

EFFECT OF CHEMICAL FRUIT THINNING OF SAMANY DATE PALM CULTIVAR.

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ABSTRACT

The effect of fruit thinning using ethephon and cytophex at different concentrations and dates of application was studied on Samany date palm cultivar in two seasons (2003-2004). Fruit set percentage was much decreased when ethephon was sprayed at all tested concentrations within 18 days after pollination compared with cytophex, in the two seasons. Moreover Samany fruit physical characteristics i.e., fruit weight, flesh weight, fruit dimensions and fruit size were enhanced with ethephon and cytophex treatments. In addition, Samany fruit contents of TSS, total soluble sugars, reducing and non-reducing sugars were increased when ethephon at 300 ppm and cytophex at 60 ppm were sprayed at 18 days after pollination.

Key words: Samany date palm cultivar- ethephon - cytophex - fruit characters - fruit thinning .

INTRODUCTION

Date palm (*Phoenix dactylifera*. L.) has a great economical importance and agricultural uses throughout human's history. In Egypt, distribution of date palm trees, covers a large area extends from Aswan to north Delta, beside the oasis of Siwa, Bahriya, Farafra, Kharga and Dakhla. Fruit thinning of date palms is an important factor in improving fruit quality (physical and chemical fruit characteristics) consequently the grade of superior fruits for native markets and exportation. Also, it reduces the alternate bearing of some date palm cultivars.

Ethephon treatments affected bunch weight, average yield and fruit quality of different date palm cultivars (EL-Makhtourm *et al.*, 1995). Spraying ethephon at 500 ppm within 2 weeks after spathe creating was the best treatment that increased fruit weight and enhanced fruit quality. (El-Hamady *et al.*, 1979; Moustafa & Seif, 1989; Kamal, 1995 and Bassal & Deeb, 2003). Also, ethephon in the high concentrations increased flesh weight (Moustafa & Seif, 1989 and Bassal & Deeb, 2003). Moreover, Ethephon treatment (500, 1000 and 1500 ppm) increased fruit dimensions (length and diameter) over control (Moustafa & Seif, 1989; El-Hamady *et al.*, 1991; Kamal, 1995 and Bassal & Deeb, 2003). However, it was clearly noticed that fruit drop percentage increased as ethephon concentration increased (El-Hamady *et al.*, 1991). On the other side, ethephon sprayed at 250, 500 and 1000 ppm increased fruit TSS of cvs Zaghloul and Samany (El-Azzouni *et al.*, 1975; Moustafa & Seif 1989; Kamal, 1995 and Bassal & Deeb, 2003).

The cytokinins are plant growth regulators that enhance plant cell division and cell expansion. In a study, cppo was sprayed to Arumanis mango trees at 14 days after blooming and showed that cppo at 10 ppm gave the

best results in increasing fruit retention, number of fruit per cluster and per plant, leaf area, fruit weight and volume (Notodimedjo, 1994).

Thus, the present investigation is planned to study the effect of ethephon and cytophex at different dates and concentrations of each on the fruit thinning of Samany date palm cultivar, aiming to improve fruit physical and chemical characteristics.

MATERIALS AND METHODS

The presents study was carried out during two successive seasons (2003 and 2004), at the Experimental Research Station, Faculty of Agriculture, Cairo University, Giza Governorate. Nine female palms of Samany date palm cultivar, (15 years old) were chosen for this study. The palms were similar in growth and received normal agricultural practives. They were pruned at 8:1 leaf/bunch ratio (El-Shazly, 1999). They were pollinated by the same source of pollen grains just after fourth days of spathe cracking in both seasons. The individual bunches were covered before and after treatments by tissue paper. Each palm was sprayed with ethephon at 100, 200 and 300 ppm and cytophex at 20, 40 and 60 ppm. Eeach of the individual concentration of the studied chemicals was sprayed on one bunch of three palms (replicets) which were separated by a water sprayed bunches (control). The aforementioned treatments were applied at either the following three dates: 6 days, 12 days or at 18 days from pollination.

The following characteristics were studied:

1- Fruit set percentage:

This was calculated using the following equation:

$$\text{Fruit set \%} = \frac{\text{Total number of setting fruits per bunch}}{\text{Total scases number per bunch}} \times 100.$$

2- Yield as average bunch weight (kg).

3- Fruit physical and chemical characteristics:

Samples of 30 date fruits were randomly picked from each bunch and evaluated the following parameters:

3-1- Fruit, flesh and seed weights:

These were determined in 5 fruits of each replicate for each treatment and the mean of weight was calculated in grams. Also fruit weight/seed weight ratio was estimated.

3-2- Fruit dimensions:

Fruit length and diameter were measured using individual fruits of each replicate (5 fruits) by using vernier caliper. Also, average size of the same fruits were determined by replacement of water in a graduated jar and calculated in cm³.

3-3- Fruit firmness:

It was estimated using pressure tester apparatus (Kg/cm²) (drill diameter, 0.3 cm) for the individual 5 fruits of each replicate per treatment.

3-4- Total soluble solids (TSS):

It was determined in fruit juice using Carl Zeiss refractometer as described in A.O.A.C. (1980).

3-5- Total soluble sugars:

It was determined in the methanolic extract using the phenol sulphuric acid method (Smith *et al.*, 1956), which was calculated as g glucose/100 g fresh weight of fruits.

Statistical analysis:

The obtained data were subjected to analysis of variance and the mean values were compared using LSD method at 5% level. The data were tabulated and statistically factorial analyzed according to the split split plot design (Snedecor and Cochran, 1972). Also, the percentages were transformed to the arcsine to find the binomial percentage according to Steel and Torrie (1980).

RESULTS AND DISCUSSION

4-1-1- Fruit set percentage:

Table (1) indicates that Samany fruit set percentages were significantly affected by different concentrations of ethephon and cytophex at the experimented spraying dates during fruit development in both seasons. The results revealed that ethephon of all tested levels were most effective in decreasing fruit set percentages compared with cytophex and control.

Concerning the effect of spraying dates, spraying after 18 days of pollination recorded more decrease in Samany fruit set percentages followed by 12 and 6 days after pollination. The same trend was also found in the second season.

In addition, the interaction between spraying dates, growth regulators and concentrations, indicated that 300 ppm of ethephon sprayed at 18 days after pollination in the 1st and 2nd seasons gave the lowest Samany fruit set percentages comparing with all other ethephon treatments. Also, 60 ppm of cytophex sprayed after 18 days from pollination produced the lowest Samany fruit set percentages in the two seasons comparing with other cytophex concentrations. In this respect, the other cytophex treatments especially these treated after 6 or 12 days of pollination were significantly equal to control at all tested concentrations.

These results are in agreement with El-Hamady *et al.* (1991) who found that fruit drop percentage of Seleg and Menify date palm cvs increased as ethephon concentration increased. Meanwhile, cytophex increased fruit retention in Arumanis mango (Reynolds *et al.*, 1992).

Table (1): Effect of spraying date and different concentrations of ethephon and cytophex on Samany fruit set percentage during 2003 - 2004 seasons.

2003 Season

Spraying date	Sampling Date (days) after pollination	Ethephon (ppm)				Mean	Cytophex (ppm)				Mean	General Mean
		0.0	100	200	300		0.0	20	40	60		
6 days after pollination	113	58.04	49.07	47.55	45.96	50.15	58.04	50.29	48.91	48.36	51.40	50.77
	138	45.29	40.94	39.42	38.09	40.93	45.29	43.08	40.47	38.36	31.00	35.96
	148	38.88	28.74	29.60	25.10	30.58	38.88	32.88	30.60	30.39	33.19	31.88
	Harvest	28.91	23.84	23.23	22.51	24.62	28.91	28.64	27.70	27.14	28.09	26.35
Mean		42.78	35.65	34.95	32.91	36.57	42.78	38.72	36.92	36.04	38.61	37.99
12 days after pollination	113	58.04	48.47	45.07	44.02	48.90	58.04	48.85	46.51	45.29	49.67	49.28
	138	45.29	39.68	38.04	36.20	39.80	45.29	41.71	38.66	36.47	40.53	40.16
	148	38.88	27.47	27.67	26.58	30.15	38.88	32.36	29.79	28.50	32.38	31.26
	Harvest	28.91	23.40	22.75	21.64	24.17	28.91	28.05	26.63	26.02	27.40	25.78
Mean		42.78	34.75	33.38	32.11	35.75	42.78	37.74	35.40	34.07	37.90	36.62
18 days after pollination	113	58.04	48.25	46.96	42.88	49.03	58.04	48.88	45.30	43.07	48.82	48.92
	138	45.29	39.44	38.69	38.36	40.44	45.29	40.03	37.31	35.20	39.46	39.95
	148	35.88	27.16	26.55	26.01	28.90	35.88	31.50	28.88	27.58	31.71	30.30
	Harvest	28.91	23.48	21.25	20.69	23.58	28.91	27.53	26.06	25.24	26.93	25.25
Mean		42.78	34.58	33.36	31.98	35.49	42.78	36.98	34.39	32.77	36.73	36.11
General Mean		42.78	34.99	33.90	32.33	35.93	42.78	37.81	35.57	34.29	37.61	-----

L.S.D at 5% Level for

Spraying date(A)	=0.637 (BxC)	=1.040 (AxBxD)	=1.800
Substances(B)	=0.520 (AxBxC)	=1.800 (CxD)	=1.380
(AxB)	=0.901 (Date of Sample(D))	=0.736 (AxCxD)	=2.410
Concentration (C)	=0.736 (AxD)	=1.270 (BxCxD)	=2.041
(AxC)	=1.270 (BxD)	=1.040 (AxBxCxD)	=3.418

2004 Season

Spraying date	Sampling Date (days) after pollination	Ethephon (ppm)				Mean	Cytophex (ppm)				Mean	General Mean
		0.0	100	200	300		0.0	20	40	60		
6 days after pollination	113	56.19	47.45	45.78	43.83	48.31	56.19	49.79	48.06	47.19	50.31	49.31
	138	45.39	40.15	37.89	36.91	40.08	45.39	42.03	40.33	39.57	41.83	40.95
	148	34.50	27.35	26.75	26.10	28.67	34.50	31.75	29.85	29.62	31.42	30.04
	Harvest	28.20	23.21	22.78	21.48	23.92	28.20	27.70	25.95	25.40	26.81	25.36
Mean		41.07	34.54	33.30	32.08	35.25	41.07	37.82	36.04	35.44	37.39	36.42
12 days after pollination	113	56.19	46.74	45.78	42.08	47.70	56.19	49.11	46.55	46.27	49.53	48.61
	138	45.39	38.14	37.06	34.10	38.67	45.39	41.70	38.97	38.22	41.07	39.87
	148	34.50	26.87	25.31	24.56	27.81	34.50	31.15	29.24	28.90	30.95	29.38
	Harvest	28.20	22.32	21.85	20.36	23.18	28.20	27.33	25.38	24.29	26.30	24.74
Mean		41.07	33.52	32.50	30.27	34.34	41.07	37.32	35.03	34.42	36.96	35.65
18 days after pollination	113	56.19	46.93	44.68	40.43	47.06	56.19	48.60	46.17	45.30	49.06	48.06
	138	45.39	37.86	34.18	33.12	37.64	45.39	41.20	38.24	37.47	40.57	39.10
	148	34.50	26.34	23.22	23.12	26.79	34.50	30.06	28.61	27.72	30.22	28.50
	Harvest	28.20	23.17	20.25	17.38	22.25	28.20	26.74	24.93	24.04	25.98	24.11
Mean		41.07	33.57	30.58	28.51	33.43	41.07	36.65	37.26	33.63	37.15	35.29
General Mean		41.07	33.88	32.13	30.29	34.34	41.07	37.26	36.11	34.49	37.23	-----

