RESULTS AND DISCUSSION

IV. RESULTS AND DISCUSSION

IV.1. Part,1 : Communis pear "Pyrus communis" and Persimon " Diospyrus lotus" :

IV.1.1. Effect of cold stratification period combined with prestratification soak in GA solutions :

During every experimental season of 1993 and 1994 years two factorial experiments were conducted, each included the same differential 15 treatments which representing the various combinations between three periods of cold stratification x 5 treatments of prestratification soak in GA solutions. Hence response of both rootstocks were independently investigated by devoting an individual experiment for seeds of each of the aforesaid two species through the following germination and growth measurements :

IV. 1.1.1 Germination measurements :

IV. 1.1.1.1 Number of days needed for 50% germination :

Data obtained during both 1993 and 1994 seasons regarding the response of both communis pear and persimon seeds to both investigated factors (duration of cold stratification and prestratification soak treatments) are presented in Table (1).

IV. 1.1.1.1.a. Communis pear :

From data of table (1), it is quite evident that all treatments i.e., combinations of stratifying the communis pear seeds for both shorter periods (4 or 8 weeks) failed generally to reach 50% germination within the period allowed for test (9 weeks from sowing seeds), regardless of prestratification soak application. Such trend was true during both 1993 and 1994 seasons, except that combination of (soaking communis pear seeds for 24 hours in GA at 2000 ppm + 8 weeks cold stratification at 5°C.) which resulted in 50% germination after about 8/10 days from sowing seeds during both 1993 and 1994 seasons, respectively.

On the other hand, all combinations of 12 weeks cold stratified seeds of communis pear from one side and different prestratification soak treatments even though unsoaked seeds from the other succeeded to reach 50% germination within the time of test (9 weeks) during two seasons of study. However soaking in 2000 ppm GA solution preceding a twelve weeks cold stratification stimulated germination of communis pear seeds to go fast and consequently needed the shortest time for reaching 50% germination. Meanwhile the other combinations of 12 weeks cold stratification could be safely arranged concerning their effeciency on germination process to go fast and consequently required shorter time to reach 50% germination into the following descending order : a- soaking in GA solutions at 3000 ppm followed by 1000 ppm, soaking in water and finally no soaking applied before stratification which ranked last during two seasons of study.

Conclusively, it is so worthy to be noticed that soaking in GA solutions did not completely replace the action of cold stratification process needed for overcoming the dormancy in seeds of communis pear. On the other hand, it is well noticeable also that prestratification soak in 2000 ppm GA solution depressed the time required for fulfillment of cold stratification of communis pear seeds with about one third i.e., with four weeks.

IV. 1.1.1.b Persimon :

Table (1) shows that germinated seeds resulted from sowing persimon seeds received the various combinations of 4 weeks stratification from one hand and all prestratification soak (except water soaking) from the other did not reach 50% germination throughout the time of measuring (9 weeks from sowing) during two seasons of study. Moreover, two opposite trends were obviously detected as the duration of cold stratification was extended. Since, with combinations of both prestratification treatments of either unsoaked or 24 hours soaked seeds, data obtained revealed that duration in days needed for 50% germination was reduced as the period of persimon seeds cold stratification was extended. On the contrary, with soaking persimon seeds in various GA solutions, the trend of response to extension of cold stratification took the other way around. This unexpected response was true during two seasons of study, especially the GA 3000 ppm soaked seeds which were entirely failed to reach 50% germination as the duration of cold stratification was prolonged to 12 weeks.

Regarding the positive relationship between the extension of cold stratification period and its accelerating effect on germination process to reach 50% after a relative shorter time from sowing, obtained results of both pear and persimon are in general agreement with the findings of several investigators. ***Madden et al., (1977)*** on pecan, ***Fadl et al., (1978)*** on apricot, ***Cezerski and Jankowska (1981)***, on apple, ***Ji and Wang***

(1987), on prunus spp. and ***Kashyap et al., (1992)*** on crab apple all supported the present results.

As for the beneficial effect of GA application on seeds of communis pear, data obtained regarding the response of number of days needed to 50% germination are in harmony with that mentioned by ***El-Nabway et al., (1980-a)*** on pecan, ***Rouskas et al., (1981)*** on peach, ***Rouskas and Hugard, (1982)***, on peach, ***Abo-Hassan (1986)***, on peach and apple, ***Bulard (1985)***, on GA concentration, ***Keleg et al., (1989) and Kashyap et al., (1992)*** on crab apple.

Nevertheless, response of persimon seeds to cold stratification period showed a general trend goes partially with the previously mentioned by the same investigators whose findings were in coincidence with pear seeds.

Nevertheless, the conflict in response of persimon seeds to GA than that of communis pear could be explained on that fact that GA application showed an inhibitor effect on seed germination of several plant species, which may be due to the liberation of inhibitors that affect several metabolic processes, ***Takaki and Dietrich (1979), and Shen and Mullins (1983)***, on coffea and calleryana seeds, respectively.

Generally, it could be concluded that cold stratifying of 2000 ppm GA soaked seeds either for 8 or 12 weeks were the most effective treatments for communis pear. However, stratification of 2000 ppm GA soaked seeds for the shorter period (8 weeks) is more advisable to be

Table (1) : Time required for 50% germination of communis pear and persimon seeds as affected by the different combinations between cold stratification periods and prestratification soak in gibberellin solutions during 1993 and 1994 seasons.

Cold stratification period / Soak treatments	Duration of Cold stratification in week											
	Communis Pear						Persimon					
	1993			1994			1993			1994		
	4 (W.)	8 (W.)	12 (W).	4 (W.)	8 (W.)	12 (W.)	4 (W.)	8 (W.)	12 (W.)	4 (W.)	8 (W.)	12 (W.)
	Days to 50% germination											
No-soak (control)	> 63	> 63	27.25	> 63	> 63	22.75	> 63	22.5	17.75	> 63	24.25	20.75
GA 0.0 (water)	> 63	> 63	23.00	> 63	> 63	21.25	23.30	20.00	18.75	18.25	19.00	18.25
GA 1000 PPm	> 63	> 63	17.5	> 63	> 63	17.25	> 63	17.5	37.00	> 63	20.75	37.25
GA 2000 PPm	> 63	8.00	8.00	> 63	9.75	15.5	> 63	20.25	32.75	> 63	20.75	38.00
GA 3000 PPm	> 63	> 63	13.25	> 63	> 63	17.75	> 63	20.75	α 63	> 63	19.25	> 63

> 63 = Means that germinated seeds failed to reach 50% of sown ones before germination precess had been ceased throughout the time of test i.e., 9 weeks from planting.

recommended than longer durations (12 weeks), because of the unpronounced differences between both combinations.

As for persimon seeds, the combination of prestratification soak in water for 24 hours preceding stratification for any of three investigated periods (4,8 or 12 weeks) were the most effective treatments in this respect.

IV.1.1.1.2. Seed germination percentage :

Pertaining the specific and interaction effects of both investigated factors i.e., cold stratification period and prestratification soak in various GA solutions on seeds germination percentage of communis pear and persimon, data obtained during two 1993 and 1994 seasons are presented in Table (2).

IV.1.1.1.2.a Communis pear :

Specific effect :

With regard to the specific effect of duration of cold stratification, date in Table (2) declared obviously that germination percentage of communis pear was positively correlated to stratification period. Hence, the highest germination percentage of communis pear seeds was always concomitant to the most elongated period of cold stratification (12 weeks). Such trend was true during both seasons of study, whereas germination percentage of 12 weeks stratified seeds exceeded significantly those seeds of two other periods which came statistically next in the descending order of 8 and 4 weeks cold stratification, respectively. The germination % gained by 12 weeks stratification reached nearly three times much more than that gained by 4 weeks period during two seasons of study.

As for the specific effect of the prestratification soak treatments, data obtained revealed obviously that prestratification soak of communis seeds either in water or 3 different GA solutions for 24 hours increased significantly the germination % over the control (unsoaked seeds). Meanwhile, soaking in GA solution at the intermediate concentration (2000 ppm) was the superior prestratification soak treatment, followed statistically in a descending order by soaking in GA at 1000, 3000 ppm and 0.0 (water) which ranked last just before control during two seasons of study. Differences resulted by different prestratification soak treatments were significant as they compared each to other during both seasons of study.

Interaction effect :

Regarding the interaction effect exhibited in germination % of communis pear seeds by different combinations of two studied factors i.e., prestratification soak treatments and duration of cold stratification, it is quite clear to be noticed the variable degrees of response to the differential combinations during two seasons of study. Since, combinations between 12 weeks cold stratification from one hand and both prestratification treatments of soaking in GA solution either at 2000 or 1000 ppm from the other not only exhibited statistically the highest percentage of seed germination as both were representative of the superior category during two seasons of study. On the contrary, seeds of communis pear received the four combinations of no - soak / soak in water for 24 h. preceding cold stratification for either 4 or 8 weeks were statistically the inferior as they resulted in the lowest germination percentage during two seasons of study. Moreover, other investigated combinations were intermediate as compared to the above mentioned two extents.

The obtained results pertaining the effect of cold stratification periods on germination percentage of communis pear seeds are in harmony with those previously mentioned by ***Madden <u>et al.</u>*, *(1977) Czerski and Jankowska (1981), Keleg <u>et al.</u>*, *(1989) and Kashyap <u>et al.</u>*, *(1992)*** on pecan, (apple, apricot, almond, peach and plum) and Crab apple, respectively. Moreover, the stimulative effect of GA application on germination % of pear seeds, data obtained are in magnitude with that demonstrated by both ***Dhillon and Sharma (1978) and Shawky <u>et al.</u>*, *(1978)*** on pear, as well as ***Hundal and Kajuria (1979)***, on peach, ***Abo - Hassan (1986)***, on apple and some stones and ***Kashyap <u>et al.</u>*, *(1992)*** on Crab apple.

IV.1.1.2.b Persimon :

Specific effect :

Referring to germination % of persimon seeds in response to specific effect of duration of cold stratification, Table (2) shows clearly that the intermediate period i.e., 8 weeks was the superior followed statistically by the more extended period (12 weeks), while 4 weeks ranked statistically last during two seasons of study.

As for the persimon seed germination percentage in response to the specific effect of prestratification soak treatments, the trend took the other way around as compared to that previously detected with communis pear. Since, soaking persimon seeds in water for 24h. was the most effective prestratification treatment which increased germination % significantly over all other investigated ones. In addition, unsoaked persimon seeds ranked statistically second to the aforesaid superior treatment from one hand and exceeded significantly all prestratification treatments of soaking in various GA solutions. The depressive effect of soaking persimon seeds in GA solutions became more pronounced as the concentration was increased, whereas GA at 3000 ppm was the most depressive in this concern, during both seasons of study.

Interaction effect :

Regarding the interaction effect gained by various combinations between duration of cold stratification and prestratification soak, data obtained revealed that combination of 12 weeks stratification and soaking in water was the superior as resulted in the highest germination % of persimon seeds during two seasons which reached an average of 90%. Moreover, stratification for 12 weeks of unsoaked persimon seeds came statistically second followed by those stratified for 8 weeks either previously soaked in water/GA at 1000 ppm or completely unsoaked. The reverse was true with persimon seeds stratified for four weeks after soaking in GA at 3000 ppm. In addition other combinations were in between during two seasons of study.

The present result of persimon seeds germination % as influenced by the duration of cold stratification are to some extent in general agreement with those findings previously discussed with communis pear. However, the depressive effect of GA application on germination % of persimon seeds (especially at higher concentration) was in partial coincidence with findings of ***Wanic et al., (1968)*** on apple, ***Abohassan et al., (1979)*** who reported that lower GA concentration (500 ppm) was more effective than higher concentrations (apricot), ***Takaki and Dietrich (1979),*** on seeds of Coffea Arabica and ***Shen and Mullins (1983),*** on pyrus

Table (2) : Germination percentage of communis pear and persimon seeds in response to specific and interaction effects of cold stratification periods and prestratification soak in some gibberellin solutions during 1993 and 1994 seasons.

Cold stratification period / Soak treatments	Duration of Cold Srratification in Week															
	Communis pear								Persimon							
	1993				1994				1993				1994			
	4 (W.)	8 (W.)	12 (W.)	mean	4 (W.)	8 (W.)	12 (W.)	mean	4 (W.)	8 (W.)	12 (W.)	mean	4 (W.)	8 (W.)	12 (W.)	mean
					Seed germination percentage											
No-soak (control)	10.0	23.3	68.3	**33.9**	11.4	25.0	71.7	**36.0**	43.3	68.3	83.3	**65.0**	49.1	71.7	84.1	**68.3**
GA 0.0 (water)	16.7	20.0	75.0	**37.2**	21.7	21.7	75.0	**39.4**	64.1	76.7	91.7	**77.5**	68.3	74.1	91.7	**78.0**
GA 1000 PPm	43.3	46.7	80.8	**56.9**	41.7	46.7	80.0	**56.1**	36.7	80.0	54.1	**56.9**	43.3	78.3	58.3	**60.0**
GA 2000 PPm	26.7	76.7	84.2	**62.5**	25.0	78.3	88.3	**63.9**	43.3	69.1	56.7	**56.4**	49.1	68.3	56.7	**58.0**
GA 3000 PPm	33.3	48.3	60.3	**47.3**	36.7	51.7	76.7	**55.0**	9.1	73.3	40.0	**40.8**	16.7	74.1	41.3	**44.0**
Mean	**26.0**	**43.0**	73.7		**27.3**	**44.7**	78.3		39.3	**73.5**	**65.2**		**45.3**	**74.3**	**66.4**	
L.S.D. at 5% level for :																
1- Cold stratification period				5.95				2.19				2.33				2.41
2- Prestratification soak treatment				7.69				2.80				2.99				3.12
3-Interaction (str.period x soak treat)				13.32				4.89				5.18				5.40

calleryana seeds, all reported either depressive or effectiveless effect of GA on germination percentage.

IV.1.1.1.3 Seed germination rate :

Referring specific and interaction effects of two studied factors viz. duration of cold stratification and prestratification treatments of soaking seeds in different GA solutions on germination rate of both communis pear and persimon, data obtained during 1993 and 1994 seasons are tabulated in Table (3).

IV.1.1.1.3.a. Communis pear :

Specific effect :

Concerning the response of germination rate to the specific effect of cold stratification period Table (3) shows that both are closely related. Such positive linear relationship was true during both 1993 and 1994 seasons, since the highest value of germination rate was statistically exhibited by the most elongated period of cold stratification (12 weeks), while the reverse was found with the shortest period (4 weeks) during both 1993 & 1994 seasons. Moreover, cold stratification for 8 weeks was in between the abovementioned two extents.

Referring specific effect of prestratification soak treatments on germination rate, data obtained pointed out that the response was not so pronounced to such grade previously found with germination percentage during two seasons. However, it could be safely concluded that both germination percentage and germination rate of communis pear followed generally the same trend regarding their response to prestratification treatments. Since, GA, 2000 ppm soaked seeds showed statistically the highest value of germination rate, while unsoaked seeds (control) was the inferior.

Interaction effect :

With respect to the interaction effect of the differential combinations between the investigated factors i.e., duration of cold stratification and prestratification soak application data obtained during both seasons declared that the different combinations between 12 weeks stratification from one hand and prestratification soak in GA at 1000, 2000, 3000 or 0.0 ppm exhibited the highest value of germination rate. On the contrary, combinations of four weeks cold stratification regardless of prestratific-ation treatments showed statistically the lowest values of germination rate during two seasons of study. Moreover, other combinations resulted statistically in intermediate values of germination rate with variable degrees of variations could be generally neglicted.

IV. 1.1.1.3.b. Persimon :

Specific effect :

As the specific effect of cold stratification on seed germination rate of persimon was concerned, data obtained during both 1993 and 1994 seasons declared that the greatest value was always concomitant to the intermediate period (8 weeks). The superiority of 8 weeks stratified seeds was significant during two seasons of study which followed in a descending order by those stratified for 12 and 4 weeks, respectively.

With regard to specific effect of prestratification soak, data presented in Table (3) declared that soaking in water for 24 hours was the superior treatment followed statistically by control "no soak application"

Table (3) : Germination rate of communis pear and persimon seeds in response to specific and interaction effects of cold stratification periods and prestratification soak in some gibberellin solutions during 1993 and 1994 seasons.

Cold stratification Period / Soak treatments	Duration of Cold Stratification in Week															
	Communis pear								Persimon							
	1993				1994				1993				1994			
	4 (W.)	8 (W.)	12 (W.)	mean	4 (W.)	8 (W.)	12 (W.)	mean	4 (W.)	8 (W.)	12 (W.)	mean	4 (W.)	8 (W.)	12 (W.)	mean
	Seed germination rate															
No-soak (control)	0.34	0.39	0.42	**0.40**	0.37	0.37	0.43	**0.39**	0.37	0.45	0.44	**0.42**	0.36	0.43	0.44	**0.41**
GA 0.0 (water)	0.38	0.39	0.44	**0.40**	0.36	0.37	0.44	**0.39**	0.44	0.45	0.46	**0.44**	0.39	0.45	0.44	**0.43**
GA 1000 PPm	0.35	0.38	0.45	**0.39**	0.36	0.36	0.45	**0.39**	0.39	0.45	0.38	**0.41**	0.38	0.45	0.36	**0.40**
GA 2000 PPm	0.39	0.43	0.45	**0.42**	0.35	0.45	0.45	**0.41**	0.37	0.45	0.36	**0.39**	0.36	0.45	0.36	**0.39**
GA 3000 PPm	0.38	0.40	0.44	**0.41**	0.36	0.38	0.45	**0.40**	0.38	0.44	0.37	**0.40**	0.36	0.44	0.37	**0.39**
Mean	**0.37**	**0.40**	**0.44**		**0.36**	**0.38**	**0.44**		**0.39**	**0.45**	**0.40**		**0.37**	**0.44**	**0.40**	

L.S.D. at 5 % level for :	Communis pear 1993	Communis pear 1994	Persimon 1993	Persimon 1994
1- Cold stratification period	0.002	0.01	0.01	0.01
2- Prestratification soak treatment.	0.007	0.01	0.01	0.01
3-Interaction (str.period x soak treat)	0.013	0.02	0.02	0.02

which ranked second. In addition, soaking persimon seeds in various GA solutions 1000, 2000 or 3000 ppm resulted in decreasing germination rate of persimon seeds. Such decrease was significant during two seasons, while it was more pronounced with increasing concentration.

