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SERVICE QUALITY IN LOGISTICS AND TRANSPORT OF FLOWERS AND LIVING PLANTS

KVALITA SLUŽIEB V LOGISTIKE A DOPRAVE KVETOV A ŽIVÝCH RASTLÍN

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Summary: High sensitive commodities quality assurance is presently more difficult task for transport, storage and maniplation activities than for individual producent. This report shortly describes the principles that should be keept in logistics activities and transport of living flowers and plants. Because of their characteristics they belong into pervertibel goods.

Key words: Flowers, living flowers, followed temperature, flowers and plants package, flowers and plants storage, flowers and plants transport.

Anotace: Zabezpečenie kvality vysokocitlivých komodít je v súčasnosti oveľa zložitejšou úlohou pre dopravu, skladovanie či manipulačné činnosti ako pre samotného producenta. Príspevok stručne opisuje zasady, ktoré by mali byť dodržiavané pri logistických činnostiach a preprave živých kvetov a rastlín. Svojimi vlastnosťami totiž patria medzi rýchloskaziteľný tovar.

Klíčová slova: Kvety, živé rastliny, sledovaná teplota, balenie kvetov a rastlín, skladovanie kvetov a rastlín, preprava kvetov a rastlín.

1. INTRODUCTION

Slovakia is not a country well-known through plants and flowers production. In the statistic of foreign trade, which is lead by Statistic Office of Slovak Republic, is following the price development in foreign trade with flowers and living plants a part of the chapter 06 of harmonised system. The chapter Nr. 06 in the price indexes in foreign trade is named: Live trees and other plants; bulbs, roots and the like; cut flowers and ornamental foliage. Even though that the Statistic Office of Slovak Republic follows a movement of this commodity, in resulting reviews the chapter Nr. 06 is absent, because the export of flowers and plants from Slovak Republic is very small in numbers.

In spite of various florists´ the interest in stocking, packaging and transport of this sensitive good is not markedly kept. As a mode of transport is the road transport expressly dominant in

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Slovak Republic, in Bohemia and in all the Europe. It is because of road transport disposition for refrigerating vehicles of all measures.

The figure Nr. 1 shows most frequent way of packaging of living flowers during transportation.

Zdroj: [www.holsteinflowers.nl/afbeeldingen/DSC00924.jpg]

Fig. 1 – Packaging of living flowers during transportation

2. HOW TO KEEP A QUALITY OF FLOWERS AND LIVING PLANTS DURING TRANSPORTATION

There are many studies that are aimed on quality aspect by transport of flowers and living plants abroad.

According an New Zaeland´s study of scientists from Auckland HortResearch Institute temperature is the major factor affecting the storage and vase life of flowers.

This is through its influence on the respiration rate of the flowers, and their response to ethylene, moisture loss and physical damage. Cooling is also necessary to reduce other metabolic activity, and to slow the rate of opening of the flowers.

The temperature of flowers and foliage at harvest is normally close to that of the ambient air. At this temperature, respiration activity is very high, and storage/vase life will be very short. Therefore it is always best to harvest flowers during the cooler parts of the day, either early morning or late afternoon. As a general rule, the faster field heat is removed from the flowers, the longer will be their storage potential. [1]

The first problem that is much discussed is a length of time necessary for the transport chain from the producer to a customer. For example a study named "Transportation costs of fresh flowers: a comparison across major exporting countries" by the Centre for Transportation Policy, Operations, and Logistics in George Mason University studied a supply chain of transportation of flowers from Ecuador – one of the biggest flower producer in the world.

Given the lack of data on incremental value contributed by each member of the flower supply chain, here an effort is made to complement the analysis by offering insight into the variability in the length of time flowers remain with each member of the supply chain. With the goal of obtaining as much consistency as possible in the data, a questionnaire was sent to the individuals responsible for operations at major cargo agencies in Quito, and their responses were used to fill in some of the blanks that emerged in the information found in published sources.