L.S.D at 5% Level for

Spraying date (A)	=0.617 (BxC)	=1.001 (AxBxD)	=1.732
Substances(B)	=0.500 (AxBxC)	=1.752 (CxD)	=1.314
(AxB)	=0.869 (Date of Sample(D))	=0.715 (AxCxD)	=2.389
Concentration (C)	=0.715 (AxD)	=1.189 (BxCxD)	=2.003
(AxC)	=1.189 (BxD)	=1.001 (AxBxCxD)	=3.394

4-1-2- Bunch weight (kg):

Table (2) indicates that Samany bunch weight was significantly affected by different concentrations of ethephon and cytophex sprayed at different dates after pollination in both seasons.

Concerning the effect of substances, cytophex gave the highest bunch weight than ethephon (10.41 and 10.17 kg) in the first and second seasons respectively, followed by ethephon which recorded 10.20 and 9.90 kg, respectively. However, control palm trees gave the highest Samany bunch weight in the both seasons (14.17 and 13.75 kg, respectively). The interaction between substances and concentrations also revealed that cytophex gave the highest Samany bunch weight at all concentrations used than ethephon.

These results are in agreement with Moustafa & seif (1989) who found that treatment with ethephon reduced the average bunch yield of sewy cv compared with the untreated ones. On the other side, Hussein *et al.* (1992) found that ethephon treatments had no significant effect on bunch weight.

4-1- Fruit weight (g):

Table (3) indicated that ethephon and cytophex treatments significantly affected fruit weight of Samany cv. by different spraying dates and concentrations in both seasons.

Respecting to the effect of substances, Samany fruit weights sprayed by cytophex and ethephon were differed significantly in the first season only. However, cytophex produced the highest Samany fruit weight than ethephon (30.75 and 28.49g, respectively) in the first season.

Regarding to substance concentration, it was clearly noticed that the highest concentration of both substances produced the highest Samany fruit weight in both season. 300 ppm of ethephon and cytophex at 60 ppm gave the highest Samany fruit weight in both seasons, comparing with other concentrations used.

In addition, the interaction between spraying dates, growth regulators, and their concentrations indicated that 300 ppm of ethephon sprayed at 6 days after pollination in the 1st and 2nd seasons gave the significant highest Samany fruit weight comparing with the other ethephon treatments. Also, 60 ppm of cytophex sprayed after 18 days from pollination produced the highest Samany fruit weight in the first and second seasons of study comparing with the other cytophex treatments.

These results were in agreement with El-Hamady *et al.* (1979), Moustaf & Seif (1993) and Kamal (1995) as they found that date palm fruit weight was increased with ethephon treatments than control. Also, cytophex increased berry weight of grapes (Reynolds *et al.*, 1992) and mango fruit weight (Notodimedjo, 1998).

4-2- Flesh weight (g):

Samany flesh weight was significantly affected by different concentrations of ethephon and cytophex at different dates during fruit development in both seasons (Table, 4).

Table (2): Effect of spraying date and different concentrations of ethephon and cytophex on Samany bunch weight during 2003- 2004 seasons.

Seasons	Spraying date (days after - polination)	Ethephon (ppm)					Cytophex (ppm)					General mean
		0.0	100	200	300	Mean	0.0	20	40	60	Mean	
2003	6	14.17	10.42	8.75	8.33	10.42	14.17	10.67	9.00	8.50	10.58	10.50
	12	14.17	10.17	8.50	8.8	10.23	14.17	10.42	8.75	8.42	10.44	10.33
	18	14.17	10.00	8.08	7.58	9.96	14.17	10.25	8.43	8.00	10.21	10.00
	Mean	14.17	10.19	8.44	8.00	10.20	14.17	10.44	8.73	8.31	10.41	10.30
2004	6	13.75	10.17	8.17	8.8	10.04	13.75	10.50	8.92	8.42	10.40	10.22
	12	13.75	10.00	8.33	7.67	9.94	13.75	10.00	8.75	8.25	10.19	10.06
	18	13.75	9.92	7.83	7.33	9.71	13.75	9.92	8.25	7.57	9.92	9.81
	Mean	13.75	10.03	8.11	7.69	9.90	13.75	10.14	8.64	8.14	10.17	10.03
	6	13.96	10.29	8.46	8.21	10.23	13.96	10.58	8.96	8.46	10.49	10.36
	12	13.96	10.08	8.42	7.87	10.08	13.96	10.21	8.75	8.33	10.31	10.19
	18	13.96	9.96	7.96	7.46	9.83	13.96	10.08	8.34	7.87	10.06	9.94
	Mean	13.96	10.11	8.28	7.85	10.05	13.96	10.29	8.68	8.22	10.29	10.17

LSD at 5% level for:

Season 2003-2004

Substances (A): 0.251
 Concentration (B): 0.355
 AxB: 0.503
 Date of spraying (c): 0.308
 AxC: 0.435
 BxC: 0.616
 AxBxC: 0.871

Date of sample : D 0.251
 AxD 0.355
 BxD 0.503
 AxBxD 0.711
 CxD 0.435
 AxCxD 0.616
 BxCxD 0.871
 AxBxCxD 1.23

Table (3): Effect of spraying date and different concentrations of ethephon and cytophex on Samany fruit weight (g) during 2003 - 2004 seasons .

2003 Season

Spraying date	Sampling Date (days) after pollination	Ethephon (ppm)					Mean	Cytophex (ppm)				Mean	General Mean
		0.0	100	200	300	0.0		20	40	60			
6 days after pollination	113	19.29	23.78	25.20	26.07	23.58	19.29	22.93	25.01	26.53	23.44	23.51	
	138	24.24	28.13	28.32	29.96	27.67	24.24	27.94	28.41	32.28	28.25	27.96	
	148	28.94	30.78	31.76	32.28	30.94	28.94	31.05	33.20	35.55	32.18	31.56	
	Harvest	30.60	32.33	33.33	40.09	34.09	30.60	34.04	36.10	42.81	31.56	32.82	
Mean		25.77	28.75	29.65	32.10	29.07	25.77	28.99	30.68	34.43	29.97	29.52	
12 days after pollination	113	19.29	23.48	24.33	27.68	23.69	19.29	24.45	25.70	26.48	23.98	23.83	
	138	24.24	28.12	28.63	29.78	27.69	24.24	31.17	31.97	33.48	30.21	28.95	
	148	28.94	29.39	30.29	31.38	30.00	29.94	33.50	33.82	35.93	33.05	31.52	
	Harvest	30.60	32.03	33.64	35.31	32.89	30.60	36.61	36.52	42.65	36.59	34.74	
Mean		25.77	28.26	29.22	31.04	28.57	25.77	31.43	32.00	34.64	30.96	29.76	
18 days after pollination	113	19.29	23.01	23.99	24.80	22.77	19.29	25.03	25.98	26.59	24.22	23.49	
	138	24.24	26.13	26.93	28.97	26.57	24.24	31.23	32.07	34.11	30.41	28.49	
	148	28.84	28.36	29.64	29.97	29.23	28.94	34.06	35.43	36.28	33.68	31.45	
	Harvest	30.60	31.89	33.68	34.94	32.78	30.60	36.15	38.27	43.11	37.14	34.96	
Mean		25.77	27.35	28.56	29.67	27.84	25.77	31.62	32.94	35.02	31.34	29.59	
General Mean		25.77	28.12	29.14	30.94	28.49	25.77	30.68	31.87	34.69	30.75	

L.S.D at 5% Level for
 Spraying date(A) = 0.294 (BxC) = 0.480 (AxBxD) = 0.832
 Substances(B) = 0.240 (AxBxC) = 0.832 (CxD) = 0.679
 (AxB) = 0.416 Date of Sample(D) = 0.339 (AxCxD) = 1.17
 Concentration (C) = 0.339 (AxD) = 0.588 (BxCxD) = 0.961
 (AxC) = 0.588 (BxD) = 0.480 (AxBxCxD) = 1.66

2004 Season

Spraying time	Sampling Date (days) after pollination	Ethephon (ppm)					Mean	Cytophex (ppm)				Mean	General Mean
		0.0	100	200	300	0.0		20	40	60			
6 days after pollination	113	19.27	23.60	25.11	27.03	23.75	19.27	20.37	21.49	24.09	21.30	22.53	
	138	23.55	26.57	28.04	29.06	26.80	23.55	24.03	26.54	27.51	25.41	26.10	
	148	29.00	30.28	31.17	32.36	30.70	29.00	26.11	28.96	30.91	28.74	29.72	
	Harvest	30.61	31.62	33.15	40.52	33.97	30.61	30.80	31.38	34.64	31.86	32.91	
Mean		25.61	28.02	29.36	32.24	28.81	25.61	25.33	27.09	29.28	26.83	27.82	
12 days after pollination	113	19.27	23.42	24.22	27.55	23.61	19.27	23.04	25.16	27.35	23.70	23.66	
	138	23.55	27.61	28.53	29.59	27.32	23.55	25.98	28.23	30.43	27.05	27.18	
	148	29.00	29.34	30.15	31.30	29.95	29.00	31.29	32.09	32.62	31.25	30.60	
	Harvest	30.61	31.66	32.43	34.85	30.14	30.61	32.74	34.75	36.83	33.73	31.93	
Mean		25.61	28.01	28.83	30.82	28.32	25.61	28.26	30.06	31.81	28.93	28.63	
18 days after pollination	113	19.27	22.95	23.76	24.26	22.56	19.27	23.74	25.81	26.05	23.72	23.14	
	138	23.55	26.09	28.84	28.52	26.25	23.55	27.93	29.11	30.07	27.66	26.96	
	148	29.00	28.13	29.51	29.82	29.11	29.00	28.77	30.61	34.44	30.70	29.91	
	Harvest	30.61	31.85	33.28	34.55	32.57	30.61	30.56	34.11	37.76	33.26	32.91	
Mean		25.61	27.25	28.53	29.29	27.62	25.61	27.75	29.91	32.08	28.84	28.23	
General Mean		25.61	27.76	28.85	30.78	28.25	25.61	27.11	29.02	31.06	28.20	

L.S.D at 5% Level for
 Spraying date (A) = 0.213 (BxC) = 0.347 (AxBxD) = 0.602
 Substances(B) = 0.174 (AxBxC) = 0.602 (CxD) = 0.492
 (AxB) = 0.301 Date of Sample(D) = 0.246 (AxCxD) = 0.852
 Concentration (C) = 0.246 (AxD) = 0.426 (BxCxD) = 0.695
 (AxC) = 0.426 (BxD) = 0.347 (AxBxCxD) = 1.20

Bakr, E. J. et al.