Interaction effect :

Table (3) shows clearly that seed germination rate of persimon reflected an obvious response to the different combinations of both investigated factors (duration of cold stratification and treatments of prestratification soak).

Nevertheless, all combinations of eight weeks cold stratification, especially those between soaking in both water and GA either at 1000 or 2000 ppm exhibited statistically the greatest values of germination rate . On the contrary combinations between stratified persimon seeds for either 12 or 4 weeks and soaking in GA solution (1000, 2000 or 3000 ppm) induced significantly the lowest values of germination rate.

The obtained results regarding the effect of stratification period and prestratification soak treatments on germination rate of both communis pear and persimon could be logically explained on the previously detected trends of responses that have been discussed formerly with both parameters of number of days needed for 50% germination and germination percentage.

IV.1.1.1.4. Seed germination value :

Concerning the response of germination value of both communis pear and persimon seeds to both specific and interaction effects of cold stratification periods and prestratification soak treatments, data obtained during two seasons of 1993 and 1994 are presented in Table (4).

IV.1.1.1.4.a Communis pear :

Specific effect :

As for the response to specific effect of cold stratification period, data obtained revealed obviously that the highest germination value was always concomitant to the most prolonged duration (12 weeks), while the reverse was true with the period of four weeks. On the other hand the trend of response to the prestratification soak in water /GA solutions for 24 hours, it could be noticed in general that the trend took nearly the same way as that previously found with both germination percentage and rate. Since, 2000 ppm GA soaked seeds of communis pear was the superior as it surpassed statistically all the other treatments in this concern.

Interaction effect :

Table (4) shows clearly the obvious reaction of germination value to the differential combinations between cold stratification periods X prestratification soak treatments. Hence, the most effective combination was that of GA 2000 ppm soaked seeds and stratified for 12 weeks followed by those of 12 weeks stratified seeds previously soaked either in GA 1000/3000 ppm and that of 8 weeks stratification + soaking in GA at 2000 ppm. Such, aforesaid four treatments (combinations) represented statistically the first category with some nonpronounced variance in responses as they were compared each to other. On the contrary the lowest germination values were generally resulted by the different combinations between both stratification periods of 4 and 8 weeks from one hand and all prestratification soak treatments from the other hand "except soaking in

GA at 2000 ppm". In addition, other combinations fell in between the abovementioned two extremes with relative variance of response.

IV.1.1.1.4.b. Persimon :

Specific effect :

Regarding the specific effect of duration of cold stratification on germination value of persimon seeds, data in Table (4) shows that the value was sharply increased by increasing period from four to eight weeks then suddenly decreased again with prolonging it to 12 weeks. On the other hand decrease in germination value associated with increasing stratification from 8 to 12 weeks was not so great to reduce it to be equal to that value of 4 weeks, hence 12 weeks period was still significantly more effective than four weeks. As the specific effect of prestratification soak treatments on germination value of persimon seeds, data obtained revealed that soaking persimon seeds in water for 24 hours was statistically the superior followed by unsoaked seeds. However, GA solutions especially the higher concentration depressed acutely the seed germination value.

Interaction effect :

Germination value of persimon seeds was statistically reacted to the different combinations of both investigated factors during two seasons of study. Since, all combinations of soaking for 24 hours in water and stratified for 8 or 12 weeks, beside stratifying the nonsoaked seeds for 12 weeks were the most effective combinations. While the opposite was found with that combinations between GA 3000 ppm soaked seeds and stratifying either for 4 or 12 weeks. Moreover other combinations resulted in an intermediate germination value during 1993 and 1994 seasons.

Table (4) : Germination value of communis pear and persimon seeds in response to specific and interaction effects of cold stratification periods and prestratification soak in some gibberellin solutions during 1993 and 1994 seasons..

cold stratification period / Soak treatments	Duration of Cold Stratification in Week															
	Communis pear								**Persimon**							
	1993				1994				1993				1994			
	4 (W.)	8 (W.)	12 (W.)	mean	4 (W.)	8 (W.)	12 (W.)	mean	4 (W.)	8 (W.)	12 (W.)	mean	4 (W.)	8 (W.)	12 (W.)	mean
	Seed germination value															
No-soak (control)	0.07	0.2	2.2	**0.82**	0.1	0.28	2.83	**1.07**	0.7	2.68	4.0	**2.46**	1.15	2.68	3.9	**2.58**
GA 0.0 (water)	0.25	0.28	3.33	**1.28**	0.25	0.38	3.3	**1.31**	2.35	4.00	3.5	**3.28**	3.03	4.53	3.68	**3.74**
GA 1000 PPm	0.8	0.98	3.98	**1.92**	0.58	0.8	3.88	**1.75**	0.65	3.7	1.4	**1.92**	0.75	3.23	1.18	**1.72**
GA 2000 PPm	0.4	3.48	4.8	**2.89**	0.25	3.75	4.55	**2.85**	0.8	3.08	1.25	**1.71**	0.98	2.85	1.23	**1.68**
GA 3000 PPm	0.48	0.93	3.53	**1.64**	0.6	1.25	3.65	**1.84**	0.06	3.18	0.63	**1.29**	0.1	2.05	0.55	**0.9**
Mean	**0.4**	**1.17**	**3.57**		**0.36**	**1.29**	**3.64**		**0.91**	**3.33**	**2.16**		**1.2**	**3.07**	**2.11**	
L.S.D. at 5% level for :																
1- Cold stratification period				0.04				0.05				0.1				0.03
2- Prestratification soak treatment				0.05				0.06				0.13				0.04
3- Interaction (str. period x soak treat)				0.09				0.11				0.22				0.07

IV. 1.1.2. Growth measurements of developed seedlings :

IV. 1.1.2.1 Average shoot length "plant height" :

Data presented in Table (5) show the influence of specific and interaction. effects of cold stratification period and prestratification soak in GA solutions on average plant height of communis pear and persimon seedlings during 1993 and 1994 seasons.

IV.1.1.2.1.a. Communis pear :

Specific effect :

Table (5) shows obviously that the average plant height "shoot length" of communis pear seedling was specifically responded to the duration of seeds cold stratification. Hence, the longest shoot "plant height" was always concomitant to the most prolonged duration of cold stratification "12 weeks", while the opposite was true with the shortest period (4 weeks), however the eight weeks duration fell in between. Differences were significant as each period was compared to the two other ones. Such trend was true during both 1993 and 1994 seasons.

Referring the specific effect of prestratification soak treatments on average shoot length (plant height) of communis pear seedlings, data presented in Table (5) disclosed that all soaking applications either in water or different GA solutions surpassed statistically control (no-soak application) except water soak in 1993 seasons which showed an insignificant increase). However, prestratification soak of pear seeds for 24 hours in GA solution of 2000 ppm being statistically the most effective during two seasons of study. Moreover other prestratification treatments of GA i.e., 3000 ppm, GA 1000 ppm and/or water soak came in a descending order next to the superior one.

Interaction effect :

It is quite clear from data in Table (5) that communis pear seedlings were obviously influenced by the different combinations investigated. Since. three categories of responses could be clearly detected in this respect. Hence, both combinations of stratifying pear seeds for either 8 or 12 weeks after they had been soaked in GA 2000 ppm, as well as to some extent prestratification soak in GA 3000 ppm preceding cold stratification for 12 weeks all were the three superior combinations "treatments" being representative of the first category. On the contrary all combinations of no soak application "control" from one hand and 4 or 8 weeks periods of cold stratification from the other, beside four weeks stratification of water soaked seeds induced significantly the shortest seedlings that represented the last "third" class. Moreover, other combinations fell in between the aforesaid two categories to represent the second one.

IV. 1.1.2.1.b. Persimon :

Specific effect :

Regarding the specific effect of cold stratification period on shoot length "plant height" of persimon seedlings, data in Table (5) disclosed the same trend previously mentioned with communis pear. Meanwhile, the longest shoot was resulted by the most prolonged stratification period while the reverse was true with the 4 weeks stratification.

Nevertheless, Table (5) shows that the response of shoot length of persimon seedlings to the prestratification soak treatments followed an opposite trend to that previously discussed with communis pear. Though soaking in water for 24 hours was the superior which induced the tallest

Table (5) : Average shoot lenght of communis pear and persimon seedlings in response to specific and interaction effects of cold stratification periods and prestratification soak in some gibberellin solutions during 1993 and 1994 seasons.

Cold stratification period / Soak treatments	Duration of Cold Stratification in Week															
	Communis pear								Persimon							
	1993				1994				1993				1994			
	4 (W.)	8 (W.)	12 (W.)	mean	4 (W.)	8 (W.)	12 (W.)	mean	4 (W.)	8 (W.)	12 (W.)	mean	4 (W.)	8 (W.)	12 (W.)	mean
	Average shoot lenght (cm.)															
No-soak (control)	5.13	7.75	7.87	**6.92**	6.50	7.30	7.90	**7.23**	11.13	14.50	17.13	**14.25**	11.88	17.00	17.25	**15.38**
GA 0.0 (water)	6.13	7.75	8.63	**7.50**	6.50	9.50	10.00	**8.66**	13.75	14.50	17.75	**15.33**	14.75	15.88	18.75	**16.46**
GA 1000 PPm	7.00	8.00	8.88	**7.59**	8.50	8.80	9.80	**9.03**	10.38	15.62	14.38	**13.46**	12.25	16.13	16.63	**15.00**
GA 2000 PPm	7.38	9.83	11.25	**9.49**	8.50	11.50	11.80	**10.60**	11.00	15.00	13.75	**13.25**	11.25	15.75	12.50	**13.17**
GA 3000 PPm	7.30	8.00	9.50	**8.27**	8.70	9.50	10.60	**9.60**	8.75	14.18	14.13	**12.35**	10.50	14.63	14.25	**13.13**
Mean	**6.59**	**8.27**	**9.23**		7.55	**8.98**	**10.02**		**11.00**	**14.76**	**15.43**		**12.13**	**15.38**	**15.48**	

L.S.D. at 5% level for :

	Communis pear 1993	Communis pear 1994	Persimon 1993	Persimon 1994
1- Cold stratification period	0.60	0.53	0.33	0.30
2- Prestratification soak treatment	0.71	0.61	0.42	0.36
3- Interaction (str.period x soak treat)	1.3	1.12	0.73	0.68

shoot, followed statistically by the no soak application. However, all prestratification treatments of soaking in various GA solutions, depressed shoot length of persimon seeds, whereas such decrease became more pronounced with increasing GA concentration.

Interaction effect :

Table (5) shows that the longest shoot of persimon seedlings was statistically in closed relationship to that combination of 12 weeks cold stratified seeds previously soaked in water for 24 hours followed by stratifying non soaked seeds for the same prolonged duration (12 weeks). On the contrary all combinations of 4 weeks cold stratification (regardless of prestratification soak treatments), beside those combinations of 12 weeks stratification and soaking in GA solutions (especially two higher concentrations) all resulted in the most depressive effect on average shoot length of persimon seedlings during two seasons of study. However, such treatments of soaking in GA 3000 ppm + 4 weeks cold stratification showed significantly the most retardation in this respect. In addition other combinations fell in between the abovementioned two extremes.

IV. 1.1.2.2. Average root length :

With regard to the specific and interaction effects of the investigated factors viz. various periods of cold stratification in combination with different prestratification soak in GA solutions on the average root length of communis pear and persimon seedlings, data obtained during both 1993 and 1994 seasons are tabulated in Table (6).

IV.1.1.2.2.a Communis pear :

Specific effect :

Data obtained during both seasons revealed that the communis pear seedlings did not follow a firm trend regarding response of their root length to specific effect of cold stratification period. However, differences due to duration of cold stratification as shown from Table (6) could be safely neglected as they were so small to be significant.

As for the specific effect of the prestratification soak treatments on root length of developed pear seedlings, data obtained showed that soaking in water or any of GA solutions increased significantly the average length of root system. However the lowest GA concentration (1000 ppm) was significantly the superior in this respect.

Interaction effect :

Referring the interaction effect of different combinations of both investigated factors "duration of cold stratification x prestratification soak application" on root length, data of Table (6) declared that the superior combinations were those of GA 1000 ppm soaked seeds regardless of stratification period, as well as stratifying seeds for 4, 8 or 12 weeks after being soaked in GA 3000, GA 2000 or water respectively. Moreover, other combinations were nearly the same with limited degrees of variations.

IV. 1.1.2.2.b. Persimon :

Specific effect :

Data presented in Table (6) showed obviously that the root length of persimon seedlings was specifically responded to the cold stratification

Table (6) : Average root **lenght** of communis pear and persimon seedlings in response to specific and interaction effects of cold stratification periods and prestratification soak in some gibberellin solutions during 1993 and 1994 seasons.

Cold stratification period / Soak treatment	Duration of Cold Stratification in Week															
	Communis pear								Persimon							
	1993				1994				1993				1994			
	4 (W.)	8 (W.)	12 (W.)	mean	4 (W.)	8 (W.)	12 (W.)	mean	4 (W.)	8 (W.)	12 (W.)	mean	4 (W.)	8 (W.)	12 (W.)	mean
	Average root lenght (cm.)															
No-soak (control)	50.00	50.10	50.1	**50.06**	52.00	52.00	52.0	**52.00**	34.3	38.8	78.3	**50.4**	34.9	41.6	80.6	**52.4**
GA 0.0 (water)	52.9	58.00	61.0	**57.3**	54.30	59.00	63.3	**58.80**	40.5	41.9	91.0	**57.8**	43.3	43.12	97.5	**61.3**
GA 1000 PPm	64.8	62.6	64.5	**64.0**	66.50	65.8	64.9	**65.7**	30.5	46.4	59.4	**45.4**	33.4	47.5	59.9	**47.0**
GA 2000 PPm	64.00	64.3	54.9	**57.0**	53.50	66.5	57.0	**59.0**	33.3	43.0	48.1	**41.4**	35.3	44.6	48.8	**42.9**
GA 3000 PPm	60.9	55.0	52.8	**56.4**	64.00	58.0	54.3	**58.7**	24.9	41.5	37.75	**34.70**	27.9	42.8	37.6	**48.1**
Mean	**58.52**	**58.00**	**56.6**		**58.10**	**60.30**	58.30		**32.7**	**42.3**	**62.9**		**34.9**	**43.9**	**64.9**	

L.S.D. at 5% level for :	Communis pear 1993	Communis pear 1994	Persimon 1993	Persimon 1994
1- Cold stratification period	3.48	2.50	6.90	7.60
2- Prestratification soak treatment	4.49	3.25	8.90	9.80
3-Interaction (str.period x soak treat)	7.79	5.73	11.4	17.00

period. Hence, the tallest root was obtained by such seeds stratified for 12 weeks before sowing. However, the reverse was true with 4 weeks stratification, beside stratification for the intermediate period. i.e., 8 weeks was statistically in between.

Nevertheless, the specific effect of prestratification soak treatments on root length of persimon seedlings took other way around as compared to that trend previously found with communis pear. Since, soaking persimon seeds for 12 weeks in tap water exhibited statistically the longest root system followed by stratifying seeds directly without soak application. In addition, soaking in GA solutions, especially at higher concentration depressed root length of developed persimon seedlings.

Interaction effect :

Data of Table (6) declared that as cold stratification for the most prolonged period was combined with the 24 hours tap water soaked persimon seeds it exhibited statistically the more pronounced interaction effect. The longest root system of persimon seedlings was always in closed relationship to the aforesaid superior combination followed by stratifying the nonsoaked seeds for 24 hours. Meanwhile, combination of 4 weeks stratified seeds irrespective of prestratification soak treatment besides GA 3000 ppm x stratification for 12 weeks were generally the inferior as resulted in the shortest root system.

IV.1.2.3. Leaves dry weight per seedling :

Data obtained regarding the specific and interaction effects of both cold stratification period and prestratification soak treatments on average leaves dry weight per seedling of both communis pear and persimon during two seasons of 1993 and 1994 are presented in Table (7).

IV.1.1.2.3.a. Communis pear :

Specific effect :

It is quite evident that the leaves dry weight / communis pear seedling was in positive relationship with duration during it seeds were remained under cold temperature to be stratified. Since the heaviest leaves were closely related to the most prolonged period (12 weeks), while the reverse was true with the 4 weeks stratified seeds. However, differences were significant only as both periods of 4 and 12 weeks cold stratification were compared each to other.

