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EFFECT OF VARIETY AND TEMPERATURE IN THE VASE LIFE OF ROSE HYBRID FLOWERS

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Abstract

This study was conducted on two varieties of rose flowers, red variety *Rosa* and whit variety Krohen, aimed for extending the vase life of flowers under wet storage conditions for seven days at a temperature of 1 ± 6 (T1), 1 ± 10 (T2), 25°C (T3) and relative humidity 80-90%. The results of the present study showed that the red variety and temperature 6°C were significantly decreased the respiration rate, amount of water lost, increased the amount of water absorbed, water balance and vase life compared to the white variety and room temperature.

Key words: Vase life, Temperature, Rose flowers

Introduction

Rosa spp. belongs to the *Rosa*ceae family, which has many types and varieties. Rose hybrid is one of the most famous and important ornamental plants and members of the rose family that includes more than 100 genera, which contains 200 species and more than 30,000 varieties in which increasing constantly. The high value of cut flowers has significantly increased their production in many developing countries, as well as being a very lucrative business in countries with an ideal environment for plant growth and low labor costs (Reid and Jiang, 2012). The flowers producing process and marketing has become one of the most vital industries in the world, the statistics of the Union Producers and Exporters of Horticultural Crops (UPEHC) indicate that 75 billion euros reached the value of the flower trade at 2003. According to statistics of 2017, Egypt tops the list of countries exporting global flowers with exports amounting to 32.8 million dollars, followed by Ethiopia, which recently, exports reached more than $ 228 million (Al-Zuhur, 2004 and 2017).

Stored the cut flowers at a low temperature ranging between 0-12°C depending on the type and variety to inhibit the respiration rate and ensure that the flowers are not damaged. Also, the relative humidity has great importance for preserving flowers, due to reducing water loss; for this reason, preserved the different types of flowers in a humidity ratio ranging between 80-90%. Numerous studies indicated that vase life varies in different varieties of many plant species used flowers for harvesting purposes, as in Clove and Gerbera varieties (Onozaki *et al*., 2001; Qara Ghouli, 2007). This is confirmed by Ichimura *et al*., (2002) that studying 25 varieties of Rose hybrid; this difference may be attributed to the difference in the genotype composition of the species and environmental effect, which lead to morphological or anatomical differences or both (Drennan *et al*., 1986). Also, the results of Pompodaki *et al*., (2005) showed that the vase life of the Akito variety was shorter than the vase life of the first red variety when comparing two varieties of roses, this difference may be due to the flowers being exposed to the binding of the necks after storage. Cevallos and Ried (2000) mentioned that an increase in respiration rate three times in stored flowers at a temperature of 10 compared to zero degrees and stored different types of flowers included cloves, daffodils, chrysanthemums and rose. Study of Swart (1986) on tulips, noted that the lower vase life was associated with increased temperature and the longest life of the vase was obtained when the temperature was 1.15°C compared to 5 and 10°C. Leonard *et al*., (2011) explained that the flowers Gerbera decrease the vase life 13% under 21°C for four days compared to stored for two days.

Materials and Methods

Executing the study

The study was carried out in one of the private nurseries in Al-Hafiz, Karbala Governorate during 2018, on the two varieties, red variety *Rosa* and White variety Krohen planted in an agricultural medium consisting of perlite and copobite (coconut fibers) and Adapted environmental development. The flowers were cut in the early morning after removing the lower leaves of the stems with 35 cm lengths. The end of the stems was cut underwater and then immersed for five hours in a preservative solution consisting of (200 mg. Liters^{-1} 8-HQS + 100 mg. Liters^{-1} AgNo3 +100 Mg^{-1} liter Sucrose + 200 mg^{-1} liter Citric acid) to maintain the continuous absorption of water and complete bloating of flower cells and their tissues (Tawgan, 1985). Then, the flowers were transferred to 250 ml plastic containers, contains distilled water. Each container contains one flower with three replicates, with five flowers per repeater, then stored for a week at a temperature of 6 and 10 in addition to the room temperature.

The experiment was done according to the complete random design CRD as experiment with two factors representing the first-factor variety V and the second-factor temperature T compared the differences between the averages according to the test of the least significant difference LSD at a probability level of 5% (Sahuki and Wahib, 1990).

Study indicators

Respiration rate

According to the speed of respiration rate using a closed system, the method according to the following formula:

$mgCO_2$ / kg / hr = $mgCO_2$ × 1 / Wt (kg) × 1 / hr

Wt: weight of sample kg.

hr: hours number (Al-Ani, 1985)

Amount of water absorbed (g. Day^{-1})

The amount of water absorbed was calculated by daily measuring the weight of the storage solution by out of the cold storage until the flowers lost their coordination value, then the formula mentioned (He *et al*., 2006) applied the following:

Water absorbed = weight of solution at the start of the experiment - the weight of solution on day 0, 1, 2, ... etc.

