RESULTS AND DISCUSSION

I- Chemical analysis of some bioconstituents in stratified and unstratified of Magnolia seeds:

Data in **Table** (2) and **Figures** (5- 15) indicate, the content of phytohormones (i.e. indol acetic acid (IAA), gibberellic acid (GA_3) and abscisic acid (ABA), fatty acids, total carbohydrates and sugars in unstratified seeds (dry ones) and those subjected to cold stratification for two months (directly after the end of stratified period).

Of interest to note is that the two determined growth promoters auxin (IAA) and gibberellic acid (GA_3) existed in higher levels in stratified seeds more than in case of unstratified ones. Since, GA_3 was of 13.5% in case of unstratified seeds, yet it rose to reach 62.7% in stratified one.

On the other hand, abscisic acid was of 11.2% in unstratified seeds, yet it decreased to reach 0.07% in stratified ones. These findings are of great importance since increment of the growth promoters IAA and GA_3 and reduction of the growth inhibitor ABA consider the responsible for the germination habit being existed when the two groups of seeds were sown. Also, these findings interpret that stimulation existed in case of GA_3, IAA and there natural source i.e. yeast extract when exogenously applied regarding enhancement of Magnolia seed germination and vigorous growth of germinated seeds.

In addition, cold stratification also increased the total soluble sugars; the one of more necessary bioconstituents during germination process. Conferring these results are the studies of **Pillay** and **Edgerton (1965); Jarvis** and **Hunter (1971); Abd El-Hamid (1974); Devlin** and **Witham (1983)** and **Mady (2000).**

Table (2): Chemical analyses (percent values) of stratified and unstratified seeds:

Compound		unstratified seeds	stratified seeds
Hormones	IAA	39.9	85.02
	GA_3	13.5	62.7
	ABA	11.2	0.07
Fatty acids	Myristic	-	1
	Palmetic	35	23
	Oleic	44	3
	linoleic	20	29
	Linolenic	-	29
	Arachidic	-	13
	Stearic	1	3
Total carbohydrates		7.040	6.798
Reducing sugars		0.160	0.176
No-reducing sugars		0.013	0.022
Total soluble sugars		0173	0.198

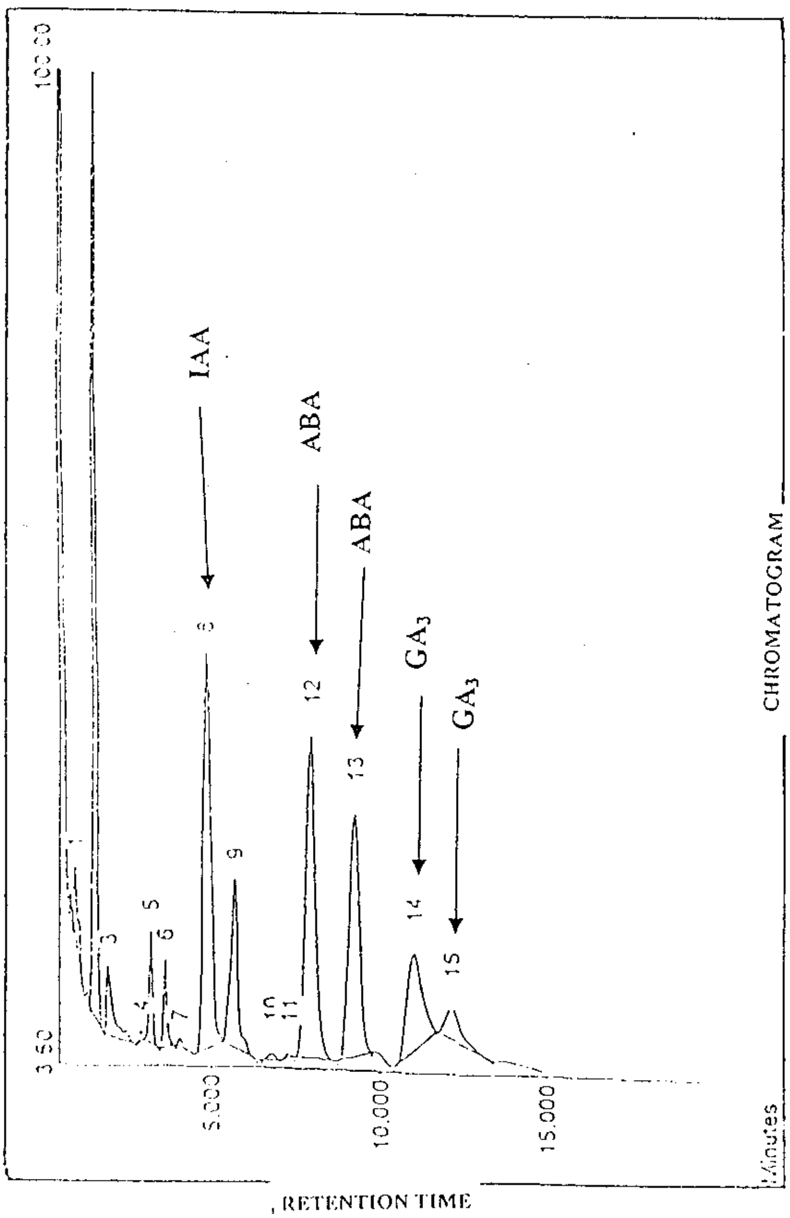
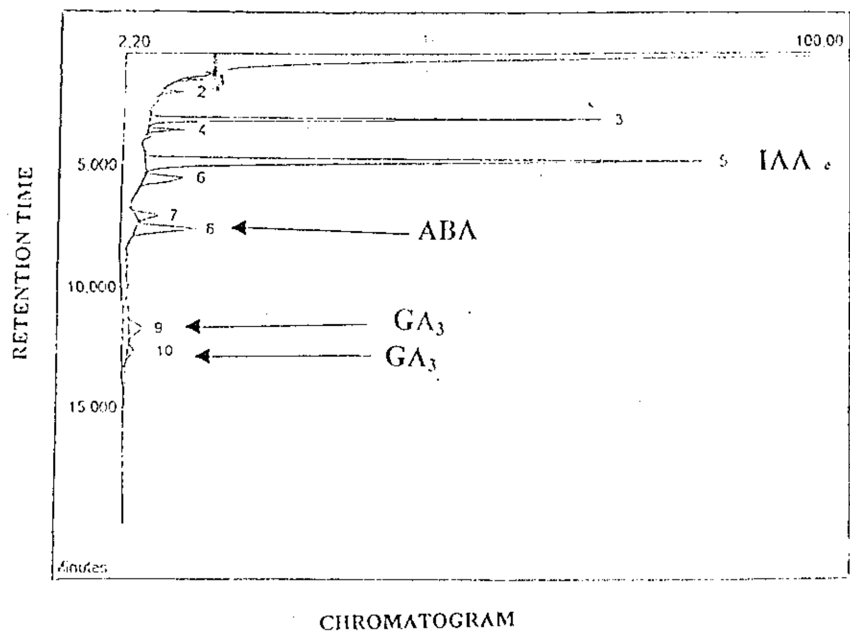
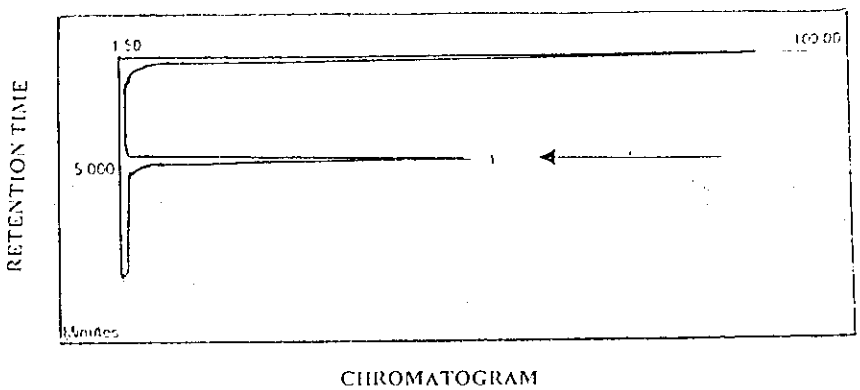


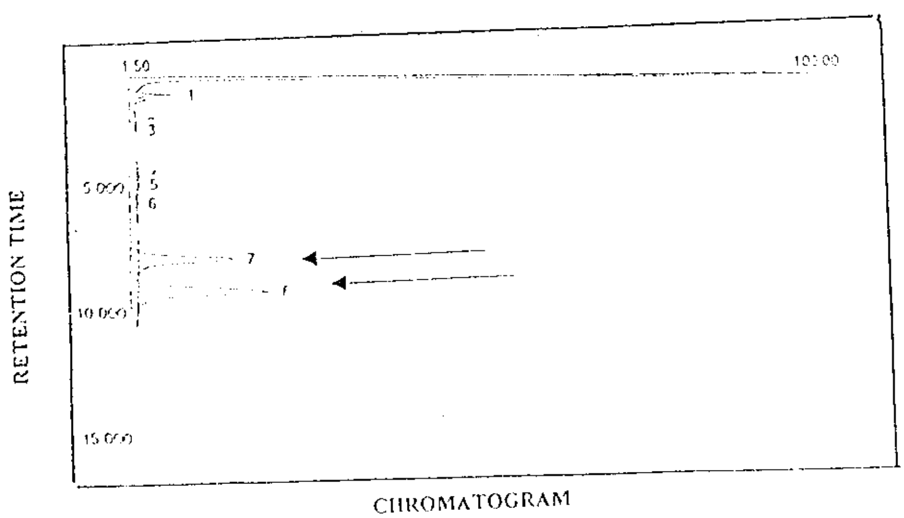
Fig (5): Standard chromatograms of Auxin (IAA), gibberellic acid (GA_3) and abscisic acid (ABA) as determined by GLC.



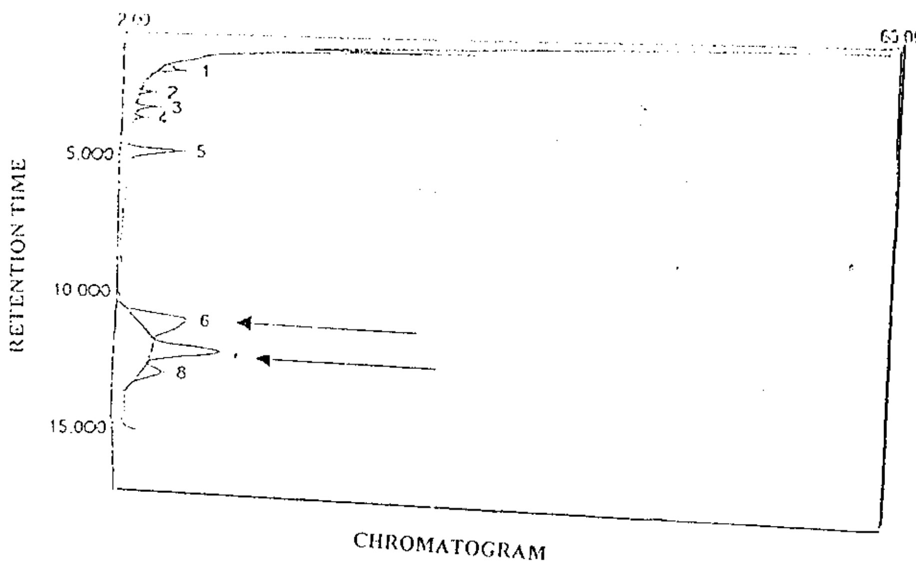
Fig(6): Chromatograms of endogenous IAA, GA_3 and ABA at 100% level as determined by GLC.