Table 1 provides a summary of the amount of time that a shipment of flowers spends under the control of different supply chain members. In terms of the variation in the time used for each process, it is apparent that producers' demand for reliability and adequate interface with other modes has clearly not been met. From the moment of harvest until the time the product arrives to the U.S. retailer, the trip can take anywhere from 44 ½ hours to almost 13 days. Assuming that roses can last up to 14 days in good condition if handled properly after harvesting and a modest retail shelf life expectancy of seven days, it is reasonable to state that from the seventh day in transit onwards, the cost of time increases as each additional travel day lowers the quality and consequently the price of the product. [3]

Tab. 1 - Potential to Affect Quality throughout the Supply Chain

Process	Time	Potential to affect quality
Post-harvest on farm, Ecuador	4 - 8 hours	Medium
Storage on farm	12 - 72 hours	Low - Medium
Transportation to cargo agencies	1 - 6 hours	Medium
Storage at cargo agency	4 hours	Low
Palletizing, Quito	6 hours	Medium - High
Customs clearance, Quito	0.5 hours	Low
Loading to aircraft, Quito	1 - 2 hours	Medium - High
Flight UIO-MIA nonstop	4 hours	High
Customs clearance, Miami	4 - 12 hours	Low
Depalletizing, Miami	2 - 4 hours	High
Storage at cargo agency, Miami	4 - 72 hours	Low - Medium
Transportation to U.S. retailer	2 hours - 5 days	Medium

Source: [3]

The time lengthening of plant or flower delivery from grower to the customer is not the only problem that is related to this specific transport. The quality of this good is beyond dispute influenced by suitable transport vehicle solution or the necessary transport conditions observance, e. g. suitable packaging, palletizing, constant temperature keeping, flowers of plants nutrition…

Temperature directly affects the respiration rates of cut flowers and foliage. Respiration is a complex process involving many enzymatic reactions. The rates of these reactions, within the normal physiological temperature range, increases exponentially with increase in temperature. In fact, between 0 and 20°C, respiratory activity of carnations can increase 25 fold. Below or above the limits of this range (which will be different depending on particular flower crop), activity falls off due to a decline in enzyme activity. [1]

In Holland which is world greatest exporter of living plants and flowers these goods are testing to define the conditions when are able to keep fresh as long as possible. This testing is operated with the VBN organization (the Dutch Flower Auctions Association) what is the umbrella organization for Dutch cooperative floricultural auctions. At the enclosure to this paper can you see an example of VBN standard – concrete a VBN standard sales simulation for cut flowers

Tab. 2 - Optimum storage temperatures (°C) of some flowers

Flower crops	**Optimum storage temperature (°C)**	**Ethylene sensitive (Y/N)**
Acacia spp.	0.5 *	N
Anthurium	> 13	Y
Aster	0 - 2	Y
Bouvardia	> 10	N
Dahlia	2 - 5	Y
Delphinium	2 - 5	Y
Chrysanthemum	0 - 2	N
Dianthus (carnation)	0	Y
Freesia	2	Y
Gerbera	2	Y
Gladiolus	2 - 5	N
Gloriosa	2	N
Gypsophila	2	Y
Iris	0	Y
Liatris	5	N
Lilium	1	Y
Limonium (statice)	2 - 5	Y
Narcissus (daffodil)	1 - 2 **	N
Rosa hybrids	0 - 2	Y
Strelitzia reginae	> 7	N
Tulipa	2	Y
Zinnia	2 - 5	Y

* avoid changes in temperature ** keep separate from other flowers as exudate blocks stems

Source: http://www.hortresearch.co.nz/

There is no unified regulation that would regulate the transport of this commodity in compliance with recognized principles of the nature or living environment protection in Slovak Republic. The area of the flowers transport is related only to the Ordinance of Ministry of Agriculture of Slovak Republic from 27th January 1999 Nr. 2785/1998-100 about phytosanitarian conditions in import, export and transfer of plants, plant products, also the things what would be the harmful organism carriers. The Ordinance is aimed on phytosanitarian condition for import, export and transfer of plants, plant products and things what would be the harmful organism carriers' allowance.

