RESULTS AND DISCUSSION

I - Pollination and growth regulators applications studies

1 - The effects on Washington navel orange

a) effect of different pollination treatments and some growth regulators on fruit set, remaining fruits after June drop and mature fruits in the Washington navel orange variety.

Data in Tables (1),(2) and (3) and figures (1), (2) and (3) show the fruit set percent, remaining fruits after June drop and yield of Washington navel orange trees as affected by bagging only, emasculation and bagging, artificial cross-pollination with Balady lime, Marsh grapefruit, Balady mandarin and Suckarry orange pollens and some growth regulators treatments during 1985,1986 and 1987 seasons. It is clear from the Tables and figures that both bagging only and emasculation and bagging treatments gave the lowest percentages of fruit set, remaining fruits after June drop and fruits remained to maturity (yield). The very low fruit set in bagging only and emasculation and bagging treatments is evidently due to the lack of functional pollen for selfing in this variety (Frost 1943). Bagging or emasculation of flowers could also exert a harmful effect on fruit set. However,

fruit set occured under the emasculation and bagging treatment is evidently due to the ability of this variety to set fruits parthenocarpically which is in agreement with the findings of EL-Tomi (1957) and Abo-EL-Komsan (1978) However, Cross-pollination with different pollinators caused highly significant increase in fruit set, remaining fruits after June drop and mature fruits compared with open pollination treatment. Moreover, different kinds of pollen varied in their effects with Balady mandarin being the highest paternal pollen and Marsh grapefruit as lowest. Generally, Fruit set in Washington navel orange is greatly increased by using of functional foreign pollen. These results are in agreement with the findings of many authors such as, EL-Tomi (1957), Khalil (1967), Sherif (1983) and Mohamed (1984). all showed that artificial cross-pollination with foreign citrus pollen had increased fruit set in Washington navel orange and other citrus varieties. The high effect of mandarin and Suckarry orange pollens on fruit set is due to its high pollen viability. The comparatively lower effect of Marsh grapefruit pollen on fruit set may be due to the fact that Marsh grapefruit produced pollen with low viability. On the contrary, Musahib-ud-Din and Kamil (1963) reported that cross-pollination resulted in poor fruit setting and Abbas (1983) who reported that, open pollination treatment increased fruit set or fruiting in all studied varieties than the artificial

cross-pollination treatments with exception of Dancy tangarine when used as a pollinator for Carter navel orange.

With respect to the effect of growth regulators treatments. It is also clear from Tables and Figures that both GA_3 at 1000 p.p.m and 2000 p.p.m or the combinations between GA_3 and N.A.A treatments had resulted in a considerable increases in fruit set, remaining fruits after June drop and fruits remained to maturity (yield) in Washington navel orange trees. The effect of GA_3 on increasing fruit set and preventing fruits abscission and drop was reported by many investigators such as Iwasami (1954) , Hield et al (1958), Coggins et al (1963), Randhawa et al (1962), Salem (1963), Hield et al ((1965), Diedda (1971), Chundawat and Randhawa (1972) Canat et al (1974) Mohamed (1978) and Bredll (1986). Moreover, N.A.A. Treatments were found to significantly decrease fruit set, remaining fruits after June drop and fruits remained to maturity (yield). These results are in agreement with the findings by Hield et al (1962). On the other hand, Sandhu et al (1986) reported that, N.A.A. at 15. p.p.m was effective in reducing pre-harvest fruit drop in Jaffa and Blood Red orange.

b) Efect of different pollination treatments and some growth regulators on physical properties of Washington navel orange fruits : -

Data in Tables (4),(5) and (6) show the physical characteristics of Washington navel fruits as affected by bagging only, emasculation and bagging, artificial cross-pollination with different pollen sources and some growth regulators treatments druing 1985,1986 and 1987 seasons. It is clear from the previous tables that bagging only treatment gave slight increase in fruit weight than open pollination during the three seasons of this study, emasculation and bagging treatment had increased fruit weight significantly as compared with open pollination during the study. These results may be due to the low number of fruits at maturity. Moreover, artifical cross-pollination with Balady mandarin and Suckarry orange pollens had significantly higher average fruit weight than the open pollination treatment during the three seasons of this study. On the other hand, grapefruit pollen was lower in average fruit weight when compared with the both different pollinators and open pollination treatment and the differences were significant. The increase in fruit weight of Washington navel orange fruits as a result of artificial cross-pollination with foreign pollen was reported earlier by Khalil (1967), Weheda (1972), Kawasmi and Oguma (1973) and Sherif (1983).

Concerning the effect of GA_3, N.A.A. and combination between GA_3 and N.A.A on fruit weight, it is noticed that GA_3 at 2000 p.p.m, N.A.A 50 p.p.m and combination with GA_3 and N.A.A treatments applied to emasculated flowers had Significantly higher increase in fruit weight than open pollination treatment. These results are similar to that reported by Deidda (1971) who found that GA_3 at 50and 100 p.p.m of GA_3 applied at full bloom caused significant increase in fruit weight. Moreover, Mawlood (1977) found that spraying grape fruit trees with 200 or 500 p.p.m of GA_3 at full bloom resulted in an increase in fruit weight. On the other hand; the same trend was found by Hield et al (1962) when appling N.A.A at 350, 500 and 1000 p.p.m to Wilking mandarin trees. This increasing in fruit weight had resulted from the thining effect.

Concerning fruit height, it is clear that bagging treatment had no effect while emasculation and bagging treatment had significanly increased the fruit height as compared with open pollination treatment during 1985, 1986 and 1987 seasons. The artificial cross-pollination with Balady lime, Balady mandarin and Suckarry orange pollen had varied from one season to another, the increase in fruit height was significantly noticed except in Balady mandarin and Suckarry orange in 1986 season, as the fruit height was not affected. In addition, cross-pollination with grapefruit pollen had not affected fruit height as

compared with open pollination treatment during this study. These results are in agreement with the finding of Khalil (1967), Weheda (1972), Sherif (1983) and Mohamed (1984).