Fig(7): Individual IAA chromatogram in yeast extract as determined by GLC.



Fig(8): Individual ABA chromatogram in yeast extract as determined by GLC.



Fig(9): Individual GA_3 chromatogram in yeast extract as determined by GLC.

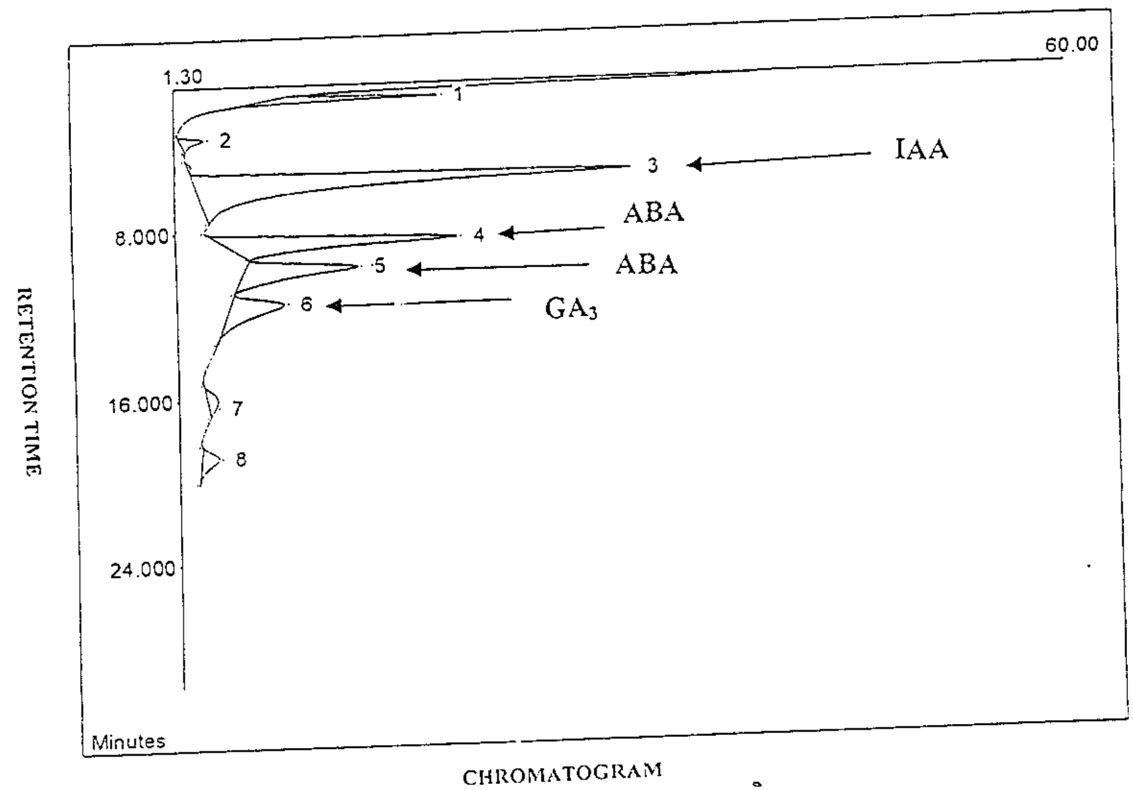


Fig 10): Hormonal profile in stratified Magnolia seeds indicating the endogenous IAA, GA_3 and ABA levels.

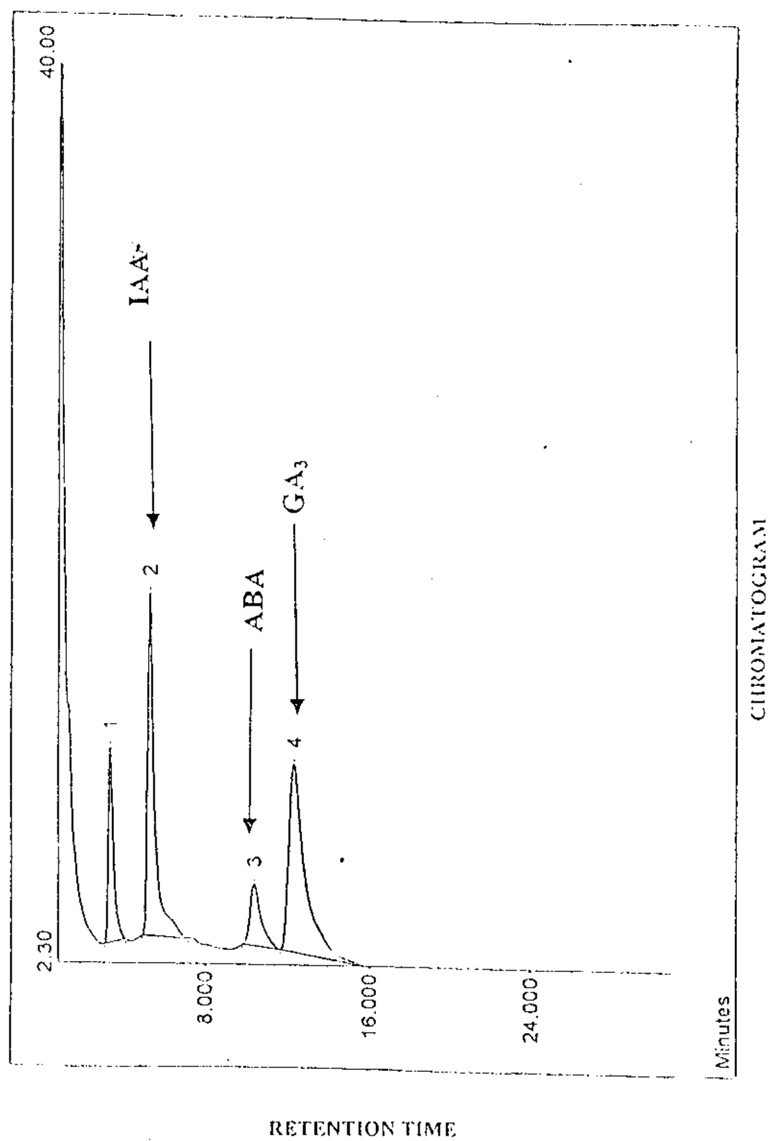
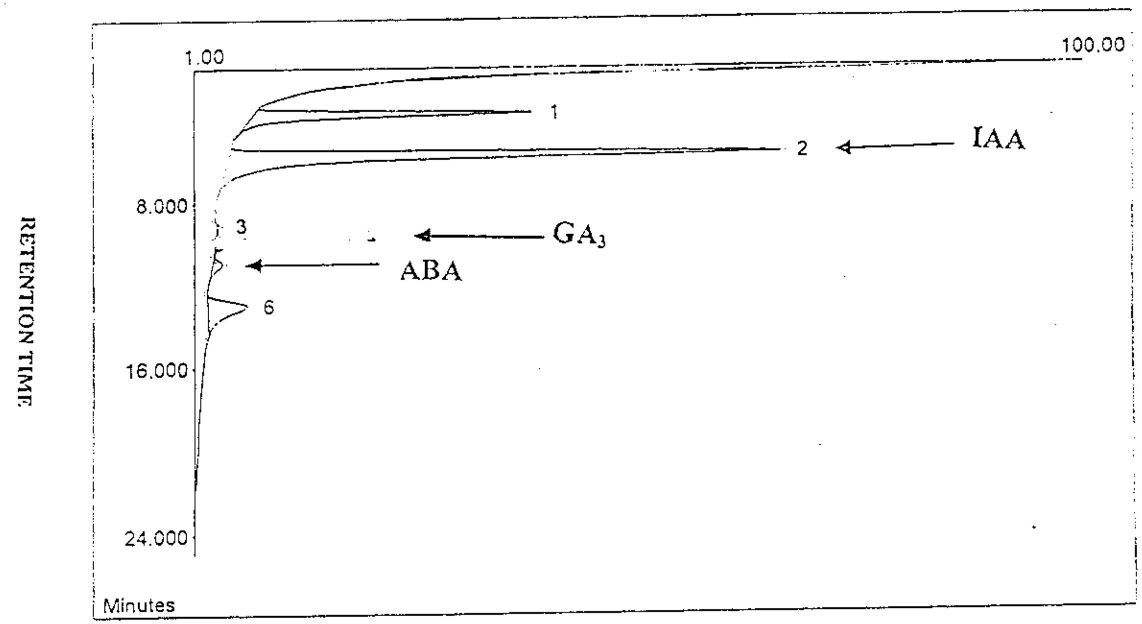


Fig (11): Hormonal profile in unstratified Magnolia seeds indicating the endogenous IAA, GA_3 and ABA levels.



CHROMATOGRAM

Fig (12): Hormonal profile in Magnolia seeds stratified for 2 months showing the endogenous IAA, GA_3 and ABA levels.

