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ABSTRACT

In two independent pot experiments, cucumber (*Cucumis sativus* L. cv. Beta Alfa) plants were sprayed twice at 15 and 30 days after sowing with 5, 10 and 50 g/L of natural palm pollen extract of palm pollen grains during 1997 & 1998 summer season, (Foliar spray experiments). In 2nd experiment during the same both seasons, seeds were soaked for 4 hours in 5, 10 and 50 g/L of pollen extract before sowing. Growth, sex expression, fruit yield & quality were estimated. In general, pollen extract as seed-soaked material was more effective when compared with foliar spray treatment regarding all investigated growth and yield characters. With regard to size of root system, stem length and number of branches, were increased significantly, mostly at the two levels of significance. Also, photosynthetic pigments formation was highly enhanced beside obvious increases in total leaf area especially in seed-soaked treatments. Hence, efficient photosynthates creatures as well as support supply of water and minerals by adequate root system were attained. Thereby, enhancement of dry matter accumulation and distribution in different plant organs took place. In addition, pollen extract treatments increased femaleness, i.e. number of pistillate flowers exceeded that of control plants. Moreover, fruit yield/plant showed significant increase in most treatments as well as increment of dry matter accumulation and NPK content as well.

Key Words: Cucumber, Natural palm pollen extract, Sex expression, Phytohormones

INTRODUCTION

Cucumber (*Cucumis sativus L.*) is one of the economic vegetables species of Cucurbitaceae family.

Several species of this family form great number of male flowers on the account of female ones. That is why many trials have been carried out trying to alter sex expression of Cucurbitaceous plants. Of these trials were the applying of growth regulators and/or different

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fertilizers (Cantliffe 1972; Longo *et al* 1982 and Ibrahim *et al* 1985 and 1986).

But, in the few last years, considering the public health, there are many cautions about the use of those synthetic plant growth regulators and also the excess of mineral nutrition on the fresh marketable vegetables and fruits. Therefore, the Botany Department, Faculty of Agriculture, Moshtohor, Zagazig University Benha Branch; have initiated a series of studies using some natural plant extracts such as the natural extract of garlic cloves and the active yeast cells (El-Desouky *et al* 1998 and Wanas *et al* 1998) to improve the growth, sex expression and fruity yield and quality of squash plant.

In this respect, Mitchell *et al* (1970) of the U.S. Department of Agric., Beltsville, Maryland, initiated a program of examining the natural extracts of plant pollens as sources of plant growth regulators. Also, Ries *et al* (1977) of Michigan State University applied the powder of alfalfa (*Medicago sativa* L.) leaves to enhance the growth and yield of many plants. Recently, Atawia and El-Desouky (1997) reported that foliar spray with natural yeast extract at the full bloom stage of Washington navel orange trees, led to significant increase of setted fruit, fruit yield/tree as well as fruit quality improvement.

In the present study, we have investigated the natural extract of palm pollens on the growth and productivity of cucumber plant. The plant pollens are well established as rich natural sources for hormones. Hence, the present study summarized different effects of the extract of palm pollens applied as seed soaking material or as foliar spray, on the growth, sex expression and fruit yield and quality of cucumber plant as well as the endogenous auxins, gibberellins and cytokinins in roots and leaves of treated plants.

MATERIAL AND METHODS

Two independent pot experiments were carried out at the greenhouse of the Agricultural Station of Botany Department, Faculty of Agriculture at Moshtohor, during 1997 and 1998 summer seasons.

Preparation of palm pollen extract

Pollen grains of palm were taken from those already prepared for hand pollination of female palm trees. Weights of 5, 10 and 50 g of pollen grains were carefully transferred into black polyethylene sacs completed with distilled water to one liter volume for each. Sacs were deeply frozen (at -5°C) and suddenly thawed two times before being used (Mitchell *et al* 1970).

Seeds of the cucumber (*Cucumis sativus* L. cv. Beta Alfa) were soaked either in distilled water (for foliar spray experiment) or in the assigned concentrations of the natural extract of palm pollen i.e. 5, 10 and 50 g/L (for seed soaked experiment).

The seeds of both treatments were soaked for four hours either in distilled water or in concentrations of natural palm pollen extract at 5, 10 & 50 g/L. The seeds were sown on March 10th (in

both seasons) in pots (30 cm in diameter) filled with fertile garden soil (10 kg/pot). Thirty pots were arranged for each treatment including the control one. Plants were thinned to leave one healthy uniform plant per pot. On the other hand, the plants attained from seeds soaked in distilled water were sprayed twice at 15 and 30 days after sowing with the assigned concentrations, i.e. 5, 10 and 50 g/L. Tween-20 was added as a spreading agent for different foliar spray treatments.

In both experiments, the normal cultural practices of growing cucumber plant including equal amounts of fertilizers and irrigation water/pot were followed.

Growth characters

Seventy days after sowing a random sample of ten plants was taken from each treatment of the two experiments and from the control one as well. In each sample, root size, length of main stem, number of branches & leaves, leaf area per plant and the dry matter content in different plant organs as well as the whole plant were recorded. Root size was determined according to the proposition of Hanson and Churchill (1968) while leaf area was determined using the dry weight method (Dericux *et al* 1973). Also, root/shoot ratio and the percentages of dry matter distribution in different plant organs were calculated. In addition, the photosynthetic pigments in the fresh leaves were estimated using the method described by Wettestein (1957) then calculated on the dry matter basis.

Flowering data

Data were taken on ten randomly selected plants. Total number of open staminate and pistillate flowers were recorded at 2-days intervals starting from first open flower till 80 days after sowing.

Fruit yield

Number and weight of fruits/plant, mean weight of fruit, fruit shape (i.e. length & diameter) as well as the mean dry weight/fruit and the percentage of dry matter/fruit were calculated.

