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PROLONGING THE MARKETING PERIOD OF ROSE PLANTS THROUGH WAXING AND COLD STORAGE

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ABSTRACT

Roses (*Rosa hybrida,* cv. Eiffel Tower) grafted onto *R. canina* were lifted on 1st Feb. 2006 and 2007. The bare – rooted one year old roses were treated with hot paraffin wax or polyethylene emulsion, packaged with polyethylene pags and later with cardbord poxes and placed in cold storage at 0˚C, RH95%. After 4, 8, 12 or 16 weeks in cold storage the bare – rooted roses were planted in pots containing clay +sand 2:1 under saran house. Plants were tested for water loss, survival plants, and numbers of buds, number of flowers and stem length. Also carbohydrates concentration were measured in rose plants in the different storage periods. Paraffin wax treated plants lost the minimum amount of water than polyethylene emulsion and control plants in all cold storage periods respectively. Also, 100% of paraffin wax treated plants developed till flowering in all cold storage periods, while 45.8% of polyethylene emulsion treated plans and 58.9% of control plants were developed only during the two seasons. The biggest number of buds, and flowers and stem length were significantly recorded in paraffin wax treated plants than control and polyethylene emulsion treated plants respectively.

There were slight differences between all treatments concerning carbohydrates concentrations as well as in different storage periods.

INTRODUCTION

Roses are considered as the most important cut flower crop in Egypt and in the world. Rose plants are used for the purposes of cut-flowers, home gardens and landscape. Handling bare-root rose plants in Egypt is only in the coldest month in winter like deciduous plants. The object of this experiment was to use surface coating materials such as hot paraffin wax or polyethylene emulsion and cold storage to decrease respiration and water loss content of stored rose plants to extend the period of handling for several months instead of only one month in the year and in addition, increasing rose plans for export.

MATERIALS AND METHODS

This study was carried out at Post-Harvest Department, Horticulture Research Institute, Giza, Egypt, for two successive years (2006-2007). One year old uniform “Eiffel Tower” rose plants grafted on *Rosa canina* were lifted on 1st Feb. 2006 and 2007. The plants washed to remove all soil debris from canes and roots. Then plants were cut to 30 cm long above the grafting union. Rose plant canes were dipped in melted paraffin wax (85˚C) for 3 seconds. The second treatment was spraying canes of rose plants with

watery emulsion (polyethylene, wax & resin 8% W/V) for 2 seconds. Control plants received no further treatment.

Every treat plants were placed in polyethylene bag and placed inside cardboard box and put in cold storage at 0˚C and relative humidity 95% for 4, 8, 12 and 16 weeks. After the end of cold storage periods rose plants were planted in 20 cm, diameter plastic pots filled with 2:1 clay and sand. (V;V) and put in saran house for two months. A completely randomized block design was used and every treatment was replicated three times and each replicate contained 6 rose plants. The differences between treatments were determined by using LSD test according to Snedecor and Cochran1980.

The following data were recorded :

- Weight loss during storage periods (percentages)
- Survival plants after planting (percentages)
- Number of buds, and flowers and stem length for two months after planting.
- The determination of carbohydrates in whole rose plants during cold storage period was done according to the method mentioned by Shaffer and Hartman, (1921).

RESULTS

Weight loss of rose plants (%) :

The results of the effect of cold storage periods, paraffin wax and polyethylene emulsion on the weight loss of 'Eiffel Tower" rose plants in the two seasons are presented in Table (1) and Fig. (1). The results indicated that the longer the plants remained in cold storage the more loss of plant weight for the all treatments in different cold storage period in the two seasons.

Also paraffin wax treatment gave significantly the lowest loss of weight compared with polyethylene emulsion and control respectively in the two seasons.

Table (1): Effect of cold storage periods, paraffin wax and polyethylene emulsion on weight loss (%) of bare – rooted of Eiffel tower rose plants in the two seasons of 2006 – 2007.

Treatments	Storage periods							
	First season				Second season			
	4 weeks	8 weeks	12 weeks	16 weeks	4 weeks	8 weeks	12 weeks	16 weeks
Control	1.80	2.10	2.43	2.78	1.60	2.02	2.58	3.09
Paraffin wax	1.02	1.04	1.08	1.11	0.96	1.11	1.23	1.42
Polyethylene emulsion	1.50	1.85	2.21	2.50	1.42	1.72	2.15	2.40
LSD 5%	0.12	0.12	0.71	0.16	0.07	0.07	0.07	0.14

F1

Survival plants (%)

The results of the effect of cold storage periods, paraffin wax and polyethylene emulsion on the survival plants of 'Eiffel Tower' rose plants in

the two seasons are presented in Table (2) and Fig. (2). The results showed that after 4 weeks of cold storage paraffin wax and control treatments gave significantly the higher rate of survival plants (100%) than polyethylene emulsion treatment (76.73 and 74.46%) in the first and second season respectively.

While after 8 weeks of cold storage paraffin wax and control treatments gave also significantly the higher rate of survival plants (100 and 77.73%) than polyethylene emulsion treatment (62.63%) in the two seasons.

