RESULTS AND DISCUSSION

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I. Effect of growth substances on root formation from the terminal cuttings of Jasminum sambac plants:

I.1. Effect on the rooting percentage:

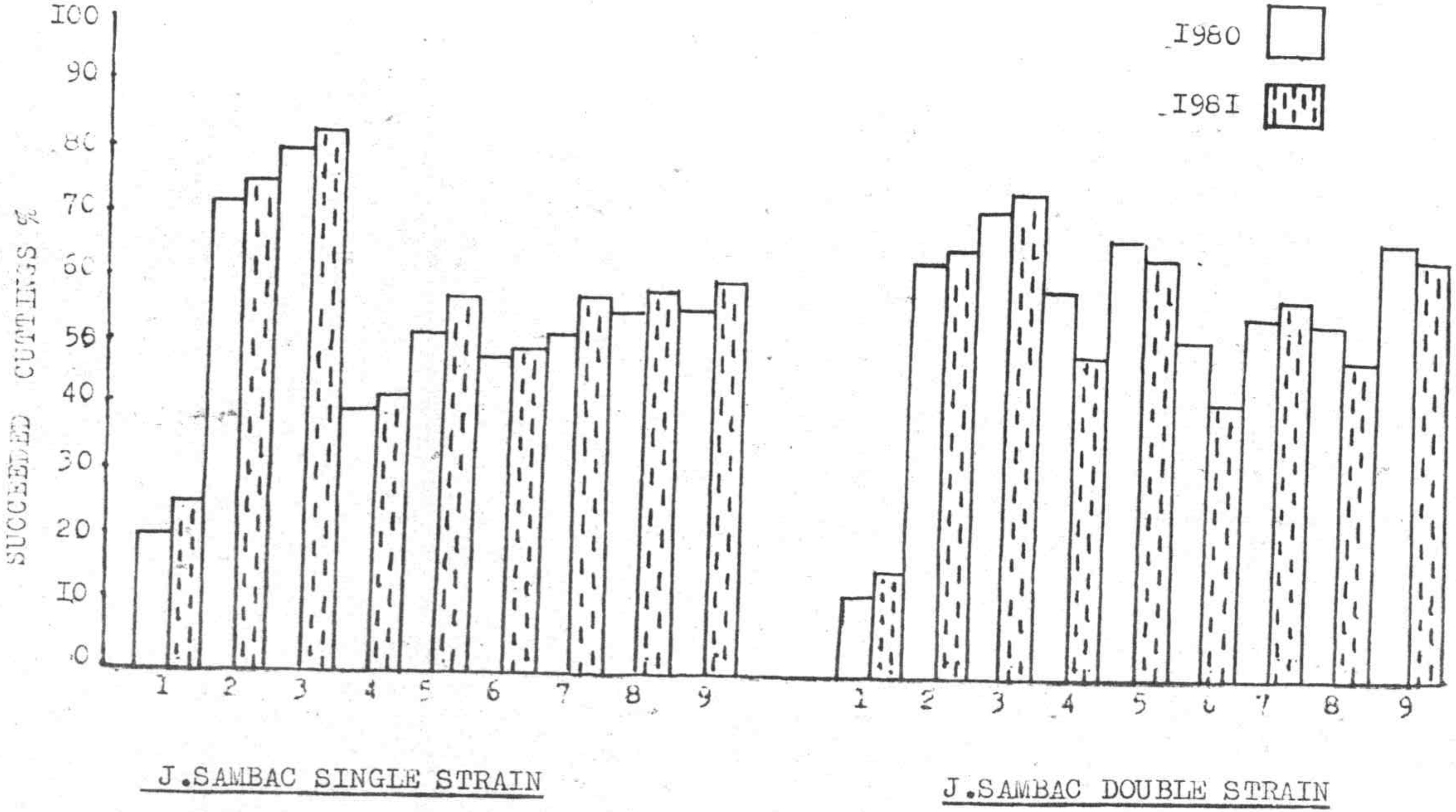
Table (1) shows that the treatments with both IBA and kinetin at the used concentrations, significantly increased the rooting ability of cuttings, however, the differences among the treatments in most cases did not reach the level of significancy, Fig. (1) shows that kinetin 25 and 50 ppm, increased the percentage of the rooted cuttings from 20 % for the untreated cuttings to reach 40 % and 52 % respectively in case of J. sambac (single strain) in the 1980 season. In case of J. sambac (double strain) the percentage increased from 12 % to 60 and 68 % respectively.

Dipping the cuttings in IBA at the rate of 2000 and 4000 ppm, significantly increased the rooting percentage to 72 and 80 % respectively with the single strain. The same treatments with the double strain, increased the percentage to 64 % and 72 % respectively compared with 12 % for the control. Results of the second season, 1981, followed the same trend. These results are in agreement with those obtained by Kale and Bhujbal (1972) on Bougainvillia var. Mary palmer and Bose et al (1973) on Hibiscus and Jasminum and Singh (1975) on Jasminum sambac. They all found that treating the cuttings of these plants with IBA, significantly improved the rooting percentage. In case of Bougainvillia, the percentage reached 75 % after the treatment compared with 15 % in the untreated cuttings.

Table (1) Effect of IBA, Kinetin and their combinations on number of the succeeded cuttings during 1980 and 1981 seasons.

IBA ppm	J. sambac single strain								J. sambac double strain							
	Kinetin (ppm)								Kinetin (ppm)							
	Zero		25		50		Mean		Zero		25		50		Mean	
	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981
Zero	1.00	1.25	2.00	2.05	2.60	2.98	1.85	2.05	0.60	0.80	3.00	2.50	3.40	3.30	2.30	2.20
2000	3.60	3.75	2.40	2.50	2.75	3.00	2.90	3.05	3.20	3.30	2.60	2.01	2.85	3.05	2.85	2380
4000	4.00	4.15	2.80	2.90	3.20	3.35	3.30	3.45	3.60	3.75	2.60	2.50	3.40	3.45	3.25	3.20
Mean	2.85	3.05	2.40	2.45	2.85	3.05	-	-	2.45	2.60	2.80	2.35	3.20	3.25	-	-

L.S.D.	J. sambac (single strain)				J. sambac (double strain)			
	1980 Kinetin & IBA	Interaction	1981 Kinetin & IBA	Interaction	1980 Kinetin & IBA	Interaction	1981 Kinetin & IBA	Interaction
0.05	0.574	0.033	0.569	0.328	0.812	0.046	0.880	0.039
0.01	0.775	0.045	0.779	0. 44	1.09	0.629	0.91	0.250



1: ZERO, 2: IBA, 2000, 3: IBA 4000 4: KINETIN 25 , 5: KINETIN 50,6:IBA 2000+ KINETIN 25, 7: IBA 2000 + KINETIN 50, 8:IBA 4000 + KINETIN 25, 9: IBA 4000 + 25 KINETIN.

Fig. (1): EFFECT OF IBA, KINETIN AND THEIR COMBINATIONS ON THE PERCENTAGE OF THE SUCCEED CUTTING.

I.2. Effect on length of the roots:

Table (2) indicates that kinetin at the used concentrations slightly increased the root length, however, the results did not reach the level of significancy in both types of Jasminum. On the other hand, IBA alone significantly increased the root length. In case of single strain, the two concentrations 2000 and 4000 ppm increased the root length from 15.60 cm in the control to reach 21.00 and 26.00cm respectively in 1980 season. In the second season the values increased from 11.50 cm to reach 20.00 and 25.50cm. In case of double strain, the lower concentration of IBA increased the root length from 11.30cm to 17.20cm while the higher concentration gave 18.80cm, in the first season. These values were 9.70, 15.00 and 18.30 cm in the second season (Fig. 2).

Combination of kinetin and IBA increased the root length than the corresponding kinetin concentration if added alone. These results are in agreement with those obtained by Loomis and Torrey (1964) on Radish roots and Gaspar et al (1967) on Hordeum. However, these treatments decreased the value compared with the corresponding dose of IBA when added separately. The results of the two seasons are quite similar.

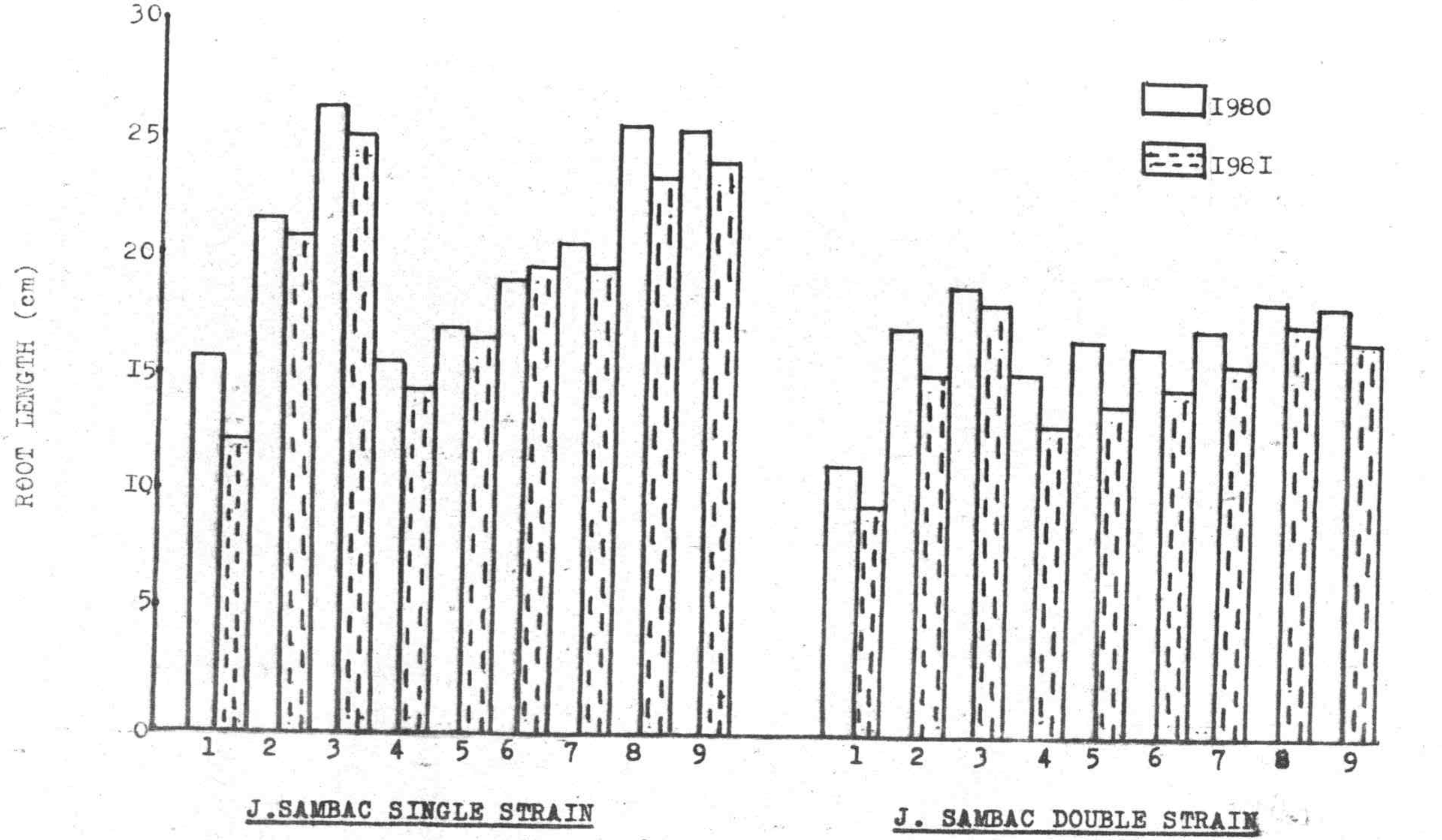
I.3. Effect on weight of the roots:

It could be seen from Table (3) that application of kinetin and IBA separately increased the weight of the formed roots on the cuttings in both the two types of Jasminum. In case of J. sambac (single strain) the weight of the roots increased from 0.90gm

Table (2): Effect of IBA, Kinetin and their combinations on the root length (cm) during 1980 and 1981 seasons.

IBA ppm	J.sambac (single strain)								J.sambac (double strain)							
	Kinetin (ppm)								Kinetin (ppm)							
	Zero		25		50		Mean		Zero		25		50		Mean	
	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981
Zero	15.60	11.50	16.00	14.75	17.00	17.50	16.20	14.58	11.30	9.70	15.50	13.00	16.50	13.50	14.43	12.07
2000	21.00	20.00	19.75	19.50	20.50	20.75	20.42	20.08	17.20	15.00	16.00	14.80	16.80	15.20	16.67	15.00
4000	26.00	25.50	25.75	23.50	24.57	25.00	25.50	24.67	18.80	18.30	17.70	16.20	18.10	17.20	18.20	17.23
Mean	20.37	19.00	20.50	19.25	20.75	21.08	-	-	15.77	15.10	16.40	14.67	17.33	15.30	-	-

L.S.D	J.sambca single strain				J.sambac double strain			
	I980		I98I		I980		I98I	
	kinetin§ IBA	Interaction	Kintein§ IBA	Interaction	Kintein§ IBA	Interaction	Kintein§ IBA	Interaction
0.05 =	5.I5	2.97	2.63	I.52	4.00	I.95	I.33	0.89
0.0I =	7.08	4.07	3.60	2.08	6.00	3.6I	2.I0	I.20