Table (4): Effect of spraying date and different concentrations of ethephon and cytophex on Samany fruit flesh weight (g) during 2003-2004 seasons.

2003 Season

Spraying date	Sampling Date (days) after pollination	Ethephon (ppm)					Mean	Cytophex (ppm)					General Mean
		0.0	100	200	300	Mean		0.0	20	40	60	Mean	
6 days after pollination	113	17.42	21.38	23.39	24.19	21.72	17.42	21.02	23.23	24.70	21.59	21.65	
	138	22.21	26.07	26.34	27.67	25.57	22.21	25.85	26.46	30.57	26.27	25.92	
	148	26.72	28.52	29.61	29.43	28.57	26.72	28.83	30.91	32.56	29.75	29.16	
	Harvest	28.12	29.82	30.90	36.92	31.44	28.12	31.59	33.82	39.52	33.26	32.35	
Mean		23.62	26.57	27.56	29.55	26.83	23.62	26.82	28.61	31.84	27.72	27.28	
12 days after pollination	113	17.42	21.53	22.33	25.64	21.73	17.42	22.51	23.73	24.37	22.01	21.81	
	138	22.21	25.95	26.55	27.52	25.56	22.21	29.09	29.86	31.14	28.07	26.82	
	148	26.72	26.92	28.05	28.69	27.59	26.72	31.11	31.55	33.21	30.64	29.12	
	Harvest	28.12	29.06	31.03	32.33	30.14	28.12	33.51	33.93	39.34	33.72	31.93	
Mean		23.62	25.87	26.99	28.55	26.25	23.62	29.06	29.77	32.01	28.61	27.43	
18 days after pollination	113	17.42	21.05	21.99	22.73	20.80	17.42	23.07	24.04	24.46	22.25	21.52	
	138	22.21	23.91	24.77	26.67	24.39	22.21	29.13	29.80	31.78	29.23	26.86	
	148	26.72	25.69	27.14	27.40	26.74	26.72	31.61	32.76	33.72	31.20	28.97	
	Harvest	28.12	28.69	30.77	31.98	29.89	28.12	33.19	35.20	40.24	34.19	32.04	
Mean		23.62	24.84	26.17	27.19	25.45	23.62	29.25	30.45	32.55	28.97	27.21	
General Mean		23.62	25.76	26.91	28.43	26.18	23.62	28.38	29.61	32.13	28.43	-----	

L.S.D at 5% Level for

Spraying date (A)	=0.299	(BxC)	=0.498	(AxBxD)	=0.847
Substances (B)	=0.244	(AxBxC)	=0.847	(Cx D)	=0.691
(AxB)	=0.423	Date of Sampler (D)	=0.345	(AxCxD)	=1.19
Concentration (C)	=0.345	(AxD)	=0.599	(BxCxD)	=0.978
(AxC)	=0.599	(BxD)	=0.439	(AxBxCxD)	=1.69

2004 Season

Spraying date	Sampling Date (days) after pollination	Ethephon (ppm)					Mean	Cytophex (ppm)					General Mean
		0.0	100	200	300	Mean		0.0	20	40	60	Mean	
6 days after pollination	113	17.52	21.78	23.35	25.21	21.96	17.52	18.43	19.69	19.67	18.82	20.39	
	138	21.68	24.63	26.09	26.86	24.82	21.68	21.98	24.57	25.23	23.36	24.09	
	148	26.55	28.23	29.09	29.42	28.33	26.55	23.94	26.77	27.72	26.24	27.29	
	Harvest	27.72	29.27	30.65	37.35	31.25	27.72	28.37	28.91	31.41	29.10	29.75	
Mean		23.37	25.98	27.29	29.71	26.59	23.37	23.18	24.99	26.66	24.55	25.38	
12 days after pollination	113	17.52	21.54	22.30	21.72	22.49	17.52	21.12	23.21	25.29	21.78	22.14	
	138	21.68	25.64	26.51	27.36	25.30	21.68	23.94	26.16	28.09	24.97	25.13	
	148	26.55	27.07	27.99	28.60	27.55	26.55	28.96	29.85	29.87	28.81	28.18	
	Harvest	27.72	28.76	29.86	31.68	29.30	27.72	29.50	32.14	33.57	30.74	30.12	
Mean		23.37	25.75	26.67	28.29	26.02	23.37	25.88	27.84	29.21	26.57	26.50	
18 days after pollination	113	17.52	21.02	21.32	22.36	20.65	17.52	21.79	23.83	24.00	21.78	21.93	
	138	21.68	24.05	24.75	26.34	24.20	21.68	25.81	26.89	27.83	25.55	24.87	
	148	26.55	25.60	27.02	27.27	26.61	26.55	26.11	28.03	31.97	28.16	27.39	
	Harvest	27.72	28.62	30.37	31.74	29.61	27.72	27.36	30.96	34.91	30.21	29.91	
Mean		23.37	24.82	25.99	26.90	25.27	23.37	25.24	27.43	29.68	26.43	25.85	
General Mean		23.37	25.52	26.65	28.30	25.96	23.37	24.77	26.75	28.51	25.85	-----	

L.S.D at 5% Level for

Spraying date (A)	=0.224	(BxC)	=0.448	(AxBxD)	=0.634
Substances (B)	=0.183	(AxBxC)	=0.455	(Cx D)	=0.517
(AxB)	=0.317	Date of Sampler (D)	=0.258	(AxCxD)	=0.896
Concentration (C)	=0.258	(AxD)	=0.448	(BxCxD)	=0.732
(AxC)	=0.448	(BxD)	=0.366	(AxBxCxD)	=1.26

Regarding to the effect of substances, cytophex produced the highest Samany flesh weight than ethephon. As for the concentration of substance, it was clearly noticed that the highest concentration of both substances raised Samany flesh weight. (28.43 and 28.30 g) for ethephon and (32.13 and 28.51 g) for cytophex.

The interaction of spraying date, substances used and concentrations revealed that 60 ppm of cytophex sprayed at 18 days after pollination produced the highest Samany flesh weight (40.24 g) in the first season comparing with other treatments. While, in the second season, 300 ppm of ethephon sprayed at 6 days after pollination gave the highest Samany flesh weight (29.55 g).

These results are in agreement with Moustafa & seif (1989) and Bassal & El-Deeb (2003) as they found that ethephon in the high concentration increased flesh weight of date palm fruits.

4-3- Seed weight:

Data presented in table (5) revealed that ethephon sprayed at 300 ppm or cytophex at 60 ppm after 6 days from pollination raised seed weight compared with other tested concentrations and control at different spraying dates. However, no significant differences were found between spraying dates of ethephon at 300 ppm or cytophex at 60 ppm. This trend was generally observed in both seasons.

5- Fruit dimensions:

5-1- Fruit length (cm):

Samany fruit length was significantly affected by different concentrations of ethephon and cytophex at different dates development in both seasons (Table, 6).

Concerning the effect of spraying date, spraying after 12 days of pollination recorded increasing in Samany fruit length (5.48 cm) followed by 18 and 6 days after pollination (5.32 and 5.15 cm, respectively) in the first season. While, in the second, season spraying after 18days after pollination showed significant increment in Samany fruit length (5.62 cm).

Respecting to the effect of substances, Samany fruit length was significantly affected by spraying cytophex or ethephon regardless spraying dates as compared with control in both seasons. However, no significant differences could be detected between the means of both substances.

Regarding to the concentration, it was clearly noticed that the highest concentration of both substances produced the highest Samany fruit length in both seasons. Ethephon at 300 ppm or cytophex at 60 ppm gave the highest Samani fruit length in both seasons, comparing with other used concentrations.

The interaction between spraying date, substance, and their concentrations indicated that 300 ppm of ethephon sprayed at 12 or 18 days after pollination gave the highest Samany fruit length comparing with other interactions. Meanwhile, cytophex at 60 ppm at any tested spraying dates had the highest effect on increasing fruit length.

Table (5): Effect of spraying date and different concentrations of ethephon and cytophex on Samany seed weight (g) during 2003 - 2004 seasons .

2003 Season

Spraying date	Sampling Date (days) after pollination	Ethephon (ppm)				Mean	Cytophex (ppm)				Mean	General Mean
		0.0	100	200	300		0.0	20	40	60		
6 days after pollination	113	1.87	1.90	1.80	1.87	1.86	1.87	1.92	1.77	1.83	1.85	1.85
	138	2.03	2.06	1.98	2.29	2.09	2.03	2.08	1.95	2.25	2.08	2.05
	148	2.22	2.26	2.16	2.85	2.37	2.22	2.22	2.29	2.98	2.43	2.40
	Harvest	2.48	2.51	2.43	3.17	2.65	2.48	2.45	2.27	3.29	2.62	2.64
Mean		2.15	2.18	2.09	2.55	2.24	2.15	2.17	2.07	2.59	2.24	2.24
12 days after pollination	113	1.87	1.95	1.99	2.04	1.96	1.87	1.93	1.98	2.12	1.97	1.97
	138	2.03	2.17	2.09	2.26	2.14	2.03	2.08	2.11	2.34	2.14	2.14
	148	2.22	2.47	2.24	2.69	2.40	2.22	2.38	2.26	2.72	2.39	2.40
	Harvest	2.48	2.97	2.60	2.98	2.76	2.48	3.10	2.59	3.31	2.87	2.81
Mean		2.15	2.39	2.23	2.49	2.31	2.15	2.37	2.24	2.62	2.39	2.33
18 days after pollination	113	1.87	1.96	1.99	2.07	1.97	1.87	1.96	1.94	2.13	1.97	1.97
	138	2.03	2.22	2.15	2.30	2.17	2.03	2.10	2.27	2.35	2.18	2.18
	148	2.22	2.67	2.50	2.57	2.49	2.22	2.46	2.68	2.56	2.48	2.48
	Harvest	2.48	3.21	2.91	2.97	2.89	2.48	2.96	3.07	2.87	2.84	2.87
Mean		2.15	2.51	2.39	2.48	2.38	2.15	2.37	2.49	2.47	2.37	2.37
General Mean		2.15	2.36	2.24	2.51	2.31	2.15	2.30	2.27	2.56	2.32	-----

