RESULTS AND DISCUSSION

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I- GROWTH SUBSTANCES EXPERIMENT:

* Effect of Gibberellin, Ethephon and Paclobutrazol at different concentrations on vegetative growth, flowering and chemical constituents of *Narcissus tazetta* plant.

I-1- Vegetative growth :

I-1-a- Leaves parameters :

I.1.a.1. Mean number of leaves per plant :

The data tabulated in table (1-a) clearly show that, spraying of gibberellin on *Narcissus tazetta* plant, significantly increased the mean number of leaves per plant when it was used only at the medium and high concentrations of 100 or 150 ppm. in both seasons, although the high concentration was not of more effect that the medium one in this concern. Spraying Narcissus plants with Ethephon also increased the number of leaves carried by plant only when the high concentration was used in the first and second seasons. It was increased also with the medium one in the second season. While the low concentration of Ethephon was of no effect on this character as it is clear from the data in table (1-a). Similar results were observed by ***Abo El-Ghait and Wahba (1994)*** on violet plants, they found that, foliar spray with gibberellin at 100 and 200 ppm. caused an increase in number of leaves per plant.

Mohamed et al. (1992) on Alpinia plants found that, spraying with gibberellin at 200 or 300 ppm. and ethryl at 100 and 200 ppm. caused significant increment in number of leaves per shoot.

On the other hand Paclobutrazol at low concentration of 50 ppm. significantly decreased the mean number of leaves only in the first season

Table (1-a): Effect of Gibberellin, Ethephon and Paclobutrazol at Different Concentrations on Leaves Parameters of *Narcissus tazetta* Plant During 1993 / 94 and 1994 / 95 Seasons.

Parameters / Treatments	Mean number of leavs / plant		Mean Length of Leaves cm.		Mean Fresh weight of Leaves g / plant.		Mean dry weight of Leaves g/plant.		Mean dry weight of Leaves g/plot.	
	1993/94	**1994/95**	**1993/94**	**1994/995**	**1993/94**	**1994/995**	**1993/94**	**1994/995**	**1993/94**	**1994/995**
Control (Dist. water)	18.67	18.00	58.33	59.67	89.33	111.33	14.29	17.81	142.93	178.13
Gibberellin 50 ppm.	18.67	18.67	65.00	64.33	98.67	124.67	15.79	19.95	157.87	199.47
Gibberellin 100 ppm.	20.00	19.67	67.33	65.00	108.00	128.00	17.28	20.48	172.80	204.80
Gibberellin 150 ppm.	20.67	19.67	69.67	65.33	111.33	130.67	17.81	20.91	178.13	209.07
Ethephon 50 ppm.	18.67	18.00	63.67	64.00	92.00	118.67	14.72	18.99	147.20	184.87
Ethephon 100 ppm.	18.67	19.00	62.33	62.33	97.33	119.33	15,57	19.09	155.73	190.93
Ethephon 150 ppm.	19.33	19.00	51.33	61.33	99.33	126.67	15.89	20.27	158.93	202.67
Paclobutrazol 50 ppm.	16.00	18.00	32.00	30.67	86.00	83.33	13.76	13.53	137.60	135.33
Paclobutrazol 100 ppm.	18.00	18.67	26.33	30.33	85.33	80.00	13.65	12.80	136.53	128.00
Paclobutrazol 150 ppm.	18.00	18.67	23.33	30.00	80.00	77.33	12.80	12.37	128.00	123.73
L.S.D. at 5%	1.52	0.69	2.63	1.03	2.79	3.46	0.44	0.75	4.39	7.55
L.S.D. at 1%	2.08	0.94	3.61	1.41	3.83	4.74	0.60	1.03	6.02	10.34

although its medium or higher concentrations were of less effect. The data of the second season in table (1-a) showed that paclobutrazol at the low concentration did not affect the number of leaves per plant while medium and high concentration slightly increased it. The values recorded for the mean number of leaves per plant in the first season were 16.00, 18.00 and 18.00 for plants treated with paclobutrazol at 50, 100 and 150 ppm respectively as compared with 18.67 for control plants, while it was 18.00, 18.67 and 18.67 respectively for the same concentrations compared with 18.00 for control in the second season.

Many workers recorded the effect of paclobutrazol on decreasing the number of leaves per plant among them. ***El-Sayed et al. (1994)***, on Dutch Iris, who found that number of leaves per plant slightly decreased as response to paclobutrazol treatments, and ***Mohamed et al. (1992)*** on Alpinia, who found that, foliar spray with paclobutrazol at 100 and 200 ppm. decreased the number of leaves per shoot.

I.1.a.2. Mean length of leaves :

Highly significant increases in the mean length of narcissus leaves were observed due to all gibberellin concentrations used over control plant as shown in table (1-a). The increase in the mean length of leaves was proportional with the increase in gibberellin concentration. The trend of results was constant in both seasons of the experiments 1993 / 94 and 1994 / 95. These results came in harmony with those obtained by ***Hassan (1996)*** on *Aspidistra elatior* and ***Mohamed et al. (1992)*** on Alpinia, who recorded that application of gibberellin increased leaf length of alpinia plants.

Ethephon sprays at low and medium concentrations of 50 and 100 ppm significantly increased the mean length of narcissus leaves at 1% level over control plants in both seasons of the experiments as shown in table (1-a), however the high concentration decreased the length of leaves in the first season and slightly increased it in the second season. The data of both seasons revealed that low concentration of ethephon was of more effect than medium or high one on increasing the length of leaves of *Narcissus tazetta* plants. These results were confirmed by ***Greef (1986)*** on Daffodils, who found that most satisfactory results were obtained by either dipping bulbs for 12 h. in ethephon or drenching with ethephon solution at 100 ml/12 cm. Pot. Concerning the effect of paclobutrazol on the mean length of *Narcissus tazetta* leaves, it is clear from the data illustrated in table (1-a) that all paclobutrazol concentrations greatly decreased the length of leaves specially with the high concentration 150 ppm., which resulted in 60% and 49.16% decrease under the control in the first and second season respectively. The mean values recorded for leaves length were 32.00, 26.33 and 23.33 cm for plants treated with 50, 100 and 150 ppm of Paclobutrazol when compared with 58.33 cm for the control plants in the first season, and it was 30.67, 30.33 and 30.33 cm for the prementioned treatments compared with 59.67 cm for control in the second seasons. The previous values proved that, paclobutrazol greatly decrease leaf length of *Narcissus tazetta*. ***Sun et al. (1991),*** confirmed this trend of results, since they mentioned that paclobutrazol inhibited leaf extention of narcissus plant. Also ***Wang et al. (1990)*** recorded that, paclobutrazol significantly inhibit the vegetative growth.

I.1.a.(3.4). Mean fresh and dry weight of leaves per plant :

Regarding the fresh and dry weights of *Narcissus tazetta* leaves as affected by spraying gibberellin at different concentrations it could be noticed from the data compiled in table (1-a), that all gibberellin concentrations resulted in high significant increases in the fresh and dry weight of leaves per plant over the untreated one. Moreover the higher the concentration of gibberellin used the higher the values of fresh and dry weights were obtained, so the higher concentration of 150 ppm. produced the maximum values of fresh and dry weight of leaves per plant in both seasons as 111.33 and 130.67 g. when compared to 89.33 and 111.23 g for control as fresh weight, and it produced 17.81 and 20.91 g compared to 14.29 and 17.81 g for control as dry weight in the first and second season respectively. The role of gibberellin on increasing vegetative growth as fresh and dry weight of leaves is well known and was recorded by nemerous investigators among them, ***Hassan (1996)*** on *Aspidistra elatior*, who found that, application of gibberellin at 100 ppm. caused an increase in fresh and dry weight of leaves.

The mean fresh and dry weights of leaves per plant was affected greatly by ethephon sprays as shown in table (1-a). All concentrations of ethephon increased significantly the mean fresh and dry weights of leaves per plant. It could be also shown that the increases in the mean fresh and dry weights of leaves were increased by increasing the concentrations of ethephon used. The mean values recorded for these characters were 92.00, 97.33 and 99.33 g. compared to 89.33 g. for control and 118.67, 119.33 and 126.67 g. compared to 111.33 g. for the control in the two seasons respectively. The values of dry weight were 14.72, 15.57 and 15.89 g.

compared to 14.29 g in the first season but, in the second season were 18.99, 19.09 and 20.27 g compared to 17.81 g for the control.

These values showed that paclobutrazol had increasing effect on the fresh and dry weight of leaves especially with high concentration of 150 ppm as well as gibberellin.

The trend of results in this concern was confirmed by the work of ***Mohamed et al. (1992)*** who reported that ethryl at 100 and 200 ppm. resulted in highly significant increase in the fresh weight of Alpinia leaves per shoot.

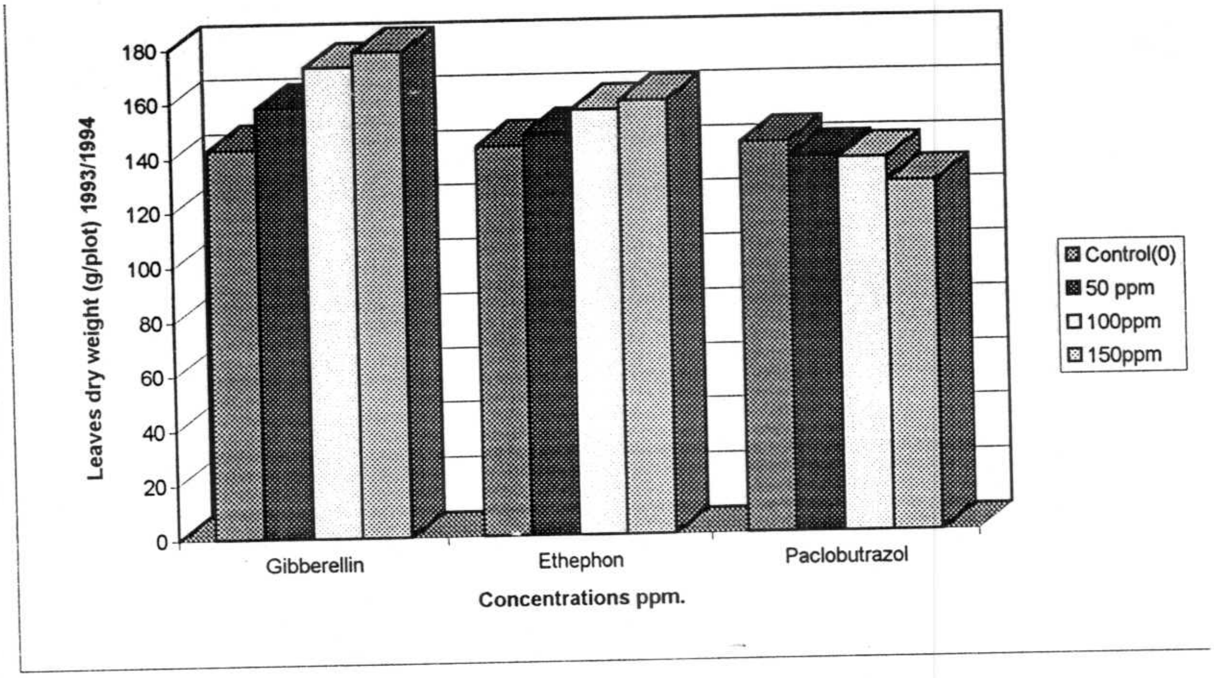
As for the effect of spraying paclobutrazol on the fresh and dry weight of *Narcissus tazetta* leaves per plant, the data in table (1-a) show that all concentrations of paclobutrazol resulted in a decrease in the fresh and dry weight of leaves per plant in both seasons of the experiments. The decreasing effect was pronounced as the concentration of paclobutrazol increased. The lowest values for fresh and dry weight of leaves per plant were obtained when the highest concentration of Paclobutrazol was used, so the percent of decrease in the fresh and dry weight of leaves per plant reached 10.45% and 30.54% in both seasons.

Similar results were obtained by ***Abo El-Ghait and Wahba (1994)*** on Violet, they found that, foliar spray with paclobutrazol at 25 and 50 ppm caused a decrease in fresh and dry weight of leaves.

Generally the data of leaves measurments for both seasons of the experiments (table 1-a) indicated that, growth substances used were of great effects on these characters. Both gibberellin and ethephon affected possitively and significantly all leaf measurments specially with higher concentration, although gibberellin was superior in this concern. Contrary was the effect of paclobutrazol which decreased most of leaf measurments specially leaf length which decreased by about 50 to 60% under the control plants.

I.1.a.5. Dry weight of leaves per plot :

The same trend of results previously obtained with the mean dry weight of leaves per the individual plant could be noticed for this measurement as it is clear in table (1-a) and Fig. (1), since it was mathematicaly observed as countable value.



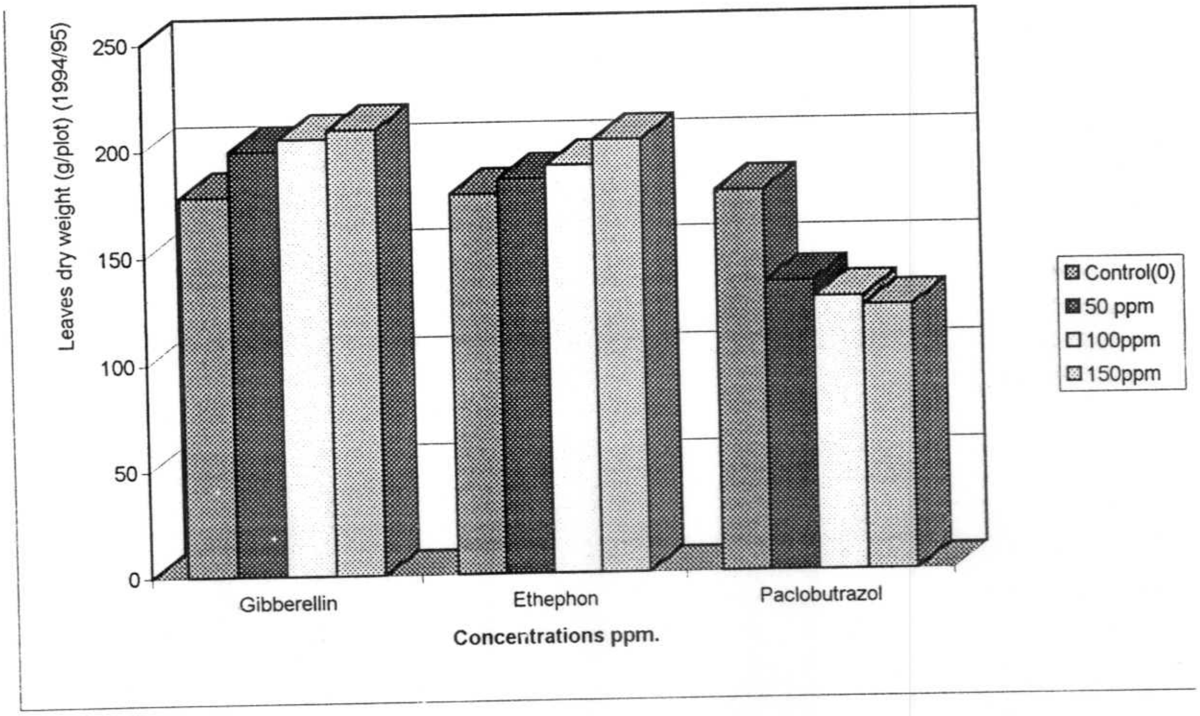


Fig. (1) : Effect of Gibberellin, Ethephon and Paclobutrazol at Different Concentrations on Leaves Dry Weight (g/plot) of *Narcissus tazetta* L. Plant During 1993/94 and 1994/95 Seasons.

I.1.b. Bulbs parameters :

I.1.b.1. Mean number of bulbs per plant :

Data tabulated in table (1-b) show the effect of growth substances gibberellin, ethephon and paclobutrazol at different concentrations on mean number of bulbs per plant.

It is clear from these data that gibberellin at all rates significantly increased the mean number of bulbs per plant over untreated plants in both seasons. The increase over control reached 26.32%, 42.11% and 42.11% for plants treated with gibberellin at 50, 100 and 150 ppm in the first season, and the values were 24.99%, 45.00% and 54.99% for the prementioned concentrations in the second season respectively.

Ethephon treatments were of lower effect for increasing the number of bulbs per plant, it had slightly increase on number of bulbs per plant, although these increases did not reach the level of significance. No clear differences due to the different concentrations of ethephon were observed. The mean values obtained for number of bulbs per plant were 7.00, 7.33 and 7.33 compared to 6.33 for control in the first season and were 8.33, 8.67 and 8.67 compared to 6.67 for control in the second season for plants treated with ethephon at 50, 100 and 150 ppm respectively.

Similar results were observed by ***Mohamed (1992)*** on *Dahlia pinnata,* who found that, foliar spray with ethrel at 100, 150 and 200 ppm caused an increase in the number of tuberous root per plant.

Paclobutrazol showed the highest effect in increasing the mean number of bulbs per plant over both gibberellin and ethephon treatments in

Table (1-b): Effect of Gibberellin, Ethephon and Paclobutrazol at Different Concentrations on Bulbs Parameters of *Narcissus tazetta* Plant During 1993/94 and 1994/95 Seasons.

Parameters / Treatments	Mean number of bulbs / plant		Mean fresh weight of bulbs g/plant.		Mean dry weight of bulbs g/plant.		Mean fresh weight of bulbs g/plot.		Mean dry weight of bulbs g/plot.	
	1993/94	**1994/95**	**1993/94**	**1994/995**	**1993/94**	**1994/995**	**1993/94**	**1994/995**	**1993/94**	**1994/995**
Control (Dist. water)	6.33	6.67	102.00	110.00	26.52	28.60	1020.00	1100.00	265.20	286.00
Gibberellin 50 ppm.	8.00	8.33	114.00	121.33	27.91	31.55	1140.00	1213.33	279.07	315.47
Gibberellin 100 ppm.	9.00	9.67	121.33	136.67	29.47	33.28	1213.33	1366.67	294.67	332.80
Gibberellin 150 ppm.	9.00	10.33	129.00	143.67	31.55	34.49	1290.00	1436.66	315.47	344.93
Ethephon 50 ppm.	7.00	8.33	113.00	120.67	27.56	29.07	1130.00	1206.67	265.60	290.67
Ethephon 100 ppm.	7.33	8.67	119.33	127.33	29.29	30.61	1193.33	1273.33	292.93	306.13
Ethephon 150 ppm.	7.33	8.67	125.00	130.00	31.20	31.33	1250.00	1300.00	312.00	313.33
Paclobutrazol 50 ppm.	9.33	9.33	117.33	132.67	28.43	33.80	1173.33	1326.67	284.27	338.00
Paclobutrazol 100 ppm.	10.00	10.00	131.33	140.33	30.51	34.84	1313.33	1403.33	305.07	348.40
Paclobutrazol 150 ppm.	10.33	11.00	134.33	148.67	31.89	36.23	1343.33	1486.67	318.93	362.27
L.S.D. at 5%	1.16	1.18	14.95	8.64	0.98	0.92	149.47	86.40	9.79	9.23
L.S.D. at 1%	1.59	1.62	20.37	11.84	1.34	1.26	203.71	118.35	13.41	12.64

both season as shown in table (1-b). All paclobutrazol concentrations produced highly significant increases in number of bulbs over untreated plants. These differences reached 47.37%, 57.90% and 63.16% over control for plants treated with paclobutrazol at 50, 100 and 150 ppm in the first season while with the second one the differences over control reached 39.99%, 50.00% and 65.00% for the prementioned concentrations respectively.

These results came in accordance with those obtained by ***El-Sayed*** ***et al. (1994)*** on Dutch Iris. They found that, number of bulbs produced varied in response to paclobutrazol according to cultivar and concentration and ***Flint and Alderson (1986)*** on Narcissus plant, found that, paclobutrazol application caused an increase in number of bulbs, per plant.

I.1.6. (2.3). Mean fresh and dry weight of bulbs per plant :

Data in table (1-b) revealed that gibberellin at 50 ppm concentration was of less effect in increasing the mean fresh and dry weight of bulbs per plant. The increase in fresh and dry weight of bulbs were proportionally with gibberellin concentrations. So the heviest bulbs were produced by plants treated with 150 ppm. gibberellin in both seasons they gave 129.00 g and 143.67 g for fresh weight compared with 102.00 g and 110.00 g for control plant and 31.55 g and 34.49 g for dry weight compared to 26.52 g and 28.60 g for untreated plants for the first and second seasons respectively.

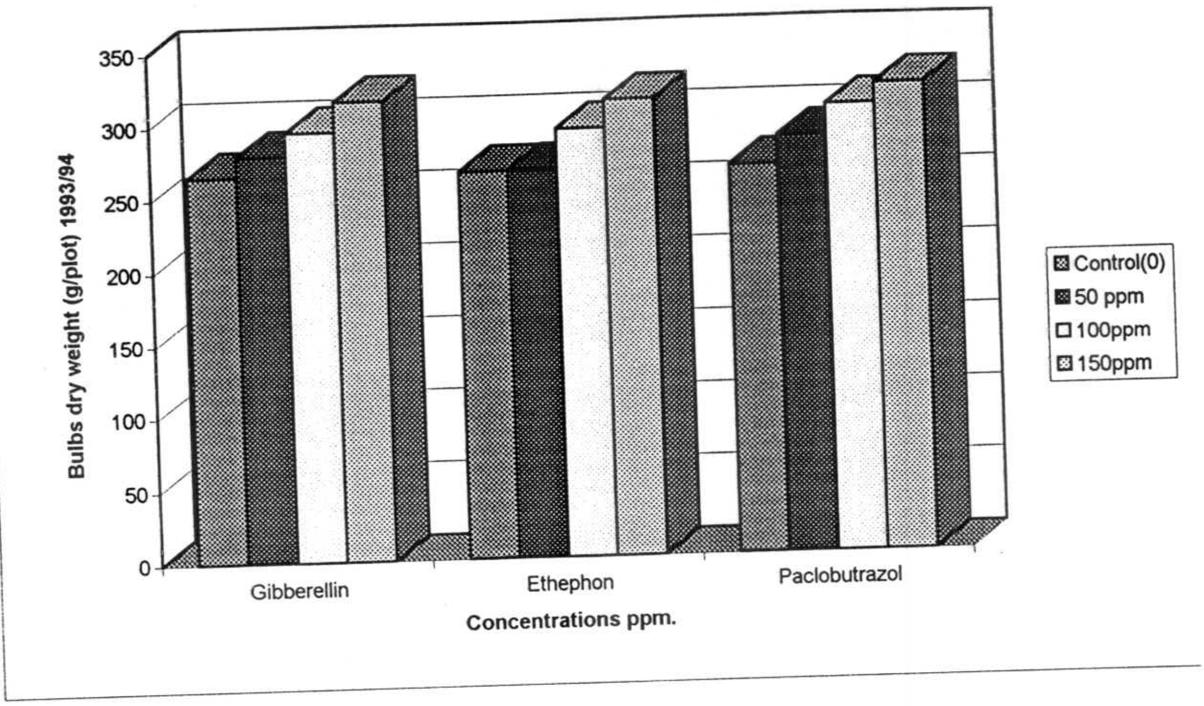
Ethephon treatments also affected the mean fresh and dry weight of narcissus bulbs. The low concentration of ethephon (50 ppm) slightly affected the mean fresh and dry weight of bulbs per plant, while the medium and high concentrations of ethephon showed significant increases in this concern during the two seasons of study table (1-b).

