RESULTS AND DISCUSSION

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FIRST EXPERIMENT

I- Effect of Media and Nutrition on the Growth of Bublets of Lilium longiforun Thunb during (1978):

a) Number of bulblets :

Data concerning the effects of media and nutrition on the number of the survival bulblets of Lily are presented in Table (1) and Figure (1). Comparing the results of the two media, it is clear that medium (B) (1 sand : 1 loam: 1 peat moss) gave more number of bulblets than medium (A) (1 sand : 1 peat moss). In this respect, the increase which was about 35% was highly significant. Numerous investigators as Einert (1972), Powell et al. (1975) on Liluim longiflorum and Widmer (1972) on Cyclamen, proved that media had great influence on successful propagation and growth.

The decrease in the number of bulblets in medium (A) was mostly due to the weak holding capacity of water and nutrients. Many reports by Post (1959), Boodley and

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Table (1) **Effect of media and nutrition on the number of survival bulblets of _Lilium longiflorum_ Thunb**

Season (1978)

Treatment	Level of nutrition			Total	Mean	For	L.S.D.	
	Low	Medium	High				0.05	0.01
Media A	26.3	31.6	41.3	98.6	32.9	Media	6.0	8.5
B	34.0	44.3	54.3	132.6	44.2	nutrition	6.6	9.4
Total	60.3	75.3	95.6	231.2				
Mean	30.1	37.7	47.8		115.6	M x N	2.4	3.4

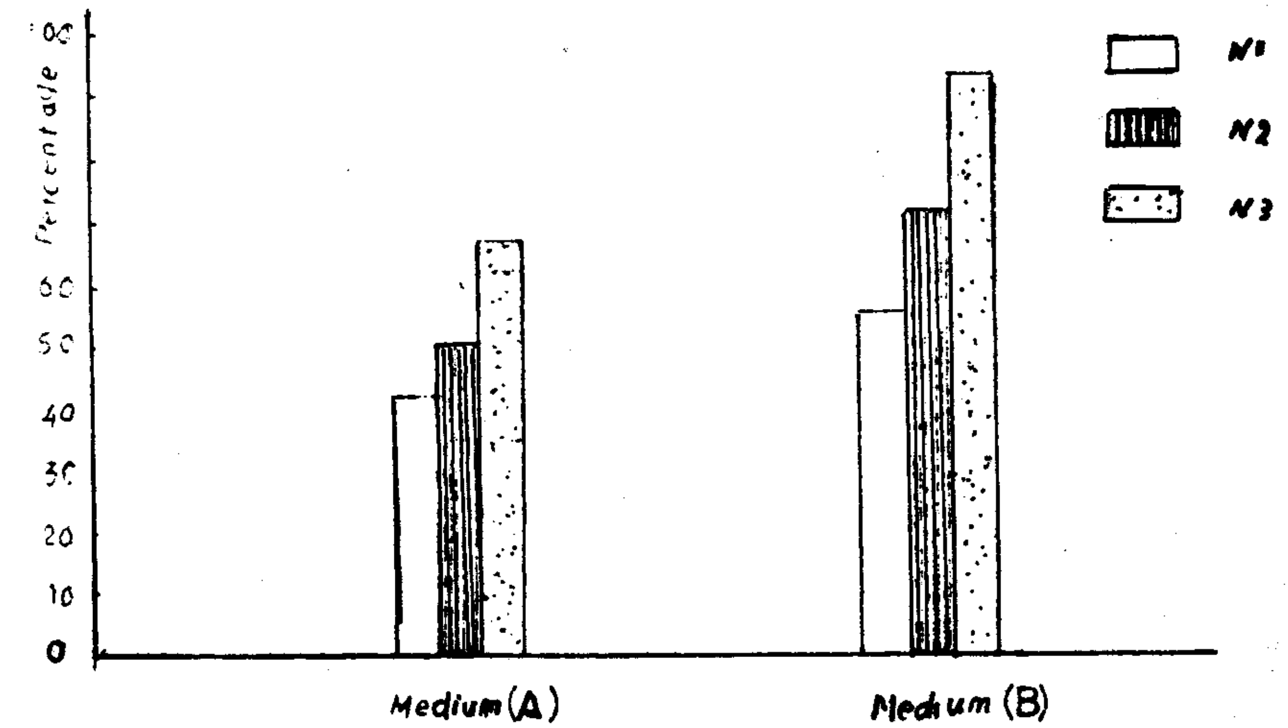


Fig (1) Effect Of media and nutrition on the percentage Of survival bulblet Of Lilium longiflorum (1978)

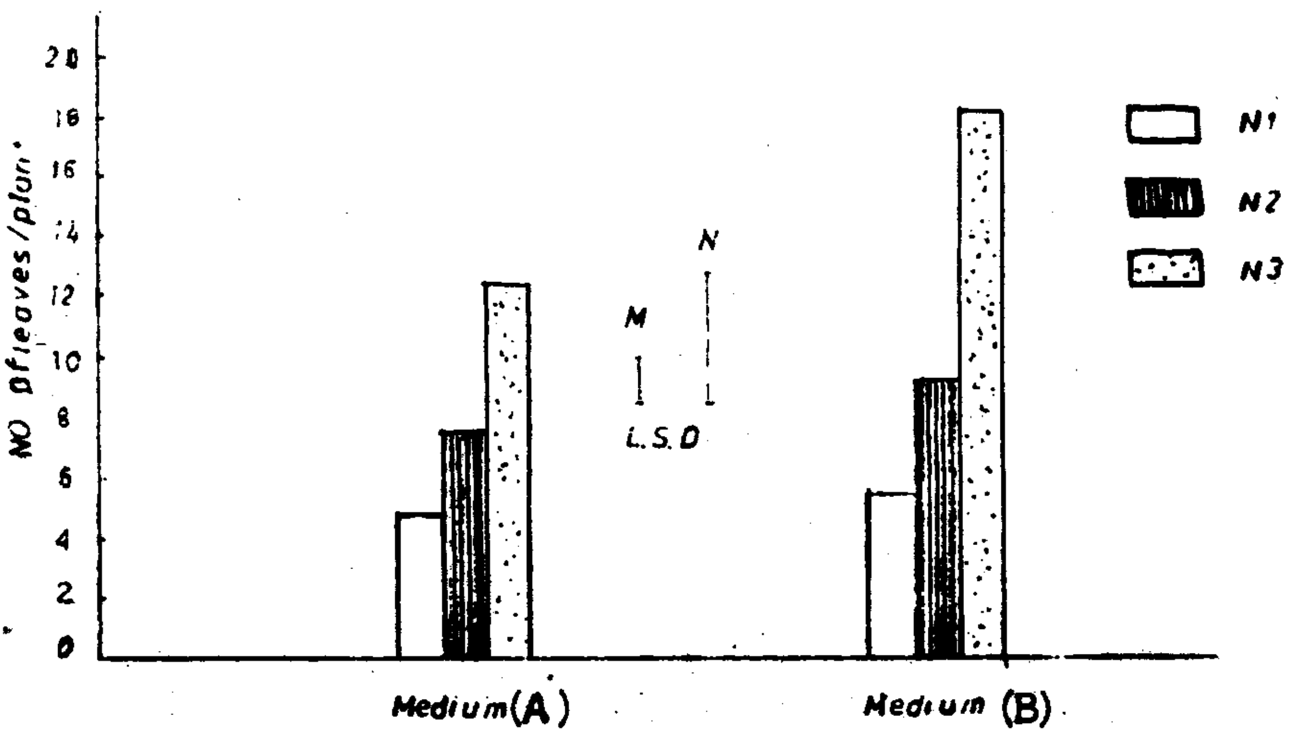


Fig (2) Effect Of media and nutrition on the number Of leaves per bulblet Of Lilium longiflorum (1978)

Sheldrake (1963), Tayama et al. (1967) and Powell et al. (1975) demonstrated that better bulblets growth in liluim was attained in a medium kept highly moist.

Regardless of the effects of media, data in Table (1) indicated that increasing the levels of nutrition significantly increased the number of bulblets. The high level of nutrition gave the maximum number of survival bulblets. This effect is due to the adequate supply of all minerals needed by the developed cells either for enzymatic or biosynthetic activity. This is particularly true for mobilization of carbohydrates into or out the parts used for propagation. It has been demonstrated by Leopold and Kriedmann (1975) that the formation and growth of tubers, bulbs, corms and other storage organs appears to be further dramatic expression of the capability of higher plants for mobilization phenomena. The growth of an onion bulb is a consequence of the mobilization of carbohydrates and minerals into the basis of the very young leaves.

The highest number of survival and healthy plants was noticed in medium (B) when supplied with the high level of nutrition. The interaction M x N was significant.

b) Number of leaves :

Considering the effect of media on the number of leaves, the results in Table (2) and Figure (2) show that the bulblets grown in medium (B) significantly gave more number of leaves as compared with medium (A). Medium (B) was better in retaining water which is needed for all biochemical reactions and growth aspects. Moreover, it is well known that dryness badly affect the survival and growth of both bulbs and bulblets of Lilium species. Such bulblets in their early stages of growth need to be grown continuously in adequate soil moisture. Post (1959) advised that Lily bulbs are to be grown in automatic watering by constant water level from the begining of growth.

The relationship between the proper soil moisture needed by bulbs and other plants and their growth was revealed by Sheehan and Joiner (1964) on Lilium longiflorum, Koopes (1962), Reppo & zaletaeva (1971) on Tulips, Halevy and Richter (1962), Sasso (1962) and Haber (1968) on gladiolus and Regar (1941) on Calandula and geranium. They mentioned that the suitable soil moisture was a main factor for growth and plant productivity.

Table (2) Effect of media and nutrition on the number of leaves carried on a bulblet of *Lilium longiflorum*. Thunb.

Season (1978)

Treatment	Level on nutrition			Total	Mean	For	L.S.D.	
	Low	Medium	High				0.05	0.01
Media A	4.7	7.8	12.3	24.8	8.3	Media	2.0	2.7
B	5.5	9.7	20.7	35.9	12.0	Nutrition	4.3	10.6
Total	10.2	17.5	33.0	60.7		M x N	3.1	4.4
Mean	5.1	8.8	16.5		30.4			

Furthermore, bulblets which were supplied with high level of nutrition solution resulted in more number of leaves as compared with those of low or medium level of nutrition. The differences in this respect were highly significant; the highest level of nutrition gave nearly thrice number of leaves of those treated with the low level of nutrition (Table 2 and Figure 2).

These results agree with previous investigations by Boodley (1962), Stekel et al. (1962) and Roberts et al. (1964) on Liluim longiflorum, Kosugi (1960), Kosugi and Kondo (1960), Kosugi and Sano (1961) and Lemeni (1965) on gladiolus and El-Gamassy et al.(1974) on amaryllis who found that increasing the level of nutrition increased the number of leaves on the plant.

The maximum number of leaves was carried by bulblets grown in medium (B) treated with the high level of nutrition. In this case the number of leaves per plant was 20.7, while it was 4.7 for medium (A) supplied with the low level of nutrition (Figure 2). The interaction was significant.

c) Fresh weight of leaves :

Data in Table (3) and Figure (3) indicate that medium (B) produced leaves heavier in their weight than medium (A). In the first case, the mean weight of leaves per plant was 4.17 gms which is about 56% over that of medium (A). The difference, in this respect is statistically significant at 0.01 level.

Similar results were demonstrated by Einert (1972) on *Lilium longiflorm* and Powell *et al*. (1975) on the same plant and Widmer (1972) on Cyclamen who concluded that the proper media benefited the growth of plants and consequently increased the weight of vegetative growth.

On the other hand, Table (3) shows that foliage fresh weight of Lily was increased by increasing nutrition level. Increasing the nutrition level from the low to the medium level increased the weight of leaves by 211%, whereas the increase was 568% when the high level of nutrition was used. The percentage of increase of the high level over that of medium level was 115%. It is obviously clear that the nutrion effect was very promising and the statistical differences were highly significant. The results agree with those obtained by Bodley

Table (3) Effect of media and nutrition on the fresh weight of leaves carried on a bulblet of <u>Lilium</u> <u>longiflorum</u>. Thunb

Season (1978)

Treatment	Level of nutrition			Total	Mean	L.S.D.		
	Low	Medium	High			For	0.05	0.01
Media A	0.7	2.0	5.3	8.0	2.67	Media	0.8	1.13
B	1.2	3.9	7,4	12.5	4.17	nutrition	2.0	2.9
Total	1.9	5.9	12.7	20.5		M x N	N.S	N.S
Mean	0.95	2.95	6.35	10.25				

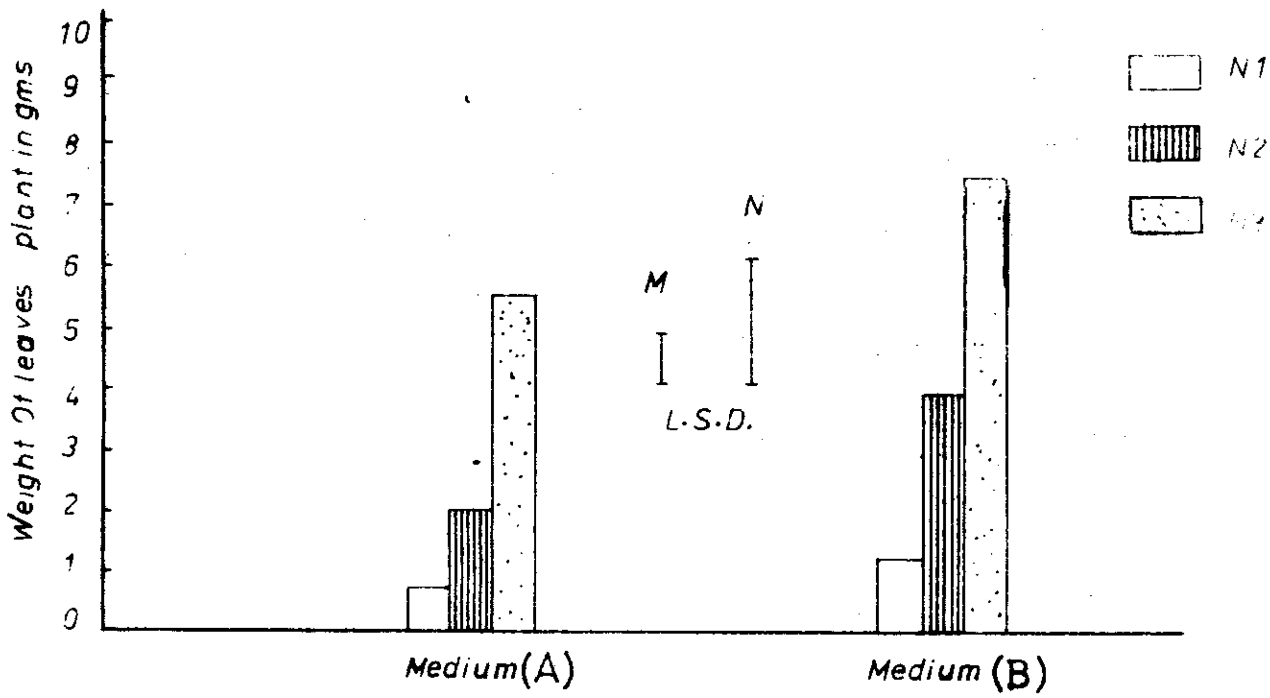
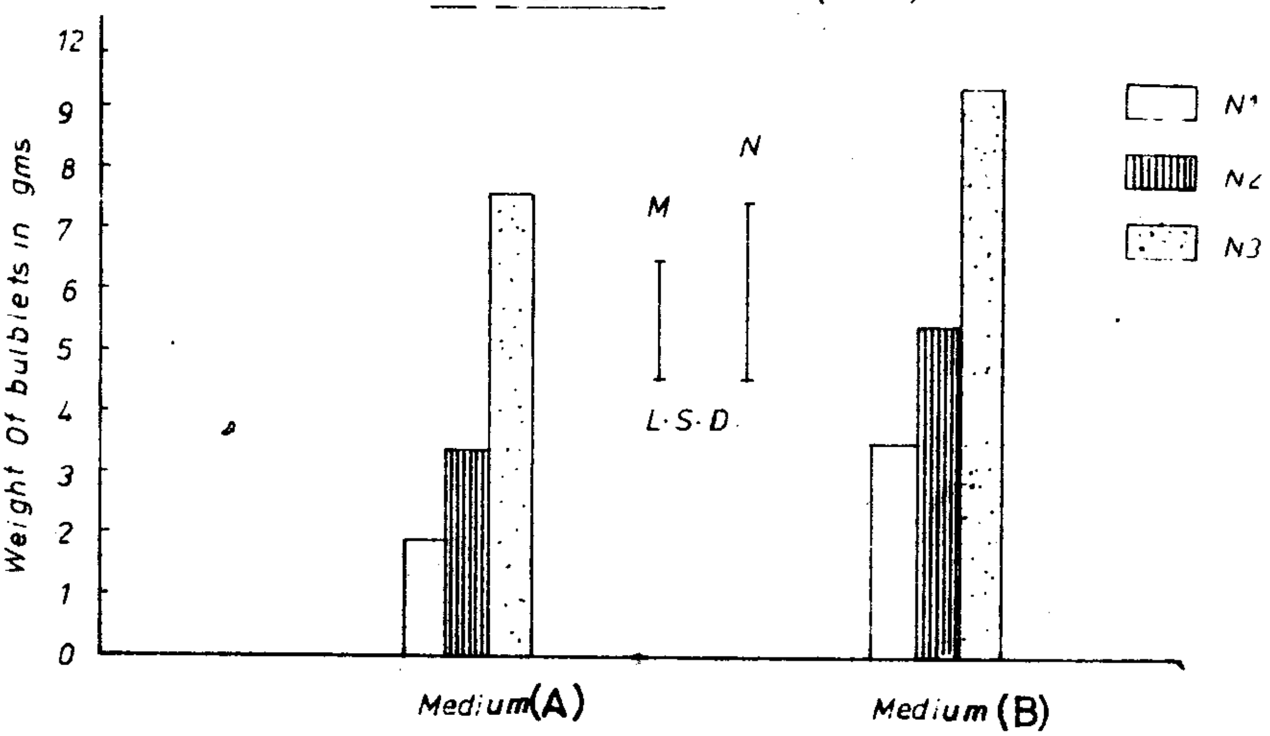


Fig.(3) *Effect Of media and nutrition On the weight Of leaves Of .L longiflorum bulblet (1978)*



Fig(4) *Effect Of media and nutrition On the weight Of bulblets Of. L .longiflorum (1978)*

(1962), who found that Croft Lily fertilized with Hoagland's solution produced the greatest amount of linear growth and showed the least amount of leaf scorch.

Also, Steckel *et al.* (1962) and Roberts *et al.* (1964) who reported that fertilization of the Croft Lily had the greatest effect on the growth. Kiplinger *et al.* (1972), Powell *et al.* (1975) and Koths and Glendhill (1978) obtained similar results with *Lilium longiflorum* El-Gamassy and Moustafa (1963) on Dahlias gave similar conclusion.

The best treatment which gave the heaviest weight of fresh leaves per plant was medium (B) supplied with the high level of nutrition. However, the medium x nutrition interaction was insignificant.

d) Fresh weight of bulblets :

Data of fresh weights of bulblets are represented in Table (4) and illustrated in Figure (4). Using medium (B) significantly increased the weights of produced bulblets. The weights of bulblets from medium (A) and (B) were 4.3 and 6.06 gms, respectively. Also, within each

Table (4) The effect of media and nutrition of the fresh weight of bulblets of <u>Lilium longiflorum</u>. Thunb

Season (1978)

Treatment	Level of nutrition			Total	Mean	For	L.S.D.	
	Low	Medium	High				0.05	0.01
Media A	1.9	3.4	7.6	12.9	4.3	Media	0.91	1.29
B	3.5	5.4	9.3	18.2	6.06	Nutrition	2.19	3.10
Total	5.4	8.8	16.9	31.1		M x N	N.S	N.S
Mean	2.7	4.4	5.4	15.5				

nutrition level, bulblets from medium (B) were heavier than those from medium (A). The statistical differences in this respect were highly significant.

The increase in the weight may be explained by the suitability of medium (B)—(Sand + loam + Peat)— for retaining enough water and minerals as well as good aeration. These mentioned factors are of great importance for better growth and increasing carbohydrates which mobilize into bulblets storage organs.

Regarding the data in the same Table (4) and Figure (4), it is clear that raising the level of nutrition, significantly increased the fresh weight of *Lilium longiflorum* bulblets. The most increase is noticed with the high level.of nutrition which approximately increased the weight of the produced bulblets by 214% over that of the low level. Such great increase clarify the importance of nutrition on the growth of bulblets.

This conclusion hold true with results obtained by Hosaka *et al.* (1962) who found that the best bulbs of *Lilium auratum* for export were produced by fertilization with high rates of N, P and K while Roberts *et al.* (1964) found that leaf and bulblet weights of *Lilium* longiflorum were more responsive to N and P than was the parent bulb. Also, Kiplinger et al. (1972) found all plants of Ace Nellie white and No. 44 Lily cvs. which received osmocote (18-9-9) or Mg Amp (17-40-6) slow release fertilizer then received further fertilizers gave the best plants.