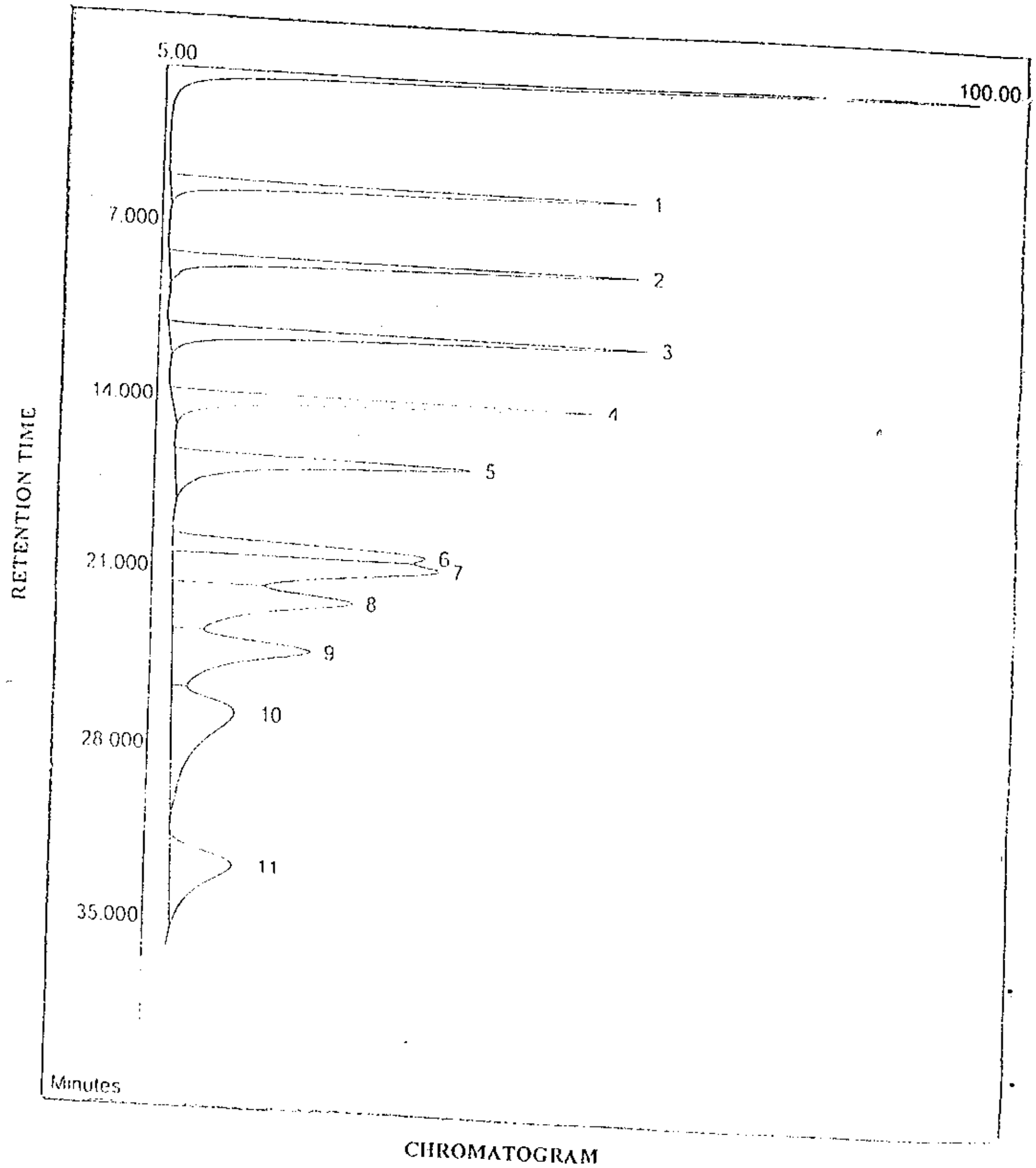


Fig (13) : Fatty acids profile (standard).

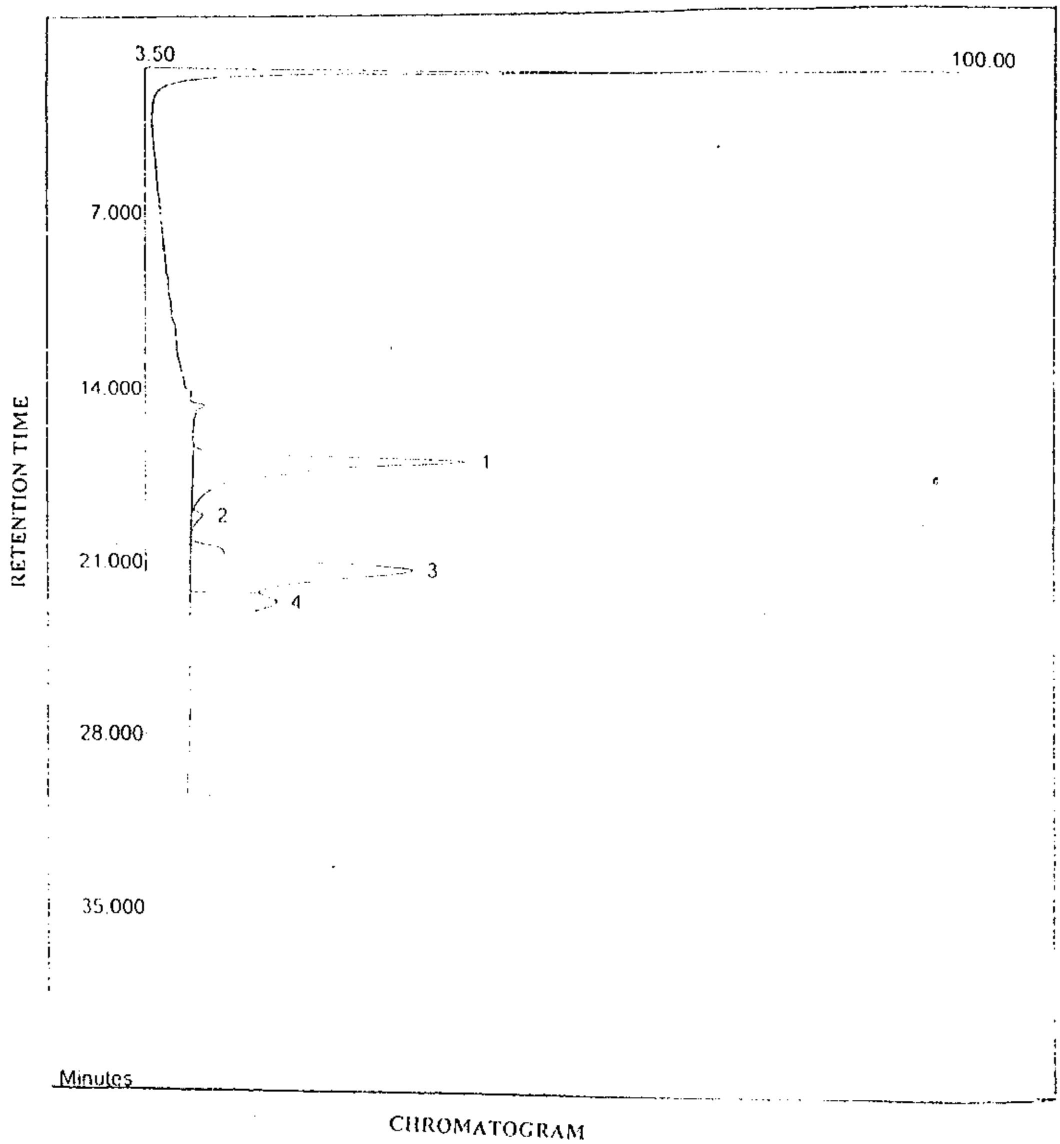
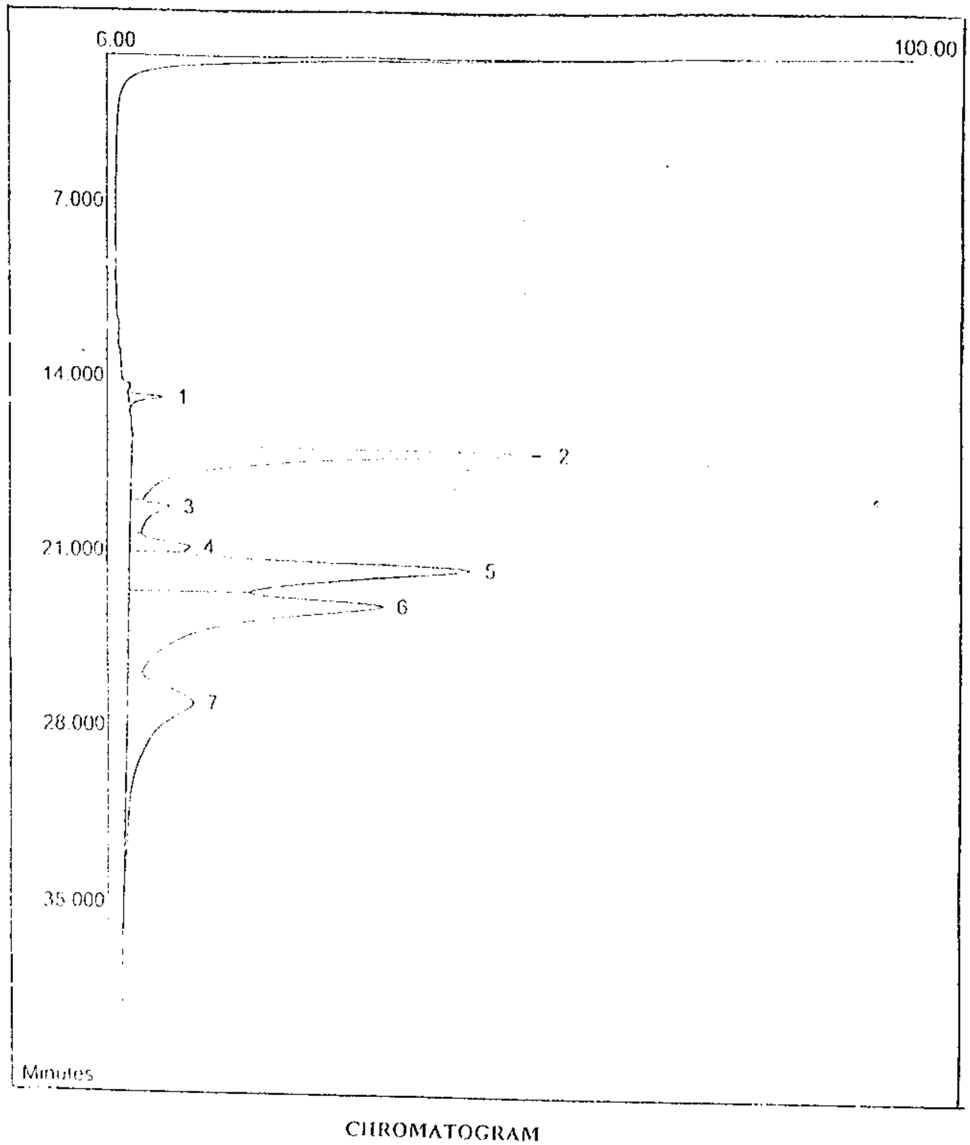


Fig (14) : Fatty acids profile in unstratified Magnolia seeds.

1 - Palmetic . 2 - Oleic . 3 - linoleic . 4 - Stearic .



Fig(15) : Fatty acids profile in stratified Magnolia seeds stratified for 2 months.

1 – Myristic . 3 – Oleic . 5 – Linolenic . 7 – Stearic .

2 – Palmetic . 4 – linoleic . 6 – Arachidic .

II- Germination process of Magnolia seeds and seedling emergence.

Data in **Table** (3) clearly indicate that during 1998 season the effect of GA_3 at 100 ppm, YE at 100 ml/l. and NAA at 25 ppm without pervious stratification of the treated seeds significantly decreased the seedling emergence % to reach the 5% level of significance. The only exception were the treatments of GA_3, YE and NAA at 50 ppm, 50 ml/l. and 50 ppm GA_3, respectively which gave significant increase.

The greatest reduction was obtained with GA_3 at 50 ppm meanwhile, NAA at 25 ppm followed by NAA at 50 ppm gave the lowest reduction of this percentage. Also, as shown in **Table** (3) the treatments of gibberellic acid (GA_3) at 50 & 100 ppm, yeast extract (YE) at 50 & 100 ml/l. and naphthalene acetic acid (NAA) at 25 & 50 ppm significantly affected the seedling emergence percentage of Magnolia seeds when stratified for two months before being treated with the assigned treatments. This significant effect was the enhancement of seedling emergence of the stratified Magnolia seeds treated with NAA at 25 ppm, GA_3 at 50 ppm YE at 100 ml/l., and GA_3 at 100 ppm in descending order.