These results are in accordance with ***Mohamed (1992)*** who found that foliar sprays of ethephon at 100 and 150 ppm increased the tuberous roots fresh weight of *Dahlia pinnata.*

Paclobutrazol treatments were the most effective for increasing bulbs production in both seasons over both gibberellin or ethephon as shown from table (1.b).

Paclobutrazol seems to be more effective in increasing the underground growth of narcissus plant, as number and weight, of more than the above ground parts which decreased under control as recorded in table (1-b). These results may be due to the depression of growth resulted from paclobutrazol which makes plant tended to store most of the metabolic substances in the storage organs. It is also clear that the increasing effect in the fresh and dry weight of bulbs went linearly with the concentrations of paclobutrazol. The highest concentration of paclobutrazol was superior over all other growth substances treatments to produce the highest yield of bulbs. The role of paclobutrazol on increasing bulb production was recorded by ***El-Sayed et al. (1994),*** on Dutch iris, who found that, weight of bulbets produced varied in response to paclobutrazol according to cultivar and concentration.

From all the above data it could be concluded that, all growth substances used (gibberellin, ethephon and paclobutrazol) clearly affected



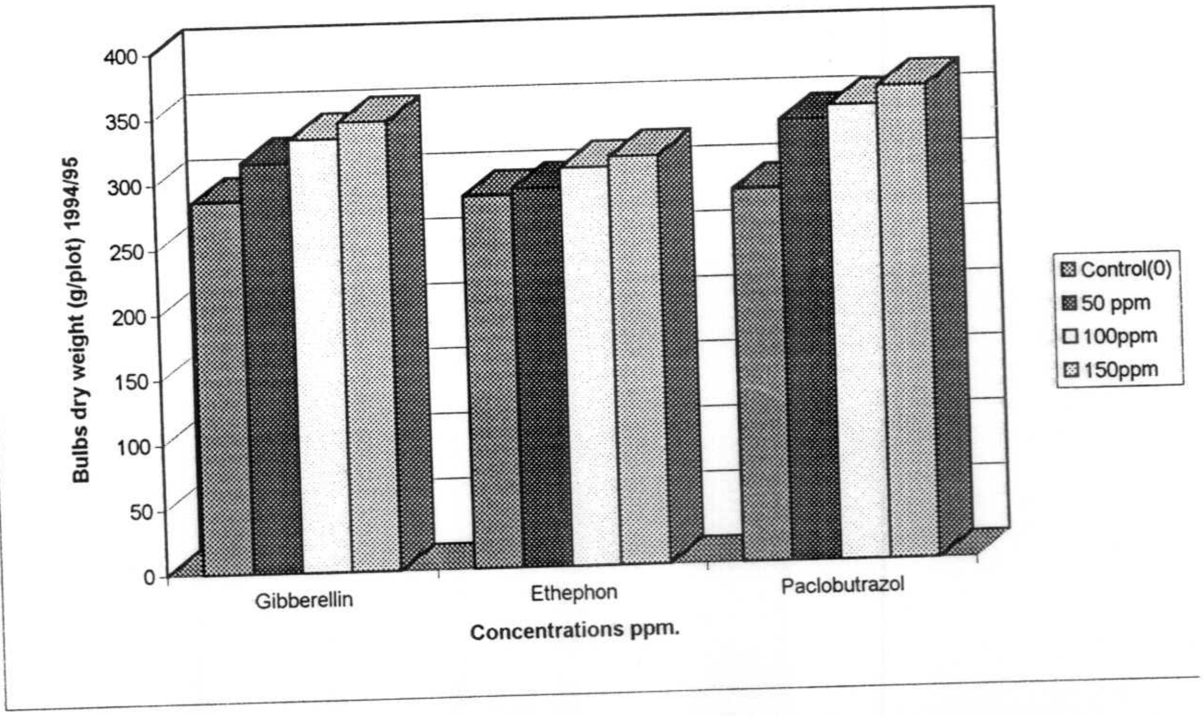


Fig. (2) : Effect of Gibberellin, Ethephon and Paclobutrazol at Different Concentrations on Bulbs Dry Weight (g/plot) of ***Narcissus tazetta*** L. Plant During 1993/94 and 1994/95 Seasons.

I.2. Flowering :

I.2.a. Peduncles parameters :

I.2.a.1. Mean number of peduncle per plant :

Data recorded in table (2-a) show the effect of growth substances i.e. gibberellin, ethephon and paclobutrazol on the mean number of peduncle per plant. It is clear from these data that no significant differences could be observed due to all growth substances used at their different concentrations, but there were slight increases over control due to all the treatments of growth substances this may be attributed to the habit of this plant, since each mature bulb produce only one peduncle throught the season.

I.2.a.2. Mean diameter of peduncle :

The mean diameter of peduncle clearly increased significantly due to all gibberellin treatments specially in the first season. In the second one only the high concentration of gibberellin (150 ppm) signifiantly increased the mean diameter of peduncle. Also there was slight increase in the mean diameter of peduncle due to treatment with both medium and low concentrations of gibberellin, (table 2-a). ***Mohamed et al. (1992)*** came to similar results on Alpinia, since they recorded slight increment in stem diameter resulted from treating plants with gibberellin at 200 and 300 ppm.

Ethephon sprays did not affect the mean diameter of peduncle in the first season, since the treated plants produced the same diameter as the control plants. The data of the second season pointed out slight increments in the mean diameter of peduncle due to ethophon treatments, although these increments were insignificant.

Table (2-a) : Effect of Gibberellin, Ethephon and Paclobutrazol at Different Concentrations on Peduncle Parameters *Narcissus tazetta* Plant During 1993 / 94 and 1994 / 95 Seasons.

Parameters / Treatments	Mean number of peduncle / plant		Mean diameter of peduncle cm.		Mean length of peduncle cm.		Mean fresh weight of peduncle g.		Mean dry weight of peduncle g.		Mean fresh weight of peduncle g/plant.		Meanight pedurant.
	1993/94	1994/95	1993/94	1994/995	1993/94	1994/995	1993/94	1994/995	1993/94	1994/95	1993/94	1994/95	1993/94/95
Control (Dist. water)	1.00	1.00	0.80	0.90	31.67	33.33	4.67	4.67	0.47	0.48	4.67	4.67	0.47.47
Gibberellin 50 ppm.	1.67	1.67	0.87	0.97	35.33	37.00	6.67	8.33	0.67	0.83	11.00	14.00	1.10.40
Gibberellin 100 ppm.	1.67	1.67	0.90	0.97	35.67	38.00	6.67	8.67	0.67	0.87	11.00	14.33	1.10.44
Gibberellin 150 ppm.	2.00	1.67	0.90	1.00	37.00	38.33	6.67	9.00	0.68	0.90	13.33	15.00	1.36.50
Ethephon 50 ppm.	1.33	1.33	0.80	0.93	32.33	34.67	5.00	6.67	0.50	0.57	6.67	8.67	0.67.87
Ethephon 100 ppm.	1.33	1.67	0.80	0.97	32.00	34.33	5.00	7.67	0.51	0.57	6.67	12.67	0.68.28
Ethephon 150 ppm.	1.33	1.67	0.80	0.97	31.67	34.00	5.00	7.67	0.51	0.59	6.67	13.00	0.68.37
Paclobutrazol 50 ppm.	1.33	1.33	0.90	1.00	25.00	25.33	4.00	4.33	0.43	0.46	5.32	5.67	0.57.61
Paclobutrazol 100 ppm.	1.33	1.67	0.90	1.00	24.00	25.33	3.90	4.20	0.42	0.45	5.23	7.01	0.50.74
Paclobutrazol 150 ppm.	1.33	1.67	0.97	1.00	23.67	25.00	3.86	4.10	0.41	0.44	5.13	6.85	0.54.73
L.S.D. at 5%	N.S	N.S	0.04	0.08	0.76	0.98	0.83	0.66	0.06	0.08	4.47	6.10	0.49.59
L.S.D. at 1%	N.S	N.S	0.05	0.10	0.94	1.34	1.14	0.91	0.09	0.11	6.13	8.36	0.69.81

Concerning the effect of paclobutrazol on the mean diameter of peduncle, all treatments increased peduncle diameter as shown in table (2-a).

All increases due to paclobutrazol concentrations were highly significant over control in the first season, while they were only significant in the second season. Moreover, paclobutrazol treatments were superior over GA3 or ethephon treatments. These results were confirmed by the work of ***Mohamed et al. (1992)*** on Alpinia, they recorded highly significant increase in stem diameter when sprayed with paclobutrazol at the rate of 100 and 200 ppm.

I.2.a.3. Mean length of peduncle :

All gibberellin concentrations significantly increased the mean length of peduncle of *Narcissus tazetta* over control in both seasons as shown in table (2-a). The increases in peduncle length due to gibberellin treatments were proportional with the increase in its concentration. These results were in accordance with those observed by ***Rudnick et al. (1976) and Sebanek et al. (1976)*** on tulip, they demonstrated that GA3 treatment caused increase in the length of the flower stem.

Ethephon treatments caused slight increase in the length of peduncle of *Narcissus tazetta*. The increases due to different concentrations of ethephon did not rise to the level of significancy except the low and medium concentrations in the second season only. ***Mohamed (1992),*** found that, stem length of *Dahlia pinnata* increased by spraying ethrel at the rate of 150 and 200 ppm.

Again paclobutrazol confirmed its effect which decreased the length of peduncle significantly with the different concentrations used as shown in table (2-a). The shortest peduncles were obtained with the highest concentration of paclobutrazol. The data were confirmed in both seasons of the experiments. Numerous investigators confirmed this trend of results among them ***Wainwright and Irwin (1987),*** on *Antirrhinum majus*, they found that, paclobutrazol produced antirrhinum plants with shorter flower spikes. On the same subject ***Bailey and Miller (1989)***, reported that, paclobutrazol decreased the length of inflorescence in *Lilium speciosum* hybrids.

I.2.a.(4-5). Mean fresh and dry weight of peduncle :

The mean fresh and dry weight of peduncle was affected clearly by all gibberellin and ethephon concentrations. All gibberellin treatments gave the same value 6.67 g., in the first season, while it ranged between 8.33 g, and 9.00 g in the second season. The most effective treatment was gibberellin at 150 ppm.

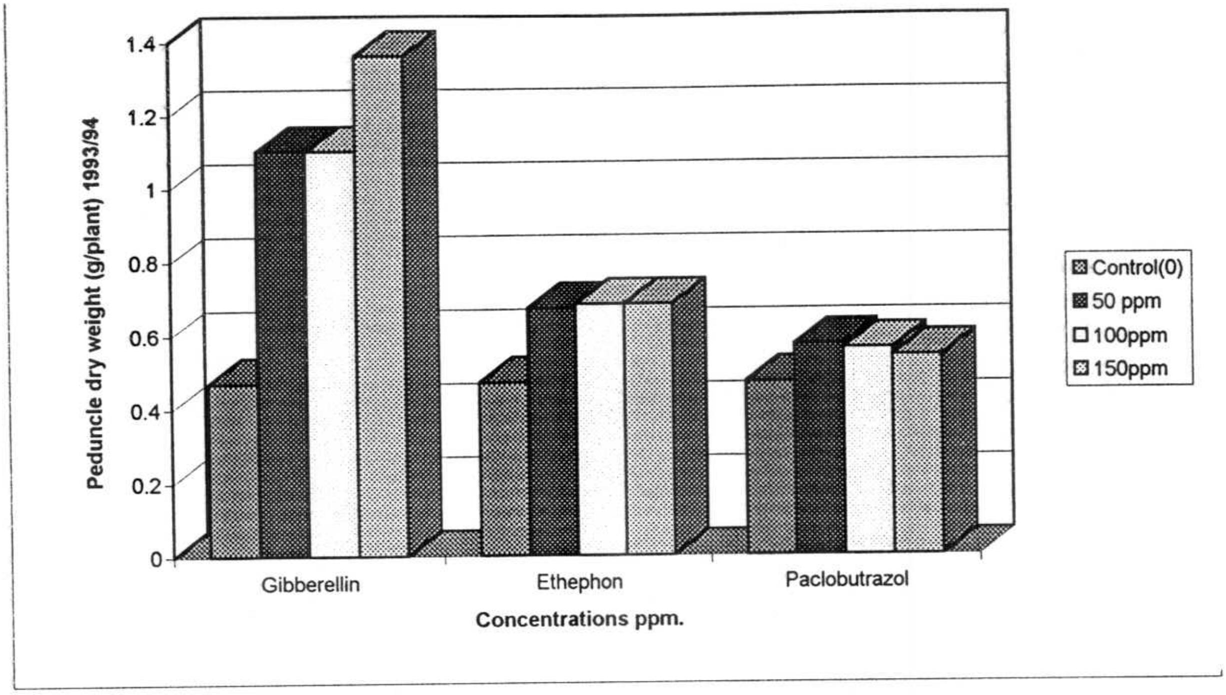
The same trend could be also noticed with the dry weight of peduncle table (2-a).

Spraying narcissus plants with ethephon also increased the mean fresh and dry weight of peduncles carried by the plant only when the high concentration was used in the two seasons.

On the other hand, paclobutrazol at low concentration of 50 ppm decreased the mean fresh and dry weight of peduncle in both seasons. The data in table (2-a) show that, paclobutrazol at the medium and high concentrations (100 and 150 ppm) decreased the mean fresh and dry weight of peduncle, the values recorded in the first season were 4.00 g, 3.90 g and 3.86 g for plants treated with 50, 100 and 150 ppm paclobutrazol respectively compared to 4.67 g for the control plants, while they were 4.33 g, 4.20 g and 4.10 g for the same concentrations respectively compared with 4.67 g for control in the second season. These results are in agreements with ***El-Sayed et al. (1994)*** on Dutch iris, they found that, the weight of spikes slightly decreased in response to paclobutrazol treatments.

I.2.a. (6-7). Mean fresh and dry weight of peduncle per plant :

The data of the mean fresh and dry weight of *Narcissus tazetta* peduncle as affected by growth substances gibberellin, ethephon and paclobutrazol at different concentrations were compiled in table (2-a) and Fig. (3). It is clear from these data that all gibberellin concentrations significantly increased the mean fresh and dry weight of peduncle per plant in both seasons over untreated plants. The highest concentration of gibberellin resulted in the highest rate of peduncle dry weight which reached 191.22% and 217.12% increase over control in the first and second seasons respectively. The mean values recorded for dry weight of peduncle resulted from gibberellin treatments were 1.10 g, 1.10 g and 1.36 g for the first season compared to 0.47 g for control, and it were 1.40 g., 1.44 g and 1.50 g for the second season compared to 0.47 g for plants treated with 50, 100 and 150 ppm Gibberellin respectively. ***Abo El-Ghait and Wahba (1994)*** came to similar results on *Viola odorata*.



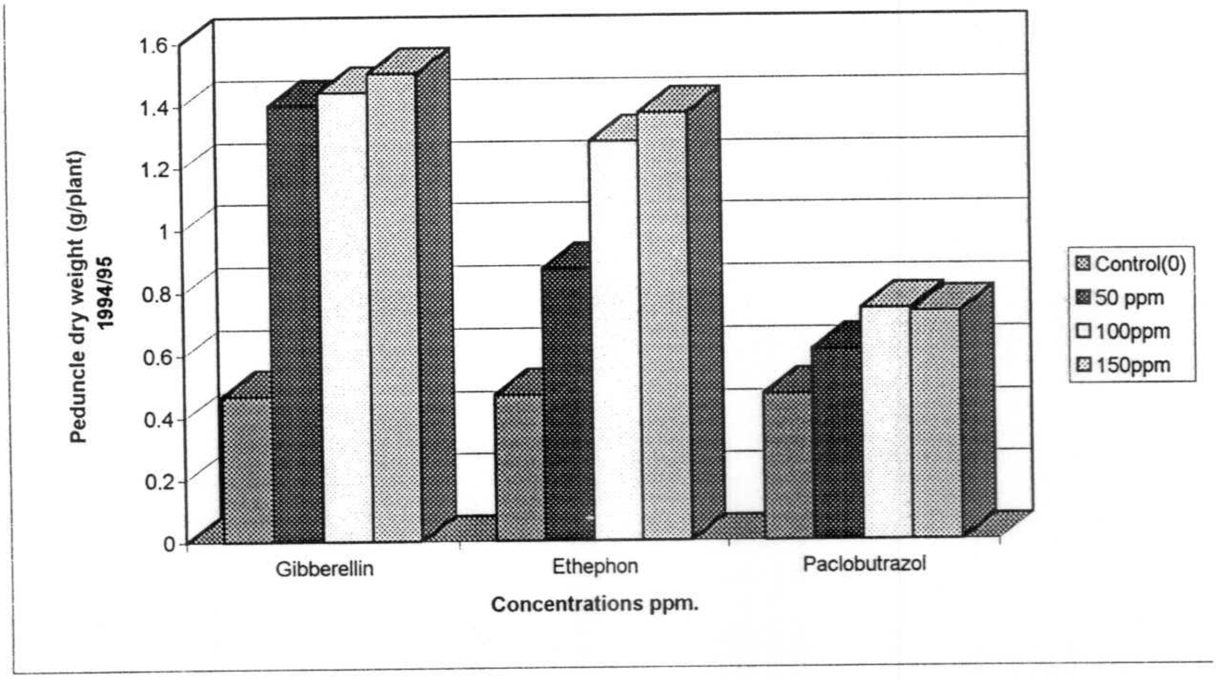


Fig. (3) : Effect of Gibberellin, Ethephon and Paclobutrazol at Different Concentrations on Peduncle Dry Weight (g/plant) of ***Narcissus tazetta*** L. Plant During 1993/94 and 1994/95 Seasons.

Ethephon sprays also affected the mean fresh and dry weight of peduncle per plant, although its effect in this concern was less than gibberellin as shown in table (2-a). All ethephon concentrations increased fresh and dry weight of peduncle per plant over control in both seasons. The increase in the fresh and dry weight of peduncle per plant was more clear in the second season than the first one. The percentages of increase over control for dry weight in the second season reached 85.11%, 172.34% and 191.49% for plants treated with 50,100 and 150 ppm ethephon respectively.

Paclobutrazol treatments on *Narcissus tazetta* plant also led to increase in mean fresh and dry weight of peduncle per plant at different concentrations used in both seasons. But, its effect in this concern was less than either gibberellin or ethephon which were clearly shown from the data in table (2-a). This lesser effect may be due to the shorter peduncle which resulted from paclobutrazol treatments and also due to the more metabolit substances stored in the underground organs previosly noticed in mean fresh and dry weight of bulbs per plant table (1-b).

I.2.b. Flowering parameters :

I.2.b.1. Number of days to start flowering :

Data presented in table (2-b) describe the clear effect of growth regulators namely : gibberellin, ethephon and paclobutrazol, on flowering. These data revealed that both gibberellin and ethephon resulted in earlier flowering than control, while Paclobutrazol delayed flowring. The number of days earlier or later due to any of the growth substances differ according to concentrations. Gibberellin treatments shortened the period to start flowering by 7.33 to 10.00 days in the first season and 5.33 to 8.33 days in the second season compared to the control treatment.

Early flowering as an effect of gibberellin treatments was recorded by many investigators among them, ***Mohamed (1992)*** on *Dahlia pinnata*, ***Galal (1982)*** on *Narcissus pseudonarcissus*, ***Braget and Gelder (1979) and Moe (1978)*** on tulip.

On the other hand ethephon treatment shortened the period to start flowering by 6.33 to 9.00 days in the first season and 2.66 to 6.00 days in the second one. In all casses, the higher concentrations of gibberellin and ethephon were more effective in shortening the period to flowering. The earlieness of flowering, as a cause of growth substances, was recorded by numerous workers among them ***Lmanishi and Yue (1987)*** on *Narcissus tazetta,* they mentioned that application of ethylene produced earlier flowers. Also ***Simmonds and Cumming (1977)*** on lilium, they recorded that treating bulbs with ethephon induced early flowering.

Table (2-b): Effect of Gibberellin, Ethephan and Paclobutrazol at Different Concentrations on Florets Parameters of *Narcissus tazetta* Plant During 1993 / 94 and 1994 /95 Seasons.

Parameters / Treatments	Mean number of days to start flowering		Mean number of days to full blooming		Mean number of florets/ peduncle		Mean number of florets / plant		Mean diameter of florets cm.		Mean fresh weight of florets g / peduncle		Mean fresh weight of florets g/plant.	
	1993/94	1994/95	1993/94	1994/995	1993/94	1994/995	1993/94	1994/995	1993/94	1994/95	1993/94	1994/95	1993/94	1994/95
Control (Dist. water)	90.00	88.33	105.33	102.33	7.67	7.67	7.67	7.67	0.83	0.90	5.33	6.00	5.33	6.00
Gibberellin 50 ppm.	82.67	83.00	91.67	94.00	9.33	9.00	15.33	15.00	0.83	0.97	7.00	8.67	11.67	14.33
Gibberellin 100 ppm.	80.00	82.00	90.67	92.67	9.33	9.67	15.33	16.00	0.93	1.00	7.67	9.00	13.00	15.00
Gibberellin 150 ppm.	80.00	80.00	88.33	91.00	9.33	9.67	19.33	16.00	1.00	1.00	8.00	9.00	16.00	15.00
Ethephon 50 ppm.	83.67	85.67	95.33	96.33	9.00	8.67	12.00	11.67	0.83	0.93	6.00	7.00	8.00	9.33
Ethephon 100 ppm.	82.00	85.33	93.00	94.00	9.00	9.00	12.00	15.00	0.83	0.97	7.00	7.33	9.33	12.33
Ethephon 150 ppm.	81.00	82.33	91.33	93.00	9.00	9.33	12.00	15.00	0.87	0.97	7.00	7.33	9.33	12.33
Paclobutrazol 50 ppm.	91.67	90.33	119.33	110.33	7.67	7.33	10.33	10.00	0.83	0.87	5.67	5.52	7.33	9.21
Paclobutrazol 100 ppm.	95.00	95.67	119.33	113.00	7.67	7.33	10.33	12.33	0.80	0.83	5.17	5.10	7.00	8.53
Paclobutrazol 150 ppm.	97.00	98.00	121.00	117.33	7.33	7.00	10.33	12.33	0.77	0.80	5.00	4.83	6.67	8.00
L.S.D. at 5%	1.48	1.83	2.54	2.38	0.82	0.94	4.35	4.04	0.07	0.08	0.71	0.82	3.72	4.78
L.S.D. at 1%	2.02	2.51	3.48	3.26	1.13	1.28	5.96	5.54	0.10	0.10	0.96	1.12	5.10	6.56

Paclobutrazol resulted in retarding flowering. The period to start flowering significantly increased over control with all paclobutrazol concentrations, but the high and medium concentrations were more effective in this regard. The increasing period due to paclobutrazol treatments reached 1.67 to 7.00 days more than control in the first season and 2.00 to 10.33 days in the second one.