L.S.D at 5% Level for
 Spraying date(A) =0.046 (BxC) = 0.076 (AxBxD) =0.132
 Substances(B) =N.S (AxBxC) = 0.132 (CxD) = 0.108
 (AxB) = 0.066 (Date of Sample(D) = 0.054 (AxCxD) = 0.187
 Concentration (C) = 0.054 (AxD) = 0.093 (BxCxD) = 0.152
 (AxC) = 0.093 (BxD) = 0.076 (AxBxCxD) = 0.264

2004 Season

Spraying date	Sampling Date (days) after pollination	Ethephon (ppm)				Mean	Cytophex (ppm)				Mean	General Mean
		0.0	100	200	300		0.0	20	40	60		
6 days after pollination	113	1.76	1.82	1.76	1.82	1.79	1.76	1.93	1.80	1.82	1.83	1.81
	138	1.87	1.93	1.94	2.20	1.99	1.87	2.05	1.97	2.28	2.04	2.01
	148	2.45	2.05	2.08	2.94	2.38	2.45	2.17	2.18	3.18	2.50	2.44
	Harvest	2.89	2.35	2.30	3.17	2.73	2.89	2.43	2.47	3.22	2.75	2.74
Mean		2.24	2.04	2.07	2.53	2.22	2.24	2.15	2.11	2.63	2.28	2.25
12 days after pollination	113	1.76	1.87	1.91	2.01	1.89	1.76	1.92	1.95	2.05	1.92	1.90
	138	1.87	1.97	2.02	2.23	2.02	1.87	2.04	2.07	2.34	2.08	2.05
	148	2.45	2.27	2.16	2.71	2.40	2.45	2.32	2.24	2.75	2.44	2.42
	Harvest	2.89	2.90	2.57	3.17	2.86	2.89	3.24	2.62	3.26	3.03	2.94
Mean		2.24	2.25	2.16	2.53	2.29	2.24	2.38	2.22	2.60	2.36	2.31
18 days after pollination	113	1.76	1.93	1.94	2.00	1.91	1.76	1.95	1.97	2.05	1.93	1.92
	138	1.87	2.04	2.09	2.19	2.05	1.87	2.12	2.22	2.23	2.11	2.08
	148	2.45	2.53	2.49	2.55	2.50	2.45	2.65	2.58	2.47	2.54	2.52
	Harvest	2.89	3.21	2.91	2.81	2.95	2.89	3.29	3.15	2.85	3.04	3.00
Mean		2.24	2.43	2.36	2.39	2.35	2.24	2.50	2.48	2.40	2.40	2.38
General Mean		2.24	2.24	2.20	2.48	2.29	2.24	2.34	2.27	2.54	2.35	-----

L.S.D at 5% Level for
 Spraying date (A) =0.064 (BxC) =0.105 (AxBxD) =0.181
 Substances(B) = 0.052 (AxBxC) =0.181 (CxD) = 0.148
 (AxB) = 0.090 (Date of Sample(D) =0.074 (AxCxD) = 0.257
 Concentration (C) =0.074 (AxD) = 0.128 (BxCxD) = 0.210
 (AxC) = 0.128 (BxD) = 0.105 (AxBxCxD) = 0.363

Table(6): Effect of spraying date and different concentrations of ethephon and cytophex on Samany fruit length (cm) during 2003 - 2004 seasons .

2003 Season

Spraying date	Sampling Date (days) after pollination	Ethephon (ppm)				Mean	Cytophex (ppm)				Mean	General Mean
		0.0	100	200	300		0.0	20	40	60		
6 days after pollination	113	4.20	4.50	5.03	5.10	4.71	4.20	4.60	4.87	5.20	4.76	4.73
	138	4.50	4.60	5.13	5.30	4.88	4.50	5.03	5.30	4.47	5.19	5.04
	148	4.87	4.97	5.37	5.50	5.17	4.87	5.33	5.60	5.70	5.45	5.31
	Harvest	5.10	5.30	5.57	5.67	5.41	5.10	5.63	5.77	5.83	5.65	5.53
	Mean	4.67	4.84	5.27	5.39	5.04	4.67	5.15	5.38	5.55	5.26	5.15
12 days after pollination	113	4.20	4.63	5.10	5.27	4.80	4.20	4.60	5.10	5.20	4.77	4.78
	138	4.50	4.90	5.40	5.53	5.08	4.50	5.13	5.33	5.63	5.15	5.11
	148	4.87	5.27	5.67	5.77	5.39	4.87	5.33	5.60	5.80	5.40	5.39
	Harvest	5.10	5.67	5.73	5.87	5.59	5.10	5.70	5.83	5.90	5.63	5.61
	Mean	4.67	5.12	5.47	5.61	5.47	4.67	5.19	5.47	5.63	5.49	5.48
18 days after pollination	113	4.20	4.77	5.23	5.40	4.90	4.20	5.03	5.10	5.33	4.91	4.90
	138	4.50	5.37	5.50	5.70	5.27	4.50	5.30	5.53	5.60	5.23	5.25
	148	4.87	5.57	5.67	5.77	5.47	4.87	5.50	5.73	5.80	5.47	5.47
	Harvest	5.10	5.73	5.77	5.90	5.62	5.10	5.87	5.90	5.90	5.69	5.65
	Mean	4.67	5.36	5.54	5.69	5.31	4.67	5.42	5.57	5.66	5.33	5.32
General Mean		4.67	5.11	5.43	5.56	5.19	4.67	5.26	5.47	5.61	5.25	-----

L.S.D at 5% Level for
 Spraying date(A) =0.22 (BxC) =0.036 (AxBxD) =0.026
 Substances(B) =0.018 (AxBxC) = 0.062 (Cx D) = 0.050
 (AxB) = 0.031 Date of Sample(D) = 0.025 (AxCxD) = 0.088
 Concentration (C) = 0.025 (AxD) = 0.044 (BxCxD) = 0.072
 (AxC) = 0.044 (BxD) = 0.036 (AxBxCxD) = 0.124

2004 Season

Spraying date	Sampling Date (days) after pollination	Ethephon (ppm)				Mean	Cytophex (ppm)				Mean	General Mean
		0.0	100	200	300		0.0	20	40	60		
6 days after pollination	113	4.73	4.83	5.00	5.13	4.92	4.73	4.77	5.20	5.47	5.07	4.99
	138	5.17	5.27	5.47	5.63	5.38	5.17	5.33	5.57	5.70	5.47	5.43
	148	5.43	5.50	5.73	5.80	5.62	5.43	5.70	5.80	5.83	5.72	5.67
	Harvest	5.60	5.80	6.00	6.13	5.88	5.60	5.97	6.10	6.10	5.98	5.93
	Mean	5.23	5.35	5.55	5.67	5.45	5.23	5.44	5.67	5.77	5.56	5.51
12 days after pollination	113	4.73	5.17	5.17	5.33	5.10	4.73	5.17	5.30	5.33	5.13	5.11
	138	5.17	5.57	5.67	5.87	5.57	5.17	5.43	5.70	5.77	5.52	5.54
	148	5.43	5.87	5.90	6.10	5.82	5.43	5.53	5.90	5.97	5.71	5.76
	Harvest	5.60	6.07	6.17	6.40	6.06	5.60	5.70	6.20	6.30	5.95	6.00
	Mean	5.23	5.67	5.72	5.92	5.63	5.23	5.46	5.77	5.84	5.57	5.60
18 days after pollination	113	4.73	5.13	5.20	5.23	5.07	4.73	5.27	5.43	5.47	5.22	5.14
	138	5.17	5.47	5.63	5.67	5.48	5.17	5.70	5.77	5.80	5.61	5.54
	148	5.43	5.67	5.80	6.00	5.72	5.43	5.90	5.90	6.00	5.81	5.76
	Harvest	5.60	5.93	6.20	6.33	6.01	5.60	6.10	6.27	6.33	6.07	6.04
	Mean	5.23	5.55	5.71	5.81	5.57	5.23	5.74	5.84	5.90	5.68	5.62
General Mean		5.23	5.52	5.66	5.80	5.55	5.23	5.55	5.76	5.84	5.59	-----

L.S.D at 5% Level for
 Spraying date (A) =0.034 (BxC) =0.056 (AxBxD) = 0.098
 Substances(B) = 0.028 (AxBxC) =0.098 (Cx D) = 0.080
 (AxB) = 0.049 Date of Sample(D) =0.040 (AxCxD) = 0.139
 Concentration (C) =0.040 (AxD) = 0.069 (BxCxD) = 0.113
 (AxC) = 0.069 (BxD) = 0.056 (AxBxCxD) = 0.197

These results were in agreement with Moustafa & Seif (1989) who found that date palm fruit length was increased with ethephon 300 ppm than other treatments.

5-2- Fruit diameter (cm):

Data in table (7) indicated that Samany fruit diameter was affected by ethephon and cytophex at different concentration and dates of application in both seasons. However, spraying with cytophex at the first season was more effective than ethephon in this respect, meanwhile; they were significantly equal at the second season.

Concerning the effect of spraying date, there was an increase in fruit diameter by late spray (18 days after pollination) of cytophex in both seasons.

Concentration of substance produced the greatest effect on Samany fruit diameter in both seasons. 300 ppm of ethephon and 60 ppm of cytophex gave the highest significantly Samany fruit diameter comparing with other concentrations used in both seasons.

Moreover, the interactions between spraying date, tested substances and their concentrations revealed that the greatest diameter at harvest was obtained with 300ppm ethephon sprayed after 12 and 6 days from pollination in the first and second seasons, respectively. Meanwhile, 60 ppm cytophex produced the greatest fruit diameter in both seasons.

The above mentioned results are in the same line with El-Hamady *et al.* (1979) and Bassal & El -Deeb (2003) as they found that ethephon treatments increased fruit diameter of date palm than control.

6- Fruit size (cm³):

Data presented in table (8) indicated that the tested substances at different concentrations and dates of spray significantly affected Samany fruit size in both seasons. However, cytophex was more effective than ethephon in the second season but they were equal in the first season.

Concerning the effect of spraying date, spraying after 12 days of pollination recorded much increase in fruit size in the first season, but spraying after 6 days was better in the second season. Meanwhile, late spray (18 days after pollination) was the best for cytophex in both seasons.

Regarding to the substance concentration, it was clearly noticed that the highest concentration of both substances raised Samany fruit size in both seasons, respectively comparing with other concentrations used.

Moreover the interactions between spraying date, substances, and their concentrations, indicated that the highest Samany fruit size at harvest was produced by 300 ppm ethephon sprayed after 12 or 6 days from pollination in the first and second seasons respectively, and with 60 ppm cytophex sprayed after 12 or 18 days from pollination in both seasons.

