A survey on the transport conditions and storage of roses (*Rosa* spp.) commercialized at CEAGESP flower wholesale in São Paulo City, Brazil[1]

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ABSTRACT

There is little information about the problems that occur in the commercialization of roses (*Rosa* spp.) in Brazil, especially those from postharvest management. There is scarce research about the conditions of transportation of roses from the farm to the market and their storage. This study investigated the postharvest conditions and commercialization of roses at CEAGESP (Companhia de Entrepostos e Armazéns Gerais de São Paulo) Flower Wholesale, especially the perception of the permission holders about the customer's profile and the main challenges faced by them in selling their products. A questionnaire was applied to 48 permission holders in order to understand the main issues in the rose supply chain, related to their commercialization: shipping, storage and origin, as well as the water quality in the flowerpot in addition to the measurement of the temperature of the water used in the marketing and the interior of the vehicle used for transport. Some bacteria species can obstruct the xylem of the cut flowers, reducing their longevity. In this way, the number of bacteria was estimated in the water where the roses were kept during the commercialization in the market place. Twenty-five samples (50 mL) from the water in the rose flowerpots were collected to estimate the number of bacteria. Serial dilutions of each sample were prepared to evaluate the bacterial population. The most commercialized rose varieties at CEAGESP Flower Wholesale are "*Carolla*" and "*Tinike*". The main postharvest disease observed in these roses was gray rot (*Botrytis cinerea*) and pest-mite (*Tetranycus urticae*). On average, water from deep wells (4.0 x 10^5 CFU mL^{-1}) had less number of bacteria than water river (5.15 x 10^5 CFU mL^{-1}) and tap water (1.0 x 10^6 CFU mL^{-1}).

Keywords: *Rosaceae; Colony-forming units; floral preservatives;*

1. INTRODUCTION

The floriculture is characterized by the cultivation of ornamental plants, cut plants (flowers and foliage), bottled plants, flower-producing or not, until the production of seeds, bulbs, palm trees, shrubs, tree saplings and other plants species (JUNQUEIRA and PEETZ, 2002). In Brazil, the production and utilization of flowers and ornamental plants have been expanding like the world market. Most Brazilian production is directed to the domestic market. In 2007, Brazil achieved a new record in exportation of flowers and ornamental plants, maintaining the performance that has characterized the sector since the early decade, when the foreign sales in the segment closed the year at US$35.28 million, resulting in a 9.18% increase over the previous year (IBRAFLOR, 2017).

The Rose genus, belonging to the Rosaceae family, presents about 200 wild species and more than 30,000 varieties, products of crosses, backcrosses and hybrid varieties that have made the rose tree, a temperate plant, adapted to the Brazil weather conditions (BOETTCHER, 1991). Brazil is an important roses producer, especially the states of São Paulo, Minas Gerais and Ceará, which exports roses to the Netherlands, the United States and Portugal (JUNQUEIRA and PEETZ, 2007). According to data from the main market centers, Brazilian annual production is estimated at 25 million dozen (TAKANE et al., 2007).

Internal and external markets require quality flowers with adequate longevity. Flowers are generally characterized as highly perishable products. Due to the ephemeral nature of the floral tissues, and the intense physiological processes, their quality is strongly dependent on postharvest management (NOWAK and RUDNICKI, 1990). The rose life is short, although it varies according to a series of pre and postharvest factors (TORRE and FDJELD, 2001). After harvesting, there are biochemical, physiological and structural alterations that lead to the disorganization and disintegration of tissues and organs, which promote senescence,an irreversible process (FINGER et al., 2003). Mechanical damage caused by inadequate handling during harvesting, sorting, storage and transport reduces the flowers vase life. Exposure to inadequate temperature for long periods after harvesting is the major cause of waste in floriculture. The high temperature increases the respiration and transpiration processes, but excessively low temperatures can also affect the flowers preservation

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(PRINCE and CUNNINGHAM, 1987). For roses, the temperature has a great effect on respiration, and the respiration rate is about three times greater at 15 °C than at 5 °C and six times higher at 25 °C (HARDENBURG et al., 1986). The optimum temperature for storing flowers, produced in temperate regions, is slightly higher than the freezing point of the tissues, in general, between 0 and 1 °C (NOWAK et al., 1991).