Also, NPK content was determined in dry matter of the fruits using the microkjeldahl method determination for nitrogen according to Pregl (1945), the calorimetric method described by Sandell (1950) for phosphorus and the Flame photometry method described by Brown and Lilliland (1946) for potassium.

Statistical analysis was carried out using the method recommended by Snedecor and Cochran (1982).

Endogenous phytohormone activities

In the second season (1998) according to the growth of different treatments; endogenous auxins, gibberellins and cytokinins were estimated in roots and leaves of plants treated with the concentration of 10 g/L

of palm pollen extract in both methods of application at 45 days after sowing (i.e. during the vigorous growth stage of cucumber plants).

I. Endogenous auxin-like substances

The method of Knight and Bruinsma (1973) was used for both extraction and purification. Wheat (*Triticum sp*) coleoptile segment straight growth bioassay test was used (Sirois, 1966).

II. Endogenous gibberellin-like substances

Gibberellins were extracted according to the method of Kopecky *et al* (1975). Lettuce seedlings bioassay test was followed up according to Silk and Jones (1975).

iii. Endogenous cytokinin-like substances

Cytokinins were extracted and purified by using column of Do-Wex 50 W ion exchange resin (mesh 200-400, H+ form). Amaranthus (*Pigweed*) dark betacyanin promotion bioassay test was used (Conrad and Kohler, 1967).

Results were statistically evaluated according to Tukey (1953).

RESULTS AND DISCUSSION

A. Growth characters

1. Root system

Data in Table (1), clearly indicate that at 1997 season foliar spray with the lowest concentration (i.e. 5 g/L) exhibited insignificant reduction in size of the root system of treated cucumber plants. Meanwhile, the other two concentrations i.e. 10 or 50 g/L showed high significant increase of the same character. While, in 1998 season foliar spray treatments showed insignificant increase in size of the root system with 5 g/L while, reached the level of significance with 10 and 50 g/L. On the other hand, in both seasons, soaking cucumber seeds in the natural palm pollens extract at different applied concentrations (i.e. 5, 10 and 50 g/L) increased significantly the size of the root system above the control values.

The above mentioned findings are of great interest, not only for for detection of the best manner of treatment, but also to elucidate to what extent the germination stage is controlling or eliminating the following stages of plant growth.

In this respect, to our knowledge, Mitchell *et al* (1970) were the first to investigate the role of the natural extracts of plant pollens as sources of plant growth regulators on plant growth and productivity as well. Also, El-Desouky *et al* (1998) found nearly the same significant effect on increasing size of the root system of squash plants (*Cucurbita pepo* L.) growing up from pre-soaked seeds in the natural extracts of fresh garlic cloves and the active yeast cells.

Pollen grains have long been known to be a rich source of growth substances, especially auxin (Barendse *et al* 1970 and Kamienska and Pharis

Table (7): Effect of the natural extract of palm pollen applied as foliar spray or as seed soaking material on the growth of different organs of cucumber (Cucumis sativus L.) plants during 1997 and 1998 seasons.

Characters / Treatments		Season 1997										
		Stem length (cm)*	Hypocotyl length (cm)	Internode length (cm)	Number of internodes	Main stem weight of the internode system (g)	No. of branches /plant	No. of leaves on the main stem	No. of leaves on the branches	Foliar No. of internodes	Fruit set (%)	Fruit yield (ton/fed.)
Foliar Spray	Control	4.95	64.40	6.18	58.20	15.00	3.89	1.80	14.00	9.80	23.00	1262.56
	5 g/L	4.85	65.40	5.95	59.50	14.80	4.82	1.70	13.80	8.20	22.10	1223.68
	10 g/L	5.88	72.00	5.26	66.62	15.40	4.33	2.40	14.40	11.50	25.90	1479.72
	50 g/L	6.65	67.80	5.85	61.95	15.10	4.10	2.56	14.10	12.10	26.20	1497.28
Seed Soaked	5 g/L	6.05	73.60	5.88	68.80	15.80	4.42	2.56	14.80	11.80	25.60	1564.01
	10 g/L	6.95	79.40	5.88	73.60	15.50	4.68	3.06	15.50	13.20	28.80	1696.67
	50 g/L	7.35	77.20	6.18	68.13	16.80	3.93	3.18	15.80	10.50	26.30	1532.66
L.S.D.	0.05	0.56	3.14	0.81	2.91	1.40	0.18	0.48	1.49	0.88	2.05	78.40
	0.01	0.74	4.17	1.08	3.81	1.86	0.24	0.64	1.96	1.17	2.72	101.91
		Season 1998										
Foliar Spray	Control	4.83	63.20	6.28	56.92	14.40	3.95	1.79	13.80	8.83	21.76	1065.61
	5 g/L	5.05	61.80	6.28	55.60	14.80	3.91	1.98	13.00	8.83	21.88	1122.97
	10 g/L	5.35	68.80	5.34	63.26	15.80	4.32	2.18	14.00	10.28	24.28	1339.82
	50 g/L	5.20	66.60	5.96	60.64	14.30	4.13	2.18	13.78	11.28	24.98	1291.84
Seed Soaked	5 g/L	6.10	69.85	5.95	63.90	15.80	4.28	2.28	14.50	10.98	24.48	1299.54
	10 g/L	6.35	72.60	5.66	66.94	15.90	4.32	2.98	14.58	12.78	27.28	1586.27
	50 g/L	5.49	68.45	5.95	62.50	15.10	3.88	3.08	13.18	9.49	24.58	1431.22
L.S.D.	0.05	0.67	2.99	0.57	2.36	1.08	0.13	0.21	1.08	0.67	1.56	67.34
	0.01	0.89	3.99	0.89	3.43	1.41	0.17	0.69	1.44	0.88	2.07	81.12

*Stem length = hypocotyl length + internodes length.