The above mentioned results are parallel with El-Hamady (1993), Kamal (1995) and Bassal and El Deeb (2003) with date palm and Notodimedjo (1998) with mango as they found increase in fruit size by spraying these substances.

J. Agric. Sci. Mansoura Univ., 31 (10), October, 2006
Table (7): Effect of spraying date and different concentrations of ethephon and cytophex on Samany fruit diameter (cm) during 2003 - 2004 seasons.

2003 Season

Spraying date	Sampling Date (days) after pollination	Ethephon (ppm)				Mean	Cytophex (ppm)				Mean	General Mean
		0.0	100	200	300		0.0	20	40	60		
6 days after pollination	113	2.43	2.57	2.70	2.93	2.66	2.43	2.77	2.93	3.13	2.81	2.73
	138	2.77	2.87	3.07	3.10	2.95	2.77	3.13	3.23	3.50	3.16	3.05
	148	2.90	3.07	3.27	3.37	3.15	2.90	3.33	3.43	3.60	3.31	3.23
	Harvest	3.20	3.27	3.47	3.50	3.36	3.20	3.53	3.63	3.80	3.54	3.45
Mean		2.82	2.94	3.12	3.22	3.03	2.82	3.19	3.31	3.51	3.21	3.12
12 days after pollination	113	2.43	2.70	2.83	3.10	2.76	2.43	2.87	3.00	3.20	2.86	2.81
	138	2.77	2.90	3.23	3.30	3.05	2.77	3.20	3.40	3.57	3.23	3.14
	148	2.90	3.27	3.43	3.50	3.27	2.90	3.30	3.50	3.73	3.36	3.31
	Harvest	3.20	3.43	3.60	3.70	3.48	3.20	3.50	3.67	3.80	3.54	3.51
Mean		2.82	3.07	3.27	3.40	3.14	2.82	3.21	3.39	3.57	3.25	3.19
18 days after pollination	113	2.43	2.73	2.83	3.20	2.80	2.43	2.83	3.07	3.17	2.87	2.83
	138	2.77	3.13	3.23	3.33	3.11	2.77	3.07	3.47	3.57	3.22	3.16
	148	2.90	3.33	3.43	3.53	3.30	2.90	3.27	3.60	3.77	3.38	3.34
	Harvest	3.20	3.57	3.63	3.63	3.51	3.20	3.47	3.73	3.90	3.57	3.54
Mean		3.22	3.19	3.28	3.42	3.43	3.22	3.16	3.47	3.60	3.51	3.47
General Mean		3.82	3.07	3.23	3.35	3.37	3.82	3.19	3.39	3.56	3.49

L.S.D at 5% Level for

Spraying date(A)	=0.020	(BxC)	=0.032	(AxBxD)	=0.056
Substances(B)	=0.016	(AxBxC)	=0.056	(CxD)	=0.046
(AxB)	=0.028	Date of Sample(D)	=0.023	(AxCxD)	=0.080
Concentration (C)	=0.023	(AxD)	=0.040	(BxCxD)	=0.080
(AxC)	=0.040	(BxD)	=0.032	(AxBxCxD)	=0.065

2004 Season

Spraying date	Sampling Date (days) after pollination	Ethephon (ppm)				Mean	Cytophex (ppm)				Mean	General Mean
		0.0	100	200	300		0.0	20	40	60		
6 days after pollination	113	2.80	2.83	2.97	3.00	2.90	2.80	2.83	2.93	3.00	2.89	2.89
	138	3.20	3.07	3.20	3.37	3.21	3.20	3.03	3.20	3.27	3.17	3.19
	148	3.27	3.23	3.37	3.50	3.34	3.27	3.13	3.30	3.37	3.26	3.30
	Harvest	3.40	3.53	3.57	3.70	3.55	3.40	3.27	3.40	3.53	3.40	3.47
Mean		3.17	3.17	3.27	3.39	3.25	3.17	3.07	3.31	3.29	3.18	3.22
12 days after pollination	113	2.80	3.00	3.07	3.13	3.00	2.80	2.83	2.97	3.00	2.90	2.95
	138	3.20	3.27	3.30	3.37	3.28	3.20	3.30	3.20	3.40	3.27	3.28
	148	3.27	3.37	3.47	3.53	3.41	3.27	3.40	3.30	3.50	3.37	3.39
	Harvest	3.40	3.47	3.57	3.67	3.53	3.40	3.47	3.40	3.67	3.48	3.51
Mean		3.17	3.27	3.35	3.42	3.30	3.17	3.25	3.22	3.39	3.26	3.28
18 days after pollination	113	2.80	2.87	2.97	3.03	2.92	2.80	3.00	3.07	3.07	2.98	2.95
	138	3.20	3.17	3.23	3.27	3.22	3.20	3.30	3.37	3.27	3.28	3.25
	148	3.27	3.27	3.37	3.40	3.33	3.27	3.43	3.50	3.47	3.42	3.37
	Harvest	3.40	3.40	3.50	3.57	3.47	3.40	3.47	3.60	3.67	3.53	3.50
Mean		3.17	3.17	3.27	3.32	3.23	3.17	3.30	3.38	3.37	3.30	3.27
General Mean		3.17	3.21	3.30	3.38	3.26	3.17	3.21	3.27	3.35	3.25

L.S.D at 5% Level for

Spraying date (A)	=0.025	(BxC)	=0.041	(AxBxD)	=0.072
Substances(B)	=0.020	(AxBxC)	=0.072	(CxD)	=0.058
(AxB)	=0.036	Date of Sample(D)	=0.029	(AxCxD)	=0.101
Concentration (C)	=0.029	(AxD)	=0.050	(BxCxD)	=0.083
(AxC)	=0.050	(BxD)	=0.041	(AxBxCxD)	=0.144

Table (8): Effect of spraying date and different concentrations of ethephon and cytophex on Samany fruit size (cm³) during 2003 - 2004 seasons .

2003 Season

Spraying date	Sampling Date (days) after pollination	Ethephon (ppm)				Mean	Cytoplex (ppm)				Mean	General Mean
		0.0	100	200	300		0.0	20	40	60		
6 days after pollination	113	13.33	18.00	18.83	21.17	17.83	13.33	14.33	17.00	18.00	15.66	16.75
	138	18.93	23.97	26.00	28.53	24.36	18.93	22.67	25.67	28.83	24.02	24.19
	148	23.17	27.83	30.67	31.33	28.25	23.17	26.33	28.00	33.17	27.67	27.96
	Harvest	29.17	31.67	33.00	34.50	32.08	29.17	31.50	32.17	36.67	32.38	32.23
Mean		21.15	25.37	27.13	28.88	25.63	21.15	23.71	25.71	29.17	24.93	25.28
12 days after pollination	113	13.33	19.83	21.00	23.17	19.33	13.33	17.67	20.17	21.17	18.08	18.71
	138	18.93	28.00	29.67	30.67	26.82	18.93	24.50	28.47	30.33	25.56	26.19
	148	23.17	31.50	32.67	34.33	30.42	23.17	29.00	31.00	34.00	29.29	29.86
	Harvest	29.17	34.67	35.67	38.00	34.38	29.17	33.13	34.00	37.00	33.32	33.85
Mean		21.15	28.50	29.75	31.54	27.73	21.15	26.08	28.41	30.63	26.57	27.15
18 days after pollination	113	13.33	16.00	16.00	17.33	15.66	13.33	17.17	18.33	19.33	17.04	16.35
	138	18.93	24.67	24.00	27.67	23.82	18.93	27.00	27.83	28.83	25.65	24.73
	148	23.17	29.00	29.33	33.67	28.79	23.17	29.80	30.67	31.83	28.87	28.83
	Harvest	29.17	33.00	33.83	37.00	33.25	29.17	33.00	34.33	36.67	33.29	33.27
Mean		21.15	25.67	25.79	28.92	25.38	21.15	26.74	27.79	29.17	26.21	25.80
General Mean		21.15	26.51	27.56	29.78	26.25	21.15	25.51	27.30	29.65	25.90	-----

L.S.D at 5% Level for

Spraying date(A)	=0.415	(BxC)	=0.678	(AxBxD)	=1.17
Substances(B)	=0.339	(AxBxC)	=1.17	(Cx D)	=0.959
(AxB)	=0.587	Date of Sample(D)	=0.479	(AxCxD)	=0.166
Concentration (C)	=0.479	(AxD)	=0.831	(BxCxD)	=1.35
(AxC)	=0.831	(BxD)	=0.678	(AxBxCxD)	=2.35

2004 Season

Spraying date	Sampling Date (days) after pollination	Ethephon (ppm)				Mean	Cytoplex (ppm)				Mean	General Mean
		0.0	100	200	300		0.0	20	40	60		
6 days after pollination	113	20.00	24.00	24.00	26.00	23.50	20.00	22.00	22.67	23.67	22.08	22.79
	138	27.00	27.00	30.00	28.67	28.17	27.00	26.00	27.67	27.83	27.12	27.65
	148	29.00	30.00	33.67	34.00	31.67	29.00	29.00	30.00	31.00	29.75	30.71
	Harvest	31.67	32.50	31.00	39.67	33.71	31.67	31.33	32.33	34.33	32.41	33.06
Mean		26.92	28.38	29.67	32.08	29.26	26.92	27.08	28.17	29.21	27.84	28.56
12 days after pollination	113	20.00	25.00	26.00	24.33	23.83	20.00	22.00	23.67	24.83	22.62	23.23
	138	27.00	30.00	32.00	30.67	29.92	27.00	28.00	29.33	30.83	28.79	29.35
	148	29.00	30.83	34.00	35.00	32.21	29.00	32.00	32.00	33.00	31.50	31.85
	Harvest	31.67	32.33	36.67	37.33	34.50	31.67	33.67	34.67	36.00	34.00	34.25
Mean		26.92	29.54	32.17	32.33	30.24	26.92	28.92	29.92	31.17	29.23	29.74
18 days after pollination	113	20.00	20.67	23.00	26.33	22.50	20.00	22.00	24.00	26.00	23.00	22.75
	138	27.00	27.00	28.00	30.00	28.00	27.00	29.17	29.67	32.00	29.46	28.73
	148	29.00	28.00	29.50	31.33	29.46	29.00	30.00	33.67	35.17	31.96	30.71
	Harvest	31.67	30.00	31.00	34.00	31.67	31.67	34.00	35.33	37.00	34.50	33.08
Mean		26.92	26.42	27.88	30.42	27.91	26.92	28.79	30.67	32.54	29.73	28.82
General Mean		26.92	28.11	29.90	31.61	29.13	26.92	28.26	29.58	30.97	28.93	-----

L.S.D at 5% Level for

Spraying date (A)	=0.276	(BxC)	=0.450	(AxBxD)	=0.780
Substances(B)	=0.225	(AxBxC)	=0.780	(Cx D)	=0.637
(AxB)	=0.390	Date of Sample(D)	=0.318	(AxCxD)	=1.10
Concentration (C)	=0.318	(AxD)	=0.552	(BxCxD)	=0.901
(AxC)	=0.552	(BxD)	=0.450	(AxBxCxD)	=1.56

7- Fruit firmness (kg/cm³):

Data in table (9) indicated that Samany fruit firmness was significantly not affected by different concentrations of ethephon and cytophex at different concentration and dates of application in the first season. Meanwhile in the second season there were significant reduction due to spraying of both chemicals specially at high concentration (200 and 300 ppm of ethephon or 40 and 60 ppm of cytophex) at early spraying date (6 days after pollination) and all tested concentrations when sprayed at 12 or 18 days after pollination.

