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Physiological studies on seed germination of *magnolia grandiflora* L.

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ABSTRACT

Magnolia grandiflora is highly ornamental and decorative evergreen tree which has a white flowers with aromatic odor. In Egypt, it is grown in botanical and private gardens. The essential oil from flowers have many medical uses.

A study was carried out during two successive seasons of 2006/2007 and 2007/2008 at the Experimental Station and Laboratory of Horticulture Department, Fac. of Agriculture, Mansoura University.

The study aimed to improve seed germination of *Magnolia grandiflora*, with different treatments such as distilled water soaking, soaking in GA_3 at (500,1000 and 2000 ppm), soaking in kinetin at (25,50 and 100 ppm) for 24 hours alone or in combination with cold stratification for (45 and 90 days).

The results of this study can be summarized as follows: -

1 - All treatments increased germination percentages than control.
2 - The highest germination percentages were (94.74, 96.51 %) and (91.24, 92.96 %) by soaking seed in GA_3 (2000 ppm) and kinetin (100 ppm) combined with cold stratification for 45 days, while soaking in distilled water were (38.60, 40. 38 %) and the control (28.84, 30.46 %) in the two seasons respectively.
3 - Also soaking seeds in GA_3 2000 ppm for 24 h, combined with cold stratification for 45 days gave the tallest plants (25.90, 25.97 cm) and the maximum number of leaves (9.33, 9.44) in the two seasons respectively.
4 - In addition total phenols was significantly decreased with the previous treatment since it were (0.131, 0.128 mg/100gDW) while in control were (0.179, 0.177 mg/100gDW) and reducing sugar percentages significantly increased, since it were (5.95, 6.08 %) while control values were (5.51, 5.55 %) during the two seasons respectively .

From the present study it could be concluded that, the best germination percentage, of Bull Bay (*Magnolia grandiflora* L.) plant, vegetative growth (the tallest plant and maximum number of leaves) , the minimum total phenols and maximum reducing sugar (%) were obtained from soaking seeds at GA_3 2000 ppm for 24 hours combined with cold stratification for 45 days .

INTRODUCTION

Magnolia grandiflora L. is an evergreen pyramidal tree, it belongs to family Magnoliaceae. It is a large evergreen tree which grow 30 meters tall and 1.8 meters in trunk diameter (Duncan and Duncan, 1988).Medicinal uses include, diaphoretic; salve; stimulant and tonic action. It is used in the treatment of malaria and rheumatism. An alcoholic extract of the plant reduces the blood pressure Odenwald and Turner (1996).

Magnolia grandiflora is commonly propagated from seeds, however the seeds germination require breaking dormancy that continue for a long time. Vines (1982).

Many investigators referred to the stimulatory effect of soaking seeds in (Distilled water, GA_3 and kinetin) alone or in combination with cold

stratification at 5 ± 1 ºC led to enhance seed germination and produce vigorous seedling growth. Misiha and El-Ashry (1991) recorded that germination of *Magnolia grandiflora* seeds increased after soaking in tap water for 24 h compared to the control .Channegowda *et al*., (2001) mentioned that seeds of *Caesalpinia sappan*, soaked in water for 18 hours, improved germination compared with the control. Pei-Dong *et al*., (2002) observed that soaking *Juglans nigra*, seeds in water for 5-6 days presented the best seed germination rate.

Misiha and El-Ashry (1991) treated seeds of *Magnolia grandiflora* by soaking in GA_3 at (250, 500 and 1000 ppm) and found that the highest germination (69-70%) was achieved by soaking in 1000 ppm $GA_3$and differ significantly from control (13 – 14 %).

Kang-Bing *et al*., (2001). Studied the effect of GA_3 on seeds of Chinese toon (*Toona sinensis*). by soaking in GA_3 (100, 500, 1000, 1500 and 2000 mg/Liter) and found that the seed germination percentages after treatment with 1500 mg/Liter of GA_3 were 80 %, while the control was 41%. Singh *et al*., (2002) treated seeds of jackfruit (*Artocarpus heterophyllus* Lam.) while treating with gibberellic acid (100 ppm) for 12 h, before sowing and achieved germination (95.33 %).