These results came in accordance with those found by ***Ismaeil (1995)*** on *Vicia faba*, ***Hashim et al. (1991)*** on Senecio, ***Wainwright and Irwin (1987) and Menhenett and Hanks (1983)*** on tulip, they concluded that paclobutrazol delayed flowering.

I.2.b.2. Mean number of days to full blooming :

Gibberellin and ethephon caused significant decrease in number of days to full blooming. Gibberellin treated plants were more earlier in reaching the full blooming stage than the ethephon treatmented. The higher concentrations of both gibberellin or ethephon shortened the period to full blooming. Also it could be noticed that the period from flowering start to full blooming decreased with increasing the concentrations of both gibberellin or ethephon. In contrary paclobutrazol increased the period to full blooming than control and also the number of days from flowering to full blooming which increased with increasing the concentration of paclobutrazol. The trend of results was constant in both seasons of the experiment as shown in table (2-b).

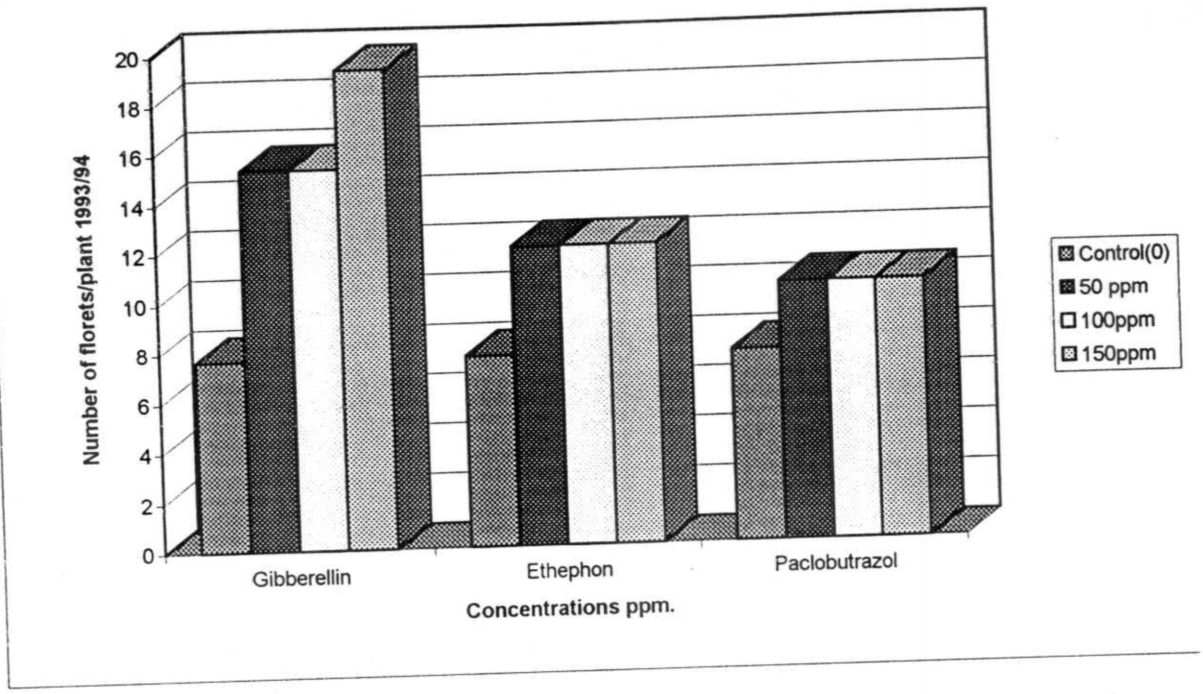
I.2.b.3. Mean number of florets per peduncle :

The mean number of florets per peduncle significantly increased by using both the growth substances gibberellin and ethephon as shown in table (2-b). There were no differences in the mean number of florets on the peduncle due to different concentrations of both growth substances in the first season. In the second season, the high (150 ppm) and medium (100 ppm) concentrations of both the two substances produced slight increase in the mean number of florets per peduncle over the low one (50 ppm.). ***Vreeburg and Dop (1990)*** pointed that ethylene influenced flower production of narcissus plant.

As for the effect of paclobutrazol on the mean number of florets per peduncle, it is clear that the low (50 ppm) and medium (100 ppm) concentrations produced the same mumber of florets per peduncle as control, while the high concentration produced slightly less number in the first season. However data of the second season showed slight decrease in the number of florets per peduncle under control plant (table 2-b). Similar results were obtained by ***Yahel et al. (1990)*** on Narcissus plant, they reported that, no significant differences in number of florets per stem were observed by using paclobutrazol.

I.2.b.4. Mean number of florets per plant :

The mean number of florets per plant as affected by growth substances, gibberellin, ethephon and paclobutrazol at the different concentrations shown in table (2-b) and Figure (4). The highest value for this character was obtained from plants treated with high level of gibberellin (150 ppm) followed by medium and low levels (100 and 50 ppm.). It is almost the same trend previously mentioned with the plants sprayed with different levels of ethephon. Plants treated with low level of



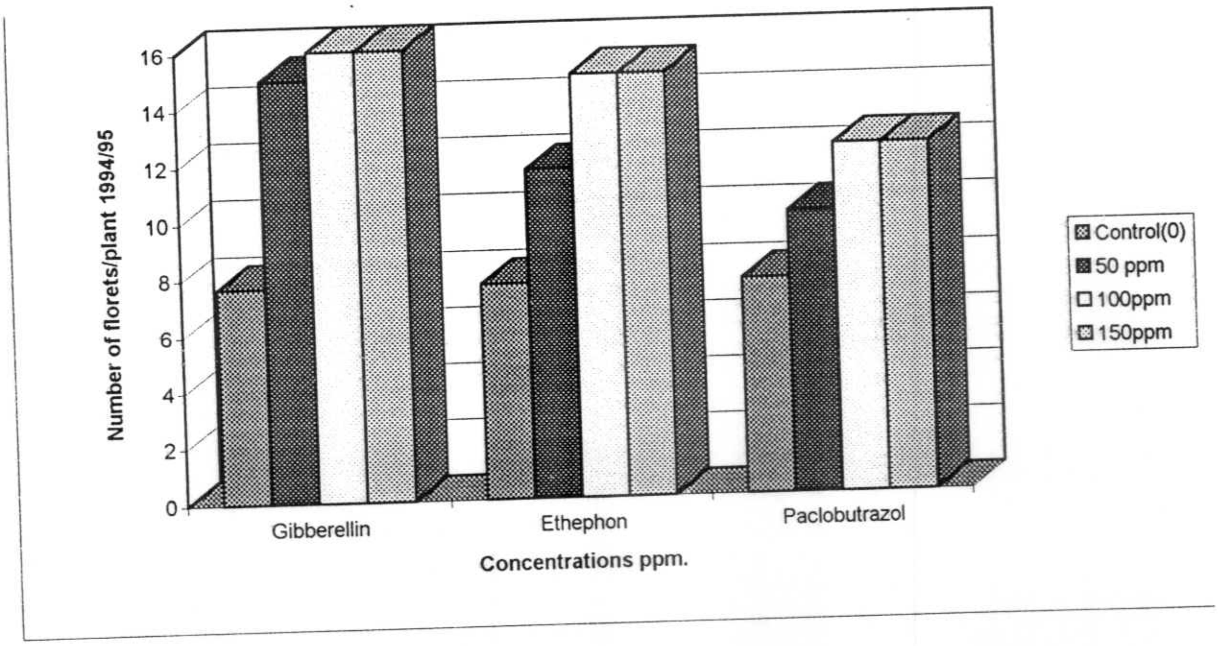


Fig. (4) : Effect of Gibberellin, Ethephon and Paclobutrazol at Different Concentrations on Number of Florets /plant of ***Narcissus tazetta*** L. plant During 1993/941993/94 and 1994/95 Seasons.

paclobutrazol gave the highest mean number of florets per plant compared with medium and high levels in both seasons. All levels of paclobutrazol increased the mean number of florets per plant compared with control treatment. The same trend of results attained in the second season by all the previous treatments.

I. 2.b.5. mean diameter of florets :

The data presented in table (2-b) representing the mean diameter of floret, showed that, the low concentration of gibberellin had no clear effect on this character. While the medium and high concentrations [100 and 150 ppm] significantly increased the floret diameter. The data was confirmed in both seasons. These results came in agreement with those observed by ***El-Gindy (1986)***, on *Chrysanthemum morifolium*, and ***Sebanek et al. (1976)*** on tulip, they concluded that, gibberellin increased the flower diameter. Ethephon at low (50 ppm.) or medium (100 ppm.) concentrations did not affect floret diameter. Slight increase was obtained with the high concentration (150 ppm) in the first season. The data of the second season showed slight increases due to the different concentrations of ethephon but it did not rise to the level of significance.

Paclobutrazol slightly decreased the mean diameter of floret without significant differences between the low and medium concentration in both seasons of the experiments. The high concentration (150 ppm) of paclobutrazol significantly decreased the mean diameter of floret in both seasons. ***Whealy et al. (1988)*** on *azalea*, mentioned that paclobutrazol did not affect the flower size.

I.2.b.6. Mean fresh weight of florets per peduncle :

Gibberellin and Ethephon significantly increased the mean fresh weight of *Narcissus tazetta* florets per peduncle over the control in both seasons of the experiments as shown in table (2-b). It is clear from these data that all gibberellin concentrations significantly increased the mean fresh weight of florets per peduncle in both seaons, over untreated plants. The highest concentration of 150 ppm resulted in the highest rate of increase which reached 8.00 g and 9.00 g in the first and second seasons respectively, compared to 5.33 g and 6.00 g in the first and second season respectively for control.

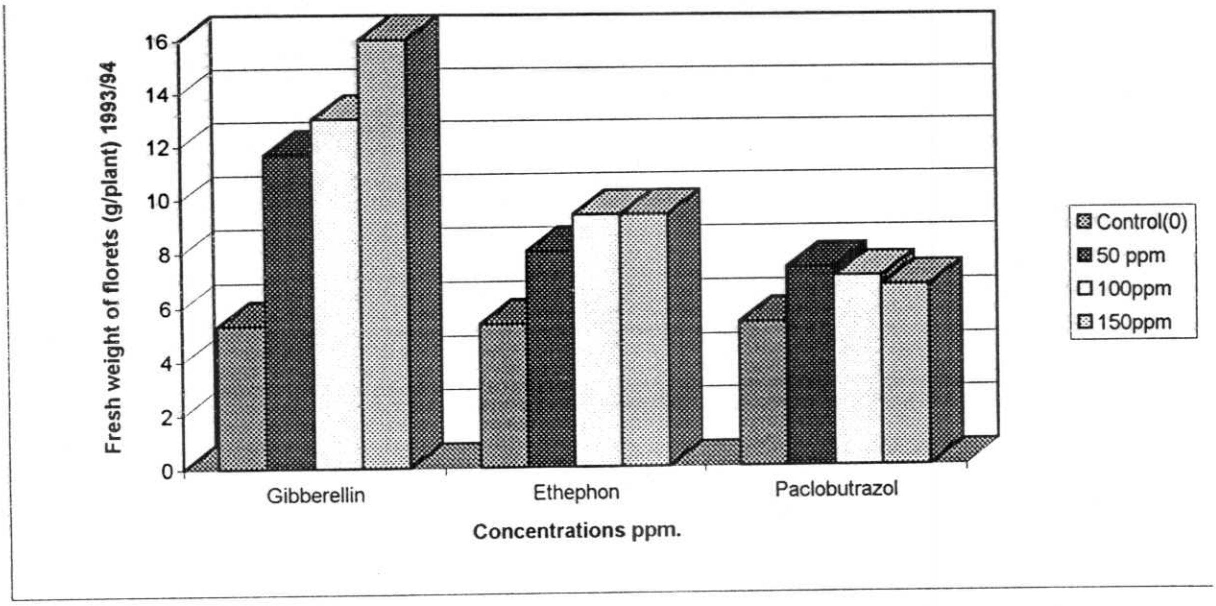
Ethephon sprays also affected the mean fresh weight of florets per peduncle, although its effect in this concern was less than gibberellin as shown in table (2-b). All ethephon concentrations increased fresh weight of florets per peduncle over control in both seasons of the experiments.

The fresh weight of florets per peduncle in the second season reached 7.00 g, 7.33 g and 7.33 g for plant treated with 50, 100 and 150 ppm Ethephon respectively.

Paclobutrazol treatments on *Narcissus tazetta* plant led to a decrease in mean fresh weight of florets per peduncle at different concentrations used in both seasons.

I.2.b.7. Mean fresh weight of florets per plant :

All growth substances used in this work increased the mean fresh weight of florets per plant in both seasons of the experiments as shown in (Table 2-b) and Figure (5). Gibberellin gave the major effect in this



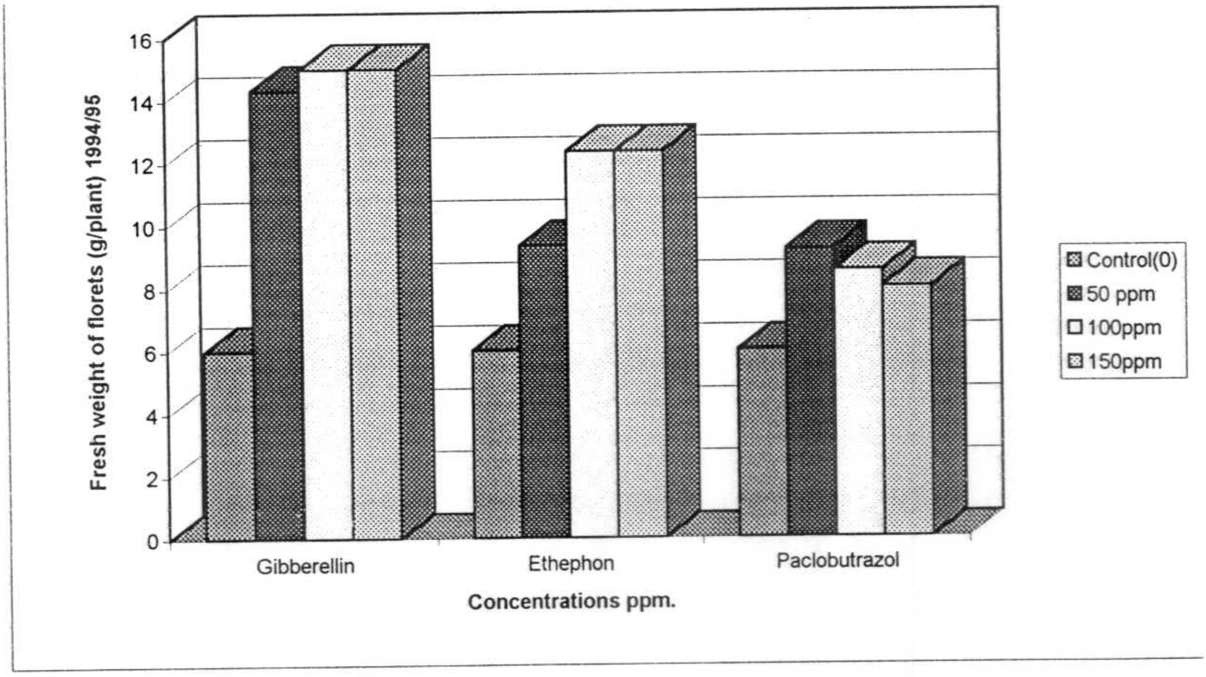


Fig. (5) : Effect of Gibberellin, Ethephon and Paclobutrazol at Different Concentrations on Fresh Weight of Florets (g/plant) of ***Narcissus tazetta*** L. plant During 1993/941993/94 and 1994/95 Seasons.

concern, it nearly doubled the fresh weight of florets per plant in the first season and more than double in the second season, through all the gibberellin concentrations. These results are in accordance with ***Abo El-Ghait and Wahaba (1994)*** on Violet, and ***El-Gindy (1986)*** on *Chrysanthemum morifolium* they mentiond that GA3 increased flower fresh weight per plant.

Ethephon also increased the mean fresh weight of florets per plant by 50% or more over the control in the first season, and more than 100% in the second one, with the medium and high concentrations (100 ppm and 150 ppm) as clearly shown from data recorded in table (2-b).

The highest concentration of both gibberellin and ethephon resulted in the highest fresh weight of florets per plant followed by the medium concentration (100 ppm) then the low one.

The effect of paclobutrazol in increasing florets fresh weight per plant came after both gibberellin or ethephon in this concern. Paclobutrazol also produced its effect by different ways, since the lowest concentration produced the highest fresh weight of florets per plant followed by the medium then the high concentration.

Generally, it could be concluded that vegetative growth and flowering were influenced greatly by the growth substances used in this work. Growth substances used differed in their effects while gibberellin and ethephon improved the vegetative growth such as leaf measurments. Yet paclobutrazol had no pronounced effect. The later improved growth of the under ground organs (number of bulbs, fresh and dry weight of bulbs).

I.3. Chemical constituents :

Different chemical analyses were performed in response to the treatments conducted, concrete oil, absolute oil and the total alkaloid content were estimated, and the effect of the treatments adopted on these constituents were obtained and discussed during seasons 1993 / 94 and 1994 / 95.

1- Concrete oil percentage in florets :

The data in table (3) indicat that, all the treatments caused highly significant increase in concrete oil percentage in the florets during the two seasons except when the plants were sprayed with paclobutrazol at the different concentrations used in the first season.

2- Absolute oil percentage in florets :

The data presented in table (3) indicate that, spraying plants with gibberellin at 100 and 150 ppm and ethephon at 150 ppm. caused slight increase in absolute oil percentage in florets compared with control and other tested treatments. On the other hand absolute oil percentage in florets did not change when the plants were sprayed with paclobutrazol at all the concentrations used in both seasons.

3- Total alkaloids percentage in peduncles :

It is obvious that in both seasons, all the tested treatments caused highly significant increase in the total alkaloids percentage in peduncles. Superior effect in this respect was noticed when plants were sprayed with paclobutrazol at dose of 150 ppm. in both seasons which caused 65.07% and 74.38% increment respectively over the control.

Table (3): Effect of Gibberellin, Ethephon and Paclobutrazol at Different Concentrations on Some Chemical constituents of Different Plant Organs of *Narcissus tazetta* During 1993 - 1994 / 1994 - 1995 Seasons.

Parameters / Treatments	Concret oil percentage in florets		Absolute oil percentage in florets		Total alkaloids percentage in peduncle		Total alkaloids percentage in leaves		Total alkaloids percentage in bulbs	
	1993 / 94	1994 / 95	1993 / 94	1994 / 95	1993 / 94	1994 / 95	1993 / 94	1994 / 95	1993 / 94	1994 / 95
Control 0.0 ppm	0.447	0.460	0.015	0.016	2.001	2.010	2.202	2.251	3.051	3.755
GA3 50 ppm	0.453	0.480	0.015	0.016	3.002	3.010	3.203	3.212	4.013	4.202
GA3 100 ppm.	0.460	0.480	0.016	0.017	3.111	3.301	3.502	3.0433	4.202	4.412
GA3 150 ppm.	0.470	0.480	0.016	0.017	3.223	3.433	3.613	3.565	4.351	4.553
Ethephon 50 ppm	0.453	0.473	0.015	0.016	3.001	3.004	3.003	3.202	4.004	4.203
Ethephon 100 ppm.	0.453	0.477	0.015	0.017	3.113	3.293	3.303	3.404	4.203	4.403
Ethephon 150 ppm.	0.460	0.477	0.016	0.017	3.212	3.433	3.544	3.555	4.333	4.551.
PP333 50 ppm	0.450	0.467	0.015	0.015	3.102	3.212	3.113	3.203	4.303	4.304
PP333 100 ppm.	0.450	0.473	0.015	0.016	3.122	3.343	3.033	3.403	4.304	4.493
PP333 150 ppm.	0.450	0.473	0.015	0.016	3.303	3.505	3.555	3.564	4.395	4.563
L.S.D at 5%	0.005	0.008	N.S	0.001	0.008	0.144	0.088	0.056	0.015	0.084
L.S.D. at 1%	0.007	0.011	N.S	N.S	0.011	0.197	0.120	0.077	0.021	0.115

4- Total alkaloids percentage in leaves :

The tabulated data included in table (3), show that in both seasons, all the tested treatments caused high increase in total alkaloids percentage in leaves. However, the best treatment in this rspect was gibberellin at concentration of 150 ppm. which attained 64.08% and 58.37% increases in both seasons respectively.

5- Total alkaloids percentage in bulbs :

The data in table (3) indicate that, all the tested treatments caused highly significant rise in total alkaloids percentage in bulbs. Moreover, the higher concentration (150 ppm.) of paclobutrazol, gibberellin and ethephon gave the highest percentage [25.21% and 21.52%], [23.96% and 21.25%] and [23.45% and 21.20%], increase in both seaons respectively.

Conclusion of this part, it was found that gibberellin and ethephon favoured and promote absoluted oil accumulation in the florets, but paclobutrazol gave an opposite picture. This finding coincide with many authors who reported that Gibberellin favours absolute oil synthesis in some plants, ***Kandeel (1987)*** on ocimum, ***El-Shamy (1982)*** on carnation, ***Mousa (1994)*** on calendula, ***Abo El-Ghait and Wahba (1994)*** on violet. ***EL-Sayed (1979)*** and ***Mohamed et al. (1992)***, on Alpinia.