Bacterial and fungal infections dramatically reduce the shelf life of the flowers, and rapid cooling (in chambers), shortly after harvest, reduces the risk of pathogens (SONEGO and BRACKMANN, 1995). The water quality is essential to extend the flowers vase life. The presence of microorganisms and their metabolites often leads to vascular blockade in cut flowers (MAROUSKY, 1986; VAN DOORN et al., 1995). At high bacterial concentrations, 3.0 x 10^9 UFC/mL, water uptake and transpiration in cut roses were reduced rapidly in only one hour, as were stem folding symptoms at the flower insertion point (ZAGORY and REID, 1986). The microorganisms responsible for vascular blockade in cut flowers include bacteria of the genus *Pseudomonas* and yeasts (VAN DOORN et al., 1995; ZAGORY and REID, 1986). The pH of the water should be low (3.0) to inhibit the vascular blockade caused by bacteria, avoiding the use of tap water, because its quality is doubtful, it may contain toxic ions and present an inadequate acidity (VAN DOORN and PERIK, 1990). Roses kept in tap water last 4.2 days, while in distilled water they last 9.8 days (HARDENBURG et al., 1986). The distilled or deionized water, besides increasing the longevity of the flowers, improves the effect of the preservative solutions (TIJA et al., 1987).

The objective of this study was to carry out a survey on the conditions of the rose transportation and storage at CEAGESP (Companhia de Entrepostos e Armazéns Gerais de São Paulo) Flower Wholesale in Sao Paulo city, Brazil. The main problems faced during the commercialization in the Warehouse were surveyed. The number of bacteria was estimated in the water from the flowerpots used during the roses commercialization at CEAGESP.

2. MATERIAL AND METHODS

A questionnaire was prepared and applied to the permission holders of roses at CEAGESP. The main problems faced by roses dealers was investigated in the questionnaire (Attachment A). The questionnaire was applied to the permission holders that were attending the "*Feira de Flores do Entreposto Terminal São Paulo*" at the "*Mercado Livre do Produtor*". All the permission holders who had cut roses to be sold in the Warehouse were interviewed during the months of January and February 2017, totaling 48 permission holders. 67% of the interviewers were rose growers and 33% were merchants responsible for the company's marketing.

The temperature of the water inside the flowerpots during the commercialization and the interior of the vehicle used to transport the roses from the farm to the market center were measured using the Fluke 62 Mini Digital Infrared Thermometer.

Twenty-five water samples (50 mL) from the water inside the flowerpots during the commercialization were collected to estimate the number of bacteria. The collection was performed on November 10th, 2017. To estimate the number of bacteria in the water, the serial dilution method was adopted (TORTORA et al., 2012) inside a laminar flow chamber. All materials used in the method were previously sterilized.

After the samples homogenization, 10 mL of the water were diluted in 90 mL of sterile water (10^{-1} dilution). Using a micropipettor and after homogenization, 1000 μL of the first diluation was transferred to another test tube (10^{-2} dilution), which contained 9 mL of sterile water. This procedure was repeated to obtain dilutions of 10^{-3}, 10^{-4}, 10^{-5} and 10^{-6} from the original water sample, always removing a 1000 μL sample from the last diluted sample to the next test tube with 9 mL of sterile water. Aliquots of 100 μL of each dilution were transferred to Petri dishes containing NA (Nutrient Agar: 250 mL distilled water, 2.0 g Agar, 0.75 g peptone, 1.25 g meat extract, autoclaved at 121°C for 15 minutes) and incubated at 28 °C for 36 hours. After the 36-hour plating period, the number of bacterial colonies grown on each plate was counted to estimate the number of bacteria in the original sample. The results were expressed by the number of Colony Forming Units (CFU) per mL (CFU mL^{-1}), following the formula 01:

CFU = (number of colonies) x 10 x (dilution used for counting) (01).