Also, it could be noticed that these treatments increased the % of emerged seedlings to reach the 5% level

Table (3): Germination percentages and rate unstratified and stratified of magnolia seeds " *Magnolia grandiflora* L." during 1997/1998 and 1998/1999 seasons.

Seasons		1997/1998				1998/1999			
		unstratified seeds		stratified seeds for*		unstratified seeds		stratified seeds for*	
		Seedling emergence		Seedling emergence		Seedling emergence		Seedling emergence	
Treatments		percentage	rate	percentage	rate	percentage	rate	percentage	rate
GA_3 ppm:	50	36.0	5.22	48.0	6.62	34.0	5.02	40.0	6.54
	100	16.0	5.60	56.0	5.65	24.0	7.48	52.0	9.45
YE ml/l.:	50	48.0	4.20	52.0	4.96	36.0	3.14	56.0	5.97
	100	24.0	7.80	40.0	10.96	32.0	6.34	40.0	9.71
NAA ppm:	25	20.0	4.82	56.0	9.81	24.0	13.92	48.0	10.78
	50	32.0	6.08	68.0	7.54	28.0	5.33	65.0	9.82
Control		28.0	10.06	48.0	9.50	24.0	9.11	44.0	9.67
L.S.D. at 5%		1.02		1.46		1.18		1.61	

* Seeds were stratified at 5± 1°C for two months.

of significance. Meanwhile, NAA at 50 ppm did not show any effect upon the percentage of emerged seedlings.

On the other hand, YE at 50 ml/l. significantly decreased the emerged seedlings percentage to reach 5% level of significance. In addition, data in **Table** (3), also show that during 1998 /1999 season the assigned treatments nearly exhibited the same trend as in 1997 /1998 season. However, the existed reduction or increment was more obvious in 1997/1998 than in 1998 /1999 season. Since, the highest decrease and increase of emerged seedlings % were 16 & 48% in 1997/1998 season compared with 24 & 36% in 1998 /1999 season. These differences could be- to some extend- attributed partially to differences in weather conditions between the two seasons or to the non-uniformity in the ripening of the cultivated seeds.

On the other hand, seedling emergence rate (i.e. the mean number of days required for seedling emergence) was reduced to 4.20 & 4.96 and 3.14 & 5.97 with GA_3 at 100 ppm for unstratified and stratified seed in 1997/1998 and 1998 /1999 seasons, respectively. On the other hand, the treatment of YE at 100 ml/l. gave the highest increase of the seedling emergence rate during the two seasons under study in case of unstratified and stratified seeds. This result could be considered of great importance, because, yeast extract is known as a rich source of phytohormones (especially cytokinins and auxins), enzymes, vitamins, ... etc. (**Table**, 1). Therefore, it could accelerate germination process, hence seedlings emergence being expected because cytokinins is known as shooting hormone **Devlin and Witham (1983), Noggle and Fritz (1992) and Marschner (1995).**

Also, it could be noticed that NAA with its low concentration gave the highest percentage of emerged seedlings as compared with the rest of treatments only in case of stratified seeds. On the other hand, in case of unstratified seeds the 50 ppm NAA significantly decreased the % of seedlings emergence during 1997 /1998 and 1998 /1999 seasons.

In this respect NAA and GA_3 are known as germination promoters for many seed types **Bausher and Yetenosky (1987), Devlin and Witham (1983) and Wien (1997),** despite that in case of unstratified seeds these growth regulators did not show the greatest values of Magnolia seedling emergence.

That might be attributed to the longevity of germination period in which is required in case of Magnolia seeds [long time period is required]. Thereby, according to the established and well known basis regarding NAA degradation **(Devlin and Witham, 1983 and Mohr and Schopfer, 1995),** so the negative effect specially in case of the low concentration of the two hormones being more accepted.

Also, because auxin (NAA i.e. auxin like activity) is known to stimulate root growth (radical) as a first known step of germination process, so, the following consequence of germination events is completely controlled and also depending on this primary step.

In general, the enhancement of stratification treatment upon Magnolia seed germination could be attributed to the positive alterations of different physiological activation those being accompanied the stratification process. Since, during this process the following being occurred:

1- rapid translocation of stored nutritive substances from storage cells towards the activated embryos, 2- high rate of sugars accumulation in embryo cells, 3- digestion of different fats, 4- it may led to disappear of some growth inhibitors or their substitution with growth promoters such as GA_3 and cytokinins and 5- various changes in the level of different anabolism processes for different nutrient substances those are implying in germination processes.

In this respect other studies have been reported nearly similar results considering the effect of NAA, GA_3 or other hormones on germination of Magnolia or other ornamental plants. Of these are **Misiha and Ashry (1991) and Hussein (1993)** who studies the effects of NAA and GA_3 on germination of stratified Magnolia seeds, and concluded that both NAA and GA_3 stimulated the germination process of pre-stratified Magnolia seeds.

III-Growth behaviour:

1- Unstratified seeds treated with gibberellic acid (GA_3), yeast extract (YE) or naphthalene acetic acid (NAA):

a- Plant height:

Data in **Tables** (4, 5 & 6) show the effect of GA_3 (50 & 100 ppm), YE (50 & 100 ml/l.) and NAA (25 & 50 ppm) as seed soaking material for 24 h. on some growth aspects of Magnolia seedlings produced from unstratified seeds at 180, 210 and 40 days after treatments age during 1998 and 1999 seasons.

As for the plant height, it was significantly increased only with yeast extract (YE) 50 ml/l. at 240 days after treatments. Meanwhile, at 180 and 210 days with the same treatment of yeast extract (YE) (50 ml/l.) as well as at 180, 210 and 240 days of plant age with gibberellic acid (GA_3) at 50 & 100 ppm and naphthalene acetic acid (NAA) at 25 & 50 ppm insignificant increase of this parameter was existed. On the other hand, the only YE at 100 ml/l. significantly decreased plant height at 180 and 210 days as well as its insignificant reduction at 240 days of plant age. Also, it could be noticed that the effect of each treatment upon plant height was due to effects on both hypocotyl and internodes lengths i.e. the two parts implies the plant height

Table (4): Effect of gibberellic acid (GA_3), yeast extract (YE) and naphthalene acetic acid (NAA) on growth behaviour of magnolia " *Magnolia grandiflora* L." seedling grown up from unstratified seeds at age of 6 months after sowing during 1997/1998 and 1998/1999 seasons.

Treatments	Seasons													
	1997/1998							1998/1999						
	Hypocotyl length (cm)	Internodes length (cm)	Number of internodes	Mean length of internodes (cm)	Plant height/ plant	Number of leaves/ plant	Leaf area (cm^2/ plant)	Hypocotyl length (cm)	Internodes length (cm)	Number of internodes	Mean length of internodes (cm)	Plant height/ plant	Number of leaves/ plant	Leaf area (cm^2/ plant)
GA_3 ppm: 50	3.60	1.20	6.00	0.20	4.80	5.00	42.85	2.80	1.20	6.00	0.20	4.00	5.00	25.20
100	3.20	1.60	5.00	0.32	4.80	4.00	37.12	2.50	1.50	6.00	0.25	4.00	5.00	20.25
YE ml/l.: 50	3.60	1.30	6.00	0.21	4.90	5.00	37.85	4.20	1.30	6.00	0.21	4.50	5.00	27.15
100	1.80	0.90	5.00	0.18	2.70	4.00	9.60	3.00	1.30	5.00	0.26	4.30	4.00	23.00
NAA ppm: 25	3.00	1.50	5.00	0.30	4.50	4.00	27.24	2.50	1.30	6.00	0.18	3.80	5.00	32.8
50	3.50	1.20	5.00	0.24	4.70	4.00	26.52	2.90	1.20	5.00	0.24	4.10	4.00	24.88
Control	2.70	1.30	4.00	0.32	4.00	3.00	22.83	2.70	1.30	5.00	0.26	4.00	4.00	26.60
L.S.D. at 5%	0.81	0.36	1.41	0.08	1.21	1.41	6.24	1.31	0.61	2.45	0.09	1.69	2.11	6.61

Table (6): Effect of gibberellic acid (GA_3), yeast extract (YE) and naphthalene acetic acid (NAA) on growth behaviour of magnolia " *Magnolia grandiflora* L." seedlings grown up from unstratified seeds at age of 8 months after sowing during 1997/1998 and 1998/1999 seasons.

Treatments	Seasons													
	1997/1998							1998/1999						
	Hypocotyl length (cm)	Internodes length (cm)	Number of internodes	Mean length of internodes (cm)	Plant height/ plant	Number of leaves/ plant	Leaf area (cm^2/ plant)	Hypocotyl length (cm)	Internodes length (cm)	Number of internodes	Mean length of internodes (cm)	Plant height/ plant	Number of leaves/ plant	Leaf area (cm^2/ plant)
GA_3 ppm: 50	5.10	1.50	7.00	0.21	6.60	6.00	71.28	4.60	1.80	8.00	0.22	6.40	7.00	49.48
100	4.70	1.60	6.00	0.26	6.30	5.00	63.15	4.00	1.60	7.00	0.22	5.60	6.00	41.58
YE ml/l.: 50	5.40	1.50	8.00	0.18	6.90	7.00	85.82	4.60	1.60	7.00	0.22	6.20	6.00	62.58
100	3.40	1.30	6.00	0.21	4.70	5.00	30.75	5.30	1.70	6.00	0.28	7.00	5.00	41.85
NAA ppm: 25	5.00	1.50	6.00	0.25	6.50	5.00	46.65	5.00	1.80	8.00	0.23	6.80	7.00	54.60
50	5.00	1.40	7.00	0.20	6.40	6.00	49.44	5.00	1.60	7.00	0.22	6.60	6.00	54.72
Control	3.70	1.70	5.00	0.34	5.40	4.00	38.36	4.10	1.90	6.00	0.31	6.00	5.00	47.45
L.S.D. at 5%	1.35	0.33	1.45	0.05	1.45	1.42	3.63	2.09	0.84	2.82	0.11	2.83	2.48	9.31

but the internodes length was to some extend more affected with different treatment as compared with hypocotyl length.

In this respect other studies have been got nearly similar results about the effect of GA_3 and auxin IAA on Magnolia growth as well as on some other ornamental plants. Of these are **Hassan (1992) and Nofal *et al.* (1981) and Misiha and Ashry (1991).** Concerning the stimulatory effect of GA_3, NAA and YE at 50 ml/l. it could be attributed to the well established effects of this substances, since, gibberellins causes cell elongation (**Yeung and Sussex, 1979, Devlin and Witham, 1983 and Pharis and King, 1985)** and auxin is implying in cell division (**Marschner, 1995)** while yeast extract is a rich source of hormones, vitamins, enzymes, ... etc (**Barnett *et al.*, 1990, Atawia and ElDesouky, 1997 and Fathy *et al.*, 2000)** see also **Table** (1).