Regarding to the substances under study, ethephon resulted in lower Samany fruit firmness in both seasons compared with cytophex, but differences between them were insignificant.

Concerning the interaction between spraying dates, substance, and their concentrations; 300 ppm of ethephon and 60 ppm cytophex sprayed at 18 days after pollination in the 1st and 2nd seasons gave the lowest Samany fruit firmness, respectively; comparing with other interactions.

These results are in agreement with El-Azzouni *et al.* (1975) who found that spraying ethephon on date palm fruits at 250 ppm reduced the fruit firmness of Samany and Zaghoul cvs.

8- Fruit content of TSS %:

Samany fruit content of TSS was significantly affected by different concentrations of ethephon and cytophex at different dates of spraying in both seasons (Table, 10). However, ethephon was significantly more effective in this concern than cytophex in the two seasons.

Concerning the effect of spraying dates the two substances under study spraying after 18 days of pollination recorded increasing in Samany fruit content of TSS % than other spraying dates in the two seasons.

Regarding the tested concentrations, it was clearly noticed that the highest concentration of both substances produced the highest Samany fruit content of TSS in both seasons comparing with other concentrations used.

In addition, the interaction between spraying date, substance and their concentrations indicated that 300 ppm of ethephon sprayed at 18 days after pollination in both seasons gave the highest TSS of Samany fruits (28.03 and 29.37%) comparing with other interactions. Also, 60 ppm of cytophex sprayed after 12 and 18 days from pollination in the first and second seasons produced the highest Samany fruit content of TSS (26.74and 29.63%, respectively) comparing with other interactions.

These results are in agreement with El-Azzouni (1975), Kamal (1995) and Bassl and El Deeb (2003) as they found that date palm fruit TSS were increased with ethephon treatments than control. Also in mango Notodimedjo (1998) found that cytophex application increased fruit TSS%.

9- Fruit content of total soluble sugars (%):

Table (11) cleared that Samany fruit content of total soluble sugars was significantly increased by different concentrations of ethephon and cytophex at different dates in both seasons. Ethephon produced the highest Samany fruit content of total soluble sugars than cytophex in the first seasons, while; the opposite was true in the second season.

Bakr, E. I. et al.

Table (9): Effect of spraying date and different concentrations of ethephon and cytophex on Samany fruit firmness (kg/cm²) during 2003 - 2004 seasons.

2003 Season

Spraying date	Sampling Date (days) after pollination	Ethephon (ppm)				Mean	Cytophex (ppm)				Mean	General Mean
		0.0	100	200	300		0.0	20	40	60		
6 days after pollination	113	7.33	7.20	7.03	6.73	7.07	7.33	7.13	7.10	7.03	7.15	7.11
	138	7.00	6.63	6.53	6.40	6.64	7.00	6.50	6.53	6.40	6.61	6.62
	148	6.47	6.40	6.23	6.20	6.32	6.47	6.53	6.43	6.33	6.44	6.38
	Harvest	6.27	6.23	6.20	6.10	6.20	6.27	6.30	6.23	6.20	6.25	6.22
	Mean	6.77	6.62	6.50	6.36	6.56	6.77	6.62	6.57	6.49	6.61	6.59
12 days after pollination	113	7.33	7.10	6.90	6.73	7.01	7.33	7.20	7.10	7.07	7.20	7.10
	138	7.00	6.57	6.73	6.63	6.73	7.00	6.53	6.40	6.37	6.57	6.65
	148	6.47	6.40	6.27	6.13	6.32	6.47	6.33	6.23	6.10	6.28	6.30
	Harvest	6.27	6.20	6.10	6.07	6.16	6.27	6.37	6.30	6.20	6.28	6.22
	Mean	6.77	6.57	6.50	6.39	6.55	6.77	6.61	6.51	6.43	6.58	6.57
18 days after pollination	113	7.33	7.17	6.83	6.70	7.00	7.33	7.07	7.07	7.03	7.12	7.06
	138	7.00	6.53	6.50	6.40	6.61	7.00	6.53	6.33	6.23	6.52	6.57
	148	6.47	6.30	6.17	6.03	6.24	6.47	6.27	6.10	6.13	6.24	6.24
	Harvest	6.27	6.17	6.07	5.97	6.12	6.27	6.07	6.20	6.13	6.17	6.14
	Mean	6.77	6.54	6.39	6.27	6.49	6.77	6.48	6.42	6.38	6.51	6.50
General Mean		6.77	6.57	6.46	6.34	6.54	6.77	6.57	6.50	6.44	6.57	-----

L.S.D at 5% Level for

Spraying date (A)	=0.037	(BxC)	=0.600	(AxBxD)	=0.105
Substances (B)	=0.030	(AxBxC)	=0.105	(Cx D)	=0.085
(AxB)	=0.048	Date of Sample (D)	=0.042	(AxCxD)	=0.148
Concentration (C)	=0.042	(AxD)	=0.074	(BxCxD)	=0.121
(AxC)	=0.074	(BxD)	=0.060	(AxBxCxD)	=0.210

2004 Season

Spraying date	Sampling Date (days) after pollination	Ethephon (ppm)				Mean	Cytophex (ppm)				Mean	General Mean
		0.0	100	200	300		0.0	20	40	60		
6 days after pollination	113	7.07	6.90	6.63	6.57	6.79	7.07	7.00	6.90	6.77	6.97	6.88
	138	6.83	6.50	6.40	6.30	6.51	6.83	6.63	6.50	6.37	6.58	6.55
	148	6.40	6.40	6.30	6.07	6.29	6.40	6.40	6.30	6.03	6.32	6.30
	Harvest	6.33	6.27	6.10	6.00	6.17	6.33	6.23	6.07	5.83	6.12	6.15
	Mean	6.66	6.52	6.36	6.23	6.44	6.66	6.57	6.44	6.25	6.50	6.47
12 days after pollination	113	7.07	6.73	6.57	6.50	6.72	7.07	6.93	6.87	6.67	6.88	6.80
	138	6.83	6.37	6.30	6.20	6.42	6.83	6.63	6.60	6.43	6.59	6.50
	148	6.40	6.20	6.00	5.93	6.13	6.40	6.47	6.40	6.27	6.62	6.37
	Harvest	6.33	6.00	5.77	5.70	5.95	6.33	6.20	6.17	5.97	6.17	6.06
	Mean	6.66	6.32	6.16	6.08	6.30	6.66	6.56	6.51	6.33	6.56	6.43
18 days after pollination	113	7.07	6.93	6.63	6.40	6.76	7.07	6.83	6.80	6.53	6.81	6.78
	138	6.83	6.43	6.37	6.17	6.45	6.83	6.33	6.33	5.97	6.36	6.40
	148	6.40	6.07	6.00	5.70	6.04	6.40	5.97	5.83	5.53	5.93	5.98
	Harvest	6.33	5.97	5.87	5.63	5.95	6.33	5.90	5.83	5.43	5.87	5.91
	Mean	6.66	6.36	6.22	5.97	6.30	6.66	6.26	6.17	5.87	6.24	6.27
General Mean		6.66	6.40	6.24	6.10	6.35	6.66	6.46	6.37	6.15	6.43	6.39

L.S.D at 5% Level for

Spraying date (A)	=0.027	(BxC)	=0.044	(AxBxD)	=0.076
Substances (B)	=0.022	(AxBxC)	=0.076	(Cx D)	=0.062
(AxB)	=0.038	Date of Sample (D)	=0.031	(AxCxD)	=0.108
Concentration (C)	=0.031	(AxD)	=0.054	(BxCxD)	=0.088
(AxC)	=0.054	(BxD)	=0.044	(AxBxCxD)	=0.152

Table (10): Effect of spraying date and different concentrations of ethephon and cytophex on Samany fruit TSS content(%) during 2003 - 2004 seasons.

2003 Season

Spraying date	Sampling Date (days) after pollination	Ethephon (ppm)				Mean	Cytophex (ppm)				Mean	General Mean
		0.0	100	200	300		0.0	20	40	60		
6 days after pollination	113	12.13	13.00	14.00	14.93	13.52	12.13	12.73	14.07	15.27	13.53	13.58
	138	17.07	18.67	20.27	24.33	20.08	17.07	18.07	20.13	22.37	19.41	19.74
	148	22.60	25.87	27.33	28.97	26.19	22.60	22.17	26.00	26.47	24.31	25.25
	Harvest	26.87	33.20	36.67	36.97	33.42	26.87	31.33	33.00	35.13	31.58	32.50
Mean		19.67	22.68	24.57	26.30	23.30	19.67	21.08	23.30	24.81	22.21	20.94
12 days after pollination	113	12.13	14.00	15.07	18.33	14.88	12.13	13.47	15.10	15.87	14.14	14.51
	138	17.07	19.20	20.00	24.47	20.18	17.07	18.73	20.00	22.90	19.67	19.92
	148	22.60	24.07	24.30	28.00	24.74	22.60	23.00	24.67	28.87	24.78	24.76
	Harvest	26.87	33.47	34.93	37.93	33.30	26.87	31.13	31.87	39.33	32.30	32.80
Mean		19.67	22.68	23.58	27.18	23.28	19.67	21.58	22.91	26.74	22.72	23.00
18 days after pollination	113	12.13	15.20	16.33	18.67	15.58	12.13	13.73	15.00	16.23	14.27	14.92
	138	17.07	20.33	21.60	22.87	20.47	17.07	19.80	21.33	24.33	20.63	20.55
	148	22.60	25.53	27.27	30.07	26.37	22.60	24.33	26.67	29.00	25.65	26.01
	Harvest	26.87	35.53	36.80	40.53	34.93	26.87	31.33	35.00	35.40	32.13	33.54
Mean		19.67	24.15	25.50	28.03	24.34	19.67	22.30	24.50	26.24	23.18	23.76
General Mean		19.67	23.17	24.55	27.17	23.64	19.67	21.65	23.57	25.93	22.70	-----

L.S.D at 5% Level for

Spraying date(A)	=0.251	(BxC)	=0.410	(AxBxD)	=0.710
Substances(B)	=0.205	(AxBxC)	=0.710	(CxD)	=0.580
(AxB)	=0.355	Date of Sample(D)	=0.290	(AxCxD)	=1.00
Concentration (C)	=0.290	(AxD)	=0.502	(BxCxD)	=0.820
(AxC)	=0.502	(BxD)	=0.410	(AxBxCxD)	=1.42