Dealing with alkaloid and the effect of growth substances on its content in some plants, ***El-Ghawwas (1988)*** reported that soaking seeds of hyoscyamus in gibberellin caused increase in total alkaloids percentage in the leaves, with *Vinca rosea*, ***Abd El-Zaher (1978)*** obtained an increase of alkaloid in stems of vinca by application of gibberellin at the rates of 25, 50 and 100 mg/L.

An increase in total alkaloids of root was reported by ***Naguib (1991)*** by treating *Datura metel* with ethrel at 300 to 600 ppm., the same finding was attained by ***El-Kady et al. (1982)*** when treated Datura plant with Ethrel.

Krishnamoorthy (1981) reported that Gibberellin induced enhancement of nucleic acids which was considered to be an after effect of growth. In other site than nucleic acid and protein synthesis, GA3, appears to be facilitate membrane permeability. This permeability increases the nonelectrolytes molecules like glucose and charged chromate ions. This movement of these substances is accompanied by increase in the activity of the enzymes accounted for increase of phospholipid synthesis that means GA cause indirect increase in the metabolic process in plant which in turn was reflected in biomass accumulation and consequently secondary metabolites.

Ethylene causes inhibition of linear growth of stems and roots of dicotyledonaus plants. The effect of increased with concentration. Inhibition of growth along the longitudinal axis is compensated with lateral growth of cells which increases the diameter, so when fresh weight is taken as an index for growth there was no inhibition but increase and the increase in fresh weight also was parallel to the increase in secondary metabolites which was revealed from the later obtained in this investigation.

Paclobuhazal represent a factor of stress for the plants. Any stresses on plants leads to increase the rools of systems of difference in the plant. These systems includes the secondary metabolites synthesisyed by the plants specially alkaloids which describes the increase in alkaloids obtained in this investigation.

II- *AMINO ACIDS EXPERIMENT :*

* Effect of Tryptophan, Aspartic and Glutamic acids at different concentrations on vegetative growth, flowering and chemical constituents of *Narcissus tazetta* plant.

II.1. Vegetative growth :

II.1.a. Leaves parameters :

III1.a.1. Mean number of leaves per plant :

Amino acids namely; tryptophan, aspartic and glutamic acids used as foliar sprays on *Narcissus tazetta* plant at different concentrations of 50, 100 and 150 ppm, affected clearly the mean number of leaves per plant in both seasons of the experiment as shown in table (4-a). It could be noticed that, all the concentrations of the three amino acids resulted in significant increases in the mean number of leaves per plant over the control, except the low concentration of all amino acids in the first season only which produced the same value as control. The increase in the mean number of leaves was proportional with the increase in the concentrations of each amino acid used. So the highest concentrations gave of the highest effect in increasing the mean number of leaves per plant over both medium or low ones in both seasons. These results were in agreement with those observed by ***Mohamed et al. (1992)*** on *Alpinia nutans,* they reported that, application of tryptophan at 50 and 100 ppm. caused an increase in number of leaves per shoot. ***El-Sherbeny and Hassan (1987)*** on *Datura stramonium,* sparayed the plants with tryptophan, phenylalanine and thiamin at 250 and 500 ppm and obtained significant increase in number of leaves.

Table (4-a): Effect of Tryptophan, Aspartic and Glutamic Acids at Different Concentrations on Leaves Parameters of *Narcissus tazetta* Plant During 1993 / 94 and 1994 / 95 Seasons.

Parameters / Treatments	Mean number of leavs / plant		Mean Length of Leaves cm.		Mean Fresh weight of Leaves g / plant.		Mean dry weight of Leaves g / plant.		Mean dry weight of Leaves g / plot.	
	1993/94	**1994/95**	**1993/94**	**1994/995**	**1993/94**	**1994/995**	**1993/94**	**1994/995**	**1993/94**	**1994/995**
Control (Dist. water)	18.67	18.00	58.33	59.67	89.33	111.33	14.29	17.81	142.93	178.13
Tryptophan 50 ppm.	18.67	19.67	62.00	63.33	92.67	133.33	14.83	21.29	148.27	212.93
Tryptophan 100 ppm.	20.00	20.00	65.67	67.00	98.00	140.00	15.68	22.40	156.80	224.00
Tryptophan 150 ppm.	23.33	22.00	68.00	68.00	100.00	160.00	16.00	25.49	160.00	254.93
Aspartic 50 ppm.	18.67	19.33	60.00	62.00	89.33	132.67	14.29	21.23	142.93	212.27
Aspartic 100 ppm.	20.00	19.67	64.67	65.67	90.00	139.33	14.40	22.29	144.00	222.93
Aspartic 150 ppm.	22.00	21.33	65.00	66.00	96.67	150.00	15.47	24.00	154.67	240.00
Glutamic 50 ppm.	18.67	19.67	60.67	62.67	89.33	132.67	14.40	21.23	144.00	212.27
Glutamic 100 ppm.	20.00	20.00	65.00	66.33	91.33	140.00	14.61	22.40	146.13	224.00
Glutamic 150 ppm.	23.33	21.33	65.67	67.00	97.33	160.00	15.57	24.53	155.73	245.33
L.S.D. at 5%	1.52	0.94	1.69	2.51	3.32	5.53	0.53	0.56	5.26	5.63
L.S.D. at 1%	2.08	1.29	2.32	3.44	4.55	7.57	0.72	0.77	7.21	7.72

II.1.a.2. Mean length of leaves:

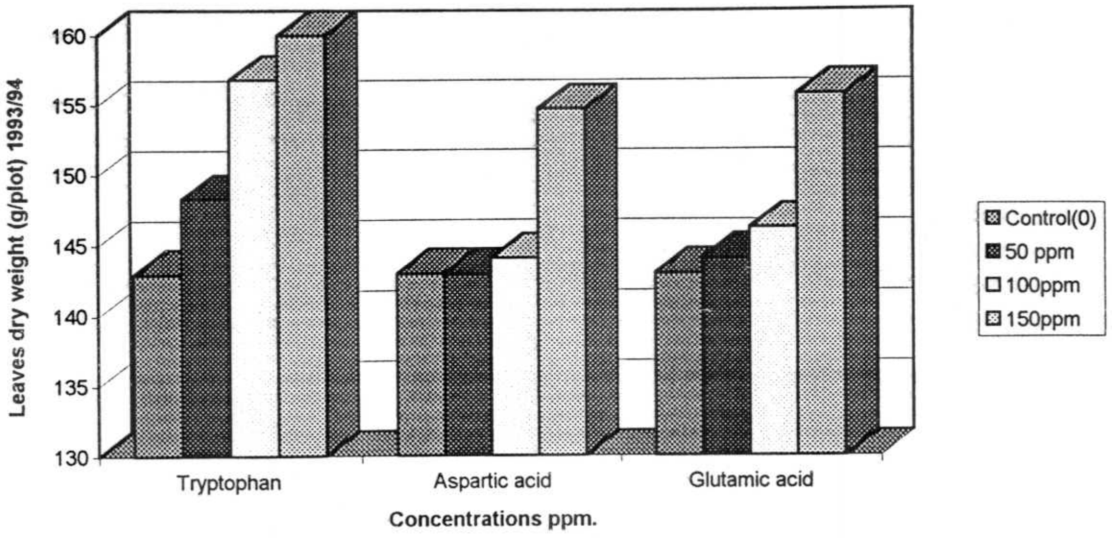
As for the length of leaves, it is clear from the data presented in table (4-a), that all amino acids treatments significantly increased the leaf length, except with the low concentration of aspartic acid which was not significant. The rate of increase in the leaf length resulted from using any of the amino acids did not differ from one to other, also nearly the same effect could be seen due to different concentrations. The difference between the medium and low concentrations was very pronounced, and significant in most cases. However no difference between the higher and medium one. Slight effect due to the higher concentration was observed in most cases. The trend of results was constant in both seasons and was confirmed by the results found by ***Mohamed et al. (1992)*** on *Alpinia nutans*.

II.1.a.(3.4). mean fresh and dry weight of leaves per plant :

The mean fresh and dry weight of leaves per plant was affected significantly by the different amino acids used and their different concentrations as it is clear from the data in table (4-a). Significant increases were obtained due to all the concentrations of the three amino acids, in both seasons, except with the low and medium concentrations of both aspartic and glutamic acid in the first season only. The highest concentration of each amino acid gave the highest effect in increasing both fresh and dry weight of leaves per plant in both seasons. These results are in agreement with those obtained by ***Mohamed et al. (1992)*** on *Alpinia nutans*, they indicated that foliar spray with tryptophan at 50 and 100 ppm. caused highly significant increase in fresh and dry weight of leaves per shoot. ***El-Sherbeny and Hassan (1987)*** on *Datura stramonium*, when sprayed the plants with tryptophan, phenylalanine and thiamin at 250 and 500 ppm obtained significant increase in fresh and dry weight of plant.

II.1.a.5. Mean dry weight of leaves per plot :

The mean dry weights of leaves per plot as affected by spraying amino acids (tryptophan, aspartic and glutamic acids) at different concentration, are shown in table (4-a) and Fig. (6). The data in this concern follow the same trend previously obtained with the mean dry weight of leaves per plant, since it was accordingly calculated owing to these results.



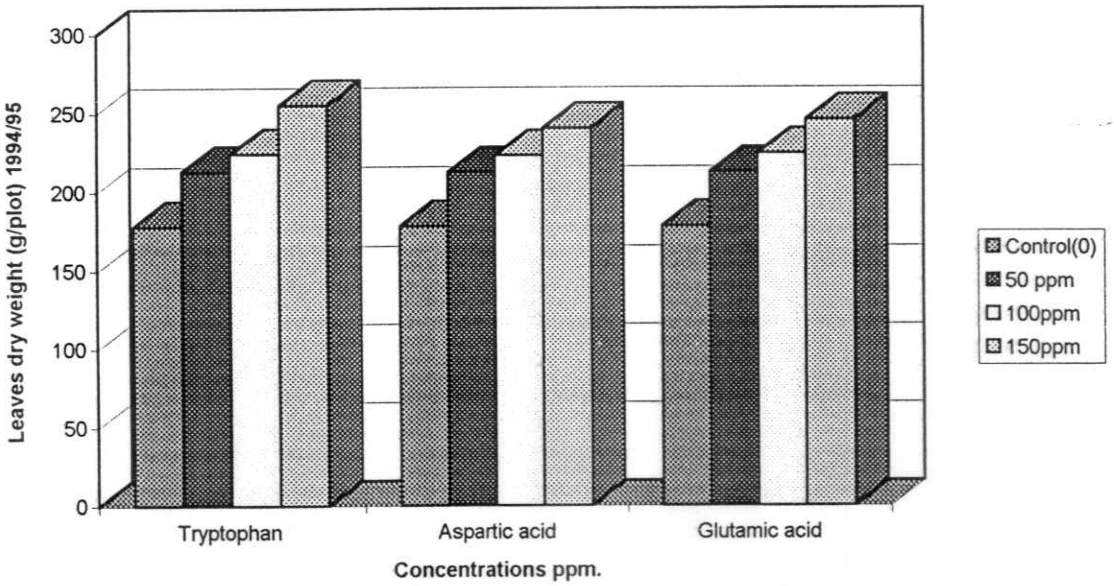


Fig. (6) : Effect of Tryptophan, Aspartic and Glutamic Acids at Different Concentrations on Dry Weight of Leaves (g/plot) of *Narcissus tazetta* L. Plant During 1993/94 and 1994/95 seasons.

II.1.b. Bulbs parameters :

II.1.b.1. Mean number of bulbs per plant :

The mean number of bulbs produced per Narcissus plant increased by the different amino acids treatments as shown in Table (4-b). These data revealed that all amino acids with its different concentrations resulted in significant increases in the mean number of bulbs per plant over the control in both seasons except with the low concentration of both aspartic and glutamic acids in the first season only. There were no clear differences observed between the three amino acids used in their effect on this character. Also, the differences between the treatments of each amino acid were insignificant in this concern. The trend of results was confirmed in both seasons of the experiments.

II.1.b.(2.3). Mean fresh and dry weight of bulbs per plant .

The mean fresh weight of bulbs per plant increased significantly, compared to control, with all amino acids and at their different concentrations in the first season. While in the second season the low concentration of all amino acids used and the medium concentration of aspartic acid produced insignificant increase in this parameter. The data of dry weight of bulbs per plant in table (4-b) clearly show significant increases due to the different concentrations of each of the amino acids over control plants. Although the differences resulting from the different concentrations of each amino acid were significant, it is also shown that there was no marked difference between the effect of the different amino acids used.

The rate of increase in the mean dry weight of bulbs was nearly the same with the different amino acids used. The data was confirmed in both

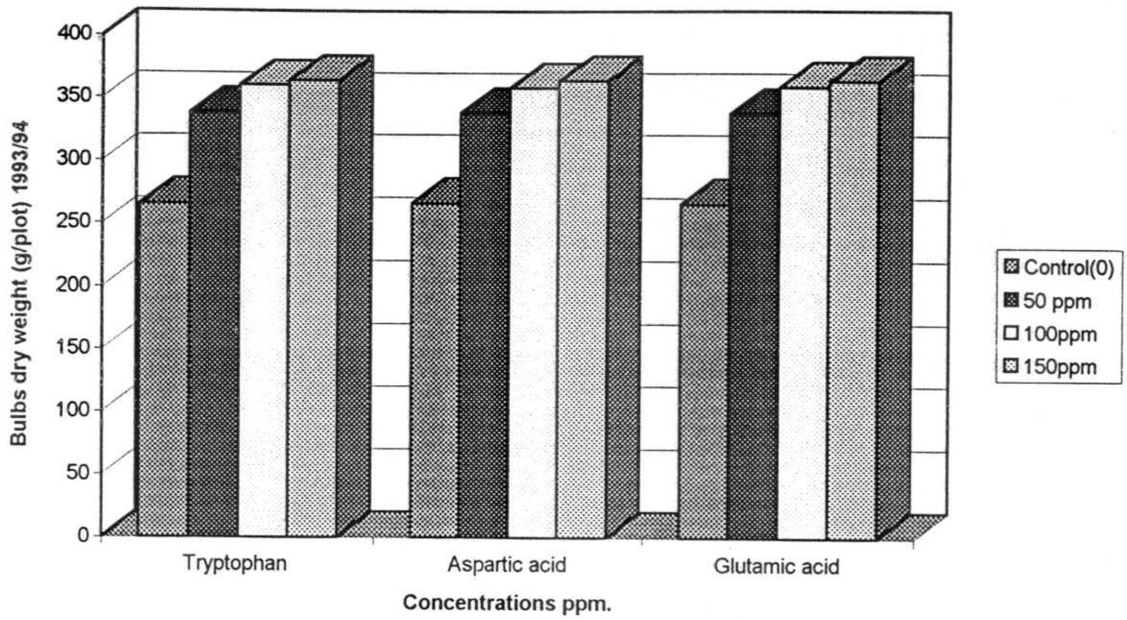
Table (4-b): Effect of Tryptophan, Aspartic and Glutamic Acids at Different Concentrations on Bulbs Parameters of *Narcissus tazetta* Plant During 1993/94 and 1994/95 Seasons.

Parameters / Treatments	Mean number of bulbs / plant		Mean fresh weight of bulbs g / plant.		Mean dry weight of bulbs g / plant.		Mean fresh weight of bulbs g /plot.		Mean dry weight of bulbs g / plot.	
	1993/94	**1994/95**	**1993/94**	**1994/995**	**1993/94**	**1994/995**	**1993/94**	**1994/995**	**1993/94**	**1994/995**
Control (Dist. water)	6.33	6.67	102.00	110.00	26.52	28.60	1020.00	1100.00	265.20	286.00
Tryptophan 50 ppm.	7.33	8.00	137.33	121.67	33.80	35.01	1373.33	1216.67	338.00	350.13
Tryptophan 100 ppm.	8.33	9.33	140.17	135.33	36.00	39.00	1401.67	1353.33	360.00	390.00
Tryptophan 150 ppm.	8.67	9.67	148.67	152.33	36.40	39.67	1486.67	1523.33	364.00	396.67
Aspartic 50 ppm.	7.00	8.00	134.00	116.67	33.80	34.15	1340.00	1166.67	338.00	341.47
Aspartic 100 ppm.	7.67	8.33	135.38	119.83	35.88	38.48	1353.80	1198.33	358.80	384.80
Aspartic 150 ppm.	8.33	9.33	145.15	143.36	36.40	39.00	1451.47	1433.63	364.00	390.00
Glutamic 50 ppm.	7.00	8.00	134.33	120.77	33.80	34.67	1343.33	1207.67	338.00	346.67
Glutamic 100 ppm.	8.00	9.33	139.83	133.45	35.93	39.00	1398.33	1334.53	359.33	390.00
Glutamic 150 ppm.	8.33	9.67	146.53	148.03	36.40	39.00	1465.30	1480.33	364.00	390.00
L.S.D. at 5%	0.86	1.29	12.35	14.75	0.49	1.49	123.50	147.46	4.88	14.90
L.S.D. at 1%	1.17	1.77	16.92	20.20	0.67	2.04	169.17	201.99	6.68	20.41

seasons as show in table (6-b). These results are in good agreement with those obtained by ***Mohamed*** ***et al.*** ***(1992)*** on Alpinia. They found that, application of tryptophan at 50 and 100 ppm caused increase in fresh and dry weight of the rhizomes per plant.

II.1.b. (4.5). Mean fresh and dry weight of bulbs per plot :

Concerning mean fresh and dry weight of bulbs per plot (1 m2), it is clear from the data in table (4-b) and Fig.(7) that the same trend of results previously mentioned with the individual plant was observed with the yield of plot, since these values were mathematically calculated according to it.



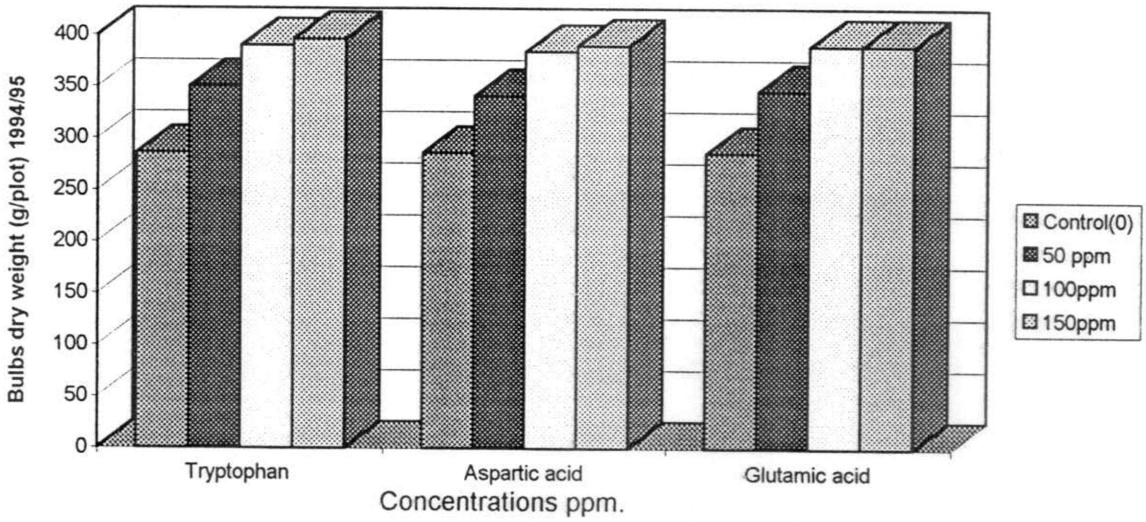


Fig. (7) : Effect of Tryptophan, Aspartic and Glutamic Acids at Different Concentrations on Dry Weight of Bulbs (g/plot) of *Narcissus tazetta* L. Plant During 1993/94 and 1994/95 seasons.

II.2. Flowering :

II.2.a. Peduncle parameters :

II.2.a.1. Mean number of peduncle per plant :

The mean number of peduncle per plant was slightly affected by the amino acids treatmens, there were small increases in the mean number of peduncle produced per plant over control due to different amino acids used although it were insignificant. The different concentrations of tryptophan 50, 100 and 150 ppm. produced the same values as those with aspartic and glutamic acids in both seasons as shown in table (5-a).

II.2.a.2. Mean diameter of peduncle :

Amino acids treatments with tryptophan, aspartic and glutamic acids with their different concentrations used, significantly increased the mean diemaeter of peduncle in the first season. While, in he second season only the high and medium concentrations of tryptophan and glutamic and the high concentration of aspartic gave significant increases in this concern as shown from the data in table (5-a). The highest concentration of each amino acid was of more effect in most cases.

II.2.a.3. Mean length of peduncle :

All the amino acids used with all their different concentrations significantly increased the mean length of peduncle of narcissus plants compared to untreated ones. There were no considerable differences between the different concentrations of each amino acids and also between the different amino acids itself concerning the mean length of peduncle as shown in table (5-a), however, tryptophan was slightly superior. The data was confirmed in both seasons 1993 /94 and 1994/95.

Table (5-a): Effect of Tryptophan, Aspartic and Glutamic Acids at Different Concentrations on Peduncle Parameters of *Narcissus tazetta* Plant During 1993 / 94 and 1994 / 95 Seasons.