Nabin-Saikia and Nath (2005) found that seeds of *Abrus precatorius* Linn soaked in 500 ppm of GA_3 showed the highest percentage of germination (92.00 %) at two weeks interval from the date of sowing. and tallest seedlings. Kang-Bing *et al*. (2001) mentioned that seeds of Chinese toon (*Toona sinensis*) were soaked with 6-BA [benzyl adenine] (20, 50, 75 and 100 mg/L) for 12 h and found that the seed germination after treatment with 50 mg/Liter of 6-BA was 85 % while the control was 41%. Naidu and Rajendrudu (2001) soaked seeds and pods of red sanders (*Pterocarpus santalinus* L.) at different. concentrations (100-500 ppm) of kinetin for (10-50 h) and the result was soaking of pods for 10 h at 500 ppm kinetin gave the highest germination (80%). Misiha and El-Ashry (1991) recorded that seeds of *M. grandiflora* were stratified in moist sand at 5 °C for 1 or 3 months, presented the best germination (61-63%) after 3 months compared with control (13 – 4 %). Yang-QiHe *et al.* (2007) indicated that cold stratifications for 30-120 days broke the endogenous dormancy of *Areca triandra* seeds. Bahrani and Khartegh (2006) observed that seed germination of (*Stipagrostis pennata* T. De Winter) was affected by dormancy-breaking treatments. Seed soaking in tap water for 3 h and stratifying10 days at 3-7 ºC had the highest germination percentage. Misiha and El-Ashry (1991) treated the seed of *Magnolia grandiflora* with GA_3 solution (250, 500 and 1000 ppm); and stratified in moist sand at 5 °C for 1 or 3 months. The highest germination was achieved by soaking in 1000 ppm GA_3. Yang-JengChuann *et al*. (2005) found that soaking sweetheart tree (*Euscaphis japonica)* seeds in 2000 ppm GA_3 for 15 h, increased germination obtained after chilling at 4 ºC. Abdel-Al *et al*. (2001) soaked seeds of Italian cypress (*Cupressus sempervirens*) in kinetin at 5 ppm with stratification and found that germination percentage reached (54%) against (19.6%)for control. Bhandari (1996) recorded that seeds of *Cinnamomum camphora* were treated with 100 ppm gibberellic acid for 48 h before sowing in pots in sandy loam/compost, gave the greatest

increase in germination and seedling growth over control. Arumugam-Shakila and Rajeswari (2006) mentioned that seeds of (*Phyllanthus niruri*) were treated with gibberellic acid (200 and 250 ppm for 6 and 12 h) gave with 200 ppm gibberellic acid for 6 h highest germination percentage, vigor index, plant height and number of leaves.

The present work was carried out in a trial to overcome the low percentage of seed germination of *Magnolia grandiflora* L.

MATERIALS AND METHODS

This study was carried out at the Experimental Station and Laboratory of Horticulture Department, Fac. of Agriculture, Mansoura University during two successive seasons of 2006 / 2007 and 2007 / 2008 to study the effect of some chemical and physical treatments such as (Distilled water, GA_3 and Kinetin) alone or in combination with cold stratification at 5 ºC ± 1 on the germination percentage, vegetative growth such as (plant height and number of leaves), total phenols mg/100g DW and reducing sugar % of *Magnolia grandiflora* seeds. A completely randomized block design was adopted in this study. Each treatment was replicated three times and each replicate included 19 seeds.

Plant material :

Seeds of Bull Bay (*Magnolia grandiflora* L.) plants were obtained from High Agricultural School, Faraskur, Damietta Governorate, Egypt.

The seed samples (1368 seeds) were treated with three experiments and were sown in seedling trays containing 1:1 (v/v peat moos: sand) in unheated green house.

First exp: seeds of (*Magnolia grandiflora* L.) plants were soaked for 24 hours in distilled water, GA_3 at (500 , 1000 and 2000 ppm) and kinetin at (25 , 50 and 100 ppm) and without soaking as control, then sown on Oct , 15.

Second exp : seeds of (*Magnolia grandiflora* L.) plants were soaked for 24 hours in distilled water, GA_3 at (500,1000 and 2000 ppm) and kinetin at (25, 50 and 100 ppm) without soaking as control and combined with cold certificated at 5 ºC ± 1 for 45 days, then sown on Dec , 1.

Third exp: seeds of (*Magnolia grandiflora* L.) plants were soaked for 24 hours in distilled water, GA_3 at (500, 1000 and 2000 ppm) and kinetin at (25, 50 and 100 ppm) without soaking as control and combined with cold certificated at 5 ºC ± 1 for 90 days, then sown on Jan ,15. in the two seasons. After 150 days from sowing seeds, seedling were transplanted on 20 cm plastic pots containing 1:1 v / v peat moos and sand. Normal agriculture practices were carried out.

Data recorded : -

Seed germination (%) :

Number of germinated seeds was recorded weakly after the beginning of germination (at visual appearance of plumula above soil) of all treatments till it became constant and these values were calculated as percentages.