The interaction M x N also indicated that the medium (B) receiving high level of nutrition was the best treatment.

e) Root length:

Comparing the lengths of roots developed in the two media, it was noticed that the plants grown in medium (A) produced longer roots. Their lengths were not significant as compared with medium (B). It seemed that the constituents of medium (A) permitted more penetration for roots as well as the searching habit of roots for water in deeper area of the soil. In Table (5) and Figure (5) the nutrition effects on root length are presented. No significant differences were noticed among the different treatments.

f) Flowering:

In season (1978) the plants gave some unsaleable flowers, data in concern are shown in Figure (6).

Table (5) The effect of media and nutrition on the root length of bulblets of *Lilium longiflorum* Thunb.

Season (1978)

Treatment	Level of nutrition			Total	Mean	L.S.D.		
	N_1	N_2	N_3			For	0.05	0.01
Media A	10.5	10.2	17.0	37.7	12.6	Media	N.S	N.S
B	12.5	9.9	12.8	35.2	11.7	nutrition	N.S	N.S
Total	23.0	20.1	29.8	72.9		M x N	N.S	N.S
Mean	11.5	10.1	14.9		36.5			

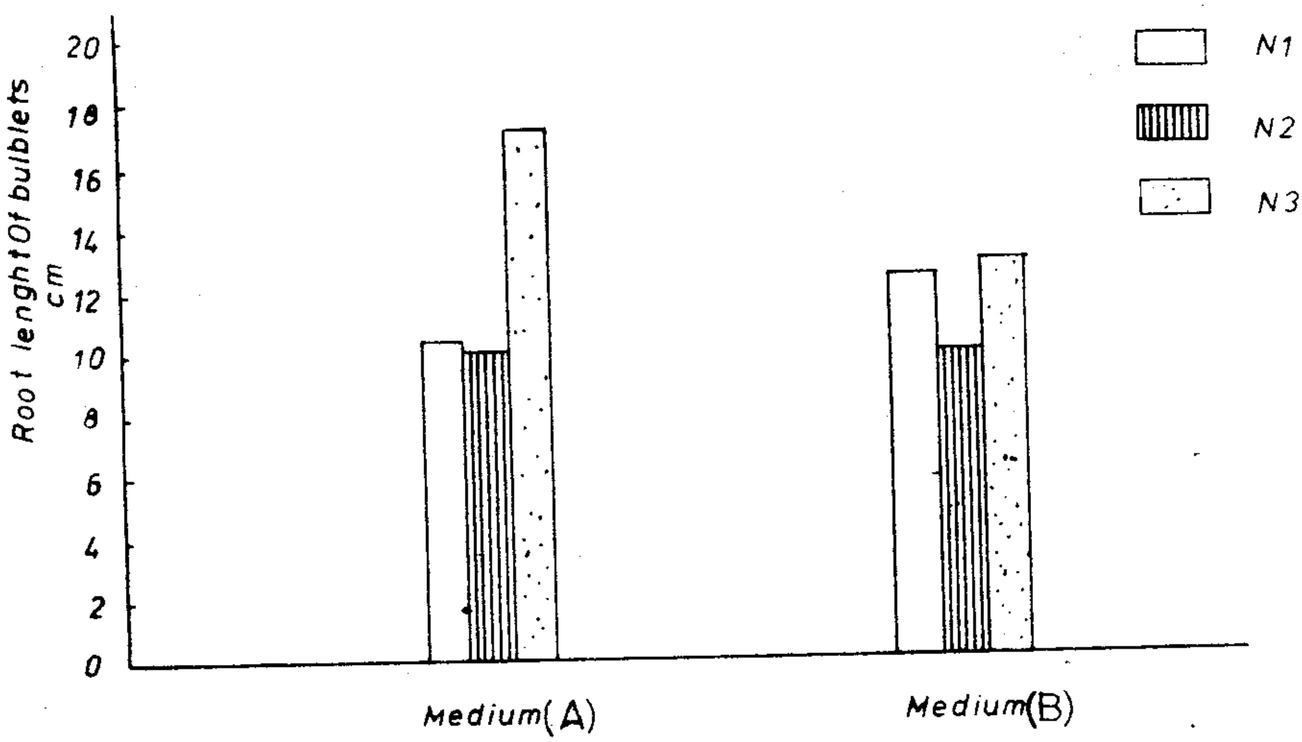
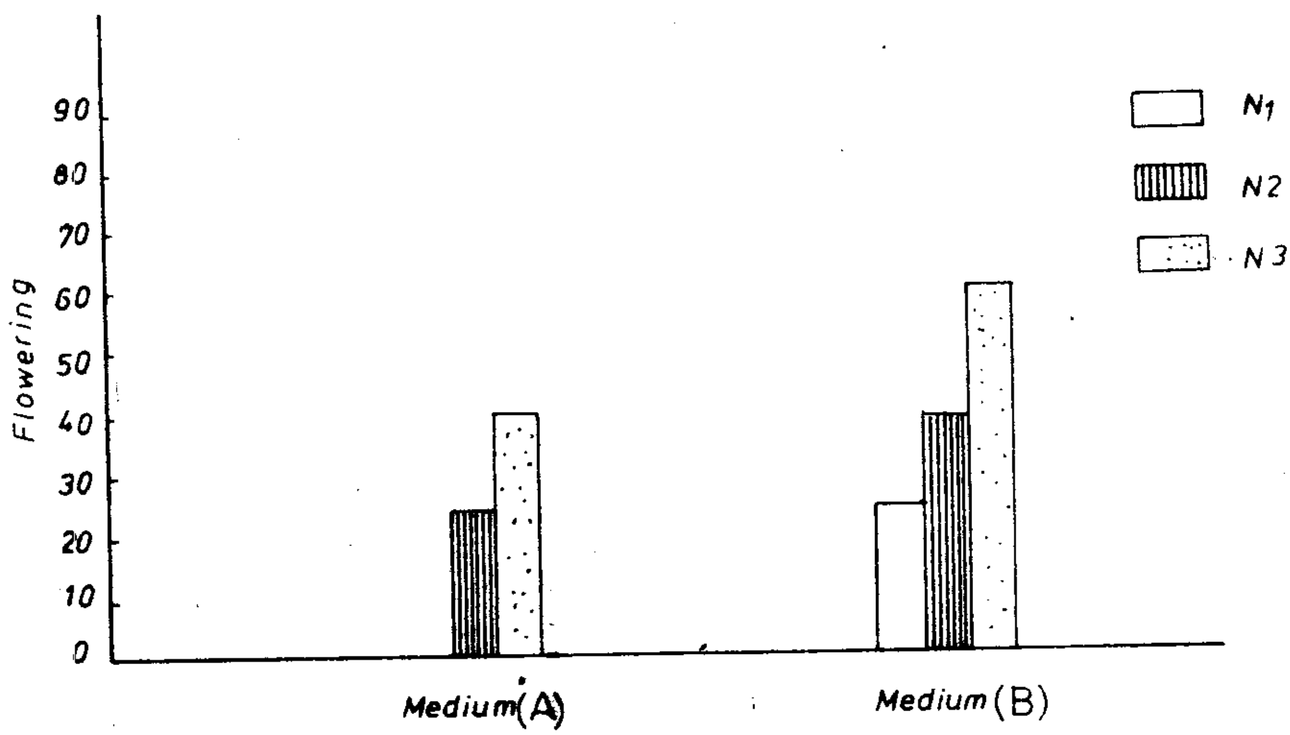


Fig (5) *Effect Of media and nutrition on the root lenght Of bulblets Of L. longiflorum (1978)*



Fig(6) *Effect Of media and nutrition on the percentage Of flowering Of L. longiflorum bulblets during (1978)*

Second season (1979)

II. Effect of Five Different Levels of Nutrition on Growth of Bulblets of *Lilium longiflorum*.

The experiment was conducted during the season (1979) using medium (B) which gave the best results in (1978). In Table (6) and Figures (7,8) data show the effects of five nutrition levels (S_1, S_2, S_3, S_4 and S_5) on the bulblet's growth.

Both percentage and number of survival bulblets were decreased with increasing the level of nutrition. The high level of the nutrition solution probably caused an increase in osmotic concentration within the bulblet tissues resulting in high accumulation of some toxic micro-elements followed by the death of bulblets. The possibility of micro-organism infection might be another liable factor of death. Bulblets which overcame the previous status were able to grow and to be responsive to the increase of the nutrition solution. Number, fresh weight, dry weight percentage of leaves as well as length, fresh weight and dry weight percentage of flower stalk-in most cases-increse with raising the level of nutrition.

Table (6) Effect of five diffrent Levels of Nutrition on growth of bulblets of *Lilium longiflorum*. Thunb. during (1979).

Growth Criteria	Nutrition treatments					L. S. D. For	
	S_1	S_2	S_3	S_4	S_5	0.05	0.01
Percentage of survival bulblet	54.66	46.66	45.33	37.33	41.33	N.S	N.S
Number of survival bulblet	13.67	11.67	11.33	9.33	10.33	N.S	N.S
Number of Leaves	23.67	26.17	24.83	24.33	35.93	N.S	N.S
Fresh weight of Leaves	3.63	4.50	1. 80	4.44	5.60	N.S	N.S
Dry weight of Leaves %	11.92	11.33	14.00	13.80	13.50	—	—
Length of flower stalk	30.1	25.33	26.90	26.67	33.7	N.S	N.S
Fresh weight of flower stalk	2.13	2.08	1.73	2.83	3.67	N.S	N.S
Dry weight of flower stalk %	21.33	14.90	19.00	17.40	32.00	—	—
Fresh weight of bulbs	6.33	3.17	3.50	4 .00	4.50	N.S	N.S
Dry weight of bulbs %	45.00	41.00	50.00	24.75	30.50	—	—
Diameter of splitted bulblet	2.4	2 .16	2.03	1.70	2 .32	N.S	N.S
Root Length	11.33	15.67	12.33	12.50	17.33	N.S	N.S

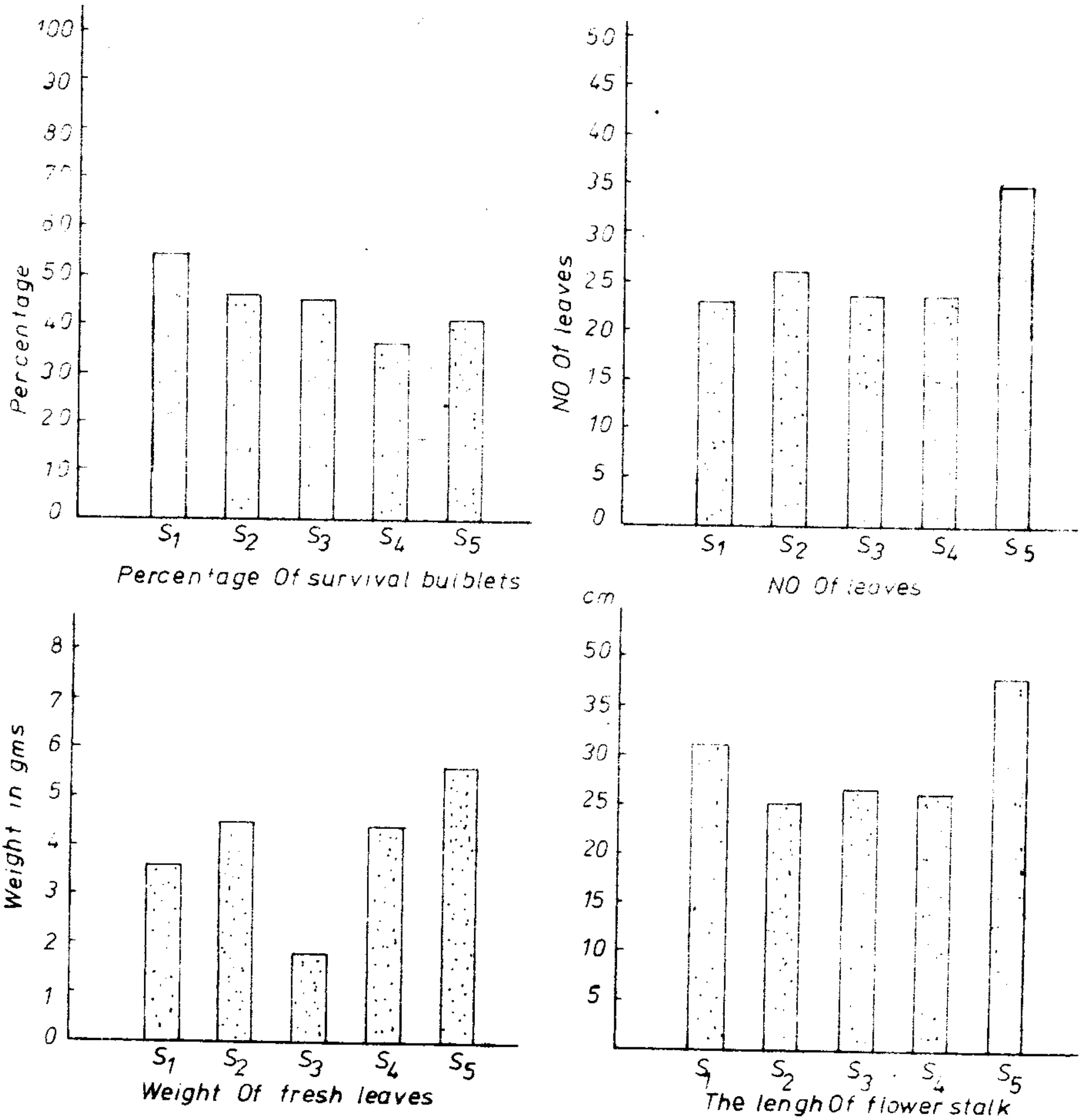


Fig. (7) *Effect Of five different levels Of nutrition on growth and flowering Of bulblets Of L. longiforum (1979)*

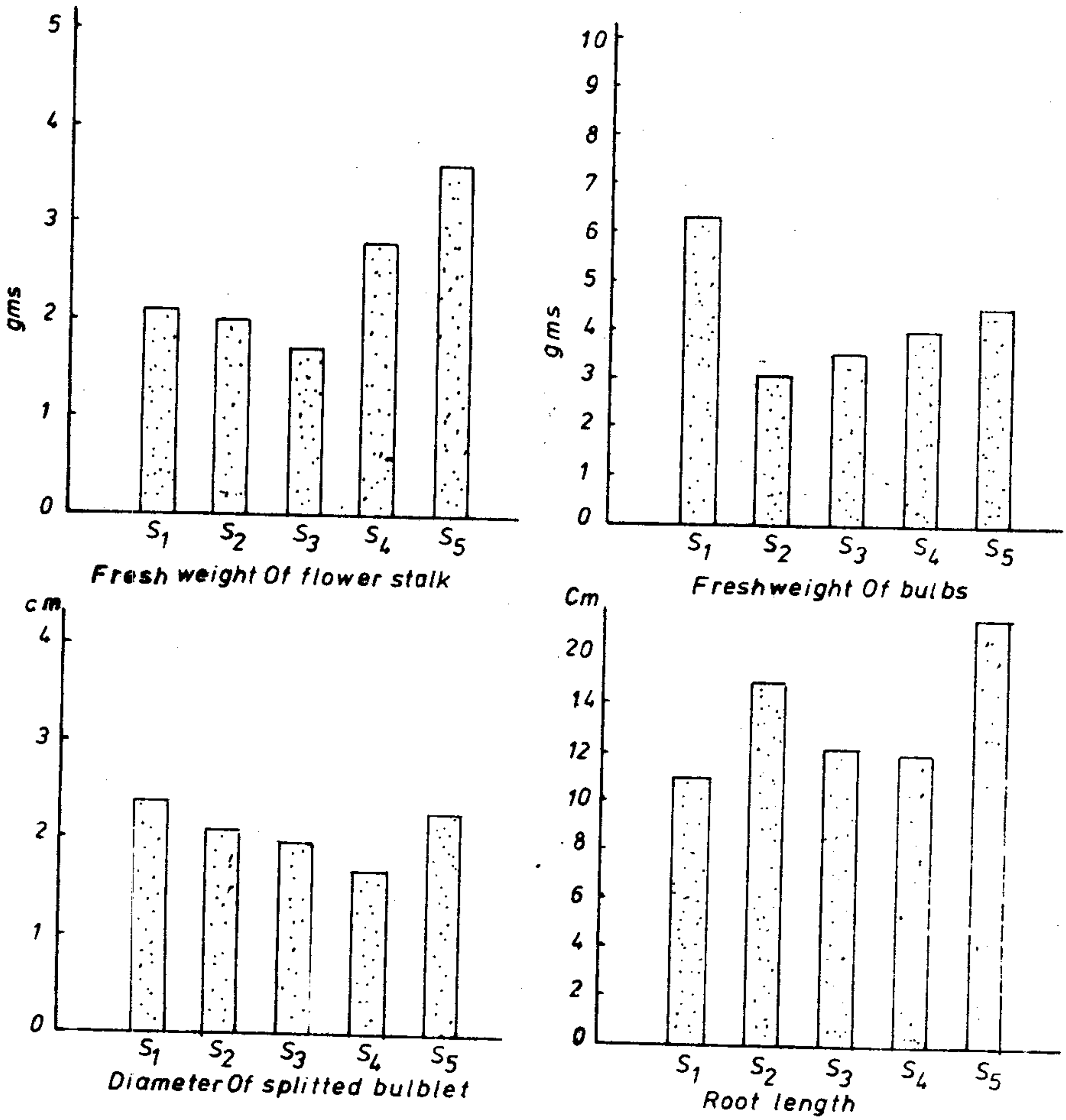


Fig. (8) Effect Of five different levels Of nutrition on growth of bulblets Of *L. longiflorum* during (1979)

On the other side, the low concentration increased the fresh weight of bulbs and the medium concentration raised the dry weight percentage of bulbs. No clear trend was noticed concerning the diameter of the splitted bulblets. The tallest roots resulted from the bulblets treated with the high level of nutrition.

However, the differences among the mentioned characters were insignificant as shown in Table (6).

It may be concluded that in order to encourage the growth of small Lilium longiflomum bulblets, a low concentration of the nutrition solution (S_1) is better to start with, this must be followed by raising the concentration of the nutrition solution to its maximum concentration as (S_5) during the vegetative growth, then lowering the standard of nutrition to (S_3) after flowering. Also the medium (1 sand : 1 loam : 1 peat moss) is proper for bulblet growth.

III Effect of Nutrition on the growth of Different Bulblets Sizes of Lilium longiflorum. Thunb.

1. Percentage of survival bulblets:

Data in Tables (7, 8, 9) and in Figure (8a) show the effect of the modified concentration of the nutrition solution on the growth of the different sizes of bulblets. It

Table (7) Effect of Nutrition on the weight of 100 bulblets from different sizes of *Lilium longiflorum*. Thunb.

Season (1978)

Nutrition	Diameter			Total	Mean	For	L.S.D.	
	Small less than 0.3	Medium from 0.3-0.6	Large more than 0.6				0.05	0.01
MS_1	98.3	82.7	105.0	286.0	95.3	Nutrition	7.32	10.08
MS_2	101.7	115.7	124.7	342.1	114.0	Diameter	N.S	N.S
M_3	118.0	112.3	128.3	358.6	119.5	N x d	N.S	N.S
Total	318.0	310.7	385.0	986.7				
Mean	106.0	103.6	119.3		328.9			

Mean weight of 100 bulblets (small size) =10 gms.
Mean weight of 100 bulblets (medium size)=28 gms.
Mean weight of 100 bulblets (large size)=65 gms.

Table (8) Effect of Nutrition on the weight of 100 bulblets from different sizes of *Lilium longiflorum* Thunb.

Season (1979)

Nutrition	Diameter			Total	Mean	For	L.S.D.	
	Small less than 0.3 cm.	Medium from 0.3 -0.6	Large more than 0.6				0.05	0.01
MS_1	93.3	82.3	103.0	278.6	92.9	Nutrition	7.7	10.6
MS_2	102.0	130.7	121.7	354.4	118.1	Diameter	N.S	N.S
MS_3	119.7	110.7	127.3	357.7	119.2	N x d	N.S	N.S
Total	315.0	323.7	352.0	990.7				
Mean	105.0	107.9	117.3		330.2			

Mean weight of 100 bulblets (small size) = 11 gms.
Mean weight of 100 bulblets (medium size)= 32 gms.
Mean weight of 100 bulblets (large size)= 76 gms.

Table (9) Effect of Nutrition on the Diameter of Different Bulblet Sizes of *Lilium Longiflorum* Thunb Season (1978).