The application of N.A.A at 50 p.p.m or N.A.A at 25 p.p.m + GA_3 at 1000 p.p.m caused highly significant increase in fruit height as compared with open pollination treatment. These results are in agreement with those reported by Srivastava et al (1973). On the other had, Bishr (1987) found that, the reverse is true.

With respect to fruit diameter it is obvious that bagging only and emasculation and bagging treatments had not affeceted fruit diameter compared with open pollination treatment. On the other hand, cross-pollination with different pollinators caused highly significant increase in fruit diameter as compared with open pollination during the three seasons of this study. These results are in confirmity with the finding of Khalil (1967), Weheda (1972) and Sherif (1983), Furthermore, GA_3 at 1000 p.p.m and 2000 p.p.m treatments decreased the fruit diameter but the differences were so slight to be significantly decreased it as compared with the open pollination treatment . In other words, N.A.A at 25 p.p.m significantly decreased fruit diameter and N.A.A at 50 p.p.m had no effect on fruit diameter while the combined

N.A.A. at 50 p.p.m + GA_3 at 1000 p.p.m or 2000 p.p.m and N.A.A. at 25 p.p.m + GA_3 at 2000 p.p.m treatments caused highly significant increase in fruit diameter as compared with open pollination treatment during this study.

Concerning fruit shape (H/D) ratio it is clear that bagging only treatment had no effect but emasculation and bagging treatment caused highly significant increase in fruit shape index. Artificial cross-pollination treatments had not affected fruit shape during this study except in grapefruit and Balady lime pollens in the first and the second season, respectively which were significantly decreased when compared with open pollination treatment. It is obvious that fruits resulted from pollination treatments, the shape index was >1. This is in agreement with the findings of Khalil (1967), Weheda (1972), Rokba et al(1976), Kitat et al (1980), Sherif (1983) and Mohamed (1984).

Growth regulators treatments on emasculated flowers with GA_3 at 1000 p.p.m and 2000 p.p.m significantly increased fruit shape index at 1985 and 1987 seasons. N.A.A at 25 p.p.m had not affected in fruit shape index while N.A.A at 50 p.p.m and N.A.A at 25 p.p.m + GA_3 at 1000 p.p.m treatments caused highly significant increase in fruit shape index as compared with open pollination treatment during 1985,1986 and 1987 seasons. Similar results on N.A.A sprays and their effects on fruit shape index were reported by Hield at al (1962) and Babu and Lavania (1986).

Regarding peel thickness, the data in the three tables 4,5 and 6 indicated that both bagging only and emasculation and bagging treatments had not affected peel thickness during this study. On other hand, artificial cross-pollination treatments showed variability from one treatment to another, cross-pollination with Balady mandarine pollen had resulted in a significant increase in peel thickness compared with open pollination treatment while other pollinators caused a slight increase in peel thickness during this study. Earlier findings of Sherif (1983) had indicated that using Balady mandarin as a pollinator for Hamlin orange, Marsh grapefruit and Balady lime had resulted in increasing peel thickness.

Applied GA_3 at 1000 p.p.m and 2000 p.p.m caused significant increase in peel thickness as compared with open pollination treatment druing this study. The increase in peel thickness as a result of GA_3 treatment was reported by Coggins at al (1963) Deidda (1971), Chundawat and Randhawa (1972), Atawia (1984) and Lima and Davies (1984). Moreover, using N.A.A at 25 p.p.m or 50 p.p.m caused slight increase in peel thickness compared with open pollination treatment during the three seasons of study. In addition N.A.A at 25 p.p.m + GA_3 at 1000 p.p.m had resulted in a significant increase in peel thickness while the addition of N.A.A at 50 p.p.m to GA_3 at 1000 p.p.m or 2000 p.p.m caused a slight increase in peel

thickness during 1985, 1986 and 1987 seasons compared with open pollination treatment.

Concerning fruit juice, it is clear from the previous tables that there is no significant differences in fruit juice percent between bagging only and emasculation and bagging treatments and open pollination treatment while artificial cross-pollination with Balady lime, Balady mandarin and Suckarry ornage pollens caused significant increase in juice percent as compared with open pollination treatment during this study. In this respect, Sherif (1983) reported that, cross-pollination with Hamlin orange pollen for Marsh grapefruit, Balady lime and Balady mandarin did not affect the juice content. The combined N.A.A at 25 p.p.m + GA_3 at 1000 p.p.m treatment had significantly increased fruit juice content compared with open pollination treatment during the study. This shows that GA_3 or N.A.A and the combination between them caused a slight increase in fruit juice percent as compared with open pollination treatment. The increase in juice content as a result of GA_3 treatments was reported by Coggins and Hield (1958) and EL-Hammady et al (1976). On the other hand Deidda (1971) and EL-Khoreiby (1976) who reported that GA_3 reduced the fruit juice content.

C) Effect of different pollination treatments and some growth regulators on the chemical properties of Washington navel orange fruits:-

Data in Tables (7),(8) and (9) show the chemical characteristics of Washington navel orange fruits as affected by bagging only, emasculation and bagging, artificial cross-pollination with different pollen sources and some. It is clear from these tables that all treatments had no affect on T.S.S content in fruit juice during second and third seasons while emasculation and bagging, cross-pollination with Balady lime and cross-pollination Marsh grapefruit had significantly reduced T.S.S in fruit juice than the open pollination treatment. These results are in agreement with those reported by Cameron (1960) and Weheda (1972) However, T.S.S was significantly decreased compared with open pollination treatment in GA_3 at 2000 p.p.m, N.A.A at 25 p.p.m, GA_3 at 1000 p.p.m + N.A.A at 50 p.p.m treatments. The decrease in T.S.S as a result of GA_3 treatments was reported by Coggins et al (1963),EL-Khoreiby (1976) and Mawlood (1977).