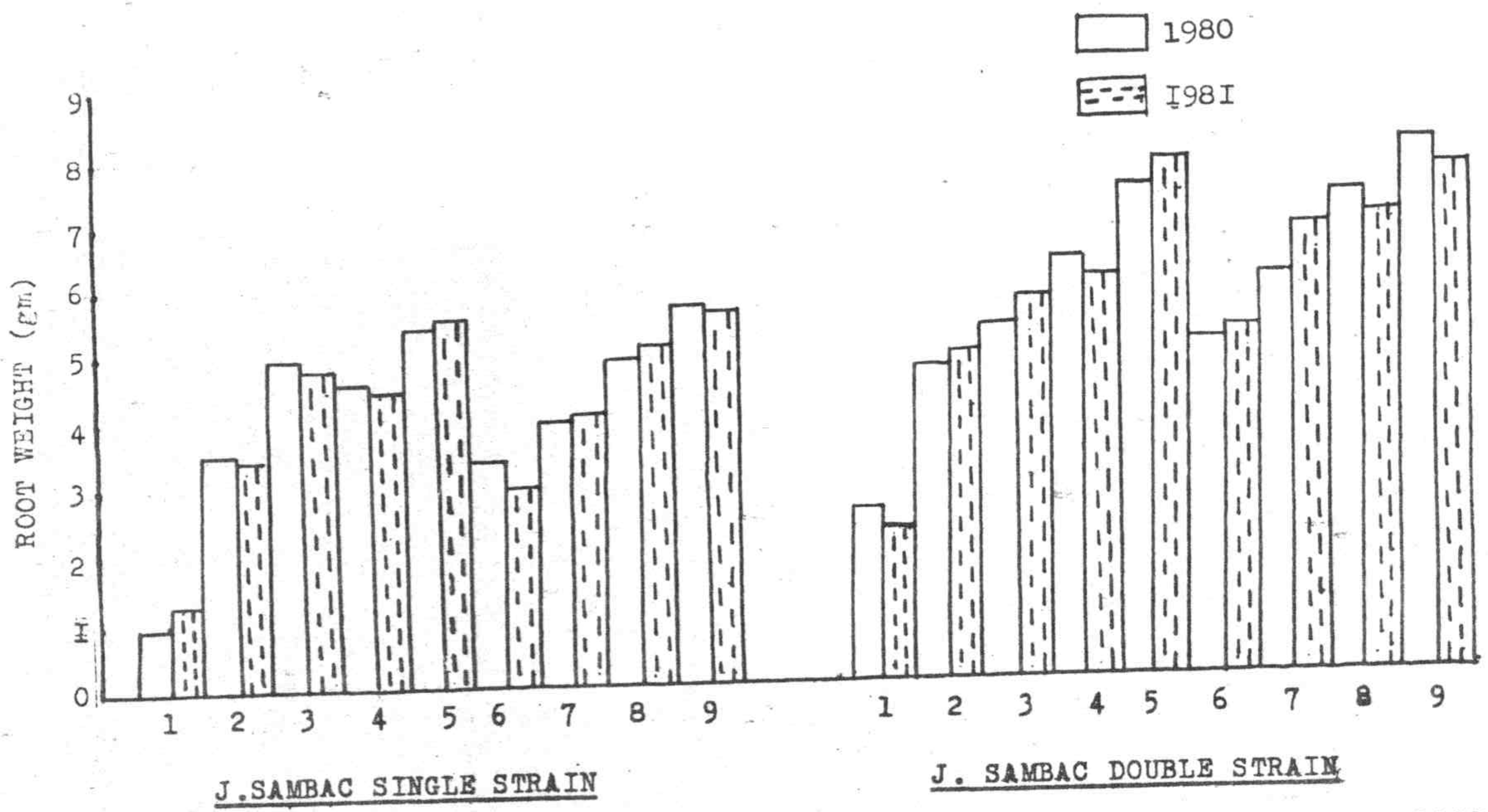
1: ZERO , 2: IBA 2000 , 3: IBA 4000 , 4: KINETIN 25 , 5: KINETIN 50 , 6: IBA 2000 + KINETIN 25, 7: IBA 2000 + KINETIN 50 , 8 : IBA 4000 + KINETIN 25 , 9: IBA 4000 + 50 KINETIN.

FIG. (2) : EFFECT OF IBA, KINETIN AND THEIR COMBINATIONSON ROOT LENGTH;

Table (3): Effect of IBA,kinetin and their combinations on weight of the root (g) during 1980 and 1981 seasons.

IBA ppm	J. Sambac(Single strain) Kinetin (ppm) Zero		25		50		Mean		J. Sambac(double strain) Kinetin (ppm) Zero		25		50		Mean	
	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981
Zero	0.90	1.20	4.47	4.40	5.32	5.50	3.56	3.70	2.50	2.13	6.15	5.87	7.33	7.67	5.33	5.22
2000	3.48	3.40	3.31	2.90	3.90	4.00	3.50	3.43	4.56	4.80	4.84	5.03	5.88	6.67	5.09	5.70
4000	4.85	4.70	4.80	5.00	5.60	5.60	5.09	5.10	5.19	5.57	7.02	6.73	7.83	7.53	6.68	6.61
Mean	3.08	3.10	4.13	4.10	4.94	5.03	-	-	6.08	4.17	6.00	5.88	7.01	6.69	-	-

L.S.D.	J. sambac Single strain 1980 Kinetin & IBA	Interaction	1981 Kinetin & IBA	Interaction	J. Sambac double Strain 1980 Kinectin & IBA	1981 Interaction	Kinetin IBA	Interaction
0.05 =	0.34	0.20	0.54	0.31	0.32	0.18	0.57	0.32
0.01 =	0.46	0.26	0.74	0.43	0.41	0.22	0.78	0.45



1: ZERO , 2: IBA 2000 , 3: IBA 4000 , 4: KINETIN 25 , 5: KINETIN 50 , 6: IBA 2000 + KINETIN 25, 7: IBA 2000 + KINETIN 50 , 8 : IBA 4000 + KINETIN 25 , 9: IBA 4000 + 50 KINETIN.

FIG. (3) : EFFECT OF IBA, KINETIN AND THEIR COMBINATIONSON ROOT WEIGHT.

for the untreated cuttings to reach four times and five times when treated with kinetin at 25 and 50 ppm. in the two seasons. With J. sambac (double strain) the values were 2.5, 6.15 and 7.33 gm respectively in 1980, while they were 2.13, 5.87 and 7.67 gm in 1981.

In 1980, cuttings of J. sambac (single strain) when treated with IBA at 2000 and 4000 gave weights of roots reached 3.48 and 4.85 gm. The same treatments gave root weight of 4.56 and 11.9gm with the J. sambac (double strain). The same trends are observed from the results of the second season. These results are in agreement with those obtained by Azmi and Bisgrova (1975) on Rosa multiflora, and Ivanicka and Pastyrik (1978) on Rosa pomifira. They obtained higher root dry weight when treated the cuttings with IBA.

Data in the same table showed that the combination of kinetin and IBA also increased the weight of the root than the untreated ones, but sometimes, the values were lower than those resulted from each of the two substances when added alone (Fig. 3).

I.4. Effect on carbohydrate content in the roots:

The two substances increased the carbohydrate content in the formed roots on the cuttings. The effect of the higher concentration from each of the two substances was more pronounced than that of the lower one. Kinetin at 25 and 50 ppm increased the total carbohydrate content in roots of the single strain from 9.66 and 10.57gm/100gm compared with 6.99 in the control. The two levels increased the values in the double strain from 5.66 in the control to reach 11.40 and 12.68 gm/100 gm respectively. IBA at 2000 and 4000 ppm increased the values from 6.99,to reach 12.00 and 13.00 gm/100gm in the single strain and from 5.66 to 10.95 and 12.30gm/100gm in the double strain. It could be noticed also from Table (4) that IBA showed no marked effect on the soluble sugar content while the kinetin treatments led to a slight decline in this respect. Haward (1965) on Humulus lupulus indicated that the success of the cuttings was probably associated with their ability to accumulate carbohydrates during the rooting period.

The combined treatments with the two substances also improved the total carbohydrate content compared with the control, but the resulted amounts were less than that obtained from each substances separately. Application of the two substances together decreased the ratio of soluble sugars under the levels estimated for the control and the treatments received the substances individualy. These results are of similar trend with both types of Jasminum.

Data in the tables from 1 to 4 undoubtly, reflex the promoting activity of IBA in root formation, length and weight. The same results had been achieved by several investigators e.g., Anand et al (1972) Gabrichidze (1972), Kale and Bhujbal (1972), Bhujbal and Kale (1973 and 1975) Chibbar et al (1974). Singh (1975) recommended dipping of the cuttings in IBA solution of 4000 ppm for obtaining the highest percentage of rooted cuttings from Jasminum sambac. Moreover, Bose et al (1973) announced that IBA increased, also, the number of roots on the cuttings.

Table (4): Effect of IBA, kinetin and their combinations on carbohydrate content (gm/100 g D.W.) in roots.

IBA (ppm)	J. (Sambac Single Strain)									J. sambac (double strain)								
	Kinetin (ppm)									Kinetin (ppm)								
	Zero			25			50			Zero			25			50		
	T.C	S.S	Rel%	T.C	S.S	Rel%	T.C.	S.S	Rel%	T.C	S.S	Rel%	T.C.	S.S	Rel%	T.C	S.S	Rel%
Zero	6.99	1.66	23.75	9.66	1.95	20.19	10.57	2.08	19.68	5.66	1.25	22.08	11.40	2.44	21.40	12.68	2.88	22.71
2000	12.00	2.80	23.33	10.50	2.10	20.00	10.75	2.05	19.07	10.95	2.65	24.20	9.33	1.80	19.29	10.26	1.93	18.81
4000	13.00	3.15	24.23	11.30	2.30	20.91	12.25	2.58	21.06	12.30	2.74	22.27	10.90	2.16	19.92	12.55	2.50	19.92

T.C.: Total carbohydrate %

S.S. : Soluble sugars %

Rel %: S.S / T.C x 100

Concerning the influence of kinetin either alone or in combination with IBA, there is lack in published work about the direct effect of kinetin on root formation on cuttings. However, there are many results derived from experiments carried out in vitro or in tissue cultures. Results of all the reviewed titles came to the same conclusion, that there is a relationship between auxins and cytokinens. While the auxins directly involved in the process of root formation, the cytokinens, however, only play its role indirectly through interaction with the auxin activity. Many investigators gave evidence that there is a ratio between kinetins and auxins at which the root formation took place. Such a conclusion would be derived from the results of Jacobs _et al_ (1969), Ohyama (1970) Churchill _et al_ (1971) Wheeler (1971) Goodwin and Morris (1979) and Johnson and Emino (1979). Galston (1969) stated the following:

" When kinetin is applied to certain plant cells, such as some calluses or roots grown in tissue culture, it acts together with auxin to produce a tremendous increase in cell division activity. Auxin alone produces only a swelling and an enlargement of the existing cells, while kinetin favours mitotic activity. When auxin and kinetin are present in a reasonable ratio, the cells will grow and divide normally. It may be that the normal miosis-producing activity of auxin is a consequence of the interaction of auxin with some naturally occuring kinin ".

Loomes and Torrey (1964) stated that kinin was shown to be necessary, with auxin, for significant cambial activity.

Discussing our results in the light of the previous conclusions, we find that both the kinetin and IBA when separately added, enhanced root production on cuttings of the two types of Jasminum. IBA at 2000 and 4000 ppm gave an absolute increase of 52 and 60 units over the control in the two types of Jasmine. However, kinetin at 25 and 50 ppm increased the percentage by 20 and 32 units in case of J. sambac (single strain) while 48 and 56 units with J. sambac (double strain), combination of the two substances gave higher percentage than kinetin alone but lower than IBA alone. The effect of kinetin was more clear in case of J. sambac (single strain). The combination in most cases gave lower values than kinetin or IBA if added alone with one exception, that is kinetin 50 ppm + IBA 4000 ppm increased the weight of the roots over the values obtained by one of them when added alone to J. sambac (single strain). The promoting effect of the two substances on length and weight of the roots could be expected in light of the increased content of total carbohydrates due to application of these substances. Carlson (1930), concluded that rooting from the bases of young shoots of Dorothy perkins Roses seemed to be related to a high content of reserve starch, Howard (1965) on Humulus lupulus, indicated that the success of leafy soft wood cuttings was probably associated with their ability to accumulate carbohydrates during the rooting period. On the other hand, Kachecheba (1976) on Hibiscus cuttings suggested that endogenous growth substances rather than carbohydrates influenced the seasonal patterns in rooting.

It could be observed from the obtained data that the two types of Jasminum differed in their rooting ability. Initially, the untreated cuttings of J. sambac (single strain) gave higher rooting percentage than J. sambac (double strain). This varied ability was clearly noticed in the two seasons. Under the treatment with kinetin, J. sambac (double strain), which has a lower rooting percentage, responded well to the treatment than did J. sambac (single strain). Similar observation could be seen comparing the results of the two types with respect to the other characters. This could be explained on the bases that J. sambac (double strain) has abnormal balance in the kinetin: auxin ratio. Addition of kinetin can change this balance to favour the normal requirements for improving the root production.

Counting of the survived cuttings:

When the succeeded cuttings reached 8 monthes old, the number of the survived cuttings was calculated and their percentages are illustrated in Fig. (5). It could be noticed that a higher percentage of the cuttings survived in case of double strain than signle strain,this was true either in the untreated or the treated ones. This could be attributed to the higher weight of roots formed on the cuttings of double strain compared with the single strain.