Vegetative growth :

Plant height (cm)

Nine plants were randomly collected from each treatment. Measuring was from the soil surface until the uppermost leaf tip after nine months from sowing date.

Number of leaves

Chemical analysis :

Total phenols mg / 100g (DW)

The concentrations of phenols in the tested samples were expressed as mg / 100 g dry weight and were estimated according to the method of Malick and Singh (1980).

Reducing sugars (%)

The amount of reducing sugars present in the sample were determined according to the method of Smoggy (1952).

Statistical analysis :

Obtained data were subjected to the statistical analysis of variance (ANOVA) of the combined analysis in a completely randomized block design as mentioned by Gomez and Gomez (1984) using the least significant difference (L .S. D) at 5 % for comparison between means of the different treatments.

RESULTS AND DISCUSSION

Seed germination (%) :

The data presented in Table (1, 2, 3) and illustrated in figures (1, 2, 3) showed that all treatments enhanced and increased germination percentages than control. Germination of seeds started after 45 days from sowing. It was found that values with 2000 ppm GA_3 combined stratification for 45 days at first, second, and third exp. were (38.61, 47.38 and 43.88 %) while control was still (0.00 %) in the three experiments respectively in the first season. The maximum percentages of germination, were obtained with soaking seeds in GA_3 2000 ppm for 24 h combined with cold stratification for 45 days after 135 days from sowing since values were (85.96 , 94.74 and 92.00 %). However kinetin100 ppm combined with stratification for 45 days achieved (84.24, 91.24 and 87.74 %) respectively in the three experiments in the first season. These results may be due to the effect of the gibberellins in hastening germination through its biochemical effect. The synthesis of hydrolytic enzymes, are responsible for hydrolysis of macro molecules stored such as starch and portions as mentioned by, Mayer and Poljakoff - Mayber (1975). Concerning the effect of kinetin in hastening germination may be through its biochemical effect, since the cytokinins are also very effective promoters of germination and increase protein synthesis. Moreover exogenously applied cytokinins could enhance protein synthesis. These results agree with Misiha and EL-Ashry (1991) on *Magnolia grandiflora* L., Kang-Bing *et al*. (2001) on *Toona sinensis* and Singh *et al*. (2002) on *Artocarpus heterophyllus* Lam. Data in the second season was in similarity with these reported in the first season.

Table (1): Effect of pre-germination treatments of the first experiment on the germination (%) of *Magnolia grandiflora* L. seeds in the two seasons of 2006/2007 and 2007/2008 .

Treatments	Germination (%)							
	Days after sowing							
	1st season							
	45	60	75	90	105	120	135	150
Control	0.00	0.00	5.28	12.31	17.56	19.30	21.06	21.06
Distilled water	0.00	13.08	26.33	31.60	33.34	33.34	35.70	35.70
GA3 500ppm	17.54	43.86	52.64	57.90	59.64	61.42	64.94	64.94
GA3 1000ppm	29.81	54.38	57.90	68.42	69.55	75.46	77.22	77.22
GA3 2000ppm	38.61	51.07	64.91	73.70	76.55	82.49	85.96	85.96
Kinetin 25ppm	0.00	23.00	24.56	29.84	43.86	56.16	57.92	57.92
Kinetin 50ppm	24.57	32.45	42.12	49.14	56.16	64.94	66.66	66.66
Kinetin 100ppm	38.58	55.43	61.42	68.42	71.94	80.72	84.24	84.24
LSD 5 %	0.04	0.04	0.03	0.03	7.15	0.04	0.02	0.02
2nd season								
Control	0.00	0.00	8.78	14.05	17.77	21.07	22.82	22.82
Distilled water	0.00	12.28	29.84	30.00	35.08	35.08	36.84	36.84
GA3 500ppm	19.31	26.32	54.38	59.64	61.43	63.15	66.66	66.66
GA3 1000ppm	31.58	47.36	56.16	68.49	70.19	77.21	78.94	78.94
GA3 2000ppm	36.85	56.16	68.44	75.43	78.94	85.96	87.73	87.73
Kinetin 25ppm	0.00	22.83	26.33	38.59	45.63	57.92	59.64	59.64
Kinetin 50ppm	26.32	33.33	40.35	50.87	61.42	66.66	68.44	68.44
Kinetin 100ppm	40.36	54.38	64.93	70.17	77.21	82.46	85.96	85.96
LSD 5 %	0.02	0.03	0.02	0.07	0.02	0.02	0.03	0.03

Table (2): Effect of pre-germination treatments of the Second experiment*on the germination (%) of *Magnolia grandiflora* L. seeds in the two seasons of 2006 / 2007 and 2007/2008 .