Regarding juice acidity, the results show that, generally, bagging only, emasculation and bagging, cross-pollination with Balady lime pollen and cross-pollination with Balady mandarin pollen appeared to induce significant increase in acidity compared to

open pollination treatment . However, all other treatments did not affect the acidity of fruit juice. This result is inagreement with the findings of Lange and Vincent (1971) and Weheda (1972).

With respect to growth regulators, the results show that . GA_3 at 1000 p.p.m in the first and third seasons, N.A.A at 50 p.p.m in the first and second seasons and the combined GA_3 at 2000 p.p.m + N.A.A at 50 p.p.m in the first season show significant increase in fruit juice acidity over open pollination treatment. GA_3 at 1000 p.p.m + N.A.A at 25 p.p.m had significantly decreased fruit acidity below open pollination treatment during this study. The increase in fruit juice acidity as a result of GA_3 treatment was reported by Salem (1963), Krezdorn and Kohen (1963) and Mawlood (1977). The acidity was not affected in all other growth regulators during this study.

Accordingly, the juice T.S.S/ acid ratio were significantly decreased in response to different treatments of bagging only, emasculation and bagging and cross-pollination with different pollen sources during the three seasons of this study. These results agree with those reported by Khalil (1967) & Rokba at al (1976) and Atawia (1984)

The effect of growth regulators treatments on T.S.S/ acid ratio show that in all GA_3 treatments, T.S.S to acid ratio was decreased. While T.S.S/acid ratio increased by N.A.A at 25 p.p.m or combiened with GA_3 at 1000 p.p.m during this study. The increase in T.S.S/acid ratio in fruit juice as a result of GA_3 treatments was reported by Cogging et al (1960), EL-Khoreiby (1976) and Hussin (1979).

Ascorbic acid in fruit juice was not affected by bagging only, emasculation and baggning and cross-pollination with different pollen sources treatments during the three seasons of this study. The same trend was reported by Cameron et al (1960) , Khalil (1967), weheda (1972) and Resk (1984). Moreover, the ascorbic acid content in fruit juice was significantly increased by GA_3 at 1000 p.p.m and 2000 p.p.m treatments during the three seasons of this study. These results are in agreement with those findings of Cutuli (1970), Kumer (1975) and Chundawat and Ramdhawa (1975).

d) Effect of different pollination treatments and some growth regulators on seediness and seed development in Washington navel orange fruits:-

The effect of different pollination treatments on the total number of seeds, well developed and shrivel seeds per fruit and pollination index of Washington navel orange were shown in Tables (10), (11) and (12) during 1985,1986 and 1987 seasons, respectively. These results show that, open pollination, bagging only and emasculation and bagging treatments did not give any seeds during the three seasons of this study. Moreover, cross-pollination with Balady mandarin caused a highly significant increase in the total number of seeds per fruit as compared with open pollination and the other cross-pollination treatments during this study. Marsh grapefruit and Balady lime gave the lowest total number of seeds perfruit (ranging from 1 to 5). These results are in agreement with the findings of Cost and Gagnara (1956), Cameron (1960), Weheda (1972), Lang and Vincent (1972) and Iwamasa and Oba (1980)

Concerning the number of well developed seeds per fruit, all cross-pollination treatments were sigri ficantly higher than open pollination treatment during this study. Cross-pollination with Balady mandarin and Suckarry orange pollens produced the highest percentage

of well developed seeds as compared with other cross-pollination treatments while Balady lime and Marsh grapefruit pollens produced the lowest as compared with other cross-pollination treatments. These results may be due to low viability of pollen grains from Marsh grapefruit and Balady lime. These results agree with previous results reported by Majsurodize (1952), Klimenko and Klimenko (1952), EL-Tomi (1957), Minessy (1959), Ibrahim (1969), Weheda (1972) and Mohamed (1984).

Regarding shirvelled seeds per fruit, the statistical analysis showed that, cross-pollination with different pollen sources caused significant increases during this study except cross-pollination with Balady mandarin and Suckarry orange but the increase was slight. On the other hand, the numbers and percentages of shrivelled seeds per fruit in Washington navel orange variety were generally higher in cross-pollination with Balady lime pollen than that in other cross-pollination treatments during this study.

Rokba et al (1976b) reported that, in Washington navel orange variety, cross-pollination with Eureka lemon gave the lowest well developed and shrivel seeds per fruit as compared with cross-pollination with Duncan and Marsh agrapefruit and shaddock pollen.

Regarding pollination index, it was calculated as a total number of well developed seeds in the treatment over the total number of the pollinated flowers within the same treatment. Data showed that either cross-pollination with Balady lime and Marsh grapefruit caused a slight increase in pollination index during this study. On the other hand, Balady mandarin and Suckarry orange as pollinators increased significantly the pollination index. These findings are in agreement with those obtained by Mohamed (1984).

Table (1) : Effect of different pollination treatments and some growth regulators on fruit set, remaining fruits after June drop and mature fruits in the Washington Navel orange variety. (1985 season).

