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RELATION OF GROWTH IN DRACAENA *FRAGRANS MASSANGEANA* (CORN PLANT) TO EXPOSING THE CANES TO LOW TEMPERATURES AT DIFFERENT PERIODS

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ABSTRACT: *During 2007 and 2008 seasons, canes of Dracaena fragrans Massangeana (corn plant) were placed in coolers at 40 ˚F (4.4 ˚C), 50 ˚F (10 ˚C), 60 ˚F (15.6 C) or 70 ˚F (21.1 ˚C) and held for 2, 4, 6 or 8 weeks. A control treatment (unstored canes) was placed immediately in propagation. Canes stored at temperatures ranging from 40 ˚ F (4.4 ˚C) to 70 ˚F (21.1 ˚C) for two weeks sprouted and rooted without problems but canes stored at 40 ˚F (4.4 ˚C) for more than two weeks failed to root than cane stored at other temperatures. When comparison was made between canes planted immediately or after storage for up to 8 weeks at 70 ˚F (21.1 ˚C), rooting was improved and shoot growth reduced on stored canes when propagated for the same time length.*

Key words: *Dracaena Fragrans Massangeana, storing canes, cold storage and propagation*

INTRODUCTION

In recent years, environmental plant producers in Egypt have especially corn plant. The canes especially 30 cm sized pieces experienced problems with the rooting and growing of Dracaena species may fail to root or produce a poorly developed root system or shoots fail to develop properly. In most dracaena species initial bud break was hastened by exposing the canes to low temperature before placement in the propagating medium (Poole *et al.,* 1974). Exposing canes of Dracaena to low temperature before propagation was very effective in increasing success degree and rootability of canes (Anonymous, 1982; Conver and Poole, 1982 and 1983a and 1983b; Poole and Conover, 1987; Morey *et al*., 1987; McConnell and Melendro, 1988 and Conver and Poole, 1991).

Subjecting canes to low temperature for different periods was found by many authors for improving the activity of enzymes that were responsible for hydrolyzing complex nutrients to simple ones such as glucose, fructose, amino acids and fatty acids as well as promoting natural hormones such as IAA and at the same time reducing the inhibitor ABA (Hartman and Kester, 1983 and Nelson, 1999 and 2000). Singh (1983) and Seogle *et al*., (1995) disclosed that low temperature and mist propagation effectively enhanced all simple foods required for rootability of cuttings of ornamentals.

The target of this study was facilitating the rootaility and sprouting of Dracaena *Fragrans Massangeana* canes for producing marketable and attractive indoor plants.

MATERIALS AND METHODS

This study was carried out during 2007 and 2008 seasons under the greenhouse of the experimental Farm of King Abdulaziz Univ. at Hoda Al- Sham that located about 120 km northeast of Jaddah, Saudi Arabia.

Four hundreds and eighty canes 30 cm long and 1.0 cm in diameter without leaves were taken from stock plants of Dracaena fragrans Kar cv. Massangeana (corn plant) on the last week of November during each season. The bottom of each cane (2.5 cm) was dipped into a 5000 ppm ethyl alcohol solution of IBA for approximately two seconds. Canes were either placed in cooler maintained at 40 ◌̊ F (4.4 ◌̊ C), 50 ◌̊ F (10 ◌̊ C), 60 ◌̊ F (15.6 C) or 70◌̊ F (21.1 ◌̊ C)

(first factor a) for 2, 4, 6 or 8 weeks (second factor b) or become part of the control without undergoing storage and temperature treatments. Storage coolers were airtight and dark so that air exchange and light exposure occurred only when doors were opened every two weeks when canes were removed. Therefore, sixteen treatments were included and each treatment was replicated three times, ten canes per each. Canes were removed from temperature controlled storage at two weeks intervals. The canes were then rooted on a greenhouse propagation bench where temperatures ranged from 65 to 90° F and maximum light intensity was 1500 ftc. Intermittent mist was supplied for five minutes at 30 minutes intervals from 12:00 noon until 4:00 pm daily. The control group (not stored) and all storage treatments were, maintained on the propagation bench for 16 weeks and growth was measured.

Complete randomized design in split plot arrangement was followed. The four temperatures and duration of storage ranked the main and subplots, respectively.

Root grade, number of roots greater than 2.5 cm plant, stem thickness (cm.), number of shoots per plant, length of shoot, number of leaves per plant and leaf dimensions (length and width, cm.) were recorded for the canes stored 2, 4, 6 and 8 weeks. Root grade was determined based on a scale of 1= little root system development and growth, 3= average root system development and 5 = excellent root system development and growth. The experiment was terminated on the last week of May 2007 and 2008 after evaluation of cane stored 8 weeks and then propagated for 16 weeks was completed.

Statistical analysis was done using new L.S.D at 5 % (Mead *et al*., 1993).