3. RESULTS AND DISCUSSION

According to the responses obtained from the permission holders, it was observed that the most commercialized roses varieties among the companies are "Carolla" (28%) - red color and "Tinike" (28%) - white color, together represent 56,0% of the total varieties sold, followed by the "Avalanche" (9%), "Samurai" and "Santa Fé" varieties (both 7%). According to Reich and Carvalho (2004), the color of the floral button with the highest market demand is red, being sought by 29% of the consumers, while those with champagne, rose and yellow color were 20%, 17% and 16% of consumer preference, respectively.

The main destinations for roses are: events (42%), floriculture (37%), final consumer (13%), landscapers (7%) and gardening (1%). This information differs from the retail distribution of flowers according to Almeida and Aki (1995), which observed that commercialization was carried out through the following chains: flower shops (55%), decorators (20%), funeral shops (8%), plant nurseries (5%) and others (2%), especially flowers in the grocery stores that grew very rapidly in large cities.

It was observed that the main trade market is the São Paulo City, concentrating 63% of all commercialized volume (Table 1), which agrees with Buainain and Batalha (2007), who report that the main market for the Brazilian floriculture is the Southeast region, with the highest concentration in São Paulo State. According to the same author, the Northeast of Brazil has registered a significant growth, followed by the North region with great potential for expansion.

Table 1. Locations of roses sale and percentage representative.

Locality	%
São Paulo City	63.0
Outback of São Paulo	13.0
Metropolitan Region of São Paulo	12.0
São Paulo Coast	7.0
Other States	3.0
Uninformed	2.0

Among the 48 permission holders interviewed, 47.92% are from the municipality of Atibaia, followed by Bragança Paulista (18.75%) and Holambra (14.58%). According to EMBRAPA (2008), about 180 million stems were shipped in 2007 from the main distributors in the state of São Paulo - CEAGESP-SP, CEASA-Campinas and Veiling Holambra - from Aguaí, Andradas, Atibaia, Bragança Paulista, Conchal, Holambra, Holambra II, Munhoz, Pará de Minas, Pouso Alegre, Santo Antônio de Posse and Serra Negra, among others. According to Buainain and Batalha (2007) the region of Atibaia produces 25% of the national production of flowers and ornamental plants, distributed in cut flowers and pots, especially roses, chrysanthemums and orchids.

Most companies (58.3%) only sells products of their own production (Table 2), but a portion resells flowers from other suppliers, mainly from Holambra and Colombia. This information corroborates with Junqueira and Peetz (2011), who report that in the same year, imported roses accounted for 15% of the global market for these flowers in Brazil, with Colombia accounting for 8.5% of the total of the market and Ecuador with 6.5%, and therefore, the supply is essentially guaranteed by domestic production.

Table 2. Proportion of the marketing that is own production and corresponding percentage.

Own Production (%)	%
100	58.3
90	6.3
60	2.1
50	2.1
0	29.2
Uninformed	2.0

The duration between the harvest and commercialization ranged from 6 hours (which was the minimum value observed) to 7 days (maximum). This large variation in the timeline between the harvest and commercialization may have been influenced by the distance from the production site to the warehouse. For some permission holders who sell roses from other suppliers, it was not possible to obtain the data. For the majority of respondents (27.08%), commercialization occurs within 6 hours after harvest. This contributes to maintain their quality. According to Nowak et al. (1991), the maximum storage period for roses in dry-cooling is 14 days at a temperature between 0.5 ºC and 3 ºC.

It was observed that most companies (85.42%) use cold storage on their property (Table 3). According to Nowak et al. (1991) and Gorsel (1994), refrigeration is one of the most effective treatments for maintaining the commercial pattern and prolonging the flowers vase life. Extended longevity is very important for the market, since it provides a longer flower durability in the flower shop and a longer vase life for the final consumer (BARBOSA et al., 2006). Low temperatures reduce transpiration, reduce ethylene production, decrease respiration, delay the degradation of sugar stores or other substrates, extending the flower durability (HARDENBURG et al., 1986).

Table 3. Form of storage in the property and percentage of companies that make use of each one.

Storage on Property	%
Does not store	4.17
Refrigerated	85.42
Without Refrigeration	8.33
Mixed*	2.08

* Part of the production is stored refrigerated and another without refrigeration.