Treatments	No. of treated flowers	Fruit set		Remaining Fruits after June dero		Mature fruits	
		Total No.	Aver. %	Total No.	Aver. %	Total No.	Aver. %
Open pollination	2265	428	18.90	132	5.83	89	3.93
Begging only	1979	330	16.68	89	4.50	58	2.93
Emasculation and begging	2034	374	18.39	100	4.92	63	3.10
Cross-pollination with Balady lime pollen.	1926	455	23.62	146	7.58	123	6.39
Cross-pollination with Marsh grapefruit pollen.	2107	493	23.40	156	7.40	133	6.31
Cross-pollination with Balady mandarine pollen.	1991	591	29.68	207	10.40	191	9.59
Cross-pollination with Suckarry orange pollen.	2123	537	25.29	197	9.28	163	7.68
GA_3 1000 p.p.m.	2169	644	29.69	221	10.19	189	8.71
GA_3 2000 p.p.m.	2204	626	28.40	201	9.12	152	6.90
N.A.A. 25 p.p.m.	1895	157	8.28	93	4.91	51	2.69
N.A.A. 50 p.p.m.	2106	141	6.70	64	3.04	40	1.90
GA_3 1000 p.p.m.+ N.A.A. 25 p.p.m.	1973	570	28.89	189	9.58	172	8.70
GA_3 1000 p.p.m.+ N.A.A. 50 p.p.m.	2089	508	24.32	182	8.71	140	6.72
GA_3 2000 p.p.m.+ N.A.A. 25 p.p.m.	1898	184	9.69	95	5.01	50	2.63
GA_3 2000 p.p.m.+ N.A.A. 50 p.p.m.	2235	673	30.11	241	10.78	199	8.90
L.S.D. at 5%				4.08		2.76	1.20
L.S.D. at 1%				5.78		3.35	2.66

Table (2) : Effect of different pollination treatments and some growth regulators on fruit set, remaining fruits after June drop and mature fruits in the Washington Navel orange variety. (1986 season).

Treatments	No. of treated flowers	Fruit set		Remaining Fruits after June drop		Mature fruits	
		Total No.	Aver. %	Total No.	Aver. %	Total No.	Aver. %
Open pollination	1994	275	13.79	158	7.92	126	6.32
Begging only	1813	208	11.47	118	6.40	80	4.41
Emasculation and begging	1989	237	11.92	127	6.39	91	4.58
Cross-pollination with Balady lime pollen.	2007	397	19.78	197	9.82	147	7.32
Cross-pollination with Marsh grapefruit pollen.	1896	309	16.30	182	9.60	131	6.91
Cross-pollination with Balady mandarine pollen.	1865	477	25.58	248	13.30	200	10.72
Cross-pollination with Suckarry orange pollen.	1946	422	21.69	230	11.82	185	9.51
GA_3 1000 p.p.m.	2133	501	23.49	275	12.89	239	11.20
GA_3 2000 p.p.m.	2207	393	17.81	212	9.61	194	8.79
N.A.A. 25 p.p.m.	2016	211	10.47	127	6.30	83	4.12
N.A.A. 50 p.p.m.	1854	156	8.41	104	5.61	72	3.88
GA_3 1000 p.p.m.+ N.A.A. 25 p.p.m.	1983	448	22.59	252	12.71	220	11.09
GA_3 1000 p.p.m.+ N.A.A. 50 p.p.m.	1897	387	2040	220	11.60	195	10.28
GA_3 2000 p.p.m.+ N.A.A. 25 p.p.m.	2046	276	13.48	149	7.28	117	5.72
GA_3 2000 p.p.m.+ N.A.A. 50 p.p.m.	2013	519	25.78	280	13.91	229	11.38
L.S.D. at 5%			3.28		1.58		1.36
L.S.D. at 1%			4.05		2.11		1.82

Table (3) : Effect of different pollination treatments and some growth regulators on fruit set, remaining fruits after June drop and mature fruits in the Washington Navel orange variety. (1987 season).

Treatments	No. of treated flowers	Fruit set		Remaining Ftuits after June drop		Mature fruits	
		Total No.	Aver. %	Total No.	Aver. %	Total No.	Aver. %
Open pollination	2149	358	16.66	144	6.70	86	4.00
Begging only	1841	274	14.88	99	5.38	64	3.48
Emasculation and begging	2306	371	16.09	131	5.69	89	3.86
Cross-pollination with Balady lime pollen.	1985	415	20.91	157	7.91	97	4.88
Cross-pollination with Marsh grapefruit pollen.	2013	411	20.42	137	6.81	92	4.57
Cross-pollination with Balady mandarine pollen.	1897	584	30.79	201	10.60	157	8.28
Cross-pollination with Suckarry orange pollen.	1997	533	26.69	196	9.81	148	7.41
GA_3 1000 p.p.m.	2193	655	29.87	239	10.90	208	9.48
GA_3 2000 p.p.m.	2305	546	23.69	217	9.41	136	5.90
N.A.A. 25 p.p.m.	2017	240	11.90	104	5.16	56	2.78
N.A.A. 50 p.p.m.	1964	194	9.88	92	4.68	47	2.39
GA_3 1000 p.p.m.+ N.A.A. 25 p.p.m.	1910	535	28.01	202	10.58	174	9.11
GA_3 1000 p.p.m.+ N.A.A. 50 p.p.m.	2165	569	26.28	214	9.88	178	8.22
GA_3 2000 p.p.m.+ N.A.A. 25 p.p.m.	1893	239	12.63	97	5.12	53	2.80
GA_3 2000 p.p.m.+ N.A.A. 50 p.p.m.	2104	619	29.42	271	12.88	220	10.46
L.S.D. at 5%				3.27		1.53	1.17
L.S.D. at 1%				4.61		2.15	1.56