Treatments	Germination (%)							
	Days after sowing							
	1st season							
	45	60	75	90	105	120	135	150
Control	0.00	0.00	7.02	15.77	19.30	21.06	28.84	28.84
Distilled water	0.00	12.33	28.08	33.36	35.10	36.86	38.60	38.60
GA3 500ppm	22.00	28.08	59.66	61.42	64.94	66.68	70.18	70.18
GA3 1000ppm	35.10	50.88	63.18	66.68	71.87	78.96	82.48	82.48
GA3 2000ppm	47.38	66.68	82.48	84.23	91.24	92.98	94.74	94.74
Kinetin 25ppm	0.00	21.06	54.40	56.16	56.16	59.66	61.43	61.43
Kinetin 50ppm	28.0	33.14	59.69	63.18	64.94	68.44	71.94	71.94
Kinetin 100ppm	43.86	59.66	78.96	82.48	84.24	89.48	91.24	91.24
LSD 5 %	0.02	0.11	0.02	0.03	0.07	0.02	0.02	0.02
2nd season								
Control	0.00	0.00	8.77	17.57	19.31	22.82	30.46	30.46
Distilled water	0.00	14.05	31.57	33.00	35.80	36.00	40.38	40.38
GA3 500ppm	22.83	33.33	57.92	64.93	66.66	68.44	71.94	71.94
GA3 1000ppm	36.84	49.14	64.93	73.69	77.22	80.72	85.96	85.96
GA3 2000ppm	49.12	66.66	84.23	87.72	89.48	91.24	96.51	٩٦.٥١
Kinetin 25ppm	0.00	24.56	56.14	57.92	61.42	63.18	64.93	64.93
Kinetin 50ppm	29.84	36.84	61.42	64.94	68.44	71.94	73.64	73.64
Kinetin 100ppm	40.35	63.17	77.21	82.00	85.96	87.73	92.96	92.96
LSD 5 %	0.02	0.02	0.03	0.02	0.02	0.01	0.03	0.03

***Second experiment : combined with cold stratification for 45 days.**

Table (3): Effect of pre-germination treatments of the third experiment* on the germination (%) of *Magnolia grandiflora* L. seeds in the two seasons of 2006 / 2007 and 2007/2008 .

Treatments	Germination (%) Days after sowing							
	1st season							
	45	90	75	90	105	120	135	150
Control	0.00	0.00	8.78	14.06	17.56	19.30	25.50	25.50
Distilled water	0.00	10.55	29.84	33.36	33.34	35.10	36.86	36.86
GA3 500ppm	21.07	28.08	56.16	61.43	63.18	66.66	68.44	68.44
GA3 1000ppm	33.35	47.38	59.67	61.42	61.43	75.46	80.72	80.72
GA3 2000ppm	43.88	61.42	77.22	80.72	84.23	89.48	92.00	092.0
Kinetin 25ppm	0.00	21.08	49.14	56.16	57.90	59.67	61.42	61.42
Kinetin 50ppm	24.58	29.85	56.16	61.43	63.18	66.68	68.44	68.44
Kinetin 100ppm	42.12	57.90	73.70	80.73	80.72	85.96	87.74	87.74
LSD 5 %	0.02	0.02	0.01	0.01	0.02	0.02	0.02	0.02
2nd season								
Control	0.00	0.00	10.55	15.78	19.30	21.06	26.58	26.58
Distilled water	0.00	12.28	28.07	31.57	33.33	36.84	38.59	38.59
GA3 500ppm	24.57	29.84	57.90	64.93	66.66	68.42	70.18	70.18
GA3 1000ppm	36.85	43.88	61.42	64.90	66.64	77.21	82.46	82.46
GA3 2000ppm	45.64	63.18	78.94	84.22	85.94	91.22	92.55	92.55
Kinetin 25ppm	0.00	24.58	52.64	57.89	59.64	61.40	63.18	63.18
Kinetin 50ppm	26.33	31.57	54.40	63.18	64.90	68.42	71.92	71.92
Kinetin 100ppm	43.86	59.63	77.20	78.94	82.46	84.22	88.00	88.00
LSD 5 %	0.03	0.03	0.02	0.02	0.02	0.03	0.04	0.02