1975). Hence, increase in the size of the cucumber root system with palm pollen extract treatment could be a consequent response for the established well known effects of auxin upon root initiation and growth (Noggle and Fritz, 1992).

2. Vegetative growth

With regard to the stem length, data in Table (1) indicate that foliar spray of palm extract at 10 and 50 g/L exhibited significant effect at 5% level of significance in both seasons. While, the lowest concentration (i.e. 5 g/L) did not show any significant increase of stem length in the two seasons. On the other hand, stem length was significantly increased at the two levels of significance and in the two seasons with different applied concentrations in case of pre-soaked seed treatment. Also, it could be noticed that, increase of stem length in the two application methods is mainly due to the increase of the internode length rather than hypocotyl length or even the number of internodes. However, seed soaking in 10 or 50 g/L significantly stimulated number of internodes above the control in both seasons concomitant with significance in the number of leaves on the main stem.

As for the number of branches/plant, data in Table (1) show that, in the two seasons, concentrations of 10 and 50 g/L as foliar spray and 5 & 10 g/L soaked-seeds gave significant increase above the control. Meanwhile, the concentration of 50 g/L as seed-soaking increased number of branches, yet it did not reach the level of significance. But the lowest concentration (i.e 5 g/L) as foliar spray insignificantly decreased this character at the first season and insignificantly increased it at the second one.

These results confirm that the seed-soaking method was more effecting for stem growth.

As regards the total number of levels per plant as shown in Table (1), different applied concentrations either as foliar spray or as seed-soaked material in both seasons; exhibited significant increase in number of leaves at the two levels of significance. The only exception was the foliar spray treatment at 5 g/L, since it showed insignificant reduction of this character in the first season and nearly had no effect in the second one. Also, it could be noticed that different treatments had the same effect on the number of leaves. The total leaf area/plant, was the resultant of that obtained in case of the total number of leaves/plant.

In general, data in Table (1), clearly indicate that; soaking seed in the natural palm pollen extract was more effective in most studied characters of cucumber growth when compared with the foliar spray application.

Furthermore, the natural extract of palm pollen stimulated different investigated aspects of cucumber growth. Therefore, it could be postulated that possesses or formation a root system adequate to supply support, water and mineral nutrients being expected. Hence, more foliage can be produced which, in turn, can increase the plant's total capacity for growth.

3 Photosynthetic pigments

As shown in Table (2) foliar spray of palm pollen extract at 10 and 50 g/L as well as the three applied concentrations as seed-soaked material exhibited an increase of chl. a, b and carotenoides, thereby increased the total photosynthetic pigments either at 5 or 1% level of significance during 1997 and 1998 seasons. Except for 5 g/L as foliar spray since it gave insignificant increase in photosynthetic pigments during both seasons.

This positive effect of palm pollen extract on photosynthetic pigments formation in leaves of cucumber treated plants could also be related to previous mentioned growth characters. In this respect, as well mentioned afterwards, extract of palm pollen treatments significantly induced cytokinins formation especially in root system. Also, other workers have postulated that the size of the root systems may control photosynthetic rate and shoot growth (Richards and Rowe, 1977).

4. Dry weights

Data in Table (3) indicate that, in 1997 season, foliar spray with palm pollen extract at 5 g/L showed insignificant increase of roots, stems and leaves dry weights. Meanwhile, in 1998 season, exhibited either insignificant increase of roots, leaves and the total dry weights or insignificant reduction of stems dry weight. While, the other two applied concentrations as foliar spray as well as all concentrations of seed-soaked treatment significantly increased this character either at 5 or 1% levels of significance during 1997 and 1998 seasons.

Also, the simulative effect of pollen extract treatments on dry weights when related to the control values, could be noticed.. In particular the seed-soaking treatment at 10 g/L reached 139.8% and 140.9% against the control in both seasons, respectively.

In addition, distribution or accumulation of the dry matter in roots being increased on the account of its accumulation rates in the leaves. That was more obvious when the root/shoot ratio is considered, since, increases of this ratio existed in all treatments.

Furthermore, it could also be noticed that seed-soaked treatment is more effective when compared with the foliar spray treatment regarding dry matter distribution and accumulation.

Moreover, these findings seem to be a consequence response to the improvement of growth characters (Table 1) and increase of photosynthetic pigments formation (Table 2), thereby photosynthates accumulation being culminated.

Besides, as well be mentioned afterwards increases of endogenous hormone levels were evident for different pollen extract treatments.

In this respect, Gifford and Evans (1981) supports the hypothesis that assimilates distribution is predominantly under sink control and may be hormonally mediated, a phenomenon commonly referred to as hormone-directed transport (Phillips, 1975). Also,

Table (2): Effect of the natural extract of palm pollens applied as foliar spray or as seed soaking material on photosynthetic pigments (calculated on the dry weight basis) of cucumber (Cucumis sativus L.) plants during 1997 and 1998 seasons.