Hence, the increase in Magnolia stem length being expected meanwhile, the higher concentration of YE i.e. 100 ml/l that significantly decreased the stem length could be attributed to the unbalance or alteration of endogenous phytohormones that could be existed under the YE at high concentration treatment.

b- Leaf characters:

With regard to the number of leaves it could be noticed that GA_3 of 50 ppm at 180 and 240 days of plant age significantly increased this parameter and insignificantly increased it at 210 days meanwhile GA_3 at 100 ppm either showed its insignificant increase at 180 and 210 days or had no effect at 210 days of plant age. In the case of YE, the lowest concentration (50 ml/l.) significantly increased the number of formed leaves at 180 and 210 days meanwhile showed insignificant increase of this number at 210 days of plant age. At the same time insignificant increase in the number of leaves was the dominant effect of YE at 100 ml/l. during the three stages of plant age.

While in case of NAA contradicting results were obtained. Since, NAA at 25 ppm insignificantly increased leaf number at 180 and 240 days of plant age but had no effect at 210 days. Meanwhile, significant increase of this character at 240 days and the case of no effect at 210 days were existed with NAA at 50 ppm.

Regarding the total leaf area/plant as shown in **Tables** (4, 5 & 6), significant increase of this area was the dominant effect for each of GA_3 at 50 & 100 ppm and YE at 50 ml/l. at the three stages of Magnolia seedlings growth.

Also, NAA with the two applied concentrations at 240 days showed significant increase of this trait and insignificant increase at 180 days of Magnolia seedlings age. On the other hand, significant reduction in leaves number was existed with YE at 100 ml/l. at the three stages of growth and with the two applied concentration of NAA at 210 days of seedling age. The above mentioned effects upon the number and area of Magnolia leaves were obtained during 1997/1998 cultivation meanwhile in 1998/1999 nearly similar results were obtained. The little differences between the two plantings could be attributed to those differences in growth conditions. In this respect, to our knowledge there are no studies have been carried out deleing with the effect of such material on leaf number and area of Magnolia plants. However, about the interpretation of present results it could be directly related them to the nature of the effect of each substance. Since, GA_3, NAA and those hormones are naturally present in the yeast extract preparation have established effects upon cell elongation and division **(Pharis and King, 1995 and Marschner, 1995)** leading to leaf area increases. Also, increase in the leaves number was preceded with parallel increase in the internodes number (**Tables**, 4, 5 & 6).

Hence, it is of interest is that increases of leaf area produced because its direct reflection upon the efficiency of photosynthesis process itself. Therefore, more assimilates being produced and translocated outside leaves into other organs. So, the growth enhancement being achieved.

2- Pre-stratified seeds and treated with gibberellic acid (GA_3), yeast extract (YE) or naphthalene acetic acid (NAA):

a- Plant height:

Data in **Tables** (7, 8 & 9) indicate the effect of seed stratification of Magnolia plants for two months (at 5±1° C) followed by pre-sowing treatment of gibberellic acid (GA_3) at 50 & 100 ppm, yeast extract (YE) at 50 & 100 ml/l. or naphthalene acetic acid (NAA) at 25 & 50 ppm as seed soaking material for 24 hours.

As for the plant height, it was insignificantly increased only with GA_3 50 ppm at 180 days of plant age. While, the rest of treatments showed either a significant reduction (100 ml/l., YE and 25 ppm NAA at 180 and 210 days) or insignificant reduction (100 ppm GA_3, 100 ml/l. YE and 50 ppm NAA at the three stages of growth. Also, as shown in **Tables**, (7, 8 & 9) it could be noticed that increases or decreases of plant height is related with the main length of the internodes and number of internodes. In addition little differences existed between growth parameters were recorded in 1998 and those of 1999 season. This differences could be attributed to the differences in growth conditions among the two seasons of the present study.

In this respect, **Misiha** and **El-Ashry (1991)** reported that stem length of Magnolia seedling was

Table (7): Effect of combined treatment of gibberellic acid (GA_3), yeast extract (YE) or naphthalene acetic acid (NAA) and seed stratification on grown behaviour of Magnolia " *Magnolia grandiflora* L." seedlings at age of 6 months after sowing during 1997/1998 and 1998/1999 seasons.

Treatments		Seasons													
		1997/1998							1998/1999						
		Hypocotyl length (cm)	Internodes length (cm)	Number of internodes	Mean length of internodes (cm)	Plant height/ plant	Number of leaves/ plant	Leaf area (cm^2/ plant)	Hypocotyl length (cm)	Internodes length (cm)	Number of internodes	Mean length of internodes (cm)	Plant height/ plant	Number of leaves/ plant	Leaf area (cm^2/ plant)
GA_3 ppm:	50	3.50	1.80	5.00	0.36	5.30	4.00	39.60	2.40	1.10	6.00	0.18	3.50	5.00	28.60
	100	3.30	1.70	5.00	0.34	5.00	4.00	35.32	2.50	1.30	6.00	0.21	3.80	5.00	22.50
YE ml/l.:	50	2.80	1.30	5.00	0.26	4.10	4.00	45.60	2.40	1.20	5.00	0.24	3.60	4.00	24.32
	100	3.60	1.40	5.00	0.28	5.00	4.00	30.00	2.60	1.60	7.00	0.22	4.20	6.00	43.26
NAA ppm:	25	3.00	1.30	6.00	0.21	4.30	5.00	38.60	2.40	1.20	6.00	0.20	3.60	5.00	32.65
	50	3.50	1.60	6.00	0.26	5.10	5.00	37.45	2.60	1.40	7.00	0.20	4.00	6.00	39.72
Control		3.50	1.70	5.00	0.34	5.20	4.00	26.80	2.10	1.10	6.00	0.18	3.20	5.00	22.20
L.S.D. at 5%		0.67	0.44	0.70	0.06	0.70	0.67	5.51	0.74	0.45	1.48	0.10	1.05	1.48	6.29

Table (8): Effect of combined treatment of gibberellic acid (GA_3), yeast extract (YE) or naphthalene acetic acid (NAA) and seed stratification on grown behaviour of Magnolia " *Magnolia grandiflora* L." seedlings at age of 7 months after sowing during 1997/1998 and 1998/1999 seasons.

Treatments	Seasons													
	1997/1998							1998/1999						
	Hypocotyl length (cm)	Internodes length (cm)	Number of internodes	Mean length of internodes (cm)	Plant height/ plant	Number of leaves/ plant	Leaf area (cm^2/ plant)	Hypocotyl length (cm)	Internodes length (cm)	Number of internodes	Mean length of internodes (cm)	Plant height/ plant	Number of leaves/ plant	Leaf area (cm^2/ plant)
GA_3 ppm: 50	4.20	1.80	5.00	0.36	6.00	4.00	39.60	3.20	1.30	7.00	0.18	4.50	6.00	48.06
100	3.70	1.70	6.00	0.34	5.40	5.00	48.72	3.30	1.50	7.00	0.21	4.80	6.00	37.86
YE ml/L.: 50	3.00	1.40	6.00	0.26	4.40	5.00	57.00	2.90	1.60	6.00	0.24	4.50	5.00	35.70
100	4.60	1.40	5.00	0.28	6.00	4.00	40.12	3.20	1.80	7.00	0.25	5.00	6.00	43.30
NAA ppm: 25	3.50	1.30	6.00	0.21	4.80	5.00	49.60	3.20	1.40	7.00	0.20	4.60	6.00	43.30
50	3.60	1.60	5.00	0.26	5.20	4.00	29.96	3.50	1.60	7.00	0.22	5.10	6.00	47.40
Control	4.40	1.70	6.00	0.34	6.10	5.00	33.50	3.40	1.20	6.00	0.20	4.60	5.00	32.60
L.S.D. at 5%	0.95	0.36	0.84	0.07	0.91	0.84	5.90	0.76	0.43	1.42	0.07	1.07	1.42	6.80

Table (9): Effect of combined treatment of gibberellic acid (GA_3), yeast extract (YE) or naphthalene acetic acid (NAA) and seed stratification on growth behaviour of Magnolia " *Magnolia grandiflora* L." seedlings at age of 8 months after sowing during 1997/1998 and 1998/1999 seasons.

Treatments	Seasons													
	1997/1998							1998/1999						
	Hypocotyl length (cm)	Internodes length (cm)	Number of internodes	Mean length of internodes (cm)	Plant height/ plant	Number of leaves/ plant	Leaf area (cm^2/ plant)	Hypocotyl length (cm)	Internodes length (cm)	Number of internodes	Mean length of internodes (cm)	Plant height/ plant	Number of leaves/ plant	Leaf area (cm^2/ plant)
GA_3 ppm: 50	4.60	1.90	5.00	0.38	6.50	4.00	47.96	4.10	1.40	7.00	0.20	5.50	6.00	59.94
100	4.30	1.70	6.00	0.34	6.00	5.00	61.60	4.00	1.50	7.00	0.21	5.50	6.00	42.30
YE ml/l.: 50	4.70	1.40	6.00	0.26	6.10	5.00	64.10	3.60	1.60	7.00	0.22	5.20	6.00	48.96
100	4.90	1.40	6.00	0.28	6.30	5.00	58.60	3.90	1.90	7.00	0.27	5.80	7.00	70.91
NAA ppm: 25	4.50	1.30	7.00	0.21	5.80	6.00	70.20	3.80	1.60	7.00	0.22	5.40	6.00	61.62
50	4.20	1.60	7.00	0.26	5.80	6.00	56.48	4.10	1.70	7.00	0.24	5.80	6.00	55.50
Control	4.70	1.90	7.00	0.34	6.60	6.00	50.64	4.20	1.50	7.00	0.21	5.70	6.00	46.08
L.S.D. at 5%	0.96	0.35	0.76	0.08	0.92	0.95	5.25	2.08	0.33	1.03	0.06	1.01	1.03	7.27

significantly increased by GA_3 applied at 250, 500 and 1000 ppm, while, stratification treatments had nonsignificant effect. Also, other investigators referred to the stimulatory effect of GA_3 to produce vigorous growth of Magnolia or other plant seedlings (**Periy** and **Vines 1974**; **Nagao** ***et al.*****, 1980** and **Nofal** ***et al.*****, 1981**).

An intersting observation was that, treating Magnolia seeds with GA_3, YE and NAA at the applied concentrations without preceding stratification gave highest stem lengths, comparing with those grown up from pre-stratified seeds followed by GA_3, YE and NAA treatments **Tables** (4,5&6).

Although stratification [as shown in **Table**, 1] enhances the germination of Magnolia seeds more than those of unstratified ones. It was also of interest to note that the analysis of the stratified seeds in the present study revealed obvious increases in the hormones IAA, GA_3, fatty acids and sugars comparing with unstratified seeds (see Figures 5-15 and **Table** (2).