Parameters / Treatments	Mean number of peduncle /plant		Mean diameter of peduncle cm.		Mean length of peduncle cm.		Mean Fresh weight of peduncle g.		Mean dry weight of peduncle g.		Mean fresh weight of peduncle g /plant.		Mean dry weight of peduncle g / plant.	
	1993/94	1994/95	1993/94	1994/995	1993/94	1994/995	1993/94	1994/995	1993/94	1994/95	1993/94	1994/95	1993/94	1994/95
Control (Dist. water)	1.00	1.00	0.80	0.90	31.67	33.33	4.67	4.67	0.47	0.48	4.67	4.67	0.47	0.48
Tryptophan 50 ppm.	1.33	1.67	0.90	0.93	36.00	36.00	7.00	7.33	0.70	0.77	9.33	12.33	0.93	1.30
Tryptophan 100 ppm.	1.67	1.67	0.97	1.00	36.67	37.33	7.33	7.33	0.82	0.80	12.33	12.33	1.32	1.30
Tryptophan 150 ppm.	1.67	1.67	1.00	1.03	37.00	37.33	8.00	8.67	0.83	0.87	13.33	14.33	1.35	1.43
Aspartic 50 ppm.	1.33	1.33	0.90	0.90	35.67	34.67	6.67	6.67	0.70	0.70	9.00	8.67	0.90	0.93
Aspartic 100 ppm.	1.67	1.67	0.93	0.93	36.33	36.00	7.33	7.00	0.74	0.71	12.00	11.67	1.24	1.18
Aspartic 150 ppm.	1.67	1.67	0.97	1.00	36.33	36.00	7.67	8.00	0.78	0.80	13.00	13.67	1.31	1.37
Glutamic 50 ppm.	1.33	1.33	0.90	0.90	35.67	36.00	6.67	6.67	0.70	0.70	9.00	8.67	0.90	0.93
Glutamic 100 ppm.	1.67	1.67	0.97	0.97	36.67	36.00	7.33	7.33	0.78	0.74	12.33	12.00	1.30	1.22
Glutamic 150 ppm.	1.67	1.67	0.97	1.03	36.67	36.00	7.67	8.33	0.80	0.83	12.67	13.67	1.34	1.37
L.S.D. at 5%	N.S	N.S	0.07	0.06	1.14	1.41	0.82	0.88	0.09	0.12	3.85	3.53	0.39	0.40
L.S.D. at 1%	N.S	N.S	0.09	0.08	1.57	1.93	1.12	1.20	0.12	0.16	5.27	4.83	0.53	0.55

II.2.a.(4-5). Mean fresh and dry weight of peduncle :

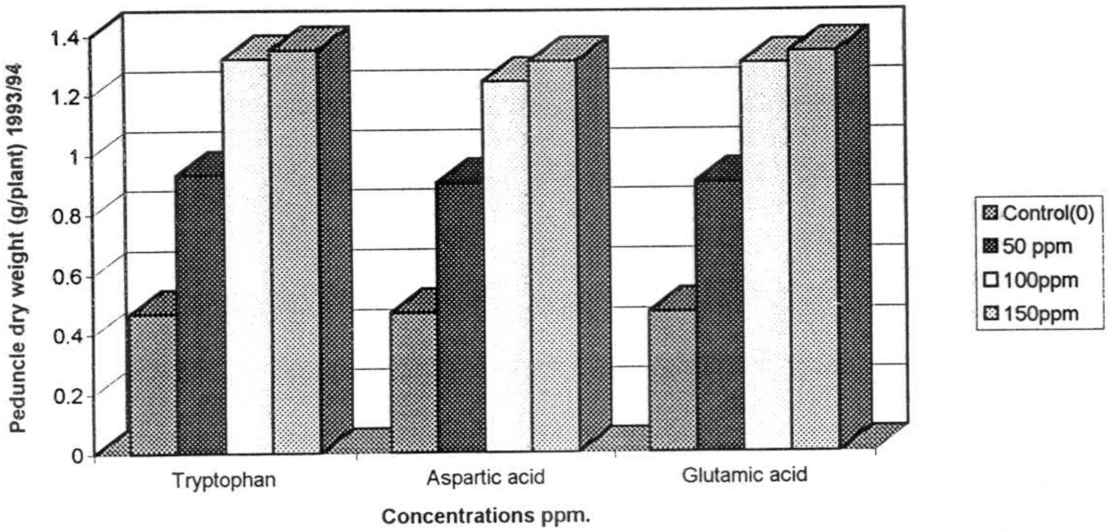
Significant increases in the mean fresh and dry weight of peduncle were observed due to amino acids treatments with their different concentrations in both seasons. The high concentration of each of the amino acids used resulted in an increase in the mean fresh and dry weight of peduncle, over both medium or low ones, this increase reached the level of significance in most cases specially with the dry weight.

Nearly similar trend of results was observed in both seasons.

II.2.a.(6-7). Mean fresh and dry weight of peduncle per plant in gm :

The mean fresh and dry weights of peduncle produced per plant were influenced clearly and significantly by amino acids treatments as shown in table (5-a) and Fig. (8). All concentrations of the three amino acids resulted in highly significant increases in the mean fresh and dry weight of peduncle produced per plant over the untreated ones. In all cases, the high concentration of each amino acid was superior than the medium or low one. The increases in the mean fresh and dry weight of peduncle per plant due to the amino acids treatments reached nearly 100% with the low concentration and more than 150% with the medium and high concentrations of all the mino acids used. This trend of results was constant with both fresh and dry weight of peduncle per plant and in both seasons.

These clear and large differences in the mean fresh and dry weight of peduncle per plant resulted from amino acids treatments could be attributed to the effect of amino acids in producing more than one peduncle from one bulb in some cases, and accordingly more fresh and dry weight of these peduncles.



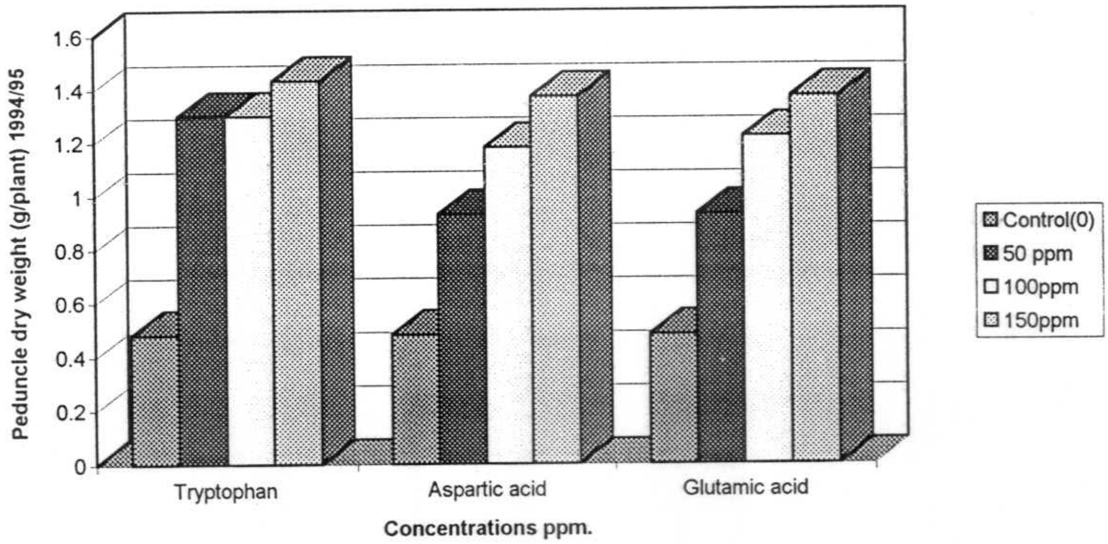


Fig. (8) : Effect of Tryptophan, Aspartic and Glutamic Acids at Different Concentrations on Dry Weight of Peduncle (g/plant) of *Narcissus tazetta* L.. Plant During 1993/94 and 1994/95 seasons.

II.2.b. Flowering parameters:

II.2.b.1. mean number of days to start flowering :

The mean number of days to start flowering significantly decreased due to amino acids treatmens as it is clear in table (5-b). All concentrations resulted in a significant decrease in the period needed to start flowring than untreated plants in both seasons. The trend of results showed that flowering was earlier as the amino acid concentration increased. Average decrease in the period to start flowering ranged between 6.33 to 9.33 days in the first season and from 4.33 to 7.33 days in the second one compared with the control. Tryptophan was the most effective amino acid in this concern.

II.2.b.2. Mean number of days to full blooming :

The period to full blooming of narcissus plant significantly decreased as a result of amino acids treatments. Data presented in table (5-b) revealed that narcissus plants reached full blooming earlier with about 20.00 to 21.33 days than control in the first season and from about 9.66 to 16.00 days in the second season as a result of the different concentrations used. The trend of results was similar to that previously obtained with the mean number of days to start flowering. Tryptophan was the most effective amino acid used and all the higher concentrations of the amino acids were more effective in this concern in the first and second seasons.

II.2.b.3. Mean number of florets per peduncle :

The mean number of florets per peduncle of narcissus plant was influenced by amino acids treatments as shown from the data in table (5-b). There were significant increases in florets number per peduncle due to different amino acids treatments at their different concentrations over

Table (5-b): Effect of Tryptophan, Aspartic and Glutamic Acids at Different Concentrations on Florets Parameters of *Narcissus tazetta* Plant During 1993 / 94 and 1994 / 95 Seasons.

Parameters / Treatments	Mean number of days to start flowering		Mean number of days to full blooming		Mean number of florets/ peduncle		Mean number of florets / plant		Mean diameter of florets cm.		Mean fresh weight of florets g / peduncle.		Mean fresh weight of florets g / plant.	
	1993/94	1994/95	1993/94	1994/995	1993/94	1994/995	1993/94	1994/995	1993/94	1994/95	1993/94	1994/95	1993/94	1994/95
Control (Dist. water)	90.00	88.33	105.33	102.33	7.67	7.67	7.67	7.67	0.83	0.90	5.33	6.00	5.33	6.00
Tryptophan 50 ppm.	83.67	84.00	85.33	92.67	9.33	9.67	12.33	16.00	1.07	0.97	8.00	8.33	10.67	14.00
Tryptophan 100 ppm.	81.33	82.00	84.33	89.00	9.67	9.67	16.00	16.33	1.10	0.97	8.00	9.00	13.33	15.00
Tryptophan 150 ppm.	80.67	81.00	84.00	86.33	9.67	9.67	16.33	16.33	1.10	1.10	8.33	9.00	13.67	15.00
Aspartic 50 ppm.	84.00	85.33	87.00	95.67	9.33	9.33	12.33	12.33	1.00	0.93	7.67	7.67	10.33	10.33
Aspartic 100 ppm.	83.00	84.00	87.00	95.00	9.33	9.33	15.67	15.33	1.03	0.93	7.67	7.67	12.67	13.00
Aspartic 150 ppm.	81.33	82.00	86.00	94.33	9.33	9.33	16.33	15.67	1.07	1.03	8.00	8.67	13.33	14.33
Glutamic 50 ppm.	84.00	84.33	85.67	92.67	9.33	9.33	12.33	12.67	1.00	0.93	7.67	8.33	10.33	11.00
Glutamic 100 ppm.	82.33	83.00	85.33	92.67	9.33	9.33	15.33	15.33	1.07	0.93	8.00	8.33	13.33	13.33
Glutamic 150 ppm.	81.00	81.67	85.33	89.33	9.67	9.67	16.00	16.00	1.10	1.07	8.00	8.67	13.67	14.33
L.S.D. at 5%	1.35	1.83	1.59	2.88	1.04	0.69	4.45	4.84	0.07	0.09	0.89	0.83	4.20	3.91
L.S.D. at 1%	1.85	2.51	2.18	3.94	N.S	0.93	N.S	N.S	0.10	0.12	1.22	1.13	5.75	5.36

control in both seasons, however the concentrations had no clear or linear effect. The same trend was observed in the second season.

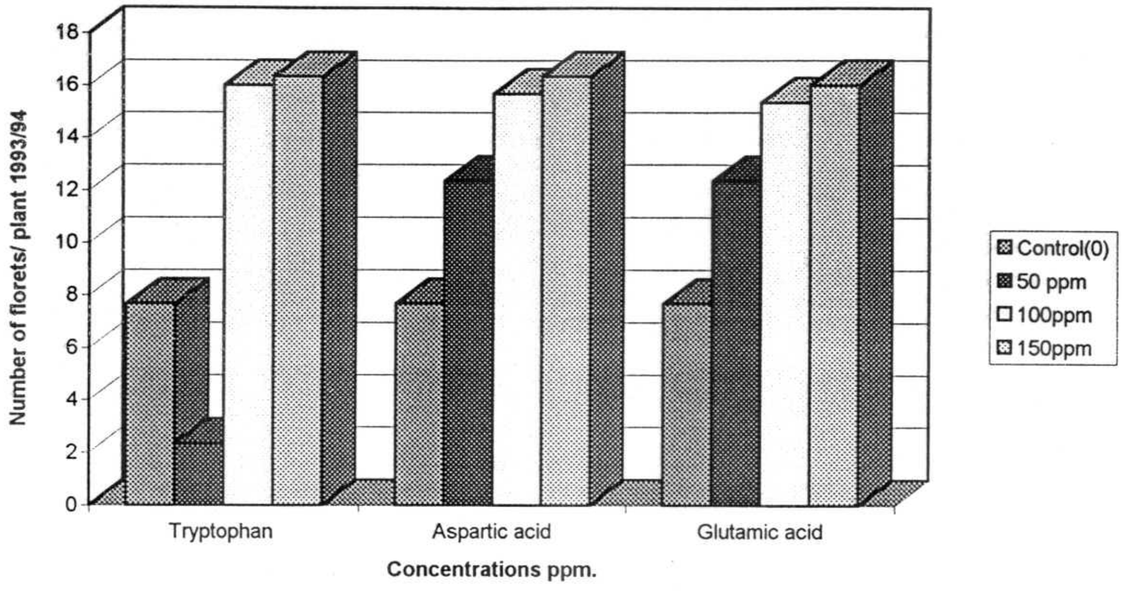
II.2.b.4. Mean number of florets per plant :

The mean number of florets produced per plant significantly increased by amino acids treatments. The low concentration (50 ppm.) of each amino acid resulted in high number of florets which reached more than 50% over control plants. While the medium and the high concentrations (100 and 150 ppm) gave more than 100% increase in this concern.

It could be noticed that the high concentration of each amino acid was always active over medium or lower one Tryoptophan with its different concentrations was more effective than other amino acids in producing the higher number of florets per plant as shown in table (5-b) and Fig. (9). It could be noted that, the high increase in the mean number of florets per plant resulted from amino acids treatments may be due to their effect on increasing the produced number of peduncle on one plant. ***Gamal El-Din (1992)*** on *Hyoscysamus muticus*, found that application of ornithine, proline and cysteine at 10, 50 and 100 pm cause significant increase in the flowers number per plant.

II.2.b.5. Mean diameter of florets :

All amino acids with their different concentrations significantly increased the mean diameter of floret compared to control plants in the first season, but only the highest concentration of each amino acid increased it in the second season as shown in table (5-b). Tryptophan was the most effective in this concern followed by glutamic then aspartic.



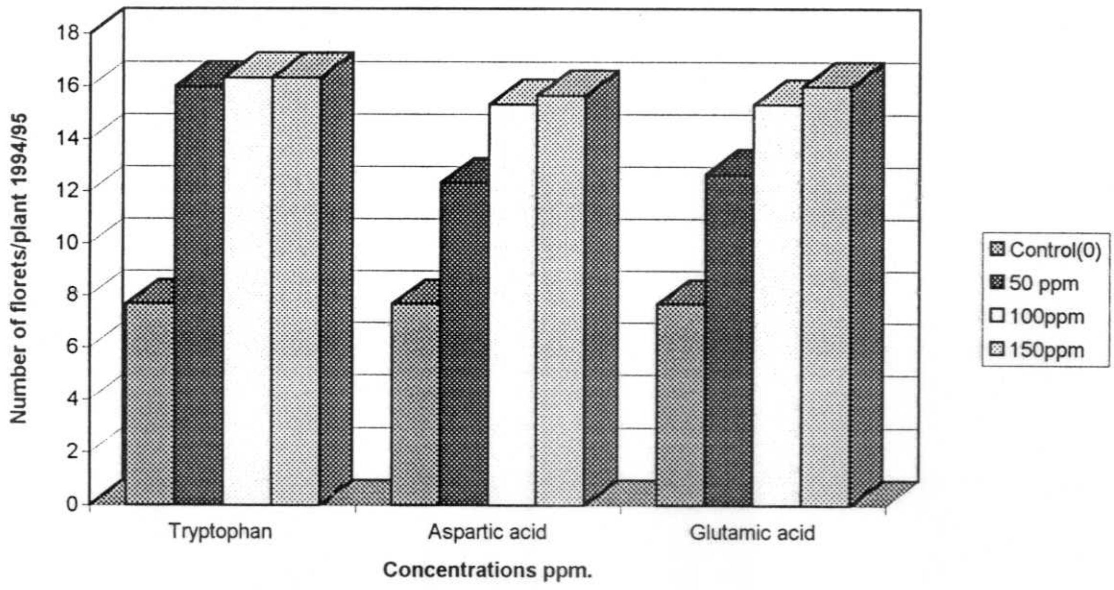


Fig. (9) : Effect of Tryptophan, Aspartic and Glutamic Acids at Different Concentrations on Number of Florets/ plant of *Narcissus tazetta* L. Plant During 1993/94 and 1994/95 seasons.

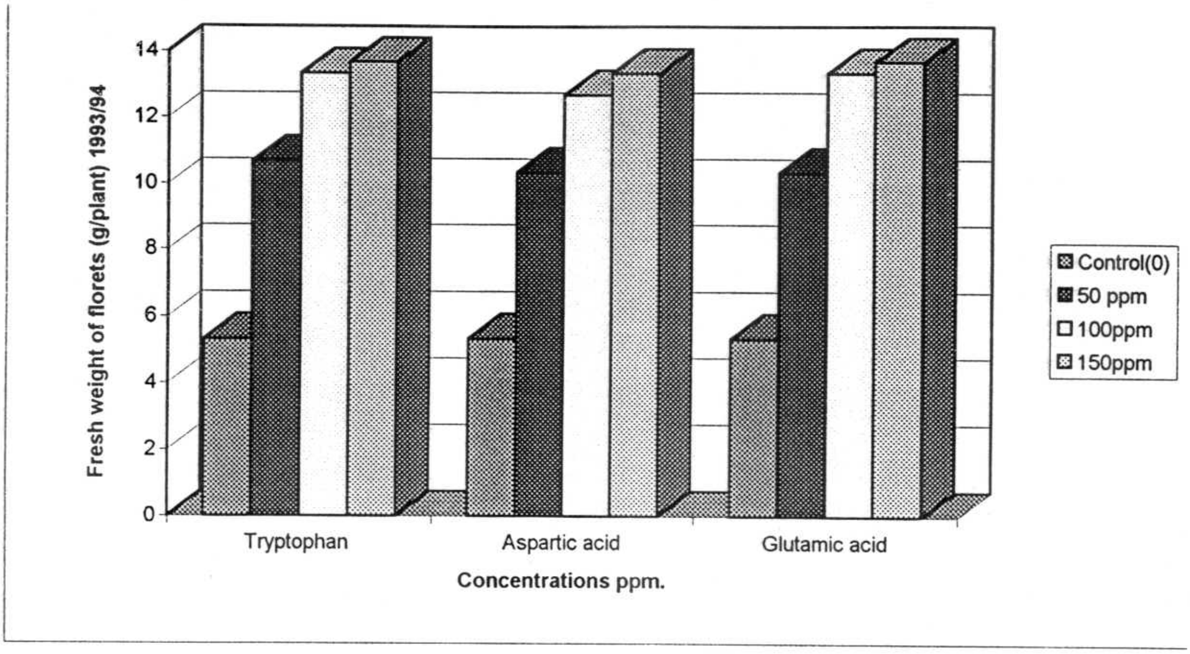
II.2.b.6. Mean fresh weight of florets per peduncle :

The mean fresh weight of florets significantly increased over control by different amino acids used as it is clear from the data in table (5-b). Also the different concentrations of each amino acid produced significant increase in the mean fresh wieght of florets per peduncle compared to control in both seasons. Trytophan was also the most effective one in this regard over both glutamic or aspartic acid.

II.2.b.7. Mean frsh weight of florets per plant:

The amino acids treatments were of great effect in increasing the mean fresh weight of florets per plant as shown in table (5-b) and Fig. (10). This great increases came directly due to the amino acids effect on increasing the number of florets on the peduncle and their weight, and indirectly due to their effect on increasing the number of peduncle produced per one plant which led to an increase reached about 50% with the low concentrations in most cases and more than 100% with the medium and high concentrations of all the amino acids used in both seasons. It is also clear that Tryptophan was of greatest role in this regard.

It could be concluded from this part that foliar spraying of amino acids (tryptophan, aspartic and glutamic acids) on *Narcissus tazetta* plant resulted in improving effects on vegetative growth parameters; leaves number, length and weight, bulbs number and weight. They had also promoting effect on flowering as earliness and flower quality parameters. This may be due to their role in protein assimilation which enable more cell growth division.



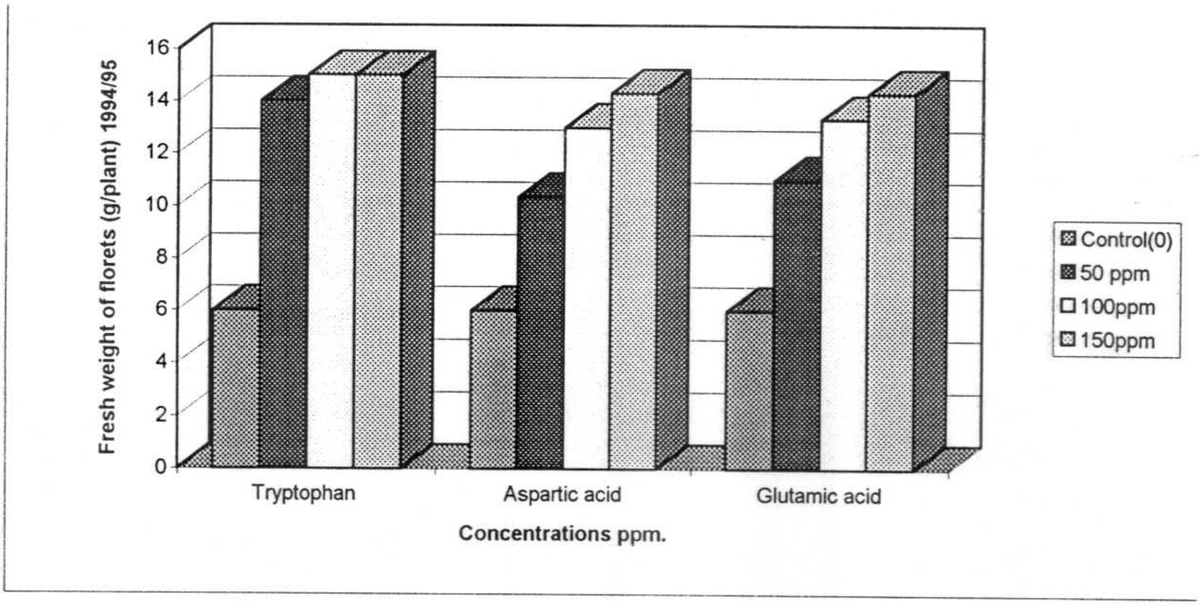


Fig. (10) : Effect of Tryptophan, Aspartic and Glutamic Acids at Different Concentrations on Fresh Weight of Florets (g/plant) of *Narcissus tazetta* L. Plant During 1993/94 and 1994/95 seasons.