Treatments	Characters	Season 1997						
		Mg/g. dry weight					Ratio	
		Chl. a	Chl. b	Chl. (a + b)	Carot.	Chl. (a + b) + Carot.	Chl. a/ Chl. b	Chl. (a + b)/ Carot.
Foliar Spray	Control	2.53	1.41	3.94	2.33	6.27	1.79	1.69
	5 g/L.	2.55	1.51	4.06	2.42	6.48	1.69	1.68
	10 g/L.	3.38	2.02	5.40	2.98	8.38	1.67	1.81
	50 g/L.	3.68	2.37	6.05	3.40	9.45	1.55	1.78
Seed Soaked	5 g/L.	3.65	2.27	5.92	3.30	9.22	1.61	1.79
	10 g/L.	4.56	2.99	7.55	4.26	11.81	1.53	1.77
	50 g/L.	4.15	2.58	6.73	3.78	10.51	1.61	1.78
L.S.D.	0.05	0.34	0.41	0.66	0.44	0.90	0.08	0.03
	0.01	0.75	0.57	0.92	0.61	1.28	0.11	0.10
		Season 1998						
Foliar Spray	Control	2.49	1.27	3.76	2.40	6.16	1.96	1.57
	5 g/L.	2.57	1.45	4.02	2.60	6.62	1.77	1.55
	10 g/L.	3.24	1.93	5.17	2.81	7.98	1.68	1.84
	50 g/L.	3.49	2.04	5.53	3.09	8.62	1.71	1.79
Seed Soaked	5 g/L.	3.34	2.01	5.35	3.01	8.16	1.65	1.71
	10 g/L.	4.47	2.56	7.03	4.04	11.07	1.75	1.74
	50 g/L.	3.68	2.36	6.04	3.32	9.36	1.56	1.82
L.S.D.	0.05	0.42	0.47	0.74	0.36	1.01	0.10	0.12
	0.01	0.58	0.65	1.03	0.50	1.41	0.14	0.17

Chl. = Chlorophyll Carot. Carotenoids

Table (3): Effect of the natural extract of palm pollen applied as foliar spray or as seed-soaking material on dry matter accumulation and distribution in different organs of cucumber (Cucumis sativus L.) plants during 1997 and 1998 seasons.

Characters / Treatments		Dry weight (g/plant)			Total dry weight (g/plant)	Dry weight % related to the control	% of Dry weight in different organs			Roots/ shoot ratio
		Roots	Stems	Leaves			Roots	Stems	Leaves	
Season 1997										
Foliar Spray	Control	0.48	1.18	4.87	6.53	100.00	7.35	18.07	74.58	0.079
	5 g/L.	0.49	1.22	5.01	6.72	102.91	7.29	18.16	74.55	0.079
	10 g/L.	0.65	1.56	5.48	7.69	117.76	8.45	20.29	71.26	0.092
	50 g/L.	0.62	1.42	5.70	7.74	118.53	8.01	18.35	73.64	0.083
Seed Soaked	5 g/L.	0.68	1.70	5.93	8.32	127.41	8.17	20.55	71.28	0.089
	10 g/L.	0.75	1.84	6.54	9.13	139.82	8.22	20.15	71.63	0.089
	50 g/L.	0.63	1.63	6.10	8.40	128.66	7.58	19.40	72.62	0.087
L.S.D.	0.05	0.05	0.21	0.24	0.24	6.54	0.53	2.01	1.23	0.005
	0.01	0.07	0.28	0.32	0.32	8.62	0.68	1.36	1.66	0.007
Season 1998										
Foliar Spray	Control	0.43	1.10	4.38	5.91	100.00	7.28	18.61	74.11	0.078
	5 g/L.	0.50	1.06	4.56	6.12	103.72	8.17	17.32	74.51	0.089
	10 g/L.	0.59	1.42	5.25	7.26	122.84	8.13	19.56	72.31	0.088
	50 g/L.	0.57	1.40	5.29	7.26	122.84	7.85	19.28	72.87	0.085
Seed Soaked	5 g/L.	0.73	1.55	5.24	7.47	126.40	9.37	20.48	70.15	0.103
	10 g/L.	0.71	1.65	5.97	8.33	140.95	8.52	19.81	71.67	0.093
	50 g/L.	0.62	1.48	5.66	7.76	131.30	7.99	19.07	72.94	0.087
L.S.D.	0.05	0.09	0.14	0.19	0.23	6.76	0.56	1.18	1.42	0.008
	0.01	0.12	0.19	0.26	0.31	8.87	0.76	1.60	1.92	0.011

further support for hormonal control over assimilates and dry matter distributions are carried out by Wicks *et al* (1985) and Noggle and Fritz (1992).

B. Productivity

i. Flowering (sex expression)

No significant effect was detected with the number of male flowers per plant, for the different treatments applied in both seasons (Table 4).

On the other hand, number of female flowers in the foliar spray treatment showed insignificant increase, with concentration of 5 g/L. Meanwhile, seed-soaking treatment exhibited significant increase with all concentrations during the two seasons of the present study.

Therefore, it is of great importance in the present study to mention that the number of female flowers almost increased on the account of male ones. That could be triggering for striking increases in fruits yield, since, number of female flowers reached its maximum i.e. 15.5 and 13.2 flower/plant with 10 and 50 g/L of seed soaked and foliar spray treatments, respectively in the 1st season. This means that, fruit yield increased by about 93 and 65% more than the control under the above mentioned two treatments, respectively.

In this respect, many studies have been carried out, trying to alter that sex expression of cucurbitaceous plants by using exogenous application of growth substances and/or different fertilizers (Longo *et al* 1982 and Ibrahim *et al* 1985 and 1986).

In general, femaleness is promoted by auxins and cytokinins, maleness by gibberellic and abscisic acids (Schneider *et al* 1977). Therefore, increases of endogenous hormones level as well mentioned later may be in intimate relation with the increase in the number of the pestillate flowers of cucumber plants (Table 4).

ii. Fruit yield and characters

Data shown in Table (5) indicate that, fruit yield g/plant, number of fruits/plant, mean weight/fruit and the percentage of fruit-set/plant, significantly increased during 1997 and 1998 seasons. The only exception was the insignificant increase of these characters by the application of 5 g/L of palm pollen extract as foliar spray.

Concerning the fruit shape, i.e. fruit length and diameter, data in Table (5) clearly show that foliar spray or seed-soaked treatments either at 10 or 50 g/L significantly increased this parameter. The same levels with seed-soaking and highest one for foliar spray, promoted fruit diameter above control. Also, the increase in the fruit diameter was more evident than in the fruit length. Therefore, the fruit shape index (i.e. length/diameter) was reduced but did not reach the level of significance under different applied treatments.