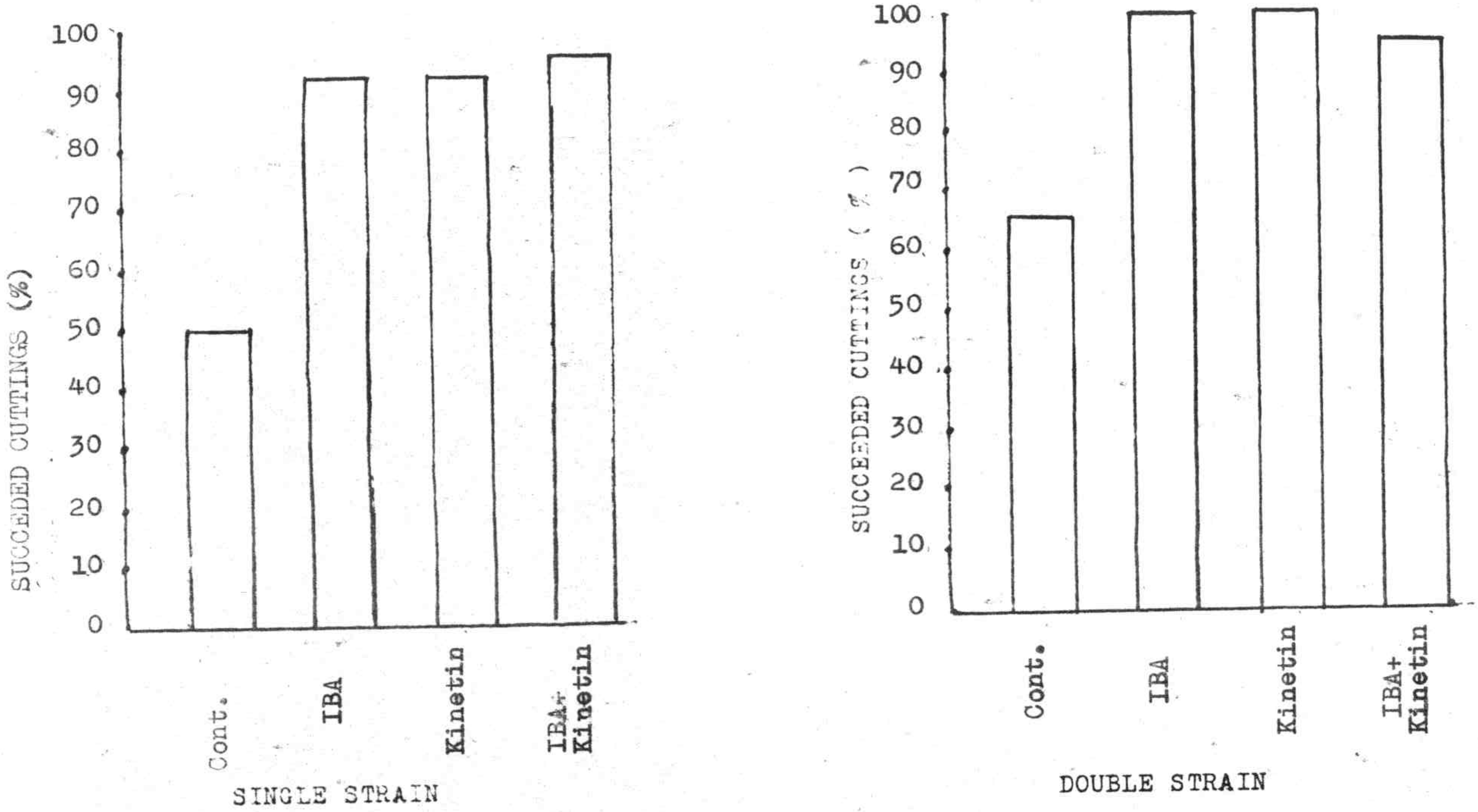


FIG.(5) EFFECT OF IBA, KINETIN AND THEIR COMBINATIONS ON COUNTING OF THE SURVIVAL CUTTINGS OF *J. SAMBAC*

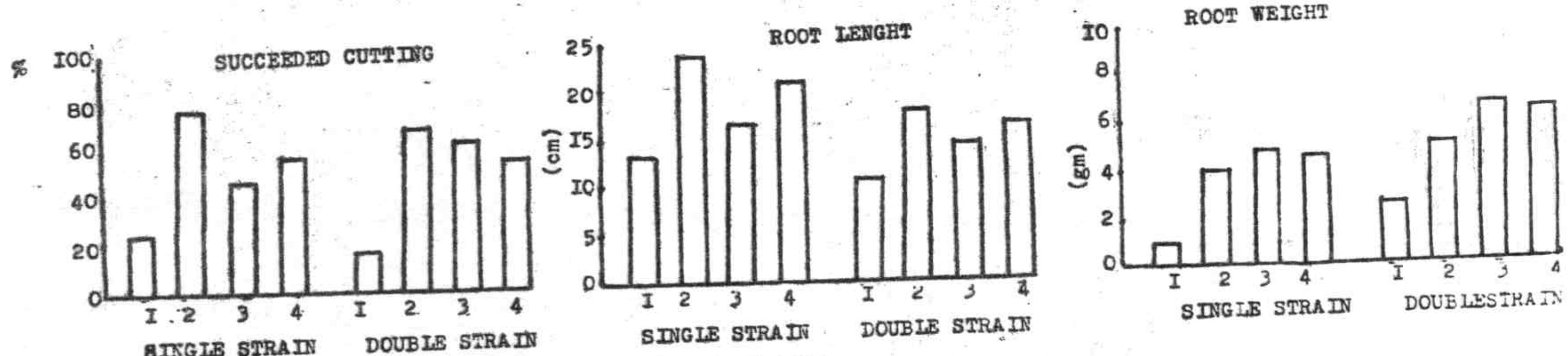
In both strains, the treatments resulted in higher percentage of the survived cuttings. Such effect may be due to the residual effect of these growth substances.

In conclusion it could be seen from the collective data in Table (5) and Fig. (6), that IBA was more effective than kinetin regarding the rooting percentage. It increased the rooting percentage in the single strain from 22.5 % in the control to 77.6 %, while in case of double strain the value was 69.5 % compared with 14.0 % in the control. This effect was indicated in higher increase in root length. Whereas, kinetin showed stimulating effect on the root weight of the two strains regardless of the concentration used. This is logic as kinetin was reported by Suguir et al (1962) to delay senescence, permiting the leaves for longer time and thus, increasing synthesis.

Treatments with the two substances together resulted in varied responses when compared with kinetin alone and the two strain, but generally, the combined treatments gave lower rooting percentage than IBA alone. Concerning the viability and survival of the rooted cuttings, there was no remarkable differences between the two substances.

Table (5) Average effects of IBA, kinetin and thier combinations on rooting parameters of *J. sambac.* cuttings (mean of 1980 and 1981 seasons).

	Single Strain			Double Strain		
	Succeeded cuttings %	Root length (cm)	Root weight (gm)	Succeeded cuttings %	Root lenght (cm)	Root weight (gm)
Control	22.5	13.55	1.05	14.00	10.50	2.32
IBA	77.6	23.13	4.11	69.50	17.33	5.03
Kinetin	97.7	16.31	4.92	61.00	14.63	6.76
IBA + Kinetin	57.2	21.74	4.44	56.70	16.40	6.43



I I:ZERO , 2:IBA 3: KINETIN, 4: IBA + KINETIN

FIG(6):EFFECT OF IBA ,KINETIN AND THEIR COMBINATIONS OF ROOT PARAMETERS OF J.SAMBAC.

II. Effects of growth regulators:

II.1. Effect on growth aspects:

a) Effect on plant height:

Data in Table (6) and Fig. (7) show that GA significantly increased the plant height. The higher concentration increased the plant height by 45 %, while the lower one gave about 30 % increase.

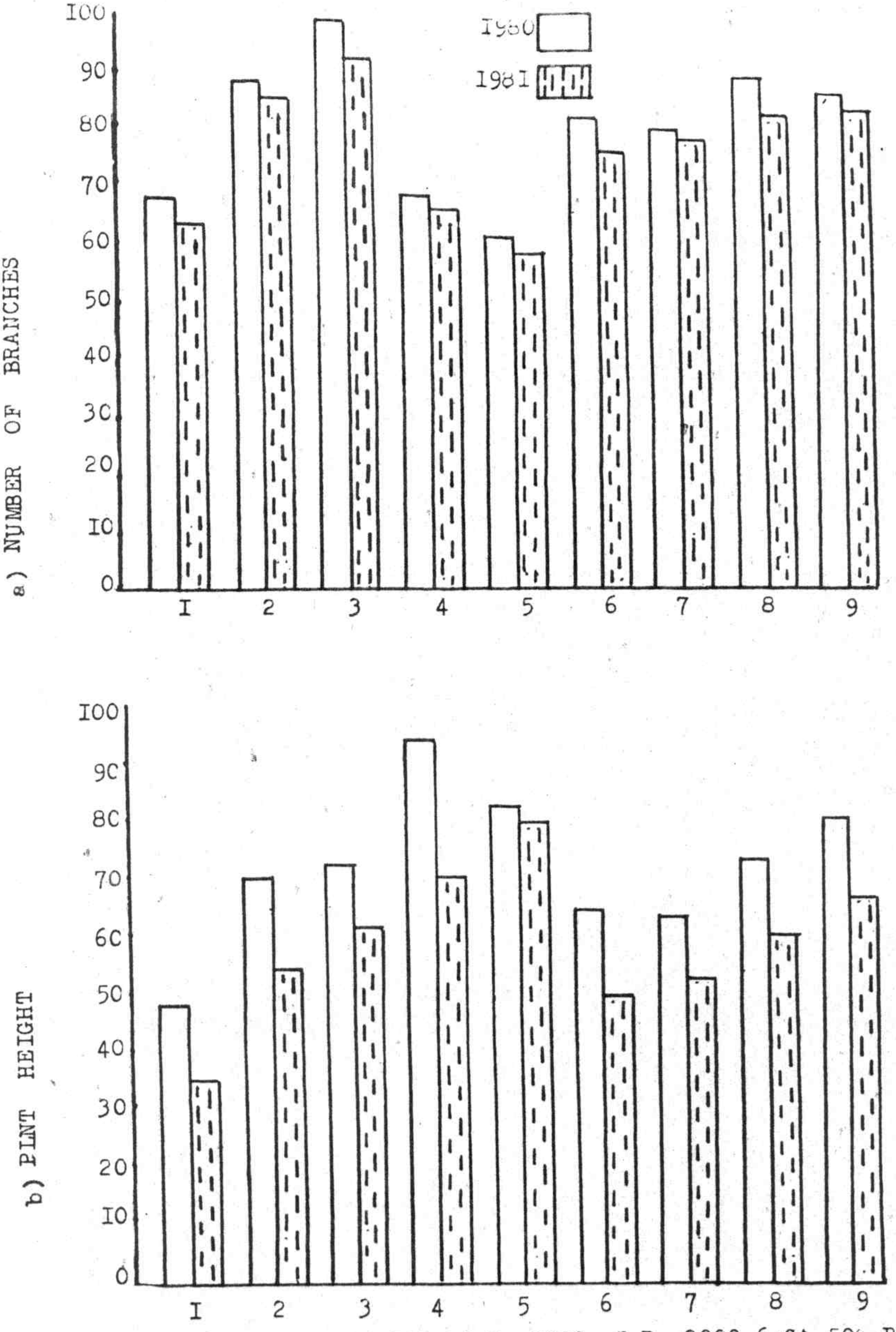
Concerning the effect of GA on stem length, Sachs and Koframek (1963), reported that it stimulated the elongation of *Chrysanthemum morifolium*. Bostrack and Struckmayer (1967) mentioned that plants of *colues blumei*, *Antirrhinum majus*, and *Salvia splendens*, all responded to foliar application of GA by elongation of subapical internodes which was due to cell division.

On the other hand, B_9 showed no marked effect in this respect. Kiplinger and Tayama (1970), reported that B_9 was not effective as a retardant on the growth of Poinsettia cultivars. However, Gabr and El-Sherbiny (1977) reported that GA at 25, 100 or 400 ppm and B_9 250 and 1000 ppm increased the plant height of *Datura metel*

Addition of GA followed by B_9, gave lower values than the same concentration of GA when added alone. As it could be seen

Table (6): Effect of GA, B_9 and their combinations on plant height, number of branches, flower weight and dry weight of the leaves during 1980 and 1981 seasons.

Treat-ments	Plant height (cm)			Number of branches			Flower weight (gm)			Dry weight of leaves (gm) (%)		
	1980	1981	Mean	1980	1981	Mean	1980	1981	Mean	1980	1981	Mean
Control	68	63	66	47	35	41	0.143	0.135	0.139	34.10	35.20	34.65
GA 50	88	85	87	70	54	62	0.298	0.290	0.294	34.50	36.40	35.45
100	100	92	96	71	56	63	0.274	0.280	0.277	34.80	37.00	35.90
B_9 1000	68	66	67	94	70	82	0.284	0.278	0.260	39.10	41.00	40.10
2000	61	59	60	82	80	81	0.281	0.275	0.278	39.60	42.50	41.10
$GA+B_9$ 50+1000	81	75	78	64	48	56	0.288	0.266	0.274	32.80	33.50	33.15
50+2000	79	78	79	63	52	57	0.265	0.245	0.255	35.20	36.20	35.70
100+1000	88	81	84	73	60	66	0.240	0.222	0.265	34.80	35.70	35.25
100+2000	85	82	87	80	66	73	0.255	0.235	0.245	35.80	37.20	36.50
L.S.D.	0.05	0.01		0.05	0.01		0.05		0.01			
GA/B_9	8	14		11	15		0.040		0.060			
$GA+B_9$	6	7		7	9		0.015		0.027			



I CONTROL :2:GA50 3:GA 100 4:B_9 1000 5:B_9 2000 6:GA 50+ B_9 1000
7:GA50+ $B_9$2000 8:GA 100+ B_9 1000 9:GA 100 + B_9 2000

FIG(7):EFFECT OF GA,B_9 AND THEIR COMBINATIONS :
A a)NUMBER OF BRANCHES and b)PLANT HEIGHT

from the mean values of plant height in Table (6), GA 50 ppm gave the value 87 cm, but when it was followed by spraying 1000 ppm B_9 or 2000 ppm, the values were 78 and 79 cm. Also, 100 ppm of GA gave plant height of 96 cm, the value decreased to 84 cm when GA was followed by 1000 ppm B_9, and 78 cm when 2000 ppm of B_9 was sprayed.

On the contrary, spraying of the two substances increased the effect over the values obtained from B_9 alone. B_9 1000 ppm gave plant height of 67 cm, while addition of GA to these plants, at the concentration of 50 and 100 ppm, the values increased to 78 and 84 cm. In case of B_9 alone at 2000ppm the plant height was 60 cm and increased to 79 and 87 cm after the addition of GA at 50 and 100 ppm respectively.

b) Effect on number of branches:

All the treatments significantly promoted the branching. Treatments of GA at 50 and 100 ppm gave 62 and 63 branches respectively compared with 41 branches on the untreated plants, Sen and Maharana (1971 & 1972) reported that GA treatments increased number of branches on Chrysanthemum.

B_9 was more effective in this respect, the two concentration gave 82 and 81 branches respectively. Many authors gave similar results about the promoting effect of B_9 on branching such as Jasa et al (1971) on Salvia splendens.

It could be noticed that the two concentrations from each substance gave about the same effect.

Spraying of GA after B_9 decreased the promoting effect of the latter. B_9 at 1000 ppm gave 82 branches, the value decreased to 56 and 66 branches after the addition of GA at 50 and 100 ppm respectively. Also, B_9 at 2000 ppm gave 81 branches, the number decreased to 57 and 73 after spraying with GA at 50 and 100 ppm.

Discussing these results, it could be concluded that GA is more effective than B_9 in controlling the plant height, however, the contrary is true with respect to number of branches per plant.

Concerning the application of the two substances in a combination form, the obtained results give the reason to believe in an antagonismic action between the two substances. This relationship led to a reduction in the effect of the substance which gave better results, whereas, increased the effect of the other substance which gave lower results when they were added separately.

c) Effect on the weight of flower:

It could be seen from the data in Table (6), that all the treatments with GA and B_9 and their combinations, significantly increased the weight of one flower. The untreated plants beared flowers having a mean value of 0.139 gm/flower. GA at the two concentrations increased the value to 0.296 and 0.277 gm/flower respectively. In case of B_9, the values were 0.259 and 0.278 gm/flower.

The increase in flower weight due to GA treatments was reported by Zieslin and Halevy (1976) on Baccara rose. Agina (1980) mentioned to on increase in flower weight of Tagetes erecta after treatment with B_9.

d) Effect on dry weight of the leaves:

It could be seen from the data in Table (6), that GA increased the dry weight of the leaves. The mean values of two seasons were 35.4 and 35.9gm due to the treatment with GA 50 and 100 ppm respectively compared with the control (34.6gm). The increase in the dry weight was more pronounced after the treatment with B_9 at the two levels; 1000 and 2000 ppm, the values were 40.1 and 41.1gm respectively. The combined treatments with GA and B_9 gave values which slightly differed from that of the control or GA treatments. Gabr and El-Sherbeny (1977) studied the effect of GA at 25, 100 or 400 ppm and B_9 at 250, 1000 or 4000 ppm on growth of Datura metel. They concluded that plant height and dry matter accumulation were increased by all GA treatments. B_9 sprays increased plant height and dry matter accumulation at the two lowest concentrations.

The observed trend of the effect of the growth substances on the dry weight is quite similar to their effect on the yield of flowers (Table 6).

II.2. The effect on the flower yield:

The values of the monthly flower yield as affected by the two growth regulators are summarized in Table (7). The statisticaly analysis of these data revealed significant effects due to GA, B_9 and their combination. The total flower yield per plot (4 plants) during 1980, increased by about 26 % and 57 % due to the treatment with the two levels of GA_3 respectively. The increase reached 42 % and 68 % when the two levels of B_9 were used. This means that the higher levels from the two substances gave better results, B_9 at 2000 ppm was the best of all treatments. Concerning the second season, it could be noticed that the results followed the same trend of the first season. The flower yield in the second season was generally lower than that obtained in the first one, it may be due to the similar size of plants chosen in that season. The relative increase in the flower yield due to the treatments was more remarkable. The GA treatments gave 30 % and 62 %, while B_9 gave 51 % and 73 % respectively.