With regard to the response to the specific effect of prestratification soak treatments, it could be noticed that leaves dry weight per communis pear seedling was increased by any treatment of prestratification soak as compared to the nonsoaked seeds (control). However, such increase was more pronounced with soaking in the GA 2000 ppm, followed by those of both GA 1000/3000 ppm while tap water soaked seeds ranked last just prior to control.

Interaction effect :

Data tabulated in Table (7) disclosed that leaves dry weight per communis pear seedling was extremely reacted to the interaction effect resulted by the different combinations of the two investigated factors (cold stratification period x soaking applications preceding chilling exposure). Hence, the combinations between 12 weeks cold stratification from one hand and soaking in GA 1000, 2000 or 3000 ppm especially 2000 ppm from the other, beside 8 weeks x 2000 ppm GA soaked seeds were the most effective one and surpassed statistically others whereas they produced seedlings having the heaviest leaves dry weight.

On the contrary, the combinations of stratifying both nonsoaked or water soaked seeds for 4 or 8 weeks were statistically the inferior as they showed the lightest leaves dry weight/seedling during both 1993 and 1994 seasons. In addition other combinations showed an intermediate position to the abovementioned two extremes.

IV.1.1.2.3.b. Persimon :

Specific effect :

Referring the specific effect of cold stratification period on leaves dry weight, data of Table (7) revealed obviously that persimon seedlings followed the same trend previously detected with communis pear. However, differences were more pronounced with persimon seedlings as the leaves dry weight of 12 weeks stratified seeds were twice much more than 4 weeks.

As for the response to the specific effect of prestratification soak treatments, the detected trend took the other way around as compared to the aforesaid trend of communis pear. In other words all GA solutions resulted in an obvious decrease in leaves dry weight of persimon seedlings as compared to the water soak or to the nonsoaked seeds. However water soak for 24 hours before exposure to chilling was the superior in this concern, in spite of the increase over the nonsoaked seeds was still insignificant during two seasons of study.

Table (7) : Leaves dry weight per seedling of communis pear and persimon in response to specific and interaction effects of cold stratification periods and prestratification soak in some gibberellin solutions during 1993 and 1994 seasons.

Cold stratification Period / Soak treatments	Duration of Cold Stratification in Week															
	Communis pear								Persimon							
	1993				1994				1993				1994			
	4 (W.)	8 (W.)	12 (W.)	mean	4 (W.)	8 (W.)	12 (W.)	mean	4 (W.)	8 (W.)	12 (W.)	mean	4 (W.)	8 (W.)	12 (W.)	mean
	D.Wt. in grame															
No-soak (control)	0.26	0.55	0.70	**0.50**	0.45	0.40	1.05	**0.63**	0.94	1.22	2.51	**1.56**	0.94	1.55	2.55	**1.68**
GA 0.0 (water)	0.62	0.85	1.02	**0.83**	0.80	0.99	1.50	**1.10**	1.15	1.37	2.64	**1.72**	1.17	1.63	2.75	**1.85**
GA 1000 PPm	0.80	0.77	1.20	**0.92**	0.97	1.10	1.70	**1.27**	0.68	1.38	2.06	**1.37**	0.82	1.52	2.13	**1.49**
GA 2000 PPm	0.99	1.02	1.65	**1.22**	1.10	1.30	1.85	**1.42**	0.82	1.21	1.54	**1.19**	1.01	1.33	1.66	**1.33**
GA 3000 PPm	0.90	0.72	0.80	**0.08**	1.20	1.20	1.75	**1.38**	1.08	1.14	1.49	**1.24**	1.16	1.24	1.62	**1.34**
Mean	**0.71**	**0.78**	**1.07**		**0.90**	**1.00**	**1.57**		0.94	1.26	**2.05**		**1.02**	**1.45**	**2.14**	

L.S.D. at 5% level for :	Communis pear 1993	Communis pear 1994	Persimon 1993	Persimon 1994
1- Cold stratification period	0.30	0.05	0.40	0.30
2- Prestratification soak treatment	0.40	0.07	0.50	0.50
3- Interaction (str.period x soak treat)	0.70	0.12	1.1	1.00

Interaction effect :

It is quite clear from data obtained during both 1993 and 1994 seasons that leaves dry weight was responded significantly to the interaction between both investigated factors. The heaviest leaves dry weight was always gained by such persimon seedlings induced by sowing the 12 weeks stratified water soaked, nonsoaked or GA 1000 ppm soaked seeds. On the other hand other combinations were statistically the same.

IV.1.1.2.4. Shoot dry weight per seedling :

With regard to shoot dry weight of communis pear and persimon seedlings as influenced by various treatments of both stratification periods and soaking in GA solutions, as well as their combinations, data obtained during both 1993 and 1994 seasons are presented in Table (8).

IV.1.1.2.4.a Communis pear :

Specific effect :

Data obtained during two seasons pointed out however the shoot dry weight of communis pear seedlings tended to be increased linearly with extending the period of cold stratification but such differences due to the specific effect of cold stratification period were so little to reach level of significance.

As the specific effect of prestratification soak treatments was concerned, it could be noticed that the prestratification treatments of soaking communis pear seeds for 24 hours in GA solution at 2000 ppm was the superior as it exceeded statistically other ones during both seasons of study. However, both nonsoak or 24 hours soak in water were the inferior. Moreover, soaking for 24 hours in GA either at 1000 or 3000 ppm ranked statistically in between the aforesaid two extents.

Interaction effect :

Regarding the interaction effect of the different combinations between various periods of cold stratification and soaking application in water/ GA solutions on shoot dry weight of communis pear seedlings, Table (8) shows clearly that stratifying of the GA 2000 ppm soaked seeds for 12 weeks induced seedlings having significantly the heaviest shoot dry weight. While, GA 2000 ppm soaked seeds ranked second when they exposed to 8 weeks cold stratification. The lightest shoot dry weight was that of nonsoaked or water soaked seeds (regardless of stratification period), however such combinations of control showed more depression in this respect.

IV.1.1.2.4.b. Persimon :

Specific effect :

Concerning the specific effect of cold stratification period on shoot dry weight, data obtained during two seasons of study pointed out that the developed persimmon seedlings from sowing 12 weeks stratified seeds were the superior in this regard. Meanwhile, the reverse was true with 4 weeks stratification. Differences were significant as seedlings of a given stratification period were compared to those of the two other ones.

As for the response to specific effect of prestratification soak treatments, data obtained declared that the 24 hours soak in tap water preceding cold stratification, as well as stratifying persimon seeds directly without soak (control) were the most effective prestratification applied.

Table (8) : Shoot dry weight per seedling of communis pear and persimon in response to specific and interaction effects of cold stratification periods and prestratification soak in some gibberellin solutions during 1993 and 1994 seasons.

Cold stratification period / Soak treatments	Duration of Cold Stratification in Week															
	Communis pear								Persimon							
	1993				1994				1993				1994			
	4 (W.)	8 (W.)	12 (W.)	mean	4 (W.)	8 (W.)	12 (W.)	mean	4 (W.)	8 (W.)	12 (W.)	mean	4 (W.)	8 (W.)	12 (W.)	mean
	D.Wt. in grame															
No-soak (control)	0.40	0.48	0.50	**0.46**	0.55	0.68	0.63	**0.62**	1.15	1.51	2.85	**1.84**	1.18	1.87	2.91	**1.98**
GA 0.0 (water)	0.50	0.65	0.83	**0.66**	0.55	0.43	0.95	**0.64**	1.47	1.66	2.93	**2.02**	1.51	1.84	3.09	**2.15**
GA 1000 PPm	0.95	0.95	1.00	**0.96**	1.03	1.05	0.89	**0.99**	0.87	1.58	2.20	**1.55**	1.05	1.74	2.33	**1.71**
GA 2000 PPm	1.20	1.50	2.20	**1.63**	1.53	1.75	2.30	**1.86**	1.05	1.48	1.81	**1.45**	1.23	1.54	1.92	**1.56**
GA 3000 PPm	0.88	0.73	0.73	**0.78**	0.98	1.05	1.1	**1.04**	1.27	1.35	1.71	**1.44**	1.18	1.52	1.78	**1.49**
Mean	**0.79**	**0.88**	**1.05**		**0.93**	**0.99**	**1.17**		**1.16**	**1.52**	**2.30**		**1.23**	**1.70**	**2.40**	

L.S.D. at 5% level for :	Communis pear 1993	Communis pear 1994	Persimon 1993	Persimon 1994
1- Cold stratification period	0.29	0.50	0.30	0.20
2- Prestratification soak treatment	0.38	0.70	0.40	0.20
3-Interaction (str.period x soak treat)	0.64	0.20	0.60	0.40

However, GA soaked seeds especially at both 2000/3000 ppm depressed significantly the shoot dry weight of developed persimon seedlings as compared to the aforesaid two superior treatments.

Interaction effect :

Table (8) shows that shoot dry weight of persimon seedlings was responded significantly to the interaction of stratification period x prestratification soak, whereas the heaviest weight was always in closed relationship with the 12 weeks stratification of water soaked or nonsoaked seeds, followed by those of GA 1000 ppm soaked seeds during two seasons of study. On the other hand the combinations of stratifying the unsoaked, water soaked and GA 1000 ppm soaked seeds for 8 weeks ranked second as being representative of the second category regarding their beneficial effect in increasing stem dry weight. In addition,other combinations ranked last, whereas the least shoot dry weight of persimon seedlings was gained.

IV.1.1.2.5. Root dry weight :

Concerning the specific and interaction effects of both stratification period and the soaking applications in water/GA solutions on root dry weight of communis pear and persimon seedlings, data obtained during 1993 and 1994 seasons are presented in Table (9).

IV.1.1.2.5.a. Communis pear :

Specific effect :

With respect to specific effect of stratification period, data obtained revealed that extending the duration increased root dry weight to reach its peak with 12 weeks stratification, while the least weight was resulted by 4 weeks. As for the response to specific effect of prestratification soak, it is quite clear that all treatments of soak application resulted in increasing root dry weight over control "nonsoaked seeds", however, the GA 2000 ppm soaked seeds of communis pear were the superior.

Interaction effect :

Referring response to different combinations between both investigated factors, data of both 1993 and 1994 seasons disclosed that the combination of GA 2000 ppm soaked seeds which stratified for 12 weeks exhibited generally the heaviest root dry weight of communis pear seedlings. However the increase was insignificant as compared to those combinations of GA solutions especially when seeds were exposed to chilling for 8 or 12 weeks during two seasons of study.

IV.1.1.2.5.b. Persimon :

Specific effect :

Data in Table (9) declared that the response of root dry weight in persimon seedlings to the specific effect of cold stratification period followed the same trend previously found with communis pear. Since, a positive relationship was significantly observed. However, the trend of response to the specific effect of prestratification soak took two opposite trends with two fruit species. While the tap water soaked seeds induced persimon seedlings having the heaviest root followed by those of nonsoaked seeds, but GA solution depressed it especially with increasing its concentration.

Interaction effect :

Table (9) shows that persimon seedlings were markedly reacted to the different combinations (cold stratification period x prestratification

Table (9) : Root dry weight per seedling of communis pear and persimon in response to specific and interaction effects of cold stratification periods and prestratification soak in some gibberellin solutions during 1993 and 1994 seasons.

cold stratification period / Soak treatment	Duration of Cold Stratification in Week															
	Communis pear								Persimon							
	1993				1994				1993				1994			
	4 (W.)	8 (W.)	12 (W.)	mean	4 (W.)	8 (W.)	12 (W.)	mean	4 (W.)	8 (W.)	12 (W.)	mean	4 (W.)	8 (W.)	12 (W.)	mean
	D.Wt. in grame															
No-soak(control)	0.45	0.45	0.95	**0.62**	0.55	0.75	1.45	**0.92**	1.83	2.30	3.16	**2.43**	1.96	2.77	3.48	**2.74**
GA 0.0 (water)	0.90	0.90	0.95	**0.92**	1.05	1.45	1.47	**1.32**	2.36	2.56	3.46	**2.79**	2.56	2.71	3.67	**2.98**
GA 1000 PPm	1.10	1.18	1.30	**1.19**	1.23	1.58	1.75	**1.52**	1.64	2.10	2.96	**2.23**	1.86	2.40	3.23	**2.50**
GA 2000 PPm	1.40	1.55	1.90	**1.62**	1.71	1.90	2.10	**1.90**	1.66	1.85	2.76	**2.09**	1.95	2.10	2.95	**2.33**
GA 3000 PPm	1.65	1.70	1.75	**1.70**	1.60	1.70	1.80	**1.70**	0.89	2.40	2.55	**1.95**	1.36	2.25	2.58	**2.06**
Mean	**1.10**	**1.16**	**1.37**		**1.23**	**1.48**	**1.71**		**1.68**	**2.24**	**2.98**		**1.93**	**2.45**	**3.18**	

L.S.D. at 5% level for :

1- Cold stratification period .... 0.14 .... 0.40 .... 0.50 .... 0.30

2- Prestratification soak treatment........ 0.18 .... 0.60 .... 0.60 .... 0.40

3- Interaction (str. period x soak treat)........ 0.31 .... 1.00 .... 1.00 .... 0.60

soak treatments) regarding their root dry weight response. Hence, the heaviest root weight was closely related to such seedlings of 12 weeks stratified seeds combined to the water soak, nonsoaking or GA 1000 ppm, while the reverse was true with 4 weeks stratified seeds especially those soaked in GA 3000 ppm.

IV. 1.1.2.6. Top /root ratio :

Data obtained during both 1993 and 1994 seasons regarding specific and interaction effects of both factors investigated (stratification period and prestratification soak treatments) are presented in Table (10).

IV.1.1.2.6.a. Communis pear :

Specific effect :

Data in Table (10) showed that neither duration of cold stratification nor prestratification soak application exhibited a firm trend regarding the response of top/root ratio in communis pear seedlings during two seasons of study.

Interaction effect :

No settled trend could be detected for the interaction effect of different combinations between both stratification period and prestratification soak on top/root ratio of communis pear seedlings during both 1993 and 1994 seasons.

V.1.1.2.6.b. Persimon :

Specific effect :

Data obtained during both 1993 and 1994 seasons showed that differences in top/root ratio of persimon seedlings as related to specific

Table (10) : Top/root ratio of communis pear and persimon in response to specific and interaction effects of cold stratification periods and prestratification soak in some gibberellin solutions during 1993 and 1994 seasons.

cold stratification period / Soak treatments	Duration of Cold Stratification in Week															
	Communis pear								Persimon							
	1993				1994				1993				1994			
	4 (W.)	8 (W.)	12 (W.)	mean	4 (W.)	8 (W.)	12 (W.)	mean	4 (W.)	8 (W.)	12 (W.)	mean	4 (W.)	8 (W.)	12 (W.)	mean
	Top/ root ratio															
No-soak (control)	1.47	2.29	1.26	**1.67**	1.80	1.44	1.16	**1.46**	1.14	1.19	1.70	**1.34**	1.08	1.23	1.57	**1.29**
GA 0.0 (water)	1.97	1.67	1.95	**1.86**	1.29	0.98	1.67	**1.31**	1.11	1.83	1.61	**1.52**	1.05	1.28	1.59	**1.31**
GA 1000 PPm	1.59	1.46	1.69	**1.58**	1.63	1.36	1.48	**1.49**	1.14	1.87	1.44	**1.48**	1.01	1.36	1.38	**1.25**
GA 2000 PPm	1.56	1.63	2.03	**1.74**	1.54	1.61	1.98	**1.71**	1.23	1.42	1.21	**1.29**	1.15	1.37	1.46	**1.33**
GA 3000 PPm	1.08	0.85	0.87	**0.93**	1.36	1.32	1.57	**1.41**	2.64	1.46	1.25	**1.78**	1.72	1.23	1.32	**1.42**
Mean	**1.53**	**1.58**	**1.56**		**1.52**	**1.34**	**1.57**		**1.45**	**1.55**	**1.44**		**1.20**	**1.29**	**1.46**	

L.S.D. at 5% level for :

	Communis pear 1993	Communis pear 1994	Persimon 1993	Persimon 1994
1- Cold stratification period	0.01	0.16	0.01	1.59
2- Prestratification soak treatment	0.02	0.21	0.01	2.05
3- Interaction (str. period x soak treat)	0.03	0.09	0.02	3.56

effect of both investigated factors did not follow a determined trend either data of each season or an average of both were concerned.

Interaction effect :

Differences due to the interaction effects were not significant from one hand and did not show a specific trend from the other during two seasons of study.

IV.1.1.2.7 Total plant dry weight :

Referring the response of total plant dry weight per individual seedling of both communis pear and persimon to the specific and interaction effects of the two investigated factors i.e, duration of cold stratification and prestratification soak, an average of data obtained during both 1993 and 1994 seasons are tabulated and illustrated in Table (11) and Figures (1-A&B) and (2), respectively.

IV.1.2.2.7.a. Communis pear :

Specific effect :

It is quite clear from Table (11) and Figure (1-A&B) that total dry weight of the individual seedling of communis pear was specifically influenced by both investigated factors. Since, the heaviest weight was obtained by the most prolonged stratification period, beside soaking seeds in any of GA solutions even zero concentration (water) increased it than control (no soak). The GA 2000 ppm soaked seeds of communis pear exceeded all other prestratification soak in this concern.

Interaction effect :

It could be noticed obviously from Table (11) and Figure (2) that the combination between perstratification soak of seeds in GA 2000 ppm for 24 h. and cold stratification for 12 weeks induced pear seedlings showed the greatest interaction as having the heaviest dry weight followed by those resulted from sowing GA 2000 ppm soaked seeds when stratified for 8 weeks.