With regard to the dry weight/fruit and its percentage, it could be noticed that pollen extract in both seasons increased the two characters. This increase didn't reach the level of significance with 5 g/L as foliar spray in the 2nd season. While the rest of

Table (4): Effect of the natural extract of palm pollens applied as foliar spray or as seed-soaking material on flowering of cucumber (Cucumis sativus L.) plants during 1997 and 1998 seasons.

Treatments	Characters	Season 1997			Season 1998		
		No. of flowers/plant		Male: Female	No. of flowers/plant		Male: Female
		Male	Female	Ratio	Male	Female	Ratio
	Control	42.60	8.00	5.33:1	39.00	7.70	5.06:1
Foliar Spray	5 g/L.	38.90	9.00	4.32:1	36.40	8.00	4.55:1
	10 g/L.	39.60	11.40	3.47:1	37.00	10.40	3.56:1
	50 g/L.	38.20	13.20	2.89:1	35.00	12.00	2.98:1
Seed Soaked	5 g/L.	38.80	11.40	3.40:1	39.40	10.70	3.68:1
	10 g/L.	36.70	15.50	2.37:1	34.80	14.60	2.38:1
	50 g/L.	39.00	12.60	3.10:1	39.60	12.20	3.25:1
L.S.D.	0.05	6.20	3.10	-	5.65	2.29	-
	0.01	8.25	4.12	-	7.51	3.05	-

Table (5): Effect of the natural extract of palm pollen applied as foliar spray or as seed-soaking material on fruit yield and characters of cucumber (*Cucumis sativus* L.) plants during 1997 and 1998 seasons.

Treatments	Characters	Fruit yield (g)/plant	No. of fruits/plant	Mean weight of the fruit (g)	% of fruit-set/plant	Fruit length (cm)	Fruit diameter (cm)	Fruit shape index (L/D)	% of dry material/fruit	Mean of the dry weight/fruit
		Season 1997								
Foliar Spray	Control	397.76	5.50	72.32	68.75	10.73	2.80	3.83	7.04	5.09
	5 g/L.	481.22	6.50	74.51	71.22	10.88	2.93	3.69	7.35	5.34
	10 g/L.	623.62	8.50	76.24	72.81	11.26	3.00	3.75	7.28	5.56
	50 g/L.	782.53	9.83	79.85	74.26	11.65	3.15	3.70	7.44	5.84
Seed Soaked	5 g/L.	649.72	8.00	73.20	75.44	11.00	3.00	3.68	7.27	5.47
	10 g/L.	904.38	11.66	80.31	74.84	11.78	3.13	3.80	7.46	6.05
	50 g/L.	813.09	9.78	84.05	78.98	12.01	3.30	3.64	7.61	6.58
L.S.D.	0.05	103.16	1.49	3.42	3.51	0.54	0.27	0.21	0.19	0.23
	0.01	139.75	1.98	3.30	4.00	0.71	0.36	0.28	0.26	0.31
		Season 1998								
Foliar Spray	Control	393.83	5.16	69.25	68.83	10.17	2.85	3.91	6.95	4.81
	5 g/L.	496.58	6.78	71.33	71.23	10.70	2.70	3.96	7.02	4.86
	10 g/L.	558.08	7.50	74.41	72.12	11.05	2.85	3.88	7.15	4.96
	50 g/L.	708.26	9.50	75.15	73.50	11.28	2.95	3.82	7.36	5.18
Seed Soaked	5 g/L.	574.72	8.00	71.84	74.71	10.63	2.80	3.80	7.24	5.01
	10 g/L.	859.49	11.20	76.74	76.71	11.45	3.00	3.81	7.48	5.32
	50 g/L.	720.53	9.50	77.78	77.81	11.80	3.05	3.77	7.49	5.49
L.S.D.	0.05	81.90	1.13	2.28	2.10	0.41	0.24	0.15	0.17	0.21
	0.01	108.07	1.51	3.00	3.42	0.58	0.32	0.20	0.23	0.29

treatments significantly increased the dry weight per fruit in both seasons (Table 5).

The above mentioned results could be attributed to the direct effect of increasing the photosynthetic efficiency (i.e. increase of both chlorophyll formation and the photosynthetic area). Thus, high assimilation rates being attained and acceleration of photosynthates translocation and accumulation into sink-function organs (i.e. flowers and fruits) took place.

iii. Fruit NPK content

Concerning the nitrogen content in fruits, data in Table (6) indicate that, in 1997 season, different pollen extract treatments either as foliar spray or as seed-soaked treatment showed its significant increase, except 5 g/L of pollen extract as foliar spray. Meanwhile, in 1998 season, N content was significantly increased by 50 g/L foliar spray or at 10 and 50 g/L in case of seed-soaked treatments. While, the rest of concentrations in both of the two methods of application, insignificantly increased this content.

As for P content, only lowest concentrations (i.e. 5 g/L) as foliar spray or seed-soaked showed insignificant content in both seasons against control. Meanwhile, the rest of treatments gained significant increase in both seasons.

However, K content, was significantly increased above control content with different pollen extract treatments in both seasons except for the low level applied as spray treatment (Table 6).

In general, it could be postulated that, (Table 1), different pollen extract treatments led to the active growth of root system that were more adequate to support water supply and mineral nutrients as well.