In addition, it has been established that stratification practice is usually can followed by:

1- rapid translocation of stored nutritive substances from storage cells towards the activated embryos, 2- high rate of sugars accumulation in embryo cells, 3- digestion of different fats, 4- it may led to disappearance of some growth inhibitors or their substitution with growth promoters such as GA_3 and cytokinins and 5- various changes in the levels of different anabolism processes for different nutrient substances those are implying in germination processes. So, stratification process included the consumption of a great part of ready and available nutrient for the accent of the germination process itself. Thereby more seeds being succeeded to germinate rising there germination percentages as obtained in **Table** (3). On the other side, according to the effect of the applied treatments as GA_3, YE and NAA without stratification were. So, it could be partially attributed to the effect upon the growth of only germinated seeds rather than to be upon different metabolic alterations that occurred as mentioned before and presented in **Table (7, 8 & 9**) for stratified seeds.

b- Leaves characters

With regard to the number of leaves as shown in **Tables (7, 8 & 9)** GA_3 at 50 & 100 ppm and YE at 50 & 100 ml/l. at 180 days of seedlings age; GA_3 at 100 ppm, YE at 50 ml/l. and NAA 25 ppm at 210 days of seedlings age and NAA at 25 ppm & 50 ppm at 240 days of seedling ages had no effect upon the leaf characters.

While significant increase was obtained in leaves number only with the two applied concentration of NAA at 180 days of seedlings age. Meanwhile, significant reduction in leaves number was obtained with GA_3 at 50 ppm, YE at

100 ml/l. and NAA with the two applied concentrations and YE at 240 days of seedlings age.

In this respect the reduction existed in leaves number was a reflection for the decreases in internodes number and the vice versa is true.

As for leaf area it could be noticed that as indicated in **Table** (7) i.e. at 180 days of seedlings age different treatment increased the leaf area parameter either significantly with the two applied concentrations of GA_3, NAA and YE only at 50 ml/l. or insignificantly increased it with 100 ml/l. YE. While at 210 days of plant age **Table** (8) different applied treatments significantly increased this area and the only exception was that insignificant reduction with 50 ppm NAA. Meanwhile, at 240 days after sowing **Table** (9) significant increase was existed with the two applied concentrations of YE and NAA as well as with 100 ppm GA_3, yet the low concentration of GA_3 [i.e., 50 ppm] insignificantly decreased this area.

In general, as previously mentioned, increases or decreases of the formed leaf area could be attributed to the endogenous levels of phytohormones as well as to the available photoassimilates produced from this area. So, this parameter [i.e. leaf area] could be considered as a precise parameter for real determination of seedlings growth rate. Therefore, the treatments of NAA at 25 ppm and YE at 50 ml/l. considered the most active treatment as they gave the highest leaf area comparing with all other treatments especially at 240 days after sowing. Also, it could be attributed that reduction in the formed leaf area to the inbalance of the hormonal profile as well as to the reduction in the efficiency of photosynthesis process itself [**Hopkins, 1995** and **Hendrix, 1995**].

III- Growth behaviour at 18 months of plant age:

1- Vegetative growth:

a- Plants grown up from unstratified seeds:

As shown in **Table** (10), different treatments significantly increased the length and size of Magnolia roots at 18 months after sowing. The highest increase of these two parameters were existed with the treatment of YE at 50 ml/l. [87.16 cm and 86.66 cm^3 for root length and root size, respectively]. Meanwhile, the lowest significant increase of these two parameters were existed in case of 50 ppm NAA treatment.

In this respect, recorded data indicate that YE gave longer plants when compared with GA_3 treatment. That it may be not only due to the plenty of hormones in yeast preparation (i.e. auxins, gibberellins and cytokinins, see **Table**, 1) but also to its content of vitamins, enzymes and several macro and micro-nutrients. So, the major requirements of plants to grow and develop well were achieved with such yeast extract treatment.

Table (10): Effect of gibberellic acid (GA_3), yeast extract (YE) and naphthalene acetic acid (NAA) on growth characteristics of magnolia "*Magnolia grandiflora* L." plants grown up from unstratified seeds sown during 1998 season at the age of "18" months.

Treatments	Plant organs													
	Roots				Stems						Leaves			Total fresh weight g/plant
	Length (cm)	Size (cm^3)	Diameter (cm)	Fresh weight g/plant	Hypocotyl length (cm)	Internodes length (cm)	Number of internodes /plant	Mean length of internodes (cm)	Plant height/ cm	Fresh weight g/plant	Number of leaves/ plant	Leaves area cm^3/ plant	Fresh weight g/plant	
GA_3 ppm: 50	85.00	85.16	1.23	59.83	12.00	18.33	26.00	0.70	30.38	11.99	25.00	115.21	45.23	117.05
100	85.16	84.50	1.22	61.10	12.33	18.66	27.00	0.66	31.99	11.98	26.00	116.00	45.56	118.64
YE ml/l.: 50	87.16	86.66	1.38	61.13	13.00	20.66	28.00	0.76	33.66	12.58	27.00	118.77	47.62	121.33
100	86.16	86.00	1.33	61.48	13.00	19.86	28.00	0.72	32.86	12.02	27.00	116.77	46.76	120.26
NAA ppm: 25	85.96	85.50	1.26	61.20	11.33	19.00	26.00	0.73	30.33	12.01	25.00	115.85	45.98	119.19
50	84.63	84.83	1.20	60.33	10.66	19.00	26.00	0.73	29.66	11.36	25.00	114.85	45.03	116.72
Control	83.33	83.33	1.13	58.65	10.00	18.33	26.00	0.70	28.33	10.94	25.00	113.99	43.65	113.24
L.S.D. at 5%	1.25	0.95	0.12	0.97	1.59	1.43	1.13	0.06	2.19	1.04	1.13	1.83	1.03	1.01

With regard to the root diameter of Magnolia plants it was significantly increased with YE at 50 & 100 ml/l. and NAA at 25 ppm meanwhile its insignificant increase was obtained with GA_3 at the two applied concentrations and NAA at 50 ppm. Herein, also of interest is to note that YE gave the highest values in root thickness. So, this treatment [i.e. YE] also gave the highest values of root fresh weight [61.48 & 61.20 g/plant for 50 & 100 ml/l., respectively].

In addition, all other treatments significantly increased the fresh weight of Magnolia roots.

As for stem characteristics of Magnolia plants (**Table,** 10) it could be noticed that it was slightly affected with most applied treatments. Since, the only YE at the two applied concentrations significantly increased the hypocotyl length, internodes length, number of internodes, plant height and fresh weight of stem. Also, gibberellic acid gave significant increase of some stem characters as internodes length, plant height and stem fresh weight and insignificantly increased the others especially the hypocotyl length but had no effect upon the others as mean of internodes length.

Regarding the leaf characters as shown in **Table** (10), only YE exhibited the highest significant increase of all estimated leaf characters (i.e. number, area and fresh weight of leaves). Meanwhile, gibberellic acid and naphthalene acetic acid nearly showed similar effects upon leaf characters and ranked the second in this respect.

In addition, during 1999 season, (**Table**, 11) each of the different applied treatment nearly behaved in the same manner as in 1998 season. Since, the more pronounced positive effect upon different estimated leaf characters was obtained with the two applied concentrations of YE. Also gibberellic acid and naphthalene acetic acid nearly behaved as the same as in the first season.

In general, as the vegetative growth is required, in case of Magnolia as an ornamental plant during the earlier stages of growth till plants rapidly could reach its flowering stage. That is of economic importance, since it is well known that Magnolia required long period till flowering. Also, it could be noticed that the obtained enhancement of Magnolia seed germination (**Table**, 3) and seedlings growth at different dates of estimation (**Tables**, 4, 5 & 6) was prolonged to the present advanced stage of Magnolia growth (i.e. 18 months after sowing). In addition, such enhancement of Magnolia growth could be shortened or reducing of the Juvenility period of Magnolia plants. Thereby, such desirable conditions were clearly attained with YE treatment followed by gibberellic acid and naphthalene acetic acid treatments. So, it could be recommended here that of economic and significant values to treat Magnolia seeds

Table (11): Effect of gibberellic acid (GA_3), yeast extract (YE) and naphthalene acetic acid (NAA) on growth characteristics of magnolia "*Magnolia grandiflora* L." plants grown up from unstratified seeds sown during 1999 season at the age of "18" months.

Treatments	Plant organs													
	Roots				Stems						Leaves			Total fresh weight g/plant
	Length (cm)	Size (cm^3)	Diameter (cm)	Fresh weight g/plant	Hypocotyl length (cm)	Internodes length (cm)	Number of internodes /plant	Mean length of internodes (cm)	Plant height/ cm	Fresh weight g/plant	Number of leaves/ plant	Leaves area cm^3/ plant	Fresh weight g/plant	
GA_3 ppm: 50	88.33	86.00	1.16	63.95	11.33	18.33	25.00	0.73	29.66	12.81	24.00	115.00	45.50	122.26
100	89.00	86.66	1.20	64.63	11.66	19.16	26.00	0.73	30.82	13.06	25.00	116.15	45.75	123.44
YE ml/l.: 50	90.83	88.33	1.30	67.50	12.16	20.16	27.00	0.74	32.32	13.61	26.00	117.98	47.45	128.53
100	89.16	88.33	1.28	65.65	11.66	19.83	26.00	0.76	28.49	13.30	25.00	115.83	47.11	126.06
NAA ppm: 25	87.33	87.00	1.20	65.31	10.50	19.00	26.00	0.76	29.50	12.98	25.00	113.13	46.00	124.29
50	86.00	85.66	1.18	63.16	10.50	18.33	26.00	0.70	28.83	12.25	25.00	112.00	45.21	120.62
Control	84.66	85.00	1.15	61.66	10.00	17.33	25.00	0.69	27.33	11.65	24.00	110.70	44.48	117.79
L.S.D. at 5%	1.38	1.21	0.12	0.98	0.69	0.32	0.52	0.06	0.93	0.75	0.52	1.27	1.27	1.01

with yeast extract at the rate of 50 or 100 ml/l. before sowing as seed soaking material.

b-Plant grown up from stratified seeds:

Obtained data in **Tables** (12 & 13) show the effects of gibberellic acid GA_3 (50& 100 ppm), yeast extract YE (50& 100 ml/l.) and naphthalene acetic acid NAA (25 & 50 ppm) on growth of different organs of Magnolia plant grown up from stratified seeds for two months at 18 months after sowing.

With regard to root growth, it could be noticed that YE and GA_3 in the two applied concentrations significantly increased root length, root size and root diameter. Meanwhile, mostly NAA insignificantly increased this parameter.

On the other hand, fresh weight of the root system was significantly increased with different applied treatments. The highest increase of this parameter was existed in case of YE treatment followed by GA_3 while NAA ranked the last in this respect.

As for the stem characters, it could be noticed that YE at the two applied concentrations, GA_3 at 100 ppm and NAA at 25 ppm significantly increased the hypocotyl length. Meanwhile, the internodes length exhibited its significant increase with different applied treatments. The highest significant increase was obtained with YE followed by GA_3 and NAA gave the lowest. Also, the number of

Table (12): Effect of gibberellic acid (GA_3), yeast extract (YE) and naphthalene acetic acid (NAA) on growth characteristics of magnolia " *Magnolia grandiflora* L." plants grown up from stratified seeds sown during 1998 season at the age of "18" months.