*** Third experiment : combined with cold stratification for 90 days.**

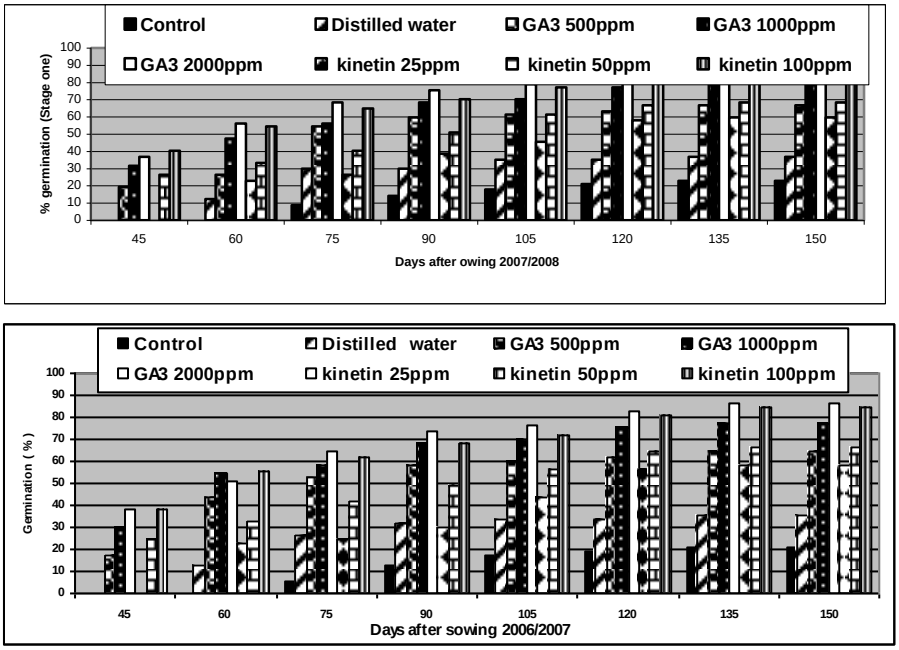

Fig. (1): Germination (%) of *Magnolia grandiflora* L. seeds as effected by different pre-germination treatments in the two seasons of 2006 / 2007 and 2007/2008.

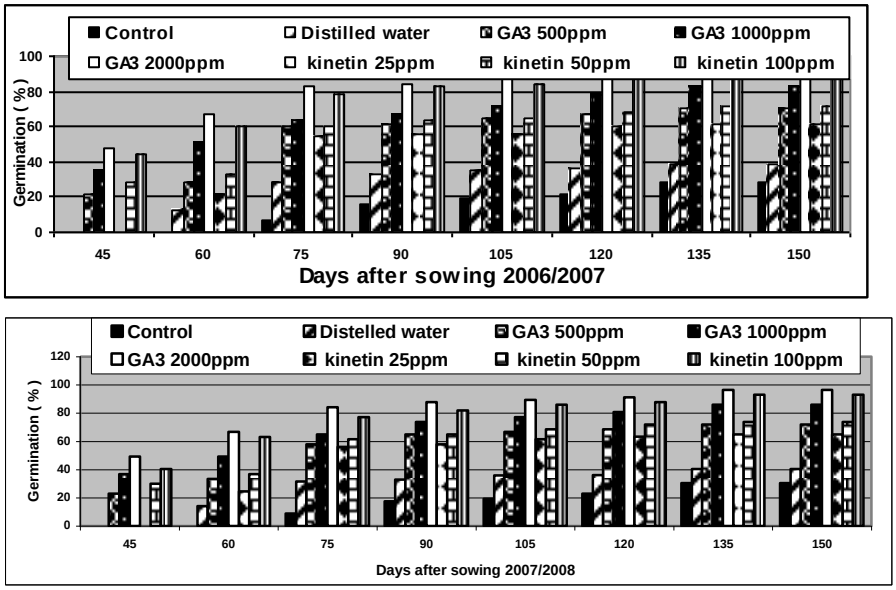

Fig. (2): Germination (%) of *Magnolia grandiflora* L. seeds as affected by different pre-germination treatments with cold stratification for 45 days in the two seasons of 2006 / 2007 and 2007/2008 .