Spraying GA followed by B_9 increased the yield of flowers in comparison with the untreated ones, however, the values did not reach those resulted from the treatment with each substance if it used separately. Vanonsem et al (1962), Zieslin and Halevy (1976), El-Shafie and Hassan (1978)and Reddy (1978) reported that application of GA increased the number of flowers per plant in many ornamental plants. Zeislin and Halvey (1976) explained this phenomenon on the bases that GA participates in the endogenous control of flower development and the possibility that it acts in directing the translocation of metabolites to flower buds.

Although B_9 is considered as a growth retardant, there are many contradictions in the published results about its activities.

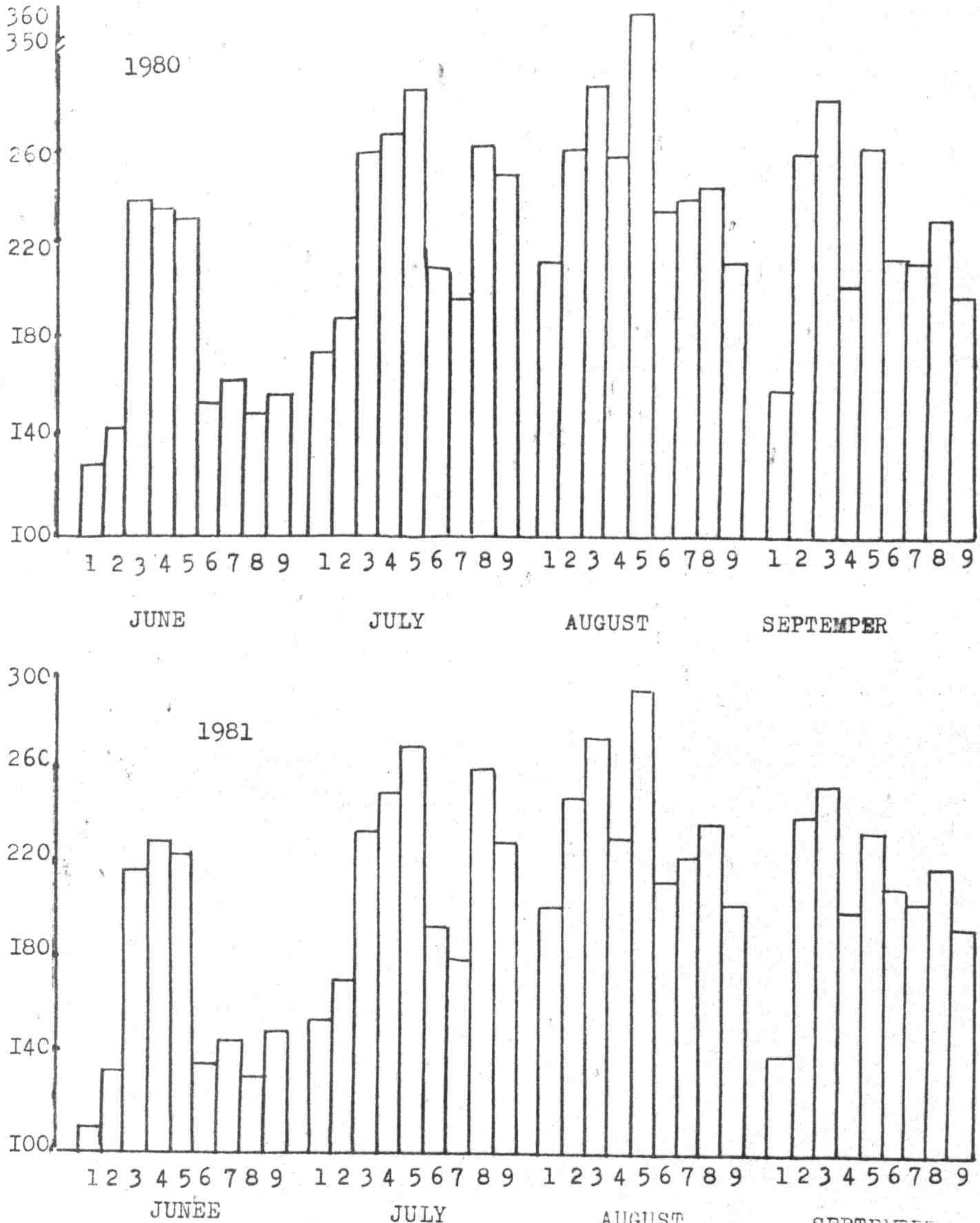
For example, Gugenhan (1971) and Jasa et al (1971) reported that application of B_9 delayed the flowering of Zinnia pumila and Salvia splendens. On the contrary, Matous (1971) and Pergola (1973) announced that such treatments slightly advanced the date of flowering in Rhodadendron obtusum and Chrysanthemum. Hore and Bose (1972) stated that different concentrations of B_9 ranged between 5000 and 10000 ppm gave different responses in the growth and flowering of ten species of flowering shrubs. They concluded that the lowest concentration was best for growth retardation and increased flowering in most of species which they studied. Increased number of flowers was also noticed by Kher (1973) in Chrysanthemum plant and Agina (1980) on Tagetes. It may be expected that these varied responses are due to differences in the plant species under investigation, the used concentrations, the method of application and many other factors.

Concerning the seasonal variation in the flower yield, the data show that the highest yield was obtained in August and September in case of GA treatments, while it was obtained in August and July with B_9 and the control. This could be observed from the data of the two seasons. Rovesti (1939) found that the peak of flowering in J. grandiflorum was during August, while it was reported by Guenther (1952) to be between August and October. Lotfy et al (1958) announced that the highest flower yield was obtained during September and October.

Table (7): Effect of GA, B_9 and their combinations on the monthly flower yield (g/plot) during 1980 and 1981 seasons.

Monthes	June		July		Aug.		Sept.		Mean Monthly yield		total yield	
treatments	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981
Control	128	107	176	155	213	205	159	140	169	151	676	604
GA: 50	143	132	190	172	259	248	260	240	213	198	852	792
100	240	220	260	234	288	275	283	255	267	246	1068	984
B_9 1000	237	230	268	250	258	230	203	201	241	221	964	884
2000	234	226	286	270	359	295	262	235	284	256	1136	1024
GA + B_9												
50 + 1000	156	138	210	195	235	216	214	210	203	189	812	756
50 + 2000	164	145	199	180	241	223	213	206	204	188	816	752
100 + 1000	150	132	264	260	247	238	233	220	230	212	920	848
100 + 2000	158	150	249	230	212	208	201	195	205	195	820	780
Mean	179	164	233	216	259	237	225	211				

L.S.D.	GA & B_9		GA + B_9		months		total yield GA & B_9		total yield GA + B_9	
	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981
0.05 =	22	15	12	8	25	17	88	60	48	33
0.01 =	29	20	17	11	34	23	120	80	69	45



1:CONTROL, 2:GA 50 ,3:GA I00, 4:B_9 I000, 5:$B_9$2000,6:GA 50+ B_9 I000
7:GA50 +B_9 2000, 8:GA I00+ B_9 I000, 9:GAI00 + B_9 20)

Fig.(8) : EFFECT OF GA, B_9 AND THEIR COMBINATIONS ON THE MONTHLY FLOWER YIELD IN 1980 AND 1981 SEASONS.

Regarding the published results on the effects of GA and B_9 on the flowering date, some contradictions could be observed. Most of the investigators introduced results which indicate that the flowering was accelerated by GA while delayed by B_9. On the other hand, Wasscher (1958) pointed out that the application of GA on Pelargonium zonale delayed flowering. The same result was obtained by Guttridge (1963) on Poinsettia. Jansen (1969) stated that GA did not affect the time of flowering of Chrysanthemum. In case of B_9, opposite results were found by Matous (1971) and Pergola (1973). They reported that B_9 gave earlier flowering in Rhodadendron and Chrysanthemum.

II.3. Effect on the concrete percentage:

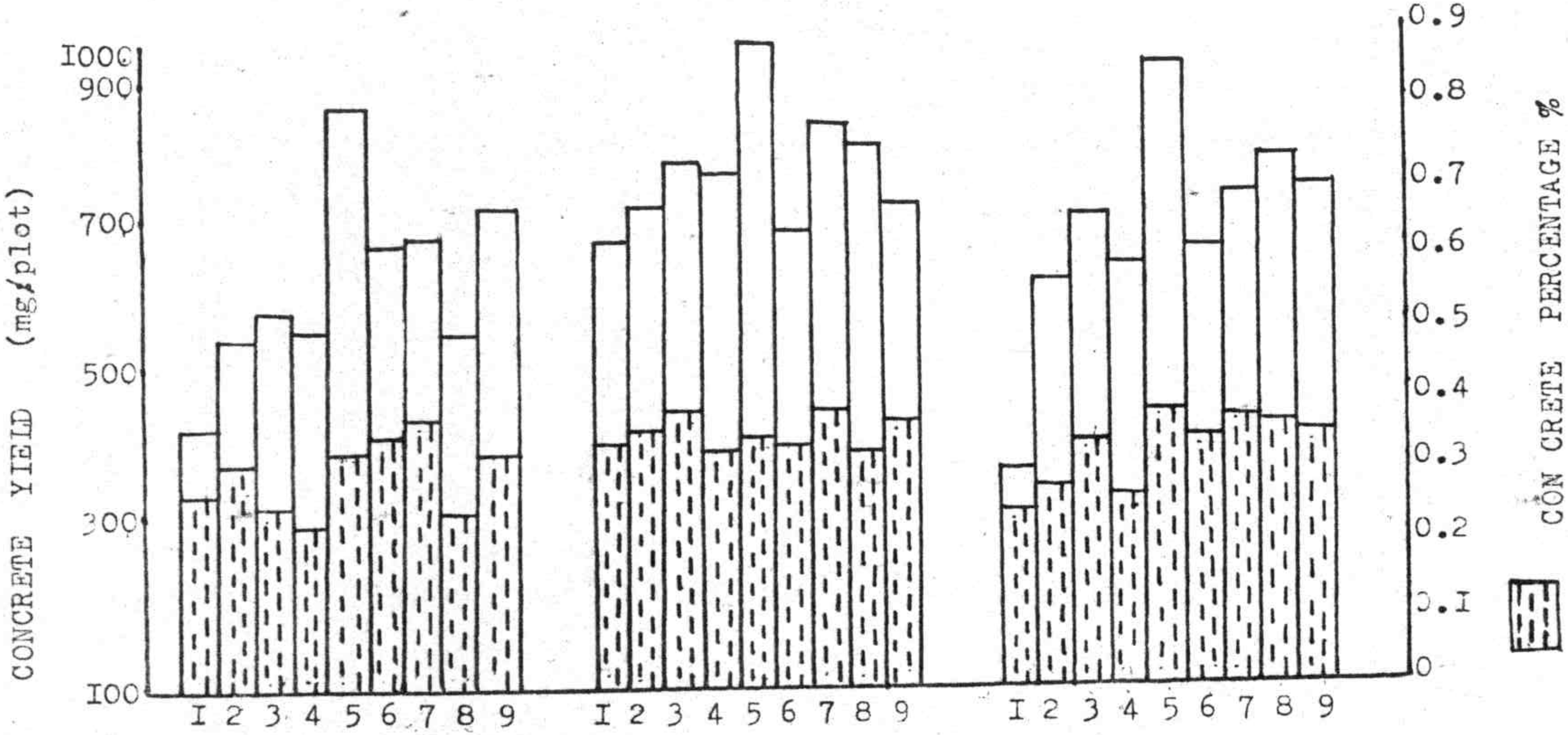
Mean values of the concrete percentage in the flowers collected in the successive monthes are illustrated in Table (8). The data clearly show that both the two substances significantly increased the concrete percentage of J. sambac flowers. The increased percentage was in relation with the increased concentrations. The two levels of GA gave a concrete percentage of 0.291 and 0.328 respectively, while B_9 gave 0.280 and 0.362 % respectively after the application of 1000 and 2000 ppm. Compared with 0.258 % in the control plants. The highest concrete percentage resulted from the treatment with B_9 2000 ppm. Similar results were achieved by Agina (1980) on Tagetes and Culati et al (1979) on Ocimum sanctum.

Table (8) : Effect of GA, B_9 and their combinations on the Concrete Percentage, Concrete yield (mg/plot) and Total Carbohydrate, Season 1980.

Mon. / Treat.	July concrete %	July concrete yield	August concrete %	August concrete yield	September concrete %	September concrete yield	Mean of concrete %	Concrete yield total	Concrete yield Mean	Total Carbohydrate%	Soluble sugars %	Soluble sugars relative %
control	0.234	411	0.332	707	0.208	330	0.258	1448	482	14.50	2.09	14
GA 50	0.245	465	0.334	865	0.296	769	0.291	2099	699	11.51	3.34	29
100	0.311	809	0.344	991	0.329	931	0.328	2731	910	21.78	2.67	12
B_9 1000	0.255	683	0.324	835	0.242	491	0.280	2009	669	9.59	2.51	26
2000	0.329	941	0.344	1217	0.332	869	0.362	3027	1009	10.56	2.57	24
GA+B9 50+1000	0.318	668	0.329	773	0.328	702	0.325	2143	714	14.19	1.37	10
50+2000	0.334	665	0.372	897	0.361	796	0.355	2358	786	11.22	1.42	12
100+1000	0.232	612	0.390	1069	0.356	829	0.326	2510	836	8.91	1.00	11
100+2000	0.316	786	0.365	774	0.343	689	0.341	2249	749	23.76	1.50	6
Total		6030		8128		6406						
Mean	0.286	670	0.348	903	0.310	771						

L.S.D.

		GA & B_9	GA + B_9	months	total concrete yield GA & B_9	total concrete yield GA + B_9
1. For Concrete %	0.05 =	0.030	0.021	0.038		
	0.01 =	0.050	0.029	0.051		
2. For concrete yield	0.05 =	23.94	13.82	13.82	69.5	40.5
	0.01 =	31.92	18.43	18.43	94.5	55.5



JULY AUGUST SEPTEMBER

1: CONTROL , 2: GA 50 , 3: GA 100 , 4: B_9 1000 , 5: B_9 2000

6: GA 50 + B_9 1000 , 7: GA 50 + B_9 2000 , 8: GA 100 + $B_9$1000

9: GA 100 + B_9 2000 .

FIG. (9) : EFFECT OF GA, B_9 AND THEIR COMBINATIONS ON THE CONCRETE PERCENTAGE AND YIELD IN 1980 .

The addition of the two substances gave a significant increase in concrete percentage for all the treatments. The combination GA 50 ppm + B_9 2000 ppm gave the highest percentage. The combined treatments gave higher values than the corresponding concentration of GA but lower than B_9 when they were separately added.

It could be seen from the data that the highest concrete percentage was reached in August with all treatments.