The duration of storage in the field until the moment of the commercialization ranged from 2 hours to 10 days, and most companies store the roses for a period of 1 day. According to Hardenburg et al. (1986), cut flowers should only be stored for short term in order to ensure customers satisfaction. It was observed that most companies (81.25%) do not use refrigerated couriers (Table 4). According to Buainain and Batalha (2007), logistics is one of the main challenges in the flower supply chain, since the floriculture products need adequate transportation to maintain the quality standard. Temperate flowers need cold rooms for transport and storage, and tropical flowers need temperature control. According to the same authors, the use of refrigerated courier for floriculture products is not very significant in the country, which predominates the transport at room temperature, that causes greater depreciation of the product and losses. The average temperature in the vehicle used to transport the plants was 20.9 °C.

Table 4. Transport conditions and corresponding percentage.

Transport Conditions	%
Without Refrigeration	75
Refrigerated	18.75
Without Refrigeration (with styrofoam)	6.25

It was observed that the minority of the companies (16.7%) use some type of preservative in the water as a way to prolong the rose durability (Table 5). The addition of preservatives, according to Nowak and Rudnicki (1990), besides to extend the flowers durability , it is not necessary to exchange the container solution daily, because generally these solutions can be used for several days and must be changed only when they look like dirty. According to Almeida et al. (2009), among the preservation systems, it was observed that the dry storage had lower durability, with signs of wilting of the petals being detected one day after harvest and necrosis three days after harvest, still inside of the cold chamber, either in roses stored in pure water or in solution with Commercial Product A, Commercial Product B, Commercial Product C or sodium hypochlorite, a durability in commercial pattern was verified in an average of 10 days, with no difference between these treatments.

Table 5. Rose storage forms at the time of marketing and percentage of companies using each of these.

Storage Forms	%
Water	43.75
Dry	39.58
Water with preservative	16.67

For those companies that use water or water with preservative (60.4%), it was asked the origin of the water used. The origin, number of companies that use a given source and percentage of the total companies that use the wet storage are present in Table 6.

Table 6. Water source and percentage of companies that use a certain source.

Source	%
Shallow well	31.03
Deep well	24.14
Pond	10.34
Tap water	10.34
Mine	3.45
River	3.45
Uninformed	17.24

Most companies use water from shallow or deep wells (55.1%). Only companies that use water or preservative water were also asked about the possibility of a flower rotation in containers and if the water was exchanged when arrived at CEAGESP or if it was complemented with water from the warehouse. Of the licensees using a moist storage medium, 58.6% said they were holding flowers in the container and 41.4% said they did not perform. All interviewers claimed that they did not exchange or supplement water in the warehouse.

Among the main problems encountered in postharvest are the moisture excess in the bud (17%), marketing struggles (15%) and presence of diseases (14%) (Table 7). However, 26% of respondents reported no problems during the marketing. The marketing issues, according to Buainain and Batalha (2007), is one of the main barriers for the flowers and ornamental plants business expansion in Brazil, because there is a low consumption per capita, due to a very restricted flowers consumption by the majority of the population, usually related to certain events such as funerals, special anniversary days, weddings, engagements, among others, and some special times such as Christmas and New Year. According to the same authors, for environment decoration, flowers and ornamental plants purchase is restricted to a portion of the population with higher purchasing power, that demands an aggressive marketing to change this habit, in order to stimulate consumption and the adoption of new creative forms for the product trade.

Table 7. Main problems found by permission holders in post-harvest roses.

Problem	%
Moisture excess in the bud	17.0
Marketing struggles	15.0
Diseases	14.0
Durability	13.0
Time	5.0
Wither	4.0
Bud dehydration	2.0
Heat	2.0
Transport	2.0
No problens	26.0

The main diseases reported by the permission holders were: gray rot (29.6%), downy mildew (28.2%) and black spot (*Diplocarpon rosae*) (16.9%) (Table 8). These diseases are the main ones according to Hortst (1998), who argues that in rose producing regions, there are several phytosanitary problems, being the above-ground fungal diseases the most important issue. Symptoms of downy mildew (*Peronospora sparsa*), powdery mildew (*Oidium leuconium*) and gray rot (*Botrytis cinerea*) can be observed on stems, leaves and petals. However, the main damage of downy mildew and powdery mildew is to affect the photosynthetic process of the plant, due to the fact that they favor senescence and foliar deformation, respectively, while gray mold mainly develops on the floral bud, harming its commercialization. Therefore, these diseases compromise both the floral stems quantity and quality of production.