Nutrition	diameter (cm)			Total	Mean	For	L.S.D.	
	small less than 0.3 cm	medium from 0.3-0.6 cm	large more than 0.6				0.05	0.01
MS_1	1.36	1.51	1.63	4.50	1.50	Nutrition	0.08	0.10
MS_2	1.56	1.56	1.75	4.87	1.62	diameter	N.S	N.S
MS_3	1.84	1.64	1.80	5.28	1.76	Nxd	N.S	N.S
Mean	1.58	1.57	1.73		4.88			

Cent. Table (9) **Effect of Nutrition on the Diameter of Different Bulbet Sizes of *Lilium lengiflerum* Thaunb Season (1979)**

Nutrition	diameter (cm) small less than 0.3 cm	medium from 0.3- 0.6 cm	large more than 0.6	Total	Mean	For	L.S.D. 0.05	0.01
MS_1	1.34	1.52	1.65	4.51	1.50	nutiratien	0.08	0.11
MS_2	1.54	1.69	1.75	4.98	1.66	diameter	N.S	N.S
MS_3	1.79	1.70	1.83	5.32	1.77	Nxd	N.S	N.S
Mean	1.56	1.64	1.74		4.94			

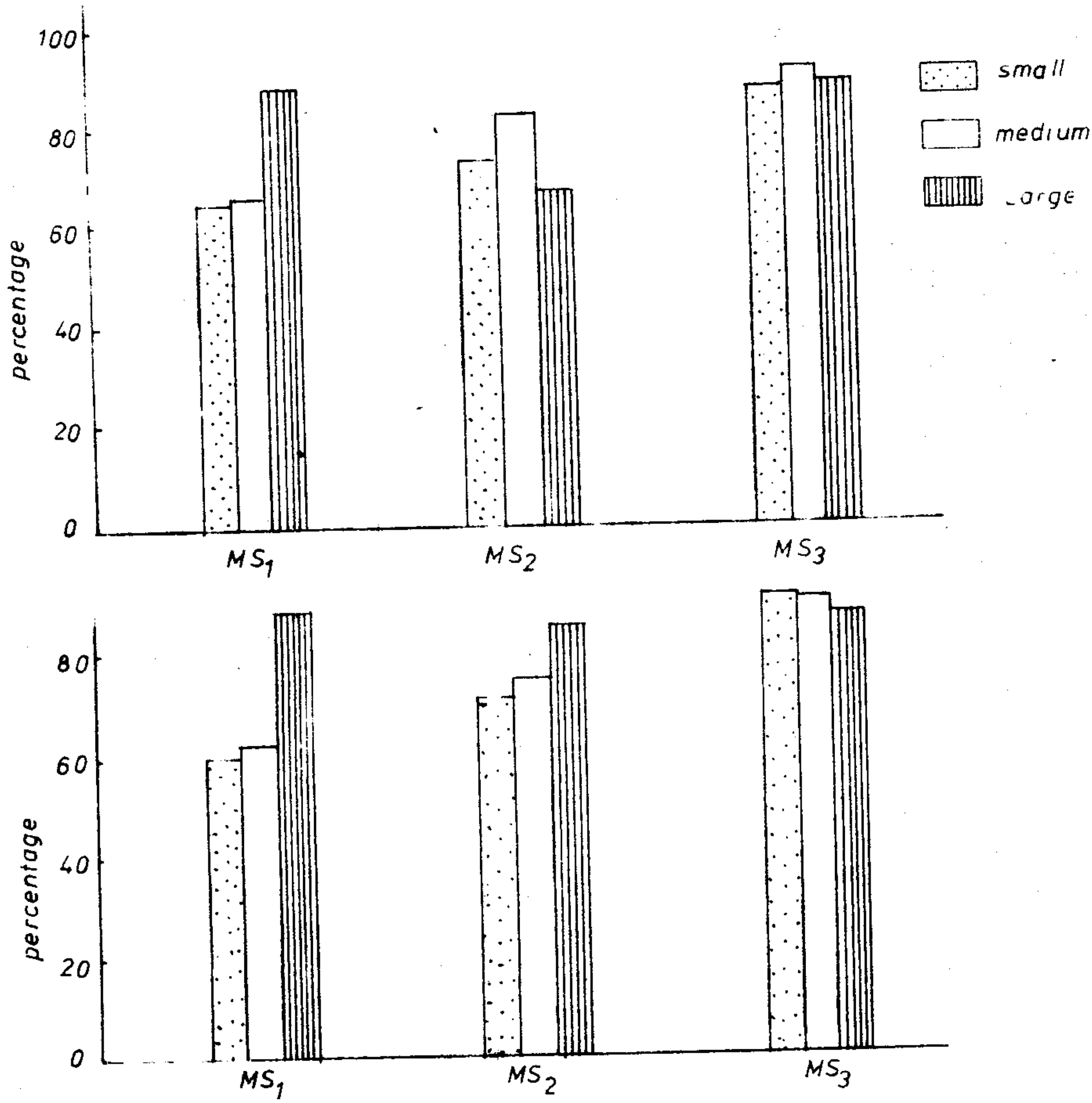


Fig 8a Effect Of nutrition on the Percentage Of survival Of the different size bulblets Of *Lilium longiflorum* (1979)

is clear from Figure (8a) that the greatest percentage of survival bulblets were attained in both seasons from the large size bulblets supplied with the low or medium concentration of the nutrition solution. It was a point of interest that the small size bulblets benifited more from the high level of nutrition.

2. Weight of 100 bulblets:

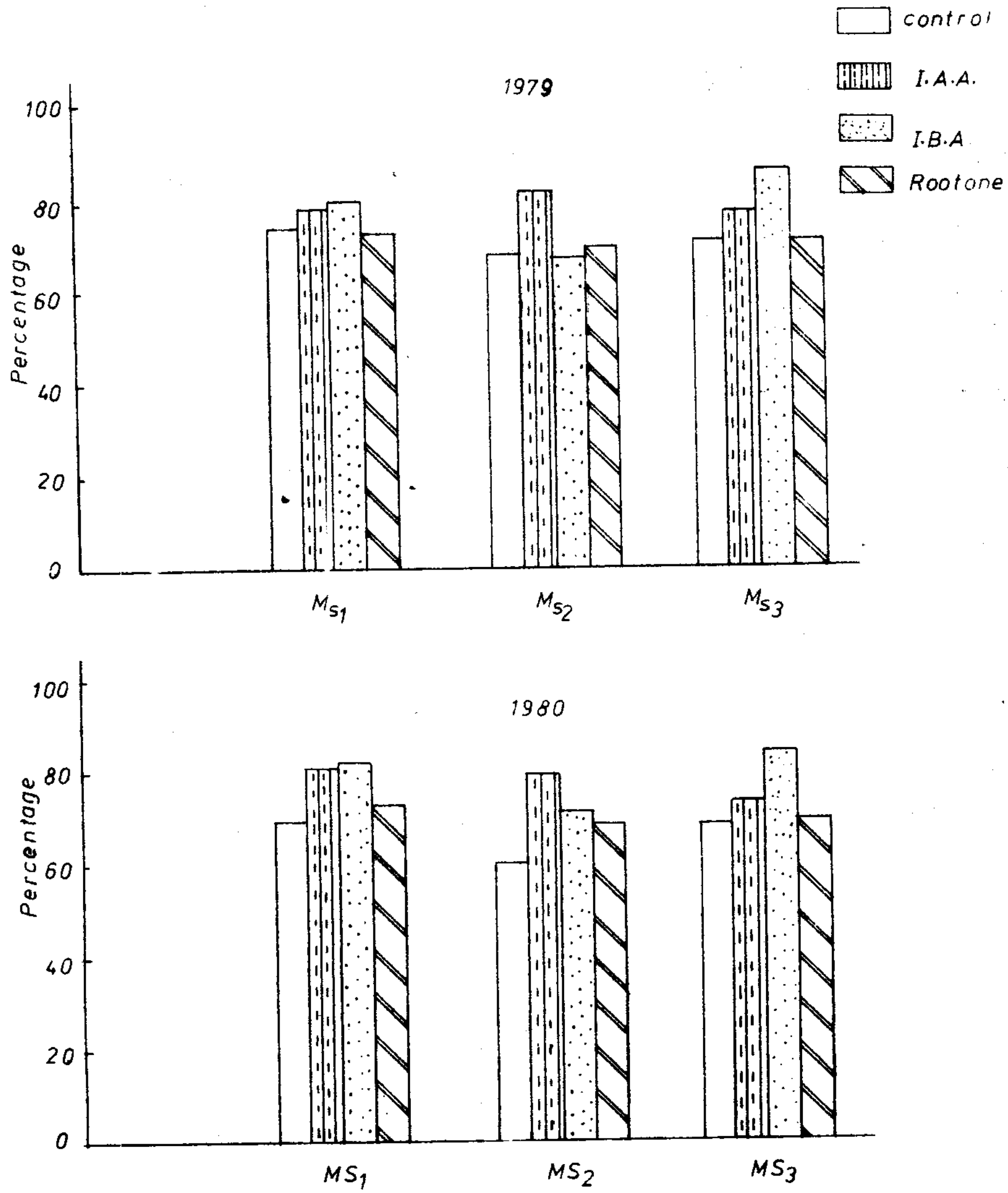
The mean weights of 100 of the started bulblets in (1978) were 10, 28 and 65 grms for the small, medium and large sizes, respectively. Nearly the similar weights were started in (1979) (Tables 7, 8). In most of cases, all different sizes increased proportionally with increasing the nutrition solution concentration. In (1978), the increasing percentages over the started weight for the samll bulblets were 883%, 917% and 1080% for the low, medium and high level of nutrition, respectively. Data of (1979) showed the same trend. The small size bulblets were more responsive for the nutrition as compared with the medium and large sizes.

3. Diameter of a bulblet:

As shown in Table (9) the bulblets of the different sizes reached nearly the same diameter after one growing season. This was more clear with the high level of nutrition. This trend was similar to that of the weight of bulblets. Hence, it is very important to advise the high level of nutrition for growing the small size bulblets. Any opinion of discarding such small sizes is false.

IV. Effect of Nutrition and Residual Effect of Growth Regulators on the Survival Bulblets of *Lilium logiflorum*. Thunb.

Data in Figure (8b) of the two seasons (1978) and (1979) indicate that growth regulators had no residual effect on the percentages of survival bulblets except with Rootone pretreatment which gave the highest percentages. This trend was more clear when the bulblets were subjected to the high level of nutrition.



Fig(8b) *Effect Of nutrition and residual effect Of growth regulatons on the percentage Of survival bulblets*

CHEMICAL COMPOSITION

I- Effect of Nutrition on the Chemical Composition.

1. Effect on the medium:

Data presented in Table (10) indicate that the chemical composition of the medium was changed after the nutrition solution applications. This was perhaps due to both nutrtion solution supply and plant uptake.

The electrical conductivity of the soil water extract which was 0.52 M. mhos/ cm at the beginning of the experiment increased to reach 1.32 for the (S_5) treatment at the end of experiment. This indicates that some salt accumulation happened.

The pH of the medium was nearly stable throughout the experiment.

Nitrogen, showed noticeable decrease in the soil supplied with (S_5); this case showed that the plants grown under this level of nutrition were still needing more nitrogen for their better growth.

Phosphorus, generally increased within narrow limits in the media supplied by the different levels of nutrition solutions.

Table (10) <u>Chemical Compostion of the 1:5 soil : water extract during (1979)</u>

No.	Sample	E.C. M. mhos. cm. at 25 °C	PH	Na	K	Ca	Mg	P	N	HCO_3	Cl	SO_4
1	Medium Before Nutrition	0.52	7.52	0.61	0.13	2.25	2.35	0.02	1.40	3.15	1.30	T
2	Media After S_1	1.00	7.81	0.53	0.78	1.38	2.75	0.06	1.23	4.21	1.02	2.20
3	S_2	0.83	7.71	0.52	0.92	1.26	2.00	0.04	1.52	4.96	0.98	2.50
4	S_3	0.79	7.73	0.09	0.49	1.39	3.12	0.05	1.71	4.18	1.16	1.86
5	S_4	1.10	7.79	0.18	0.43	1.81	3.06	0.04	1.79	4.36	1.10	1.79
6	S_5	1.32	7.71	0.13	0.29	1.61	3.18	0.05	1.12	4.09	1.31	2.00

* meq/100 gms soil

Table (11) Effect of Nutrition on the Chemical Composition of plant organs.

No.	part of plant	Level of Nutrition	Dry matter %	N%	P%	K%	Ca %	Mg %	Fe p.p.m
1-	Leaves	S_1	11.65	3.69	0.28	1.83	1.26	0.16	326
		S_2	13.55	2.69	0.26	1.90	1.33	0.16	321
		S_3	14.00	2.95	0.19	1.42	1.87	0.21	211
		S_4	9.50	3.18	0.31	1.84	1.24	0.18	329
		S_5	14.95	4.32	0.25	1.71	1.11	0.17	323
2-	flower stalk	S_1	9.60	3.18	0.14	1.62	1.25	0.17	221
		S_2	9.30	2.50	0.14	1.60	1.31	0.17	2 15
		S_3	9.10	2.61	0.15	1.70	1.32	0.16	225
		S_4	8.80	2.84	0.17	1.76	1.35	0.15	240
		S_5	17.95	3.58	0.18	1.80	1.25	0.16	226

Cont. Table (11) Effect of nutrition on the chmical composition of plant organs

No.	Part of plant	level of nutrition	% dry matter	% N	% P	% K	% Ca.	% Mg.	% Fe P.P.m.
3.	Flower	S_1	10.05	3.75	0.17	1.56	1.25	0.12	213
		S_2	9.90	4.65	0.19	1.64	1.25	0.10	216
		S_3	9.96	4.25	0.19	1.69	1.27	0.15	220
		S_4	9.70	3.29	0.19	1.56	1.07	0.18	215
		S_5	12.50	6.24	0.23	1.80	1.25	0.12	194
4.	Bulbs	S_1	45.00	2.38	0.13	2.00	1.93	0.23	205
		S_2	41.00	3.63	0.11	1.60	2.13	0.20	201
		S_3	50.00	2.84	0.13	1.60	1.79	0.12	216
		S_4	24.80	4.09	0.11	1.48	1.87	0.19	211
		S_5	30.50	4.31	0.12	2.00	1.88	0.21	202

Potassium, showed similar trend as phosphorus and the increases in its percentages were particularly with (S_1) and (S_2) solutions.

At the end of experiment calcium was decreased in the media indicating its utilization by plants.

Magnesium in most cases, increased in the media especially with the high levels of nutrition. This trend was also observed with bicarbonate and sulphate ions, sulphate whereas, no clear trend was noticed with chloride.

2. Effect on plant organs:

a) Leaves:

The highest percentage of dry matter was recorded from the leaves of (S_5) and the least one was that of (S_3) plants.

The high level of nutrition (S_5) gave the highest percentage of nitrogen in leaves.

Without clear trend the percentages of phosphorus, potassium, calcium, magnesium and iron in the leaves were slightly changed due to the nutrition levels. However, with (S_3) phosphorus, potassium and iron percentages were the lowest and in contrary the same treatment showed the highest percentages in Ca , Mg as shown in Table (11).

b) Flower stalk:

Data in Table (11) show that the highest percentages of dry matter, nitrogen, phosphorus and potassium in the flower stalk were recorded from the plants supplied with the highest level of nutrition solution. No clear trend, in this respect, was noticed with the other treatments. The variation in the nutrition solution concentration did not affect the Ca, Mg, and Fe percentages in the flower stalk.

c) Flower:

In the same Table (11), it is clear that the highest level of nutrition increased the percentages of dry matter, nitrogn , phosphorus and potassium in the flower of *Lilium longiflorum*. The percentages of the other elements were not affected with the different levels of nutrition.

d) Bulbs:

Data shown in Table (11), demonstrate that the low and the medium concentrations of the nutrition solutions (S_1, S_2 and S_3) gave higher percentages of dry matter in the bulbs as compared with the high levels.

The highest percentage of nitrogen was found in bulbs of (S_5) followed with those of (S_4).

Phosphorus, calcium, magnesium and iron percentages in bulbs were slightly changed due to the variation in the nutrition solution concentrations. Whereas, with potassium the percentages declined with (S_2, S_3, and S_4) concentrations. Generally, it may be concluded that the percentages of nitrogen in leaves, flower stalks, flowers and bulbs of Lilium longiflorum small plants ranged between (2.69-4.32),(2.50-3.58), (3.29 - 6.24) and (2.38 - 4.31), respectively. This indicates that the flowers posses the highest percentage of nitrogen.

For phosphorus, the percentages in the pre-mentioned organs, respectively ranged between (0.19 - 0.31), (0.14 - 0.18), (0.17 - 0.23) and (0.11 - 0.13), indicating that the leaves had the highest percentages.

Potassium percentages ranged between (1.42 - 1.90) , (1.60 - 1.80), (1.56 - 1.80) and 1.48 - 2.00), respectively for the same organs. The range was nearly similar in the different organs. However, it is clear that the percentages of most minerals increased with the highest levels of nutrition reflecting on the better growth attained by the plants.

Similar results were reported by Boodley (1962), who found that Croft Lily fertilized with Hoagland's solution produced the greatest amont of linear growth. Hosaka et al (1962), stated that the best bulbs of Lilium auratum were produced by fertilization with high rates of N,P, and K. While, Steckel et al. (1962), found that total dry weight in Croft Lily was increased by high soil P levels and unaffected by soil Ca level. At high-soil P levels the greatest accumulation of P. occured in stem tissue. Kiplinger at at (1972), found that all the plants of Ace, Nellie white and No. 44 Lily cvs which were grown with Osmocote (18 - 9 - 9) or Mag Amp (7-40-6) slow release fertilizers incoroporated in the soil mixture before potting produced saleable quality, but those which received further fertilizers gave the best plants and flowering. Similar trend of results was obtained by Powell et al. (1975), on Easter Lily-Nellie white, Weider (1977) on Lily El-Gamassy and Moustafa (1963) on Dahlias, Lameni (1965) on Gladolus, Blanssinsky (1967) on Cyclamen.

Effect of nutrition on the percentage of carbohydrates:

a) Dry matter :

The percentage of dry matter in leaves of lily ranged between (9.50 - 14.95) as shown in Table (12). The low value was from the plants of S_4. This treatment gave the least values for dry matter in the different organs of the plant. The highest percentages of dry matter were those in leaves, flower stalk and flowers of the plants which received the highest level of nutrition (S_5). The medium level of nutrition (S_3) gave the highest percentage of dry matter in bulbs.

b) Total carbohydrates :

The total carbohydrate percentages were nearly the same in the leaves and the flower stalk of lilium. The flower contained the least percentages whereas the bulbs had the highest ones. In all different organs, nutrition did not affect the percentages of total carbohydrates except with the flowers of S_5 which contained considerably higher percentage as compared with the other treatments.

Table (12) Effect of Nutrition on the percentage of Carbohydrates and suger in plant organs.

No.	part of plant	level of mutrition	Dry matter %	Total Carbohydrate %	R. suger %	N.R suger %	T. ss %
1-	Leaves	S_1	11.65	14.35	2.56	1.87	4.52
		S_2	11.55	14.50	3.06	2.30	5.36
		S_3	14.00	13.80	2.99	1.87	4.86
		S_4	9.50	15.20	2.78	1.86	4.64
		S_5	14.95	14.00	2.98	2.05	5.03
2-	flower stalk	S_1	9.60	13.45	3.47	1.89	5.36
		S_2	9.30	13.60	2.95	1.79	4.74
		S_3	9.10	13.55	2.99	1.09	4.79
		S_4	8.80	13.40	3.00	1.97	4.97
		S_5	17.95	13.25	3.50	1.78	5.28

Cont. Table (12) Effect of Nutrition on the percentage of carbohydrates and suger in plant organs.

No.	part of plant	Level of mutrition	Dry matter %	Total Carbohydrate %	R. suger %	N.R. suger %	T. S. S. %
3-	flower	S_1	10.05	9.85	1.80	1.67	3.47
		S_2	9.90	9.60	2.54	2.11	4.65
		S_3	9.96	9.63	2.60	1.95	4.59
		S_4	9.70	9.10	2.65	1.87	4.52
		S_5	12.50	11.3	1.85	1.65	3.5
4-	bulbs	S_1	45.00	15.70	2.98	2.11	5.09 5.09
		S_2	41.00	17.40	3.61	2.41	6.02
		S_3	50.00	16.50	3.28	2.38	5.66
		S_4	24.80	16.50	4.21	2.36	6.57
		S_5	30.50	16.80	4.16	2.91	7.07

c) Soluble sugars :

The percentages of reducing sugars in the leaves ranged between 2.56 and 3.06. The increasing values were with the high levels of nutrition. These results agree with those reported by Mohamed (1968), on gladiolus. The same trend was observed with both non-reduced sugars and the total soluble sugars (Table 12).

In the flower stalk the reduced sugars reached its maximum percentage (3.50) with the highest level of nutrition (S_5). The values with the treatments S_2, S_3 and S_4 were nearly the same. The high level of nutrition S_4 gave the highest percentage of the non-reduced sugars. However, the lowest and the highest level of nutrition resulted in the highest percentages of the total soluble sugars in the flower stalk.