IV.1.1.2.7.b Persimon :

Specific effect :

Data in Table (11) and Figure (1-A&B) showed obviously that the total plant dry weight per persimon seedling was greatly responded to specific effect of duration of cold stratification. Since, the more prolonged stratification period the heaviest dry weight was resulted, whereas the 12 weeks stratification doubled the value of dry weight per plant as compared to that of 4 weeks. However, the prestratification soak influenced also the dry weight of total persimon seedling but the trend took other way around in comparison to that previously discussed with pear. Hence, soaking in water followed by no soak application were more effective than GA solutions.

Interaction effect :

From Table (11) and Figure (2) it is quite clear that the 24 hours water soaked seeds of persimon when stratified for 12 weeks induced seedlings having the heaviest dry weight followed in a descerding order by those seeds of either no soak (control) or GA 1000 ppm soaked ones as both were remained to be stratified for the same duration of 12 weeks.

Table (11) : Total plant dry weight of communis pear and persimon seedlings in response to specific and interaction effects of cold stratification periods and prestratification soak in some gibberellin solutions (an average of both 1993 and 1994 seasons).

cold stratification period / Soak treatment	Duration of cold stratification in week							
	Communis pear				Persimon			
	4 (W.)	8 (W.)	12 (W.)	mean	4 (W.)	8 (W.)	12 (W.)	mean
No-soak(control)	1.3	1.7	2.7	1.9	4.0	5.6	8.7	6.1
GA 0.0 (water)	2.2	2.6	3.4	2.7	5.0	5.9	9.3	6.7
GA 1000 PPm	3.1	3.3	3.9	3.4	3.7	5.4	7.5	5.5
GA 2000 PPm	4.0	4.5	6.0	4.8	3.9	4.8	6.3	5.0
GA 3000 PPm	3.6	3.6	3.7	3.6	3.5	5.0	5.9	4.8
Mean	2.8	3.1	3.9		4.0	5.3	7.5	

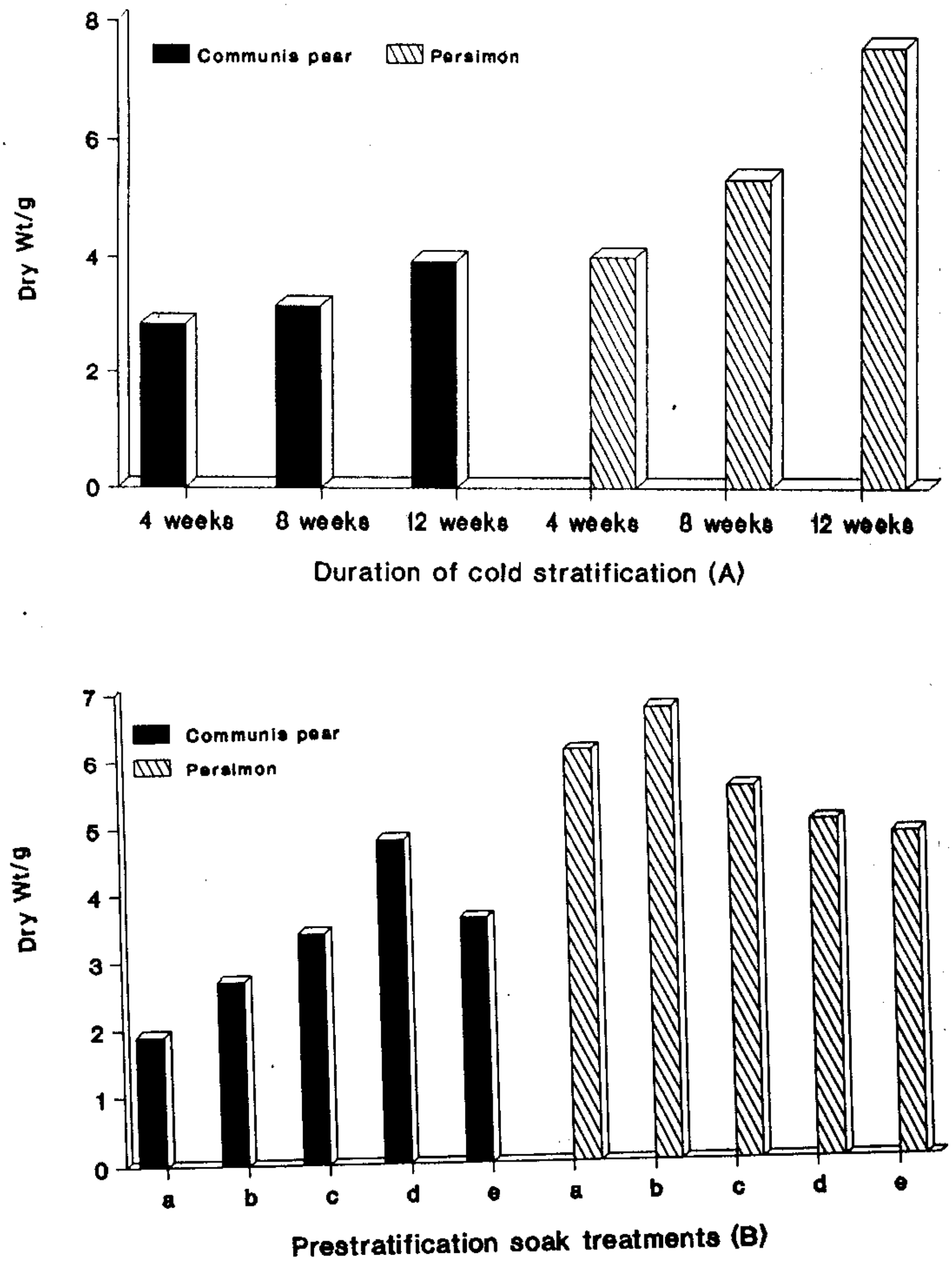

Fig. (1) : Specific effect of cold stratification period (A) and prestratification soak treatments (B) on total plant dry weight of communis pear and persimon seedlings. (an average of 1993 and 1994 seasons)

a = No soakeing (control).
b = Water soaked seeds.
c,d and e = 1000, 2000 and 3000 GA soaked seeds, respectively.

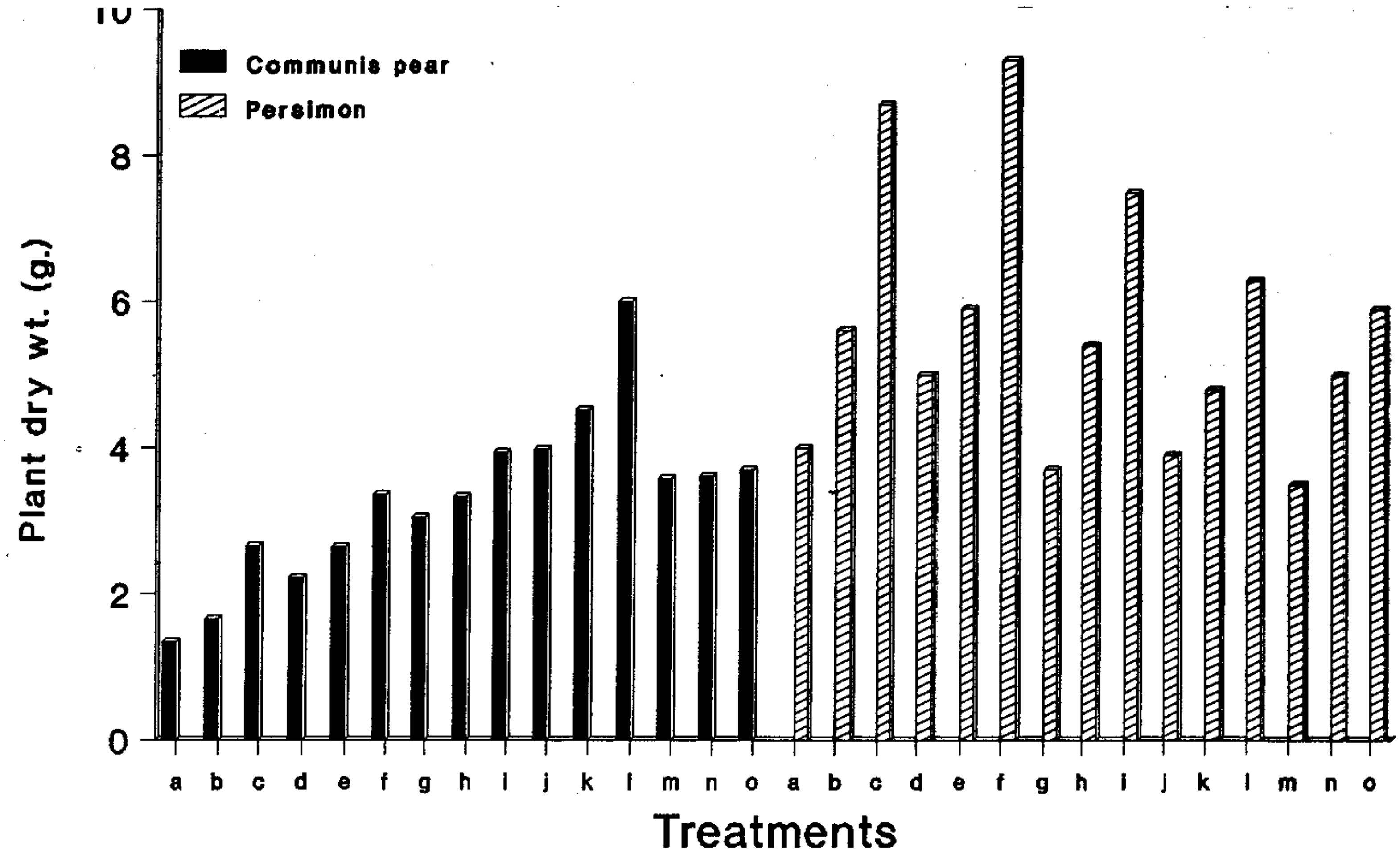

Fig. (2): Total plant dry wieght of communis pear and persimon seedlings as affected by different combination between stratification period and prestratification soak application.

a,b and c mean : Nonsoaked seeds stratified for 4,8 and 12 weeks, respectively.
d ,e and f mean : Water soaked seeds stratified for 4,8 and 12 weeks, respect.
g,h and i mean : GA 1000 ppm soaked seeds stratified for 4,8 and 12 weeks, respect.
j,k and l mean :GA 2000 ppm soaked seeds stratified for 4,8 and 12 weeks, respect

The present results concerning the beneficial effects of extending the duration of exposure to chilling and that gained by soaking seeds in GA solutions especially at 2000 ppm on the different growth measurements of three plant organs (leaves, stem and root) could be explained logically either by the earliness of germination exhibited by such seeds received any/both of them which sertainly might be reflected positively on the developed seedlings, or to the direct effect of GA and cold stratification as the findings of some investigators had been reported before.

Nevertheless, ***El-Nabawy et al. (1980-a)*** on pecan seeds, ***El-Nabawy et al. (1985)*** on pecan, ***Ji and Wang, (1987)*** on peach seeds ***Abo - Hassan (1986)*** on apple seeds, ***Keleg et al. (1989)*** on some stones species and ***Kashyap et al. (1992)*** on Crab apple all demonstrated that extended period of cold stratification increased various vegetative growth parameters of developed seedlings.

As for stimulative effect of soaking seeds of communis pear in GA solutions on growth parameters of the developed seedlings, present result is in partial agreement of the findings of ***El-Nabawy et al. (1980- a). Bulard (1986),*** on apple seeds, ***Kilany, Omaima (1986)*** on peach and ***Keleg et al. (1989),*** on some prunus spp. On the other hand, the depressive effect of soaking persimon seeds in GA solution on growth of seedlings developed goes to great extend with the findings of ***Wanic et al. (1968)*** on apple, ***Takaki and Dietrich (1989)*** on coffea seeds and ***Shen and Mullins (1983)*** on seeds of calleryana pear.

IV.2. Part, II : Nemaguard Peach "Prunus domestica" and Hamawy apricot "Prunus armeniaca" :

IV.2.1 Effect of presowing soak of nonstratified, endocarp-free seeds in gibberellin and other chemical solutions :

IV.2.1.1. Effect on some germination parameters :

In this regard four germination parameters namely : a- number of days required for 50% germination, b- germination percentage, c- germination rate and d- germination value of nonstratified, endocarp-free seeds of both Nemaguard peach and Hamawy apricot were investigated regarding their response to 14 differential treatments of presowing soak in water and various solutions of GA, thiourea, zinc sulphate, potassium permanganate and citric acid, beside no soaking as control. Data obtained during both 1993 and 1994 seasons concerning the responses of the aforesaid four germination measurements are presented in Table (12).

IV. 2.1.1.1. Number of days needed fro 50% germination :

Data obtained revealed that, seeds of both Nemaguard peach and Hamawy apricot failed completely to reach 50% germination within the time of test (8 weeks from sowing seeds) whereas at its end process of germination was nearly ceased. This result was detected during both seasons, regardless of presowing treatments had been received by the unstratified seeds of both concerned prunus species. This result is in partial agreement with finding of ***Bulard (1986)***, on apple who reported that GA did not completely reproduce the effect of cold stratification.

IV. 2.1.1.2. Germination percentage :

IV.2.1.1.2.a. Nemaguard peach :

Regarding the response of germination % of nonstratified, endocarp - free seeds of Nemaguard peach to the various presowing soak treatments, data tabulated in Table (12) showed a variable significant differences during both 1993 and 1994 seasons. The highest germination percentage was significantly detected by such seeds soaked in either GA solutions at 1000/2000 ppm or thiourea at 500/750 ppm, beside soaking in GA at 3000 ppm. However, GA 1000 ppm soaked seeds tended to reflect its superiority over the aforesaid effective treatments, especially in the 1993 seasons whereas difference was significant .

Nevertheless, soaking in GA solution at the lowest concentration i.e., 500 ppm or in zinc sulphate solution at higher concentration "4000 ppm" showed an intermediate level of efficiency so they ranked statistically second to the abovementioned superior treatments. Mean-while, soaking in the higher concentration of citric acid (4000 ppm) came third as it showed a relative lower germination percentage i.e., 18.3 and 15.0% during 1993 and 1994 seasons, respectively. On the other hand, unsoaked and potassium permanganate 10000 ppm soaked seeds were the inferior whereas both exhibited the lowest germination percentage as an average of two seasons was concerned i.e., 1.8 and 0.0% for former and later ones, respectively. In addition other presowing soak treatments i.e., soaking in water, zinc sulphate at 2000 ppm, potassium permanganate at 5000 ppm and citric acid resulted statistically in the lowest increase in germination percentage over control, since they generally showed a germination % ranged from 6-10% during both seasons of study.

IV.2.1.1.2.b. Hamawy apricot :

From data tabulated in Table (12), it is quite evident that the germination percentage of nonstratified endocarp - free Hamawy apricot seeds was significantly influenced by the differential presowing soak in various chemical solutions. However, all preplanting soak treatments increased statistically the germination percentage over control, but the treatments of 24 hours soak in GA at 2000/3000 ppm, thiourea at 500 ppm, potassium permanganate at 5000 ppm and to great extent zinc sulphate at 2000 ppm and citric acid at 4000 ppm were the superior and represented the 1 st category of effectiveness in this respect. The increase in germination percentage resulted by such effective treatments was significant as compared to those of other investigated treatments during both 1993 and 1994 seasons, except some cases of comparison between two later treatments (zinc sulphate at 2000 ppm and citric acid at 4000) from one side and some other soak treatments from the other side. Moreover, soaking in GA at 1000 ppm, zinc sulphate at 4000 ppm and potassium permanganate at 10000 ppm ranked second to the aforesaid superior treatments. In addition, tap water soaking came last where it showed the least increase in germination percentage over control, while other treatments of soaking in Hamawy apricot seeds in GA 500 ppm, thiourea 750 ppm and citric acid at 2000 ppm represented statistically the third category during both seasons of study.

IV.2.1.1.3. Germination rate :

IV.2.1.1.3.a. Nemaguard peach :

Concerning the response of germination rate to the differential investigated treatments of presowing soak the nonstratified, endocarp - free seeds of Nemaguard peach, data obtained during 2 seasons disclosed that all soaking application (regardless of solutions used) increased significantly the germination rate over control (nonsoaked seeds). On the other hand differences between differential soaking treatments was not so pronounced to reach level of significance as each was compared to others during two seasons of study.

IV.2.1.1.3.b. Hamawy apricot :

Data in Table (12) declared that the germination rate of nonstratified endocarp - free seeds of Hamawy apricot followed the same trend of response that previously mentioned with Nemaguard peach regarding the influence of the presowing soak treatments.

However, the trend of germination rate in response to various treatments of preplanting soak for both Prunus species, did not agree that of their germination percentage, but it could be explained by that fact based on the paralleled rates of emergence the developing seedlings of analogous treated seeds along the period of estimating this parameter.