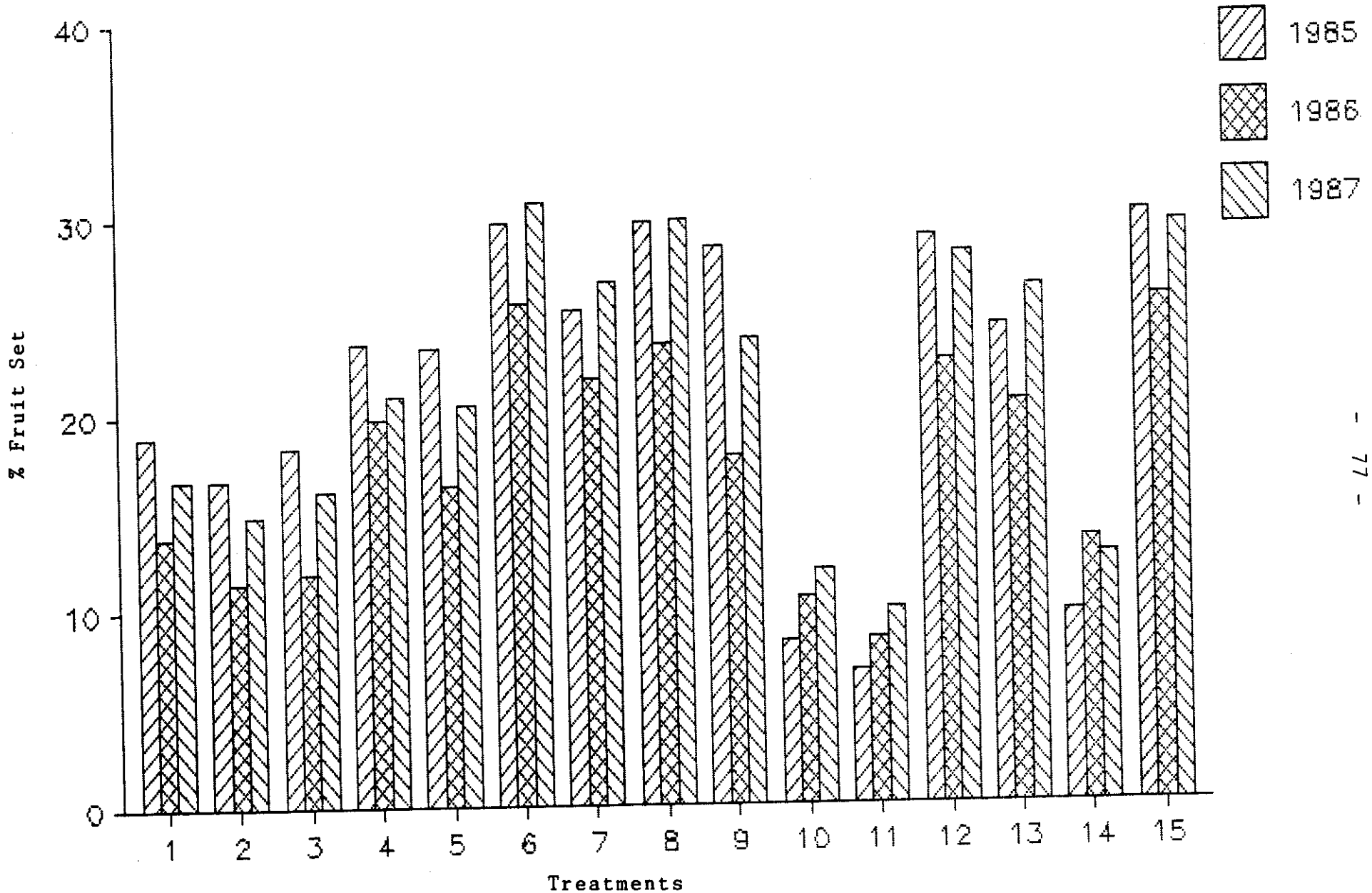

Fig. (1)Effect of Different Pollination Treatments and Some Growth Regulators on Fruit Set in the Washington Navel Orange Variety