Amount of water lost (g. Day^{-1})

The amount of water lost was calculated by daily weighting the cut flowers with their solutions and measuring their weight together. Then the weight tested daily until the flowers lose their coordination value, as follows:

Water lost = weight of flowers with their solutions at the start of the experiment - the weight of flowers with their solutions on the day 0,1,2, ... etc.

Amount of water balance (g. Day $^{-1}$)

The water balance was extracted as follows:

Water balance = water absorbed - water lost (He *et al*., 2006).

Vase life

The days number calculated the vase life that the flowers retained their coordination and marketing value (Hassan, 2005), were determined when 50% of the signs of leaves and petals wilted, their color changed, broken, or the necks of the flowers were bent, or they were affected by microorganisms.

Results and Discussion

Table 1 showed that there is a significant difference between the two varieties in the speed of respiration rate, red varieties V2 achieved the lowest rate for this trait 85.44, more than the white varieties V1, in which increase the respiration rate to 93.97 $mgCO_2$/kg/hr

The variation between the two varieties in respiration rate may be due to morphological and anatomical differences, and this fact is indicated by (Drennan *et al*., 1986) while studying 25 varieties of rose, this finding agreed with Celikel and Ried, (2002). The temperature exceeded 6°C by lowering the respiration rate to the lowest rate of 86.00 mg CO_2 kg^{-1}/hour compared to the room temperature that recorded the highest respiration rate of 93.79 $mlCO^2$ / kg/hr.

This indicates the importance of low temperature to reducing metabolic processes, including respiration, while those processes, increased at room temperature (Clelikel and Ried, 2000; Maalekuetal, 2006). Cevallos and Ried, 2000 confirmed that storing Gerbera flowers increased respiration rate three times under 10°C compared to the flowers stored at 0°C.

Effect of interaction between the variety and temperature was effect significantly on the speed of respiration rate, the treatment of bilateral interaction V1T3 gave the highest speed of respiration rate 99.25 $mlCO_2$ / kg/hr^1, while the treatment of bilateral interaction V2T1 gave the lowest speed of respiration rate 82.00 $mgCO_2$ / kg/hr. We noted that the effect of bilateral interaction factors in this trait was identical to effect single factor; thus, the combined effect of these factors was evident in reducing or raising the speed of respiration rate.

The results of Tables 2, 3 and 4 indicate that there were significant differences between the two varieties

Table 1: Effect of variety, temperature, and their interactions on the respiration rate for two varieties of Rose hybrid flowers after storage.

Varieties	Temperature (T)			(V)Varieties effect
	T1 (6 C°)	T2 (10 C°)	T3 (Room Temp)	
White Variety (V1)	90.00	92.67	99.25	93.97
Red Variety (V2)	82.00	86.00	88.33	85.44
Temp effect (T)	86.00	89.33	93.79	
LSD 0.05 Varieties (V)	Temp (T)	1.358	2.700	2.204
	interactions (V×T)			

Table 2: Effect of variety, temperature, and their interactions on the amount of water absorbed (g. Day^{-1}) for two varieties of rose hybrid flowers after storage.

Varieties	Temperature (T)			(V)Varieties effect
	T1 (6°C)	T2 (10°C)	T3 (Room Temp)	
White Variety (V1)	28.67	20.17	13.50	20.78
Red Variety (V2)	29.50	25.50	16.67	23.89
Temp effect (T)	29.08	22.83	15.08	
LSD 0.05	Temp	0.952	0.673	0.55
Variety (V)	((Tinteraction (V×T))			

Table 3: Effect of variety, temperature, and their interactions on the amount of water lost (g. Day^{-1}) for two varieties of Rose hybrid flowers after storage.

Varieties	Temperature (T)			(V)Varieties effect
	T1 (6°C)	T2 (10°C)	T3 (Room Temp)	
White Variety (V1)	16.33	20.17	24.42	20.31
Red Variety (V2)	10.67	13.67	17.17	13.38
Temp effect (T)	13.50	16.92	20.79	
LSD 0.05	Temp			
Variety (V)	((Tinteraction (V×T))	1.164	0.951	

Table 4: Effect of variety, temperature, and their interactions on the amount of water balance (g. Day^{-1}) ($mg.gm^{-1}$) for two varieties of Rose hybrid flowers after storage.