For packaging and storage of flowers and plant is the ethylene origination very dangerous. Ethylene causes the reducing of freshness, longevity, blackening and colour lost of flowers. To avoid the possibility of this risk is important to keep ethylene sensitive flowers separately from ethylene-producing fruit, vegetables or foliage in coolstores. On the basis of research of scientists from Auckland HortResearch Institute were the optimal flower storage temperatures defined (see table 2). Most of flowers and plants are able to keep fresh in very low temperatures storage longer. The optimal temperature is from 0°C to 10°C. Is necessary to note that exotic flowers and plants is not suitable to make out to very low temperature.

3. PHYSICAL DAMAGE DURING STORAGE AND TRANSPORTATION

Indelicate handling with these sensitive goods could bring other negative effect. The flowers or living plants could be physically damaged, what is an indicator of low quality of provided services.

Incorrect storage and packaging can cause wounds and bruises to cut flowers and plants. Damaged parts may cause acceleration of decomposition through temperature increasing and ethylene production. Dangerous could be also violent temperature change for flowers and plants. In summer is necessary to keep flowers in refrigerators and in winter to keep away from freezing.

Source: http://www.flowercare.net/uitpakken.pdf

Fig. 2 - Packaging of flowers due the transport

Prompt cooling to low temperatures slows these processes, reducing the effects of physical damage. The best options of course are to ensure that systems are in place throughout the handling chain to reduce the likelihood of damage, and to ensure that no damaged product is packed. Harvesting during the hotter times of the day can lead to many quality problems, especially wilting of the flowers, accelerated opening and senescence, and damage to the buds, e.g. Oriental lilies can develop brown depressions on the top surface of the buds during storage if harvested during hot weather and placed immediately into the coolstore.[1]

The transport vehicle selection is also and important problem of living flowers and plants transportation. There are existing transporters in abroad that are specialized for transportation of these commodities. Here is the temperature during transport control necessary. The picture Nr. 2 shows and example of common packaging of flowers during a transport.

Presently more abroad studies are aimed on problem of keeping constant temperature during storage and transportation of flowers. Unfortunately, Slovak Republic is kept behind also in this area. The result of study named: “Quality flowers are cooled flowers” by New Zealand King Research Institute was the experimental definition of optimal storage time and an ideal storage temperature. In the table 3 is listed an example of some selected plants storage.

Tab. 3 - Optimum storage temperatures for selected cut flowers

Flower species	Storage temperature C°	Maximum period of storage	wet/dry
Astra	0-4	1-3 weeks	-
Chrysanthemum	1	3 weeks	-
Cyclamen	0-1	3 weeks	-
Orchid	5-8	4 weeks	-
Dahlia	4	3-5 days	-
Delphinium	4	1-2 days	-

Gerbera	4	3-4 weeks	wet
Gladiolus	2-5	1-4 weeks	dry
Freesia	0-0,5	10-14 days	-
Narcissus	0-0,5	1-3 weeks	-
Lily	0-1	4-6 weeks	dry
Rose	0,5-3	2 weeks	dry
Strelitzia reginae	8	4 weeks	-
Tulip	-0,5-0	2-3 weeks	dry
Zinnia	4	5-7 days	-

Source: www.crop.cri.nz

4. CONCLUSION

It is necessary to ensure the rapid cooling of packaged cut flowers, plants or foliage, excluding exotic plants in flowerpots. To keep defined temperatures it allows prolonging quality and vase life.

Freshly cut flowers and foliage are highly perishable and deteriorate quickly when exposed to unfavourable environmental conditions such as adverse temperatures. Any technology which ensures that cut flowers reach the required low temperatures as soon as possible, and also maintains these optimal temperatures, is of considerable benefit to people involved in their production and sale. Rapid cooling is therefore the vital first step in the coolchain of cut flowers [1].

Flowers and living plants are goods very sensitive for manipulation. Harsh manipulation causes damage which causes the ethanol production. Flowers and plants underlie to the prompt destruction. Using unsuitable temperature causes flowering, maturing, wilting and rotting. Good is unsaleable.

When the transport and logistic service providers want to reach the defined level of quality in the international trade with these goods, it is necessary to ensure the suitable transport units and vehicles with the controlled temperature. Because the transport and logistic firms are the members of supply chain in this trade, it is necessary to follow accurate instruction of flower and plant producer and sellers.