Table 8. Main diseases found in rose crop and percentage of companies that reported each disease.

Disease / Causal Agent	%
Gray rot (*Botrytis cinerea*)	29.6
Downy mildew (*Peronospora sparsa*)	28.2
Black spot (*Diplocarpon rosae*)	16.9
Powdery mildew (*Sphaerotheca pannosa*)	9.8
Anthracnose (*Sphaceloma rosarum*)	4.2
Without diseases	11.3

The main pests found out in the crop reported by the permission holders were: mites (35%), thrips (29%) and caterpillars (9%) (Table 9). However, 24% of the permission holders reported absence of pests, probably because roses came from locals where phytosanitary control had been already done. According to Barbosa (2003), the most common pest in roses are mites, aphids, thrips and caterpillars, which can attack floral leaves and buds. In addition to causing damage to plants, some species of thrips and aphids can also transmit viruses.

Table 9. Main pests found in the rose crop and percentage of companies that reported the occurrence of each pest
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Praga	%
Mites (*Tetranychus urticae*)	35.0
Thrips (*Frankliniella Occidentalis*)	29.0
Caterpillars	9.0
Mealybug (*Dactylopius coccus*)	1.0
Ants	1.0
Aphids	1.0
Absence of pests	24.0

It was observed that 54.17% of the interviewed permission holders have the quality and size of the stem as the criterion of classification; 31.25% classify the rose according to the size of the stem; 8.33% classify it according to their quality; 4.17% according to the size of the button and only 1 company reported that the classification is made according to the variety, whether it is domestic or imported (Table 10). According to the Veiling Holambra Cooperative (2009), in the classification stage of rose bushes, important characteristics such as stem and bud length, stem thickness and button opening point are observed; the absence of serious defects such as disease and pest damage and mechanical damage to leaves and flower is recommended for a quality stem, as these defects may evolve during the marketing process.

Table 10. Classification discretion of roses in marketing and percentage of companies adopting them.

Discretion	%
Stem size and quality	54.17
Stem size	31.25
Quality	8.33
Bud size	4.17
Variety	2.08

The sizes of the rods reported by the companies varied in 17 different patterns, however, 56.27% of the permission holders used the sizes of 40cm, 50cm and 60cm. However, Barguil et al. (2010) classify the stems based on the following morphological characters:

• Type A: straight rod, straight button and rod with at least 60cm in length;

• Type B: a little crooked stem or a little crooked button and a stem with a minimum of 60cm in length;

• Type C: a slightly crooked stem or a short crooked button and a stem with a minimum of 50cm in length;

• Type D: slightly crooked stem or short crooked button and stem with at least 40cm in length;

• Type E: crooked stem and / or crooked button and rod with at least 40cm in length.

Table 11. Price classification discretion and percentage of companies adopting them.

Price Classification Discretion	%
Stem length	60.0
Quality	18.0
Season	9.0
Color	4.0
Demand	3.0
Source	2.0
Mesh	2.0
Variety	2.0

It was observed that among the criteria of price differentiation, stem length is the main one used by companies (60%) (Table 11).

It was observed that all the permission holders interviewed reuse the container where the bundles of roses are at the time of commercialization; 24 of the 29 that use water in the conservation of the rose at the time of sale in the warehouse (only water or preservative water) used apparently clean water (82.76%); all use apparently clean packaging; Only 10 of the 48 companies (20.8%) make use of some kind of marketing in packaging. The average temperature found in the water used to store the packs in the warehouse was 20.7 °C. The minimum and maximum temperature was 18.8 and 21.8 °C, respectively.