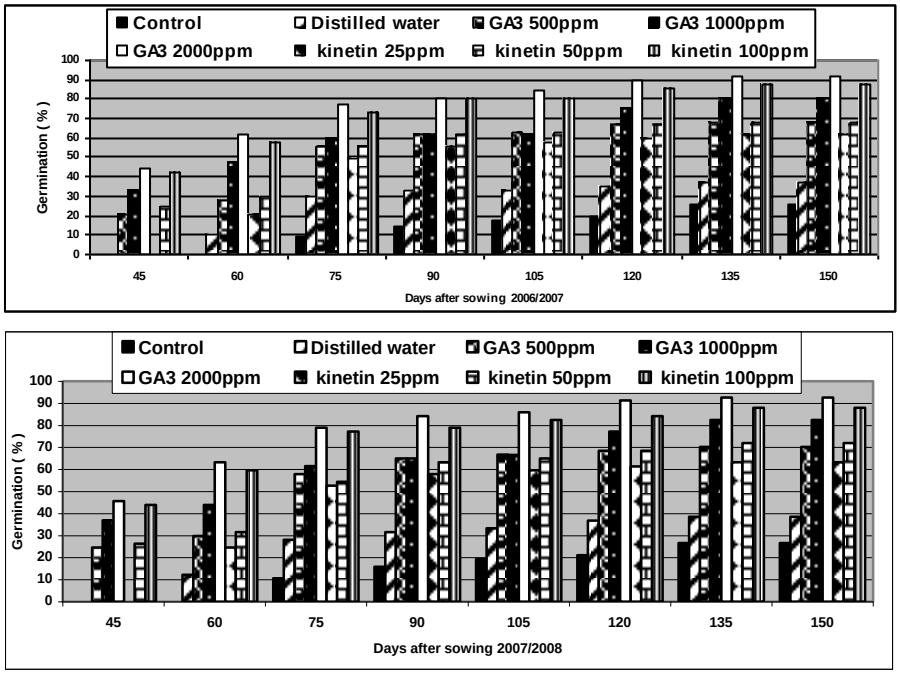

Fig. (3): Germination (%) of *Magnolia grandiflora* L. seeds as affected by different pre-germination treatments with cold stratification for 90 days in the two seasons of 2006 / 2007 and 2007/2008 .

Plant height (cm)

The data in Table (4) showed that all treatments achieved the tallest plants (cm) as compared with the control. After 9 months from sowing seeds, the tallest plants were with soaking GA_3 2000 ppm combined with cold stratification for 45 days since the lengths were (22.00, 25.90 and 24.72 cm) while control were (11.76, 12.06 and 11.80 cm) in the first, second and third exp. respectively during the first season .Data in the second season was in similarity with these reported in the first season .

These results may be due to the influence of this growth regulator on promoting cell elongation Hassan (1972)moreover These results agree with Misiha and El-Ashry (1991) on *Magnolia grandiflora* and Nabin and Nath (2005) on *Abrus precatorius*. Recently it is reported that stratification may have a role in disappearing of inhibitors such as abscisic acid, beside building growth activators such as gibberellins and cytokines. The major endogenous growth inhibitor as abscisic acid can be regulated by cold storage. Through the stratification interval many changes happen in nutrion materials such as the convention of starch (immobile) to soluble sugars, Ginzburg (1973).

Table (4): Effect of different pre-germination treatments on plant height and number of leaves of *Magnolia grandiflora* L. seeds in the two seasons of 2006/2007 and2007/2008 .

Treatments	Plant height(cm) and number of leaves					
	1st season					
	First exp. (without st .)		Second exp. (st 45 days)		Third exp. (st. 90 days)	
	plant height	numbers of leaves	plant height	numbers of leaves	plant height	numbers of leaves
Control	11.76	4.66	12.06	5.00	11.80	5.23
Distilled water	14.09	5.44	14.73	5.66	14.46	5.89
GA3 500ppm	15.49	5.77	16.79	6.22	16.38	5.77
GA3 1000ppm	18.64	7.00	20.52	7.11	19.95	6.88
GA3 2000ppm	22.00	8.00	25.90	9.33	24.72	8.44
Kinetin 25ppm	14.96	5.66	16.54	6.00	15.52	6.55
Kinetin 50ppm	16.44	6.55	18.00	6.89	17.42	7.00
Kinetin 100ppm	20.01	7.44	22.71	7.66	21.11	7.22
LSD 5 %	0.78	0.46	0.99	0.53	0.65	0.76
2nd season						
Control	11.86	4.78	12.16	5.11	11.80	5.11
Distilled water	14.22	5.55	14.92	5.78	14.80	6.00
GA3 500ppm	15.74	5.88	16.83	6.33	16.62	5.89
GA3 1000ppm	18.78	7.11	20.81	7.22	20.11	6.99
GA3 2000ppm	22.13	8.11	25.97	9.44	24.92	8.44
Kinetin 25ppm	15.11	5.78	16.12	6.11	15.76	6.66
Kinetin 50ppm	16.61	6.66	18.17	7.00	17.64	7.11
Kinetin 100ppm	20.07	7.55	22.88	7.77	21.39	7.33
LSD 5 %	0.88	0.46	0.87	0.53	0.58	0.72