In the flower, the highest percentages of soluble sugars (reduced, non-reduced and total soluble sugars) were found with the treatments S_2, S_3 and S_4.

In bulbs, the percentage of sugars increased with increasing the levels of nutrition. The highest percentages were from the bulbs of S_5.

Generally, it can be concluded that the high level of nutrition increased the total carbohydrates and the soluble sugars especially in the flower stalk and bulbs. These results agree with those reported by Meawad (1977) on gladiolus, who found that urea fertilization slightly increased the percentages of total and non-reduced sugars in the new corms of gladiolus.

SECOND EXPERIMENT

Effect of Some Growth Regulators, Temperature and Wounding on the induction of Bulblets on the Stem Cuttings and Bulb scales of Lilium longiflorum. Thunb.

I. Effect of growth Regulators:

1. Effect of IAA on propagtion by cutting:

a) Percentage of survival cuttings:

Data in Table (13) and Figure (9) indicate that in both seasons 1978 and 1979 - the percentages of survival cuttings horizontally planted were nearly twice those of the vertical ones.

In (1979) treating the cuttings before planting with the high concentration of IAA as 200P.P.M. considerably increased the percentage of survival horizontally planted cuttings which was 88.8% compared to 27.7% for the vertical cuttings. The increase may be explained as a balance in the distribution of the promoting substance horizontally in all the cutting tissues instead of localization of the auxin in the base of the cutting. Such distribution may permit suitable balance

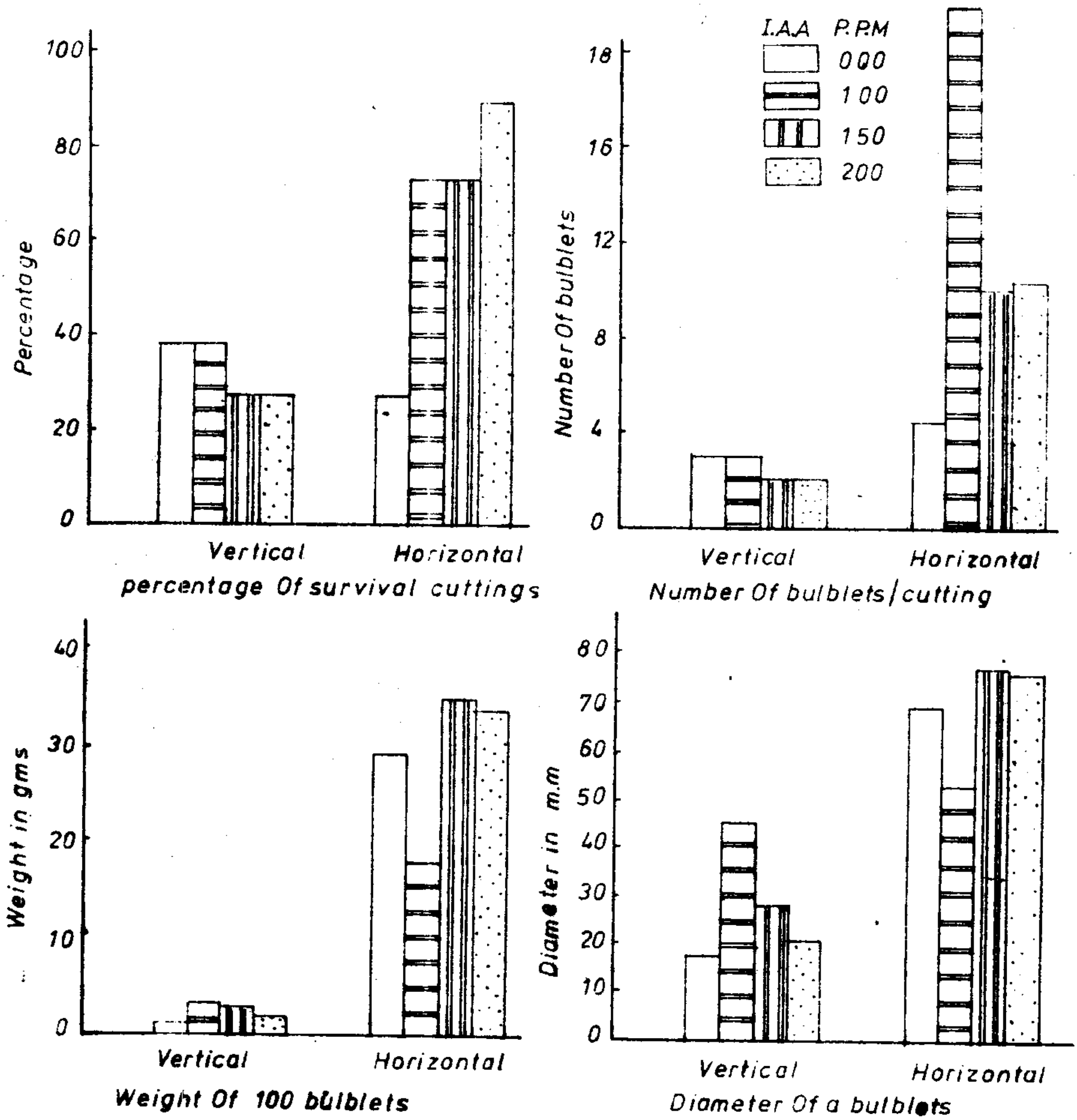
Table (13) Effect of IAA on the percentage of survival cuttings of *Lilium longiflorum*. Thunb.

Season (1978)

Position	Treatment, P. P. m.				Total	Mean
	0.00	100	150	200		
Vertical	22.2	22.2	27.7	16.6	88.7	22.2
Horizontal	22.2	55.5	72.2	83.3	233.2	58.3
Total	44.4	77.7	99.9	99.9	321.9	40.2
Mean	22.2	38.8	49.9	49.9		

Season (1979)

Vertical	38.8	38.8	27.7	27.7	133.0	33.3
Horizontal	27.2	72.2	72.2	88.8	260.9	65.2
Total	66.5	111.0	99.9	116.5	393.9	49.2
Mean	33.3	55.5	50.0	58.3		



Fig(9) Effect Of I A A on the induction Of bulblets on the stme cutting Of L longiflcrum between the auxin and the sugars in the cutting tissues.

It was reported by Hassan (1976) on Lilium longiflorum that IAA had great effect as a promoting substance for propagation. Also, other investigators as Singh (1967), who reported that IAA increased the germination of sugar cane cuttings, whereas Kukulezanka (1969) demonstrated that IAA at certain concentration stimulated the development of the first root at the base of newly formed corms of freesia. Nanda et al (1969), found that the exogenous application of IAA and IBA enhanced the rooting of inverted cuttings of Ipomoea spp. and Hibiscus spp. Similar results were reported by Chakraverty (1970) on Baugainvillea spp. In (1973), Ohkawa found that IAA (0.5%) increased the rooting ability of rose cuttings. While, Mansour et al. (1975) found that dipping bases of cuttings of 4 Carnation cvs. in IAA at 50-200 P.P.m. for 5 minutes stimulated rooting and this effect rose with IAA concentration. Lipecki et al (1976) reported that IBA and IAA stimulated rooting of Black currant, Sour cherry and Forsythia. Davies et al. (1978), reported that IBA : NAA and IAA. stimulated advantitious root formation in mature stem cuttings of Ficus pumila, while juvenile controls rooted 100%.

b) Number of bulblets per cutting:

In both seasons (1978) and 1979), data in Table (14) show that the mean number of bulblets produced on the horizontal or vertical cuttings of control was nearly the same. When such cuttings were pre-treated with IAA, the mean number of induced bulblets increased. This was particularly clear with the high concentration of IAA. Although with vertical cuttings, IAA gave considerable and highly significant increase as compared with control Figure (9) and photo (1), the new formed bulblets on a horizontal cutting were many times as much as those carried on a vertical one. The suitable concentration of IAA in this respect was 100 P.P.m. Previous investigation by Hassan (1976), shawed that IAA resulted in increasing the number of bulblets formed on

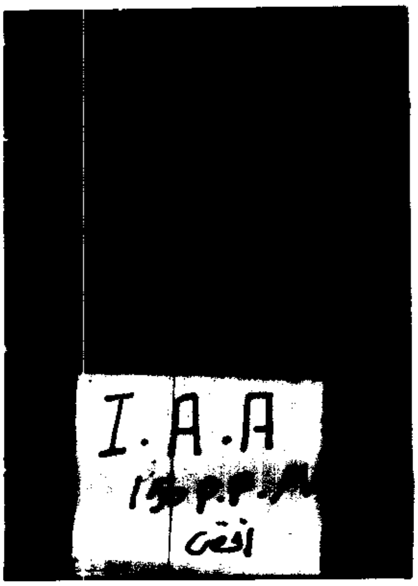
Table (14) Effect of IAA on the number of bulblets produced by a vertical or horizontal cutting of *Lilium longiflorum.* Thunb.

Season (1978)

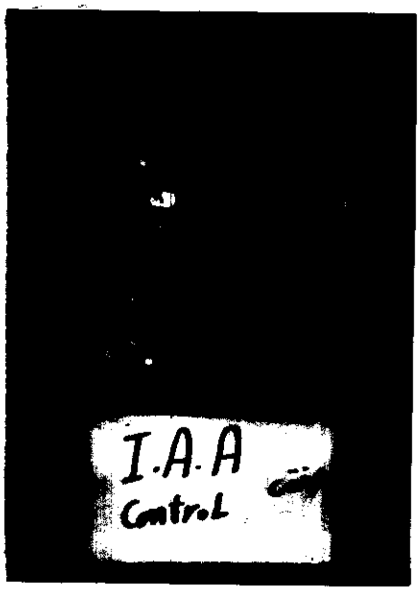
Position	Treatment , P. P. m.				Total	Mean	L. S. D.		
	0.00	100	150	200			For	0.05	0.01
Vertical	3.33	6.00	1.25	0.75	11.33	2.83	Position	5.10	7.07
Horizontal	3.33	23.07	18.07	13.37	57.84	14.46	IAA	2.92	4.05
Total	6.66	29.07	19.32	14.12	69.17		PxIAA	4.97	6.89
Mean	3.33	14.53	9.66	7.06		34.58			

Season (1979)

Vertical	3.06	3.11	2.13	2.13	10.43	2.61	position	3.84	5.32
Horizontal	4.63	19.40	10.33	11.26	45.62	11.40	IAA	1.97	2.67
Total	7.69	22.51	12.46	13.39	56.05	14.01	PxIAA	3.72	5.16
Mean	3.84	11.26	6.23	6.69		28.02			



Cuttings in horizontal position



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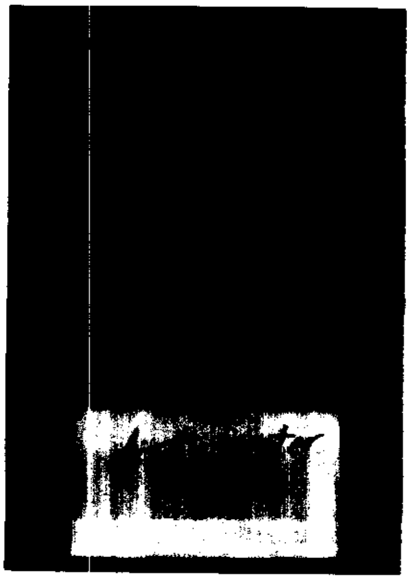
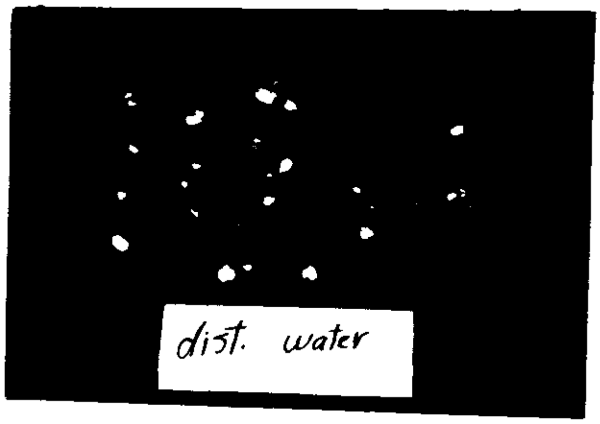


Cuttings in horizontal position



Cuttings in vertical position

Photo (1) Effect of IAA on the Induction of Bulblets on the cuttings of *Lilium longiflorum*, Thunb

Lilium longiflorum cuttings. Generally, the best treatment as shown from the interaction Position x IAA (Table (14) was the horizontal planting when the cutting was pre-treated with 100 P.P.m. of IAA

c) Weight of 100 bulblets:

Regarding the mean weights of 100 bulblets which formed of *Lilium longiflorum* cuttings, it is clear in Table (15) and Figure (9), that the horizontal planting was much better as compared with vertical planting. The differences in this respct were highly significant.

On the other hand, the concentration variation of the IAA treatments had no significant effect on the weight of the new formed bulblets either with vertical or horizontal planting. However, the heaviest weight of the new formed bulblets was obtained from the horizontal cuttings treated with IAA as 200 P.P.m. This was true in both seasons.

Similar results were reported by Pillai (1978), on Tomatoes; Samantarai and Nanda (1979) on

Table (15) Effect of IAA on the weight of 100 bulblets (in gms) produced from vertical and horizontal cuttings of <u>Lilium longiflorum</u>. Thubb.

Season (1978)

Position	Treatment, P. P. m..				Total	Mean	L. S. D.		
	0.00	100	150	200			For	0.05	0.01
Vertical	1.0	3.6	3.3	2.0	9.9	2.5	Position	12.36	17.13
Horizontal	31.3	18.3	37.6	35.3	122.5	30.5	IAA	N.S.	N.S.
Total	32.3	21.9	40.9	37.3	132.4		PxIAA	N.S.	N.S.
Mean	16.2	10.9	20.5	18.6		66.2			

Season (1979).

Vertical	1.4	3.3	3.0	1.9	9.6	2.4	Position	11.77	16.32
Horizontal	29.6	18.0	35.3	34.0	116.9	29.25	IAA	NSS.	N.S.
Total	31.1	21.3	38.3	35.9	126.6		PxIAA	N.S.	N.S.
Mean	15.5	10.7	19.2	17.9		63.3			

Capsicum annuum and Aloni (1979) on Coleus who found that IAA enhancement reflects on some different plant organs or tissues. While, Brunner (1977), reported that IAA raised the contents of sugars in Bean hypocotyle.

d) Diameter of a bulblet:

Data in Table (16) and Figure (9) show that horizontal planting significantly increased the diameter of the new formed bulblets. This was clear within each concentration of IAA in both seasons.

The different concentrations of IAA had no influence on increasing the bulblet diameter. Also, the interactions of Position X IAA were insignificant.

2. Effect of IBA on propagation by cuttings:

a) Percentage of survival cuttings:

In Table (17) and Figure (10) indicate that the horizontal planting of the untreated cuttings in (1979) gave more survival cuttings than vertical ones. When the cuttings were pre-treated with 100, 200 and 250 P.P.m. of IBA, the percentage of

Table (16) Effect of IAA on the diameter (cm) of a bulblet produced from vertical and horizontal cuttings of __Lilium longiflorum.__ Thunb.

Season (1978)

Position	Treatment, P. P. m.				Total	Mean	L. S. D.		
	0.00	100	150	200			For	0.05	0.01
Vertical	0.16	0.50	0.40	0.20	1.26	0.31	Position	0.18	0.25
Horizontal	0.72	0.65	0.79	0.77	2.93	0.73	IAA	N.S.	N.S.
Total	0.88	1.15	1.19	0.97	4.19		PxIAA	N.S.	N.S.
Mean	0.44	0.57	0.59	0.49		2.09			

Season (1979)

Vertical	0.17	0.45	0.37	0.21	1.20	0.30	Position	0.18	0.25
Horizontal	0.69	0.63	0.77	0.76	2.85	0.71	IAA	N.S.	N.S.
Total	0.86	1.08	1.14	0.97	4.05		PxIAA	N.S.	N.S.
Mean	0.43	0.54	0.57	0.48		2.02			

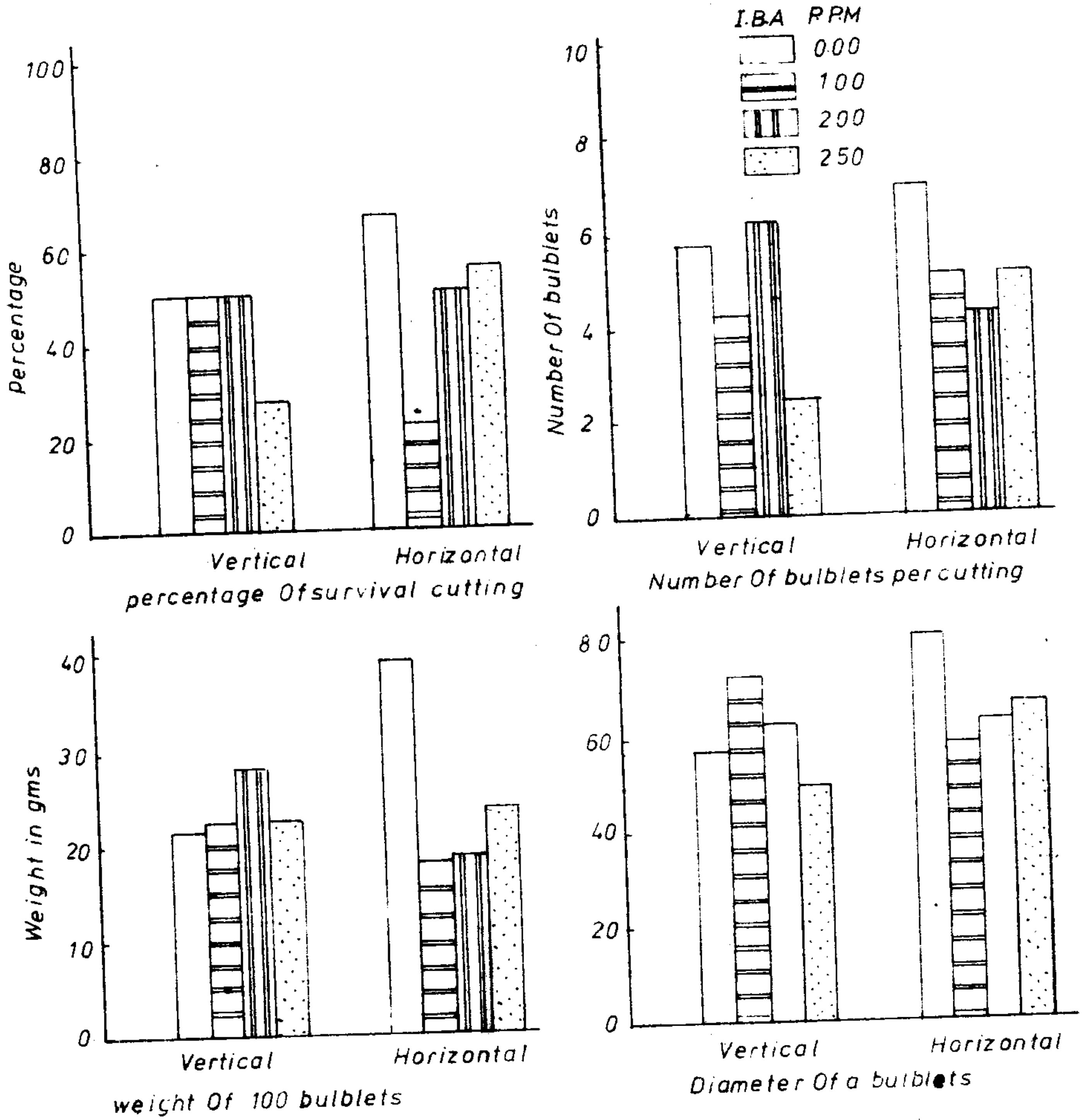
Table (1') Effect of IBA on the percentage of survival cuttings of *Lilium longiflorum*. Thunb.

Season (1978)

Position	Treatment P. P. m.				Total	Mean
	0.0	100	200	250		
Vertical	94.4	33.2	33.2	49.9	210.7	52.7
Horizontal	83.3	27.7	16.6	44.4	172.0	43.0
Total	177.7	60.9	49.8	94.3	382.7	47.8
Mean	88.9	30.5	25.0	47.2		

Season (1979)

Vertical	49.9	49.9	49.9	27.7	177.4	44.4
Horizontal	66.6	22.2	49.9	55.5	194.2	48.6
Total	116.5	72.1	99.8	83.2	371.6	46.5
Mean	58.3	36.1	49.9	41.6		



Fig(10) Effect Of I·B·A on the induction Of bulblets on the stme cutting Of L longiflowrum survival of the vertical cuttings was, in most cases, more than the horizontal. This trend was more clear in the data of (1978) season. However, the control treatment in both seasons gave the best results as compared to the other treatments except that of the 200 P.P.m. IBA concentration with horizontal planting in (1979). Hence, the moderate concentration of IBA. can be advised for increasing the survival cuttings.

b) Number of bulblets per cutting:

In both seasons data in Table (18) and Figure (10) concerning the mean number of bulblets formed on a cutting show that planting cuttings horizontally or vertically had no significant effect in this respect. More bulblets formed on the vertical cuttings in (1978) and the contray happened in (1979).