It could also be concluded that, all the amino acids did not differ in their effect on all the aspects studied, although tryptophan was of superior effect on all aspects over the other amino acids under study. The higher concentration of each amino acid was mostly of the highest effect on all the studed charachers.

II- Chemical contituents:

1- Concrete oil percentage in florets :

The data in table (6) showed that, all the tested treatments caused significant increase in the concrete oil percentage in florets in 1993 / 94 and 1994 / 95 seasons. The best result in this study was obtained when the plants were sprayed with tryptophan at 150 ppm., which gave 5.85% and 6.52% increase in the first and second seasons respectively, followed by spraying the plants with glutamic acid at 150 ppm. which produced 5.82% and 5.87% increase in both seasons.

2- Absolute oil percentage in florets :

It was noticed that, there is no significant differences between the different amino acids on absolute oil extracted from the florets.

In this respect these results hold true with the findings of ***Mohamed et al. (1992),*** they sprayed the plants with tryptophan and had no significant effect on the oil percentage of Aplinia leaves.

3- Total alkaloids percentage in peduncles :

It is clear from table (6), that the total alkaloids percentage in peduncles were differed from treatment to another. All the tested treatments caused significant increase in total alkaloids percentage in peduncle, and the superior treatment in this respect was spraying the plants with tryptophan at 150 ppm., which gave 83.56% and 98.61% increase over the control in the first and second seasons, respectively.

Table (6): Effect of Tryptophan, Aspartic and Glutamic Acids at Different Concentrations on Some Chemical contituents of Different Plant Organs of *Narcissus tazetta* During 1993 - 1994 / 1994 - 1995 Seasons.

Parameters / Treatments	Concrete oil percentage in florets		Absolute oil percentage in florets		Total alkaloids percentage in peduncle		Total alkaloids percentage in leaves		Total alkaloids percentage in bulbs	
	1993 / 94	1994 / 95	1993 / 94	1994 / 95	1993 / 94	1994 / 95	1993 / 94	1994 / 95	1993 / 94	1994 / 95
Control 0.0 ppm	0.467	0.460	0.015	0.016	2.001	2.010	2.202	2.251	3.510	3.755
Tryptophan 50 ppm	0.473	0.480	0.016	0.017	3.251	3.571	3.301	3.602	4.533	5.593
Tryptophan 100 ppm.	.0473	0.487	0.017	0.017	3.612	3.893	3.991	3.993	5.402	6.003
Tryptophan 150 ppm.	0.473	0.490	0.017	0.018	3.673	3.992	4.011	4.013	5.593	6.022
Aspartic 50 ppm	0.457	0.477	0.016	0.016	3.242	3.373	3.291	3.501	4.202	4.981
Aspartic 100 ppm.	0.470	0.487	0.016	0.016	3.342	3.613	3.902	3.892	4.593	5.982
Aspartic 150 ppm.	0.473	0.487	0.016	0.017	3,404	3.654	4.002	4.002	4.982	5.993
Glutamic 50 ppm	0.463	0.477	0.016	0.016	3.243	3.372	3.291	3.513	4.304	4.992
Glutamic 100 ppm.	0.470	0,483	0.016	0.016	3.372	3.673	3.970	3.903	4.604	5.992
Glutamic 150 ppm.	0.473	0.487	0.017	0.017	3.505	3.705	4.002	4.004	5.165	6.003
L.S.D at 5%	0.009	0.007	N.s	N.s	0.022	0.052	0.055	0.028	0.018	0.053
L.S.D. at 1%	0.013	0.010	N.s	N.s	0.071	0.071	0.076	0.038	0.024	0.073

4- Total alkaloids percentage in leaves :

The data presented in table (6) showed that, all the tested treatmens caused significant increase in total alkaloids percentage in leaves in both seasons. However, spraying plants with tryptophan at 150 ppm. was the best in this respect. This treatment gave 82.15% and 78.28% increase in both seasons adopted.

In the second rank was spraying glutamic acid in dose of 150 ppm. which produced [81.74% and 77.88%] then came the treatment of spraying aspartic acid 150 ppm. which gave an increase of 81.70% and 77.79% in both seasons, respectively.

5- Total alkaloids percentage in bulbs :

The effect of spraying amino acids; tryptophan, glutamic and aspartic acids on the alkaloids percentage were studied and the data were compiled in table (6) which revealed that, all the amino acids with its different doses exerted a highly significant increase in the total alkaloids. The trend of increase due to the different acids were the same like that with leaves and peduncle, tryptophan, followed by glutamic then aspartic, affected the total alkaloid in the two seasons of this investigation.

The same findings were reported by different authors on other plants with the same amino acids or others. ***Koriesh (1984),*** obtained higher alkaloid content of *Catharanthus roseus* by spraying the plant with tryptophan. ***Harridy (1986)*** came to the same conclusion with the same plant and the same amino acids.

El-Sherbeny and Hassan (1987), on *Datura stramonium* obtained higher alkaloidal content by spraying the plants with phenylalanine and thiamine. On the same plant ***El-Bahr et al. (1990)*** obtained higher increase in alkaloid content by treating the plants with phenylalanine and ornithine. With other amino acids, ornithine, proline, and cysteine, ***Gamal El-Din (1992),*** on *Hyocyamus muticus*, obtained higher alkaloid content in the leaves.

In conclusion of the effect of different amino acids on alkaloid accumulation, it is well known that biosynthetically the alkaloids are derived almost from the amino acids, ornithine lysine, phenylalanin, tyrosine and tryptophane ***Winterstein and Trier (1931).***

Amaryllidaceae alkaloids to which the nacissus alkaloids belong were derived from the amino acid phenylalanine or tyrosine which were decarboxylated to its amine. This amine supplies the N of the Amaryllidaceae alkaloids.

The indole alkaloid established or derived its indole nucleus from the tryptopham amino acid, which is furnished by inevalonate or isopentyl pyrophosphate. So, the exogenous addition of amino acids to plant represent an addition of a precursor which inturn go through the metabolic pathway of the alkaloids and hence initiate the formation of it and increase its accumulation.

This was found with tryptophan rather than the two other amino acids aspartic or glutamic.

So, one can explain the role of tryptophare that it affer its nucleus which furnish the alkaloid conserved with the plants with net result of increasing its accumulation. The other two amino acids may initiate the alkaloid formation or the amide systesis with end result of increasing compounds with N structure either alkaloids or N bases ***(Dieter Hess, 1975).***

So, if the object of any studies is to increase the specific alkaloid of any plant, it must be go firstly to its precursor, the amino acids then it was added to the soil or sprayed with it, or recently it was added to the culture which quickly biosynthesis to the desired alkaloid.

III. STORAGE OF THE BULBS UNDER DIFFERENT TEMPERATURES:

Effect of different storage temperatures on vegetative growth, flowering and chemical constituents of *Narcissus tazetta* plants during 1993 / 94 and 1994 / 95 seasons :

III.1. Vegetative growth :

III.1.a. Leaves parameters :

III.1.a.1. Mean number of leaves per plant :

Storage of narcissus bulbs at different temperatures clearly affected the number of leaves produced per plant as it is clear from the data in table (7-a). These data showed that storing the bulbs at room temperature (27± 2°C) decreased the number of leaves per plant than those stored in soil (25 ± 2°C). While cold storage at low temperature (10 ± 2°C) or (5 ± 2°C) increased clearly the mean number of narcissus leaves per plant in both seasons over both bulbs stored in soil or at room temperature. The increase was insignificant with (10 ± 2°C) but was significant with those stored in cold temperature (5 ± 2°C) in the first season, while the increase was highly significant with the two cold treatments in the second season. The coolest treatment was the most effective one in increasing leaves number per plant. ***Nabih (1992)*** on Freesia observed similar results.

III.1.a.2. Mean length of leaves :

The data relative to mean length of leaves table (7-a) revealed no significant differences between plants which its bulbs stored at different temperatures in the first season, although bulbs stored at room temperature produced leaves of less length than both control [Stored in soil] or those stored at low temperature (10 ± 2°C and 5 ± 2°C). Also bulbs stored at

Table (7-a): Effect of Different storage Temperatures of bulbs on Leaves Parameters of *Narcissus tazetta* Plant During 1993/94 and 1994 /95 Seasons.

Parameters / Treatments	Mean number of leavs / plant		Mean Length of Leaves cm.		Mean Fresh weight of Leaves g / plant		Mean dry weight of Leaves g/plant		Mean dry weight of Leaves g/ plot	
	1993/94	1994/95	1993/94	1994/995	1993/94	1994/995	1993/94	1994/995	1993/94	1994/995
(25± 2°C) In Soil	18.67	18.00	58.33	59.67	89.33	111.33	14.29	17.81	142.93	178.13
(27 ± 2°C) In room	16.67	16.67	55.00	56.00	89.33	110.00	14.29	17.60	142.93	176.00
10 ± 2°C (In refrigerator)	19.33	22.00	58.33	63.67	94.00	130.00	15.04	20.40	150.40	204.00
5 ± 2°C (In refrigerator)	22.00	22.33	60.00	64.33	95.33	130.67	15.25	20.91	152.53	209.07
L.S.D. at 5%	2.21	0.94	3.33	1.60	2.31	1.49	0.37	0.24	3.69	2.36
L.S.D. at 1%	3.35	1.43	5.04	2.42	3.50	2.26	0.56	0.36	5.59	3.58

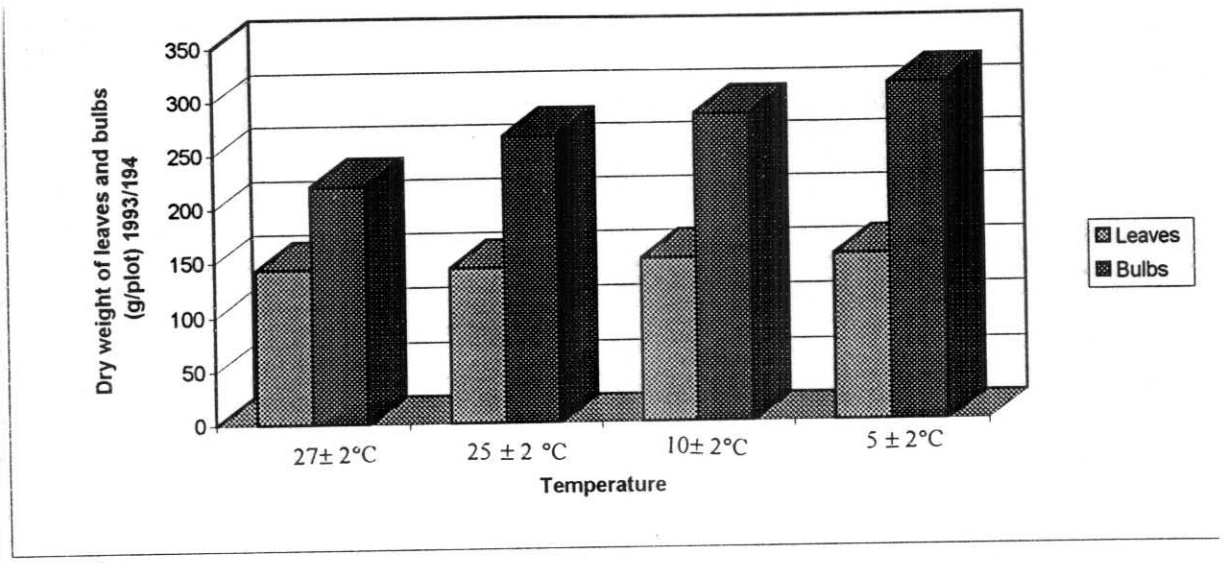
room temperature produced significantly shorter leaves compared to soil storage or cold storage in the second season. It could be said that the lowest storage temperature (5 ± 2°C) was of most effect on increasing the mean length of narcissus leaves over all other treatments.

III.1.a.(3,4). Mean fresh and dry weights of leaves per plant :

The different storage temperatures of bulbs resulted in high significant differences in the mean fresh and dry weights of leaves produced by plant. Data in table (7-a), show that bulbs stored at low temperatures (10 ± 2°C and 5 ± 2°C) produced the heviest fresh and dry weights of leaves per plant over both stored bulbs at room temperature or in soil till time of planting. The increases in mean fresh and dry weight of leaves due to cold storage was highly signficant over storage at room temperature (27 ± 2°C) or in soil (25 ± 2°C). There were no clear differences in the mean fresh and dry weights of leaves produced per plant between bulbs stored at room temerature or in soil. The trend of results was constant in the two seasons of the experiments.

III-1.a.5. Mean dry weight of leaves per plot :

The mean dry weight of leaves per plot as affected by storage of the bulbs under different temperatures (27± 2°C, 25 ± 2°C, 10 ± 2°C and 5 ± 2°C) were clear from the data in table (7-a) and Fig. (11). The data in this concern follow the same trend previously obtained with the mean dry weight of leaves per plant, since it was accordingly calculated owing to these results.



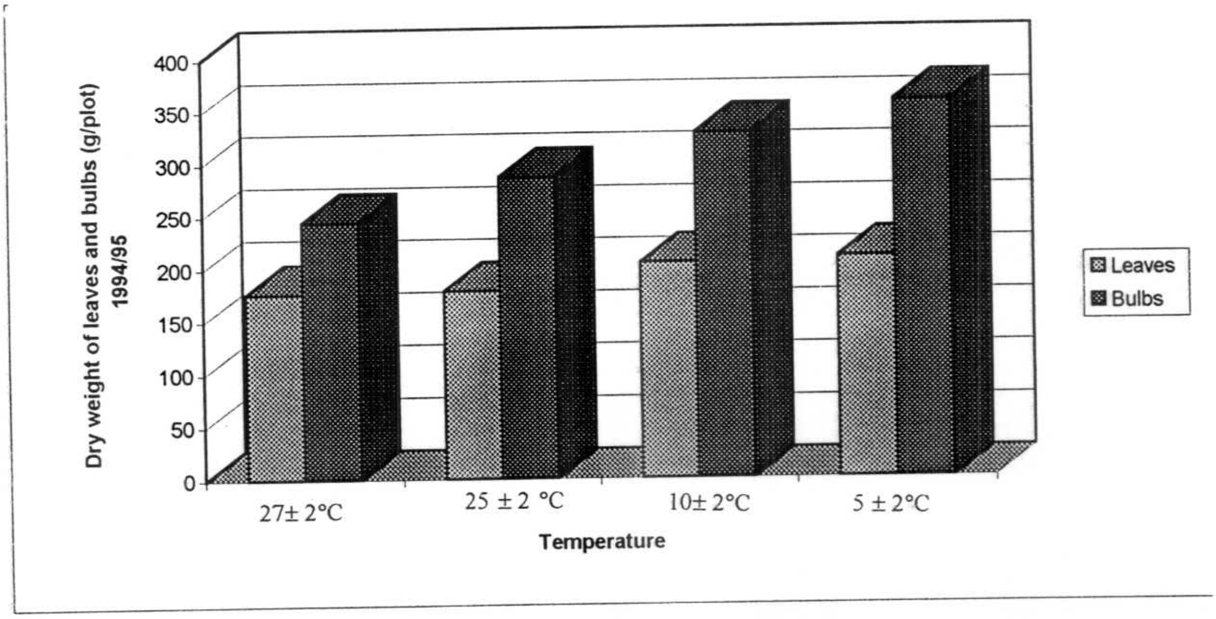


Fig. (11) : Effect of Different Storage Temperature of Bulbs on Dry Weight of Leaves and Bulbs (g/plot) of Narcissus tazetta L. Plant During 1993/94 and 1994/95 Seasons.

III.1.b. Bulbs parameters :

III.1.b.1. Mean number of bulbs per plant :

The mean number of bulbs produced per narcissus plant was slightly affected by the different temperatures used in storage of the mother bulbs. The data presented in table (7-b) showed no significant differences in the mean number of bulbs per plant due to different storage temperatures. The lowest storage temperature (5 ± 2°C) showed significant increase in this concern over all other treatments in the first season. While, with the second one no significant differences could be observed, although the trend of results brought out slight superiority for cold storage than both room temperature or soil storage.

Slight decrease in the mean numbe of bulbs was noticed due to storage at room temperature (27± 2°C) in both seasons. These results were confirmed by ***Nabih and Aly (1989) and Nabih (1992)*** on freesia plant.

III.1.b.(2-3). Mean fresh and dry weights of bulbs per plant :

Data compiled in table (7-b), show the mean fresh and dry weights of produced bulbs as affected by different storage temperatures. These data showed that although the mean number of bulbs did not respond to the storage temperatures yet the mean fresh and dry weights responded well to these treatments. The lower temperature treatment (5 ± 2°C) produced the heaviest fresh and dry weight of bulbs, followed by the more higher temperature (10 ± 2°C), then those stored in soil. The bulbs stored at room temperature (27 ± 2°C) produced the lowest fresh and dry weights of the produced bulbs. The data was confirmed in both seasons of the experiments and came in agreement with the results observed by ***Nabih and Aly (1989) and Nabih (1992)*** on freesia.

Table (7-b): Effect of Different Storage Temperatures of bulbs on Bulb Parameters of *Narcissus tazetta* Plant During 1993 / 94 and 1994 / 95 Seasons.

Parameters / Treatments	Mean number of bulbs / plant		Mean fresh seight of bulbs g/plant		Mean dry weight of bulbs g/plant		Mean fresh weight of bulbs g/plot		Mean dry weight of bulbs g/plot	
	1993/94	1994/95	1993/94	1994/995	1993/94	1994/995	1993/94	1994/995	1993/94	1994/995
(25 ± 2°C) In soil	6.33	6.67	102.00	110.00	26.52	28.60	1020.00	1100.00	265.20	286.00
(27 ± 2°C) In room	5.33	5.67	89.67	99.33	22.01	24.40	896.67	993.33	220.13	244.00
10 ± 2°C (In refregerator)	6.67	7/33	115.00	12.6.33	28.48	32.76	1150.00	1263.33	284.80	327.60
5 ± 2°C (In refregerator)	7.67	8.33	127.00	140.00	31.36	35.76	1270.00	1400.00	311.60	357.60
L.S.D. at 5%	0.88	N.S	3.60	1.92	1.13	1.18	36.02	19.20	11.31	11.77
L.S.D. at 1%	1.34	N.S	5.46	2.91	1.71	1.78	54.57	29.09	17.13	17.82

II.1.b.(4-5). Mean fresh and dry weights of bulbs per plot :

The yield of bulbs produced per plot as affected by storage temperature were tabulated in table (7-b) and illustrated in Fig. (11). The increase follow the same trend previosly noticed with the mean fresh and dry weight of bulbs produced per plant, since it is mathematically counted.

It could be concluded that storage of mother bulbs of Narcissus plant at low temperature was the best treatment to promote vegetative growth as fresh and dry weights of the produced leaves and bulbs. It could be also recorded from the previously mentioned results that field storage of bulbs is much better to induce vegetative growth than storage at room temperature, if cold storage is not available. Cold storage is an important treatment in keeping nutrient contents and indogenous chemical changes in the bulb which improve early sprouting and accordingly more vegetative growth and early flowering. Many investigators recorded the effect of cold storage of bulbs of different plants on the vegetative growth and the producing bulbs, among them ***Nabih and Aly (1989) and Nabih (1992)*** on freesia plant, who found that, cold storage at 5 ± 2°C of corms, significant increased the corms yield.

III.2. Flowering :

III.2.a. Peduncle parameters :

III.2.a.1. Mean number of peduncle per plant :

Storage temperature of narcissus bulbs had no significant effect on increasing the mean number of peduncle produced per plant as shown in table (8-a). There were slight increases in the mean number of peduncles per plant due to bulbs stored at 5±2°C, however insignificant. This effect was attained in the two seasons. Also, the data showed that bulbs stored in soil or at room temperature produced one peduncle per plant in both seasons. Similar results was found by ***Nabih (1992)*** on freesia.

III.2.a.2. Mean diameter of peduncle :

Insignificant differences in the mean diameter of peduncle due to different storage temperatures of bulbs were stated from the data in table (8-a). Again the storage temperature had no effect on peduncle diameter or its number.

III.a.3. Mean length of peduncle :

Concerning mean length of peduncle, the data of the first season in table (8-a) revealed significant increases in mean length of peduncle with the colder treatments which favours the peduncle length. Soil stored bulbs produced more taller peduncle than that of bulbs stored at room temperature. However, the data of the second season showed no significant differences between all storage treatments. These results came in agreement with those obtained by ***Greef (1985)*** on Narcissus and ***Nabih (1992)*** on freesia.

Table (8-a): Effect of Different storage Temperatures of bulbs on Peduncle Parameters of *Narcissus tazetta* Plant During 1993/94 and 1994/95 Seasons.

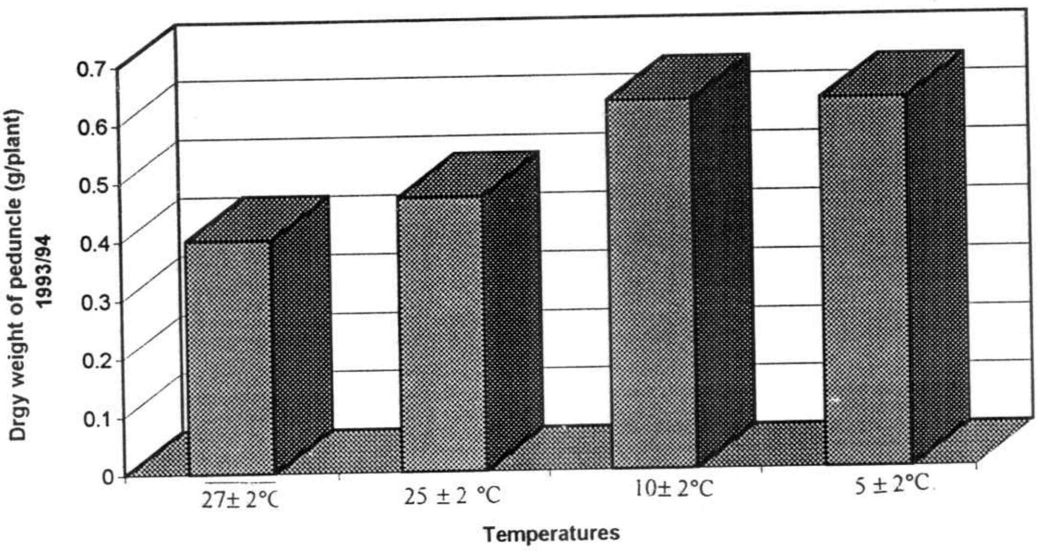
Parameters / Treatments	Mean number of peduncle /plant		Mean diameter of peduncle cm.		Mean length of peduncle cm.		Mean Fresh weight of peduncle g.		Mean dry weight of peduncle g.		Mean fresh weight of peduncle g / plant		Mean dry weight of peduncle g/ plant	
	1993/94	1994/95	1993/94	1994/995	1993/94	1994/995	1993/94	1994/995	1993/94	1994/95	1993/94	1994/95	1993/94	1994/95
(25 ± 2 °C) In soil	1.00	1.00	0.80	0.90	31.67	33.33	4.67	4.67	0.47	0.47	4.67	4.67	0.47	0.47
(27± 2°C) In room	1.00	1.00	0.73	0.90	30.33	33.00	4.00	4.33	0.40	0.44	4.00	4.33	0.40	0.44
10± 2°C (In refrigerator)	1.33	1.33	0.80	0.93	32.00	33.67	4.67	5.33	0.47	0.57	6.33	7.33	0.63	0.76
5 ± 2°C (In refrigerator)	1.33	1.67	0.83	0.97	32.00	34.00	4.67	6.00	0.47	0.61	6.33	10.00	0.63	1.02
L.S.D. at 5%	N.S	N.S	N.S	N.S	0.74	N.S	N.S	1.10	N.S	N.S	N.S	N.S	N.S	N.S
L.S.D. at 1%	N.S	N.S	N.S	N.S	1.12	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S

III.2.a.(4.5). Mean fresh and dry weight of peduncle :

The mean fresh and dry weight of one peduncle was not affected with different storage temperature in both seasons except with the lowest temperature treatment (5 ± 2°C) which produced significant increase in this respect over all other treatments, in the second season only. Cold storage treatments and soil stored bulbs had the same values of peduncle fresh and dry weight, and were slightly more heavey over that obtained by storing at room temperature in the first season. The data of the second season showed higher values than the first one.