IV. 2.1.1.4. Germination value :

IV. 2.1.1.4.a. Nemaguard peach :

From data presented in Table (12), it is quite evident that the germination value of Nemaguard peach was significantly responded to the differential presowing soak treatments during both 1993 and 1994 seasons. Hence, the lowest germination values were those of such nonsoaked endocarp - free seeds "control", tap water soaked, zinc sulphate 2000 ppm, potassium permanganate 10000 ppm and citric acid 2000 ppm soaked seeds. Whereas all represented significantly the inferior treatments. On the other hand, soaking the nonstratified endocarp - free seeds prior to

Table (12) Effect of pre-sowing soak in gibberellin and other chemical solutions on some germination measurements (8 weeks from planting) of nonstratified, endocarp - free seeds of Nemaguard peach and Hamawy apricot during 1993 and 1994 Seasons.

Treatments of soaking for 24 hrs.	Germination measurements															
	Nemaguard peach								Hamawy apricot							
	Days to 50% ger.		Germ. %		Germ. rate		Germ. value		Days to 50% ger		Germ. %		Germ. rate		Germ. Value	
	1993	1994	1993	1994	1993	1994	1993	1994	1993	1994	1993	1994	1993	1994	1993	1994
No- soaking "control"	> 56	> 56	1.7	1.7	0.10	0.01	0.04	0.04	>56	>56	1.7	1.7	0.10	0.10	0.05	0.08
Tap water	>56	> 56	10.0	10.0	0.40	0.42	0.06	0.8	>56	>56	8.3	16.7	0.35	0.43	0.25	0.29
GA 500 PPm.	> 56	> 56	26.7	21.7	0.37	0.36	0.49	0.51	>56	>56	21.7	28.3	0.36	0.45	0.28	0.32
GA 1000 PPm.	> 56	> 56	43.3	41.7	0.37	0.35	0.93	0.98	>56	>56	28.3	31.7	0.35	0.46	0.40	0.45
GA 2000 PPm.	> 56	> 56	36.7	38.3	0.38	0.38	0.78	0.79	>56	>56	41.7	43.3	0.35	0.45	0.73	0.80
GA 3000 PPm.	> 56	> 56	35.0	35.0	0.39	0.36	0.63	0.66	>56	>56	38.3	41.7	0.36	0.47	0.70	0.74
Thiourea 500 PPm	> 56	> 56	38.3	41.7	0.36	0.35	0.72	0.75	>56	>56	40.0	43.3	0.36	0.45	0.85	0.91
Thiourea 750 PPm.	> 56	> 56	36.7	40.0	0.35	0.36	0.62	0.67	>56	>56	26.7	26.7	0.35	0.45	0.43	0.48
Zinc sulphate 2000.PPm	> 56	> 56	8.3	10.0	0.33	0.42	0.05	0.07	>56	>56	33.3	38.3	0.37	0.43	0.63	0.73
Zinc sulphate 4000.PPm	> 56	> 56	28.3	21.7	0.38	0.36	0.49	0.53	>56	>56	30.0	36.7	0.33	0.41	0.50	0.55
Potass. permangan. 5000. PPm	> 56	> 56	6.7	8.3	0.42	0.33	0.03	0.04	>56	>56	38.3	40.0	0.34	0.46	0.58	0.62
Potass. permangan.10000.PPm	> 56	> 56	0.0	0.0	0.0	0.0	0.00	0.00	>56	>56	28.3	31.7	0.32	0.46	0.43	0.46
Citric acid 2000 PPm.	> 56	> 56	6.7	8.3	0.42	0.41	0.03	0.03	>56	>56	18.3	25.0	0.34	0.45	0.35	0.38
Citric acid 4000 PPm.	> 56	> 56	18.3	15.0	0.38	0.38	0.19	0.21	>56	>56	31.7	38.3	0.33	0.44	0.48	0.52
L.S.D. at 5% level			4.04	4.26	0.181	0.195	0.018	0.022			5.41	4.35	0.008	0.012	0.009	0.008

sowing in GA 1000 ppm exhibited statistically the highest germination value followed by those of GA 2000/3000 ppm and thiourea 500/750 ppm soaked seeds. While other treatments were in between the abovementioned two extremes.

IV. 2.1.1.4.b. Hamawy apricot :

Concerning the seeds germination value of Hamawy apricot in response to various presowing soak treatments, data in Table (12) showed clearly that all soaking application exhibited a significant increase over control. However, thiourea 500 ppm soaked seeds was statistically the superior followed in a descending order by GA 2000 ppm, GA 3000 ppm and/or zinc sulphate 2000 ppm soaked seeds. Moreover, other combinations ranked third category except those of soaking either in tap water or GA 500 ppm which ranked last just before control such trend was true during 1993 and 1994 seasons.

IV.2.1.2. Growth measurements of developed seedlings :

In this regard some linear measurements (average length of stem and root) and dry weight of various plant organs "leaves, stem, roots" as well as top/root ratio were the various growth measurements included in this respect. Data obtained during both 1993 and 1994 seasons regarding the response of the aforesaid parameters for two prunus species i.e., Nemaguard peach and Hamawy apricot are presented in Tables (13) and (14), respectively.

IV. 2.1.2.1. Average stem length "plant height"

IV.2.1.2.1.a. Nemaguard peach :

Regarding the influence of differential presowing soak treatments on stem length of Nemaguard peach seedlings, data in Table (13) disclosed obviously that soaking of unstratified, endocarp - free seeds in GA 1000/2000 ppm, thiourea 500 / 750 ppm "especially higher conc.", zinc sulphate 2000/4000 ppm and citric acid 2000 / 4000 ppm all induced seedlings having statistically the longest stem. On the contrary developed seedlings from either unsoaked or tap water soaked seeds of Nemaguard peach showed the most depressed plant height. Meanwhile, other treatments fell in between the abovementioned two extents.

IV. 2.1.2.1.b. Hamawy apricot :

Concerning the effect of presowing soak treatments on stem length of Hamawy apricot seedlings, data in Table (14) showed clearly that all investigated treatments increased it significantly over control (unsoaked seeds). However, soaking for 24 hours in tap water had the least effect, while the reverse was true with soaking in GA 2000/3000 ppm, thiourea 500 ppm, zinc sulphate 2000 ppm, potassium permanganate 5000 ppm or citric acid 4000 ppm whereas they resulted in inducing Hamawy apricot seedlings having significantly the tallest stem during both 1993 and 1994 seasons. On the other hand, other investigated treatment were in between in this concern.

IV. 2.1.2.2. Average root length :

IV. 2.1.2.2.a. Nemaguard peach :

Data in Table (13) disclosed clearly that the shortest root system of Nemaguard peach seedlings was induced by sowing its nonstratified, endocarp- free seeds either directly "without soak application i.e., control" or after soaking for 24 hours in tap water, potassium permanganate at 5000 ppm and citric acid at 4000 ppm. On the other hand, other preplanting soak treatments increased average root length statistically than the aforesaid inferior treatments. However, soaking seeds in GA 2000 ppm followed by soaking in zinc sulphate either at 2000/4000 ppm induced seedlings with longer root as compared to the other effective treatments during both 1993 and 1994 seasons.

IV. 2.1.2.2.b. Hamawy apricot :

Data obtained during both 1993 and 1994 seasons declared obviously as shown in Table (14) that average root system of Hamawy apricot seedlings was influenced by the investigated presowing soak treatments. Since, nonsoaked or tap water soaked seeds showed the shortest root, while soaking seeds in GA (especially at 2000 ppm), thiourea 500 ppm, zinc sulphate 2000 ppm, potassium permanganate 5000 ppm and citric acid. 4000 ppm induced seedlings having significantly the longest root system. Moreover, other investigated treatments were in between the abovementioned two extents with some degrees of variance in this respect.

IV. 2.1.2.3. Leaves dry weight per seedling :

IV. 2.1.2.3.a. Nemaguard peach :

Table (13) shows clearly the pronounced differences in dry weight of leaves per Nemaguard peach seedling as influenced by the differential presowing soak treatments during both 1993 and 1994 seasons. Meanwhile, the heaviest leaves dry weight was always concomitant to those seedlings developed by sowing seeds previously soaked in GA at

500/1000/2000 ppm, thiourea at 500/750 ppm or citric acid at 2000 ppm. Such trend was true during both 1993 and 1994 seasons, whereas increases over other treatments were significant, however 2000 ppm GA application tended to be the superior and surpassed statistically the other ones in this respect. On the contrary developed seedlings of Nemaguard peach induced from sowing nonsoaked or tap water soaked seeds had significantly the lowest leaves dry weight per seedling. Meanwhile, other treatments were intermediate in this respect.

IV.2.1.2.3.b. Hamawy apricot :

Table (14) shows that an obvious variançe in leaves dry weight per Hamawy apricot seedling in response to the differential presowing soak treatments could be detected. All treatments of soaking the nonstratified endocarp - free seeds of Hamawy apricot in various solutions of GA, thiourea, zinc sulphate, potassium permanganate and citric acid increased significantly the leaves dry weight / seedling over those seedlings of nonsoaked or tap water soaked seeds. However, soaking in GA 2000/3000 ppm, zinc sulphate 2000 ppm, potassium permanganate 5000 ppm, citric acid 4000 ppm and to great extent thiourea at 750 ppm were the superior treatments as they surpassed statistically all other ones in this regard. In addition other investigated soak application situated an intermediate location to the aforesaid two extents.

IV.2.1.2.4. Stem dry weight per seedling :

IV. 2.1.2.4.a. Nemaguard peach :

From data tabulated in Table (13) it is quite clear to be noticed that stem dry weight of Nemaguard peach seedling was significantly responded to the differential presowing treatments during both 1993 and 1994 seasons. The heaviest stem dry weight was always achieved by such seedlings developed from sowing such nonstratified, endocarp - free seeds that previously soaked in GA 1000/2000 ppm, thiourea at 750 ppm and citric acid 2000 ppm. However, the two former treatments resulted in more pronounced increase over the other ones of the aforesaid effective treatments. Moreover, soaking either in GA at 500/3000 ppm or zinc sulphate at 2000/4000 ppm and thiourea 500 ppm ranked statistically next as they being representative of the second category. While the lightest stem dry weight was closely related to unsoaked, water soaked and potassium permanganate 5000 ppm soaked seeds.

IV.2.1.2.4.b. Hamawy apricot :

Regarding the effect of different presowing soak treatments on stem dry weight of Hamawy apricot seedlings regenerated by using unstratified, endocarp - free seeds, data in Table (14)/revealed obviously the same trend previously detected with leaves dry weight / seedling during both 1993 and 1994 seasons. Since, treatments of soaking in GA 2000/3000 ppm, thiourea 500 ppm, zinc sulphate 2000 ppm, potassium permanganate 5000 ppm and citric acid 4000 ppm surpassed statistically all other treatments in this concern. However, water soaked or unsoaked seeds were the inferior. While other treatments being in between.

IV. 2.1.2.5. Average root dry weight per seedling :

IV. 2.1.2.5.a. Nemaguard peach :

Table (13) shows that average root dry weight per seedling of Nemaguard peach was responded significantly to the various preplanting soak treatments of the nonstratified, endocarp - free seeds. Hence, all treatments of presowing soak in different chemical solutions (except potassium permanganate at 5000 ppm) resulted in a significant increase over both treatments of no-soaking or tap water soaked seeds. However treatment of GA 2000 ppm soaked seeds was statistically the superior followed by those of soaking in GA 1000 ppm, thiourea 500/750 ppm and citric acid 2000 ppm, whereas all were approximately of the same efficiency except later one which was relatively more effective.

IV.2.1.2.5.b. Hamawy apricot :

Data obtained during both 1993 and 1994 seasons disclosed obviously the pronounced response of average root dry weight of Hamawy apricot seedlings to the various investigated treatments of soaking the endocarp - free seeds "nonstratified" in the different chemical solutions. Nevertheless soaking in GA 2000/3000 ppm, zinc sulphate 2000 ppm, potassium permanganate at 5000 ppm and citric acid 2000 ppm, beside soaking in thiourea at 500 ppm were the most effective treatments and exceeded statistically all other treatments in this respect. Such trend was true during both 1993 and 1994 seasons, however the later one (soaking in thiourea 500 ppm) was relatively of less effectiveness as compared to other aforesaid effective treatments. On the other hand, the remainder treatments fell in between the abovementioned two extremes in this concern.

IV.2.1.2.6. Top/root ratio :

IV. 2.1.2.6.a. Nemaguard peach :

Regarding the response of top / root ratio of Nemaguard peach seedlings to the preplanting soak treatments, data in Table (13) revealed that no firm trend could be detected during two seasons of study. However, it could be generally concluded that nonsoaking seeds (control)

Table (13) : Growth measurement of Nemaguard peach seedlings as influenced by presowing soak of its nonstratified endocarp - free seeds in gibberellin and other chemical solutions during 1993 and 1994 seasons.

Treatments Soaking for 24 h.	Stem length		Root length		Leaves D.Wt.		Stem D. Wt.		Root D. Wt.		Top/root ratio	
	1993	1994	1993	1994	1993	1994	1993	1994	1993	1994	1993	1994
No-soaking "control"	6.4	7.0	2.6	2.9	0.02	0.05	0.07	0.09	0.05	0.07	1.8	2.00
Tap water	7.7	8.7	3.4	4.5	0.04	0.07	0.09	0.10	0.08	0.09	1.63	1.88
GA 500 PPm.	25.8	28.7	16.3	31.1	1.35	1.65	1.55	1.75	1.48	1.57	1.95	2.16
GA 1000 PPm.	52.6	54.6	18.7	21.1	1.25	1.88	2.15	2.45	1.90	1.95	1.78	2.22
GA 2000 PPm.	44.1	44.5	28.4	31.1	1.88	1.90	2.45	2.60	2.57	2.60	1.68	1.73
GA 3000 PPm.	28.3	29.3	20.3	22.6	0.70	0.79	1.53	1.55	1.18	1.28	1.88	1.83
Thiourea 500 PPm	34.9	36.5	18.5	21.1	1.23	1.85	1.60	1.69	1.50	1.57	1.89	2.25
Thiourea 750 PPm.	40.6	41.9	18.9	19.9	1.35	1.65	1.88	1.95	1.80	1.88	1.79	1.91
Zinc sulphate 2000.PPm	46.4	48.1	24.8	26.4	0.85	0.90	1.45	1.65	1.28	1.35	1.79	1.88
Zinc sulphate 4000.PPm	47.9	49.3	26.1	27.8	0.65	0.70	1.28	1.45	1.25	1.28	1.54	1.68
Potass. permangan. 5000. PPm	9.0	9.5	3.9	5.80	0.04	0.06	0.08	0.09	0.08	0.09	1.50	1.66
Potass. Permangan.10000.PPm	00.0	00.0	00.0	00.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Citric acid 2000 PPm.	45.9	46.4	19.1	20.9	1.13	1.23	2.35	2.45	2.15	2.35	1.62	1.57
Citric acid 4000 PPm.	39.8	39.8	21.0	20.0	0.94	0.96	1.80	1.90	1.67	1.69	1.64	1.69
L.S.D at 5% level	4.91	4.71	0.77	0.61	0.07	0.05	0.6	0.4	0.07	0.06	0.01	0.01

Table (14): Growth measurement of Hamawy apricot seedlings as influenced by presowing soak of its nonstratified endocarp - free seeds in gibberellin and other chemical solutions during 1993 and 1994 seasons.

Treatments	Stem length		Root length		Leaves D.Wt.		Stem D. Wt.		Root D. Wt.		Top/root ratio	
Soaking for 24 h.	1993	1994	1993	1994	1993	1994	1993	1994	1993	1994	1993	1994
No-soaking "control"	7.5	8.6	2.4	2.8	0.10	0.17	0.2	0.40	0.3	0.4	1.0	1.40
Tap water	10.5	11.8	3.3	3.9	0.40	0.52	0.43	0.73	0.83	1.13	1.0	1.10
GA 500 PPm.	35.1	38.3	28.3	29.9	1.03	1.15	1.50	1.90	2.60	3.05	0.97	1.00
GA 1000 PPm.	42.7	43.5	18.4	20.8	1.15	1.35	1.65	1.95	3.05	3.55	0.92	0.93
GA 2000 PPm.	73.3	75.6	29.1	31.9	2.65	2.68	2.68	3.20	5.58	5.88	0.96	1.00
GA 3000 PPm.	67.8	69.8	23.3	25.3	2.45	2.55	2.55	1.92	5.20	5.55	0.96	0.81
Thiourea 500 PPm	66.5	68.3	25.9	27.05	1.93	1.98	2.03	2.51	4.20	4.88	0.94	0.92
Thiourea 750 PPm.	48.3	50.8	14.6	16.4	1.23	1.35	1.43	1.83	2.83	3.15	0.94	1.0
Zinc sulphate 2000.PPm	65.1	68.3	28.2	27.0	2.15	2.23	2.33	2.75	4.63	5.15	0.97	0.97
Zinc sulphate 4000.PPm	63.5	65.5	20.0	22.5	1.68	1.75	1.65	2.15	3.45	3.95	0.96	0.99
Potass. permangan. 5000. PPm	80.1	73.3	21.9	23.3	2.35	2.45	2.65	3.21	5.20	5.88	0.96	0.96
Potass. Permangan.10000.PPm	56.8	59.3	10.3	11.4	1.55	1.65	1.53	2.10	3.23	3.75	0.95	1.00
Citric acid 2000 PPm.	45.5	47.5	9.6	10.7	1.05	1.09	1.18	1.54	2.38	2.75	0.94	0.96
Citric acid 4000 PPm.	54.3	57.5	23.0	25.7	2.15	2.25	2.35	2.91	4.55	5.05	0.99	0.10
L.S.D at 5% level	7.41	7.10	1.03	0.65	0.61	0.40	0.60	0.51	0.90	0.81	0.01	0.03

and GA either at 500 or 1000 ppm soaked seeds induced seedlings having a higher top / root ratio as an average of two 1993 and 1994 seasons was concerned. While others to great extent are equally the same.