RESULTS AND DISCUSSION

Root grade and number of roots per plant:

It is clear from the data in Table (1) that increasing storage temperatures from 40 to 70° F significantly increased root grade and number of roots greater than 2.5 cm length on 30 cm cane. When canes were stored at 40 ° F for longer than two weeks may have been chill damaged, since it did not produce roots when placed in the propagation benches. The storage treatments demonstrated that canes storage at higher temperature was not damaging and indeed was even somewhat beneficial effect on rooting. These results could very useful to producers, since it would allow more flexibility in scheduling of this crop.

Increasing storage times from two until eight weeks significantly increased root grade and number of roots/ plant.

Root grade and number of roots per plant were significantly affected by the interaction of storage temperature and storage time. Storing canes at 70° F for 8 weeks before propagation gave the best root grade and number of roots/ plant. On the other hand, when canes were stored at 40° F for more than two weeks (4, 6 or 8 weeks) rootability failed completely. These results were true during 2007 and 2008 seasons. Control canes had the lowest values.

The beneficial effect of cold temperature and longer storage duration on rootability might be attributed to the promotion of the availability of simple sugars, amino acids, fatty acids and natural hormones which were responsible for enhancing root development (Hartman and Kester, 1983).

These results are in agreement with those obtained by Conover and Poole (1991) who found that cooling canes and increased storage duration enhanced rootability of dracaena plants.

Vegetative growth characters:

It is obvious from the data in Tables (1 & 2) that growth characters (stem thickness, number of shoots/ plant, length of shoot, number of leaves per plant and leaf dimensions length and width) significantly stimulated as storage temperatures were increased and the maximum values were recorded with using 70° F. At 40° F canes may have suffered from chilling damage which became evident after propagation. These growth characters significantly reduced as storage time increased and these characters were lower when canes were stored for 8 weeks.

Table 1

Table 2

The studied interaction had significant effect on these growth characters. They were much lower after 8 weeks storage at 70° F. At 40° F storage using storage duration above two weeks, canes subjected to harmfull chilling damage. Growth was significantly declined when canes were stored for two weeks at 40° F. The control canes gave the maximum values.

The depletion of organic and inorganic foods as storage duration was prolonged could explained the present results.

Theses results are in harmony with those obtained by Conover and Poole (1982) and Conover and Poole (1983a) and (1983b).

Based on these results, 30 cm canes of Dracaena Fragrans Massangeana (corn plants) should not be stored at 40° F (4.4 º C) for more than two weeks but at 50° (10 º C)F to 70° F (21.1 ºC) storage for up to 8 weeks is possible.

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"علاقة النمو في دراسينا الذرة بتعريض بعض القصبات لدرجات الحرارة المنخفضة علي فترات مختلفة"

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الملخص العربي

خلال موسمي 2007، 2008 تم وضع قصبات دراسينا الذرة في مبردات علي درجات حرارة 40 º ف (4.4 º م) ، 50 º ف (10 º م) ، 60 º ف (15.6 º م) ، 70 º ف (21.1 º م) لمدة 2، 4، 6، 8 أسابيع أما معاملة المقارنة (القصبات الغير مخزنة) فقد تم زراعتها مباشرة. ولقد تم تجذير وإنبات القصبات المخزنة علي درجات حرارة ما بين 40 º ف (4.4 º م) إلى 70ْ ف (21.1 º م) لمدة أسبوعين بدون مشاكل. أما القصبات المخزنة علي درجة حرارة 40ْ ف = 4.4 º م لمدة اكثر من أسبوعين. فقد فشلت في التجذير وتكوين النموات الخضرية. وذلك بالمقارنة بالقصيبات المخزنة علي درجات الحرارة الأخري. وعند إجراء المقارنات بين القصبات التي لم يتم تخزينها وزرعت مباشرة أو تلك التي تم تخزينها لمدة ثمانية أسابيع علي درجة حرارة 70ْ ف = 21.1 º م فإن التجذير يتجه إلى التحسن أما النمو الخضري فإنه يقل في القصبات المخزنة عند الإكثار في نفس المدة.

Table (1): Root grade, number of roots per plant, stem thickness and number of shoots per plant on canes of *Dracaena fragrans Massangeana* stored for various times and different temperatures during 2007 and 2008 seasons.