II.4. Effect on the yield of concrete:

The mean values of concrete yield (mg/plot) from the collected flowers through the productive period as well as the total yield of concrete in the whole season are illustrated in Table (8). Application of GA and B_9 either separately or combination together resulted in a significant increase in the concrete yield. It is clearly noticed that the increase was more pronounced with the higher levels than the lower ones from the two substances. The plant treated with GA 50 ppm gave an increase of 45 % while the GA 100 ppm gave an increase of 89 % over the control plants. The treatment with B_9 2000 ppm nearly doubled the concrete yield compared with the control plants. This apparent improvement in the concrete oil production could be attributed to the increase in both the flower yield and concrete percentage. Such effect was more pronounced when higher level of each substance was applied.

All the combinations of the two substances increased the yield of concrete over the untreated ones, but the obtained values remained at lower levels than the individual substances. The rate of GA 100 ppm + B_9 1000 ppm gave the best result. It increased the concrete yield by 73 % over the control. This value is lower than that obtained from the treatment with GA 100 ppm alone, however, higher than that resulted from B_9 1000 ppm. The reduced values after the application of the two substances could be persumable due to the retarding effect of B_9.

Concerning the concrete yield in the different months, the results show that the highest concrete yield reached the maximum in August. This was parallel to the highest concrete percentage and highest yield of flowers which were recorded in this month. These results are in harmony with those obtained by Rovesti (1928), La Face (1948) and El-Shafie _et al_ (1975) on _J. grandiflorum_. Application of growth substances did not change the situation with the concrete percentage or yield, they remained at their maximum in August. Such characters are characteristic for the antagonestic behaviour of a given genera.

II.5. _Effect on the carbohydrate content in the leaves:_

It could be seen from Table (8) and Fig. (10) that the two concentrations of B_9 as well as the low level of GA, reduced the carbohydrate content in the leaves, while increased the amount and the relative percentage of the soluble sugars compared with the control. Shanmugam and Muthuswamy (1974) reported that the carbohydrate content in the foliar parts of Chrysanthemum was reduced by GA treatment. On the other hand, GA 100 ppm increased both the carbohydrate content and total soluble sugars, the later was relatively decreased.

The two substances when sprayed on the same plant reduced the amount and the relative percentage of the soluble sugars below the levels of the control and the plants recieved one of the two substances. There was an exception, that is, GA 100 ppm + $B_9$2000 ppm increased the carbohydrate content.

The influences of these growth substances on the productivity of Jasminum plants may be better understood in the light of their effect on the carbohydrate content. It seems that application of the two substances specially at the lower concentration caused a breakdown of the carbohydrate in the aerial parts to form soluble intermediates which were transported to the productive organs.

Such reduction in the carbohydrate was parallel to an increase in activity of carbohydrate enzymes with increasing transport of photosynthates from vegetative organs to storage organs. These were the results of many investigators such as El-Fouly and El-Baz (1969) and Amberger (1954).

The higher concentration of GA (100 ppm); although increased the amount of soluble sugars over the control, but the relative percentage to the total carbohydrate, which also increased, remained much lower than the other treatments and this was accompanied with a low concrete percentage. With respect to the effect of the two substances sprayed on a plant, except the case of GA 100 ppm + B_9 2000 ppm, there was a tendency to reduce the total carbohydrate contents, the amount and the relative percentage of soluble sugars. These treatments gave lower flower yield compared with the results when each of the two substances was added alone. Exceptionally, the treatment with the higher doses of the two substances; GA 100 ppm + B_9 2000 ppm, increased the carbohydrate content but decreased the amount of soluble sugars, and thus its relative percentage to be the least one. This was parallel to a low concrete percentage and concrete yield.

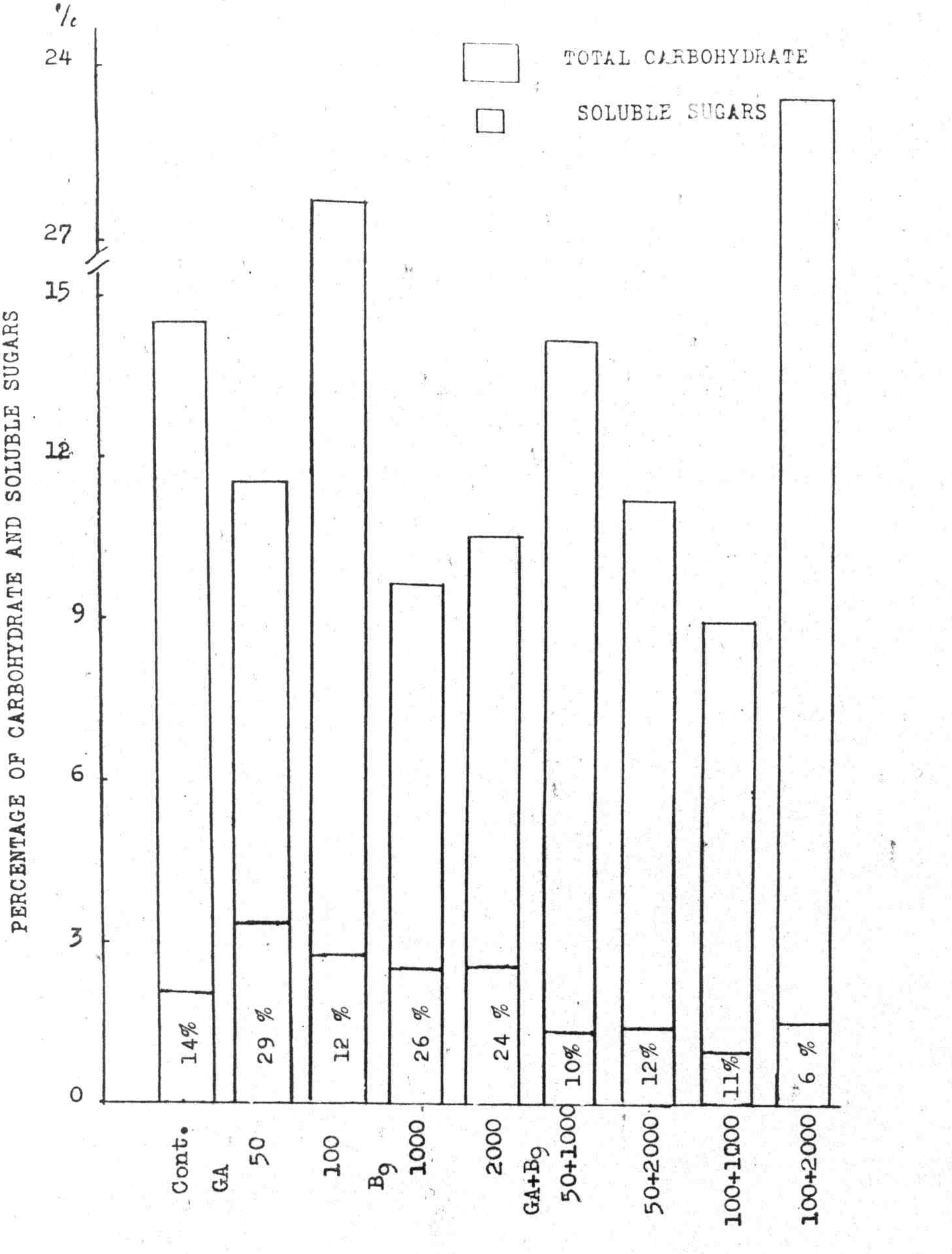


FIG. (10)) : EFFECT OF GA, B_9 AND THEIR COMBINATIONS ON CARBOHYDRAT AND SOLUBLE SUGARS IN LEAVES OF <u>J. SAMBAC</u>.

Summarizing the influences of GA and B_9 and their combination on the growth aspects and productivity of Jasminum sambac as shown in Table (9) and Fig. (11), the following could be concluded. All the treatments showed a beneficial effects on the studied characters. GA gave the best results concerning the plant height and mean of flower weight. On the other hand B_9 was superior regarding the effect on number of branches and dry weight of the leaves. This was in relation to heigher yield of flowers (1002 gm/plot) and concrete oil (839 mg/plot), without significant influence on the concrete percentage. Results of the combined treatments are not advisable, since their results were, in most cases, lower than those obtained from each of the two substances. Hence, it can be concluded that the application of B_9 spray will give better yield of flowers and concrete oil.

Table (9) Average effects of GA, B_9 and their combinationson growth characters and productivity of J.sambac (single strain), (mean of 1980 and 1981 seasons)

Treatment	Plant height (cm)	Number of branches	Flower weight (gm)	Dry weight of leaves %	Flower yield (gm/plot)	Conerete (%)	Concrete yield (mg/plot)
Control	66.00	41.00	0.139	34.60	640	0.258	482.00
GA	91.50	62.00	0.290	35.68	924	0.310	804.50
B_9	63.50	81.00	0.270	40.60	1002	0.320	839.00
GA + B_9	82.00	63.00	0.260	35.18	813	0.340	771.25

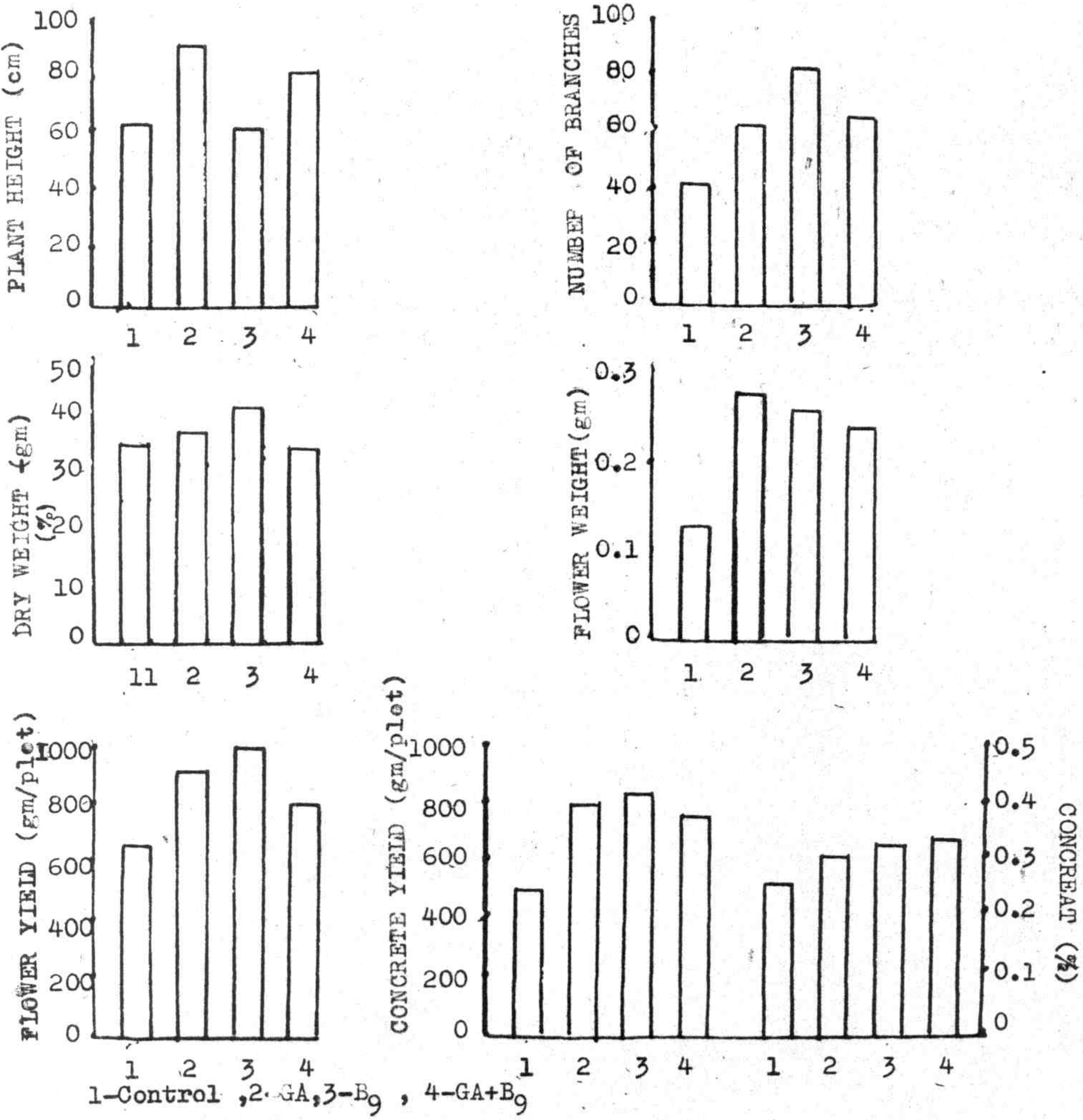


Fig. (11) Effect of GA, B_9 and their combinations on growth characters and productivity of **J. sambac** (single strain) mean of 1980 and 1981 seasons.

III. Effects of Fertilization:

III.1. Effect of fertilization on some growth aspects:

a) Effect on plant height:

Although it seems from the data in Table (10) and Fig. (12) nitrogen fertilization slightly affected the plant height, however, the statistical analysis of these data revealed no significant effect due to N-fertilization.

b) Effect on number of branches:

It is clearly noticed from the data that all the treatments significantly increased the branching of the plant over the control. The highest values resulted from N_1 and N_3.

