quality of the products. Compared to pot plants and rooted stems, cut flowers and foliage are more vulnerable to postharvest quality deterioration. Handling practices adopted from harvesting onwards can have a significant impact on the end-user life of cut ornamentals (Van Doorn and Tijskens, 1991). Therefore, this study was conducted with a view to understanding the handling chains involved in the export of cut ornamentals and the associated postharvest problems along the chain. The objective was to recognize areas for quality improvement in order to enhance the postharvest performance of cut ornamentals exported from Sri Lanka.

## METHODOLOGY

The Western and North Western Provinces, due to their favourable logistics, have become the major location for export floriculture firms. A sample of 33 exporters registered under the Sri Lanka Export Development Board (SLEDB) and whose production nurseries have been located in the Western or North Western Provinces, were therefore, selected for the survey which was conducted from January – May 2013. Data were collected using a structured, pre-tested questionnaire and face-to-face interviews. The information collected included, but was not limited to main products and their origin, quality of supplies, pre-treatments, postharvest handling practices, species-specific postharvest problems, financial and marketing aspects, sanitation and consumer satisfaction. Data were analyzed using STATA (StataCorp, USA) program.

## RESULTS AND DISCUSSION

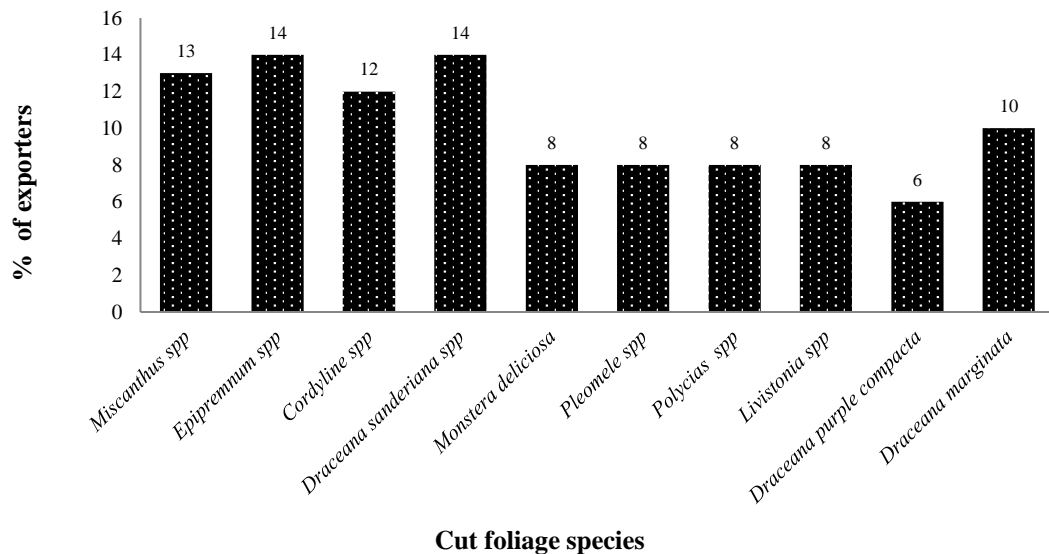
The results revealed that, out of the total range of products, 60% of cut decorative leaves, 32% of unrooted cut stems with leaves and 8% of rooted stems of products were exported to the international market. Cut flowers were rarely exported by the companies in the sample because the products failed to meet international quality standards and also because of the high cost of *production involved*. Out of the total production 89% was exported to the international market while only 11% was sold in the domestic market. The majority of the respondents (14%) exported *Epipremnum* spp. and *Dracaena sanderiana* followed by *Miscanthus* spp. (13%) and *Cordyline* spp. (12%) (Figure 1).

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Exporters had different systems of obtaining products. Eighty one percent of exporters obtained products from outside growers. However, exporters revealed that the products from outside growers rarely matched the required quality standards. Among the outside growers, 83% cultivated plants in open fields without providing artificial shade in the form of net houses or poly tunnels. Only 16% of growers grew plants under shade nets.