Treatments	Plant organs													
	Roots				Stems						Leaves			Total fresh weight g/plant
	Length (cm)	Size (cm^3)	Diameter (cm)	Fresh weight g/plant	Hypocotyl length (cm)	Internodes length (cm)	Number of internodes /plant	Mean length of internodes (cm)	Plant height/ cm	Fresh weight g/plant	Number of leaves/ plant	Leaves area cm^3/ plant	Fresh weight g/plant	
GA_3 ppm: 50	82.50	83.66	1.46	65.33	11.33	18.66	26.00	0.71	29.99	11.61	25.00	113.33	47.15	124.09
100	82.00	84.66	1.43	65.16	11.83	18.33	27.00	0.67	30.16	11.61	26.00	114.00	47.83	124.60
YE ml/l.: 50	83.33	86.16	1.53	66.83	12.33	19.66	27.00	0.72	31.99	12.76	26.00	119.83	49.41	129.00
100	83.50	86.00	1.45	65.66	11.83	19.00	27.00	0.70	30.83	12.23	26.00	116.83	48.40	126.29
NAA ppm: 25	82.00	83.83	1.30	64.83	11.33	18.66	26.00	0.71	29.99	11.43	25.00	115.65	47.63	123.89
50	81.50	83.00	1.30	64.66	10.83	18.00	25.00	0.72	28.83	10.65	24.00	112.33	46.58	121.89
Control	80.66	81.66	1.18	64.33	10.33	17.66	25.00	0.69	27.99	10.52	24.00	110.66	45.68	120.23
L.S.D. at 5%	1.11	1.04	0.19	1.15	1.08	0.80	1.12	N.S.	1.67	0.39	1.12	1.44	1.25	0.93

Table (13): Effect of gibberellic acid (GA_3), yeast extract (YE) and naphthalene acetic acid (NAA) on growth characteristics of magnolia "*Magnolia grandiflora* L." plants grown up from stratified seeds sown during 1999 season at the age of "18" months.

Treatments	Plant organs													
	Roots				Stems						Leaves			Total fresh weight g/plant
	Length (cm)	Size (cm^3)	Diameter (cm)	Fresh weight g/plant	Hypocotyl length (cm)	Internodes length (cm)	Number of internodes /plant	Mean length of internodes (cm)	Plant height/ cm	Fresh weight g/plant	Number of leaves/ plant	Leaves area cm^3/ plant	Fresh weight g/plant	
GA_3 ppm: 50	82.66	81.16	1.46	73.63	11.16	19.00	25.00	0.76	30.16	12.95	24.00	111.83	47.58	134.16
100	83.33	82.16	1.46	74.33	11.66	19.50	26.00	0.75	31.60	13.15	25.00	113.00	47.70	135.18
YE ml/l.: 50	84.33	83.50	1.53	75.76	12.16	20.33	26.00	0.78	32.49	14.48	25.00	113.83	48.91	135.15
100	84.00	86.00	1.45	74.76	12.16	19.33	26.00	0.74	31.49	13.60	25.00	111.83	48.46	136.82
NAA ppm: 25	81.00	81.33	1.30	73.83	11.50	19.00	25.00	0.76	30.50	12.81	24.00	111.00	47.90	134.54
50	80.00	79.83	1.30	72.93	10.83	18.83	24.00	0.78	29.66	12.13	23.00	109.93	47.53	132.41
Control	78.33	78.33	1.18	61.50	10.50	18.00	24.00	0.78	28.50	11.60	23.00	109.23	45.63	118.73
L.S.D. at 5%	2.18	2.79	0.19	1.04	0.80	0.71	0.61	0.06	1.07	0.79	0.61	1.50	0.85	0.89

internodes/plant showed significant increase with YE, GA_3 and only 25 ppm NAA, yet 50 ppm NAA had no effect upon these parameters.

In addition the mean of internodes length did not show significant increase with any of the applied treatments and insignificantly was reduced in case of GA_3 with the two applied concentrations, YE 100 ml/l. and NAA at 25 ppm. Despite the above mentioned results; plant height was significantly increased with different applied treatments to reach its maximum with YE. Herein, also it could be noticed that the fresh weight of stem nearly behaved as the same as plant height.

Concerning the leaf characters it could be, clearly noticed that number, area and fresh weight of leaves were significantly increased with different applied treatments except that insignificant increase existed in case of leaf area/plant and no effect in case of leaves number/plant with 50 ppm NAA treatment.

That is completely reversed upon the total fresh weight/plant since its significant increase was existed with all treatments.

Generally, it could be noticed that the above mentioned results are nearly the same during the two seasons of the present study. But of interest also is to note that the stratification practice (**Tables**, 12 & 13) gave vigorous growth rate of Magnolia plants more than those plants grown up from unstratified seeds (**Tables**, 10 & 11). This increment of fresh weight in plants grown up from stratified seeds could be mainly attributed to that increase of root fresh weight when compared with those grown up from unstratified seeds.

In addition, the enhancement of Magnolia growth [fresh weight] could be attributed to the well known effects of stratification treatments upon sub-cellular and many bioconstitunets synthesis. Of these effects are: 1- rapid translocation of stored nutritive substances from storage cells towards the activated embryos, 2- high rate of sugars accumulation in embryo cells, 3- digestion of different fats, 4- it may led to disappear of some growth inhibitors or their substitution with growth promoters such as GA_3 and cytokinins and 5- various changes in the level of different anabolism processes for different nutrient substances those are amplying in germination processes **Corocker (1906)**. So, the alternation of hormonal balance, de novo synthesis of some enzymes as well as the improvement of root growth could be reflected into the obtained vigorous growth of plants and increasing minerals uptake and/or photosynthates translocation. Thereby, under such conditions increment of fresh weight being expected, yet that it may extend to increasing the dry matter accumulation in different plant organs (**Marschner, 1995; Hopkins, 1995; Hendrix, 1995;**

El-Desouky and Khedr, 2000; and El-Desouky *et al.*, 2000).

2- Dry matter partitioning and distribution

a- Plants produced from unstratified seeds:

Data in **Tables** (14 & 15) show the effect of GA_3 (50 & 100 ml/l.) and NAA (25 & 50 ppm) on dry matter partitioning into different Magnolia organs (i.e. leaves, stems and roots) and its distribution or allocation in to different plant organs.

As for leaves dry weight it could be noticed that its insignificant reduction was obtained with 50 ppm GA_3 and NAA at the two applied concentrations. Meanwhile its insignificant increase was existed with YE at the two applied concentrations and the highest concentration of GA_3 (i.e 100 ppm).

As for the stem dry weight it could be noticed that the only YE at the two applied concentrations significantly increased it. Meanwhile, its insignificant increase was existed with GA_3 at the two applied concentrations but NAA at 25 ppm significantly decreased stem dry weight, yet 50 ppm NAA had no effect.

With regard to roots dry weight, clearly it could be noticed that most treatments significantly increased it. Exception was only its insignificant increase with 25 ppm NAA. Also of interest is to note that different treatments enhanced root growth on the account of dry matter being

Table (14): Dry matter partitioning and distribution in different organs of Magnolia plants grown up from unstratified seeds at "18" months of plant age during 1998 season.

Seasons		1997/1998									
		Dry weight of different organs g/organ			Total dry weight g/plant	% distribution in different organs			% increase or decrease in different organs as related to control		
Treatments		Leaves	Stems	Roots		Leaves	Stems	Roots	Leaves	Stems	Roots
GA_3 ppm:	50	14.55	3.85	10.76	29.16	50.75	13.14	36.09	97.97	103.21	111.50
	100	14.95	3.92	10.71	29.58	51.66	13.22	35.10	100.67	105.09	110.98
YE ml/l.:	50	15.90	4.32	12.48	32.70	49.08	14.02	36.80	107.07	115.81	129.32
	100	16.01	4.85	12.08	32.94	49.58	14.93	34.33	107.81	130.02	125.18
NAA ppm:	25	14.13	3.50	10.49	28.12	51.61	13.14	35.96	95.15	93.83	108.70
	50	13.23	3.73	10.73	27.69	49.15	13.66	37.30	89.09	100.00	111.19
Control		14.85	3.73	9.65	28.23	53.75	13.09	33.14	100.00	100.00	100.00
L.S.D. at 5%		1.29	0.20	0.96	2.58	3.29	1.20	2.96	-	-	-

Table (15): Dry matter partitioning and distribution in different organs of Magnolia plants grown up from unstratified seeds at "18" months of plant age during 1999 season.

Seasons		1998/1999									
		Dry weight of different organs g/organ			Total dry weight g/plant	% distribution in different organs			% increase or decrease in different organs as related to control		
Treatments		Leaves	Stems	Roots		Leaves	Stems	Roots	Leaves	Stems	Roots
GA_3 ppm:	50	15.97	3.50	11.78	31.25	52.92	11.36	35.18	100.44	95.89	104.71
	100	15.58	3.83	12.10	31.51	51.08	12.55	36.35	97.98	104.93	107.55
YE ml/l.	: 50	16.32	4.37	12.65	33.34	50.62	13.53	35.83	102.64	119.72	112.42
	100	16.70	4.50	13.45	34.65	50.30	13.47	36.25	105.03	123.28	119.55
NAA ppm:	25	14.93	3.47	11.73	30.13	51.60	11.89	36.49	93.89	95.06	104.26
	50	14.70	3.37	11.48	29.55	51.88	11.74	36.36	92.45	92.32	102.04
Control		15.90	3.65	11.25	30.80	51.77	11.81	36.39	100.00	100.00	100.00
L.S.D. at 5%		1.14	0.43	1.00	2.45	3.11	1.14	1.22	-	-	-

accumulated rather in leaves and stems. That is true for GA_3 and NAA treatments. Meanwhile, YE improved dry matter accumulation in the plant organs (i.e., leaves, stems and roots). Moreover, the highest increment of dry matter percentage being allocated in stems was obtained with YE treatment that reached 14.2 & 14.93% for YE at 50 & 100 ml/l., respectively. Meanwhile it was only 13.09% in case of control plants. Furthermore, the highest increase in the percentage of root-dry matter when compared with the control was also existed in case of YE treatment. Since, these values were 129.23 & 125.18%, 112.44 & 119.55% for 50 & 100 ml/l. YE at 1997/1998 and 1998/1999 seasons, respectively.

In general it could be noticed that the same trend existed with different applied treatments during 1997/1998 season (**Table**, 14) was also obtained during 1998/1999 season (**Table**, 15).

b- Plants grown up from stratified seeds:

The effect of different applied treatments upon dry matter accumulation and distribution in different organs of Magnolia grown up from stratified seeds for "2" months is shown in **Tables** (14 & 15).