After 12 weeks of cold storage the same pattern was noticed. After 16 weeks of cold storage the results showed the superior significant effect of paraffin wax treatment with (100%) over control and polyethylene emulsion with (00.0%) in the two seasons.

Number of buds

After planting 'Eiffel Tower' rose plants which achieved different cold storage periods the number of swollen buds on canes were recorded. Data presented in Table (3) showed that after 4 weeks of cold storage paraffin wax treatment gave significantly the biggest number of buds (3.7, 4.2) than polyethylene emulsion (3.2, 3.4) and control (3.25, 357) in the first and second seasons respectively.

The same trend was observed after 8 and 12 weeks of cold storage in the two seasons. After 16 weeks of cold storage paraffin wax gave significantly the biggest number of buds (6.4, 6.87) than the other treatments (0.0)

Table (2): Effect of cold storage periods, paraffin wax and polyethylene emulsion on survival plants (%) of bare – rooted of Eiffel Tower rose plants in the two seasons of 2006 – 2007.

Treatments	Storage periods							
	First season				Second season			
	4 weeks	8 weeks	12 weeks	16 weeks	4 weeks	8 weeks	12 weeks	16 weeks
Control	100.0	80.73	60.80	0.0	100.0	74.73	55.46	0.0
Paraffin wax	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Polyethylene emulsion	76.73	60.80	40.46	0.0	74.46	64.46	49.80	0.0
LSD 5%	0.39	0.41	0.45	0.07	1.09	1.09	0.98	0.07

Stem length (cm)

Data presented in table (3) showed that after 4 weeks of cold storage paraffin wax treatment gave significantly the tallest stem length (23.50, 24.73) than control (21.23, 18.57) and polyethylene emulsion (20.87, 17.9) in the two seasons respectively.

F2

The same trend was observed after 8 weeks of cold storage in the two seasons. After 12 and 16 weeks of cold storage paraffin wax treatment gave significantly the tallest stems than polyethylene emulsion and control in the two seasons.

Number of flowers/plant :

concerning that paraffin wax treatment Table(3) a significant biggest number of flowers in all different cold storage period was noticed than control and polyethylene emulsion treatments in the two seasons.

It may be added that the number of flowers decreased with the increase of cold storage duration in all treatments. It may be due to the dryness of buds.

Carbohydrates concentration in stored rose plants:

Total carbohydrates concentration were measured in whole plant in the different storage periods.

Data presented in table (4) showed that there were very little differences between treatments when different storage periods were compared with each other.

Also, storage periods affected slightly the concentration of carbohydrates in rose plants, in increase or decrease rate.

Table (3): Effect of cold storage periods, paraffin wax and polyethylene emulsion on number of buds, stem length and number of flowers of bare-rooted of Eiffel Tower rose plants in the two seasons of 2006-2007.

Treatments	First Season											
	4 weeks			8 weeks			12 weeks			16 weeks		
	N.buds	S.length	N.Flowers	N.buds	S.length	N.Flowers	N.buds	S.length	N.flowers	N.buds	S.length	N.Flower
Control	3.25	21.23	0.42	5.2	20.83	0.40	5.10	14.33	0.42	0.0	0.0	0.0
Paraffin wax	3.7	23.50	0.64	5.4	26.4	0.60	5.7	21.99	0.68	6.4	15.03	0.35
Plyethylene emulsion	3.2	20.87	0.42	3.6	18.00	0.31	4.1	16.10	0.15	0.0	0.0	0.0
LSD 5%	0.20	0.97	0.07	0.29	0.78	0.12	0.37	0.23	0.51	0.12	0.32	0.07
	Second Season											
Treatments	4 weeks			8 weeks			12 weeks			16 weeks		
	N.buds	S.length	N.Flowers	N.buds	S.length	N.Flowers	N.buds	S.length	N.flowers	N.buds	S.length	N.flower
Control	3.57	18.57	0.35	4.06	17.20	0.38	4.8	15.43	0.21	0.0	0.0	0.0
Parrafin wax	4.2	24.73	0.61	5.17	23.10	0.53	5.8	21.4	0.36	6.87	28.9	0.4
Polyethylene emulsion	3.4	17.9	0.47	3.06	16.13	0.34	3.3	15.6	0.12	0.0	0.0	0.0
LSD 5%	0.07	0.7	0.04	0.35	0.05	0.07	0.25	0.37	0.07	0.78	2.75	0.07

DISCUSSION

Waxing and surface coatings :

The application of wax or wax emulsion coating to certain perishable products has been practiced for many years. Waxing reduces moisture loss and, thus, retard shriveling (Platenius, 1939) and (Segall, *et al* 1974). Some types of nursery stock keep better in storage and during marketing after receiving a wax coating. Dormant rose plants are an example (Miller, *et al*

1950). Toy, *et al* 1961). Application methods include spraying with or dipping into water emulsions. Roses are more to desiccation compared to other woody nursery stock (Toy and Mahlstede, 1959). Lyle (1955) confirmed that hot wax treatment was not detrimental to vegetative and reproductive growth when rose canes were exposed from 1 to 6 sec. to wax between 77 and 98˚C.