Sharaf (1965) and Mahmoud (1970) found similar the influence of N-fertilization on branching of Geranium.

c) Effect on flower weight:

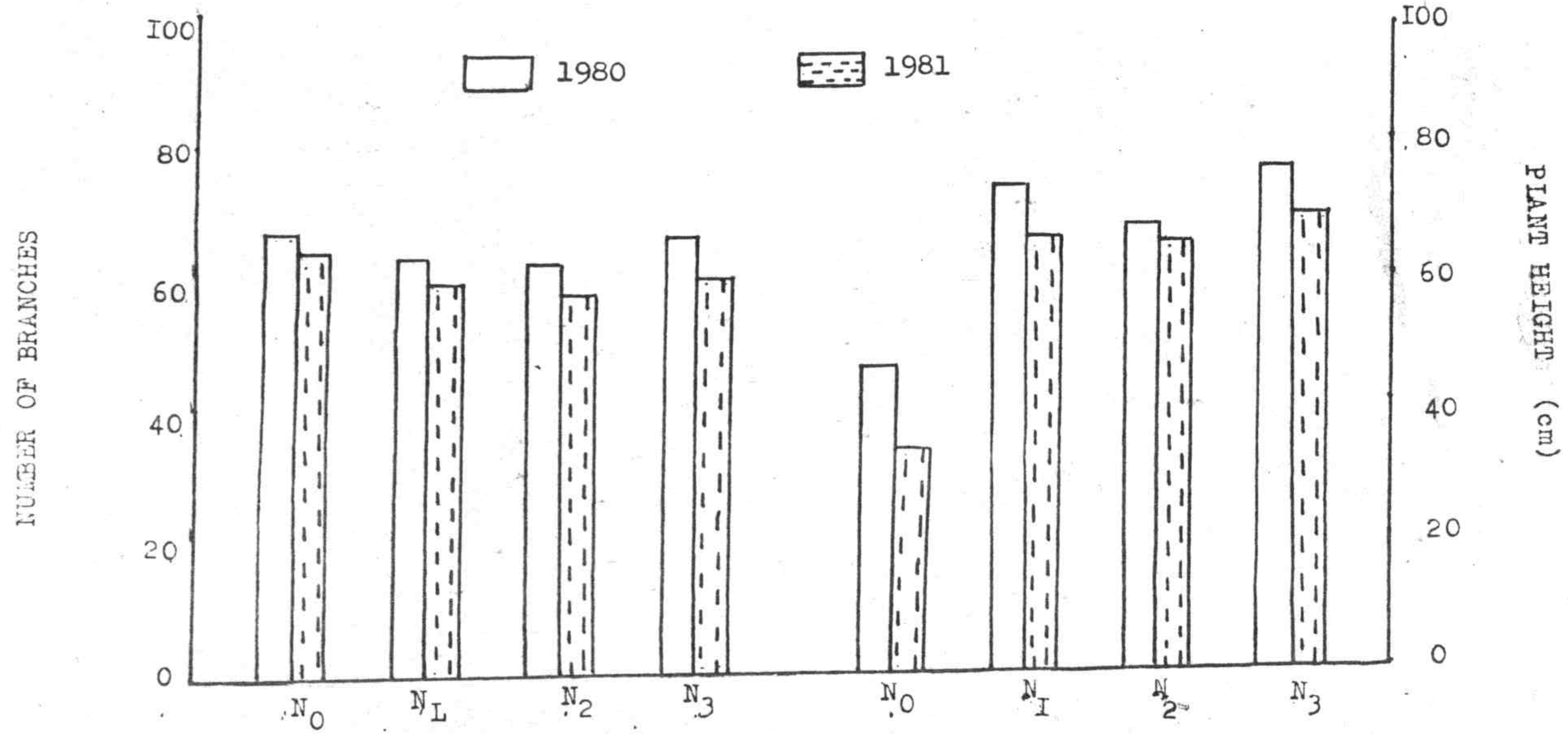
It could be seen from the data in Table (10) that all the nitrogen treatments significantly affected this trait. The highest flower weight resulted from N_1 (0.296 gm), followed by N_3 (0.275 gm), the lowest one was N_2 (0.263 gm) compared with (0.139 gm) control.

d) Effect on dry weight of the leaves:

Data in Table (10) show that all the nitrogen fertilization treatments somewhat increased the dry weight of the leaves. The value was 34.6 gm in the control, and increased to 37.0, 36.5 and 39.0 gm after the N_1, N_2 and N_3 treatments respectively.

Table (10): Effect of Fertilization on plant height, number of branches, flower weight and dry weight of the leaves during 1980 and 1981 seasons.

Treatments	Plant height (cm)			Number of branches			Flower weitht			Dry weight (%)		
	1980	1981	Mean	1980	1981	Mean	1980	1981	Mean	1980	1981	Mean
No	68	63	66	47	35	41	0.143	0.135	0.139	34.10	35.20	34.65
N1	64	60	62	75	67	71	0.294	0.278	0.296	36.70	38.20	37.45
N2	63	57	60	68	66	67	0.267	0.259	0.263	35.88	37.10	36.45
N3	67	61	64	77	70	73	0.286	0.264	0.275	37.80	40.20	39.00
L.S.D.												
0.05	N.S.			8	5		0.017	0.019				
0.01	N.S.			10	7		0.020	0.028				



a) PLANT HEIGHT b) NUMBER OF BRANCHES

FIG. (12): EFFECT OF FERTILIZATION ON PLANT HEIGHT AND NUMBER OF BRANCHES.

trend is parallel to that of the total carbohydrate content and the flower yield. Gilliam and Wirght (1977) reported that plants of japanese holly grown at 300 or 150 ppm nitrogen had greater shoot numbers and length, height, and dry weight compared with plants grown at 150 ppm.

III. 2. Effect on yield of flowers:

Data on the effect of fertilization on the mean values of the flower yield per plot (4 plants) are illustrated in Table (11) It is clear from that data that all the treatments gave higher yield of flowers than the untreated ones. The high level of nitrogen (N_3) significantly increased the yield by 77 % and 79 % in the first and second season compared with the control. Both N_1 and N_2 treatments gave an increase of about 48 % during the first season, while in the second season they increased the yield by 46 and 41 % respectively. This means that the equal doses of nitrogen gave the same influence on the yield even though they are added in different forms; Urea or Ammonium sulphate. The highest yield of flowers was obtained in August. It comprises about 29 - 33 % of the total yield depending on the different treatments. These results are in agreement with those obtained by El-Shafie *et al* (1973) about the effect of fertilization and the peak of the flowering period in *J. grandflorum*.

III.3. Effect on the concrete percentage:

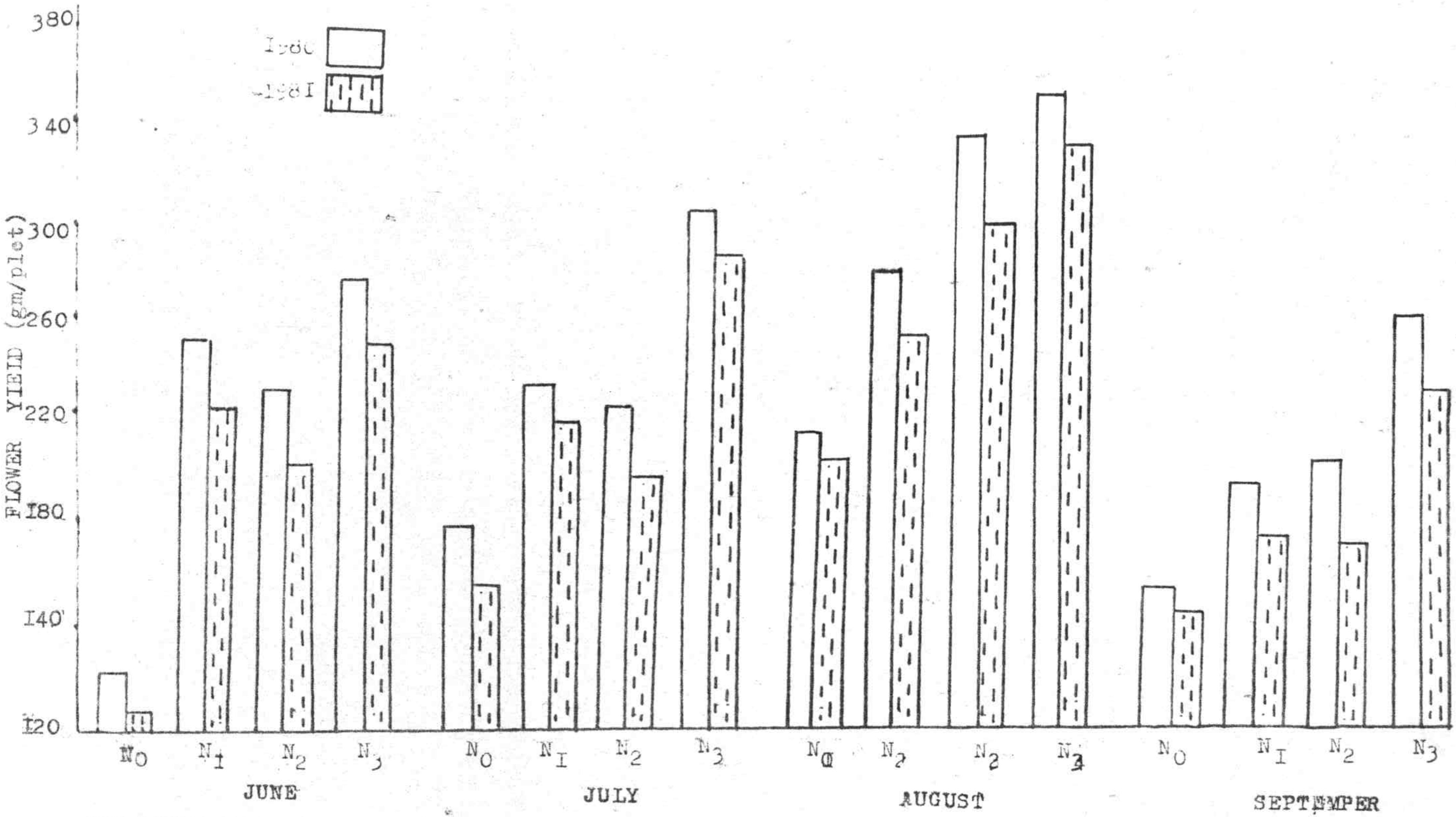
The data presented in Table (12) indicate that the fertilization treatments although slightly improved the concrete

Table(11) Effect of Fertilization on flower yield (g/plot) during 1980 and 1981 seasons

monthes / treatments	June		July		Aug.		Sept.		Mean monthly yield		Mean Total Yield	
	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981
N_0	128	107	176	155	213	205	159	140	169	151	676	604
N_1	254	225	237	215	301	278	210	171	250	222	1000	888
N_2	237	206	222	193	334	293	207	166	250	214	1000	856
N_3	277	246	309	286	348	330	260	230	298	273	1193	1092
Mean	224	193	236	209	299	270	209	174				

L.S.D.

	months		mean total yield		treatements	
	1980	1981	1980	1981	1980	1981
0.05 =	36	31	108	93	27	23
0.01 =	46	42	138	126	34	31



FIG(I3)EFFECT OF NITROGEN FERTILIZATION ON FLOWER YIELD OF J.SAMBAC DURING I980&I98I

percentage, but this effect was not significant. The same data show that the control plants gave the highest concrete oil percent in August followed by July. Similar results were achieved by La Face (1948) and El-Shafie _et al_ (1973). However, in case of our study, the N_1 and N_2 treatments shifted the peak of the concrete oil to be in July. This means that low doses of nitrogen somewhat accelerated the accumulation of the oil in the flowers without remarkable improvement in the average percentage throughout the whole season.

III.4. Effect on yield of concrete:

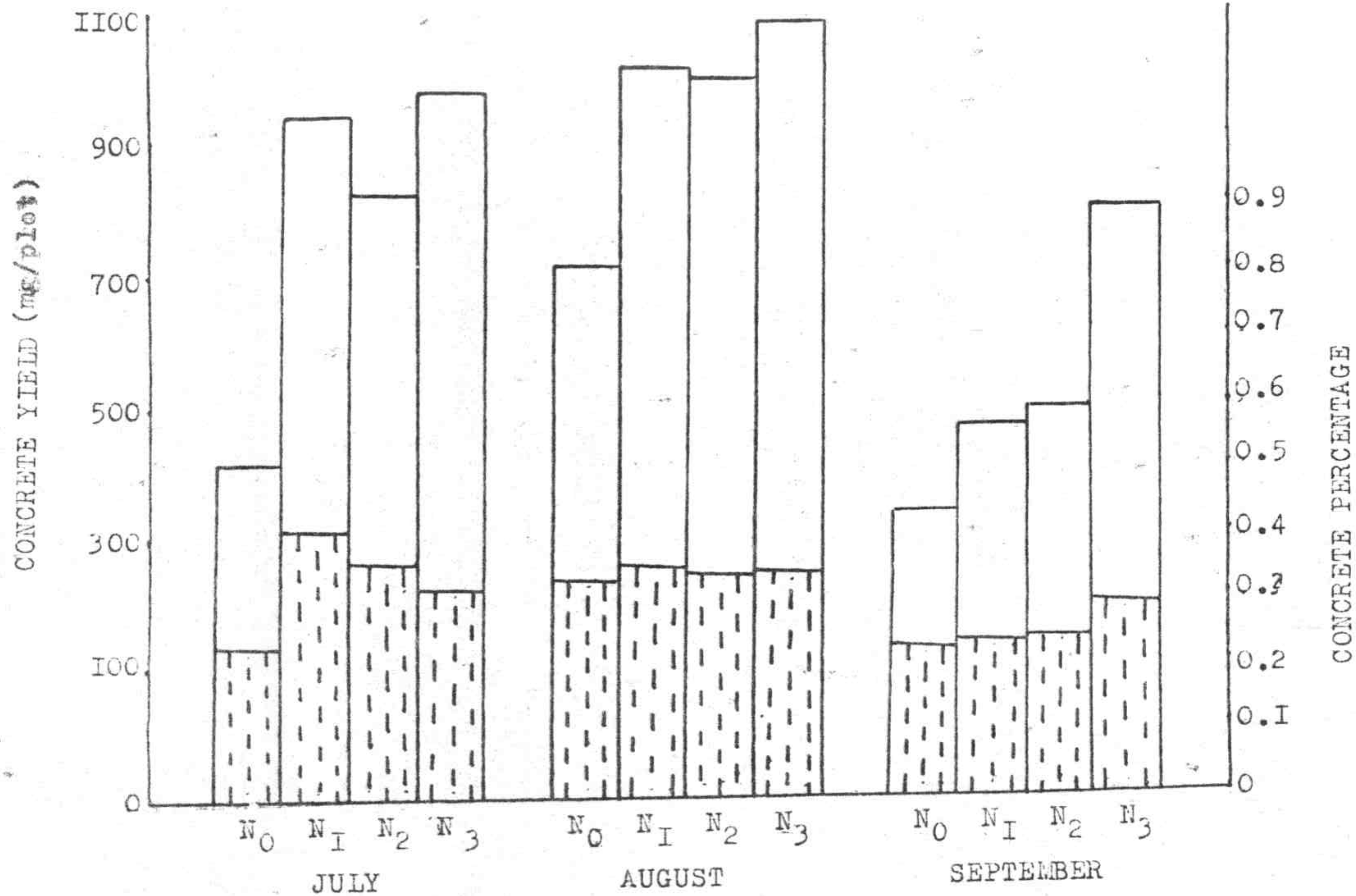
Data on the effect of fertilization on the concrete oil yield as milligrams concrete per plot (4 plants) are tabulated in Table (12). The data clearly show a significant improvement in the yield of concrete due to the different fertilization treatments. The N_3 treatment improved the concrete oil yield by 97 % compared with the control (482 mg). This increase was significantly higher than that obtained with N_1 and N_2 which gave an increase reached 69 % and 59 % respectively. It could be noticed that the total yield of concrete oil rather followed the flower yield than the concrete percentage.

Concerning the differences among the concrete oil yield of the different monthes, it is clear that it was the highest in August followed by July without significant difference between the two monthes, Rovesti (1928), La Face (1948) and El-Shafie _et al_(1973)

Table(12) **Effect** of fertilization on the concrete percentage and concrete yield (gm/plot)

monthes / treatments	July		Augest		September		Concrete %	concrete yield	
	%	yield	%	yield	%	yield	Mean	total	Mean
Control	0.234	411	0.332	707	0.208	330	0.258	1448	482
N_1	0.406	946	0.352	1009	0.226	464	0.328	2419	806
N_2	0.360	820	0.340	998	0.243	488	0.314	2306	768
N_3	0.312	973	0.342	1088	0.292	793	0.315	2854	951
Total	1.312	3265	1.366	3442	0.969	2075	-	-	-
Mean	0.328	816	0.341	853	0.242	518	-	-	-

L.S.D.	percentage months	percentage treatments	concrete yield months	concrete yield treatements	mean total yield
0.01 =	0.042	0.125	55.72	48.20	114
0.05 =	0.056	0.171	75.72	65.59	195



FIG(14): EFFECT OF FERTILIZATION ON CONCRETE OIL PERCENTAGE AND YIELD IN 1980.

achieved similar result on J. grandiflorum. It must be mentioned, that the N_1 and N_2 treatments also gave the highest yield of concrete in the same month, because the high flower yield produced in this month overcame the decline in the concrete percentage.