IV.2.1.2.6.b. Hamawy apricot :

Data in Table (14) showed that the response to different preplanting soak treatment disclosed that changes in top / root ratio of Hamawy apricot seedlings were not so acute to show a firm trend. However, as an average of two seasons was concerned it could be noticed that an increase was detected with Hamawy apricot seedlings developed from sowing unsoaked, seeds "control" and tap water or GA 500 ppm soaked seeds.

The results obtained concerning the effect of preplanting soak treatments on top/root ratio of developed seedlings could be logically explained by the two trends of responses for both aboveground and underground systems to a given treatment (were they paralleled or conflicted?).

IV.2.1.2.7. Total plant dry weight :

Regarding the response of total plant dry weight of both Nemaguard peach and Hamawy apricot seedlings to the presowing soak treatments of their nonstratified, endocarp - free seeds an average of data obtained during both 1993 and 1994 seasons are presented and illustrated in Table (15 and Figure (3), respectively.

IV.2.1.2.7.a Nemaguard peach :

It is quite clear that all presowing soak treatments except tap water and potassium permanganate (5000/10000 ppm) increased dry weight of

Table (15) : Total plant dry weight of Nemaguard peach and Hamawy apricot seedlings as influenced by presowing soak of their nonstratified endocarp - free seeds in GA and other chemical solutions (an average of both 1993 and 1994 seasons).

Treatment of soaking for 24 h.	Total plant dry weight in gm.	
	Nemaguard peach	Hamawy apricot
No-soaking "control"	0.2	0.8
Tap water	0.3	2.0
GA 500 ppm	4.7	5.7
GA 1000 ppm	5.8	6.4
GA 2000 ppm	7.0	11.3
GA 3000 ppm	3.5	10.1
Thiourea 500 ppm	4.7	8.8
Thiourea 750 ppm	5.3	5.9
Zinc sulphate 2000 ppm	3.7	9.6
Zinc sulphate 4000 ppm	3.3	7.3
Potassium permanganate 5000 ppm	0.2	10.9
Potassium permanganate 10000 ppm	0.0	6.9
Citric acid 2000 ppm	5.8	5.0
Citric acid 4000 ppm	5.5	7.1

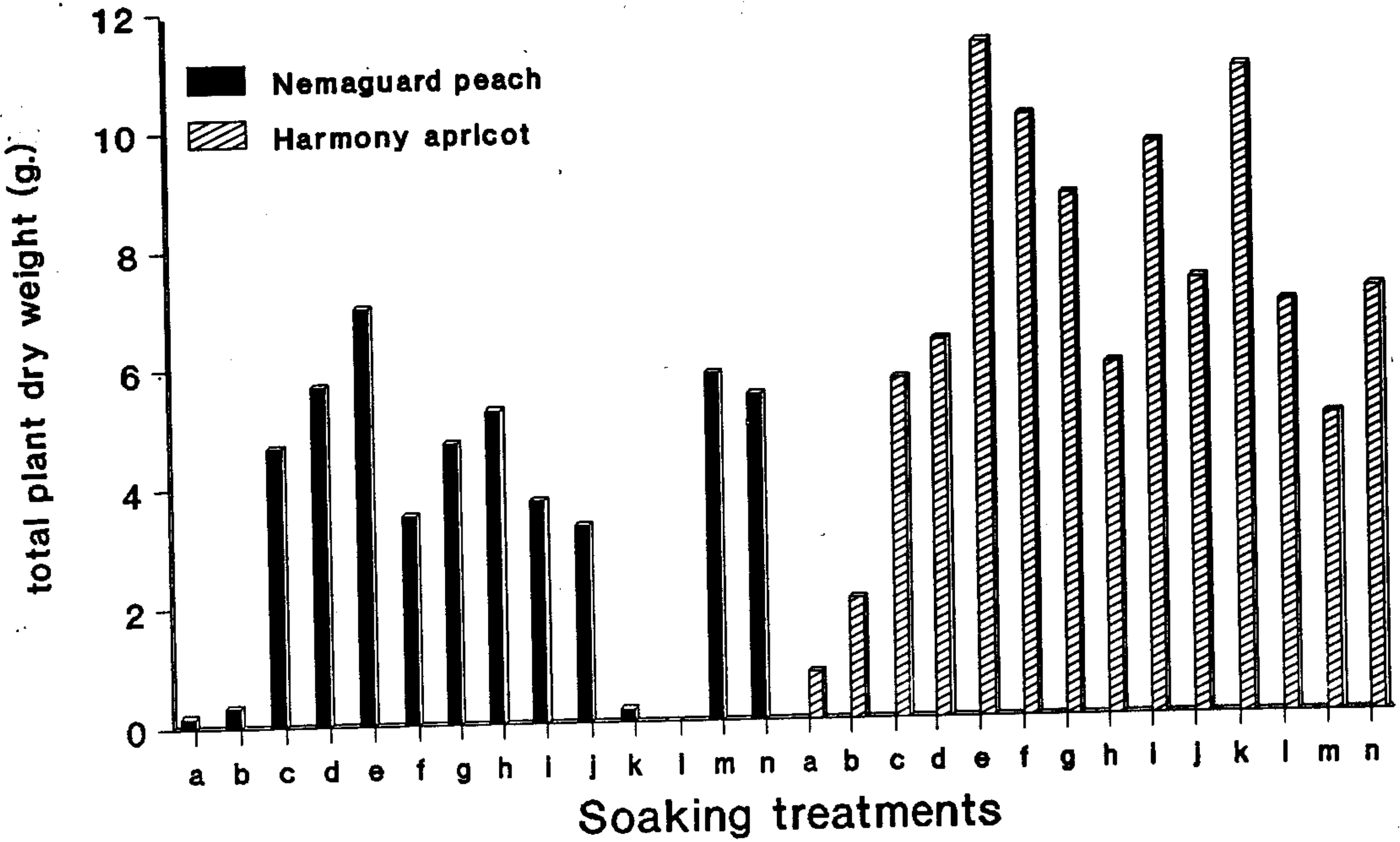

Fig. (3): Total plant dry weight (an average of 1993 & 1994 seasons of Nemaguard peach and Hamawy apricot seedlings as ifnluenced by soaking their nonstratified endocarp- free seeds in different chemical solutions.

a = Nonsoaked seeds.
b = Water soaked seeds.
c,d,e and f = GA, 500,1000,2000 and 3000 ppm soaked seeds,respectively.
g and h = Thiourea 500 and 750 ppm. soaked seeds, respect.
i and j = Zinc sulphat 2000 and 4000 ppm soaked seeds, respect.
k and l =Potassium permanganat 5000 and 10000 ppm soaked seeds, respect.
m and n = Citric acid 2000 and 4000 ppm soaked seeds, respect.

Generally it could be concluded that presowing soak either in GA at 1000/ 2000 ppm (especially higher concentration) or citric acid at 2000 ppm followed by thiourea 500/750 ppm were the most effective treatments for the nonstratified endocarp - free seeds of Nemaguard peach. However, with Hamawy apricot, soaking in GA at 2000 / 3000, ppm potassium permanganate 5000 ppm, and citric acid at 4000 ppm followed by both thiourea and zinc sulphate at 500 and 2000 ppm respectively were the most desirable treatments. These aforesaid superior treatments casused the highest values of both seed germination and growth parameters of the different seedling organs for the two prunus species.

The obtained data regarding the effect of presowing soak in GA, thiourea, zinc sulphate, potassium permanganate and citric acid solutions are in general agreement with that previously mentioned by several investigators. The beneficial effect of soaking in GA solution is in confirmity with that previously reported by ***Jarvis et al., (1968)*** who found that RNA synthesis and DNA availability in the cormatin in GA treated seeds of hazel were 7 and 3 times respectively much more than control "untreated seeds". Moreover, ***El-Tomi et al., (1978)*** demonstrated that soaking peach seeds in GA solutions encouraged the disappearance of inhibitors but enhanced the dominance auxin like substances. ***Abohassan et al., (1979)*** on apricot, ***Hundal and Kajukia (1979)***, on peach, ***Rouskas et al., (1981)*** on peach, ***Davis (1983)***, on endocarp - free seeds of Nemaguard peach, ***Mehanna and Marten (1984)***, on nonstratified seeds of peach, ***Abohassan (1986)***, on peach and apple seeds, ***Bulard (1986)***, on different GA concentrations - treated apple seeds, ***Kilany, Omima (1986)***, on ***Meet-Ghamr*** peach ***Kashyap et al., (1992)*** on Crab apple ***and Tripathi and Arora (1994)*** , on endocarp - free seeds of 5 plum cvs. All reported the stimulation effect of preplanting soak in GA solutions on both seeds germination and growth parameters of developed seedlings. Beside the variability in response due to the GA concentrations.

The present results regarding the effect of presowing soak in thiourea solutions for seeds of both Nemaguard peach and Hamawy apricot go in the line of the findings of ***Paul*** and ***Bigges (1963)***, on peach, ***Singh and Nijjar (1968)***, on peach, ***Kilany, Omima (1989)***, on peach and ***Tripthi and Arora (1994)***, on plum (unstratified, endocarp - free seeds). However finding of ***Siyapananot (1988),*** is in disagreement with our results.

Nevertheless, the beneficial effect of presowing seeds soak in zinc sulphate is coincided by those reported by ***Makarem (1978)***, on pear, ***Darwish and Khamus (1981)***, on citrus rootstock seeds and ***Helail (1989)*** a, b and c on pecan and persimon walnuts seeds :

Meanwhile ***Darwish and Khamis (1981)***, supported the importance of soaking in either manganese salt or citric acid. However, ***Helail and Mehanna (1989)***, on annona found that germination was improved by soaking seeds in potassium permanganate.

IV. 2.2. Effect of cold stratification duration in combination with removing endocarp of Nemaguard peach and Hamawy apricot seeds :

In this regard two factorial experiments were conducted each included the same eight treatments i.e., combinations between four periods of cold stratification (0, 3, 6 and 9 weeks) and two cases of persistence the endocarp with seeds (intact / free). Meanwhile, an experiment was devoted for Nemaguard peach seeds while the second was dedicated for Hamawy apricot to study the following aspects :

IV. 2.2.1. Effect on some germination parameters :

IV. 2.2.1.1. Number of days needed to 50% germination :

IV. 2.2.1.1.a. Nemaguard peach :

Table (16-a) shows obviously that intact seeds of Nemaguard peach did not succeed to reach 50% germination within the period of test i.e., till germination process was ceased (8 weeks from sowing), regardless of duration during which seeds were stratified. On the other hand, endocarp - free seeds either stratified for 3 weeks or planted directly without stratification failed also to reach 50% germination during both 1993 and 1994 seasons. Meanwhile, as the duration of cold stratification for the endocarp - free seeds was prolonged to 6 or 9 weeks 50% germination was achieved after 22.5/26.0 days from sowing the 6 weeks stratified seeds during 1993 and 1994 seasons, respectively.

While the 9 weeks stratified endocarp - free seeds accomplished 50% germination rapidly after relative shorter time from sowing i.e., 17.3/20.0 days from sowing during 1993 and 1994 seasons, respectively.

In other words as the duration of cold stratification was extended, the time needed in days for 50% germination was decreased.

IV.2.2.1.1.b. Hamawy apricot :

Regarding the effect of different combinations between the intact and endocarp-free seeds of Hamawy apricot from one hand and duration of cold stratification from the other on number of days required for 50% germination, data in Table (16-a) disclosed that unstratified seeds did not reach 50% germination, irrespective of endocarp of seed was removed or seed remained intact. Meanwhile the intact seeds reached 50% germination only as the duration of stratification was prolonged to 9 weeks or 6 weeks during 1993 and 1994 seasons, respectively.

Nevertheless, the cold stratified endocarp - free seeds of Hamawy apricot succeeded to reach 50% germination, regardless of duration during which seeds remained to be stratified. However, as the duration of chilling exposure was extended the number of days needed depressed. Hence the 9 weeks stratified endocarp - free seeds of Hamawy apricot reached 50% germination rapidly i.e., after 15.5 and 20.0 days from sowing during 1 st and 2nd seasons, respectively. On the other hand, stratified seeds for the shortest period (3 weeks) required longer time to reach 50% germination i.e., 30.25 and 35.25 days during 1993 and 1994 seasons, respectively.

IV. 2.2.1.2. Germination percentage :

IV. 2.2.1.2.a. Nemaguard peach :

Specific effect :

With regard to specific effect of removing the seed endocarp of Nemaguard peach on germination percentage, data in Table (16- b) show

On the other hand, combination of non stratified seeds were the inferior in this respect. While other combinations showed an intermediate effect during two seasons of study.

IV.2.2.1.3. Germination rate :

IV. 2.2.1.3.a Nemaguard peach :

Specific effect :

Regarding the specific effect of both investigated means i.e., removing seed endocarp and cold stratification period on germination rate of Nemaguard peach, data obtained during both 1993 and 1994 seasons are presented in Table (17-a).

As for the specific effect of removing the endocarp, data obtained declared that variations in germination rate of Nemaguard peach were so small to be significant as intact and endocarp - free seeds were compared each to other during both 1993 and 1994 seasons. Meanwhile, the germination rate was significantly increased by any of the different periods of stratification as it responded specifically to cold stratification when compared with the nonstratified seeds. On the other hand, the various periods of cold stratification were equally the same in their effectiveness as compared each to other, while they exceeded statistically the unstratified seeds only.

Interaction effect :

Generally it could be noticed that combinations of the nonstratified seeds either their endocarps were removed or remained intact showed significantly the lowest rate of germination. However, other combinations between 3, 6 or 9 weeks cold stratification from one hand and intact or endocarp - free seeds from the other were approximately the same.

IV. 2.2.1.3.b. Hamawy apricot :

Specific effect :

Referring, the germination rate of Hamawy apricot seeds, data in Table (17 - a) disclosed obviously that it was specifically responded to the application of endocarp removing, especially during 1993 whereas the difference was more pronounced.

Meanwhile, germination rate was greatly influenced by the specific effect of cold stratification, whereas all stratified seeds showed significantly higher rates than nonstratified ones regardless of period during which they remained under cold temperature from one hand. On the other hand the 9 weeks cold stratification was the superior, whereas it surpassed statistically both durations of 3 and 6 weeks during both 1993 and 1994 seasons.

Interaction effect :

From data in Table (17-a), it is quite evident to notice that germination rate of Hamawy apricot seeds was responded to the interaction effect of two studied factors. Hence, the highest germination rate was closely related to both combinations of 9 weeks cold stratification, in spite of such combination of the endocarp - free seeds ranked 1 st as a superior but other i.e., of the intact seeds came statistically second in this respect. Moreover, other combinations of 3 or 6 weeks stratification from one hand and the intact or endocarp - free seeds from the other were equally the same, but they exceeded statistically the nonstratified combinations during two seasons.

IV.2.2.1.4. Germination value :

IV.2.2.1.4.a. Nemaguard peach :

Specific effect :

Data presented in Table (17-b) revealed obviously that germination value of Nemaguard peach seeds were specifically responded to both investigated factors. Hence, the endocarp-free seeds exhibited the greatest germination value, while the intact seeds showed significantly the lowest value during two seasons of study. On the other hand as the specific effect of cold stratification duration on seed germination value of Nemaguard peach was concerned, it could be observed that both were in closed positive relationship. Differences were highly significant during two seasons of study.

Interaction effect :

Data obtained showed that the effect of the different combinations on germination value of Nemaguard peach was so definite , whereas the highest value was always concomitant to such treatment of stratifying the endocarp - free seeds for 9 weeks followed in a descending order by those of 6 weeks stratified endocarp - free seeds and three combinations of intact seeds stratified for 9/6 weeks and endocarp - free seeds stratified for 3 weeks. On the contrary the nonstratified intact / endocarp - free seeds were the inferior as they showed statistically the lowest germination value.

IV.2.2.1.4.b Hamawy apricot :

Specific effect :

Data in Table (17-b) showed clearly that Hamawy apricot seeds followed nearly the same trends of specific effect of both duration of cold stratification and mechanical removing of seeds endocarp previously found with Nemaguard peach. However the response to removing the endocarp was less pronounced with Hamawy apricot, while the reverse was true with stratification period whereas apricot seeds showed more pronounced influence.

Interaction effect :

Data revealed that Hamawy apricot seeds followed the same trend of response previously detected with Nemaguard peach regarding the interaction effect of the different combinations of two investigated factors. However, the more pronounced response of Hamawy apricot seeds to duration of cold stratification was certainly reflected on interaction effect. Meanwhile, it could be safely concluded that the highest germination value was closely related to such combination of 9 weeks stratification X endocarp - free seeds followed statistically by 9 weeks X intact seeds and 6 or 3 weeks x endocarp - free seeds, while the 6 weeks stratified intact seeds ranked last just preceding the inferior combinations (No stratification of either intact or endocarp - free seeds).

The obtained results regarding the improving effect of removing the seed endocarp on germination parameters of both Nemaguard peach and Hamawy apricot are in confirmity with the findings of several investigators. ***Staden and Diamall (1977)***, on pecan, ***Toit et al., (1978)*** on peach, ***Rouskas et al., (1980)*** on peach ***Keleg et al., (1989)*** on peach,

Table (17) : Germination rate and value of Nemaguard peach and Hamawy apricot seeds in response to specific and interaction effects of cold stratification periods and mechanical removing of endocarp preceding stratification during 1993 and 1994 seasons.