Varieties	Temperature (T)			(V)Varieties effect
	T1 (6°C)	T2 (10°C)	T3 (Room Temp)	
White Variety (V1)	12.33	1.67	10.92	8.31
Red Variety (V2)	18.83	11.83	1.17	10.61
Temp effect (T)	13.75	1.79	4.50	
LSD 0.05	Temp			
Variety (V)	((Tinteraction (V×T))	1.095	0.894	

Table 5: Effect of variety, temperature, and their interactions in vase life of two varieties of Rose hybrid flowers after storage.

Varieties	Temperature (T)			(V)Varieties effect
	T1 (6°C)	T2 (10°C)	T3 (Room Temp)	
White Variety (V1)	17.40	17.45	10.67	15.17
Red Variety (V2)	22.17	20.85	11.22	18.08
Temp effect (T)	19.78	19.15	1.94	
LSD 0.05	Temp			
Variety (V)	((Tinteraction (V×T))	0.764	0.624	

in both the amount of water absorbed, water lost and water balance, the red variety V2 increase significantly, achieving the highest rate of water absorbed 23.89g. Day^{-1}, the lowest rate of water lost 13.83g. Day^{-1} and the highest water balance, 10.61g. Day^{-1} compared to the white variety V1, which recorded the lowest rate of water absorbed 20.78 gm. Day^{-1}, the highest rate of water lost 20.31 g. Day^{-1} and the lowest rate of water balance, 8.31 g. Day^{-1}. Rates variation between the two varieties may be due to the difference in species genotype composition and interaction with the environment, which is subsequently effected on morphological or anatomical differences, or both (Drennan *et al*., 1986).

The effect of temperature on these traits, we noticed that the 6°C temperature of (T1) had increased the amount of water absorbed from 29.08 g. Day^{-1} compared to room temperature (T3) 15.08 g. Day^{-1} and reduce the amount of water lost to 13.50 g. Day^{-1} compared to room temperature T3, which recorded the highest rate of 20.79g. Day^{-1}. Also, the 6°C level recorded the highest rate of water balance 13.58g. Day^{-1}, while room temperature T3 recorded the lowest rate of 4.04g. Day^{-1}.

The increased in the amount of water absorbed, water balance, and the decrease in water lost achieved at T1 temperature can be explained that degree has decreased the transpiration rate and maintaining the swelling pressure of cells, which affects the water relations and osmotic pressure of the plant (Sayed and Muhammad, 1982) while room temperature caused an increased in respiration rate (Table 1) due to stress exposed to flowers under this degree, which led to an increase in the amount of water lost by transpiration, which was reducing the amount of water absorbed.

Amount of water absorbed, water lost and water balance (g. Day^{-1}).

The results of interaction between the treatments showed that there were significant differences between them, the V2T1 interaction to be the highest rate of water absorbed 29.50g. Day^{-1} compared to the lowest rate of 13.50 grams. Day^{-1} for the treatment of V1T3 interaction, while the VT treatment showed a non-significant effect on the average amount of water loss, but it affected the water balance rate. V2T1 recorded the highest rate of 18.83 g. Day^{-1} compared to the interaction treatment V1T2, 1.67 g. Day^{-1}.

Vase life

The results in Table 5 showed that there were significant differences between the two varieties in the vase life of rose flowers, the red variety V2 recorded the longest vase life 18.08 days compared to 15.17 days for the white variety V1. Drennan *et al*., (1986), who discussed this difference may be attributed to the difference in the genotype composition of the species and environmental effect, which lead to morphological or anatomical differences or both. and may due the strong growth of the red variety, increased the rate of water absorbed and the reduction of the amount of water loss from the flowers, which maintain a better vitality than the white varieties of V1. In the other hand, the temperature T1 maintained prolong vase life of the flowers to 19.78 days, while the vase life less than 10.94 days at room temperature T3, which indicates that this degree has reduced vital processes, including respiration, Table 1, maintaining the food stock of flowers, especially carbohydrates, as well as reducing transpiration and maintaining cells by swelling pressure through increasing the amount of water absorbed and reducing the amount of water lost, Table 2 and 3, which agreed with results of Song *et al*., (1992). Who find the low temperature reduces the water lost, thereby delaying the flowering aging and extending the vase life. We find that the room temperature T3 was a reason for the end of the vase life as a result of the increased in the vital activities of the flowers, including the respiration process accompanying consumption of food or effectiveness of oxidative enzymes such as the phenolase enzyme, which cause increase in the transpiration rate and the lack of water absorbed as a result of the occlusion of vessels due to the growth of microorganisms, thus the increase in the effectiveness of aging hormones such as ethylene which increase the rate of respiration or due to protein degradation due to tissue peaches that negatively affect on the flower life (Elgar, 1998). These results agreed with findings of (Ichimura *et al*., 1988) that the flower life of Gerbera flowers decreases 38% and rose flowers 40% after storage for five days under 10°C compared to zero degrees of temperature.

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