Also, as well be mentioned afterwards, different pollen extract treatments showed significant increase of endogenous hormone levels in roots and leaves of cucumber plants. In this respect, few studies investigated the effect of hormones on mineral nutrient uptake and translocation into the fruits which represent the strong sinks. Ilan (1971) reported that K absorption was stimulated in segments of sunflower hypocotyl by cytokinin treatment. Also, K content was increased with gibberellin treatment in short-term experiments in a dwarf maize mutant (Neumann and Janossy 1977). While, P content was increased by gibberellin and cytokinin treatments (Beraud and Penot, 1982). In addition, application of hormones to fruit can increase their power as sinks (Weaver and Johnson, 1985).

iv. Endogenous phytohormones

a. Auxin-like substances

As shown in Fig. (1) it could be noticed that foliar spray and seed-soaked treatments exhibited nearly the same enhancing effect of auxin-like substances in both roots and leaves of treated plants. However, the seed-soaked

Table (5): Effect of the natural extract of palm pollens applied as foliar spray or as seed-soaking material on NPK contents of cucumber (*Cucumis sativus* L.) fruits (mg/g dry weight) during 1997 and 1998 seasons.

Characters / Treatments		Season 1997			Season 1998		
		N	P	K	N	P	K
	Control	22.90	2.75	21.05	23.10	2.63	20.54
Foliar	5 g/L.	24.23	2.73	21.36	23.15	2.70	21.32
Spray	10 g/L.	25.10	2.90	22.68	23.93	2.83	22.25
	50 g/L.	25.03	2.98	23.68	25.35	2.88	22.98
Seed	5 g/L.	24.88	2.85	22.12	23.43	2.75	22.15
Soaked	10 g/L.	26.05	3.03	23.40	25.16	2.95	23.07
	50 g/L.	26.43	3.13	23.71	25.18	3.00	23.31
L.S.D.	0.05	1.65	0.12	0.91	1.80	0.16	1.22
	0.01	2.29	0.16	1.26	2.50	0.22	1.79

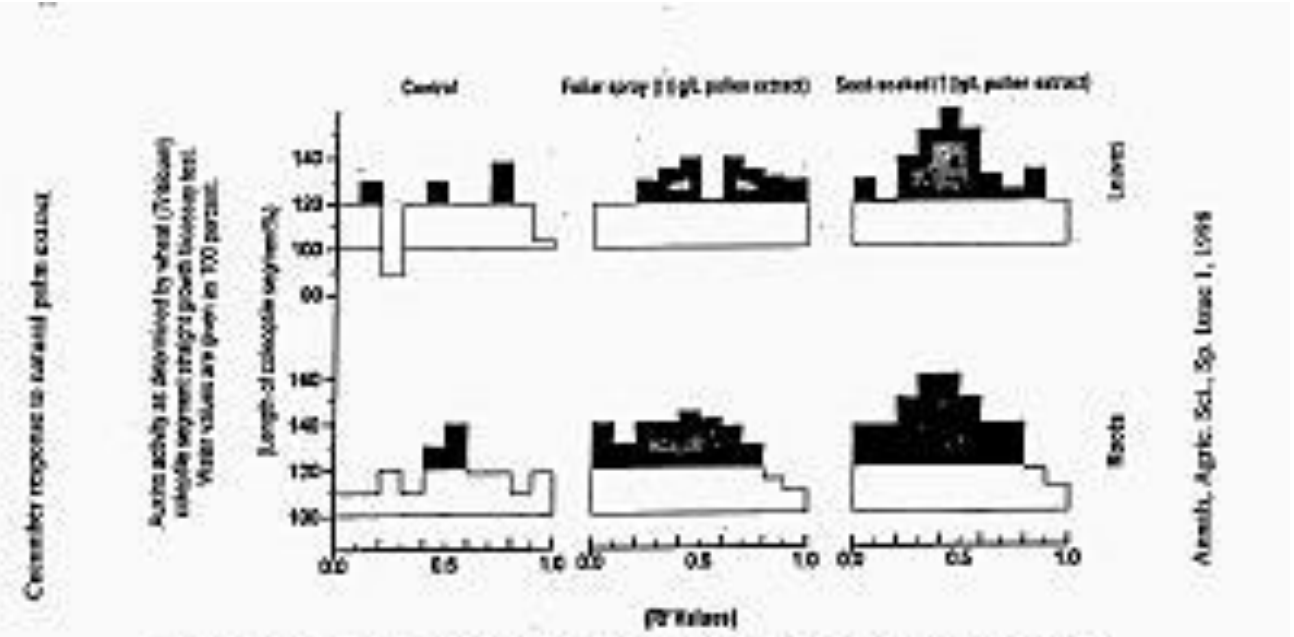

Fig. (1): The biological activities of endogenous auxin-like substances in roots and leaves of cucumber plants.

The least significant difference between any two readings is 1.1 mm at 1% level significance (the base of the bent part).

method was more effective in this respect.

b. Gibberellin-like substances

Fig. (3) clearly shows that seed-soaked method was effective upon the biological activity of gibberellin-like substances, especially in leaves. However, palm pollen extract seemed to be less active upon gibberellins activity when compared with its effect on auxins activity. In addition, the activity of natural inhibitors was only found in roots of control plants and was more less in roots of sprayed plants.

c. Cytokinin-like substances

As shown in Fig. (3) the application of natural palm pollen extract either as foliar spray or as seed-soaked method dramatically increased this activity in both roots and leaves of treated plants.

In this respect, increase of the biological activities of auxins gibberellins and cytokinins with different natural pollen extract treatments, are of great importance. Since, these hormones have been established to have principle roles upon germination, seedling emergence, leaf growth, flower initiation, flower emergence, anthesis, pollination, fertilization and fruit development. Auxins, gibberellins and cytokinins all have variable effects on these processes (**Van Leon and Bruinsma 1992**).