2004 Season

Spraying date	Sampling Date (days) after pollination	Ethephon (ppm)				Mean	Cytophex (ppm)				Mean	General Mean
		0.0	100	200	300		0.0	20	40	60		
6 days after pollination	113	12.27	13.63	14.33	17.60	14.46	12.27	14.13	14.97	16.40	14.44	14.45
	138	17.47	18.97	20.70	24.53	20.42	17.47	20.57	22.40	23.27	20.93	20.67
	148	21.00	25.47	26.40	31.27	26.03	21.00	25.80	27.73	29.00	25.88	25.95
	Harvest	25.00	34.63	36.00	39.30	33.73	25.00	32.83	33.97	38.40	32.55	33.14
Mean		18.93	23.17	24.36	28.18	23.66	18.93	23.33	24.77	26.77	23.45	23.55
12 days after pollination	113	12.27	14.13	15.37	18.47	16.31	12.27	14.20	16.00	17.40	14.97	15.64
	138	17.47	21.87	23.60	27.13	22.52	17.47	20.47	23.13	25.93	21.75	22.13
	148	21.00	26.90	29.97	32.00	27.47	21.00	26.47	28.27	29.87	26.40	26.94
	Harvest	25.00	35.27	38.17	40.07	34.63	25.00	33.47	36.73	37.93	33.28	33.96
Mean		18.93	24.54	26.77	29.42	24.91	18.93	23.65	26.03	27.78	24.10	24.50
18 days after pollination	113	12.27	13.53	16.47	18.90	15.29	12.27	15.73	17.27	18.43	15.92	15.61
	138	17.47	22.87	23.27	27.17	22.69	17.47	23.33	26.40	28.40	23.90	23.29
	148	21.00	28.87	28.80	31.07	27.43	21.00	28.40	29.67	32.23	27.82	27.63
	Harvest	25.00	36.50	37.13	40.33	34.74	25.00	34.13	36.53	39.43	33.77	34.26
Mean		18.93	25.44	26.42	29.37	25.04	18.93	25.40	27.47	29.63	25.36	25.20
General Mean		18.93	24.39	25.85	28.99	24.54	18.93	24.13	26.09	28.06	24.30	-----

L.S.D at 5% Level for

Spraying date(A)	=0.306	(BxC)	=0.490	(AxBxD)	=0.849
Substances(B)	=0.245	(AxBxC)	=0.849	(CxD)	=0.693
(AxB)	=0.424	Date of Sample(D)	=0.346	(AxCxD)	=1.20
Concentration (C)	=0.346	(AxD)	=0.600	(BxCxD)	=0.981
(AxC)	=0.600	(BxD)	=0.490	(AxBxCxD)	=1.69

Table (11): Effect of spraying date and different concentrations of ethephon and cytophex on Samany fruit total soluble sugars content (%) during 2003 - 2004 seasons.

2003 Season

Spraying date	Sampling Date (days) after pollination	Ethephon (ppm)				Mean	Cytophex (ppm)				Mean	General Mean
		0.0	100	200	300		0.0	20	40	60		
6 days after pollination	113	14.50	16.24	17.65	22.40	17.70	14.50	15.34	17.32	24.99	18.04	17.87
	138	17.49	19.24	22.60	26.59	21.48	17.49	18.74	22.26	28.05	21.64	21.56
	148	24.18	27.49	30.75	31.29	28.43	24.18	27.07	31.02	33.02	28.82	28.63
	Harvest	31.21	38.02	39.27	40.21	37.17	31.21	34.39	38.64	40.82	36.26	36.72
Mean		21.84	25.25	27.57	30.12	26.20	21.84	23.89	27.31	31.72	26.19	26.19
12 days after pollination	113	14.50	16.44	21.65	22.64	18.81	14.50	15.78	20.64	23.15	18.52	18.66
	138	17.49	20.32	25.03	26.06	22.22	17.49	20.38	23.60	27.22	22.17	22.20
	148	24.18	28.53	32.48	32.27	29.36	24.18	27.43	26.78	34.59	28.34	28.80
	Harvest	31.21	38.90	39.63	43.32	38.26	31.21	36.41	40.75	42.45	37.70	37.98
Mean		21.84	26.05	29.70	31.07	27.16	21.84	25.00	27.94	31.86	26.66	27.13
18 days after pollination	113	14.50	19.09	22.05	25.91	20.39	14.50	18.90	22.42	26.75	20.64	20.52
	138	17.49	22.25	24.11	26.40	22.56	17.49	21.22	25.33	30.79	23.71	23.13
	148	24.18	26.58	34.75	33.72	29.81	24.18	24.26	29.44	33.73	27.90	28.86
	Harvest	31.21	40.55	42.50	44.28	39.63	31.21	40.05	41.98	45.00	39.56	39.59
Mean		21.84	27.12	30.85	32.58	28.10	21.84	26.11	29.79	34.07	27.95	28.03
General Mean		21.84	26.14	29.37	31.26	27.15	21.84	25.00	28.35	32.55	26.93	-----

L.S.D at 5% Level for

Spraying date (A)	=0.432 (BxC)	=0.706 (AxBxD)	=1.22
Substances (B)	=0.353 (AxBxC)	=1.22 (CxD)	=0.998
(AxB)	=0.611 Date of Sample (D)	=0.499 (AxCxD)	=1.73
Concentration (C)	=0.499 (AxD)	=0.865 (BxCxD)	=1.41
(AxC)	=0.865 (BxD)	=0.706 (AxBxCxD)	=2.44

2004 Season

Spraying date	Sampling Date (days) after pollination	Ethephon (ppm)				Mean	Cytophex (ppm)				Mean	General Mean
		0.0	100	200	300		0.0	20	40	60		
6 days after pollination	113	15.08	16.63	18.67	23.14	18.38	15.08	16.94	19.31	25.15	19.12	18.75
	138	18.33	19.43	24.29	27.22	22.32	18.33	19.58	24.57	28.15	22.65	22.49
	148	25.51	29.26	31.15	32.53	29.61	25.51	29.96	28.88	33.15	29.37	29.49
	Harvest	33.17	38.06	39.03	40.06	37.58	33.17	39.67	38.64	40.94	38.10	37.84
Mean		23.02	25.85	28.29	30.74	26.97	23.02	26.53	27.85	31.85	27.31	27.14
12 days after pollination	113	15.08	16.82	21.40	21.90	18.80	15.08	19.72	22.38	23.68	20.71	19.51
	138	18.33	20.73	25.53	25.51	22.52	18.33	23.70	24.31	27.89	23.56	23.04
	148	25.51	28.21	33.88	33.28	30.22	25.51	28.80	28.21	34.93	29.36	29.79
	Harvest	33.17	40.24	39.11	43.19	38.93	33.17	41.61	41.73	43.78	40.07	39.50
Mean		23.02	26.50	29.98	30.97	27.62	23.02	28.46	29.16	32.57	28.30	27.96
18 days after pollination	113	15.08	19.39	22.39	26.30	20.79	15.08	21.41	22.81	27.23	21.63	21.21
	138	18.33	23.15	26.00	27.56	23.71	18.33	23.88	26.50	30.13	24.71	24.21
	148	25.51	28.88	35.10	34.66	31.03	25.51	28.85	30.22	34.45	29.76	30.39
	Harvest	33.17	41.24	41.55	45.00	40.24	33.17	42.14	43.20	45.50	41.00	40.62
Mean		23.02	28.17	31.26	33.33	28.94	23.02	29.07	30.68	34.33	29.27	29.11
General Mean		23.02	26.84	29.84	31.68	27.84	23.02	28.02	29.23	32.92	28.30	-----

L.S.D at 5% Level for

Spraying date (A)	=0.427 (BxC)	=0.697 (AxBxD)	=1.20
Substances (B)	=0.348 (AxBxC)	=1.20 (CxD)	=0.936
(AxB)	=0.604 Date of Sample (D)	=0.493 (AxCxD)	=1.70
Concentration (C)	=0.493 (AxD)	=0.854 (BxCxD)	=1.39
(AxC)	=0.854 (BxD)	=0.697 (AxBxCxD)	=2.41

Concerning the effect of spraying date, the results indicated that spraying at 18 days of pollination recorded the significant highest increases in Samany fruit content of total soluble sugars (28.03%) followed by spraying at 12 and 6 days after pollination (27.13 and 26.19, respectively) in the first season. This trend was also found in the second season with the two chemicals under study.

Regarding to substance concentration, it was clearly noticed that the highest concentration of both substances raised Samany fruit content of total soluble sugars in both seasons. 300 ppm of ethephon and 60 ppm of cytophex gave the highest Samany fruit content of total soluble sugars in both seasons (31.26 & 31.68% and 32.55 & 32.92%, respectively).

The interaction between spraying date, substance and their concentrations revealed that 300 ppm of ethephon or 60 ppm of cytophex sprayed at 18 days after pollination in the both seasons gave the highest Samany fruit content of total sugars comparing with other interactions used.

10- Fruit content of reducing sugars (%):

Samany fruit content of reducing sugars was significantly increased due to different concentrations of ethephon and cytophex spraying at different dates in both seasons (Table, 12).

Ethephon treatments produced Samany fruit with the highest content of reducing sugars than cytophex treatments.

Concerning the effect of spraying dates, application of both chemicals after 18 days of pollination recorded significant increase in Samany fruit content of reducing sugars (2.89%) followed by 12 then 6 days after pollination in the first season. This trend was found in the second season.

Regarding to substance concentrations, it was clearly noticed that the highest level of both substances (300 ppm ethephon and 60 ppm cytophex) raised Samany fruit content of reducing sugars in both seasons, comparing with other concentrations used.

Moreover, the interactions between spraying dates, substances and their concentrations revealed that the highest Samany fruit contents of reducing sugars at harvest were produced by 300ppm ethephon or 60 ppm cytophex sprayed after 18 days from pollination in the first and second seasons.

These results are in agreement with El-Hamady *et al.* (1979), Mohammed *et al.* (1986); Moustafa and seif (1989); Kamal (1995) and Bassal and El-Deeb (2003) as they found that date palm fruit content of total and reducing sugars were increased than control.

11- Fruit content of non-reducing sugars %:

Non-reducing sugars of Samany fruits was significantly increased by different concentrations of ethephon and cytophex spraying at different dates during development in both season (Table, 13).

Respecting to the effect of substances, ethephon gave the highest content of non reducing sugars than cytophex (24.69% and 24.31%, respectively) with significant effect between them in the two seasons.

Table (12): Effect of spraying date and different concentrations of ethephon and cytophex on Samany fruit reducing sugars content (%) during 2003 - 2004 seasons.