None of the IBA concentrations gave higher number of bulblets as compared with control except for the 100 P.P.m. with the vertical cuttings and 200 P.P.m. with the horizontal cuttings in (1978) and (1979), respecitively. However, the differences in this respect were insignificant. Photo (2)

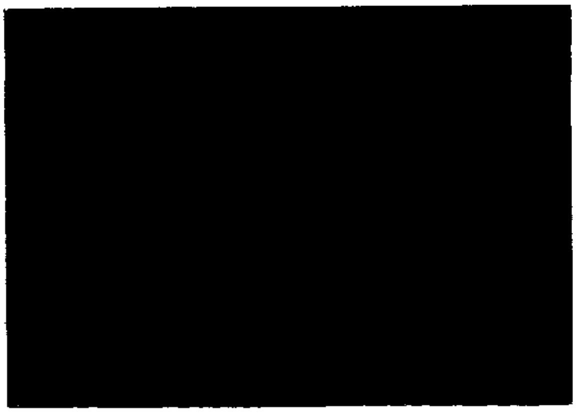
Table (18) Effect of IBA on the number of bulblets produced from a vertical or horizontal cutting of *Lilium longiflorum*. Thunb.

Season (1978)

Position	Treatment , P. P. m.				Total	Mean	L. S. D.		
	0.00	100	200	250			For	0.05	0.01
Vertical	12.70	15.37	7.23	11.07	46.36	11.59	Position	N.S.	N.S.
Horizontal	9.23	6.17	8.17	8.50	32.07	8.02	IBA	N.S.	N.S.
Total	21.93	21.54	15.40	19.57	78.43		PxIBA	N.S.	N.S.
Mean	10.96	10.77	7.70	9.78		39.21			

Season (1979)

Vertical	5.73	4.23	6.26	2.13	18.34	4.59	Position	N.S.	N.S.
Horizontal	6.93	5.00	4.23	5.00	21.16	5.29	IBA	N.S.	N.S.
Total	12.66	9.23	10.49	7.13	39.51		PxIBA	N.S.	N.S.
Mean	6.33	4.61	5.24	3.57		19.75			



IBA 100 P.P.m.

Cuttings in horizontal position

IBA 250 P.P.m.

Cuttings in horizontal position

Photo (2) Effect of IBA on the Induction of Bulblets on the cuttings of <u>Lilium</u> <u>longiflorum</u>. Thunb shows the effects of IBA on the induction of bulblets.

c) Weight of 100 bulblets:

The weight of 100 bulblets formed on horizontal cuttings of control was more than that of vertical cuttings as shown in Table (19) and Figure (10). This was true in both seasons, but no significant difference was attained when the horizontal cuttings gave nearly double weight of the vertical ones.

The 200 P.P.m. IBA concentration -in both seasons - was the only one which fairly increased the weight of bulblets when applied with the vertical cuttings.

d) Diameter of a bulblet:

Horizontal planting of the untreated cuttings gave thicker diameter of bulblets than vertical planting as shown in Table (20) and Figure (10). The differences in this respect were insignificant.

The application of IBA - in most cases - did not affect the diameter of the new formed bulblets except for the treatments of 100 and 200 P.P.m.

Table (19) Effect of IBA on the weight of 100 bulblets (in gms) produced from vertical and horizontal cutting of *Lilium longiflorum*, Thunb.

Season (1978)

Position	Treatment, P .P .m.				Total	Mean	L. S. D. For		
	0.00	100	200	250				0.05	0.01
Vertical	23.3	23.3	30.0	24.0	100.6	25.1	Position	N.S.	N.S.
Horizontal	41.3	19.6	20.6	24.0	105.5	26.4	IBA	N.S.	N.S.
Total	64.6	42.9	50.6	48.0	206.1		PxIBA	N.S.	N.S.
Mean	32.3	21.4	25.3	24.0		103.0			

Season (1979)

Vertical	21.3	22.0	28.6	22.0	93.9	23.5	Position	N.S.	N.S.
Horizontal	39.0	18.0	18.6	23.0	98.6	24.7	IBA	N.S.	N.S.
Total	60.3	40.0	47.3	45.0	192.6		PxIBA	N.S.	N.S.
Mean	30.2	20.0	23.6	22.5		96.3			

Table (20) Effect of IBA on the diameter (cm) of a bulblet produced from vertical and horizontal cuttings of *Lilium longi florum.* Thunb.

Season (1978)

Position	Treatment, P.P.m.				Total	Mean	For	L. S. D.	
	0.00	100	200	250				0.05	0.01
Vertical	0.61	0.75	0.67	0.53	2.56	0.64	Position	N.S.	N.S.
Horizontal	0.83	0.61	0.65	0.66	2.75	0.69	IBA	N.S.	N.S.
Total	1.44	1.36	1.32	1.19	5.31		PxIBA	N.S.	N.S.
Mean	0.72	0.68	0.66	0.59		2.65			

Season 1979)

Vertical	0.57	0.72	0.63	0.50	2.42	0.60	Position	N.S.	N.S.
Horizontal	0.80	0.58	0.63	0.66	2.67	0.67	IBA	N.S.	N.S.
Total	1.37	1.30	1.26	1.16	5.09		PxIBA	N.S.	N.S.
Mean	0.68	0.65	0.63	0.58		2.54			

on the vertically planted cuttings. These treatments slightly increased the bulblet diamter as compared with control. Generally, it can be concluded that IBA had more influence on the development of new bulblets on the vertically planted cuttings. The suitable concentration was 100 and 200 P.P.m. These results agree with those obtained by Young (1967), who showed that IBA stimulated bulblet formation as well as the root system on treated scales of Lilium speciosum and Hassan (1976), who found that bulblets formation on the stem cuttings of Lilium longiflorum. Thunb can be encouraged by both IAA and IBA each at 50, 100, 150 P.P.m. He also found that increasing the levels of IAA and IBA up to 100 P.P.m. increased to different extent the number of survival cuttings which formed bulblets. Many investigator such as Leshem and Schwarz (1968) on Chrysanthemum, Nanda et al. (1969) on Ipomoea and Hibsicus spp., Bose and Mondal (1970) on 10 tropical tree species, Chakraverty (1970) on Baugainvillea, Sandved (1970) on cotoneaster, Gorgoshidze (1971) on Feijoa, Moe (1971) on Rose, Anand et al (1972) on Ipomoea fistulosa, Denmhrk, statens

(1972) on *Malus* sp., Morris *et al.* (1972) on *Cornus florida*, Bhujbal and Kale (1973) on *Rosa bourboniana* and *R. moscata*, Murray and Whitcomb (1973) on *Callistemon ctrinus* , Beck and Sink (1974) on Poinesettia, Boylan and Davidson (1975) on *Ilex verticillata*, Lipecki *et al* (1976) on Black currant, Sour cherry and *Forsythia*, Singh (1976) on *Jasminum sambac*, Dirr and Biedermann (1978) on *Forthergilla gardeni*; Palsingh (1979) on *Ixora*. spp., they found that both IAA and IBA have promoting effects on the rooting of cuttings of different species.

3. Effect of Rootone on propagation by cuttings

a) Percentage of survival cuttings:

It is apparent form Table (21) and Figure (11) that control cuttings, in both seasons, varied in their response to the position of their planitng. In (1978) the vertical cuttinge gave higher percentage, while in (1979) contrary results were noticed.

On the other side, the pre-treatment with Rootone dust at a concentration of 2000 P.P.m. remarkably increased the percentage of the

Table (21) Effect of Rootone on the percentage of survival cuttings of *Lilium longiflorum*. Thunb.

Season (1978)

Position	Treatment: Talc	Treatment: 2000 P.P.m.	Total	Mean
Vertical	54.2	75.0	129.2	64.6
Horizontal	33.3	72.2	105.5	52.8
Total	87.5	147.2	234.7	58.7
Mean	43.8	73.6		

Vertical	33.3	66.6	99.9	49.9
Horizontal	55.5	77.7	133.2	66.6
Total	88.8	144.3	233.1	58.3
Mean	44.4	72.1		

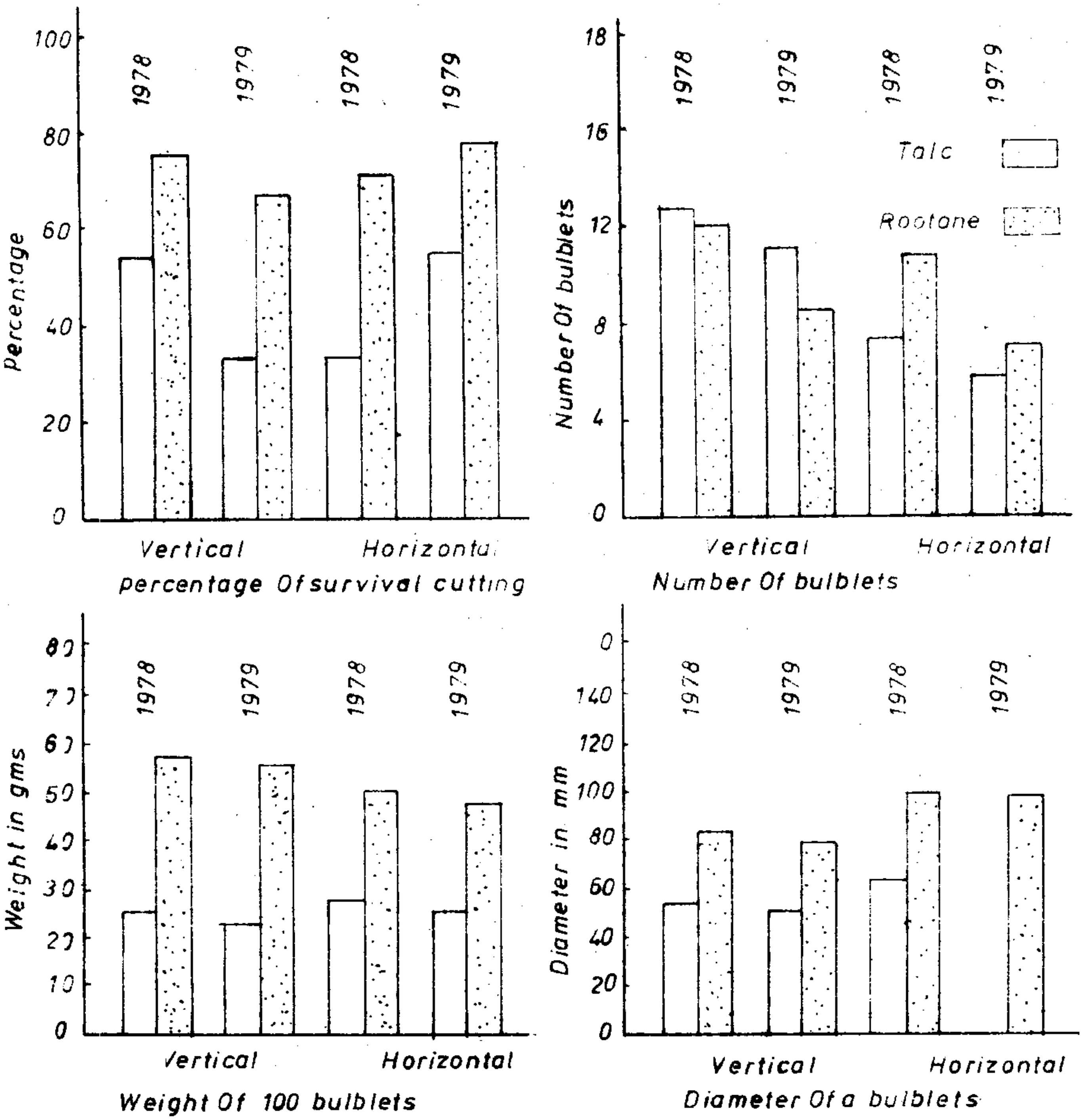


Fig (11) Effect Of root one on the induction Of bulblets on the stem cutting Of L. longiflorum 1978 survival cultting of both vertical and horizontal planting. The increasing percentage ranged between 21% and 39%.

b) Number of bulblets per cutting:

No significant differences among the nubmer of bulblets per cutting are noticed in Table (22) in regard to the position of planting. However, the vertically palnted cuttings whether treated with Rootone or not, gave more number of bulblets as compared with the horizontal planting.

Rootone increased the number of bulblets as compared with control. This was evident in both seasons; the increase was about 39% in (1978) and 25% in (1979). Figure (II) and Photo (3) show the éffect of Rootone on the number of new formed bulblets.

e) Weight of 100 bulblets:

Data in Table (23) and Figure (11) indicate that the horizontal planting of control cuttings gave heavier weights of bulblets as compared with vertical planting.

Table (22) Effect of Rootone on the number of bulblets produced from a vertical or horizontal cutting of *Lilium longiflorum.* Thunb.

Season (1978)

Position	Treatment		Total	Mean	For	L. S. D.	
	Talc	Rootone 2000 p.p.m				0.05	0.01
Vertical	12.70	12.13	24.83	12.41	Position	N.S.	N.S.
Horizontal	7.50	10.46	17.96	8.98	Rootone	N.S.	N.S.
Total	20.20	22.59	42.79		PxR	N.S.	N.S.
Mean	10.1	11.29		21.39			

Season (1979)

Vertical	10.93	8.43	19.36	9.68	Position	N.S.	N.S.
Horizontal	5.83	7.30	13.13	6.56	Rootone	N.S.	N.S.
Total	16.76	15.73	32.49		PxR	N.S.	N.S.
Mean	8.38	7.86		16.24			

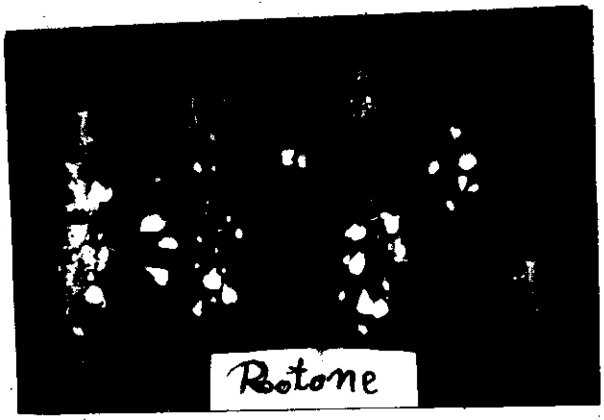
Table (23) Effect of Rootone on the weight (in gms) of 100 bulbelts produced from vertical and horizontal cuttings of <u>Lilium longiflorum.</u> Thunb.

<u>Season (1978)</u>

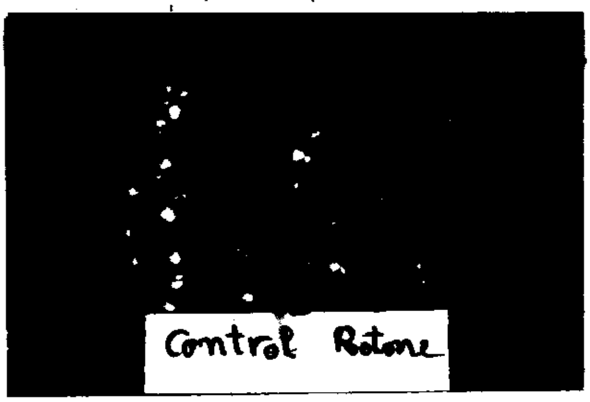
Position	Treatment		Total	Mean	For	L.S.D.	
	Talc	Root-one 2000 P.P.m.				0.05	0.01
Vertimal	25.33	57.65	82.98	41.49	Position	N.S.	N.S.
Horizontal	28.00	50.33	78.33	39.16	Rootone	9.33	29.27
Total	53.33	107.99	161.31		PxR	N.S.	N.S.
Mean	26.66	53.99		80.65			

<u>Season (1979)</u>

Vertical	23.33	56.33	79.66	39.83	Position	N.S.	N.S.
Horizontal	25.33	47.33	72.66	36.33	Rootone	19.45	29.45
Total	48.66	103.66	152.32		PxR	N.S.	N.S.
Mean	24.33	51.83		76.19			



Cuttings in vertical position



Cuttings in vertical position

Photo (3) Effect of Rootone on the Induction of Bublets on the cuttings of <u>Lilium longiflorum</u>. Thunb.

Rootone application increased the weight of the produced bulblets. In both seasons the increase was statistically significant. The most promising effect was noticed with the vertically planted cuttings which doubled the weight of the produced bulblets. Similar results were reported by Raugh and Korus (1970) who found that Rootone and Hormodin had increasing effects on the rooting percentage and quality in the more difficult-to-root varieties of cotoneaster.

d) Diameter of a bulblet:

The diameter of the new formed bulblet was increased by the horizontal palnting as shown in Table (24) and Figure (11).

The differences in this respect were significant in both seasons.

Rootone with horizontal planting of cuttings gave thicker new formed bulblets than vertical planting. For this reason, Rootone application may be advised for the production of better sizes of bulblets from *Lilium longiflorum* cuttings.

Table (34) Effect of Rootone on the diameter of a bulblet produced from vertical or horizontal cutting of *Lilium longiflorum*. Thunb.

Position	Treatment		Total	Mean	For	L. S. D.	
	Talc	Root-one 2000 P.P.m.				0.05	0.01
Vertical	0.54	0.82	1.36	0.68	Posi-tion	0.08	1.29
Horizon-tal	0.64	0.97	1.61	0.81	Root-one	0.22	0.33
Total	1.18	1.79	2.97		PxR	N.S.	N.S.
Mean	0.59	0.89		1.48			

Season (1979)

Vertical	0.51	0.79	1.30	0.65	Posi-tion	0.08	0.12
Horizon-tal	0.59	0.96	1.55	0.77	Root-one	0.22	0.34
Total	1.10	1.75	2.85		PxR	N.S.	N.S.
Mean	0.55	0.87		1.42			

II- Effect of Wounding and Temperature on the Propagation of *Lilium longiflorum*. Thunb by scales.

1- Effect of wounding:

Data in Table (25) and photo (4) show the effect of wounding the base of the *Lilium longiflorum* bulb scale on propagation. It is clear that wounding as a mechanical process was very useful.

In both seasons wounding resulted in more survival scales, number of bulblets formed on a scale, heavier weight and thicker diameter of bulblets formed on the scale, such increases were significant in the second season and the most noticeable effects were recognised with the number of bulblets on a scale and the mean weight of 100 bulblets as shown in Table (25).

Such practices was reported by Day (1933), who mentioned that wounding the cutting may help in absorption more water from the cutting medium than the unwounded cuttings. Also, it was concluded by Smith and Manginnes (1966), that wounding the scale of hybrid Lilies did not markedly increase rotting. Koller (1977), found that native species (*Pieris Phillyreifolia*) proved easy to

Table (25) Effect of wounding and temperature on the propagation of <u>Lilium</u> <u>longiflorum</u>. Thunb by **scales**

Season 1978

Treatment / Temp.	% survival scales			No. of bulblets/ scale			Wt. of loo bulblets (gm)			Diameter of a bulblet (cm)		
	N.W.	W.	Mean	N.W.	W.	Mean	N.W.	W.	Mean	N.W.	W.	Mean
C° **	24.1	29.2	26.7	3.2	2.7	3.0	9.8	13.5	11.7	0.5	0.5	0.5
10°	54.8	57.4	56.1	1.8	2.1	2.0	12.9	11.1	12.0	0.6	0.4	0.5
25°	29.2	36.9	33.1	1.9	2.2	2.1	9.4	7.9	8.7	0.5	1.0	0.8
Mean	36.0	41.2	38.6	2.3	2.3	2.3	10.7	10.8	10.8	0.5	0.6	0.6

L.S.D. at	0.05	0.01	0.05	0.01	0.05	0.01	0.05	0.01
For wounded *	-	-	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Temp.	-	-	0.4	0.6	N.S.	N.S.	N.S.	N.S.
TXW.	-	-	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

* C° = scales seperated from freshly dug bulbs

cont. Table (25) Effect of wounding and temperature on the propagation of *Lilium longiflorum*. Thunb by scales

Season (1979)

Treatment / Temp.	% Survival scales			No. of bulblets/ scale			Wt. of Loo bulblets (gm)			Diameter of a bulblet (cm)		
	N.W.	W.	Mean	N.W.	W.	Mean	N.W.	W.	Mean	N.W.	W.	Mean
C° **	29.4	53.7	41.6	0.4	0.9	0.7	8.0	8.9	8.5	0.5	0.6	0.55
10°	29.4	29.6	29.5	0.7	1.7	1.2	10.9	29.7	20.3	0.5	0.8	0.65
25°	54.4	66.9	60.7	1.2	1.6	1.4	9.1	6.1	7.6	0.5	0.5	0.50
Mean	37.7	50.1	43.9	0.8	1.4	1.1	9.3	14.9	12.1	0.50	0.63	0.57

L.S.D. at	0.05	0.01	0.05	0.08	0.05	0.01	0.05	0.01
For wounded	-	-	0.4	0.6	2.9	4.2	0.06	0.08
Temp.	-	-	N.S.	N.S.	5.3	7.5	0.07	0.10
TXW.	-	-	N.S.	N.S.	8.6	12.3	0.14	0.19

** C° scales seperated from freshly dug bulbs.

Wounded scales   Unwounded scales

Photo (4) Effect of wounding on scale propagation of Lilium longiflorum. Thunb.

propagate from cuttings wounded and treated with Hormo-Root C (IBA) at 5000 p.p.m.