Data clearly indicate that the only YE and GA_3 with the two applied concentrations of each significantly increased dry matter accumulation in both stems and roots. Despite that GA_3 treatment significantly decreased dry matter accumulation in leaves of treated plants, YE treatments showed insignificant increase of dry matter accumulation in leaves of treated plants. Therefore, that was completely reflected on the total dry matter being accumulated/plant in each treatment. Since, significant increase in the amount of the total dry matter that accumulated/plant was only existed in case of YE treatment, yet its significant reduction was attained in case of GA_3 treatment. On the other hand, regarding the percentage of dry matter distribution in different plant organs it could be noticed that GA_3 showed the lowest % in leaves and its maximum in roots. But for YE treatment increase was included both dry matter percentage in leaves, stems and roots as well. Also, the highest increase was obtained in case of stems that reached the significant level.

In addition, these results were nearly behaved closely similar during the two seasons of the present study (**Table**, 16 & 17).

VI- Effect on chloroplast pigments in leaves and some bioconstitents in different plant organs:

1- Chloroplast pigments:

As shown in **Table** (18) stratification of Magnolia seeds followed by their soaking in any of GA_3 (50 & 100 ppm), YE (50 & 100 ml/l.) or NAA (25 & 50 ppm) led to obvious increase of chloroplast pigments in leaves of growing plants at "18" months after sowing.

Table (16): Dry matter partitioning and distribution in different organs of *Magnolia* plants grown up from the stratified seeds at "18" months of plant age during 1998 season.

Seasons		1997/1998									
		Dry weight of different organs g/organ			Total dry weight g/plant	% distribution in different organs			% increase or decrease in different organs as related to control		
Treatments		Leaves	Stems	Roots		Leaves	Stems	Roots	Leaves	Stems	Roots
GA_3 ppm:	50	12.78	2.93	10.93	26.64	48.30	11.06	40.62	81.81	105.77	109.84
	100	13.20	3.09	10.81	27.10	49.00	11.37	39.62	84.50	111.55	108.64
YE ml/l.	: 50	15.93	3.61	11.38	30.92	52.79	11.96	36.37	101.98	130.32	114.37
	100	15.83	3.55	11.45	30.83	52.76	11.06	37.91	101.34	128.15	115.07
NAA ppm:	25	12.96	3.30	10.28	26.54	49.09	12.53	38.35	82.97	119.13	103.31
	50	14.56	2.83	9.80	27.19	53.71	10.70	37.16	93.21	102.16	98.49
Control		15.62	2.77	9.95	28.28	51.75	9.80	35.26	100.00	100.00	100.00
L.S.D. at 5%		1.52	0.36	0.65	2.15	2.60	1.20	2.41	-	--	--

Table (17): Dry matter partitioning and distribution in different organs of Magnolia plants grown up from the stratified seeds at "18" months of plant age during 1999 season.

Seasons		1998/1999									
		Dry weight of different organs g/organ			Total dry weight g/plant	% distribution in different organs			% increase or decrease in different organs as related to control		
Treatments		Leaves	Stems	Roots		Leaves	Stems	Roots	Leaves	Stems	Roots
GA_3 ppm:	50	14.44	3.21	11.31	28.96	46.65	11.12	39.21	97.50	101.90	103.28
	100	14.98	3.33	11.56	29.87	49.79	11.27	38.91	101.14	109.71	105.57
YE ml/l.	: 50	15.51	3.68	13.28	32.47	47.53	11.29	40.99	104.72	116.82	121.27
	100	15.64	3.92	13.50	33.06	47.20	10.82	40.96	105.60	124.44	123.28
NAA ppm:	25	14.64	3.08	11.80	29.52	49.51	10.45	40.01	98.85	97.77	107.76
	50	14.63	3.00	11.55	29.18	49.76	10.33	39.88	98.78	95.23	105.47
Control		14.81	3.15	10.95	28.91	50.96	11.03	37.99	100.00	100.00	100.00
L.S.D. at 5%		1.11	0.45	0.46	2.01	2.45	1.12	2.46	--	--	--

Table (18): Effect of growth regulators treatments (GA_3, YE* and NAA) and/or stratification on the chloroplast pigments in fresh leaves of "18" months aged Magnolia plants.

Treatments		Chlorophyll (a)	Chlorophyll (b)	Carotenoids	Chlorophylls (a + b)	Total pigments
GA_3 ppm:	50	0.770	0.535	0.515	1.305	1.820
	100	0.785	0.570	0.525	1.355	1.880
YE ml/l. :	50	0.889	0.645	0.529	1.534	2.063
	100	0.845	0.624	0.589	1.469	2.058
NAA ppm:	25	0.698	0.530	0.540	1.228	1.768
	50	0.665	0.466	0.533	1.131	1.664
Control		0.644	0.433	0.576	1.077	1.653

* YE as indicated in Table "1" is considered as a rich natural source of hormones, vitamins, enzymes, ... etc.

The highest content of total pigments (i.e. chlorophylls a + b + carotenoids) was obtained with the treatment of YE at 50 & 100 ml/l. that reached 2.063 and 2.058 mg/g fresh weight (f.w.), respectively. Meanwhile, gibberellic acid was the second in this respect since its two applied concentrations (50 & 100 ppm) gave 1.82 & 1.88 mg/g f.w., respectively. While, naphthalene acetic acid ranked the third in this respect since it gave 1.768 & 1.664 mg/g f.w. with NAA at 25 & 50 ppm, respectively.

On the other hand, the stratification treatment without hormones (i.e. control treatment) showed the lowest content of chloroplast pigments as it was "1.653" mg/g. f.w.

In this respect, as shown in **Table** (18) the increment of chloroplast pigments mainly came from those increment of both chlorophyll "a" and "b" rather than to be due to carotenoids content. That was true either for stratification alone (i.e. control treatment) or followed by the growth regulators treatments. Here of interest, is to note that in addition to the all established known effects of stratification practice regarding hormone biosynthesis and some other bioconstituents it also stimulates chlorophyll biosynthesis. Hence, this increment of chloroplast pigments with stratification followed by growth regulators treatment especially YE would be completely reflected into enhancement of Magnolia growth that also is in intimate relation with assimilates biosynthesis and their translocation to other plant organs (**Hopkins, 1995 and Hindrix, 1995).**

2-NPK and some bioconstituents:

a-NPK content

Data in **Table** (19) clearly indicate that during 1999 season treatment of growth regulators proceeded with stratification treatment generally increased NPK content in different Magnolia organs at "18" months after sowing more than in case of stratification as a single treatment (i.e. control plants).

Also, it could be noticed that nitrogen content exhibited its maximum value in roots followed by stems while leaves ranked the last in this respect. The same trend was existed in case of phosphorous. Meanwhile, potassium content gave its highest content in leaves followed by roots yet, its lowest content was existed in stems.

c- Some bioconstituents:

As for total carbohydrates (**Table**, 19) it could be concluded that stratification treatment alone or stratification followed with growth regulators nearly gave the same content of total carbohydrates in different plant organs despite the slight increase in case of growth regulators treatment.

With regard to the reducing and total sugars it could be noticed that growth regulators preceded with stratification treatment increased their content more than in

Table (19): Effect of growth regulators treatment (GA_3, YE and NAA) and/or stratification on the NPK and some bioconstituents contents in different Magnolia organs at "18" months after sowing during 1999 season.

Treatments			NPK %			Total carbohydrates mg/g dry weight	Reducing sugars mg/g fresh weight	Non-reducing sugars mg/g fresh weight	Total soluble sugars mg/g f.w.
			N	P	K				
GA_3 ppm:	50	Leaves	1.53	0.062	3.40	320.362	4.995	4.215	9.210
		Stems	1.57	0.119	2.45	397.456	1.895	2.585	4.280
		Roots	1.92	0.195	3.10	366.375	3.845	3.862	7.707
	100	Leaves	1.52	0.075	3.35	326.455	4.825	4.325	9.150
		Stems	1.65	0.118	2.40	396.679	1.950	2.450	4.400
		Roots	1.95	0.210	3.25	365.112	3.956	3.840	7.796
YE ml/l. :	50	Leaves	1.65	0.092	3.65	341.642	5.599	4.905	10.504
		Stems	1.98	0.128	2.68	403.989	2.115	2.785	4.990
		Roots	2.01	0.215	3.55	372.695	4.572	3.958	8.530
	100	Leaves	1.62	0.083	3.54	345.688	5.618	4.758	10.376
		Stems	1.95	0.124	2.55	405.356	2.125	2.980	5.105
		Roots	2.01	0.211	3.12	380.125	4.655	4.000	8.655
NAA ppm:	25	Leaves	1.42	0.062	3.20	325.624	4.959	4.118	9.077
		Stems	1.48	0.119	2.50	396.452	1.895	2.556	4.451
		Roots	1.85	0.195	3.10	367.920	3.975	3.895	7.870
	50	Leaves	1.38	0.052	3.18	324.855	4.715	4.102	8.817
		Stems	1.55	0.115	2.45	395.600	1.755	2.450	4.205
		Roots	1.87	0.198	2.95	365.024	3.850	3.857	7.707
Control		Leaves	1.33	0.052	3.10	320.620	4.416	2.948	7.364
		Stems	1.57	0.109	2.40	391.985	1.644	2.346	3.990
		Roots	1.82	0.189	2.90	362.024	3.792	3.728	7.520

case of stratification treatment alone. That was true for different plant organs. Also, YE at the two applied concentrations being more effective in this respect as they gave 5.99, 2.115 & 4.572 and 10.376, 5.105 & 8.655 mg/g. dry weight (d.w.) for reducing sugars and total sugars, respectively with 50 ml/l. YE. Meanwhile, 100 ml/l. YE also gave high positive effect. This increment was also reflected upon the calculated non-reducing sugars.

The above mentioned results are of great importance because they show that both minerals absorption by roots and its translocation to other plant organs as well as the carbohydrate and sugars biosynthesis and translocation being stimulated. Also, they determined the efficiency of photosynthesis process itself. Thereby, these results strongly answered and lightened that question about why did YE treated plants preceded with stratification treatment grown very well ?; and also why they exhibited the vigorous growth when compared with the other treatments?.

In conclusion it could be report that 1- stratification of Magnolia seed for "2" months followed by YE treatment gave the highest enhancement of germination process (**Table**, 3), 2- also, the same treatment exhibited vigorous growth of emerged seedlings during different periods of estimations i.e., at 6, 7, 8 and 18 months after sowing **Tables** (4, 5, 6, 7, 8 & 9), 3- dry matter accumulation exhibited its significant increase at the late stage of growth (i.e. 18 months after sowing) in different plant organs as well as for the whole plant as well, also, with YE treatment preceded with stratification of seeds.

Form the all above mentioned observations the use of yeast extract could be recommend at the level of 50 or 100 ml/l. as soaking material preceded with seed stratification for enhancement of Magnolia seed germination and improving growth of emerged seedlings as well as shortening of pre- flowering - vegetative growth period. Thereby, plants grown from seeds applied with YE preceded with stratification could be flower earlier than those plants either grown up from untreated seeds or even those grown up from only growth regulators-treated seeds.

In general the present study strongly admit the use of yeast extract preparation as a natural source of hormones with the concentrations of 50 & 100 ml/l. as seed soaking material for 24 hours preceded with the stratification for "2" months to enhance Magnolia seed germination and to improve seedling growth as well as to shorten the vegetative growth period that being required before plants be able to flower.