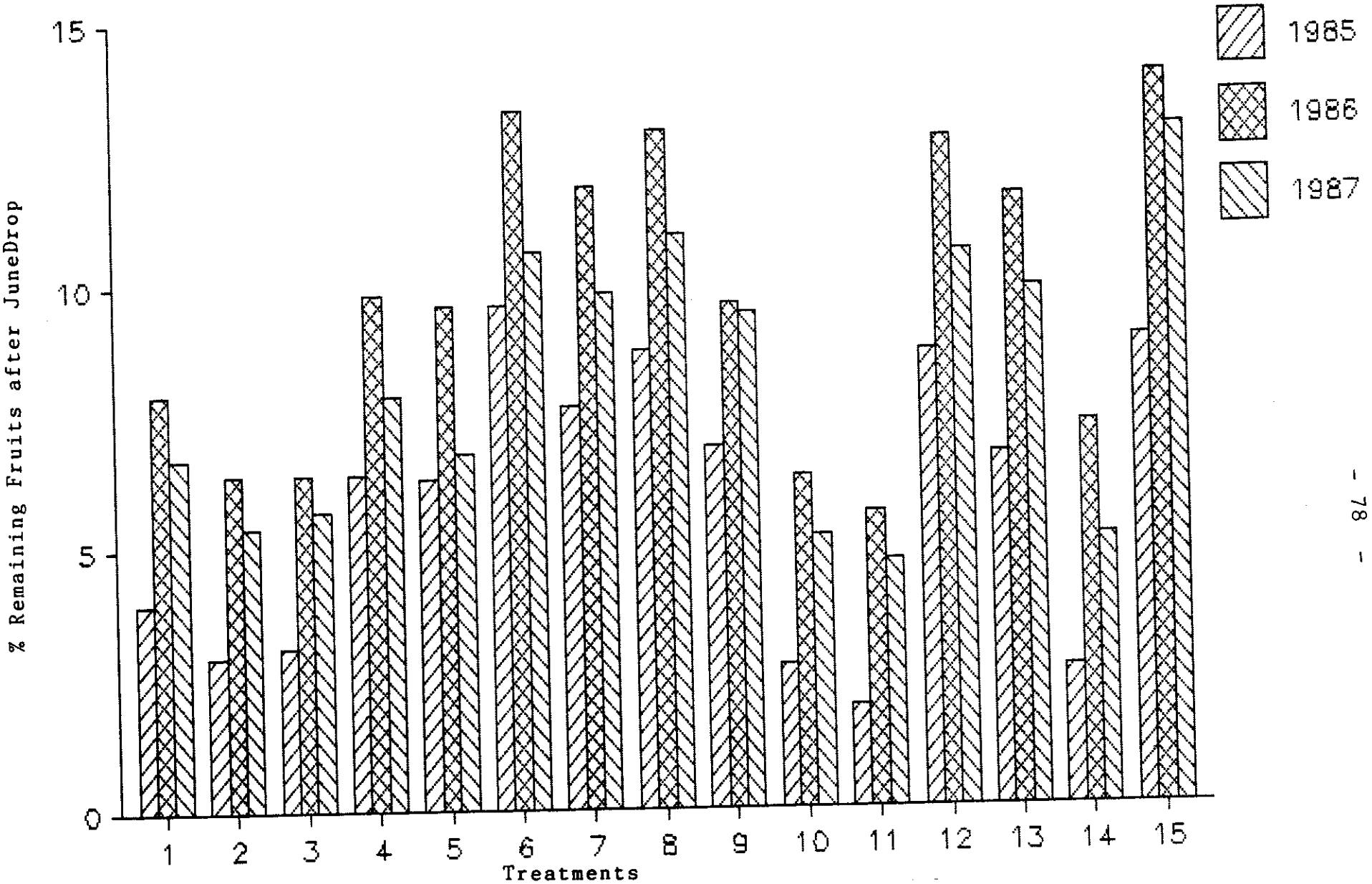

Fig. (2) Effect of Different Pollination Treatments and Some Growth Regulators on Remaining Fruits after June Drap in the Washington navel Orange Variety.

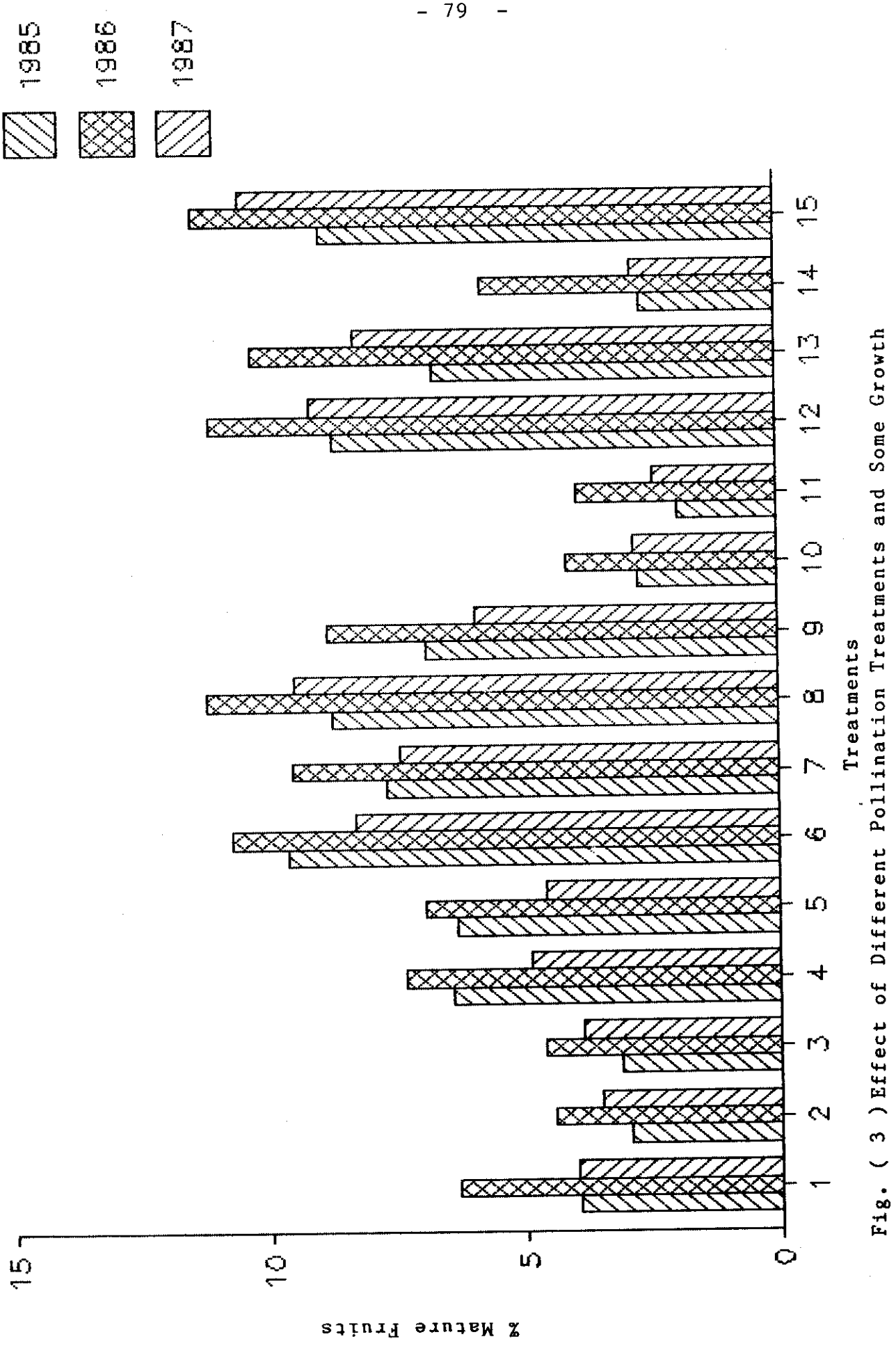

Fig. (3) Effect of Different Pollination Treatments and Some Growth Regulators on Mature Fruits in Washington Navel Orange Variety

Table (4) : Effect of different pollination treatments and some growth regulators on fruit physical properties in the Washington navel orange variety. (1985 season).