Duration of cold stratification in weeks	Seed mechanical application (presence of endocarp)											
	Nemaguard peach						Hamawy apricot					
	1993			1994			1993			1994		
	Intact	Free	Mean	Intact	Free	Mean	Intact	Free	Mean	Intact	Free	Mean
a- Germination rate												
0.0 W.	0.10	0.10	**0.10**	0.01	0.1	**0.1**	0.11	0.11	**0.11**	0.11	0.11	**0.11**
3.0 W.	0.38	0.41	**0.40**	0.37	0.37	**0.37**	0.37	0.52	**0.45**	0.42	0.45	**0.43**
6.0 W.	0.44	0.47	**0.45**	0.38	0.41	**0.39**	0.42	0.45	**0.48**	0.43	0.44	**0.44**
9.0 W.	0.45	0.45	**0.45**	0.41	0.41	**0.41**	0.57	0.96	**0.76**	0.60	0.75	**0.68**
Mean	**0.34**	**0.37**		**0.31**	**0.32**		**0.37**	**0.53**		**0.46**	**0.55**	
L.S.D. at 5% level for :												
Stratification period........			0.07			0.04			0.058			0.095
Endocarp removing.........			0.07			0.02			0.047			0.056
Strat. period x end. remov.......			0.09			0.06			0.146			0.127
b- Germination value												
0.0 W.	0.04	0.04	**0.04**	0.04	0.04	**0.04**	0.04	0.04	**0.04**	0.04	0.04	**0.04**
3.0 W.	0.27	0.50	**0.39**	0.29	0.70	**0.49**	0.60	1.80	**0.70**	0.80	2.10	**1.45**
6.0 W.	0.54	2.77	**1.66**	0.59	2.90	**1.75**	1.10	1.60	**1.40**	1.40	1.80	**1.60**
9.0 W.	0.88	4.09	**2.49**	0.94	4.20	**2.57**	2.80	4.60	**3.70**	2.90	4.90	**3.90**
Mean	**0.43**	**1.85**		**0.47**	**1.96**		**1.13**	**1.57**		**1.29**	**2.21**	
L.S.D. at 5% level for :												
Stratification period........			0.56			0.51			0.44			0.36
Endocarp removing.........			0.49			0.42			0.31			0.27
Strat. period x end. remov.......			0.82			0.70			0.62			0.51

apricot, almond and plum and ***Kilany, Omaima (1986)***, on peach, all demonstrated that mechanical removing of endocarp improved seed germination percentage and resulted in accelerating, germination process of stratified seeds of the concerned stone fruit species.

Nevertheless, the present data pertaining the response of different germination parameters to the cold stratification were supported by the finding of ***Madden et al., (1977)*** on pecan, who demonstrated the positive effect of increasing the period of stratification on germination process. ***Fadl et al., (1978)*** concluded the gradual disappearance of inhibitors like substances from apricot seeds with extending period of cold stratification. Moreover, ***Gzerski and Janakowska (1981)***, on nonstratified and stratified apple seeds for different periods, ***Davies (1983)***, on Nemaguard peach, ***Ji and Wang (1987)***, on effect of extending period of cold stratification for peach seeds and ***Kashyap et al., (1992)***on Crab apple, all reported the importance of cold stratification and its prolongation on improving various parameters of seed germination.

IV.2.2.2. Effect on growth measurements of developed seedlings :

IV. 2.2.2.1. Average stem length "plant height" :

Regarding the specific and interaction effects of both investigated factors i.e., duration of cold stratification and mechanical removing of seed endocarp on stem length of Nemaguard peach and Hamawy apricot data obtained during both 1993 and 1994 seasons are presented in Table (18-a)

IV.2.2.2.1.a. Nemaguard peach :

Specific effect :

Concerning specific effect of removing seed endocarp of Nemaguard peach on plant height of developed seedlings data in Table (18-a) revealed obviously the significant increase in stem length gained by such mechanical procedure. Meanwhile, the response to specific effect of cold stratification was clearly occurred, whereas all stratified seeds significantly increased plant height of developed seedlings over the nonstratified seeds, regardless of duration of stratification. However, the plant height was in closed positive relationship with the duration of cold stratification, whereas the highest seedlings were developed from sowing the 9 weeks stratified seeds.

Interaction effect :

Regarding the plant height response to the interaction effect of the different combinations between both removing of seed endocarp and the duration of cold stratification, data of Table (18-a) showed that the tallest seedlings were developed by the endocarp - free seeds stratified for 9 weeks followed statistically in a descending order by those of endocarp-free or intact seeds stratified for 6 or 9 weeks, respectively. Such trend was true during both 1993 and 1994 seasons. On the contrary both combinations of nonstratified the intact or endocarp - free seeds induced seedlings having statistically the most depressed stem length. Moreover, other combinations fell in between the abovementioned two extremes in this concern.

IV. 2.2.2.1.b. Hamawy apricot :

Specific effect :

Table (18-a) shows obviously that the stem length "plant height" of Hamawy apricot in response to specific effect of both duration of cold stratification and removing of seed endocarp followed typically the same trends previously detected with Nemaguard peach. However, the differences due to changes in each investigated factor were more pronounced in Hamawy apricot than Nemaguard peach during both 1993 and 1994 seasons.

Interaction effect :

Data obtained during both seasons disclosed that the tallest seedlings were statistically related to such combination of stratifying the endocarp - free seeds of Hamawy apricot for 9 weeks. Moreover, both combinations of 9 weeks stratified intact seeds and 6 weeks stratified endocarp - free seeds represented statistically the 2 nd and 3rd effective treatments, respectively. On the other hand combinations of nonstratified intact/endocarp-free seeds resulted significantly in inducing seedlings having stems of the most depressed length. In addition other combinations were in between.

IV.2.2.2.2. Root length :

Regarding the response of root length of both Nemaguard peach and Hamawy apricot seedlings to both duration of cold stratification and removing of seed endocarp, as well as their combinations, data obtained during two seasons are presented in Table (18-b).

IV.2.2.2.2.a. Nemaguard peach :

Specific effect :

Data obtained disclosed that the specific effect of both investigated factors on average length of root system per Nemaguard peach seedling showed generally the same trend previously discussed with stem length. However, variations in root length were less pronounced, although reached level of significance with both investigated factors during two seasons of study.

Interaction effect :

Referring the interaction effect of various combinations between cold stratification periods and removing the seed endocarp on average root length, data in Table (18-b) showed that the 9 weeks stratification X endocarp - free seeds was the superior followed by 6 weeks stratified endocarp - free seeds. However, both combinations of the intact - stratified seeds for 6 or 9 weeks were equally the same pertaining their efficiency from one side and ranked third from the other. On the other hand nonstratified intact / endocarp - free seeds were the inferior and they being preceded statistically by both combinations of intact and removed endocarp seeds which stratified for 3 weeks.

IV. 2.2.2.2.b. Hamawy apricot :

Specific effect :

Table (18-b) shows that response of root length in Hamawy apricot seedlings to specific effect of stratification period and removing of seed endocarp followed nearly the same trend previously detected with stem length. Since, differences occurred in root length were relatively less pronounced.

Table (18) : Average plant height and root lenght of Nemaguard peach and Hamawy apricot seedlings in response to specific and interaction effects of cold stratification periods and mechanical removing of endocarp preceding stratification during 1993 and 1994 seasons.

Duration of cold stratification in weeks	Seed mechanical application (presence of endocarp)											
	Nemaguard peach						Hamawy apricot					
	1993			1994			1993			1994		
	Intact	Free	Mean	Intact	Free	Mean	Intact	Free	Mean	Intact	Free	Mean
a- Average plant height (cm.)												
0.0 W.	5.4	6.4	5.9	6.8	7.3	**7.0**	7.2	8.2	**7.7**	8.2	9.3	**8.70**
3.0 W.	46.6	50.3	**48.5**	48.3	52.3	**50.3**	40.0	51.0	**45.5**	40.8	55.3	**48.00**
6.0 W.	48.5	57.0	**52.8**	48.5	58.2	**53.4**	46.1	58.0	**52.1**	49.2	60.3	**54.70**
9.0 W.	52.2	65.3	**58.7**	55.2	67.8	**61.5**	66.9	76.2	**71.6**	70.8	80.1	**75.40**
Mean	**38.2**	**44.8**		39.7	46.4		**40.1**	**48.4**		**42.2**	**51.2**	
L.S.D. at 5% level for :												
Stratification period........		2.06				2.01			3.94			3.99
Endocarp removing.........		1.45				1.35			5.57			5.25
Strat. period x end. remov.......		2.90				2.85			7.88			7.71
b- Average root lenght (cm.)												
0.0 W.	4.7	4.3	**4.5**	5.0	5.5	**5.3**	2.8	2.8	**2.8**	3.6	3.8	**3.7**
3.0 W.	22.2	22.2	**22.2**	24.6	24.0	**38.9**	10.3	15.6	**13.1**	12.4	18.1	**15.3**
6.0 W.	30.0	35.1	**32.6**	29.6	37.3	**33.5**	12.5	16.6	**14.6**	14.9	18.6	**16.7**
9.0 W.	28.9	43.3	**36.1**	31.0	45.7	**28.4**	18.4	19.6	**19.0**	20.1	21.1	**20.6**
Mean	**21.4**	**26.3**		**22.6**	**28.1**		**11.0**	**13.7**		**12.7**	**15.4**	
L.S.D. at 5% level for :												
Stratification period........		1.5				1.0			3.7			3.9
Endocarp removing.........		1.00				1.4			2.6			2.7
Strat. period x end. remov.......		2.15				2.0			5.2			5.5

Interaction effect :

The response of root length to the various combinations of both investigated factors showed an intermediate reaction. However, the combinations between the endocarp - free seeds from one hand and 3, 6 or 9 weeks stratification from the other, beside the intact 9 weeks stratified seeds were the superior ones in spite of the longer chilling exposure tended to show some tendency of superiority. Moreover, the 3 and 6 weeks stratified intact seeds came next to the aforesaid combinations then followed by the inferior ones (nonstratified intact / endocarp - free seeds).

IV. 2.2.2.3. Leaves dry weight / seedling :

Data obtained during both 1993 and 1994 seasons regarding the specific and interaction effects of both duration of cold stratification and mechanical removing of seed endocarp on leaves dry weight per Nemaguard peach and Hamawy apricot seedlings are tabulated in Table (19-a).

IV.2.2.2.3.a Nemaguard peach :

Specific effect :

It is quite clear that leaves dry weight per Nemaguard peach seedling was significantly responded to the specific effect of both investigated factors. Hence the developed seedlings from sowing the endocarp-free seeds surpassed statistically those of intact seeds as the dry weight of their leaves was concerned. Meanwhile, stratified seeds "irrespective of duration" increased significantly leaves dry weight of Nemaguard seedlings than nonstratified ones. However, the increase was in positive relationship with prolonging the duration of cold stratification.

Interaction effect :

Data obtained during both seasons revealed that stratifying the endocarp - free seeds of Nemaguard peach for 9 weeks induced seedlings having significantly the heaviest leaves dry weight followed statistically by those of stratifying the endocarp - free seeds for either 3 or 6 weeks as well as the 9 weeks stratified intact seeds. While both combinations of stratifying the intact seeds for 3/6 weeks were the least effective as compared to others from one hand and they were significantly the same from the other side.

IV.2.2.2.3.b. Hamawy apricot :

Specific effect :

From data obtained during both seasons of study it was so easy to be noticed that the leaves dry weight of Hamawy apricot seedlings was specifically responded to both investigated factors from one hand and followed typically the same trends previously discurssed with Nemaguard peach from the other. However, the degree of difference due to elongation of cold stratification period was more pronounced with Hamawy apricot than Nemaguard peach.

Interaction effect :

Table (19-a) shows clearly that both combinations of the endocarp - free seeds of Hamawy apricot stratified for 9/6 weeks surpassed statistically other combinations in increasing leaves dry weight, however such combination of prolonged exposure to chilling (9 weeks) tended to reflect its superiority over that of 6 weeks especially in 1994 season, whereas the increase was significant. Moreover, 3weeks stratified endocarp - free seeds came statistically next to the aforesaid both superior combinations, followed in a descending order by all those of intact seeds stratified for 9,6 weeks and finally 3 weeks which ranked just before the inferior combinations (of nonstratified intact or endocarp - free seeds).

IV.2.2.2.4. Shoot dry weight :

Data presented in Table (19-b) show the specific effect of both investigated factors viz. removing of endocarp and stratification periods, as well as the interaction effect of their combinations on shoot dry weight of Nemaguard peach and Hamawy apricot seedlings during 1993 and 1994 seasons.

IV.2.2.2.4.a. Nemaguard peach :

Specific effect :

Data obtained revealed obviously that the previously detected trends of leaves dry weight response to specific effect of both investigated factors were also reflected on the shoot dry weight of Nemaguard peach seedlings. Although, the increase in shoot dry weight gained by extending the duration of cold stratification was not so pronounced to that level of leaves.

Interaction effect :

Nevertheless, the shoot dry weight per Nemaguard peach seedling was reacted significantly to the different combinations of removing endocarp and stratification periods during both seasons. Hence, all combinations of stratifying for 3,6 or 9 weeks from one hand and intact or endocarp-free seeds from the other increased significantly stem dry weight of Nemaguard peach rather than both nonstratified intact or endocarp-free seeds. On the other hand all combinations of stratified endocarp-free seeds

Table (19) : Leaves and shoot dry weight of Nemaguard peach and Hamawy apricot seedlings in response to specific and interaction effects of cold stratification periods and mechanical removing of endocarp preceding stratification during 1993 and 1994 seasons.

Duration of cold stratification in weeks	Seed mechanical application (presence of endocarp)											
	Nemaguard peach						Hamawy apricot					
	1993			1994			1993			1994		
	Intact	Free	Mean	Intact	Free	Mean	Intact	Free	Mean	Intact	Free	Mean
a- Leaves D.Wt. in grame												
0.0 W.	0.1	0.1	**0.1**	0.2	0.2	**0.2**	0.1	0.1	**0.1**	0.2	0.2	**0.2**
3.0 W.	0.6	1.5	**1.0**	0.8	1.9	**1.3**	1.7	3.1	**2.4**	1.9	3.8	**2.8**
6.0 W.	0.9	1.8	**1.3**	1.0	2.0	**1.5**	2.2	4.4	**3.3**	2.9	4.9	**3.9**
9.0 W.	1.1	2.2	1.7	2.0	2.8	**2.4**	2.3	5.1	**3.7**	3.0	5.8	**4.4**
Mean	**0.7**	**1.4**		1.0	1.7		**1.6**	**3.1**		**2.0**	**3.7**	
L.S.D. at 5% level for :												
Stratification period........			0.28			0.26			0.65			0.63
Endocarp removing.........			0.19			0.17			0.46			0.42
Strat. period x end. remov.......			0.38			0.35			0.93			0.90
b- Shoot D.Wt. in grame												
0.0 W.	0.1	0.1	**0.1**	0.2	0.2	**0.2**	0.1	0.1	**0.1**	0.2	0.2	**0.2**
3.0 W.	1.3	2.3	**1.8**	2.0	3.3	**2.6**	1.8	3.3	**2.5**	1.9	4.8	**3.3**
6.0 W.	1.4	2.6	**2.0**	2.3	3.5	**2.9**	2.3	4.7	**3.5**	2.8	5.3	**4.0**
9.0 W.	1.6	2.9	**2.2**	2.8	3.8	**3.3**	2.6	5.2	**3.9**	3.2	6.2	**4.7**
Mean	**1.1**	**2.0**		**1.8**	**2.7**		**1.7**	**3.3**		**2.0**	**4.1**	
L.S.D. at 5% level for :												
Stratification period........			0.056			0.047			0.65			0.62
Endocarp removing.........			0.041			0.035			0.45			0.40
Strat. period x end. remov.......			0.081			0.073			0.92			0.90

were statistically of the same efficiency from one side and surpassed significantly the corresponding ones of the intact seeds from the other, irrespective of duration of cold stratification.

IV. 2.2.2.4.b. Hamawy apricot :

Specific effect :

Obtained results revealed that the response of shoot dry weight of Hamawy apricot to specific effect of both period of cold stratification and removing of seed endocarp was nearly the same as previously mentioned with Nemaguard peach in this respect. However, variances were more clear in Hamawy apricot than Nemaguard as specific effect of both studied factors were concerned.

Interaction effect :

From data in Table (19-b) it could be noticed clearly that all combinations of intact and endocarp - free seeds from one hand and cold stratification for 3, 6 or 9 weeks from the other increased significantly the shoot dry weight over the nonstratified seeds. However the combinations of endocarp - free seeds exhibited more efficiency especially those stratified for the most prolonged duration (9 weeks). While these of the intact seeds were in between in this respect.

IV.2.2.2.5. Root dry weight per seedling :

Regarding the response of root dry weight to specific and interaction effects of cold stratification and removing of seed endocarp for both Nemaguard peach and Hamawy apricot, data obtained during 1993 and 1994 seasons are presented in Table (20-a).