Although there are a huge number of publications on the effect of fertilization on ornamental and oil-bearing plants, however, very little is known about the effect of nitrogen fertilization on J. sambac. Reviewing the published works in this field, we find that many authors reported that the nitrogen fertilization improved the oil yield or content. In most cases this statement needs more explanation or difinition for the components of that yield and if it means the oil percentage or not. Another group of investigators criticaly spoke about the oil percentage. Some of them reported that N-fertilization increased the oil percentage, on the other hand some others gave the opposite conclusion. We hold the opinion that nitrogen additions to the oil-bearing plants rather affect the herb or flower yield than the oil percentage. Erwin (1959) found that the volatile oil in peppermint was non significantly affected by N-fertilization. Schroeder (1959) on Origanum bulgare stated that there is no definite effect of NPK on the volatile oil content. Ellis (1960) and Byron (1964), reported that N-fertilization of peppermint had no effect on the oil composition although it increased the yield of plant. Ellis added that no element was extremely specific for increasing the production of oil. El-Beltagy (1966) mentioned that nitrogen failed to give any increase in the oil percentage of majoram plant. Hotin and Segal (1968) stated that the different forms of nitrogen had no marked effect on essential oil content of chamomile. Abo Zeid (1973) compared the effect of different levels of Urea and Ammonium sulphate on peppermint. He found no differences between the different treatments on the oil percent.

III.5. Effect on carbohydrate content:

Table (13) indicate that the lower dose of nitrogen even in the two forms applied, (N_1 and N_2) slightly increased the carbohydrate content and the soluble sugars. The higher dose (N_3) doubled the carbohydrate content. This treatment although increased the amount of the soluble sugars, but their relative percentage to the total carbohydrate was about the half in comparison with the other treatments.

The results concerning the effect of N-nutrition on the carbohydrate content may throw the light on those responses following the nitrogen fertilization. The lower doses of nitrogen either in form of Urea or ammonium sulphate improved the relative percentage of the soluble sugars than the control plants. This came in relation with some increase in the flower yield and accelerated the accumulation of the oil in an early date. The higher dose of nitrogen highly increased the carbohydrate content giving the highest flower yield. This treatment failed to give similar improvement in the concrete percentage because it caused a sharp decline in the ratio of the soluble sugars.

Table (13) Effect of fertilization on carbohydrate content (g/100 g D.W.) in leaves of *Jasminum sambac*.

Treatments	T.C. %	S.S. %	Rel. %
N_0	14.52	2.09	14
N_1	15.51	2.52	17
N_2	15.86	2.25	17
N_3	28.38	2.34	18

T.C. : Total Carbohydrate %

S.S.: Soluble sugars %

Rel.: S.S/T.C. x 100

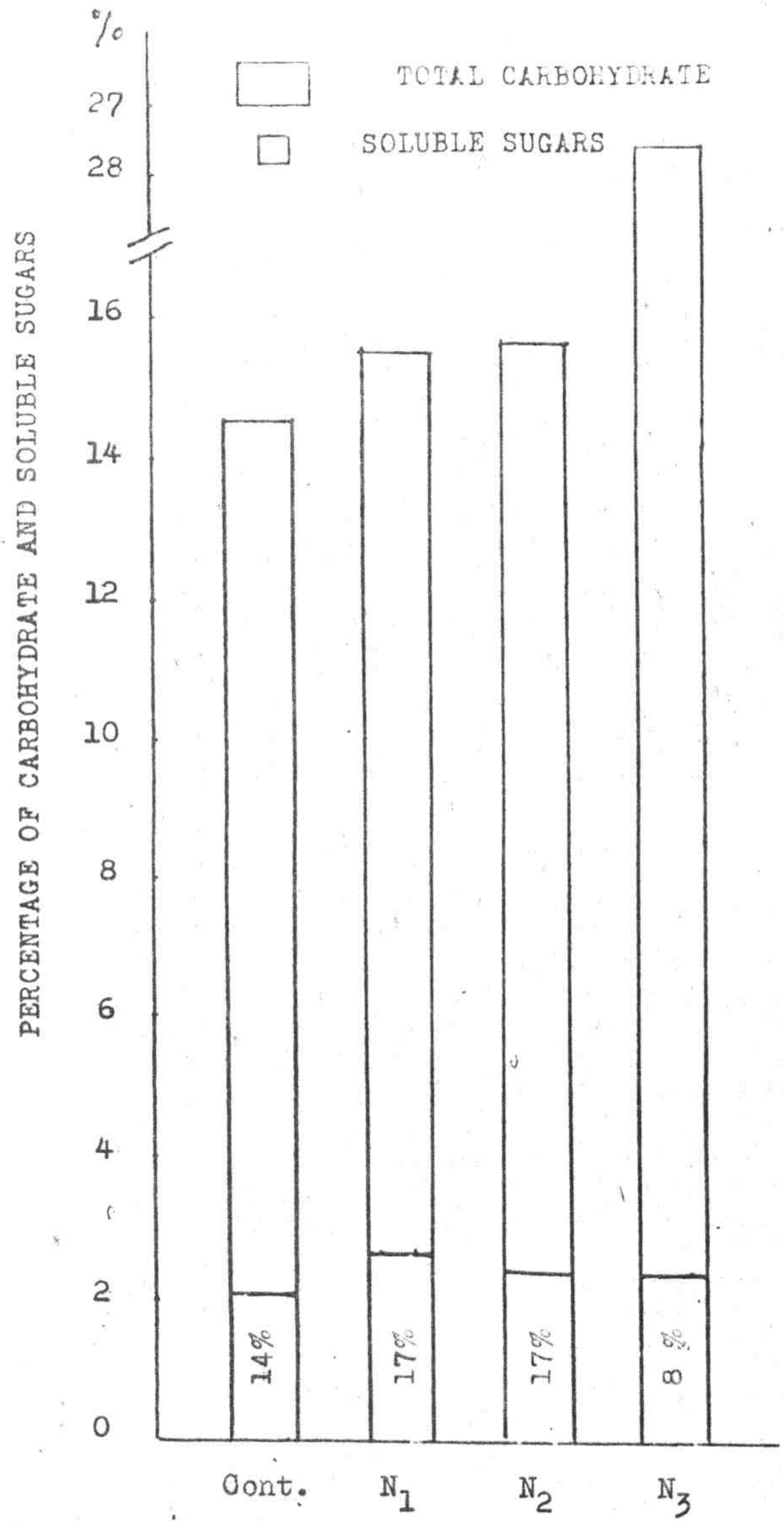


FIG. (15): EFFECT OF NITROGEN FERTILIZATION ON THE CARBOHYDRATE AND SOLUBLE SUGARS IN LEAVES OF J. SAMBAC.

Once more we came to the same conclusion that the total carbohydrate content rather affects the flower yield than it does with the concrete percentage which, in turn, is mainly influenced by the soluble sugars.

III.6. Effect of fertilization on the minerals in the leaves:

Contents of N, P, and K as estimated in the leaves of *J. sambac* with and without N-fertilization are illustrated in Table (14) and Fig. (16).

It is noticed that N and P contents in the leaves frequently increased from N_0 to N_3. The potassium content also increased as compared with the control, but the values showed a decreasing trend from N_1 to N_3.

Bik (1962) and Waters (1965) stated that the nitrogen content of carnation leaves increased linearly as the nitrogen manuring was increased. In general, Kazimirova (1977) found a direct correlation between soil nutrient content and carnation composition.

The obtained data on the effect of nitrogen fertilization on *J. sambac*(single strain) show that equal doses of nitrogen even in two forms gave about the same effect. This could be detected from the results of N_1 (Urea 46.5 %, 300 Kg/Feddan) and N_2 (Ammonium sulphate 22.5 %, 600 Kg/Feddan). These results are in agreement with those obtained by Schroeder (1959) on *Origanum vulgare*.

(Table 14) Effect of fertilzation on N,P,K. content (%) in leaves of *J. sambac* (single strain)

Treatments	N %	P %	K %
N_0	1.63	0.320	1.78
N_1	2.22	0.350	2.28
N_2	2.33	0.330	2.30
N_3	2.57	0.355	2.25

N_0 = contral.

N_1 = Urea = 300 Kg Fad.

N_2 = Ammonium sulphate = 600 kg Fed.

N_3 = " " 900 kg fed .

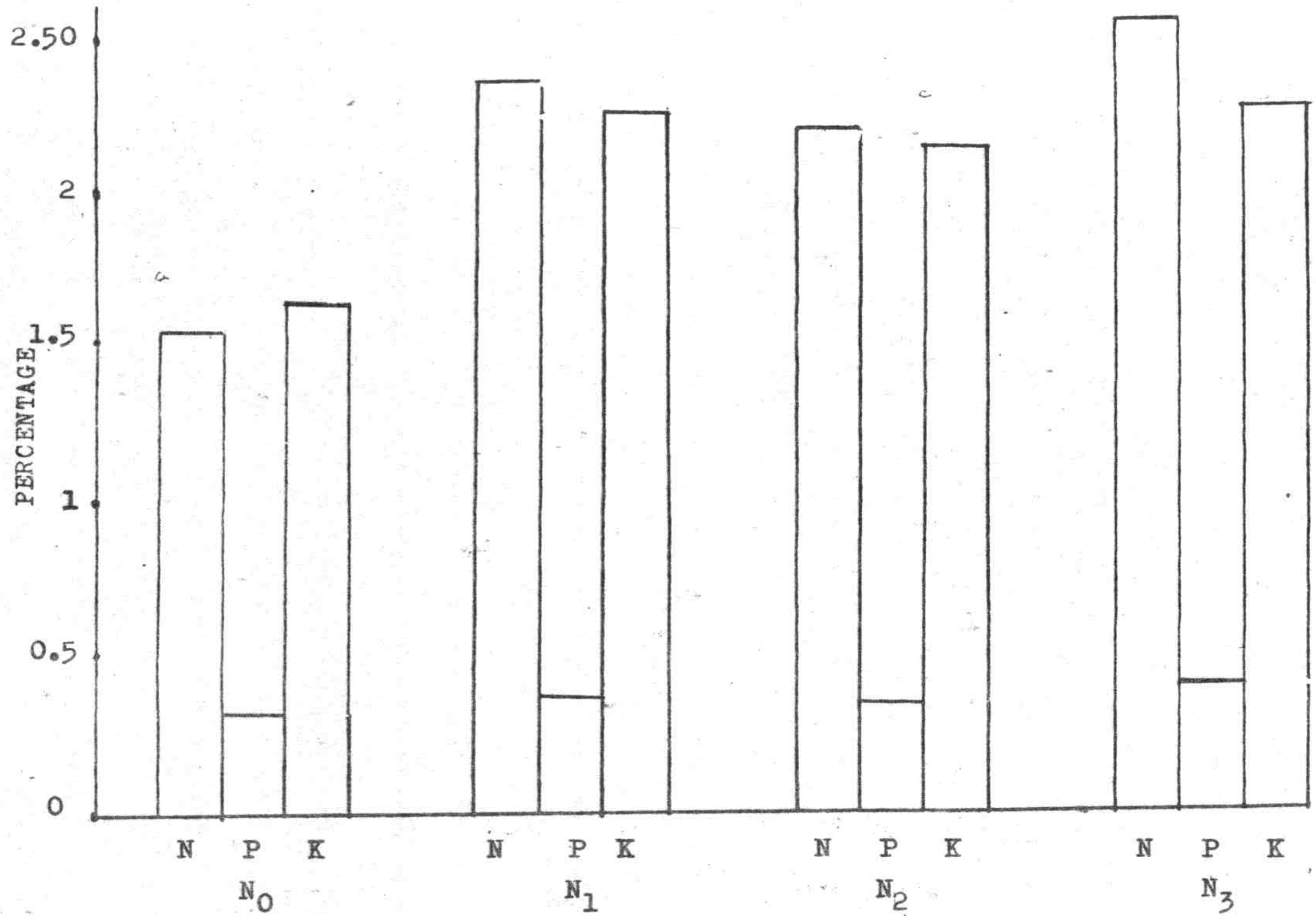


FIG. (16): EFFECT OF FERTILIZATION ON N, P, K, % IN LEAVES OF <u>J. SAMBAC.</u>

Results about the effects of the nitrogen fertilization are sammarized in table (15) and Fig. (17). They show that the higher level of nitrogen (N_3)was thebest among the used treatments concerning plant height, number of branches and dry weight of the leaves. This was reflected in superior yields of flowers and concrete. If lower doses of nitrogen would be used, then , Urea is advisable.