A majority of the outside growers (92%) used soil while 8% of them used a potting medium with coir dust and compost added to the soil. Approximately 78% of the exporters obtained products from their own nurseries. 82% percent of exporters stated that the products obtained from owned nurseries were ‘excellent in quality’ while 18% mentioned that they were ‘good in quality’.



**Figure 1. Major species of cut foliage exported.**

Harvested cut foliage and stems were delivered to the export companies by the outside growers without subjecting them to any special postharvest treatment with preservatives. About 98% of outside growers delivered their harvest by public transport (*e.g.* by bus) or by private transport systems such as motor-bikes and small trucks without maintaining the cold chain. Only 2% of growers used refrigerated transport systems particularly for *Codiaeum* spp., *Aglaonema* spp., *Calathea* spp. and *Philodendron* spp. A majority of the outside growers (81%) did not use proper packaging to deliver the harvest to the exporters. They packed cut foliage as tight bundles. Only 19% of outside growers used a proper packaging system consisting of plastic containers. Products below the export quality standard have been rejected at exporter sites (Table 1). About 33% of exporters had rejected 20% of outside supplies per month (Table 1). Major reasons for rejection were: products not in the right stage, improper colour, wilting, pest and disease problems and mechanical damages during transport. Non-uniformity of the growing environment, sub-optimal light levels and crop management practices could have resulted in improper colour of foliage products and pest and disease problems. Inappropriate packaging leads to mechanical damages while dry and non-refrigerated transport systems result in wilting problems due to water loss coupled with product energy depletion.

Cut foliage should be harvested during a cool part of the day so that their metabolic rate is low and removal of field heat is less difficult. However, in most of the nurseries (93%), harvesting was not done at specified times of the day. Cut stems were trimmed, graded and sorted according to customers’ requirements, to eliminate diseases incidence, physical damages and insect attacks. Seventy nine percent of exporters did not use any pre-treatments to extend postharvest life. Only 21% exporters used treatments solely to control pests and

diseases. Sixty seven percent of exporters used pre-cooling systems, which consisted of walk-in cold rooms, before dispatch. There were incidents of damage due to over cooling during cold storage. Yellow patches, wilting, and blackening of leaf margins were the most common symptoms. However, 33% of exporters did not practice pre-cooling as their nurseries and packing houses were in close proximity to the airport. Nonetheless, pre-cooling is an essential practice to extend the longevity of fresh horticultural produce. It is important to identify the best range and duration of cool storage for different species to avoid low temperature injury.

**Table 1. Frequency of rejecting the supplies provided by outside growers at the exporter sites.**

Rejections/Month (%)	Exporters (%)
< 5	26
5	9
10	8
15	8
20	33
30	13
35	3

The majority of the exporters (77%) used dry packing system and 22% of exporters used wet packing, *i.e.* wet cotton wool soaked in water is kept at cut stem-end. All exporters used corrugated cardboard boxes as the primary package. Seventy three percent exporters delivered their products to the airport using normal temperature transport systems while only 27% used refrigerated trucks. Frequent rejections and complaints have been received from foreign buyers. Major complaints were revealed to be over-cooling or heating damages, low quality packaging materials, long internal transport, and damages during transport, wilting problems and low quality products. Wilting problems at the end-user could be caused by poor water status of the cut stems.

## CONCLUSIONS/RECOMMENDATIONS

The sub-standard quality of supplies from outside growers, inappropriate packaging and transport methods, failure to maintain cold chain throughout, damages caused by extensive security checks at various points have caused quality loss of produce. Moreover, non-adoption of postharvest treatments to improve water status of cut stems and foliage could have a negative impact on their end-user shelf life. Postharvest pulse treatments with surfactants (wetting agents) and preservatives, applied before dispatch can improve the water status of cut stems. The quality of products degrades due to inappropriate handling practices by the workers. Frequent supervision and providing necessary skills to the workers would minimize that problem. The results of this study indicate areas for quality improvement in handling chains at exporter sites. Further research will estimate the end-user life of a range of cut ornamental products after simulated export.

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