III.2.a.(6-7). Mean fresh and dry weight of peduncle per plant:

Table (8-a) and Fig. (12) indicated that no significant differences were showed due to different storage temperature of narcissus bulbs. Inspite of this unsignificancy yet the colder temperature produced the higher fresh and dry weight of peduncle specially in the second season and with 5 ± 2°C. Concerning fresh weight of peduncle per plant in the second season marked increases were recorded in favour of cooling treatments of bulbs at 5 ± 2°C or 10 ± 2°C over those stored at room temperature (27 ± 2°C) or stored in soil. The values recorded were (6.33 & 10.33 gm), (6.33 & 7.33 gm) and (4.00 & 4.33 gm) compared to (4.67 & 4.67 gm) for bulbs stored at 5 ±2°C, 10 ±2°C, 27 ± 2°C and stored in soil (25 ± 2°C) in the first and second season respectively. Also slight decrease was noticed in the mean fresh weight of peduncle per plant due to storage bulbs at room temperature compared with those stored in the soil. As for dry weight of peduncle per plant, it could be said that inspite of the unsignificant differences cleared by the statistical analyses, the data revealed that, bulbs stored at cold (5 ± 2°C or 10 ± 2°C) resulted in the heviest dry weight of peduncle per plant in both seasons.



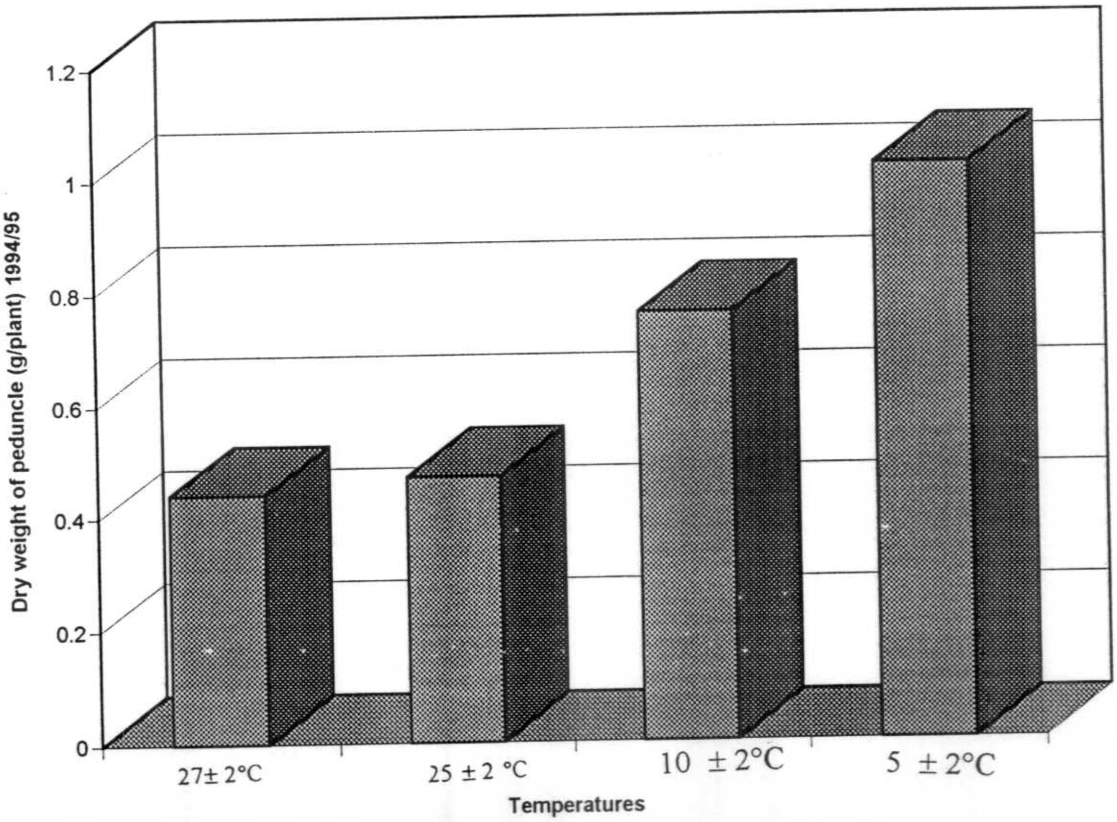


Fig. (12) : Effect of Different Storage Temperature of Bulbs on peduncle dry weight (g/plant) of Narcissus tazetta L. Plant During 1993/94 and 1994/95 Seasons.

Cooling treatments (5 ± 2°C and 10 ± 2°C) produced dry weight of peduncle reached 0.63 gm. and 0.75 gm for 5 ± 2°C in the first and second season respectively compared to 40.00 gm and 47.00 gm in the first season and 0.44 gm and 0.47 gm in the second one for bulbs stored at room temperature and those stored in the soil respectively.

It could be concluded that cold storage of bulbs at 5 ± 2°C or 10 ± 2°C have an improving effect on the mean number, length, fresh and dry weight of peduncle of *Narcissus tazetta* plant. Also, bulbs stored in the soil produced better characters of the producing peduncle than those stored at room temperature. The same results were found by ***Greef (1985)*** on Narcissus plant and ***Nabih (1992)*** on fressia plants.

III.2.b. Flowering parameters :

III.2.b.1. Mean number of days to start flowering :

Data compiled in table (8-b), pointed out highly significant decreases in the mean number of days needed to start flowering of *Narcissus tazetta* plant, due to cold storage of bulbs at 10 ± 2°C or 5 ± 2°C in the first season compared to those stored at room temperature or stored in the soil. The lowest storage temperature (5 ± 2°C) resulted in earlier flowering of 10.00 days than storage in soil, and 11.00 days earlier than room temperature storage. Also low temperature (10± 2°C) resulted in early flowering by 5.00 days before the treatment of storage in the soil and 6.00 days before storage at room temperature. Comparing storage in the soil and storage at room temperature there was slight difference in this concern in favour of soil storages, since it brought earlier flowering, ranged from one to two days than storage at room temperature. The data of the second season proved nearly similar trend of results to that of the first one as shown in table (8 b). ***Yimin et al. (1995),*** on freesia came to similar results.

III.2.b.2. Mean number of days to full blooming :

The maximum flowering of *Narcissus tazetta* plants was reached after 94 days and 91.33 days for bulbs stored at the lowest storage temperature used (5 ± 2°C) for first and second seasons respectively, compared to 105.33 days and 102.33 days for bulbs stored in the soil, and 114.00 days and 110.67 days for bulbs stored at room temperature in both seasons respectively. The low storage temperature of (10±2°C) resulted in significantly shorter period till full blooming than both room temperature or soil stored bulbs in both seasons of the experiments. It could be stated

Table (8-b): Effect of Different storage Temberatures of bulbs on Florets Parameters of *Narcissus tazetta* Plant During 1993 /94 and 1994/95 Seasons.

Parameters / Treatments	Mean number of days to start flowering		Mean number of days to full blooming		Mean number of florets/ peduncle		Mean number of florets / plant		Mean diameter of florets cm.		Mean fresh weight of florets g/ peduncle		Mean fresh weight of florets g/ plant	
	1993/94	1994/95	1993/94	1994/995	1993/94	1994/995	1993/94	1994/995	1993/94	1994/95	1993/94	1994/95	1993/94	1994/95
(25± 2°C) In Soil	90.00	88.33	105.33	102.33	7.67	7.67	7.67	7.67	0.83	0.90	5.33	6.00	5.33	6.00
(27 ± 2 °C) In room	91.00	90.33	114.00	110.67	7.67	7.67	7.67	7.67	0.80	0.80	5.00	5.67	5.00	5.67
10 ± 2°C (In refrigerator)	85.00	86.67	100.33	94.00	8.00	8.67	11.00	11.67	0.90	0.90	6.00	6.33	8.00	8.67
5 ± 2°C (In refrigerator)	80.00	81.00	94.00	91.33	8.67	9.00	11.67	15.00	0.97	0.90	6.33	7.00	8.33	11.67
L.S.D. at 5%	1.91	2.81	1.67	1.79	N.S	0.99	N.S	N.S	0.09	N.S	0.88	0.74	N.S	N.S
L.S.D. at 1%	2.90	4.25	2.52	2.72	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S

that, cold storage of bulbs resulted in early flowering and that the rate of earliness was proportional with the decrease in storage temperature.

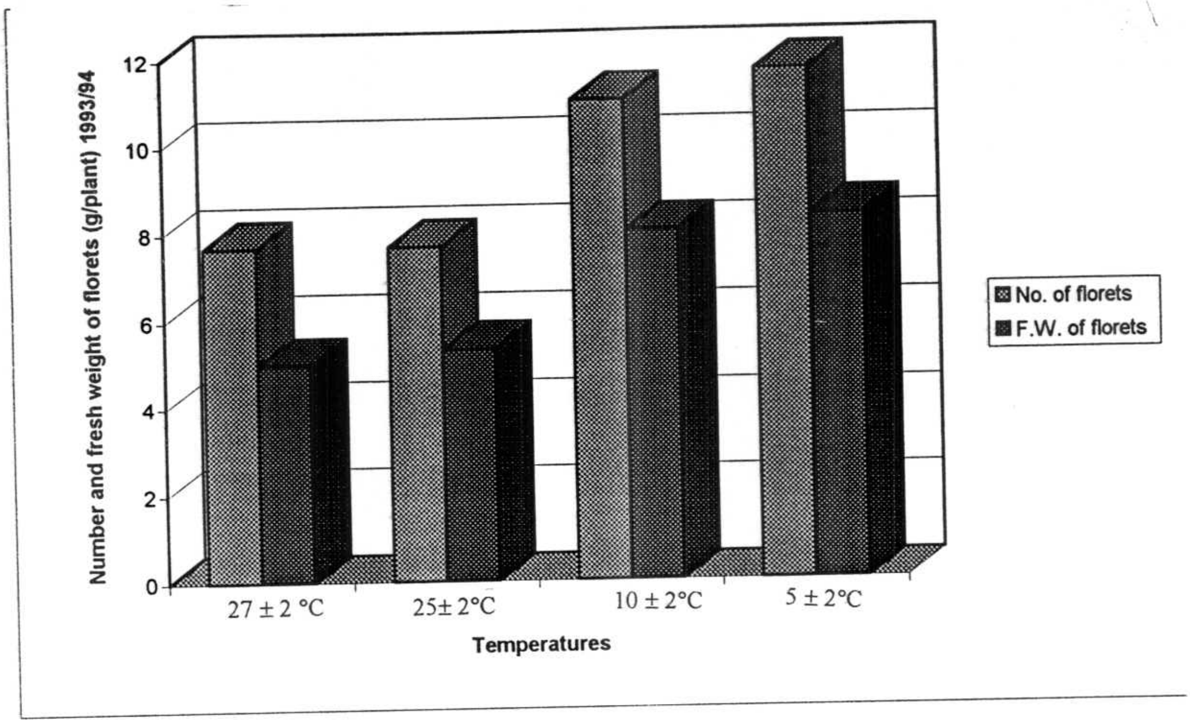
Bulbs stored in soil flowered earlier than those stored at room temperature, the difference reached about 8.67 to 8.34 days in both seasons.

III.2.b.3. Mean number of florets per peduncle :

There were no significant differences between different storage temperatures concerning the mean number of florets per peduncle as shown in table (8-b). Bulbs stored in soil and those stored at room temperature produced the same number of florets per peduncle in both seasons (7.67). Cold stored bulbs produced slightly higher number of florets per peduncle over the previous treatments although the differences were insignificant. The results hold true with those reported by ***Nabih (1992)*** on freesia.

III.2.b.4. Mean number of florets per plant :

The effect of different storage temperatures of bulbs on the mean number of florets produced by plant seemed to be more clearer, since cold storage, in some cases, produced more than one peduncle from one bulb. This accordingly increased the mean number of florets per plant than the uncooled ones. So, the mean number of florets per plant increased significantly by cold storage at 10 ± 2°C or 5 ± 2°C in both seasons as it is clear from the data in table (8-b) and Fig. (13). Also, the lowest storage temperature of 5 ± 2°C was more effective in increasing the mean number of florets specially in the second season. The ordinary storage of bulbs in soil or at room temperature, produced plants of less number of florets per



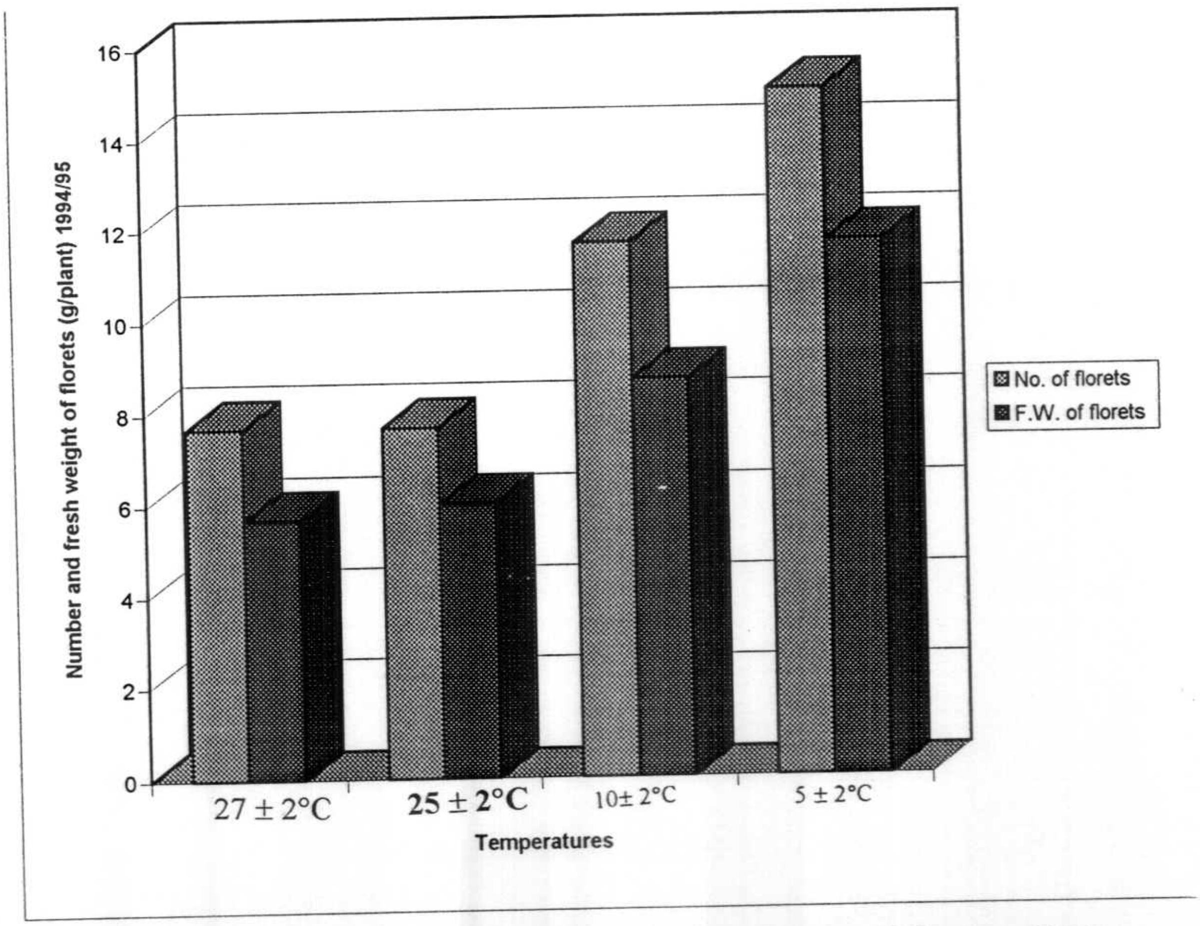


Fig. (13) : Effect of Different Storage Temperatures of Bulbs on Number of Florets and fresh Weight of Florets (g/plant) of Narcissus tazetta L. Plant During 1993/94 and 1994/95 Seasons.

plant (7.67 florets), for both treatments and in both seasons compared to (11.00 florets & 11.67 florets) and (11.67 florets & 15.00 florets) for low and lowest storage temperature, in the first and second seasons respectively.

III.2.b.5. Mean diameter of florets :

The mean diameter of florets as affected by storage temperature of bulbs table (8-b) showed that cold storage resulted in unsignificant differences in most cases as shown from the data in table (8-b). The widest diameter of florets obtained by plants which its bulbs were stored at the lowest temperature of (5 ± 2°C) followed by those stored at (10 ± 2°C) and then soil stored bulbs. While the narrowest diameter of florets was obtained by plants which its bulbs were stored at room temperature (27 ± 2°C). The data was confirmed in both seasons.

III.2.b.6. Mean frsh weight of florets per peduncle

Mean fresh weight of florets per peduncle significantly increased due to storage of bulbs under cooling condition than those stored either in soil or at room temperature. Soil stored bulbs were slightly superior than those stored at room temperature in this concern. Similar trend of results was obtained in both seasons as shown in table (8-b).

III-2.b.7. Mean fresh weight of florets per plant :

Cold treatments of bulbs resulted in an increase in the mean fresh weight of florets produced per plant than uncooled bulbs as shown in table (8-b) and Fig. (13). The highest fresh weight of florets per plant produced from bulbs stored at (5 ± 2°C). The weight was 8.33 g and 11.67 g in both seasons respectively. In the second order came those bulbs stored at 10 ±

2°C which gave mean fresh weight of florets per plant of 8.00 g and 8.67 g in both seasons respectively. Bulbs stored in soil resulted in mean fresh weight of florets per plant of 5.33 g and 6.00 g in the two seasons respectively. The lowest value in this concern was obtained from plants which its bulbs were stored at room temperature (27 ± 2°C) and reached 5.00 g and 5.67 g in both seasons respectively.

From the previous data it could be stated that cold storage of *Narcissus tazetta* bulbs may encourage endogenous changes in the bulbs which enable earlier sprouting and accordingly longer period for more vegetative growth. Moreover it resulted in lesser consumption of the nutrient materials throughout respiration prosess in the bulb. So, good results in vegetative flower earliness were observed due to cold storage of bulbs.

Many investigators obtained similar results, ***Greef (1985),*** on Narcissus plant, ***Nabih and Aly (1989), Nabih (1992) and Yimin et al. (1995)*** on freesia they proved that lower storage temperature had its promotion effect on many internal reactions in the plant which consequently affect earliness of flowering and duration of blooming.

Different temperatures

1 = 25°C 2= 27°C 3= 10°C 4= 5°C

Effect of Different storage temperatures of Bulbs on the vegetative grwoth and flowering of *Narcissus tazetta* L. During 1993 / 94 season.

III- Chemical constituents :

1- Concrete oil percentage in florets :

Table (9) revealed that, bulbs which stored at room temperature (27 ± 2°C) had no effect on the concrete oil percentage in florets. However, storage at temperature (5 ± 2°C) and (10 ± 2°C) caused more increase in concrete oil percentage in florets in the second season while slight increase was obtained in the first season.

2- Absolute oil percentage on florets :

It is clear from table (9), that storage of the bulbs at different temperatures i.e. (27 ± 2°C), (10 ± 2°C) or (5 ± 2°C) did not affect the absolute oil percentage in florets.

3- Total alkaloids percentage in peduncles :

The data recorded in table (9) showed that, storage of bulbs at room temperature (27 ± 2°C) did not affect the total alkaloids percentage in peduncles during both seasons. On the other hand, bulbs stored at (10 ± 2°C) and (5 ± 2°C) produced highly significant increase in the total alkaloids percentage. However, the storage at (5 ± 2°C) considered the most effective treatment, hence resulted in 49.93% and 49.80% increment when compared with the control in the two seasons respectively.

4- Total alkaloids percentage in leaves :

The data presented in table (9) showed that, bulbs stored at 5 ±2°C and (10 ± 2°C) attained highly significant increase in the total alkaloids in leaves and that storage at (5 ± 2°C) was the optimum treatment in this respect, which gave the highest increment in total alkaloids in leaves

Table (9): Effect of Different Storage Temperatures of bulbs on Some Chemical Constituents of Different Plant Organs of *Narcissus tazetta* During 1993 - 1994 / 1994 - 1995 Seasons.