2- Effect of temperature as a pre-treatment of wounding

Data in Table (25) show that in (1978) storing Lilium bulbs a week before wound application at 10°C resulted in the highest percentage of survival scales. In the next year (1979) storing bulbs at room temperature at (25°C) gave the highest percentage of survival scales.

Generally scale wounding following any of the temperature treatments was better in increasing the survival scales. In many cases, as shown in Table (25), storing the bulbs at 10°C, before wound treatment was effective in increasing the number, weight and diameter of the produced bulblets.

Godden and Watson (1962) used (70°F) to study the bulblet development on the outer scales of three Lilium cultivars. They Practised wounding as a factor and they found that bulblets, which were derived by the simultaneous division of the epidermal and sub-epidermal cells

III- Effect of Growth Regulators and Temperature on the Propagation of *Lilium longiflorum*. Thunb by scales:

1- Effect of IAA :

a) Percentage of survival scales:

Table (26) shows that, in (1978) the application of IAA as 100 or 150 p.p.m. increased the percentage of the survival scales. The next season, scales from bulbs stored at 10°C or 25°C and treated with IAA as 150 and 100 p.p.m., respectively, gave the highest percentages of survival scales.

In both seasons, it seemed that the storing temperature had a promising effect on increasing the percentages of the survival scales as compared with scales separated from freshly dug bulbs.

b) Number of bulblets per scale :

In both seasons the average yield of bulblets per scale increased due to IAA applications (Table 26) photo 5. In (1978) all concentrations of IAA were effective, and the increases in the number of bulblets over control were significant.

Table No. 26

Effect of IAA and temperature on the propagation of *Lilium longiflourm*. Thunb by scales.

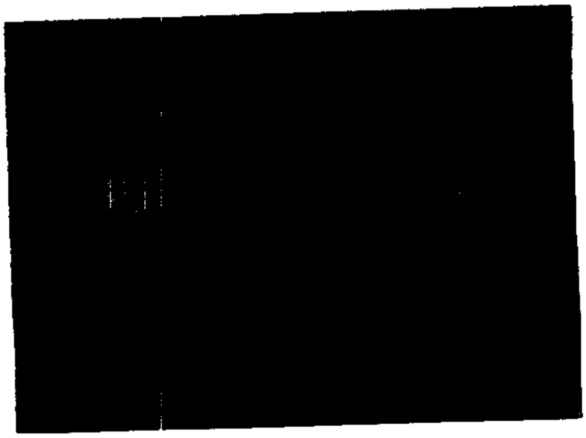
Treatments	Percentage of survival scales								Number of bulblets / scale							
Season	1978				1979				1978				1979			
Conc.P.P.M. / Temp.	4 C°	10°	25°	Mean	C°	10°	25°	Mean	C°	10°	25°	Mean	C°	10°	25°	Mean
0.00	34.3	35.9	39.0	36.4	75.3	83.7	62.8	73.9	1.25	1.38	1.22	1.28	1.25	1.46	1.25	1.32
100	39.4	39.4	44.6	41.1	46.2	67.0	87.7	67.0	2.08	1.88	1.98	1.98	1.92	1.59	1.48	1.66
150	42.0	49.7	66.4	52.7	37.8	87.7	56.7	61.4	1.72	2.25	1.70	1.89	1.48	1.72	1.28	1.49
200	49.3	47.1	39.5	45.3	42.0	58.7	58.7	53.1	1.65	1.92	2.05	1.87	1.58	1.82	1.48	1.63
Mean	41.2	43.0	47.5	43.9	50.3	74.3	67.0	63.8	1.68	1.86	1.74	1.76	1.56	1.65	1.37	1.52

L.S.D. at	1978: 0.05	1978: 0.01	1979: 0.05	1979: 0.01
For : IAA	0.16	0.21	N.S.	N.S.
Temp.	N.S.	N.S.	N.S.	N.S.
IAA X temp	N.S.	N.S.	N.S.	N.S.

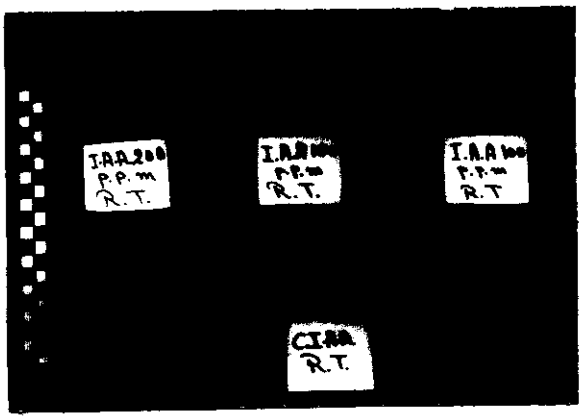
cent. Table (26) **Effect of I.A.A. and temperature on the propagation of *Lilium longiflorum*. Thumb by scales**

Treatments	Percentage of survival scales								Number of bulblets / scale							
Season	1978				1979				1978				1979			
Conc.P.P.M. \ Temp.	* C°	10°	25°	Mean	C°	10°	25°	Mean	C°	10°	25°	Mean	C°	10°	25°	Mean
0.00	21.7	12.5	19.3	17.8	23.3	14.4	22.6	20.1	0.92	0.58	0.85	0.78	0.98	0.61	0.95	0.85
100	19.0	17.8	14.4	17.1	24.3	24.3	16.1	21.6	0.58	0.55	0.53	0.55	0.91	0.87	0.64	0.81
150	15.7	15.4	9.9	13.7	17.3	15.9	13.3	15.5	0.51	0.60	0.49	0.53	0.53	0.61	0.68	0.60
200	18.7	20.9	8.5	16.0	25.3	21.5	14.2	20.3	0.61	0.51	0.46	0.53	0.87	0.70	0.59	0.72
Mean	18.8	16.6	13.0	16.1	22.6	19.0	16.6	19.4	0.66	0.56	0.58	0.60	0.82	0.69	0.72	0.74
L.S.D. at			0.05	0.01			0.05	0.01			0.05	0.01			0.05	0.01
For : I.A.A.			N.S.	N.S.			1.31	1.78			0.06	0.08			0.05	0.07
Temp.			2.09	2.85			1.47	2.0			0.017	0.023			0.03	0.04
I.A.A. X temp			N.S.	N.S.			2.53	3.45			N.S.	N.S.			0.10	0.14

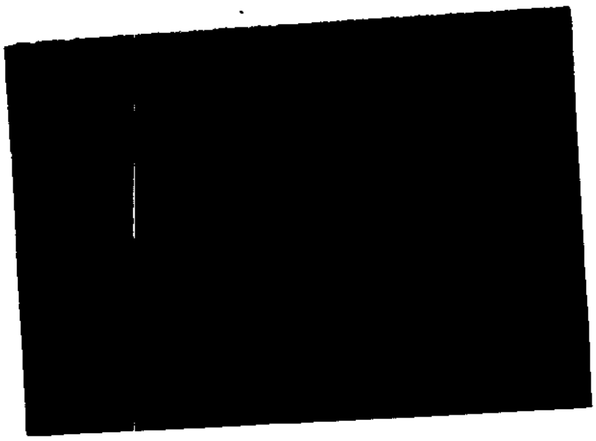
* Scales seperated from freshly dug bulbs



(1) Scales from bulbs stored at cold temperature



(2) Scales from bulbs stored at room temperature



(3) Scales from freshly dug bulbs

Photo (5) Effect of different concentrations of IAA on pre-treated bulb scales of <u>Lilium longiflorum</u>. Thunb.

In both seasons, storing bulbs before IAA treatments at 10°C resulted in more number of bulblets per scale as compared with the other treatments. The most suitable concentration of IAA in this case was 150 p.p.m., when bulbs were stored at room temperature (25°C), the suitable concentration of IAA was 200 p.p.m., and for the freshly dug bulbs 100 P.P.m. was the adequate concentration .

Similar results on the effect of IAA on propagation were reported by Hackett (1969), who found that the addition of IAA to agar media for bulb scales of Lilium longiflorum promoted bulblets formation to a far extent. also, Hassan (1976), reported that bulblets formation on stem cuttings of Lilium longiflorum Thunb was encouraged by both IAA and IBA each at 50, 100, 150 p.p.m. Also, he added that increasing the levels of IAA and IBA up to 100 p.p.m. increased to a far extent the number of survival cuttings which formed bulblets. Whereas, Kukulezanka (1969) demonstrated that IAA at certain concentrations stimulated the development of the first root at the base of newly formed corms of freesia. Nanda et al., (1969), found that the exogenous application of IAA and IBA enhanced the rooting of inverted cuttings of *Ipomoea* and *Hibiscus* spp. While Chakraverty (1970), reported that all concentrations tested (7, 10 and 100 p.p.m.) of IBA, IAA and NAA improved rooting of hardwood cuttings of *Baugainvillea* sp. In (1973), Ohkawa reported that IAA (0.5%) increased the rooting ability of rose cuttings. Mansour *et al.* (1975), reported that IAA at 50-200 p.p.m. stimulated rooting of carnation cuttings and this effect rose with IAA concentrations. Lipecki *et al.* (1976), found that IBA and IAA stimulated rooting of Black currant, Sour cherry and *Forsythia*. Davies et al. (1978), demonstrated that IBA:NAA and IAA stimulated advantitious root formation in mature stem cuttings of *Ficus pumila*. Merganov (1979), stated that best rooting was obtained in softwood cuttings of some Sourcherry cultivars treated with IAA at 100 mg/l. or IBA at 25-50 mg/l.

Post (1959), on Lily stated that high temperature (70°F) favoured bulb formation on the scales. While Utada *et al.* (1973) attempted scale propagation at intervals from April to March and held at 20-25°C found that the scales were usually formed but they did not develop well. When low temperature treatments were applied to scales or bulbs before propagation bulblets formed at all seasons. The optimal treatment was at 0-5°C for 4-8 hours. Matsuo (1977), revealed that the leaf development of Lilium longiflorum increased with the chilling duration and was greater for bulblets developed at 25°C. Matsuo and Arisumi (1977), also mentioned that the bulblet of Lilium longiflorum was slightly earlier with a chilling period of 4-5 weeks rather than 1, 2, 3 weeks. Mansour (1968), reported that the greater development of freesia corms was attained at low temperature. Esashi, (1964), Esashi et al. (1964), reported that in Begonia evansiana tubers will form even without short photoperiods if low night temperatures are given.

c) Weight of 100 bulblets :

The data in the same Table (28) revealed that IAA had a reducing effect on the weight of bulblets which formed on scales from bulbs previously stored at 25°C. This was true on both seasons, the decrease was significant in (1979).

The application of IAA as 100 p.p.m. on the scales of bulbs previously stored at 10°C considerably increased the weight of the new formed bulblets. This increase was significant in (1979).

Temperature of store wehther cool or high had bad influence on the weight of the produced bulblets as shown in Table (26). The freshly dug bulbs carried heavier bulblets than those stored. Similar results on the effect of temperature on the produced bulblets were reported by Utada et al., (1973). They found that when the scales were held at 20-25°C, bulblets were usually formed but they did not develop well. When low temperature treatments were applied to scales or bulbs before propagation bulblets formed at all seasons; the optimal treatment was at 0-5°C for 4-8 hours. However, Tuyl (1979), found that prolonging the warm treatment period from 6-12 weeks and raising the temperature from 23° to 30°C trebled bulb production from scale.

d) Diameter of a bulblet :

In both seasons, data in Table (26) concerning the diameter of bulblet, show that IAA applications reduced the diameter of the bulblet the decreases were statistically significant.

The same trend was clear with the storing temperatures which resulted in smaller bulblets as compared with those produced from scales of bulbs freshly dug.

According to the results it can be concluded that for higher production of bulblets, IAA may be applied as 100 p.p.m. for scales from freshly dug bulbs, 150 p.p.m. for scales of bulbs previously stored at 10°C and 200 p.p.m. for those from the 25°C stored bulbs.

The action of IAA in this respect was demonstrated by the reports of Hackett (1969), who found that the addition of IAA to agar media for bulb scales of Lilium longiflorum promoted bulblet formation to a far extent and Hassan (1976), who found that bulblets formation on stem cuttings of Lilium longiflorum. Thunb was encouraged by both IAA and IBA each at 50, 100 and 150 p.p.m.

In this respect, Thimann and Went (1934) showed that B-Indole acetic acid (IAA) stimulates the formation of adventitious roots in pea stem segments, but knowledge of the mechanisms of rhizogenesis is still fragmentary. It has become clear that auxin one of the different factors influencing vegetative regeneration of plants. Besides the nutritional and environmental influences the plant factors such as age of tissue, juvenility, degree of lignification affect propagation (Hartman and Kester 1959). Numerous endogenous and exogenous compounds (reviewed by Hess, 1969), also affect propagation.

Some other investigators as (Fernqvist, 1966, Bastin, 1966, Girouard 1969, Fadl and Hartman,1967), mentioned other phenolic compounds which have a great role in propagation. There is at present no clear understanding of the function of these substances in adventitious root formation. The existence of auxin - phenol rhizocalins (Bouillenne and Bouillenne 1955) remains on open question, as does the importance of the IAA-sparing effects of phenolic compounds.

Some aspects of current plant propagation practice indeed suggest that ethylene is involved in the rooting of cuttings. Treatments which stimulate root formation, such as auxin application or wounding, are known to stimulate ethylene production. In (1933) Zimmermann and Hitchcock showed that unsaturated hydrocarbon gases cause aerial root production in several herbaceous and woody species. With lateral root formation, however, recent work by Radin and Loomis (1969) has shown that ethylene inhibits the formation of adventious primordia. Finally, there may be significance in the fact that some of the phenolic compounds which stimulate rooting have been implicated in the regulation of ethylene biosynthesis (Yang, 1967).

On the other hand, the bio-effect of IAA, though not clear, was stated by some other investigators. It has been known for many years that when B-indole-acetic acid (IAA) is applied to the stems of bean plants, metabolities tend to accumulate at the point of hormone application so that there is an increase in the content of protein and starch at that point (Mitchell and Martin, 1937; Stuart, 1939). Since, in these early experiments, the hormone was allowed to act for several days, during which time growth was stimulated, it was concluded that the effect of the hormone was an indirect one, resulting from the establishment of a "sink" at the point of application. More recent experiments have shown that when IAA is applied to decapitated pea stems, labelled metabolities and nutrients, such as ^{14}C-sucrose and ^{32}P-orthophosphate, applied to a lower part of the stem, accumulate at the point of hormone application within 6-8 hours, at which time there is no visible sign of growth at the cut surface (Davies and Wareing, 1965). It was concluded, on various grounds, that IAA probably acts by a rather specific and direct effect upon the transport process itself, rather than by the establishment of a "sink". However, it is still possible that the application of the hormone causes an increased rate of metabolism and biosynthesis in the neighbouring tissues, before there are any visible signs of growth, and thereby establishers a "metabolic sink".

Other opinions were reported to show that expression of auxin activity may involve an interaction with specific proteins or other macromolecules. Siegel and Galston, 1953, Zenk, 1964; Venis, 1968). More recently, interest in this field has been stimulated by preliminary reports that in the presence of protein mediators, 2, 4-D (Matthyse and Phillips, 1969)and Cytokinins (Matthyse and Abrams, 1970) are able to enhance RNA synthesis supported by isolated pea chromatin or DNA.

2- Effect of IBA :

a) Percentage of survival scales :

Data in Table (27) show that the best concentration of IBA which resulted in the highest percentage of survival scales was 200 p.p.m., about 20% increase was attained by the application of this treatment. Although, in (1978), storing bulbs either at 10°C or 25°C reduced the percentage of the survival scales, in the next season scales from bulbs stored at 10°C gave 10% more survival scales. The interaction of T x IBA in (1978) shows that the best treatment which gave the highest percentage of survival scales was for scales from the freshly dug bulbs treated with 200 p.p.m. IBA. Whereas, in (1979), the storing at room temperature and treating the scales with the same level of concentration gave the best results.

b) Number of bulblets per scale:

The number of bulblets per scale was increased as the level of IBA concentration was increased up to the 200 p.p.m. This concentration was the best in the two seasons although the level of significance was not reached (Table 27). Storing temperatures seemed to

Table (27) Effect of IBA and temperature on the propagation of *Lilium longiflorum*. Thumb by scales

Treatments	Weight of 100 bulblets in (gm)								Diameter of a bulblet in (cm)							
Season	1978				1979				1978				1979			
Conc.P.P.M. / Temp.	* C°	10°	25°	Mean	C°	10°	25°	Mean	C°	10°	25°	Mean	C°	10°	25°	Mean
0.00	5.5	7.1	2.9	5.2	15.1	16.8	11.9	14.6	0.23	0.26	0.27	0.25	0.79	0.63	0.60	0.68
100	3.9	4.2	5.7	4.6	18.4	10.8	8.3	12.5	0.29	0.35	0.37	0.34	0.67	0.60	0.49	0.59
200	11.2	7.1	5.5	7.9	21.8	7.3	11.1	13.4	0.50	0.39	0.37	0.42	0.83	0.44	0.18	0.48
250	14.2	3.8	9.3	9.1	8.1	21.8	14.5	14.8	0.48	0.33	0.50	0.44	0.77	0.79	0.68	0.75
Mean	8.7	5.6	5.9	6.7	15.9	14.2	11.5	13.8	0.38	0.33	0.38	0.36	0.76	0.62	0.49	0.62

L.S.D. at	Weight 1978 0.05	Weight 1978 0.01	Weight 1979 0.05	Weight 1979 0.01	Diameter 1978 0.05	Diameter 1978 0.01	Diameter 1979 0.05	Diameter 1979 0.01
For : IBA	1.05	1.43	N.S.	N.S.	0.04	0.06	0.04	0.05
Temp	0.85	1.16	1.08	1.47	N.S.	M.S.	0.05	0.07
IBA X temp	1.77	2.40	3.99	5.44	N.S.	N.S.	N.S.	N.S.

* C° = scales seperated from freshly dug bulbs

Cont.Table (27) Effect of IBA and temperature on the propagation of *Lilium longiflorum*. Thumb by scales

Treatments	Percentage of survival scales								Number of bulblets / scale							
Season	1978				1979				1978				1978			
Conc.P.P.M. \ Temp.	* C°	10°	25°	Mean	C°	10°	25°	Mean	C°	10°	25°	Mean	C°	10°	25°	Mean
0.00	37.0	13.8	13.8	21.5	33.7	42.0	25.3	33.7	1.22	0.72	0.38	0.77	1.38	1.05	1.05	1.16
100	18.6	13.8	44.6	25.7	42.0	50.4	42.0	44.8	1.32	1.05	2.05	1.47	1.52	1.82	2.02	1.79
200	61.6	21.2	34.3	39.0	42.0	50.4	67.0	53.1	1.62	1.32	1.75	1.50	1.55	1.75	1.58	1.63
250	26.6	18.9	16.4	20.6	33.7	42.0	67.0	47.7	1.07	1.05	0.88	1.00	1.48	1.55	1.42	1.48
Mean	36.0	17.0	27.2	26.7	37.8	46.2	50.3	44.8	1.31	1.03	1.27	1.20	1.48	1.54	1.52	1.51

L.S.D. at				
For : IBA	—	—	N.S.	N.S.
Temp.	—	—	N.S.	N.S.
IBA X temp	—	—	N.S.	N.S.
	—	—		

* Scales seperated from freshly dug bulbs

decrease the number of produced bulblets on scales as shown in control treatments of both seasons. When the bulbs were stored at the room temperature (25°C) then their scales treated with IBA as 100 p.p.m. each scale carried more than two bulblets. Also, promising results were noticed with the scales of bulbs stored at 10°C when treated with IBA as 100 p.p.m. so, it can be stated that the treatment of IBA is dependent on the previous storing temperature. Choosing the method of propagation must be related to the facilities stated before. Similar results were reported by Young (1967), who showed that IBA stimulated bulblet formation as well as the root system on treated scales of Lilium speciosum Whereas, Utada et al. (1973) mentioned that the scales of Lilium longiflorum which were held at 20-25°C and dipped in IAA, IBA, 2,4-D, GA and BA solutions did not enhance the formation of bulblets from them. While Hassan (1976), found that bulblets formation on stem cuttings of Lilium longiflorum. Thunb was encouraged by both IAA and IBA each at 50, 100, 150 p.p.m. He also found that increasing the levels of IAA and IBA up to 100 p.p.m. increased to different extent the number of survival cuttings which formed bulblets.