2003 Season

Spraying date	Sampling Date (days) after pollination	Ethephon (ppm)					Mean	Cytophex (ppm)				Mean	General Mean
		0.0	100	200	300	0.0		20	40	60			
6 days after pollination	113	0.94	1.27	1.56	1.78	1.39	0.94	1.21	1.52	1.72	1.35	1.37	
	138	1.28	1.46	1.99	2.27	1.75	1.28	1.39	1.96	2.17	1.70	1.72	
	148	2.09	2.42	2.98	3.22	2.68	2.09	2.32	2.84	2.98	2.56	2.62	
	Harvest	3.94	4.67	4.79	5.18	4.64	3.94	4.37	4.73	4.83	4.46	4.55	
Mean		2.06	2.45	2.83	3.11	2.61	2.06	2.32	2.76	2.93	2.52	2.56	
12 days after pollination	113	0.94	1.35	1.85	1.93	1.52	0.94	1.28	1.81	1.94	1.49	1.50	
	138	1.28	1.57	2.58	2.75	2.05	1.28	1.49	2.52	2.71	2.00	2.02	
	148	2.09	2.69	3.39	3.62	2.95	2.09	2.61	3.35	3.82	2.96	2.95	
	Harvest	3.94	4.75	4.96	5.43	4.77	3.94	4.33	4.40	5.11	4.44	4.60	
Mean		2.06	2.59	3.20	3.43	2.82	2.06	2.43	3.02	3.40	2.73	2.77	
18 days after pollination	113	0.94	1.47	1.82	2.09	1.58	0.94	1.49	1.73	2.13	1.57	1.57	
	138	1.28	1.63	2.64	2.90	2.11	1.28	1.67	2.58	2.89	2.11	2.11	
	148	2.09	2.73	3.61	3.68	3.03	2.09	3.25	3.57	3.82	3.18	3.10	
	Harvest	3.94	4.92	5.29	5.63	4.94	3.94	4.38	4.85	5.41	4.65	4.79	
Mean		2.06	2.70	3.34	3.57	2.91	2.06	2.70	3.18	3.56	2.88	2.89	
General Mean		2.06	2.58	3.12	3.37	2.78	2.06	2.48	2.99	3.29	2.70	

L.S.D at 5% Level for

Spraying date(A)	=0.039	(BxC)	=0.064	(AxBxD)	=0.111
Substances(B)	=0.032	(AxBxC)	=0.111	(CxD)	=0.090
(AxB)	=0.055	Date of Sample(D)	=0.045	(AxCxD)	=0.157
Concentration (C)	=0.045	(AxD)	=0.078	(BxCxD)	=0.128
(AxC)	=0.078	(BxD)	=0.064	(AxBxCxD)	=0.222

2004 Season

Spraying date	Sampling Date (days) after pollination	Ethephon (ppm)					Mean	Cytophex (ppm)				Mean	General Mean
		0.0	100	200	300	0.0		20	40	60			
6 days after pollination	113	1.06	1.40	2.30	2.41	1.79	1.06	1.28	2.23	2.49	1.76	1.77	
	138	1.39	1.71	2.74	2.88	2.18	1.39	1.52	2.64	2.92	2.12	2.15	
	148	2.64	3.11	3.74	4.17	3.42	2.64	3.02	3.67	4.23	3.39	3.40	
	Harvest	5.36	5.85	6.81	7.05	6.27	5.36	5.79	6.352	6.95	6.16	6.21	
Mean		2.61	3.02	3.90	4.13	3.41	2.61	2.90	3.76	4.15	3.36	3.38	
12 days after pollination	113	1.06	1.48	2.35	2.48	1.84	1.06	1.34	2.24	2.69	1.83	1.83	
	138	1.39	1.80	2.94	3.20	2.33	1.39	1.62	2.78	2.95	2.18	2.25	
	148	2.64	3.22	4.19	4.68	3.68	2.64	3.44	3.88	4.25	3.55	3.61	
	Harvest	5.36	6.02	7.40	7.68	6.61	5.36	5.82	6.89	7.11	6.29	6.45	
Mean		2.61	3.13	4.22	4.51	3.62	2.61	3.05	3.95	4.25	3.47	3.54	
18 days after pollination	113	1.06	1.84	2.74	2.77	2.10	1.06	1.66	2.78	2.94	2.11	2.10	
	138	1.39	2.36	2.94	3.37	2.52	1.39	1.85	3.36	3.52	2.53	2.52	
	148	2.64	3.36	4.42	4.84	3.82	2.64	3.96	4.63	4.74	3.99	3.90	
	Harvest	5.36	6.45	7.51	8.14	6.87	5.36	6.38	7.08	7.25	6.52	6.69	
Mean		2.61	3.50	4.41	4.78	3.83	2.61	3.46	4.46	4.61	3.79	3.81	
General Mean		2.61	3.22	4.17	4.47	3.62	2.61	3.14	4.06	4.34	3.54	

L.S.D at 5% Level for

Spraying date (A)	=0.043	(BxC)	=0.070	(AxBxD)	=0.122
Substances(B)	=0.035	(AxBxC)	=0.122	(CxD)	=0.099
(AxB)	=0.061	Date of Sample(D)	=0.049	(AxCxD)	=0.017
Concentration (C)	=0.049	(AxD)	=0.086	(BxCxD)	=0.141
(AxC)	=0.086	(BxD)	=0.070	(AxBxCxD)	=0.244

Table (13): Effect of spraying date and different concentrations of ethephon and cytophex on Samany fruit non-reducing sugar content (%) during 2003 - 2004 seasons.

2003 Season

Spraying date	Sampling Date (days) after pollination	Ethephon (ppm)				Mean	Cytophex (ppm)				Mean	General Mean
		0.0	100	200	300		0.0	20	40	60		
6 days after pollination	113	13.55	14.06	15.76	23.21	16.65	13.55	15.03	16.14	20.68	16.33	16.50
	138	16.21	17.35	20.26	25.19	19.75	16.21	17.85	20.64	24.42	19.78	19.76
	148	22.09	24.66	28.04	29.79	26.15	22.09	25.17	27.91	28.31	25.87	26.01
	Harvest	27.27	29.72	33.85	35.64	31.62	27.27	33.65	34.54	35.38	32.71	32.16
Mean		19.78	21.45	24.48	28.46	23.54	19.78	22.93	24.81	27.20	23.68	23.61
12 days after pollination	113	13.55	14.42	18.79	21.22	17.00	13.55	15.17	19.84	20.70	17.32	17.16
	138	16.21	18.81	21.01	24.47	20.13	16.21	18.82	22.51	23.37	20.23	20.18
	148	22.09	24.75	23.39	30.97	25.30	22.09	25.93	29.13	28.46	26.40	25.85
	Harvest	27.27	31.66	35.79	37.02	32.94	27.27	34.47	35.24	38.20	33.82	33.38
Mean		19.78	22.41	24.75	28.42	23.84	19.78	23.62	26.68	27.68	24.44	24.14
18 days after pollination	113	13.55	17.43	20.60	24.67	19.06	13.55	17.60	20.31	23.78	18.81	18.93
	138	16.21	19.59	22.69	27.89	21.60	16.21	20.58	21.53	23.51	20.46	21.03
	148	22.09	21.53	25.83	30.05	24.87	22.09	23.34	31.18	29.90	26.63	25.75
	Harvest	27.27	35.13	36.70	39.37	34.62	27.27	32.10	37.65	38.87	33.97	34.29
Mean		19.78	23.42	26.45	30.49	25.04	19.78	23.41	27.67	29.01	24.97	25.00
General Mean		19.78	22.43	25.23	29.12	24.14	19.78	23.32	26.39	27.96	24.36	-----

L.S.D at 5% Level for

Spraying date (A)	=0.487	(BxC)	=0.796	(AxBxD)	=1.37
Substances (B)	=N.S	(AxBxC)	=1.37	(Cx D)	=1.12
(AxB)	=0.689	Date of Sample (D)	=0.563	(AxCxD)	=1.95
Concentration (C)	=0.563	(AxD)	=0.975	(BxCxD)	=1.59
(AxC)	=0.975	(BxD)	=0.796	(AxBxCxD)	=2.76

2004 Season

Spraying date	Sampling Date (days) after pollination	Ethephon (ppm)				Mean	Cytophex (ppm)				Mean	General Mean
		0.0	100	200	300		0.0	20	40	60		
6 days after pollination	113	14.02	15.54	17.00	22.74	17.33	14.02	15.35	16.44	20.65	16.62	16.97
	138	16.94	17.86	21.82	25.27	20.47	16.94	17.91	21.66	24.30	20.20	20.33
	148	22.87	26.85	25.14	28.97	25.96	22.87	26.23	27.48	28.30	26.22	26.09
	Harvest	27.81	33.82	31.85	33.89	31.84	27.81	32.27	32.51	33.11	31.43	31.63
Mean		20.41	23.52	23.95	27.72	23.90	20.41	22.94	24.52	26.59	23.62	23.76
12 days after pollination	113	14.02	18.24	20.04	21.20	18.38	14.02	15.48	19.16	19.21	16.97	17.67
	138	16.94	21.89	21.37	24.70	21.22	16.94	19.12	22.75	22.55	20.34	20.78
	148	22.87	25.63	24.01	30.25	25.69	22.87	24.77	30.00	29.03	26.67	26.18
	Harvest	27.81	36.12	34.34	36.21	33.62	27.81	34.41	32.22	36.08	32.63	33.12
Mean		20.41	25.47	24.94	28.09	24.73	20.41	23.44	26.03	26.72	24.15	24.44
18 days after pollination	113	14.02	19.57	20.06	24.46	19.53	14.02	17.73	19.61	23.45	18.70	28.88
	138	16.94	21.52	23.56	26.76	22.19	16.94	21.31	22.63	23.94	21.20	21.69
	148	22.87	25.49	25.80	29.61	25.94	22.87	24.93	30.57	29.92	27.07	26.50
	Harvest	27.81	35.69	35.68	37.36	34.13	27.81	34.86	34.48	37.75	33.72	33.92
Mean		20.41	25.57	26.28	29.55	25.45	20.41	24.70	26.82	28.76	25.17	25.31
General Mean		20.41	24.85	25.05	28.45	24.69	20.41	23.70	25.79	27.36	24.31	-----

L.S.D at 5% Level for

Spraying date (A)	=0.425	(BxC)	=0.694	(AxBxD)	=1.20
Substances (B)	=0.347	(AxBxC)	=1.20	(Cx D)	=0.982
(AxB)	=0.601	Date of Sample (D)	=0.490	(AxCxD)	=1.70
Concentration (C)	=0.490	(AxD)	=0.850	(BxCxD)	=1.38
(AxC)	=0.850	(BxD)	=0.694	(AxBxCxD)	=2.40