The estimation of the number of bacterial colonies (CFU mL^{-1}), the origin of the water used in the flowerpots during the commercialization and the use of preservatives, of each of the 25 samples analyzed are described in Table 12.

Table 12. Estimated bacterial concentration (CFU mL^{-1}) in water samples collected in containers with roses at CEAGESP; origin of the water used in the containers and use of preservative in the water used in the containers with flowers.

Water Source	Sample	Bacterial Concentration (CFU mL^{-1}) *	Preservative
River	1	5.6 x 10^5	No
	3	1.6 x 10^5	No
	8	2.1 x 10^5	Commercial Product A
	10	5.4 x 10^5	No
	13	8.0 x 10^5	No
	15	8.0 x 10^5	No
	17	1.4 x 10^5	No
	24	9.1 x 10^5	Sodium Hypochlorite
	Average	**5.15 x 10^5**	
Deep Well	2	1.6 x 10^6	No
	4	1.1 x 10^5	Commercial product A
	6	5.4 x 10^5	No
	7	9.2 x 10^5	Sodium hypochlorite
	12	2.0 x 10^4	Uninformed
	22	1.0 x 10^4	No
	23	0	Uninformed
	25	0	Sodium hypochlorite
	Average	**4.0 x 10^5**	
Tap Water	14	6.0 x 10^4	No
	16	9.8 x 10^5	No
	20	5.0 x 10^4	No
	21	3.1 x 10^6	Uninformed
	Average	**1.0 x 10^6**	
Fountain Mine	9	0	No
	5	5.9 x 10^6	Uninformed
Uninformed	11	0	Uninformed
	18	2.9 x 10^5	Commercial product B

* CFU estimated by the serial dilution method.

The different sources of water reported by the permission holders during the collection were: rivers, deep wells, fountain mine and tap water. Three did not know the source of the water used to conserve the roses in the containers. The variation of CFU (Colony Forming Units) was 0 (minimum) to 5.9 x 10^6 CFU mL^{-1} (maximum). CFU equal to 0 was found out in 4 samples: sample 9 (fountain mine, without preservative use), 11 (unknown origin, but does use preservative), 23 and 25 (both from deep well water, using preservative).

Among the samples from river water, the minimum CFU was 1.4 x 10^5 CFU mL^{-1} and the maximum was 9.1 x 10^5 CFU mL^{-1}. The mean value found was 5.15 x 10^5 CFU mL^{-1}. For the samples using deep well water, the minimum CFU was 1.0 x 10^4 CFU mL^{-1}, the maximum was 1.64 x 10^6 CFU mL^{-1} and the mean value was 4 x 10^5 CFU mL^{-1}. For samples using tap water, the minimum CFU was 5.0 x 10^4 CFU mL^{-1}, the maximum was 3.1 x 10^6 CFU mL^{-1} and the mean was 1.0 x 10^6 CFU mL^{-1}. Of those who use river water to fill the container where they put the roses (8 in total), only 2 use some type of preservative (25%). Those who use deep well water (8 in total), 5 use preservatives (62.5%) and among those who use tap water (4 in total), none use any preservatives or additional treatment.

The mean CFU found for those who use some preservative, regardless of water source, was 2.4 x 10^5 CFU/mL and double (4.8 x 10^5 CFU mL^{-1}) for those who did not use any treatment.

Of the 25 samples collected from different companies, only 10 (40%) use some preservative in the commercialization water. Among the treatments used are: Commercial Product A, Commercial Product B and sodium hypochlorite.

According to Dai and Paull (1991), pure water is rapidly contaminated by bacteria or fungi, which develop on the tissues of plants or their residues, producing or inducing the production of substances such as tannins, which can block vessels communicating the rods. Biocides or disinfectants may be added to the water to inhibit the growth of microorganisms within the container and on the cut branch surface (NOWAK et al., 1991). In Brazil, the most used product is chlorine, being used in horticulture, post-harvesting of flowers to control bacteria and fungi, during handling and as a maintenance solution (VAN DOORN et al., 1990; FARAGHER et al., 2002). The mode of action of chlorine is not specific and involves the oxidation of cellular components of microbial agents, including proteins from cell membranes and protoplasm (DYCHDALA, 1983). Aluminum sulphate (present in commercial product B) acidifies the solution, limiting bacterial growth and favors water absorption, preventing premature wilting of roses (VAN DOORN and WITTE, 1991).