Treatments	Fruit weight gm.	Fruit height cm.	Fruit diameter cm.	Shape index	Peel thickness mm.	Juice weight gm.	Juice %
Open pollination.	175.00	6.85	6.73	1.02	0.41	72.59	41.48
Bagging only.	181.00	6.91	6.74	1.03	0.39	70.00	38.67
Emasculation and bagging.	184.00	7.27	6.64	1.09	0.42	70.00	38.04
Cross-pollination with Balady lime pollen.	193.45	7.30	7.50	0.97	0.47	78.16	40.40
Cross-pollination with Marsh grapefruit pollen.	180.61	6.90	7.26	0.95	0.46	73.11	38.36
Cross-pollination with Balady mandarine pollen.	206.00	7.54	7.61	0.99	0.52	83.86	40.71
Cross-pollination with Suckarry orange pollen.	194.00	7.41	7.42	1.00	0.44	78.06	40.24
GA_3 1000 p.p.m.	171.10	6.99	5.87	1.19	0.58	69.91	40.86
GA_3 2000 p.p.m.	190.00	7.65	6.73	1.14	0.49	93.96	47.45
N.A.A. 25 p.p.m.	175.86	6.91	6.51	1.00	0.49	68.90	39.18
N.A.A. 50 p.p.m.	186.00	7.18	6.64	1.08	0.44	77.00	41.40
GA_3 1000 p.p.m. + N.A.A. 25 p.p.m.	200.00	7.65	6.52	1.17	0.51	91.33	45.67
GA_3 1000 p.p.m. + N.A.A. 50 p.p.m.	197.00	7.10	7.10	1.00	0.50	74.40	37.77
GA_3 2000 p.p.m. + N.A.A. 25 p.p.m.	182.00	7.11	6.97	1.02	0.46	69.86	38.38
GA_3 2000 p.p.m. + N.A.A. 50 p.p.m.	194.00	7.12	6.46	1.10	0.45	74.83	38.57
L.S.D. at 5%	7.55	0.33	0.22	0.06	0.09	3.38	3.99
L.S.D. at 1%	10.10	0.45	0.29	0.14	0.12	4.54	5.67

Table (5) : Effect of different pollination treatments and some growth regulators on fruit physical properties in the Washington navel orange variety. (1986 season).

Treatments	Fruit weitht gm.	Fruit height cm.	Fruit diameter cm.	Shape index	Peel thickness mm.	Juice weight gm.	Juice %
Open pollination.	189.00	7.73	7.30	1.06	0.39	82.10	43.44
Bagging only.	194.00	7.71	7.64	1.01	0.46	80.16	41.32
Emasculation and bagging.	200.00	8.62	7.43	1.16	0.48	84.00	42.00
Cross-pollination with Balady lime pollen.	195.60	7.99	7.96	0.94	0.52	87.00	44.48
Cross-pollination with Marsh grapefruit pollen.	190.16	7.51	7.64	0.98	0.54	85.36	44.89
Cross-pollination with Balady mandarine pollen.	199.83	8.07	8.43	0.96	0.58	94.00	47.04
Cross-pollination with Suckarry orange pollen.	196.10	7.76	7.74	1.00	0.52	90.00	45.89
GA_3 1000 p.p.m.	183.00	7.76	7.04	1.10	0.59	81.23	44.39
GA_3 2000 p.p.m.	198.00	7.79	7.10	1.10	0.58	95.10	48.03
N.A.A. 25 p.p.m.	190.00	7.55	7.10	1.06	0.48	86.00	45.26
N.A.A. 50 p.p.m.	195.86	8.14	7.29	1.12	0.47	85.60	43.70
GA_3 1000 p.p.m. + N.A.A. 25 p.p.m.	204.00	8.53	7.12	1.20	0.58	99.13	48.59
GA_3 1000 p.p.m. + N.A.A. 50 p.p.m.	200.00	7.69	7.56	1.02	0.52	87.40	43.70
GA_3 2000 p.p.m. + N.A.A. 25 p.p.m.	193.00	7.86	7.55	1.04	0.59	82.70	42.85
GA_3 2000 p.p.m. + N.A.A. 50 p.p.m.	200.00	7.74	7.56	1.02	0.51	88.96	44.48
L.S.D. at 5%	6.10	0.38	0.20	0.06	0.19	5.36	4.56
L.S.D. at 1%	8.16	0.51	0.27	0.12	0.25	7.40	5.10

Table (6) : Effect of different pollination treatments and some growth regulators on fruit physical properties in the Washington navel orange variety. (1987 season).