Storage temperature (A)	Root grade										Number of roots/plant									
	2007					2008					2007					2008				
	Storage periods (weeks) (B)																			
	2	4	6	8	Mean (A)	2	4	6	8	Mean (A)	2	4	6	8	Mean (A)	2	4	6	8	Mean (A)
Control	--	--	--	--	2.0	--	--	--	--	2.1	--	--	--	--	3.5	--	--	--	--	4.0
Stored at 40° F	1.0	0.0	0.0	0.0	0.3	1.2	0.0	0.0	0.0	0.3	6.5	0.0	0.0	0.0	1.6	7.0	0.0	0.0	0.0	1.8
Stored at 50° F	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.3	7.1	7.3	7.5	7.6	7.4	7.4	7.6	8.2	8.1	7.8
Stored at 60° F	2.3	2.6	2.7	2.7	2.6	2.4	2.4	2.5	2.5	2.5	7.6	7.5	7.7	8.0	7.7	8.0	8.3	8.5	8.6	8.4
Stored at 70° F	2.4	2.7	2.9	3.2	2.8	2.5	2.5	2.5	2.5	2.5	8.1	8.3	8.4	8.5	8.3	8.2	8.5	8.8	9.0	8.6
Mean (B)	2.0	2.5	2.6	2.7		2.1	2.4	2.4	2.4		6.9	7.7	7.9	8.0		7.7	8.1	8.4	8.6	
New L.S.D at 5%	A		B		AB	A		B		AB	A		B		AB	A		B		AB
	0.2		0.2		0.4	0.2		0.2		0.4	0.3		0.2		0.4	0.2		0.3		0.6
Character	Stem thickness (cm.)										Number of shoots/ plant									
Control	--	--	--	--	1.8	--	--	--	--	1.7	--	--	--	--	4.1	--	--	--	--	4.3
Stored at 40° F	1.2	0.0	0.0	0.0	0.3	1.2	0.0	0.0	0.0	0.3	2.8	0.0	0.0	0.0	0.7	2.6	0.0	0.0	0.0	0.7
Stored at 50° F	1.4	1.3	1.2	1.1	1.3	1.5	1.3	1.2	1.1	1.3	3.3	3.1	3.0	2.9	3.1	3.5	3.0	2.9	2.8	3.1
Stored at 60° F	1.6	1.5	1.4	1.3	1.5	1.6	1.5	1.4	1.3	1.5	4.0	3.8	3.7	3.5	3.8	4.0	3.8	3.7	3.6	3.8
Stored at 70° F	1.7	1.6	1.3	1.2	1.5	1.7	1.6	1.3	1.2	1.5	4.2	3.9	3.8	3.6	3.8	4.2	4.0	3.9	3.8	4.0
Mean (B)	1.5	1.5	1.3	1.2		1.5	1.5	1.3	1.2		3.5	3.6	3.5	3.3		3.6	3.6	3.5	3.4	
New L.S.D at 5 %	A		B		AB	A		B		AB	A		B		AB	A		B		AB
	0.2		0.2		0.4	0.2		0.2		0.4	0.3		0.2		0.4	0.2		0.2		0.4

Table (2): Length of shoot, number of leaves per plant and leaf dimension (length and width) on canes of *Dracaena fragrans Massangeana* stored for various times and different temperatures during 2007 and 2008 seasons.

Storage temperature (A)	Length of shoot (cm.)										Number of leaves/ plant									
	2007					2008					2007					2008				
	Storage periods (weeks) B																			
	2	4	6	8	Mean (A)	2	4	6	8	Mean (A)	2	4	6	8	Mean (A)	2	4	6	8	Mean (A)
Control	--	--	--	--	57.3	--	--	--	--	56.0	--	--	--	--	19.0	--	--	--	--	18.5
Stored at 40° F	44	0.0	0.0	0.0	11.0	47	0.0	0.0	0.0	11.8	15	0.0	0.0	0.0	3.8	17	0.0	0.0	0.0	4.3
Stored at 50° F	50	46	44	41	45.3	54	47	44	40	46.3	19	18	16	15	17.0	21	20	18	16	18.8
Stored at 60° F	55	52	50	48	51.3	60	50	50	47	51.8	20	16	15	14	16.3	20	18	17	14	17.3
Stored at 70° F	57	55	53	52	54.3	62	51	50	50	53.3	21	17	16	14	17.0	20	19	17	13	17.3
Mean (B)	51.5	51.0	49.0	47.0		55.8	49.3	48.0	45.7		18.8	17.0	15.7	14.3		19.5	19.0	17.3	14.3	
New L.S.D at 5%	A 0.2		B 0.2		AB 0.4	A 0.2		B 0.2		AB 0.4	A 0.3		B 0.2		AB 0.4	A 0.2		B 0.3		AB 0.6
Character	Leaf length (cm.)										Leaf width (cm.)									
Control	--	--	--	--	51	--	--	--	--	52.0	--	--	--	--	3.6	--	--	--	--	3.6
Stored at 40° F	45	0.0	0.0	0.0	11.3	47	0.0	0.	0.0	11.8	2.4	0.0	0.0	0.0	0.6	2.5	0.0	0.0	0.0	0.6
Stored at 50° F	47	44	42	41	43.5	50	49	47	46	48.0	2.8	2.6	2.5	2.4	2.6	2.9	2.6	2.4	2.3	2.6
Stored at 60° F	50	48	46	45	47.3	52	49	48	47	49.0	3.1	3.0	2.8	2.7	2.9	3.2	3.0	2.9	2.8	3.0
Stored at 70° F	52	50	48	46	49.0	55	52	50	49	51.5	3.5	3.2	3.0	2.9	3.2	3.5	3.3	3.1	3.0	3.2
Mean (B)	48.5	47.3	45.3	44.0		51.0	50.0	48.3	47.3		3.0	2.9	2.8	2.7		3.0	3.0	2.8	2.7	
New L.S.D at 5 %	A 0.2		B 0.2		AB 0.4	A 0.2		B 0.2		AB 0.4	A 0.3		B 0.2		AB 0.4	A 0.2		B 0.2		AB 0.4