IV.2.2.2.5.a. Nemaguard peach :

Specific effect :

Data obtained during both seasons disclosed clearly that root dry weight of Nemaguard peach seedlings was specifically responded to both studied factors. Hence, the endocarp - free seeds induced seedlings having significantly heavier root system as compared to those developed from intact seeds. On the other hand, extending period of stratification increased root dry weight whereas both periods of 6 and 9 weeks cold stratification surpassed statistically not only the nonstratified seeds but also those stratified for 3 weeks.

Interaction effect :

It could be obviously noticed that all combinations of cold stratifying the intact or endocarp - free seeds for 3, 6 or 9 weeks increased root dry weight of Nemaguard peach seedlings over those developed from sowing intact/endocarp-free seeds directly without stratification. Neverthe-less, the combinations of the endocarp removed seeds regardless of period of cold stratification exceeded statistically all combinations of intact seeds.

IV. 2.2.2.5.b. Hamawy apricot :

Specific effect :

Root dry weight of Hamawy apricot in response to specific effect of both investigated factors followed the same trends previously found with Nemaguard peach. However, differences resulted in seedlings of Hamawy apricot were more pronounced as treatments of each factors were compared each to others in both 1993 and 1994 seasons. Since, root dry weight of developed seedlings from the endocarp - free seeds and that of 9 weeks stratified seeds was nearly doubled as compared to those of intact seeds and 3 weeks stratified seeds, respectively.

Interaction effect :

The heaviest root dry weight in Hamawy apricot seedlings was always concomitant to both combinations of endocarp - free seeds stratified for either 6 or 9 weeks. However the combinations between no stratification applied from one hand and removing or remaining seed endocarp from the other side were statistically the inferior as both resulted significantly in the lightest root dry weight. In addition other combinations fell in between the aforesaid two extents.

IV. 2.2.2.6. Top/root ratio :

Concerning the top / root ratio of both Nemaguard peach and Hamawy apricot seedlings in response to specific and interaction effects of two investigated factors viz cold stratification and seed endocarp removing, data obtained during 1993 and 1994 seasons are presented in Table (20-b).

IV.2.2.2.6.a. Nemaguard peach :

Specific effect :

With respect to specific effect of endocarp removing of Nemaguard peach seeds on top/root ratio of developed seedlings, data obtained during both seasons revealed that however it tended to be increased with the endocarp - free seeds than intact ones, but such difference was so small to reach level of significance. As for the specific effect of cold stratification period, the greatest value of top / root ratio was related to the nonstratified seeds. However, cold stratification (regardless of duration) decreased it as

Table (20) : Root dry weight and top / root ratio of Nemaguard peach and Hamawy apricot seedlings in response to specific and interaction effects of cold stratification periods and mechanical removing of endocarp preceding stratification during 1993 and 1994 seasons.

Duration of cold stratification in weeks	Seed mechanical application (presence of endocarp)											
	Nemaguard peach						Hamawy apricot					
	1993			1994			1993			1994		
	Intact	Free	Mean	Intact	Free	Mean	Intact	Free	Mean	Intact	Free	Mean
a- Root D.Wt. in grame												
0.0 W.	0.1	0.1	**0.1**	0.2	0.2	**0.2**	0.1	0.1	**0.1**	0.2	0.2	**0.2**
3.0 W.	1.3	2.3	**1.8**	2.2	3.3	**2.7**	3.8	6.6	**5.2**	2.2	7.3	**4.7**
6.0 W.	1.5	2.6	**2.0**	2.5	3.8	**3.1**	4.8	9.5	**7.1**	5.9	10.0	**7.9**
9.0 W.	1.6	2.9	**2.2**	2.9	3.5	**3.2**	5.3	10.3	**7.8**	6.3	11.3	**8.8**
Mean	**1.1**	**2.0**		**2.0**	**2.7**		**3.5**	**6.6**		**3.6**	**7.2**	
L.S.D. at 5% level for :												
Stratification period........		0.3			0.3				1.3			1.0
Endocarp removing.........		0.2			0.2				0.9			0.8
Strat. period x end. remov.......		0.4			0.4				1.8			1.5
b- Top root ratio												
0.0 W.	2.00	2.00	**2.00**	2.00	2.00	**2.00**	2.00	2.00	**2.00**	2.00	2.00	**2.00**
3.0 W.	1.46	1.65	**1.55**	1.27	1.58	**1.43**	0.92	0.97	**0.95**	1.74	1.17	**1.46**
6.0 W.	1.53	1.69	**1.61**	1.32	1.45	**1.39**	0.94	0.96	**0.95**	0.97	1.02	**1.00**
9.0 W.	1.68	1.76	**1.72**	1.65	1.89	**1.77**	0.92	1.00	**0.96**	0.98	1.06	**1.02**
Mean	**1.66**	**1.7**		**1.56**	**1.73**		**1.20**	**1.23**		**1.42**	**13.1**	
L.S.D. at 5% level for :												
Stratification period........		0.41			0.51				0.61			0.40
Endocarp removing.........		0.32			0.42				0.41			0.33
Strat. period x end. remov.......		0.60			0.81				0.71			0.51

greatest value of top / root ratio as compared to other combinations. However, stratifying of either intact or endocarp free seeds of Hamawy apricot (especially for 6 and 9 weeks) were equally the same as they came statistically second to the aforesaid combination regarding their effect on top / root ratio.

The variance detected in top/root ratio could be explained by such unparalleled response of both aboveground and underground systems to a given treatment as previously discussed.

IV.2.2.2.7. Total plant dry weight :

An average of data obtained during both 1993 and 1994 seasons was tabulated in Table (21) and illustrated in Figures (4&5).

Specific effect :

Seedlings of both Nemaguard peach and Hamawy apricot were specifically responded to the mechanical removing of endocarp, whereas the endocarp-free seeds resulted in increasing total plant dry weight about twice much more than the intact ones. However, the response to specific effect of stratification period was also observed. Hence all stratified seeds increased the total plant dry weight of both Nemaguard peach and Hamawy apricot seedlings. Such increase was positively related with duration of stratification, whereas the 9 weeks stratified seeds induced the heaviest seedlings.

Interaction effect :

The response of the different organs dry weight (leaves, shoot and roots) to the different 8 combinations of removing seeds endocarp and the greatest value of top / root ratio as compared to other combinations. However, stratifying of either intact or endocarp free seeds of Hamawy apricot (especially for 6 and 9 weeks) were equally the same as they came statistically second to the aforesaid combination regarding their effect on top / root ratio.

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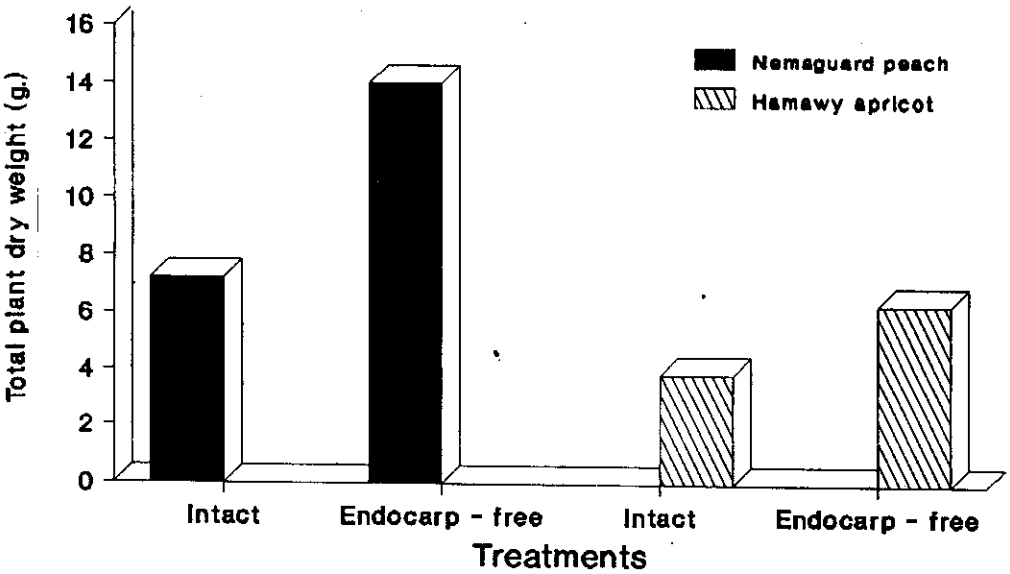
Interaction effect :

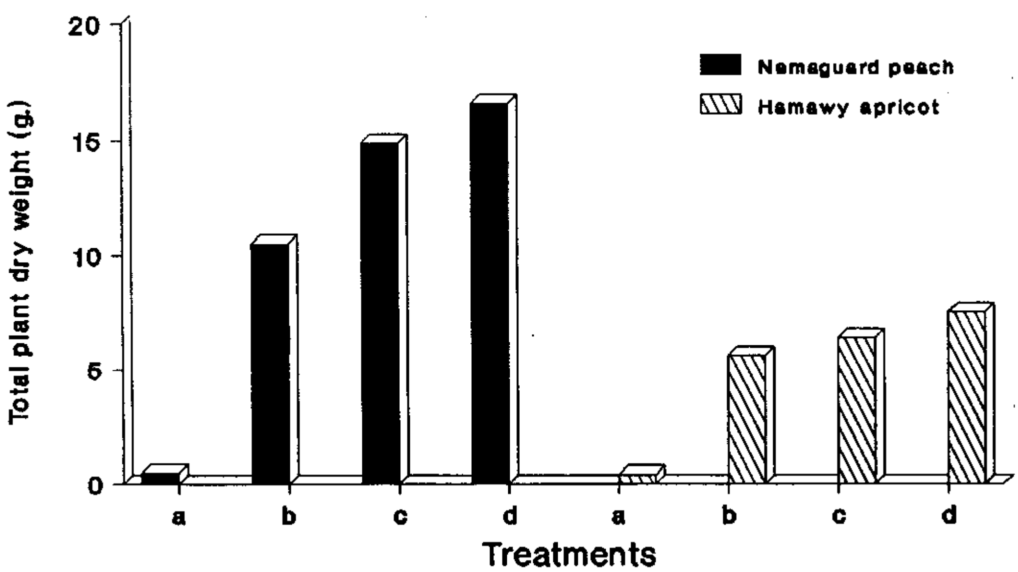
The response of the different organs dry weight (leaves, shoot and roots) to the different 8 combinations of removing seeds endocarp and the stratification periods was certainly reflected on the total plant dry weight to show the same trend i.e., whereas the stratified endocarp- free seeds for 9 weeks was the superior followed by those of 6 weeks stratified endocarp - free seeds. The reverse was true with the combinations of nonstratified intact/endocarp - free seeds . Moreover, the other combinations were in between the abovementioned two extremes in this respect for seedlings of both prunus species.

Table (21) : Total plant dry weight of Nemaguard peach and Hamawy apricot seedlings (an average of two 1993 and 1994 seasons) as affected by specific and interaction effects of stratification period and mechanical removing of endocarp.

Duration of cold stratification in weeks	Seed mechanical application (presence of endocarp)					
	Nemaguard peach			Hamawy apricot		
	Intact	Free	Mean	Intact	Free	Mean
0.0 W.	0.4	0.5	**0.5**	0.4	0.4	**0.4**
3.0 W	6.7	14.3	**10.5**	4.0	7.2	**5.6**
6.0 W	10.5	19.3	**14.9**	4.7	8.1	**6.4**
9.0 W	11.3	21.9	**16.6**	5.9	9.0	**7.5**
Mean	**7.2**	**14.0**		**3.8**	**6.2**	



(A) : Specific effect of mechanical removing of seeds endocarp



(B) : Specific effect of stratification period.

Fig. (4): Specific effect of mechanical removing of seed endocarp (A) and stritification period (B) on total plant dry weight of Nemaguard peach and Hamawy apricot seedlings (an average of 1993 and 1994 seasons).

a means : Non stratified seeds.
b means : 3 weeks stratified seeds.
c means : 6 weeks stratified seeds.
d means : 9 weeks stratified seeds.

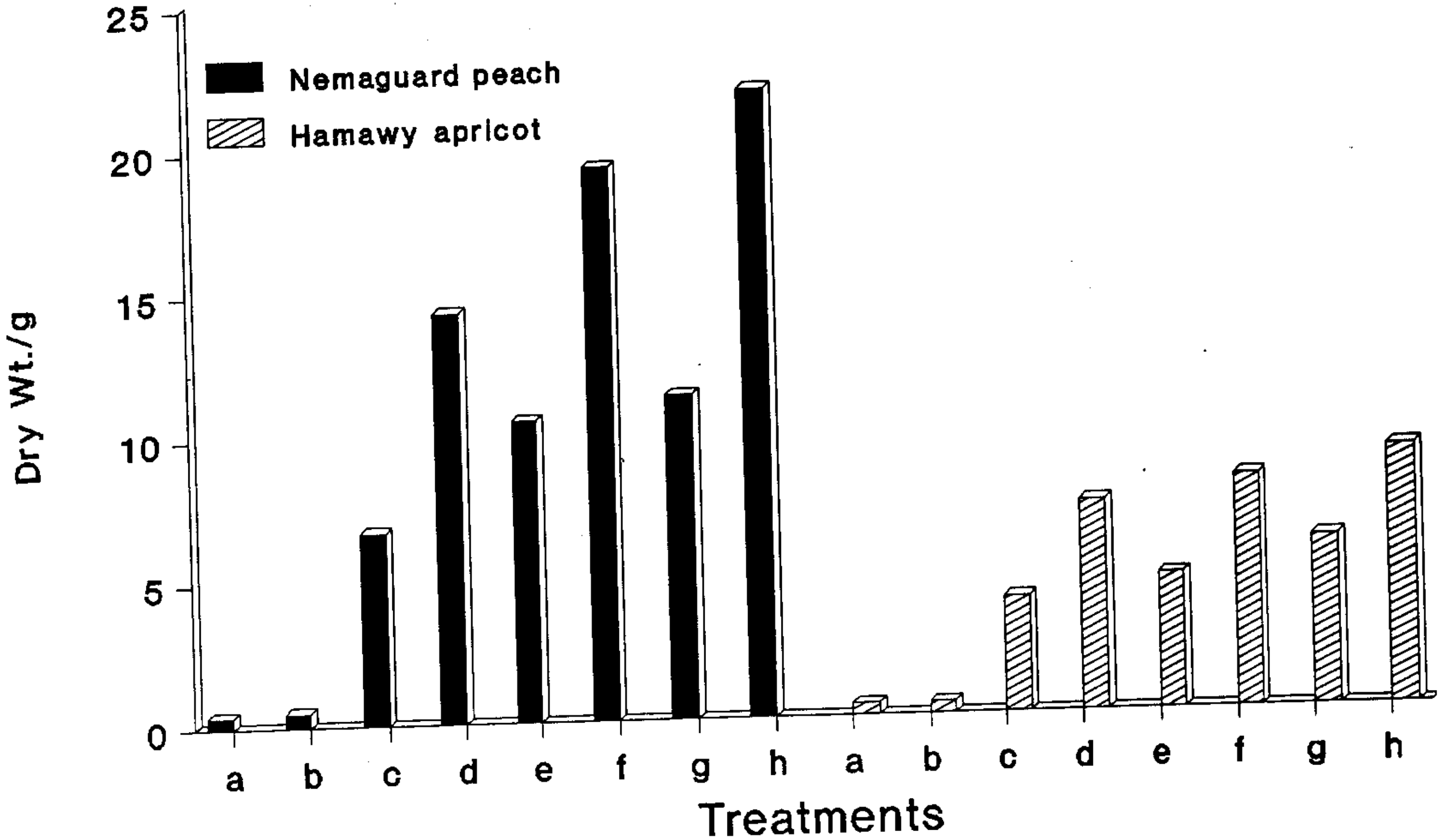


Fig. (5): Total plant dry weight of Nemaguard peach and Hamawy apricot seedlings as affected by different combinations between mechanical removing of endocapr and cold stratification period (an average of 1993 and 1994 seasons).

a and b = Nostratified intact and endocarp - free seeds, respectively.
c and d = 3 weeks stratified intact and endocarp - free seeds, respectively.
e and f = 6 weeks stratified intact and endocarp - free seeds, respectively.
j and h = 9 weeks stratified intact and endocarp - free seeds, respectively.

Obtained results regarding the improving influence of cold stratification on vegetative growth parameters of various plant organs of Nemaguard peach and Hamawy apricot seedlings are in general agreement with the findings of several investigators. In this regard, ***El-Nabawy et al.*, *(1980 - a)*** and ***El-Nabawy et al.*, *(1985)*** on Van Deman pecan seeds who reported that the 6 weeks cold stratification increased stem length, fresh and dry weight of developed seedlings and they were increased as the period was prolonged. ***Keleg et al.*, *(1989)*** found the same response concerning the effect of cold stratification and its duration. Moreover, the finding of ***Ruiz - arrozola and Vidal - Lezama (1989)***, supported the present result, regarding the effect of cold stratification on growth measurements of developed seedlings. ***Kashyap et al.*, *(1992)*** on Crab apple demonstrated also the same trend of response to cold stratification which goes in line with the obtained result in this study.

Meanwhile, the finding of ***Keleg et al.*, *(1989)*** on apricot, almond, peach and plum was in harmony with the obtained results of this investigation regarding the beneficial effect of removing seed endocarp on various growth parameters of various plant organs. However, ***Kilany, Omaima (1986)***, demonstrated that the endocarp - free seeds of Meet Ghamr peach cultivar induced seedlings having less values of growth parameters as compared with those seedlings of intact seeds.