*** st : Cold stratification,**

Number of leaves

The data in Table (4) showed that all treatments increased number of leaves when compared with the control. After 9 months from sowing seeds, number of leaves was significantly increased with GA_3 2000 ppm combined

with cold stratification for 45 days at first, second and third exp. since values were (8.00, 9.33, and 8.44) while in control were (4.66 , 5.00 and 5.23) respectively during the first season. Data in the second season was in similarity with these reported in the first season. Varner *et al.* (1965) stated that the mode of action of GA_3 is biochemical as it enhances the synthesis and release a group of substances which degrade complex materials such as cereal aleurone cells, likewise, the findings of other research workers. These results agree with Misiha and El-Ashry (1991) on *Magnolia grandiflora* and Nabin and Nath (2005) on *Abrus precatorius*.

Total Phenols

Results in Table (5) indicated that the all treatments reduced total phenols in the seeds as affected compared with control. In this field soaking with GA_3 2000 ppm in combination with stratification for 45 days values at first, second and third exp. were (0.255, 0.131 and 0.187 mg/ 100 g D.W.) While in control were (0.313, 0.179 and 0.247 mg/ 100 g D.W.) respectively during the first season. These lowest values of total phenols were obtained from soaking the seeds in GA_3 at 2000 ppm when combined with cold stratification for 45 days. The reduction in phenols increased with increasing the concentration of GA_3. This may be due to the increase in absorption of GA_3 and increase in diffusion of phenols out of the seeds. Some of the substances associated with inhibition are various phenols, coumarin and abscisic acid. Hartmann *et al.* (1990).

Table (5): Effect of different pre-germination treatments on total phenols and reducing sugar of *Magnolia grandiflora* L. seeds after soaking in the two seasons of 2006/2007 and2007/2008 .

Treatments	Total phenols mg/100g(DW) and reducing sugar(%)					
	1st season					
	First exp. (without st.)		Second exp. (st. 45 days)		Third exp. (st. 90 days)	
	total phenols	reducing sugar	total phenols	reducing sugar	total phenols	reducing sugar
Control	0.313	4.43	0.179	5.51	0.247	4.98
Distilled water	0.305	4.49	0.172	5.56	0.241	5.04
GA3 500ppm	0.298	4.62	0.166	5.70	0.236	5.11
GA3 1000ppm	0.273	4.79	0.142	5.83	0.209	5.24
GA3 2000ppm	0.255	4.94	0.131	5.95	0.187	5.48
Kinetin 25ppm	0.291	4.57	0.157	5.79	0.229	5.07
Kinetin 50ppm	0.283	4.70	0.149	5.78	0.221	5.16
Kinetin 100ppm	0.264	4.86	0.136	5.88	0.198	5.41
LSD 5 %	6.191	5.16	0.191	0.01	0.002	5.48
2nd season						
Control	0.316	4.45	0.177	5.55	0.245	4.95
Distilled water	0.309	4.54	0.175	5.58	0.240	5.05
GA3 500ppm	0.296	4.64	0.163	5.73	0.233	5.16
GA3 1000ppm	0.275	4.77	0.140	5.85	0.207	5.33
GA3 2000ppm	0.257	4.95	0.128	6.08	0.183	5.45
Kinetin 25ppm	0.294	4.95	0.155	5.77	0.226	5.08
Kinetin 50ppm	0.280	4.73	0.146	5.80	0.223	5.19
Kinetin 100ppm	0.262	4.89	0.134	5.97	0.197	5.38
LSD 5 %	6.760	0.01	0.001	4.77	0.003	0.36

st : Cold stratification

Phenols were soluble in water accordingly immersing the seeds in running water help in getting rid from phenols are easily. This may be due to their effect on softening seed coat allowing more water to penetrate.

These results are in harmony with the findings of Marbch and Nayer (1975) and Misiha and El-Ashry (1991) on *Magnolia grandiflora*.

Reducing sugars

Results in Table (5) indicated that all treatments increased reducing sugars in the seeds as compared with control, by applying GA_3 2000 ppm combined with cold stratification for 45 days values at first , second and third exp. were (4.94, 5.95 and 5.48 %) while in control were (4.43 , 5.51 and 4.98 %) respectively at the first season. Data in the second season was in similarity with these reported in the first season.