Parameters / Treatments	Concrete oil percentage in florets		Absolute oil percentage in florets		Total alkaloids percentage in peduncle		Total alkaloids percentage in leaves		Total alkaloids percentage in bulbs	
	1993 / 94	1994 / 95	1993 / 94	1994 / 95	1993 / 94	1994 / 95	1993 / 94	1994 / 95	1993 / 94	1994 / 95
25± 2°C Control (in soil)	0.447	0.460	0.015	0.016	2.001	2.010	2.202	2.251	3.510	3.0755
27 ± 2°C (Room temp.)	0.447	0.460	0.015	0.016	2.005	2.013	2.203	2.251	3.004	3.503
10±2°C (in refrigerator)	0.457	0.470	0.016	0.016	2.252	2.513	3.293	3.502	3.803	4.003
5 ± 2°C (in refrigerator)	0.460	0.480	0.016	0.017	3.000	3.011	3.304	3.541	4.005	4303
L.S.D at 5%	0.010	0.010	N.s	N.s	0.106	0.018	0.099	0.055	0.010	0.093
L.S.D. at 1%	0.015	0.015	N.s	N.s	0.161	0.027	0.151	0.084	0.015	0.141

[50.05% and 57.31%] in the first and second seasons respectively. On the other hand, room temperature storage had no significant effect through the two seasons of this study

5- Total alkaloids percentage in bulbs :

Table (9) showed that, room temperature storage (27 ± 2°C) did not produce any increase on the total alkaloids percentage in bulbs. However, storage at (5 ± 2°C) and (10 ± 2°C) caused highly significant increase, and stored bulbs at (5 ± 2°C) gave the highest amount of total alkaloids in bulbs [14.10% and 14.59%] in both seasons respectively.

Temperature either cold or hot was reported to alter metabolic characteristics in many plant species, as protoplasmic streaming ***Alexandrov (1964)*** photosynthesis and ***Berry (1975)*** the exposure to high temperature was reflected by changes in sub-cellular structure and an increase in protein of the hardeved seeds. On the other hand the cold temperature was used to induce germination of seeds with problems in its germination by enhancing endogenous hormones and also several physiological changes were known of take place during hardening. From these changes which occurred due to temperature soluble proteins, lipids, and sugar which increased specially in the aerial parts. These physiological changes inturn increased secondary metabolites i.e. alkaloids and volabile oils which contain mono or sesquiterpenoids.

Nothing in the literature was found concerning the effect of the storage temperature on secondary plant metabolites, yet the effect of low temperature was studied on *Ammi majus*; ***Reda, (1988)*** obtained higher furanocoumarins when treated Ammi plants with low temperature (6°C).

G.L.C. Analysis of the Absolute oil of *Narcissus tazetta* florets from different treatments :

Table (10) presented the data obtained when analysing the absolute oil by G.L.C. in a representative treatments from growth substances, amino acids or stored temperature of the bulbs, the treatments which produced higher or best results.

First of all, Linalool and ethyl cinnamate were the major constituent in the oil, however a-pinene was the major in control treatments and in bulbs stored at 5 ± 2°C.

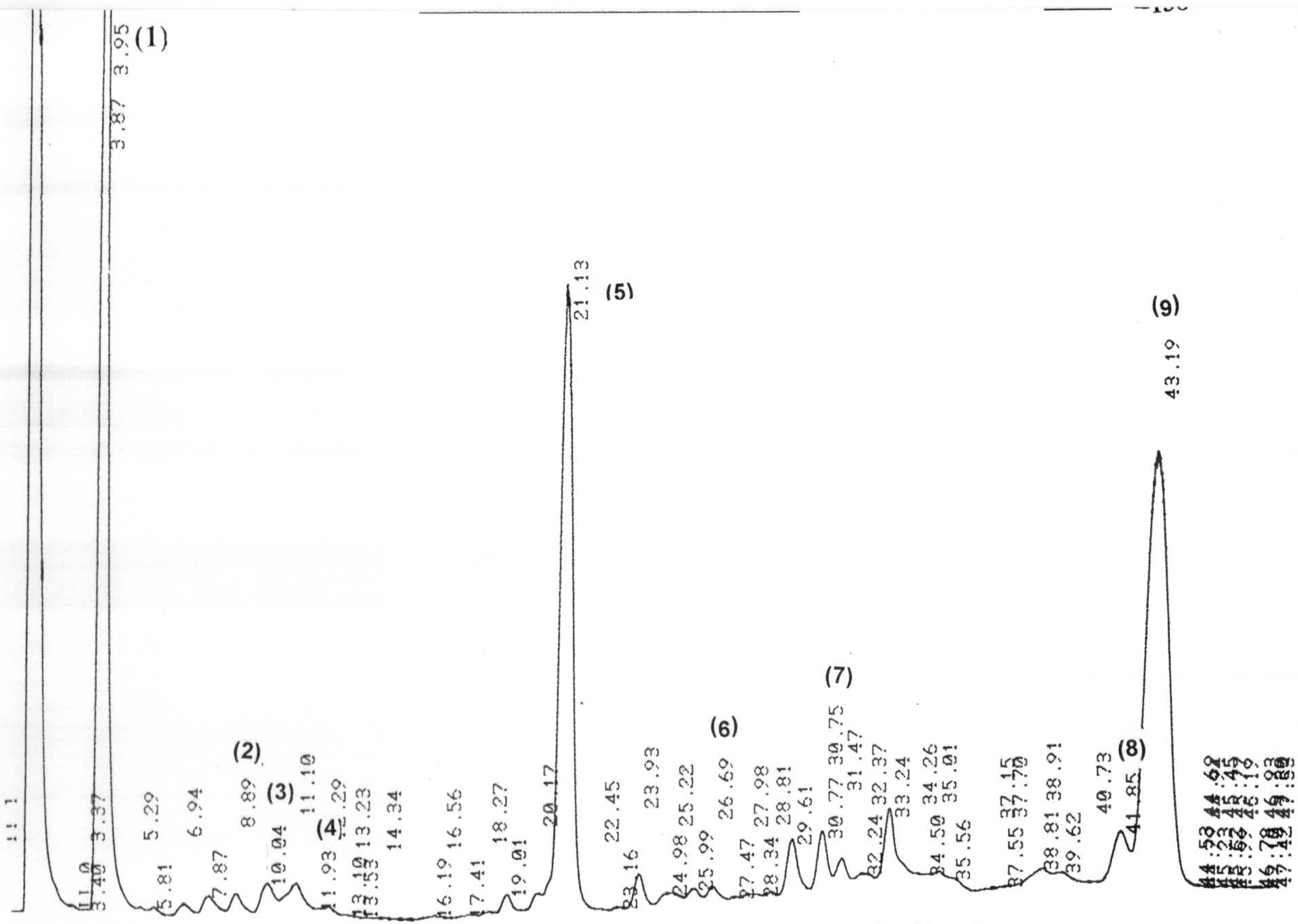
The growth substances reduced α-pinene than control. The two growth substances gibberellin and ethephon raised all the constituents than control. Paclobutrazol increased only the major constituents of the oil; linalool and ethyl cinnamate, and in return decreased all the other constituents.

All amino acids tested gave lower α- pinene than control, but higher α-pinene content was due to treating with tryptophan and aspartic.

Glutamic acid initiated accumulation of the major constituents linalool and ethyl cinnamate, the same function caused by paclobutrazol.

Cold storage temperature produced oil with higher contents of α-pinene, linalool and ethyl cinnamate.

In conclusion, no fixed trend can be obtained from the different treatments on the oil constituents, but it can be postulated that paclobutrazol, glutamic acid and cooled storage temperature increased the content of major constituents in the oil. Paclobutrazol and cold storage can be considered as a sort of stress which in turn inhance the secondary metabolites. No literature could be traced in that concern.



G.L.C. Analysis of the Absolute Oil of *Narcissus tazetta* L. Florets.

Table (10): GLC Analysis of the Absolute Oil of *Narcissus tazetta* Florets from Different Treatments.

Name of compound / Treatments	Area percentage								
	(1) ∝-pinene	(2) Limonene	(3) P-cymene	(4) Cineol	(5) Linalool	(6) ∝-terpineol	(7) γ-terpinene	(8) Methyl cinnamate	(9) Ethyl cinnamate
RT	3.950	8.890	10.040	11.930	21.130	26.690	30.750	41.850	43.190
Control	32.855	0.288	0.756	0.344	10.620	0.358	1.454	0.908	9.169
Gibberellin at 150 ppm	11.127	0.723	1.127	0.092	18.881	0.771	1.057	2.762	23.615
Ethephon at 150 ppm	2.712	0.807	0.901	0.083	20.658	0.058	1.785	0.955	10.746
Paclobutrazol at 150 ppm.	0.077	0.069	0.263	0.434	32.393	0.491	1.254	0.005	19.843
Tryptophan at 150 ppm.	14.880	0.449	0.700	1.324	15.139	0.528	1.303	2.182	16.362
Aspartic at 150 ppm.	20.817	0.524	0.773	1.113	15.836	0.154	1.620	0.359	15.619
Glutamic at 150 ppm.	0.035	1.167	0.408	0.149	41.742	0.154	0.810	0.192	27.310
Storage at 5 ± 2°C	23.030	0.258	0.485	0.047	20.198	0.205	1.958	0.567	21.798

The effect of bulb size and growth stages on total alkaloids percentage:

Different samples were taken from leaves and bulbs in intervals of one month through the growth season and lasted for 7.5 months.

Table (11) indicated that, the total alkaloids increased progressively with the plant age from 1.55 % to 2.00% in 1994 and from 1.67% to 2.00 % through 1995 in the leaves, while these value were from 1.98% to 3.51%, and from 1.99% to 3.75% in bulbs during the growth stages.

Figure (14 and 15), illustrate the gradual increase in total alkaloids percentage during the stages of growth and with different bulbs size.

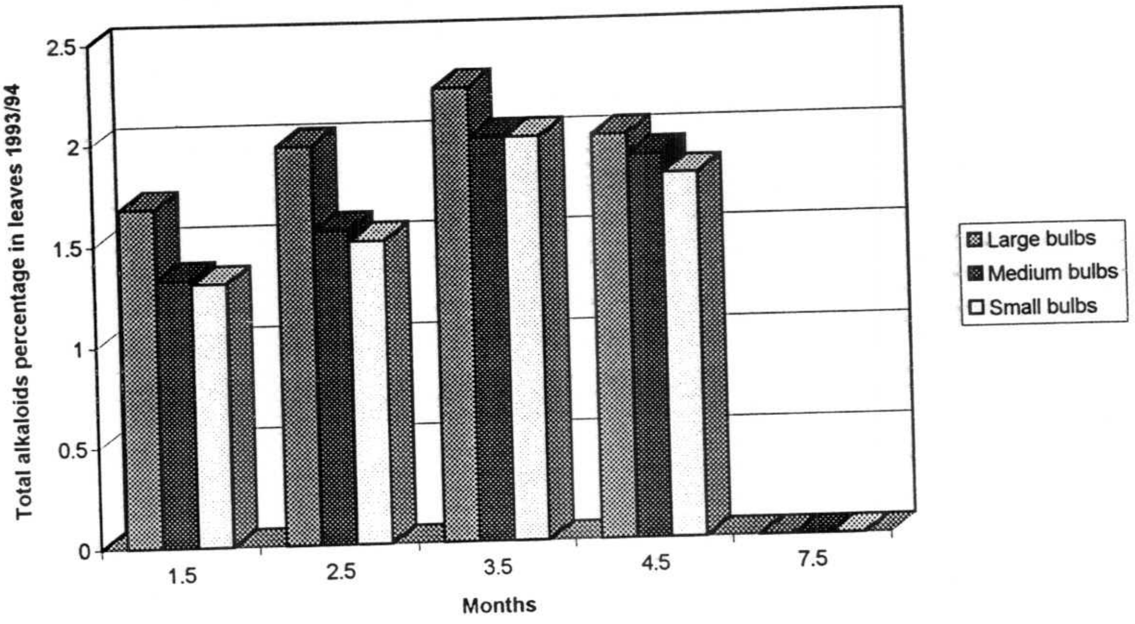
Higher total alkaloidal percentage were obtained with the larger bulbs which reached 3.51% and 3.75 % after 7.5 months in the two successive seasons. The medium and small bulbs attained the same total alkaloids percentage at 7.5 months from cultivation.

Although the level of alkaloid biosynthesis is gene governed, yet there are remarkable fluctuations in the alkaloids.

Environmental conditions affect the general growth of the plant as well as the formation of alkaloids. Most alkaloids are formed in young actively growing tissues, and factors affect these tissues will consequently affect alkaloid formation.

Table (11): Effect of Bulb Size and Growth Stage on Total Alkaloid Percentage in Leaves and Bulbs of *Narcissus tazetta* During 1993 / 94 and 1994 /95 Seasons.

Paramethers	Large bulbs				Medium bulbs				Small bulbs			
	Total alkaloids percentage in leaves		Total alkaloids percentage in bulbs		Total alkaloids percentage in leaves		Total alkaloids percentage in bulbs		Total alkaloids percentage in leaves		total alkaloids percentage in bulbs	
Treatments	1993/94	1994/95	1993/94	1994/95	1993/94	1994/95	1993/94	1994/95	1993/94	1994/95	1993/94	1994/95
1.5 month	1.553	1.676	1.987	1.999	1.333	1.325	1.505	1.467	1.330	1.305	1.500	1.459
2.5 month	1.873	1.977	2.350	2.590	1.532	1.555	2.000	2.222	1.511	1.500	2.000	2.120
3.5 month	2.202	2.251	2.987	3.533	1.999	2.000	2.993	3.101	1.999	1.999	2.973	3.000
4.5 month	2.001	2.000	3.502	3.753	1.595	1.899	3.333	3.553	1.605	1.800	3.333	3.533
7.5 month	-	-	3.510	3.755	-	-	3.433	3.633	-	-	3.403	3.60
L.S.D. 5%	0.095	0.059	0.018	0.082	0.025	0.005	0.031	0.027	0.033	0.128	0.025	N.s
L.S.D. 1%	0.144	0.089	0.055	0.249	0.038	0.008	0.095	0.081	0.050	0.194	0.076	N.s



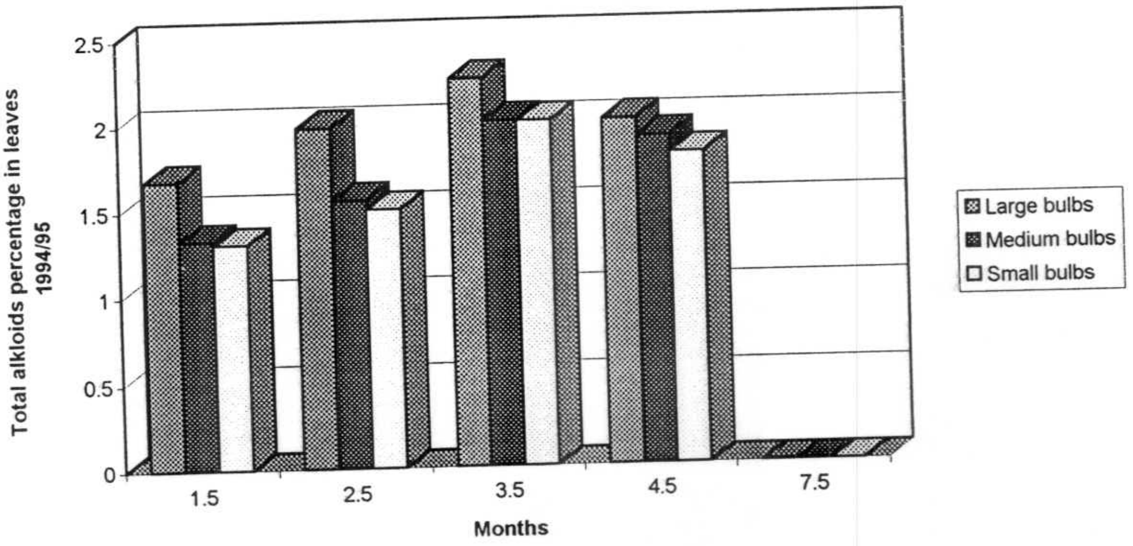
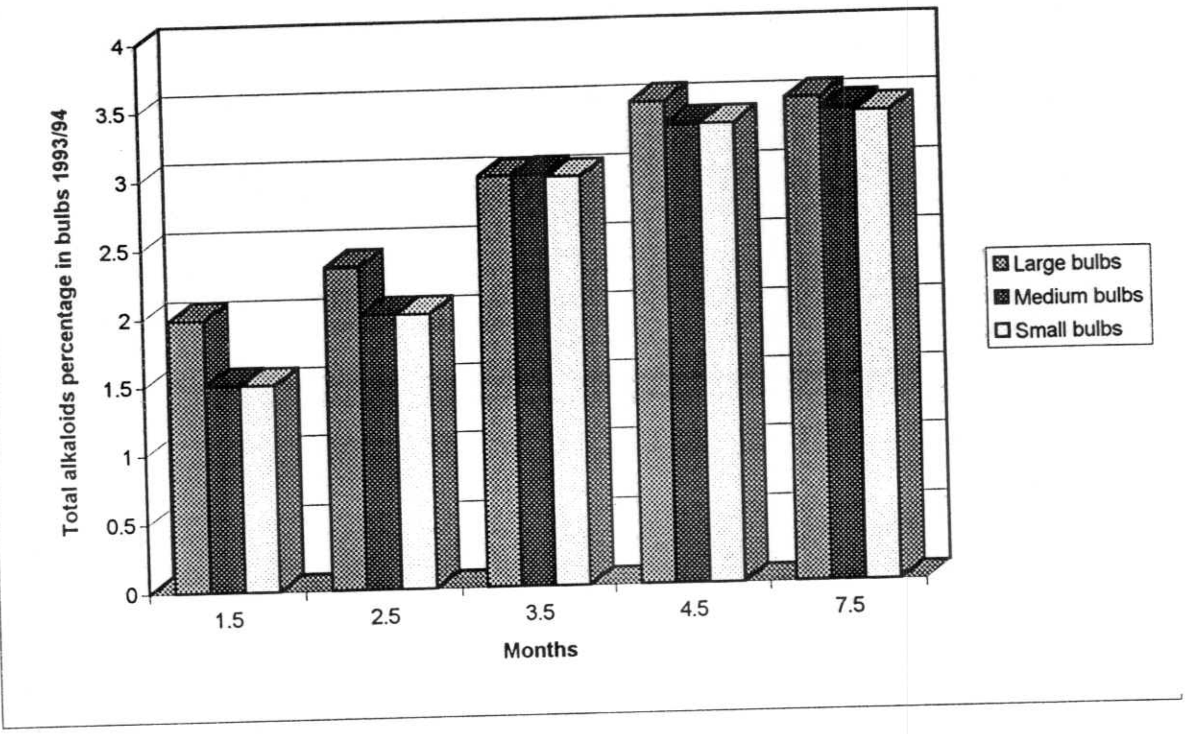


Fig. (14) : Effect of Bulb Size and Growth Stage on Total Alkaloids Percentage in Leaves of Narcissus tazetta L. Plant During 1993/94 and 1994/95 seasons.



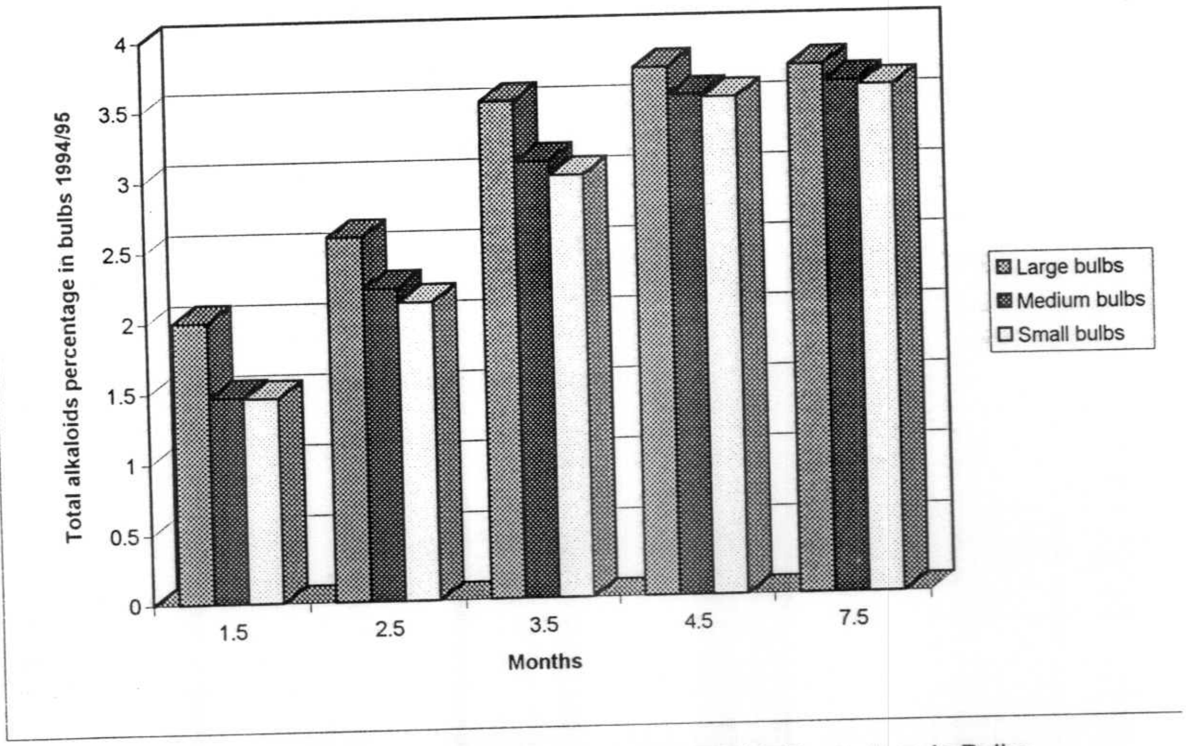


Fig. (15) : Effect of Bulb Size and Growth Stage on Total Alkaloids Percentage in Bulbs of Narcissus tazetta L. Plant During 1993/94 and 1994/95 Seasons.

Sehmid (1948) reported that seeds of nicotiana germinated in the dark contained more total alkaloids than seeds with daily exposure to light.

In legume plants in which alkaloids were senthesise in the aerial parts, darkeness affect its accumulation, as the synthesis of alkaloids by plants grown in the dark was notably retarded compared to those grown in light. The steroidal alkaloids of solanum tuberosum (potatoes) are formed in tubers exposed to light. Also a short - time light experiment in the dark usually caused a retardation of alkaloid synthesis in plants that produced alkaloids in the aerial part *(Nowacki, 1958)* while plants that produce alkaloids in the roots did not show decreased alkaloid formation while shaded.

These previous finding confirm the results obtained with narcissus bulbs which reveal a higher alkaloid formation in the bulbs rather than the aerial parts. The large bulbs also contain more alkaloids as their dry weight increased and consequently alkaloids.

Bulb Size

1 = Small 2= Medium 3= Large

Effect of bulb size on vegetative growth and flowering of *Narcissus tazetta* L. During 1993 /94 season.