According to França and Maia (2008), although most companies do not adopt the use of preservatives, this is a measure that can decrease the proliferation of bacteria in the water, resulting in a better quality rose, for a longer time; thus, agribusiness of flowers needs to improve more and more the process of training and professionalization of the various segments of the supply chain, in order to increase the competitiveness of the national floriculture.

4. CONCLUSIONS

The most commercialized roses at CEAGESP are “Carolla” and “Tinike”, with their main destinations to events and flower shops. The main destination of the roses sale is to the São Paulo city, being Atibaia the main production city. The refrigerated storage in the rose producing area is the most used by the companies, remaining the roses in the refrigeration chamber around one day. Refrigerated courier is not a practice used by most.

The main form of rose storage is in the moisture environment. However, most who uses this procedure, does not use preservatives or some form of treatment. The water from the flowerpots, used during commercialization, comes mainly from deep or shallow well. Of those who use a moisture storage type, the majority performs flower rotation in the containers.

Gray rot (*Botrytis cinerea*) was the main reported disease affecting the rose and pest-mite (*Tetranychus urticae*) the main pest. The main criteria of classification are the quality and the size of the stem, being used the standards 40-50-60 cm in sales, being the main criterion of price differentiation. The marketing issue is not something that seems important by the permission holders.

In relation to the presence of bacteria in the water from flowerpots used by the permission holders, in general, those from deep wells presented the lowest CFU average. The number of bacterial colonies ranged from 0 (minimum) to 5.9×10^6 CFU mL^{-1} (maximum).

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AUTHORS CONTRIBUTIONS

M.S.P.: elaboration of the questionnaire; interviewing and data collection; water analysis and CFU count; tabulation, data analysis and table creation; writing of the text and standardization of the standards according to the journal. **M.V.F.**: tabulation, data analysis and creation of tables; writing the text and standardizing the standards according to the journal; revision of the text. **M.C.G.G.**: water analysis and CFU count; tabulation, data analysis and table creation; revision of the text. **T.O.**: elaboration of the questionnaire.

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Attachment A - Questionnaire applied to permission holders.

INTERVIEW PERMISSIONARY ROSES - 2017			
Date: ____/____/________	Locality: _______________ Section: _______________________		
Company:			
Interviewee's role: ____			
Varieties it markets	Proportion %	Varieties it markets	Proportion %
% of sale (amount) per destination equipment	______ Floriculture ______ Funerary ______ Lwandscaper ______ Gardening	______ Supermarket ______ Events ______ Final costumer ______ Other (to specify)	
% by destination	_____ São Paulo City _____ Metropolitan Region of São Paulo ___ Outback of São Paulo	______ São Paulo Coast ______ Other States ______ Other Countries	
How much of your marketing is own production? _____________% Place of production:			
What is the duration between harvesting and marketing?			
Storage in the countryside	( ) Refrigerated	( ) Without refrigeration	Time: _________
Shipment	( ) Refrigerated	( ) Without refrigeration	Temp (ºC):___
Packing	( ) Water	( ) Water + preservative	( ) Dry
Preservative? Which? Water: ( ) Shallow well ( ) Deep well ( ) Tap Water ( ) Pond or river Change the water in CEAGESP? ( ) No ( ) Yes ( ) Complete or ( ) put new water in CEAGESP? Caster of flowers in containers? ( ) No ( ) Yes			
After harvesting, what are the main problems with roses?			
What are the main diseases?			
What are the main pests?			
How is the classification done? Size? Quality?			
How big is the stem?			
What sets the price apart?			

Attachment A - cont.

LOOK:
Type of container that is in rose: (   ) Reused   (   ) Not reused
Is water apparently clean? (   ) Yes (   ) No
Packaging is apparently clean? (   ) Yes (   ) No
Is there any kind of marketing in the packaging? (   ) Yes (   ) No
Water temperature: ______ °C