The increase in reducing sugars might be interpreted by the rapid hydrolysis of starch into reducing sugars, such hydrolysis is activated by exogenous GA_3 as suggested by Mayer and Poljakoff – Mayber (1975). Herein results may be explained by the finding of Hartmann *et al.,* (1990) stated that gibberellins appeared in the embryo translocated to the three to four cell layered aleurone surrounding, the endosperm and induce devolve alpha – amylase enzyme then move to the endosperm, starch is converted to the growing points to provide energy for seedling development.

From the present study it could be concluded that, the best germination percentage and vegetative growth were obtained from soaking seeds of *Magnolia grandiflora* for 24 h, in GA_3 2000 ppm combined with cold stratification at 5 ^{o}C ± 1 for 45 days and sawing seeds at 1st Dec.

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دراسات فسيولوجية على الإكثار البذري لأشجار المانوليا جراندفلورا

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المانوليا شجرة زينة مستديمة الخضرة ذات أزهار بيضاء عطرية . و توجد فى مصر فى كل من الحدائق النباتية والحدائق الخاصة وهى شجرة تصويرية تستخدم للزراعة على المسطحات الخضراء والزراعة في الشوارع وللحصول على الزيت العطري من الأزهار والذي له استخدامات طبية عديدة ولقد تم عمل دراسة خلال الموسمين الزراعيين المتتاليين ٢٠٠٦ / ٢٠٠٧ و ٢٠٠٧/ ٢٠٠٨ في المزرعة التجريبية ومعمل قسم البساتين كلية الزراعة جامعة المنصورة . بهدف دراسة تأثير النقع في الماء المقطر لمدة ٢٤ ساعة و الجبريللين بتركيز (٥٠٠ و ١٠٠٠ و٢٠٠٠) جزء فى المليون و الكينيتين بتركيز (٢٥ و ٥٠ و ١٠٠) جزء فى المليون منفردا ومع الكمر البارد على درجة حرارة ٥ م °±١ لمدة (٤٥ و ٩٠ يوم) بالاضافة لمعاملة المقارنة (بدون نقع او كمر). على النسبة المئوية للإنبات و قوة النمو الخضري وكذلك المكونات الكيماوية (الفينولات و السكريات) لبذور أشجار المانوليا جراند فلورا من خلال إجراء ثلاث تجارب .

ويمكن تلخيص النتائج المتحصل عليها في التالي : -

١- أظهرت النتائج أن النسبة المئوية للإنبات لجميع المعاملات زادت بشكل ملحوظ عن معاملة المقارنة.

٢- تم الحصول على أعلى نسبة مئوية للإنبات بمعاملة البذور بالنقع فى التركيز الأعلى للجبريللين (٢٠٠٠ جزء في المليون) مع الكمر البارد على درجة حرارة ٥ م °±١ لمدة ٤٥ يوم حيث وصلت إلى (٩٤.٧٤ و ٩٦.٥١ %) ثم الكينيتين عند تركيز١٠٠ جزء فى المليون (٩١.٢٤ و٩٢.٩٦ %) بينما انخفضت النسبة المئوية للنقع في الماء المقطر حيث كانت (٣٨.٦٠ و ٤٠.٣٨ %) بمعاملة المقارنة (٢٨.٨٤ و ٣٠.٤٦ %) خلال موسمي الزراعة على التوالى .

٣- تم الحصول على أعلى ارتفاع للنبات وأكثر عددا للأوراق بمعاملة البذور بالنقع فى التركيز الأعلى للجبريللين ٢٠٠٠ جزء في المليون مع الكمر البارد على درجة حرارة٥ م °±١ لمدة ٤٥ يوم حيث وصل طول النبات بعد زراعة البذور بتسعة أشهر إلى (٢٥.٩٠ و ٢٥.٩٧سم) و عدد الأوراق (٩.٣٣ و ٩.٤٤) خلال موسمي الزراعة على التوالي .

٤- انخفض محتوى البذور من نسبة الفينولات الكلية في نفس المعاملة حيث وصلت إلى (١٣١,. و ١٢٨,. ملجم / ١٠٠ جرام بذور جافه) . وقد زاد محتوى البذور من نسبة السكريات الذائبة بشكل ملحوظ فقد كانت (٥.٩٥ و ٦.٠٨ %) خلال موسمي الزراعة.

- ينصح بنقع بذور أشجار المانوليا جراند فلورا في محلول حمض الجبريللك بتركيز ٢٠٠٠ جزء في المليون لمدة ٢٤ ساعة مع الكمر البارد لمدة ٤٥ يوم على درجة حرارة (٥ م° ± ١) ثم الزراعة في أول ديسمبر . وذلك للحصول على اعلي نسبة إنبات و أفضل صفات لنمو الشتلات .

قام بتحكيم البحث

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