Table (15) Average effects of the nitrogen fertilization treatments on growth characters and productivity of ***J. sambac*** (single strain), (mean of 1980 and 1981 seasons)

Treatments	Plant height (cm)	Number of branches	Flower weight (gm)	Dry weight of leaves %	Flower yield (gm/plot)	Concrete %	concrete yield (mg/plot)
N_0	66	41	0.139	34.60	640	0.258	482
N_1	62	71	0.296	37.45	944	0.328	806
N_2	60	67	0.263	36.47	928	0.314	768
N_3	64	73	0.275	39.00	1142	0.315	951

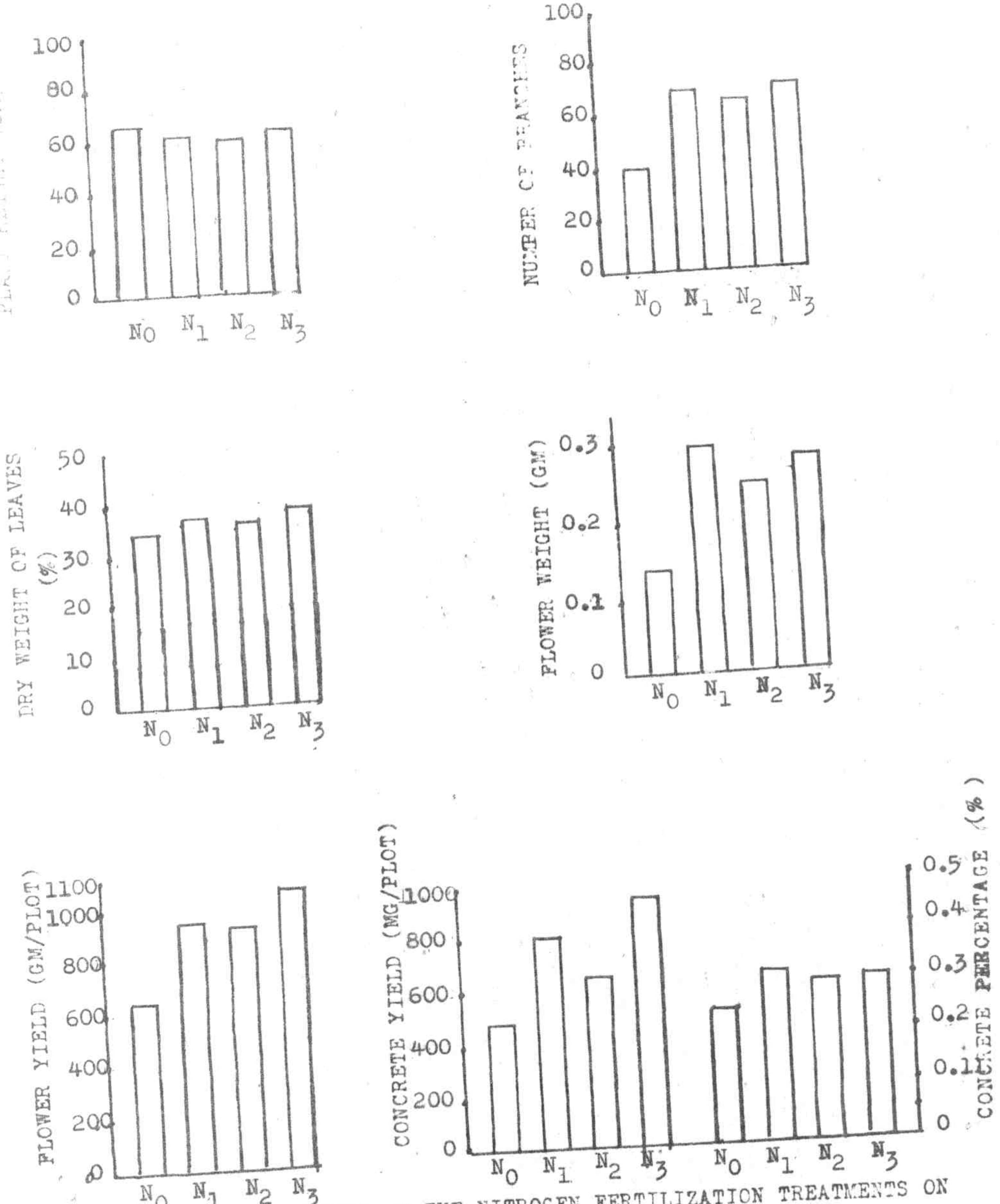


FIG (17) AVERAGE EFFECTS OF THE NITROGEN FERTILIZATION TREATMENTS ON GROWTH CHARACTERS AND PRODUCTIVITY OF *J. SAMBAC*.

IV. The chemical composition of the concrete and absolute oil of *J. sambac* (single strain):

Extraction of the absolute oil from a 0.354 gm of concrete resulted in 0.209 gm (59 %) of absolute oil and 0.145 gm (41 %) of floral wax. With this respect, Cheng and Chao (1977) demonstrated that the fresh flowers of *J. odoratissimum* yielded 0.31 % of concrete which was separated into 0.20 % absolute and 0.11 % floral wax. Guenther (1952) reported that the concrete of *J. grandiflorum* yields from 45 to 52 % of alcohol soluble absolute. He added that concrete extracted in the beginning of the flowering season give 53 to 44 % of absolute.

Gas-chromatographic analysis of the obtained absolute oil (Fig. 19) reveals the presence of 25 peaks. Table (16) illustrates the identified compounds, their retention time and relative percentages.

It could be concluded that the absolute oil of *J. sambac* (single strain) contains at least 25 compounds from which the following were identified and arranged in a decreasing sequence according to their relative percentage: Benzyl acetate, Linalool, Jasmone, Eugenol, Indole, iso-Phytol, Benzyl benzoate, Phytol, Farnesene, Farnesol, B-Pinene and α-Pinene.

The other peaks in the chromatogram could not be identified due to the lack of the corresponding authontics, this well be the subject of further investigations.

Guenther (1952), mentioned the same constituents in the oil of *J. grandiflorum*, besides; Linalyl acetate, Geraniol, Nerol, Terpineol, Cresol and Methyl anthranilate.

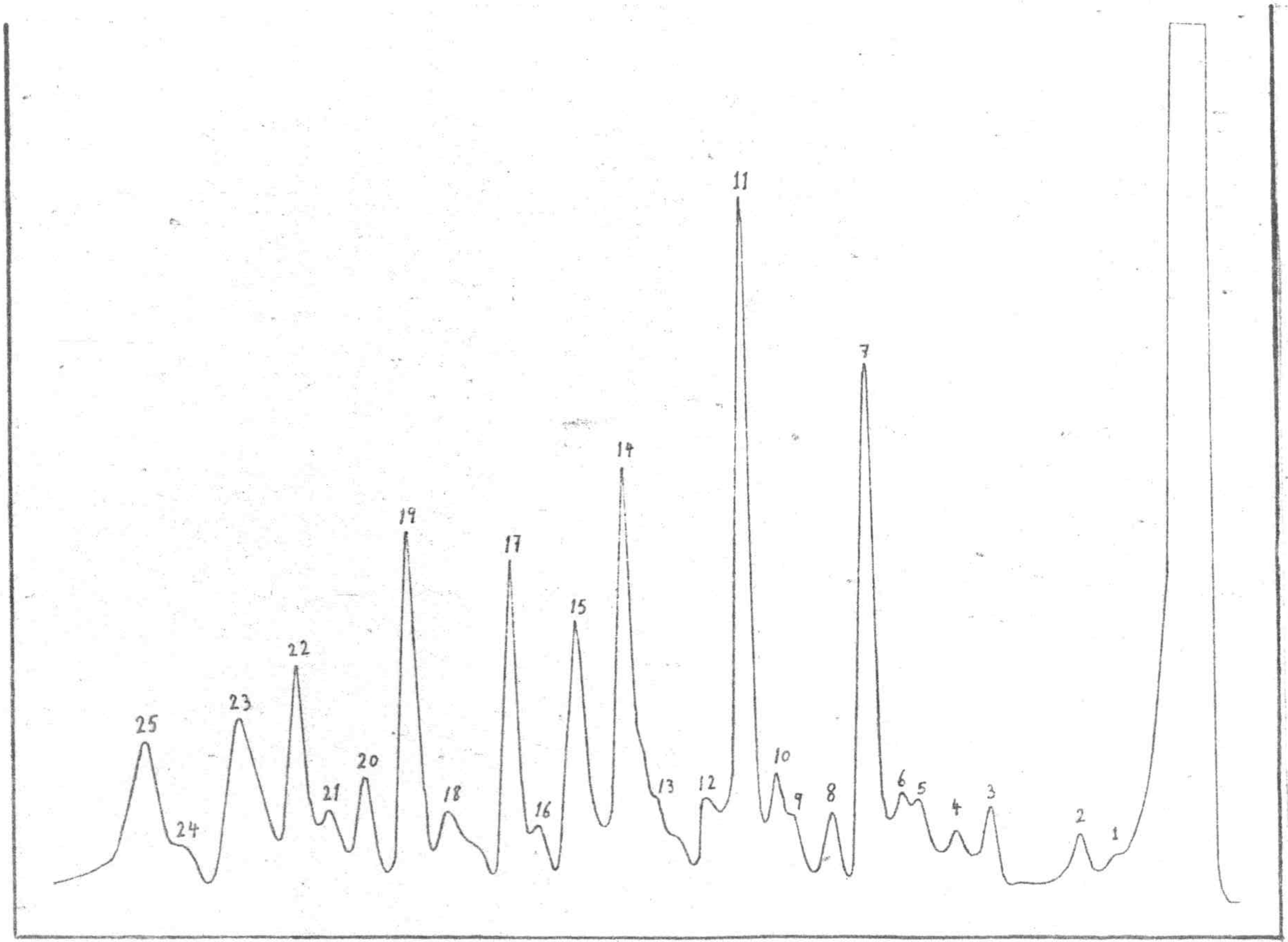


Fig. (17): GLC analysis of absolute oil of *J. sambac* (single strain)

Table (16): Results of the GLC investigation of the oil of *J. sambac*, (single strain)

Peak No.	RT	%	Component
1	2.5	0.49	α - pinene
2	3.4	0.98	B - pinene
3	5.6	1.39	-
4	6.4	1.47	-
5	7.3	1.54	-
6	7.8	2.31	-
7	8.5	11.54	linalool
8	9.5	1.10	-
9	10.3	1.68	-
10	10.8	1.96	-
11	11.5	13.69	Benzyl acetate
12	12.5	2.12	Farnesene
13	13.7	1.35	—
14	14.5	9.27	Jasmone
15	15.7	7.73	Eugenol
16	16.7	1.73	Farnesol
17	17.3	6.45	Iso-phytol
18	19.0	2.09	-
19	19.8	7.08	Indole
20	21.0	2.05	-
21	22.0	4.27	-
22	22.7	5.38	Phytol
23	24.2	6.61	Benzyl benzoate
24	25.7	0.69	-
25	26.5	5.03	-

SUMMARY

The aim of this work was to find out some useful treatments that can improve the propagation and productivity of *Jasminum sambac* plants. The terminal cuttings from single and double strains were subjected to different treatments of kinetin (25 and 50 ppm) and IBA (2000 and 4000 ppm). Effects of the growth substances GA (50 and 100 ppm) and B_9 (1000 and 2000 ppm) on growth, flower and concrete oil yields was also studied.

Another goal of this work was to study the effect of nitrogen fertilization on growth and productivity of this plant. Two levels of nitrogen fertilizers were tried; 600 and 900 Kg/F. of Ammonium sulphate. At the level 600 Kg/Feddan, two forms of nitrogen fertilizers were compared, that is ammonium sulphate (22 %) 600 Kg/Feddan and Urea (46 %), 300 Kg/Feddan.

The obtained results could be summurized in the following:

1. The study indicated that originally, the rooting ability of the cuttings from *J. sambac*, (double strain)(12 %), is lower than *J. sambac*, (single strain) (20 %). The former responded to the application of growth substances to a higher extent than did the latter.

2. The treatments with IBA 2000 and 4000 ppm significantly increased the rooting percentage of *J. sambac*, (single strain) to be more than three times compared with the control. Due to these treatments, the rooting percentage of *J. sambac* (double strain) reached 64 and 72 % respectively. This was in relation with a significant increase in root length, root weight and the total carbohydrate content in the formed roots, but without remarkable effect on the content of the soluble sugars.

3. Applying kinetin at the rate of 25 and 50 ppm, increased the rooting ability of *J. sambac*, (single strain) to 40 and 52 % respectively compared with 20 % in the control. In case of *J. sambac*, (double strain) the percentage increased from 12 % in the control to reach 60 and 80 % respectively. These treatments slightly increased the root length but significantly increased the root weight. This was parallel to an increase in the carbohydrate content and a decrease in the soluble sugars.

A combined treatment with the two substances, although improved the rooting percentage, root length and root weight, but the results were almost less than that obtained from IBA and higher than that of kinetin when they were added separately. These treatment resulted in an increase in the carbohydrate content and reduction in the soluble sugars.

5. Concerning the effects of the growth substances GA and B_9 on the plant growth, the results showed that GA was more

effective than B_9 in controlling the plant height. The contrary was true with respect to number of branches per plant. Results from the application of the two substances on the same plant gave the Season to believe in an antagonistic action between the two substances.

6. There was a significant improvement in the flower yield due to the treatments with GA and B_9 and their combinations. The total flower yield per plot (4 plants) during 1980, increased by about 26 and 57 % after the treatment with GA 50 and 100 ppm respectively. The increase reached 42 and 68 % after the addition of B_9 1000 and 2000 ppm respectively. Results of the second season followed the same trend. Spraying the two substances, also increased the flower yield in comparison with the untreated ones, however, the values did not reach those resulted from the treatments with one substance when it was used separately.

7. The highest yield of flowers was obtained in August and September in case of GA treatments, while it was obtained in August and July with B_9 and the control.

8. Both the two substances significantly increased the concrete percentage the higher the concentration, the higher was the percentage. The highest concrete percentage resulted from B_9 2000 ppm. The combination gave higher values than the corresponding concentration of GA but lower than B_9 when they were separately added. The combination GA 50 ppm + B_9 2000 ppm gave the highest concrete percentage.

9. GA 50 ppm increased the concrete oil yield by 45 %, while GA 100 ppm gave an increase of 89 %, and the treatment with B_9 2000 nearly doubled the concrete yield compared with control plants.

10. The concrete yield reached the maximum in August. This was parallel to the highest concrete percentage and highest yield of flowers which were recorded in this month.

11. The two concentrations of B_9 as well as the low level of GA reduced the carbohydrate content in the leaves, while increased the amount and the relative percentage of the soluble sugars compared with the control. It could be suggested that the higher concentrations of the used substances affected the carbohydrate content which in turn played a part in the flower production. Meanwhile, the low concentrations may regulate the soluble portion of the carbohydrates, namely soluble sugars which are responsible for the oil accumulation.

12. Concerning the effects of nitrogen fertilization on the growth of the plant, a slight increase in plant height was noticed but it was not significant. On the other hand, all the treatment significantly increased the branching of the plant. The highest values resulted from N_1 and N_3.

13. The high level of nitrogen (N_3) significantly increased the flower yield by 77 % and 79 % in the first and second season respectively, compared with the control. Both N_1 and N_2 treatments gave an increase of about 48 %, during the first season while in second season they increased the yield by 46 and 41 % respectively.

14. This means that the equal doses of nitrogen gave the same influence on the yield even though they are added in different forms; Urea or Ammonium sulphate.

15. A slight improvement in the concrete percentage was observed after the nitrogen fertilization but the differences were not significant.

16. N_1 and N_2 treatments shifted the peak of the concrete % to be in July. This means that low doses of nitrogen somewhat accelerated the accumulation of the oil in the flowers without remarkable improvement in the average percentage throughout the whole season.

17. The N_3 treatment improved the concrete yield by 97 % compared with the control. This increase was significantly higher than that obtained with N_1 and N_2 which gave an increase 69 % and 59 % respectively. It could be noticed that the total yield of concrete rather followed the flower yield than the concrete percentage.

18. The lower doses of nitrogen either in form of urea or Ammonium sulphate improved the relative percentage of the soluble sugars than the control plants. This came in relation with some increase in the flower yield and accelerated the accumulation of the oil in an early date. The higher dose of nitrogen reduced the ratio of soluble sugars, but highly increased the carbohydrate content giving the highest flower yield.

19. The N and P contents in the leaves frequently increased from N_0 to N_3. The potassium content also increased compared with the control, but the values showed a decreasing trend from N_1 to N_3.

To obtain better growth and concrete yield from *J. sambac* plants, the following points can be recommended; for propagation, cuttings would be dipped in IBA solution (4000ppm) for 10 seconds before inserting. Yield of flowers and concrete oil could be improved by spraying the plants with B_9 at 2000 ppm, and fertilization with 900 Kg/Feddan of ammonium sulphate.

20. Gas chromatographic analysis of the absolute oil of *J. sambac* (single strain) revealed the presence of 25 compounds, from which the following were identified:-

Benzyl acetate, linalool, jasmone, Eugenol, Indole, Isophytol, Benzyl benzoate, Phytol, Farnesene, Farnesol, B-pinene, and α-pinene.