Weight loss of rose plants :

Welch and Cameron (1990) suggested that hot wax treatment is more effective in preventing moisture loss from the plants during storage and display than other treatments studied. Higher moisture content of rose canes may result in more rapid recovery and more vigorous vegetative growth once plants are removed from cold storage.

Cameron and Maqbool (1986) pointed out that, water loss varied from nearly 0% to 60% based on the difference between initial and final fresh weights.

Number of buds:

A similar increase in the number of lateral breaks was observed for the waxed roses compared to nontreated ones after transplanting (Welch and Cameron, 1990).

Carbohydrates concentration:

Menoud, *et al* (1991) indicated that during the first eight weeks of storage at 1˚C of 'Mme A.Meillanel' rose plants soluble carbohydrates concentration in shoots, bottom breaks and graft union remained constant, while those in the tap-root and lateral roots increased.

Similar results have been reported in Malus doemstica during winter (Kandiah, 1979) and in lilium longiflorum bulbs stored at –1˚C (Miller and Longhans, 1990). During the following 8 weeks of cold storage, glucose and fructose accumulated in the hole plant, except in the shoots, while sucrose concentration decreased and starch hydrolysis ceased.

After 16 weeks period in cold storage, the total changes were slightly which is indicative to low respiration rtes. So, the results suggest that the establishment and subsequent growth of cold stored plants do not depend on the total amount of carbohydrates accumulated before lifting.

Table (4) : Effect of cold storage periods, paraffin wax and polyethylene emulsion on total carbohydrates (g glucose/100 gm D.M) in bare-rooted of Eiffel Tower rose plants in the two seasons of 2006-2007.

Treatments	First season			
	4 weeks	8 weeks	12 weeks	16 weeks
Control	13.06	13.36	12.60	13.00
Paraffin	14.20	13.90	13.87	12.96
Polyethylene	13.90	12.96	13.20	13.10
Treatments	Second season			
	4 weeks	8 weeks	12 weeks	16 weeks
Control	15.12	15.40	15.90	14.80
Paraffin	15.80	14.45	14.85	14.10
Polyethylene	14.90	13.95	14.20	13.90

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تم تقليع نباتات هجين الورد صنف برج إيفل – عمر سنة والمطعوم على أصل ورد النسر من التربة فى الأول من فبراير عام ٢٠٠٦ ، ٢٠٠٧ .

تم معاملة شتلات الورد عارية الجذور بشمع البرافين الساخن ومستحلب البولى ايثلين ثم غلفت الشتلات بأكياس البولى ايثلين ووضعت فى صناديق كرتون ووضعت فى التخزين البارد على صفر ٥ م ورطوبة نسبية ٩٥% .

وبعد ٤ ، ٨ ، ١٢ ، ١٦ أسبوعا من التخزين البارد تم إخراج الشتلات كل فى موعده وزرعت فى أصص تحتوى على طمى + رمل بنسبة ٢ : ١ تحت ظروف الصوبة السيران لمدة شهرين.

وتم اختبار النباتات فيما فقدته من الماء أثناء التخزين فى المدد المختلفة ، وكذلك نسبة النباتات التى نجحت بعد الخروج من التخزين وتطورت حتى الأزهار . كذلك تم تقدير عدد البراعم وعدد الأزهار وطول الساق للنباتات الناجحة .

كذلك تم تقدير محتوى الشتلات المخزنة من الكربوهيدرات فى مراحل التخزين المختلفة وكانت أهم النتائج مايلى :

1 - النباتات التى عوملت بشمع البراقين كانت معنويا أقل النباتات فقدا فى الماء عن مستحلب البولى ايثلين والكونترول وفى كل فترات التخزين الأربعة على الترتيب.

2 - النباتات التى عوملت بشمع البرافين نجحت فى النمو حتى الأزهار فى كل فترات التخزين بنسبة ١٠٠% بينما كانت نسبة نجاح النباتات المعاملة بمستحلب البولى ايثيلين ٤٥,٨% والكونترول ٥٨,٩% على الترتيب فى السنتين .

3 - النباتات التى عوملت بشمع البرافين أعطت معنويا أكبر عدد من البراعم النابتة وأكبر عدد من الأزهار وأطول ساق زهرة عن الكونترول ومستحلب البولى اثيلين على الترتيب فى السنتين .

4 - أعطت نتائج تحليل الكربوهيدرات فروقا قليلة بين المعاملات وبين مدد التخزين المختلفة.

5 - وتشير النتائج المتحصل عليها إلى إمكانية تداول شتلات الورد صنف برج ايفل لمدة ١٦ أسبوع فى العام بدلا من ٤ فقط وذلك بتقنية التشميع بشمع البرافين والتخزين البارد على صفر مئوى وكذلك إمكانية تصدير الشتلات للخارج نظيفة وبدون تربة.