LITERATURE

[1] http://www.hortnet.co.nz/publications/hortfacts/hf305004.htm
[2] http://www.iadb.org/intal/aplicaciones/uploads/ponencias/Foro_LAEBA_2008_06_01_Paper_Vega.pdf
[3] http://www.vbn.nl/en/codes/sortingcodes/index.asp
[4] http://www.vbn.nl/en/overvbn/index.asp

[5] http://www.nt.gov.au/d/Primary_Industry/Content/File/horticulture/cut_flower/PAGES+FROM+TB293-CUTFLOWERS+TEMP+LOG.pdf

[6] KONEČNÝ, V.: Multikriteriálny prístup k realizácii hodnotenia kvality služieb v cestnej nákladnej doprave, In zborník prednášok z 5. vedeckej konferencie s medzinárodnou účasťou „Kvalita dopravních a přepravních procesů a služeb“, Pardubice 9. 6. 2004, ISBN 80-7194-675-3.

Enclosure: An example of VBN testing of cut flowers to define test storage and transport conditions

VBN standard sales simulation for cut flowers

1. Introduction

The standard sales simulation for testing the vase life of cut flowers was set up in consultation with the *Proefstation voor de Bloemisterij en Glasgroente* (PBG; Research Station for Floricultural Products and Glasshouse Vegetables) and the VBN Testing study group.

Chapter 2 outlines the general sales simulation. Chapter 3 provides a survey of the specific conditions for the ten most important cut flower products.

2. Sales simulation

From growers up to and including auctions

duration:	1 day;
temperature:	5 ± 1 degrees C (products sensitive to low temperatures 15 degrees C);
relative humidity:	80 ± 10%;
ethylene content:	at most 0.1 ppm;
light conditions:	dark;
packaging:	in accordance with the VBN product specifications;
transport conditions:	dry/in tap water, optionally containing pretreatment agent/bottle, depending on the product.

From purchasers to retail traders

duration:	4 days (except tulip and iris: 2 days);
temperature:	8 ± 1 degrees C (products sensitive to low temperatures 15 ± 1 degree C);
relative humidity:	80 ± 10%;
ethylene content:	at most 0.1 ppm;
light conditions:	dark;
packaging:	if packed, leave wrapped in sleeve; if unpacked, roll in paper or wrap in sleeve, then place in an appropriate box or container (see also the annex);
transport conditions:	dry/in tap water, optionally containing pretreatment agent/bottle, depending on the product;
vibration:	(optionally 1000 km transport)

Retail traders

duration:	2 days;
temperature:	20 ± 1 degrees C;
relative humidity:	60 ± 10%;
ethylene content:	at most 0.1 ppm;
light conditions:	12 hours light/dark, ± 13,5 µmol.$m^{-2}s^{-1}$, TL 84 (corresponding to 1.000 lux on table level);
packaging:	unpacked (see also the annex);
treatment:	In the case of dry transport, cut at most 2 cm from the stem and place in tap water in buckets/containers for 2 days. In the event of wilting leaves, first water the bunches in the sleeve; in the case of wet transport, transfer to buckets/containers containing tap water and leave for 2 days (do not cut);
bucket contents:	clean tap water, do not replace by fresh water.

Consumers

temperature:	20 ± 1 degree C;
relative humidity:	60 ± 10%;
ethylene content:	at most 0.1 ppm;
light conditions:	12 hours light/dark, ± 13,5 µmol.$m^{-2}s^{-1}$, TL 84 (corresponding to 1.000 lux on table level);
packaging:	unpacked in vases;
vase:	a vase with a height of at least one third of the stem length. Support flowers in a shorter vase.
vase contents:	tap water, optionally with cut flower nutrients as extra treatment.
treatment:	cut at most 2 cm from the stem and strip the leaves from the bottom part of the stem that will be submerged in the vase water before placing it in the vase.

The vase life is calculated from the moment that the flowers are placed in the vase.

Source: www.vbn.nl