Since, auxins, gibberellins and cytokinins do flowers and later fruits function as sinks into which move water and solutes from other parts of the plant (**Bernier *et al* 1981**), hence, application of palm pollen extract especially in case of seed-soaked application, led to the vigorous growth of cucumber seedlings. Consequently that was followed and/or accompanied with adequate size of root system, great number of formed leaves and their total leaf area as well, thereby efficient photosynthesis was achieved. Also, increases of the biological activities of auxins, gibberellins and cytokinins in the presence of efficient supply of photosynthates and adequate uptake of minerals by roots; positively was reversed on improvement of flower initiation (including pistillate ones), acceleration of fruit development and increased their sink capacity.

Therefore, reproductive growth (i.e. flowering and fruit set & development) was also positively affected. Since, number of pistillate flowers was increased, thereby, highest fruit set were attained with pollen extract application.

Further, comparing the obtained results by the application of pollen extract as seed-soaked material or as foliar spray; it was found that the superiority of the soaked seed treatment (Table 1-5) could be expected, as spraying took place 15 days after sowing where many physiological processes has been already initiated or even completed. So, the effect will be less than seed-soaked application.

Therefore, the present study strongly admits the usage of natural extract of palm pollen grains as source of growth substances for pre-sowing seed application for vegetables freshly consumed.

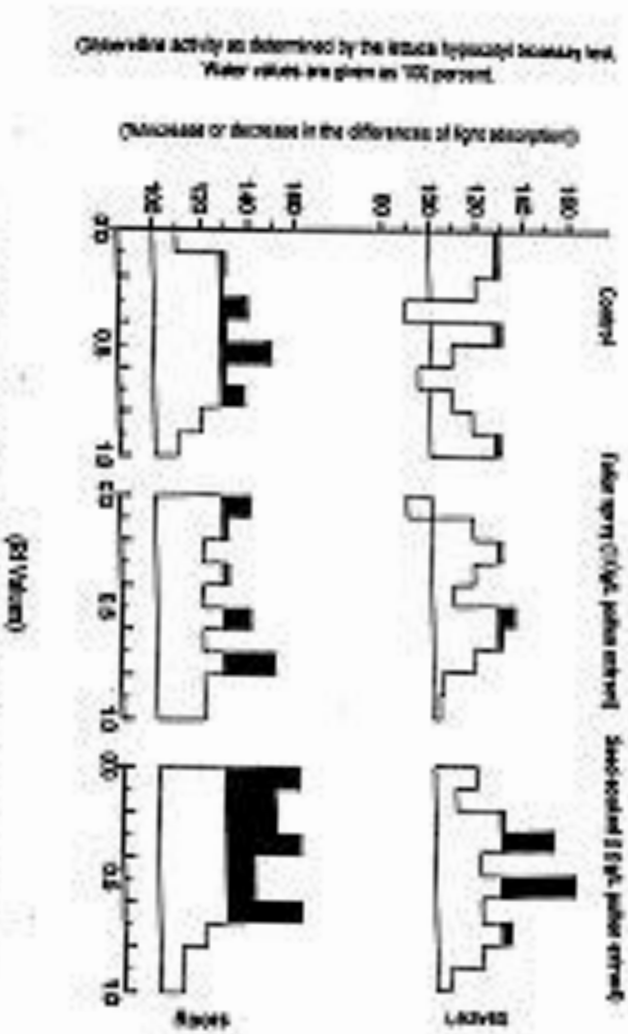

Fig. (7): The biological activities of gibberellin-like substances in roots and leaves of cucumber plants.

The least significant difference between any two readings is 1.4 mm at 5% level significance (the base of the black parts).