The effect of temperature on scale propagation was stated by Utada *et al.* (1973), they found that when the scales were held at 20-25°C bulblets were usually formed but they did not develop well. When low temperature treatments were applied to scales or bulbs before propagation bulblets formed at all seasons; the optimal treatment was at 0-5°C for 4-8 hours. Matsuo (1975), in his study on the effect of temperature on leaf emergence of scale bulblets of *Lilium longiflorum* found that leaf scale development on the scale bulblets was greater in light than darkness, and greater after previous treatment at 15°C than at 25°C, In darkness most leaf scale development occurred at 10°C the best leaf scale development appeared to follow initial treatment at 15°C and subsequent treatment at 10-12°C in light. Whereas Matsuo (1977), found that leaf development of *Lilium longiflorum* increased with the chilling duration and was greater for bulblets developed at 25°C. Matsuo and Arsumi (1977), also found that the leaf emergence of scale bulblet of *Lilium longiflorum* was slightly earlier when the chilling period was 4 or 5 weeks rather than 1, 2 or 3 weeks. In (1978), Matsuo *et al.* found that hot water treatment before scaling of large parent bulbs of cv. Hinomoto Lily increased the rate of leaf emergence of scale bulblets produced on scales from these bulbs with scaling in the light.

c) Weight of 100 bulblets :

The weight of 100 bulblets was significantly increased with the high concentrations of IBA treatment as 200 and 250 p.p.m. as shown in Table (27).

The storing temperature at 10°C seemed to be helpful in increasing the weight of the produced bulblets. The least weight of bulblets for control scales was found with the scales previously stored at the room temperature.

On the other side, it is clear that the best treatments which increased the weight of bulblets were the 200 and 250 p.p.m. IBA applied on scales from freshly dug bulbs. These results agree with those obtained by Utada et al. (1973) and Tuyl (1979), on *Lilium longiflorum*.

d) Diameter of bulblets :

Data presented in Table (27) demonstrated that the application of IAA on bulb scales of *Lilium longiflorum* increased in most cases- the diameter of the bulblet. This was particularly clear with the 200 p.p.m. concentration which gave significant increase in this respect. This was true in both seasons. The temperature of the store is of less importance on increasing the diameter of the bulblet. Photo (6) shows the effects of IBA on bulblets formation on the scales.

(1) Scales from bulbs stored at cold temperature

(2) Scales from bulbs stored at room temperature

(3) Scales from freshly dug bulbs.

Photo (6) Effect of different concentrations of IBA on pre-treated bulb scales of <u>Lilium longiflorum</u>. Thunb.

3- Effect of Rootone:

a) Percentage of survival scales:

Rootone application had slight effect on increasing the percentage of survival bulblets as shown in Table (28). Concerning the previous storing temperature effect, the results of the two seasons showed different trend.

b) Number of bulblets:

Concerning the number of bulblets formed on a scale, data in Table (28) show insignificant effect for rootone application. However, in (1978) the storing temperatures significantly decreased the number of produced bulblets on the scale.

In both seasons, the application of a Rootone minimized the number of bulblets per scale of the previously stored bulbs at low or high temperature

Table (28) Effect of rootone and temperature on the propagation of *Lilium longiflorum.* Thunb **by scales**

Season 1978

Treatments	% Survival scales			No. of bulblets/scale			Wt. of 100 bulblets (gms)			Diameter of a bublet (cm)		
Conc. P.P.M. / Temp.	0.000	2000	Mean	0.000	2000	Mean	0.000	2000	Mean	0.000	2000	Mean
C°	31.8	34.3	33.1	2.8	2.3	2.6	19.2	16.3	17.8	0.62	0.55	0.59
10°C	49.7	21.5	35.6	1.2	1.6	1.4	18.4	9.9	14.2	0.66	0.52	0.59
25°C	29.1	35.6	32.4	1.7	1.8	1.8	9.2	15.1	12.2	0.49	0.57	0.53
Mean	36.9	30.5	33.7	1.9	1.9	1.9	15.6	13.8	14.7	0.59	0.55	0.57
L.S.D. at		-	-		0.05	0.01		0.05	0.01		0.05	0.01
For rootone		-	-		N.S.	N.S.		N.S.	N.S.		N.S.	N.S.
Temp.		-	-		0.04	0.6		N.S.	N.S.		N.S.	N.S.
RXT		-	-		N.S.	N.S.		N.S.	N.S.		N.S.	N.S.

Cont. Table (28) Effect of rootone and temperature on the propagation of
***Lilium longiflourm*. Thunb by scales**

Season 1979

Treatments	% survival scales			No. of bulblets/scale			Wt. of 100 bulblets (gm)			Diameter of a bulblet		
Conc. P.P.M. / Temp.	0.00	2000	Mean	0.00	2000	Mean	0.00	2000	Mean	.00	2000	Mean
C °	29.4	29.4	29.4	0.5	1.1	0.8	18.0	8.2	13.1	.80	0.45	0.63
10°C	41.7	58.5	50.1	1.5	1.0	1.3	19.9	15.9	17.9	2.61	0.63	1.62
25°C	50.2	29.4	39.8	1.2	0.7	1.0	19.2	9.6	14.4	.95	0.56	0.75
Mean	40.4	39.1	39.7	1.1	0.9	1.0	19.0	11.2	15.1	1.45	0.55	1.0
L.S.D. at		-	-		0.05	0.01		0.05	0.01		0.05	0.01
For Rootone		-	-		N.S.	N.S.		4.1	5.8		0.17	0.24
Temp.		-	-		N.S.	N.S.		N.S.	N.S.		N.S.	N.S.
RXT		-	-		N.S.	N.S		N.S	N.S		N.S.	N.S.

c) Weight of 100 bulblets :

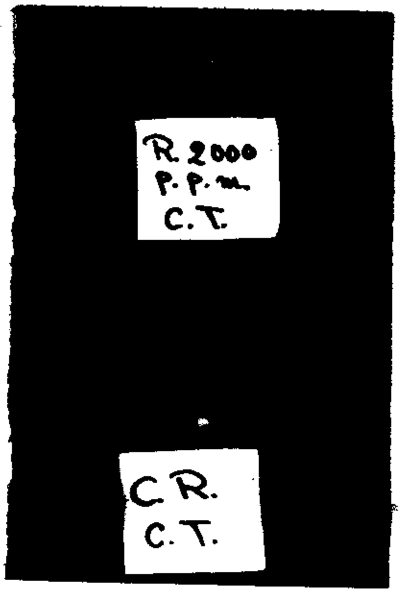
Results in Table (28) concerning the weight of bulblets show that Rootone application decreased the weight of the bulblets formed on the scales. The decrease was significant in (1979).

In (1978) the untreated scales from bulbs stored at 25°C and the Rootone treated ones of the 10°C showed remarkable decrease in the weight of the new formed bulblets. In (1979), different results were obtained.

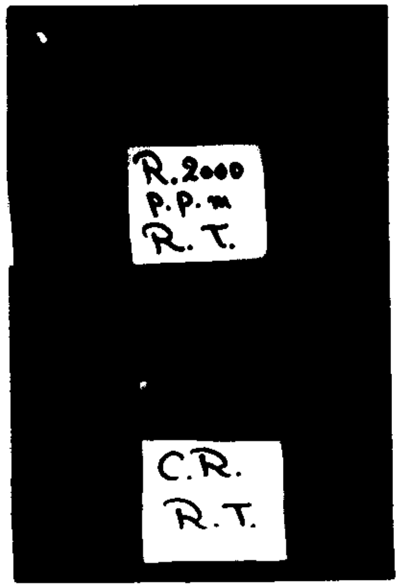
d) Diameter of a bulblet :

In both seasons, the diameter of the bulblet formed on the scale decreased due to Rootone treatments. The difference in this respect was significant in(1979) as shown in Table (28).

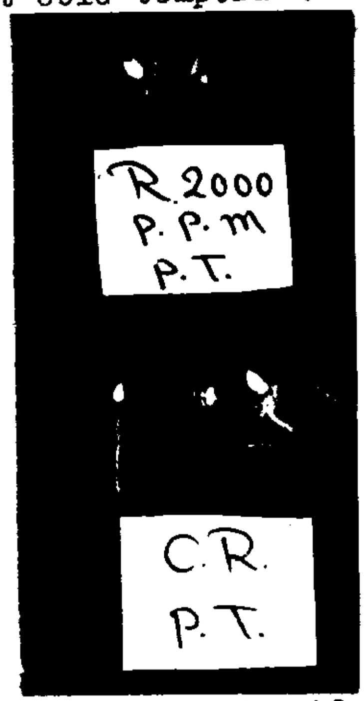
Storing the bulbs at 10°C before planting their scales seemed to increase the new formed bulblet, this trend was more clear in the results of (1979). Photo (7) show the influence of some Rootone concentrations on producing bulblets on the scales from bulbs previously stored in cool or high temperature.



(1) Scales from bulbs stored
at cold temperature



(2) Scales from bulbs stord
at room temperature



(3) Scales from freshly dug
bulbs

Photo (7) Effect of Rootone on pre-treated bulb scales
of <u>Lilium longiflorum</u>. Thunb

It can be concluded that the growth regulaters applications benefited the propagation by scales. Indole butaric acid, seemed to have similar action as IAA. Its action was more dependant on the pre-treatment of the bulbs used in the propagation.

Rootone was helpful in propagation especially in increasing the new formed bulblets.

III- Effect of nutrition on the growth and flowering of *Lilium longiflorum.* Thunb.

1) Vegetative growth

a) Mean number of leaves per plant:

Data in Table (29) show that the high level of nutrition (S_3) resulted in the most number of leaves carried on plant. In (1978), the increase in the number of leaves per plant was about 24.4% over that of the medium level (S_2) and 39.2% over that of the low level (S_1). These increases were significant. Also, the medium level of nutrition gave more leaves as compared with control plants (S_1). The differences also were significant.

These results show that nutrition had great influence on increasing the number of leaves which might be due to the more supply of different minerals needed by the plant. Similar results were reported by Boodley (1962), who found that Croft Lily fertilized with Hoagland's solution produced the greatest amount of linear growth. Also, Kosugi and Kondo (1961), reported that N fertilizer resulted in significant increase in the number of gladiolus leaves. Whereas, El-Gamassy *et al.* (1974) with Amaryllis found that the application

Table (29) Effect of different levels of nutrition on the
Lilium longiflorum. Thunb (Flowering size bulbs)

Season (1978)

Leaf / plant	Level of nutrition		
	S 1	S 2	S 3
a. Mean number of leaves	31.2	38.8	51.3
b. Mean weight of leaves (gm)	19.4	28.6	43.9
c. Mean length of a leaf (cm)	10.7	12.0	13.4
d. Mean width of a leaf (cm)	1.6	1.8	1.8

Season (1979)

Leaf / plant	S 1	S 2	S 3
a. Mean number of leaves	38.4	35.2	31.5
b. Mean weight of leaves (gm)	14.6	15.7	17.0
c. Mean length of a leaf (cm)	7.8	8.4	9.1
d. Mean width of a leaf (cm)	1.4	1.5	1.6

of fertilizers at the high rates of N and P with or without potassium increased the vegetative growth and the nitogen resulted in increasing the number of leaves.

In (1979), nutrition levels did not show the similar effect on the number of leaves as in (1978). The data showed that the high level of nutrition decreased the number of leaves but the decreases were insignificant.

In that season, the decreases may be due to the unusual high temperature which prevailed during March and April in A.R.E. (P.N. Table (I) in Appendix)

b) <u>Mean weight of leaves per plant:</u>

The mean weight of leaves per plant was increased as the nutritional level increased (Table 29) the increase was significant. The most increase was attained with (S_3) level of nutrition which gave 43.9gm leaves/plant while the low nutrition level (S_1) gave 19.4 gm leaves/plant. Although the increase in (1979) was insignificant, The mean weight of leaves per plant was lower than in (1978), this was due to the effects of unusual high temperature during March and April (1980). (P.N. Table (I) in Appendix).

Table No. 30 Effect of different levels of nutrition flowering of lilium Longiflorum.

Season 1978

Flower characters	Level of nutrition			
	S 1	S 2	S 3	For
a. Mean length of flower stalk (cm)	40.7	64.7	96.3	
b. Total weight of flower stalk (gm)	33.3	40.8	53.3	
c. Mean fresh weight of the bare stalk (gm)	11.7	19.1	30.5	
d. Mean circumfrence of flower stalk (cm)	2.4	2.3	3.0	
e. Mean diameter of flower stalk (cm)	0.6	0.6	0.8	
f. Mean number of flowers per stalk	1.5	2.6	4.1	
g. Mean weight of a flower on the stalk (gm	9.6	8.7	8.4	
h. Mean length of flower trumpt (cm)	18.6	16.5	17.1	
i. Cross trumpt diameter (cm)	16.1	12.1	14.2	
j. Mean length of flower peduncle (cm)	4.9	5.4	6.4	

Cont. Table (30) Effect of different levels of nutrition on th

of *Lilium longiflourm*.Thunb

Season 1979

Flower characters	Level of nutrition			
	S 1	S 2	S 3	For
a. Mean length of flower stalk (cm)	43.8	45.4	43.4	
b. Total weight of flower stalk (gm)	27.7	28.9	28.1	
c. Mean fresh weight of the bare stalk (gm)	10.6	10.4	10.9	
d. Mean circumfrence of flower stalk (cm)	2.3	2.4	2.5	
e. Mean diameter of flower stalk (cm)	0.6	0.6	0.6	
f. Mean number of flowers on the stalk	1.8	2.0	1.9	
g. Mean weight of a flower on the stalk (gm)	11.5	10.1	9.8	
h. Mean length of flower trumpt (cm)	18	16.5	16.4	
i. Cross trumpt diameter (cm)	13.9	13.4	12.8	
j. Mean length of flower peduncle (cm)	6.6	5.8	6.1	

Similar results were reported by Roberts et al. (1964), who reported that leaf weight was more responsive to N and P nutrition. Whereas, Kosugi (1960) Kosugi and Kondo (1960), Kosugi and Sano (1961), stated that fresh weight of gladiolus top was increased with nitrogenous fertilizer. Also, El-Kadi and Raafat (1968), reported that the highest fresh and dry weights of freesia leaves were obtained by applying the highest P level with any of three N levels. Mohamed (1975), found that heaviest fresh and dry weights of Narcissus leaves resulted from plants treated with the low fertilization level in the first season then followed by high fertilization in the next season. While, the least fresh weight of leaves resulted from plants of the low fertilization level in the two successive seasons.

c) Mean length of a leaf:

Data in Table (29) show that the high level of nutrition (S_1) resulted in longer leaves. The increase was significant as compared with (S_2) and(S_1) such increases in the leaf length may add to the beauty of flower stalk.

Simular results were obtained in (1979), but the increase was not significant.

d) Mean width of a leaf:

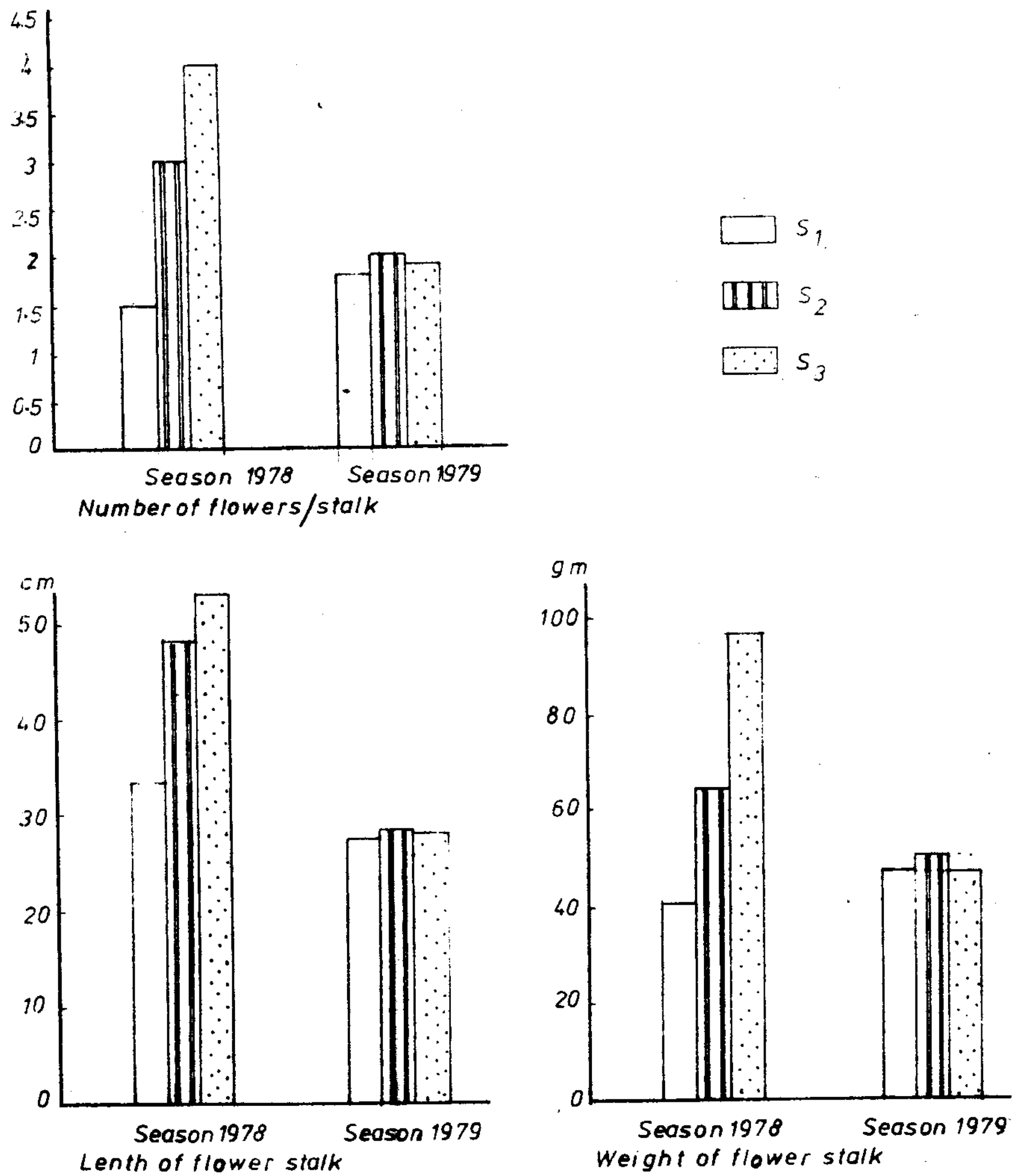
The width of the leaf was slightly affected by the different levels of nutrition as shown in Table (29). The increases in this respect were insignificant in both seasons.

2) Flowering:

a) Mean length of flower stalk:

Data in Talbe (30) and Figure (12) show that the increase in the length of flower stalk was encouraged with increasing levels of nutrition. In (1978), using the high level of nutrition gave significant increase in the flower stalk as compared with the low level. Insignificant increases in the lengths of stalks of (S_3) over those of (S_2) (medium level) were true.

In (1979), the average lengths of flower stalks were 27.7, 28.9 and 28.1 for S_1, S_2 and S_3, respectively. The lengths were far shorter than those produced in (1978) and did not show the responsive effect to nutrition. This was due to unusual high temperature



Fig(12) Effect of different levels of nutrition on the flowering of <u>Lilium longiflorum</u>.

which prevailed during the spring season 1980 and perhaps stopped the advancing of the flower growth (P.N. Table (I) in Appendix).

Similar results which showed that the high levels of nutrition and fertilization increased the flower stalks, heads or spikes of bulbous plants were reported by Kosugi and Kondo (1960) and 1961), on gladiolus Roberts et al. (1964), on Lilium longiflorum El-Gamassy et al. (1974), on Hippeastrum vittatum, Jana et al. (1974), on Dahlia and Tuberose. Shoushan et al. (1978), on Hippeastrum vittatum.

b) Total fresh weight of flower stalk:

It is clear from data in Table (30) and Figure (12) that the high level of nutrition resulted in more fresh weight of flower stalk as compared with the medium or low level. The increase, in this respect exceeded twice that weight of the control plants (S_1). Also, the medium level (S_2) gave heavier stalks than control. It means that nutrition was very important in improving the flower quality of Lilium longiflorum.

In the second season as shown in the same Table insignificant increase in flower stalk's weight stopped at the medium level of nutrition (S_2). This might be due to the high temperature effects which prevailed during the second season reflecting on bad growth (P.N. Table (I) in Appendix).

Numerous investigators gave similar results indicating the response of bulbous plants for nutrition. Among those Boodley (1962), and kiplinger et al. (1972), they found that all the plants of Ace, Nellie white and No. 44 Lily cvs which were grown with osmocote (18-9-9) or Mag Amp (7-40-6) slow-release fertilizers incorporated in the soil mixture before potting produced saleable quality, but those which received further fertilizers gave the best plants and flowering. Whereas Powell et al. (1975), reported that slow-release fertilizer incorporated at potting of Easter Lily-Nellie white and regular applications of soluble fertilizers gave good results. Garibaldi (1964), El-Bakly (1966) and Mohamed (1968) stated that NPK fertilization resulted in the longest spikes of gladiolus.

c) Mean fresh weight of the bare stalk:

In the same Table in (1978), the same trend was noticed on the weight of the bare stalk which increased significantly with the increasing level of nutrition. The percentage of increases with (S_3) treatment reached 61.6% over the low level of nutrition (S_1).

In the second season, there was slight insignificant increase with the same treatment (S_3) as compared with the other treatments. These results agree with those obtained by Kosugi (1960), Kosugi and Kondo (1960), Kosugi and Sano (1961) on Gladiolus.

d) Mean circumfrence of flower stalk:

When the circumfrence of the flower stalk was measured at base, middle and upper portions of the stalk, the highest level of nutrition gave the greatest mean of circumfrence as compared with the two other treatments. In (1978), the increase in this respect was significant.

The same trend was noticed in (1979), but the increases were insiginficant (Table 30).

e) Mean diameter of flower stalk:

In (1978), concerning the diameter of flower stalk in the prementioned portions, data in Table (30) indicate that high nutrition level significantly increased it. This was not clear in the results of the second season.

Generally it can be concluded that high level of nutrition resulted in more vigorous flower stalks of *Lilium longiflorum*. These results are in agreement with those reported by Boodley (1962), on Croft Lily, Kiplinger *et al*. (1972), on Ace, Nellie white and No. 44 Lily cvs. Amaki and Hagiya (1961), on Tulip, Lemeni (1965), on Gladiolus and El Gamassy *et al*. (1974) on Amarylis.

f) Mean number of flowers per stalk:

Data in Table (30) showed that the highest level of nutrition nearly gave double and treble number of flowers per stalk of those from plants receiving medium and low level, respectively.

In (1979), the increases in the flower's number were stopped at (S_2) and slightly decreased with (S_3) and this was due to bad weather influences rather than nutrition.

Similar results about the effect of nutrition on increasing the number of flowers were obtained by Roberts *et al*. (1964), they found that the flower of Croft Lily, *Lilium longiflorum* were more responsive to nitrogen and phosphorus. While Weider (1977), in his study on manuring of Lilies, found that the combination of 2% poly-crecal (NPK 14-10-14) base dressing and 1% poly-crescal weekly application begining about 8 weeks after planting, gave the greatest number of flowers per plant, the highest number and longest floral trumpts but had no effet on flowering date. McClellan and Stuart (1947), Brewer (1953), Sarova (1954), Woltz (1954), Guttay and Krone (1957), Kosugi and Kondo (1960 and 1961), Lemeni (1965), El Bakly (1966), and Mohamed (1968) reported that NPK fertilization increased number of florets per spike of Gladiolus plants.

g) Mean weight of a flower on the stalk:

Data in Table (30) showed that in (1978) the highest level of nutrition decreased the weight of the individval, this might be due to the more number of flowers carried on the stalk of the (S_3) treatment.

The differences in this respect were insignificant.

The same trend of results was observed in the second season. The heaviest weight of flowers was produced from the control plants. There are some evidences which showed that the different organs of plants might differ in thier response to nutrition. Roberts et al. (1964), reported that in Croft lily, *Lilium longiflorum*, leaf and bulblets weights and flower numbers were more responsive to N and P than was the parent bulb with its daughter or replacement portions. N and P fertilization changed the composition of the plant, at times the weight of leaves, bulbs and bulblets and the mumder of flowers produced. Dl-Kadi and Raafat (1968) found that differnt levels of N and P had no significant effects on freesia shoot development, flowering, number of leaves, number of florets per spike, length and weight of spike. Both N and P fertilizers significantly increased the weight of the new corms. Mohamed (1975), found that different levels of fertilizers in two years had great influences on the number of offsets, fresh and dry weights of leaves, number and weights of flowering stalks and bulbs of Narcissus but did not affect the number of flowers per stalk.

h) Mean length of flower trumpt:

In both seasons (S_1) (low level of nutrition) resulted in longer flower trumpt as compared with either the flowers of (S_2) or (S_3) (Table 30). In (1978), significant increase was noticed with the length of trumpt of (S_1) as compared with (S_2). However, (S_3) gave slightly longer flower as compared with (S_2), in this respect, the difference was insignificant. The decreases in the lengths of trumpts from treatments (S_2) and (S_3) might be due to the more number of flowers carried on the stalk.

i) Cross trumpt diameter:

Data in Table (30) show that the lowest level of nutrition gave the greatest cross opening of flower as compared with (S_2) or (S_3) levels. The decreases in the flower diameter were twards the high level of nutrition. This was significant in the first season and insignificant in the second season. This may be attributed to the fewer flowers carried on the stalk produced under the low level of nutrition.

j) <u>Mean length of flower peduncle</u>:

In (1978), data in table (30) show that the length of flower peduncle was increased as the level of nutrition increased but these increases were insignificant.

In (1979), nutrition levels did not show the similar effect; high level of nutrition insignificantly, decreased the length of flower peduncle. It seemed that nutrition had no effect on this character.

In conclusion, the results of flowering clearly demonstrated that nutrition of flowering size bulbs is extremly important if better quality of cut flowers is aimed. The high level of nutrition, in most cases, significantly increased the length of flower stalk, total weight of flower stalk, fresh weight of the bare stalk, circumfrance and diameter of flower stalk and the number of flowers per stalk.

3- The bulb and offsets production:

a) <u>Mean diameter of mother bulb</u>:

Data in Table (32) show that the high level of nutrition gave the largest bulb size, the diameter of bulb increased as the level of nutrition increased but the increases were insignificant.

Table **(31)** Effect of different

bulb and offsets pro

(Flo

Bulb growth	Le
	S
a. Mean diameter of mother bulb (cm)	2
b. Mean weight of mother bulb (gm)	13
c. Mean number of offsets	1
d. Mean diameter of one offset (cm)	1
e. Mean length of roots (cm)	28.
a. Mean diameter of mother bulb (cm)	2.
b. Mean weight of mother bulb (gm)	16.
c. Mean number of offsets	8.
d. Mean diameter of one offset (cm)	2
e. Mean length of roots (cm)	29.

The same trend of results was obtained in the second season. The differences among the treatments were insignificant.

b) Mean weight of Mother bulb:

It is clear from the data in the same Table (31) that the mean fresh weight of the produced bulb considerably increased with increasing the level of nutrition. In (1979), the low level of nutrition gave bulbs with a mean fresh weight as 13.3 gms/bulb, while the high level gave 25.7 gms/bulb. Such increase is about 48%. The defferences, however, did not reach the level of significance.

Also, similar proportional increase was noticed in the second season(1979).

These results were in harmony with those reported by Hosaka *et al.* (1962) on *Lilium auratum*. McClellan and Stuart (1948), Moulton (1949), Brewer (1953), Sarova (1954), Woltz (1954 and 1955), Guttay and Krone (1957), Tamura and Mega (1959), El-Gendy (1962), Melholland and Bickford (1965), Waters (1965), and Skalska (1968 and 1970), on Gladiolus. El-Kadi and Raafat (1968) on Fressia, El-Gammassy *et al.* (1974), on amaryllis Mohamed (1975), on Narcissus tazetta they concluded that increasing the level on nutrition resulted in increasing the bulb weight.

c) Mean number of offsets:

In (1978), the highest level of nutrition (S_3) gave more number of offsets than the medium level (S_2) or the low level (S_1). In the second season, the increases in this respect, were obviously remarkable with the medium level of nutrition. The high level of nutrition caused reduction in the number of offsets. The mother bulbs of this treatment were noticeably greater than the medium one. It seemed that there was a balance between the size of the mother bulb and the number of offsets attached to it.

The results in this respect agree with those reported by Roberts et al. (1964), on Lilium longiflorum who found that fertilizers increased bulblet production. Also, McClellan and Stuart (1947), reported that NPK fertilization increased the number of gladiolus cormels produced. While, Mohmaed (1975), reported that the medium levels of fertilizers in the two years increased the number of offsets of

Narcissus compared to plants fertilized with low fertilization level in the first year and was followed by a medium level in the next year.

d) Mean diameter of one offset:

It is worthily to notice that there was a relation between the nubmer of the produced offsets and thier diameter. When any treatment decreased the number of the produced offsets, such offsets were characterized with greater diameters as shown in Table (31). In (1978), (S_1) treatment gave the least number of offsets combined with the largest diameter.

The following season, this was also true with the highest level of nutrition (S_3). In both seasons, however, the differences among the treatments were insignificant.

No obvious trend was observed to show that nutrition influenced the diameter of the produced offsets.

e) Mean length of roots:

It can be noticed that the length of roots was affeted with nutrition levels as shown in Table (31).

In both seasons, a proportional decrease in the length of roots was observed as the level of nutrition increased. The shortest roots were coincided with the highest level of nutrition, but in both seasons, the differences among the treatments were insignificant.

Hence, it can be concluded that nutrition has great effect on the bulb and offsets quality. The adequate nutrition increased the diameter and weight of mother bulb, number and diameter of offsets.

This agree with results obtained by Hosaka _et al_. (1962), on _Lilium auratum_ Roberts _et al_. (1964) on _Lilium longiflorum_ Kiplinger _et al_. (1972), on Ace, Nellie white and No. 44 Lily cvs, El-Kadi and Raafat (1968) on Freesia, Skalska (1968 and 1970) on Gladiolus. El-Gamassy _et al_. (1974), on Amarylis Shoushan _et al_. (1978) on _Hippestrum vittatum_, they showed that better quality of bulb , corm , bulblet, cormels and offsets was attained with sufficient nutrition.

According to the results, it may be advised that a medium consisted of 1 sand: 1 peatmoss then supplied every two weeks with a suitable nutrition solution as that previously mentioned will cover the requirments of Lilium longiflorum. Thunb plants. Undiluted solution may be preferably used to attain superior flowering of Lily plants.

CHEMICAL COMPOSITION

I. Effect of Nutrition of *Lilium longiflorum* (flowering size bulbs) on the chemical composition.

1. Effect on the medium:

The results presented in Table (32) demonstrated that after nutrition the medium was changed to some extent in its properties and chemical composition, e.g. the electrical conductivity was proportionally increased with the nutrition levels increase. This indicated that some minerals especially potassium and magnesium took place.

The pH of the medium was slightly changed twards alkalinity.

After nutrition application throughout the bulb growing season, some nutrients increased in the soil: water extract. The low level of nutrition caused increases in K, Mg, P, HCO_3 and SO_4. Similar effect was noticed with both (S_2) and (S_3) levels of nutrition. On the other side, the soil: water extract analysis showed depletion in Ca and N content, this indicated that lily plants had more requirements for these nutrients.

Table (32) Chemical Composition of the 1:5 soil : water estract of the medium used for growing the flowering bulb sizes of **Lilium longiflorum**. Thunb.

Sample	E.C. M. mhos / cm. at 25°C	PH	Na	K	Ca	Mg	P	N	HCo_3	Cl	So_4
Medium Before Nutrition	0.52	7.52	0.61	0.13	2.25	2.35	0.02	1.40	3.15	1.30	T
Media After Nutrition (1980) S_1	0.83	7.71	0.52	0.61	1.60	3.16	0.04	1.12	3.73	0.76	0.31
S_2	1.02	7.68	0.63	0.85	2.13	2.98	0.05	0.98	2.98	0.93	1.16
S_3	1.24	7.76	0.61	0.37	1.16	3.01	0.04	0.76	3.51	0.79	1.0

2. Effect of nutrition on minerals in Lilium longiflorum organs:

The results of the average dry weight of leaves, flower stalk and flowers of Lilium longiflorum in relation to nutrition treatments are presented in Tables (33) and (34). It is clearly shown that nutrition resulted in an increase in dry matter percentages of leaves and flowers of S_3 (high level of nutrition). This was true in both seasons.

Nutrition treatments were less effective on the dry weight of the flower stalk. Concerning the mineral percentages in the dry matter of the prementioned organs, the nitrogen percentages were increased in the different organs with the increasing level of nutrition. The flowers contained the highest percentages of nitrogen.

In both seasons, the minerals P, K, Ca, Mg and Fe were not considerably affected due to the nutrition levels variation, except with phosphorus which increased in the flowers with the increasing of nutrition level. Generally, the organs of flowers differed in their percentages of the determined minerals as shown in Table (33) and (34).

Data in Table (34) indicate that the medium level of nutrition gave the highest percentages of dry matter in bulbs as well as N, P and K percentages in the dry matter.

Table (33) Effect of nutrition on the chemical compostion of plant organs of *Lilium longiflorum*. Thunb.

Season (1978)

Plant organs	Level of nutrition	Dry matter %	N %	P %	K %	Ca %	Mg %	Fe P.P.M.
LEAVES	S 1	12.94	4.71	0.24	1.89	1.24	0.16	305
	S 2	12.01	4.92	0.21	1.90	1.28	0.17	325
	S 3	14.86	5.17	0.27	1.87	1.31	0.15	324
FLOWER STALK	S 1	21.67	1.74	0.20	1.48	1.37	0.15	220
	S 2	20.57	2.07	0.20	1.49	1.17	0.13	211
	S 3	18.39	2.42	0.20	1.61	1.25	0.17	218
FLOWERS	S 1	10.59	4.20	0.16	1.63	1.24	0.11	190
	S 2	19.94	5.22	0.20	1.59	1.19	0.11	193
	S 3	15.46	4.77	0.24	1.60	1.23	0.12	194

* Determination on dry weight basis at the end of experiment of 1978

Table (34) Effect of nutrition on the chemical composition of plant organs of Lilium longiflorum . Thunb

Season (1979)

Plant organs	Level of nutrition	Dry matter %	N %	P %	K %	Ca %	Mg %	Fe %
Leaves	S 1	11.41	2.91	0.21	1.92	1.19	0.17	350
	S 2	10.90	4.08	0.24	1.21	1.21	0.18	356
	S 3	11.87	4.54	0.23	1.27	1.27	0.17	332
Flower stalk	S 1	14.17	1.33	0.16	1.22	1.22	0.19	210
	S 2	13.27	2.57	0.16	1.22	1.22	0.20	217
	S 3	11.93	2.75	0.16	1.54	1.54	0.21	213
Flowers	S 1	11.02	3.97	0.18	1.20	1.20	0.13	210
	S 2	11.53	4.54	0.21	1.18	1.18	0.11	211
	S 3	13.03	4,65	0.20	1.23	1.23	0.11	203
Bulb	S 1	31.06	2.21	0.12	1.33	2.12	0.21	216
	S 2	34.52	2.39	0.15	1.40	2.03	0.19	220
	S 3	28.01	3.46	0.14	1.40	2.08	0.22	218

... the end of experiment of 1979

The results agree with those reported by Woltz (1956), who found that increasing the levels of nitrogen and potassium applied to gladiolus plants, resulted in increasing the average percentages of nitrogen and potassium respectively in the corms, except at the highest potassium level. While Kosugi and Sano (1961), stated that percentage of N in the dry matter of the tops of gladiolus was lower in the plants which did not receive N application. El-Gamassy and Moustafa (1963) reported that the percentages and total amounts of nitrogen in the dahlia plants were increased as a result of increasing nitrogen level in the nutrient solution from the low to the high. Whereas Barbagallow and Silivia (1964), mentioned that in gladiolus plants low N resulted in low dry matter production and poor utilization of P and K while Mohamed (1975), found that the heaviest dry weights of Narcissus leaves resulted from plants treated with the low fertilization level in the first season then followed by high fertilization in the next season. Also, Meewad (1977), found that the soil application of urea slightly increased the fresh and dry weight of plant parts of gladiolus.

3. Effect of nutrition on carbohydrates in *Lilium longiflorum* organs:

1. Leaves:

a) Total carbohydrate:

Data of total carbohydrates in the leaves of *Lilium longiflorum* as affected by nutrition are presented in Table (35). In (1978), the medium level gave the highest percentage 16.30% compared to 14.20 and 15.75% for low and high levels, respectively. The same trend was observed in (1979).

b) Soluble sugars:

In (1978), the reduced sugar percentages in leaves ranged between 4.34% for the low level and 4.66% for the high one.

In (1979), the high level of nutrition produced the minimum percentage of reduced sugar in leaves as 3.93%; the non-reduced sugars ranged between 2.12% and 2.70% (for the two seasons). The total soluble sugar percentages were high in the leaves of the plants fromthe medium level of nutrition, followed by those from the high level.

Sililar results which indicated that adequate nutrition increasedthe carbohydrates and sugars in the

Table (35) : Effect of nutrition on the percentages of carbohydrates and sugars in plant organs on *Lilium longiflorum* Thunb

Plant organs	Level of nutrition	Season 1978 Total carbohydrate %	Season 1978 R. Sugar %	Season 1978 N.R. Sugar %	Season 1978 T.S.S.	Season (1979) Total carbohydrates %	Season (1979) R. Sugar %	Season (1979) N.R. Sugar %	Season (1979) T.S.S.
Leaves	S 1	14.70	4.34	2.35	6.69	15.30	4.12	2.13	6.25
	S 2	16.30	4.43	2.70	7.13	16.10	4.26	2.38	6.64
	S 3	15.75	4.66	2.12	6.78	15.93	3.93	2.41	6.34
Flower stalk	S 1	12.18	2.75	1.96	4.71	13.30	3.01	1.92	4.93
	S 2	12.63	2.80	1.91	4.71	13.87	2.94	2.11	5.06
	S 3	12.90	3.58	2.27	5.85	12.50	2.92	1.96	4.88
Flowers	S 1	11.70	1.97	1.74	3.71	10.46	2.47	1.89	4.36
	S 2	10.70	1.87	1.63	3.49	11.47	2.44	1.83	4.27
	S 3	11.50	1.98	1.74	3.72	9.77	2.22	1.70	3.91
Bulb	S 1					16.25	3.88	2.18	6.06
	S 2					16.25	4.38	2.77	7.15
	S 3					17.60	4.57	2.60	6.61

* Determination on dry weight basis at the end of two seasons

leaves were reported by Mohamed (1968), on Gladiolus, who revealed that higher level of N, P and K resulted in more content of soluble sugars in the leaves.

2. Flower stalk:

a) Total carbohydrate:

In the same Table (35), it is clear that the flower stalks were poorer in the total carbohydrates as compared with leaves. The nutrition levels, in both season, seemed to have slight influence on the percentages of total carbohydrates in the flower stalk.

b) Soluble sugars:

No particular trend can be observed concering the effect of nutrition on the percentages of reduced, non-reduced or the T.S.S. in flower stalks Table (35), the results of the two seasons did not show the same trend. However, in (1978), the highest percentage of reduced sugars was 3.58, non-reduced 2.27 and T.S.S. 5.85., this was combined with the highest level of nutrition. The increasing effect was logic, hence, the highest quality of flower stalks was recorded from the (S_3) treatment. Also, the data of the second season might be coincided with other unusual environmental conditions (P.N. Table (I) in Appendix). The results agree with those obtained by Kosugi and Kondo (1960) on Gladiolus, Roberts et al. (1964) on Lilium longiflorum, Jana et al. (1974) on Dahlia and Tuberose, El-Gamassy et al. (1974) on Hippeastrum vittatum and Shoushan et al. (1978) on Hippeastrum vittatum.

3. Flowers:

a) Total carbohydrate:

In (1978), as shown in Table (35), the total carbohydrate percentages in the flowers of Lilium longiflorum were 11.70, 10.70 and 11.50 for S_1, S_2 and S_3 treatments respectively. In the next season, the least percentage was that of S_3 which gave 9.7% total carbohydrate. The nutrition did not show clear trend in this respect.

b) Soluble sugars.

Comparing the percentage of T.S.S. in the different flower organs it is clear that the flower had the least ones as compared with leaves or flower stalks. It is also shown in Table (35) that nutrition had slight effect on the percentages of the reduced, non-reduced and T.S.S. in the flowers.

4. Bulbs:

a) Total carbohydrate:

Data presented in Table (35), indicate that (S_3) produced bulbs with high percentage of total carbohydrate as 17.60%. Whereas, low and medium levels of nutrition produced bulbs with 16.25% total carbohydrate.

b) Soluble sugars:

The percentages of reduced sugars in bulbs were propontionally increased with the increased level of nutrition. The low level of nutrition gave the least percentages of non-reduced, reduced and T.S.S. sugars as shown in Table (35).

The reslts are in harmony with those obtained by Meawad (1977) who found that urea fertilization slightly increased the percentages of total and non-reducing sugars in the new corms of Gladiolus.

Since the vegetative growth increased with the high levels of nutrition, the increase in total carbohydrates and T.S.S. may be attributed to metabolic enhancement and hence the rate of building up the metabolites which reflected on the growth of the other plant organs.

On this ground, it may be concluded that it is better for the production of supreme quality of *Lilium longiflorum* flowers to use high levels of nutrition for the flowering size bulbs.