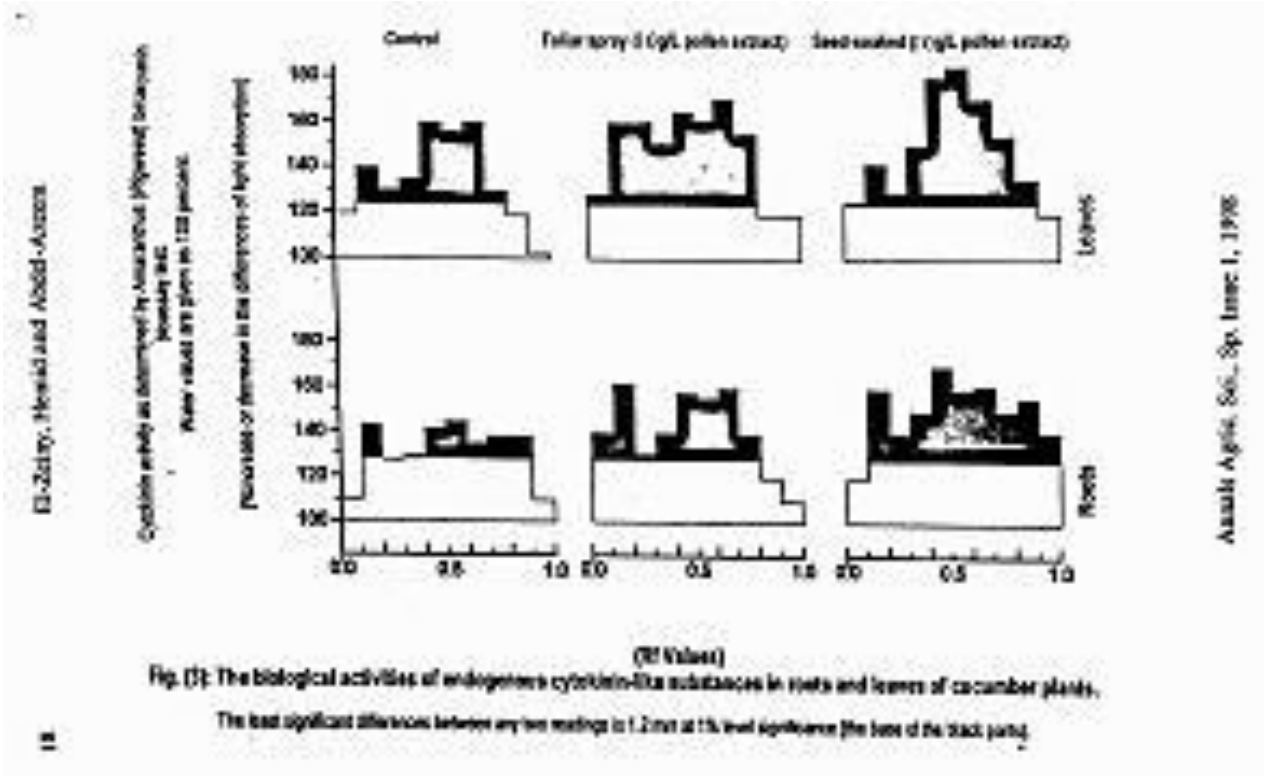

Fig. (3): The biological activities of endogenous cytokinin-like substances in roots and leaves of cucumber plants.

The least significant differences between any two readings is 1.2 mm at 1% level significance (the base of the black parts).

This is a promising method for both vegetable producers and consumers since, its benefits lies in the complete safety on the public health and minimize total costs of production as well.

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المؤتمر العلمي لبحوث التنمية الزراعية ، كلية الزراعة ، جامعة عين شمس ، القاهرة ، ديسمبر ١٥-١٧ ، ١٩٩٨
عدد خاص ، حوليات العلوم الزراعية ، ج ١ ، ١٩٩٨

استجابة نبات الخيار للمعاملة بالمستخلص الطبيعي لحبوب لقاح النخيل وذلك رشاً على المجموع الخضري او كمادة لنقع البذور

[١]

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اجريت تجربتان مستقلتان في الاصيص خلال الموسم الصيفي لعامي ١٩٩٧ و ١٩٩٨ وذلك بالصوبة الزجاجية بالمزرعة التجريبية لقسم النبات الزراعي بكلية الزراعة بمشتهر .

وفي التجربة الاولى (الرش على المجموع الخضري) تم نقع بذور الخيار صنف بيتا-الفا لمدة ٤ ساعات في الماء العطر ثم زرعت في اصص (قطرها ٣٠ سم) ملئت بـ ١٠ كيلو جرام تربة حديقة مخصبة لكل اصيص . وبعد الانبات تركت النباتات المتماثلة بمعدل نبات واحد في كل اصيص . وتم الرش بالتركيزات الاتية : ٥ ، ١٠ و ٥٠ جم لتر من المستخلص الطبيعي لحبوب لقاح النخيل والذي سبق تجهيزه وذلك مرتين في عمر ١٥ ، ٣٠ يوماً من الزراعة .

اما في التجربة الثانية (معاملة نقع البذور) فقد تم نقع بذور الخيار في نفس التركيزات السابقة ثم زراعتها في نفس الميعاد وتحت نفس الظروف وبعد ٧٠ يوماً من الزراعة اخذت عينة من النباتات الكاملة وكانت اهم النتائج المتحصل عليها كالاتي :

١ - زاد حجم المجموع الجذري زيادة معنوية عالية وكذلك طول الساق وعدد الافرع الجانبية ، كما زاد عدد الاوراق ومساحتها الكلية خاصة في معاملة نقع البذور .

٢ - زاد محتوى الاوراق من صبغات البناء الضوئي بسبب زيادة عدد الاوراق والمساحة الكلية مما ولد انعكس هذا على عملية التمثيل .

٣ - زاد تراكم المادة الجافة في اجزاء النبات المختلفة تحت تاثير مختلف المعاملات وخاصة النقع منها .

قياسات الازهار

تم تسجيلها من تفتح اول زهرة وذلك مرة كل يومين وحتى عمر ٨٠ يوماً من الزراعة . ادت جميع المعاملات وخاصة النقع الى زيادة

عدد الازهار المؤنثة الى خرجة للعقوبة فى كثير من المعاملات وبالتالى تغيرت النسبة الجنسية .

الثمار وخواصها

١ – زاد العدد الكلى للثمار وبالتالى كمية محصول الثمار زيادات معنوية عالية خاصة فى معاملات الثمع .

٢ – زاد تراكم المادة الجافة فى الثمار وكذلك عناصرها المعدنى من النتروجين والفسفور والبوتاسيوم .

المحتوى الداخلى للاكسينات والجبريللينات والسيتوكينينات في مرحلة نمو النشاط لنبات الخيار

ادت المعاملة بالمستخلص الطبيعي لجذوع النخيل الى زيادات معنوية فى كل من الاكسين والسيتوكينين فى الجذور واوراق النباتات المعاملة فى حين زاد الجبريللين معنويا فى الاوراق وذلك فى كل من طريقتى المعاملة .

وبوجه عام كان النشاط فى حالة نقع البذور اعلى منه فى حالة الرش على المجموع الخضرى .

حوليات
العلوم الزراعية

كتاب بحوث
المؤتمر السابع لبحوث التنمية الزراعية

١٥-١٧ ديسمبر ١٩٩٨ ، القاهرة

مجلد خاص
المجلد : ١
السنة : ١٩٩٨
الترقيم الدولي : ١٧٨٣ - ٠٥٧٠

المؤتمر السابع لبحوث التنمية الزراعية ، كلية الزراعة ، جامعة عين شمس ، القاهرة ، ديسمبر ١٥-١٧ ، ١٩٩٨
المجلد خاص ، حوليات العلوم الزراعية ، ٤١ ، ١-٢٣ ، ١٩٩٨

استجابة ثلاث أقوار للمعاملة بالمستخلص الطبيعي لحبوب لقاح النخيل وذلك رشاً على المجموع الخضري أو كمعاملة للقح البذور

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