Treatments	Fruit weight gm.	Fruit height cm.	Fruit diameter cm.	Shape index	Peel thickness mm.	Juice weight gm.	Juice %
Open pollination.	187.63	7.15	6.94	1.03	0.40	77.60	41.36
Bagging only.	188.00	6.90	6.82	1.01	0.44	76.00	41.30
Emasculation and bagging	197.80	7.80	6.93	1.13	0.43	76.90	40.90
Cross-pollination with Balady lime pollen.	196.00	7.69	7.83	0.98	0.52	82.10	41.89
Cross-pollination with Marsh grapefruit pollen.	190.93	7.42	7.56	0.98	0.46	80.64	42.24
Cross-pollination with Balady mandarine pollen.	199.00	7.93	7.98	0.99	0.58	84.00	42.21
Cross-pollination with Suckarry orange pollen.	196.87	7.75	7.96	0.97	0.49	84.00	42.67
GA_3 1000 p.p.m.	183.46	7.46	6.62	1.13	0.58	75.97	41.41
GA_3 2000 p.p.m.	200.00	7.56	6.63	1.14	0.56	96.60	48.30
N.A.A. 25 p.p.m.	185.60	7.56	6.54	1.15	0.46	76.10	41.00
N.A.A. 50 p.p.m.	194.76	7.63	6.74	1.13	0.52	79.83	40.99
GA_3 1000 p.p.m. + N.A.A. 25 p.p.m.	199.10	7.63	6.20	1.23	0.58	93.18	46.80
GA_3 1000 p.p.m. + N.A.A. 50 p.p.m.	199.00	7.21	6.83	1.06	0.53	81.90	41.16
GA_3 2000 p.p.m. + N.A.A. 25 p.p.m.	190.00	7.46	7.31	1.02	0.44	76.10	40.05
GA_3 2000 p.p.m. + N.A.A. 50 p.p.m.	196.11	7.93	7.68	1.03	0.54	80.96	41.28
L.S.D. at 5%	5.43	0.48	0.31	0.10	0.14	4.47	5.23
L.S.D. at 1%	7.28	0.63	0.42	0.19	0.18	5.99	6.90

Table (7) : Effect of different pollination treatments and some growth regulators on fruit chemical characteristics in the Washington navel orange variety. (1985 season).

Treatments	T.S.S %	Tetratable acidity %	T.S.S / acid Ratio	Ascorbic acid mg/100 ml Juice
Open pollination	12.2	0.84	14.50	47.10
Bagging only	12.4	1.00	12.40	49.19
Emasculation and bagging	11.0	0.83	13.30	49.00
Cross-pollination with Balady lime pollen.	10.2	0.78	13.07	50.00
Cross-pollination with Marsh grapefruit pollen.	10.2	0.78	13.07	47.13
Cross-pollination with Balady mandarine pollen.	12.0	0.85	14.12	45.26
Cross-pollination with Suckarry orange pollen.	12.2	0.88	13.86	47.18
GA_3 1000 p.p.m.	12.2	0.93	13.12	51.60
GA_3 2000 p.p.m.	11.0	0.79	13.92	53.00
N.A.A 25 p.p.m.	10.8	0.70	15.42	47.00
N.A.A 50 p.p.m.	12.0	0.91	13.19	46.17
GA_3 1000 p.p.m. + N.A.A. 25 p.p.m.	11.0	0.73	15.07	48.53
GA_3 1000 p.p.m. + N.A.A. 50 p.p.m.	10.8	0.83	13.01	45.96
GA_3 2000 p.p.m. + N.A.A. 25 p.p.m.	11.0	0.82	13.41	45.11
GA_3 2000 p.p.m. + N.A.A. 50 p.p.m.	12.2	1.03	11.84	53.30
L.S.D at 5%	0.98	0.07	0.29	3.83
1%	1.31	0.15	0.56	5.12

Table (8) ; Effect of different pollination treatments and some growth regulators on fruit chemical characteristics in the Washington navel orange variety. (1986 season).

Treatments	T.S.S %	Tetratable acidity %	T.S.S / acid Ratio	Ascorbic acid mg/100 ml Juice
Open pollination	12.60	0.92	13.70	59.00
Bagging only	12.60	1.14	11.05	56.11
Emasculation and bagging	12.00	0.59	20.34	57.00
Cross-pollination with Balady lime pollen.	12.00	1.04	11.54	59.00
Cross-pollination with Marsh grapefruit pollen.	11.40	0.99	11.52	57.63
Cross-pollination with Balady mandarine pollen.	12.00	0.99	12.12	58.22
Cross-pollination with Suckarry orange pollen.	11.80	1.00	11.80	55.00
GA_3 1000 p.p.m.	13.00	0.99	13.13	65.00
GA_3 2000 p.p.m.	11.40	0.86	13.26	63.10
N.A.A 25 p.p.m.	11.20	0.77	14.55	55.00
N.A.A 50 p.p.m.	12.00	0.97	12.37	59.60
GA_3 1000 p.p.m. + N.A.A. 25 p.p.m.	11.40	0.72	15.83	59.00
GA_3 1000 p.p.m. + N.A.A. 50 p.p.m.	11.80	0.94	12.55	58.46
GA_3 2000 p.p.m. + N.A.A. 25 p.p.m.	12.20	0.92	13.26	58.10
GA_3 2000 p.p.m. + N.A.A. 50 p.p.m.	11.80	0.96	12.29	65.86
L.S.D. at 5%	No.s	0.12	0.63	3.72
L.S.D. at 1%	No.s	0.18	0.89	4.97

Table (9) : Effect of different pollination treatments and some growth regulators on fruit chemical characteristics in the Washington navel orange variety. (1987 season).

Treatments	T.S. S. %	Tetratable acidity %	T.S.S/ acid Ratio	Ascorbic acid mg/1000 ml Juice
Open pollination	11.20	1.01	11.09	42.00
Bagging only	10.80	1.00	10.80	40.16
Emasculatrion and bagging	11.00	0.86	12.79	45.00
Cross-pollination with Balady lime pollen.	12.20	1.24	9.84	45.00
Cross-pollination with Marsh grapefruit pollen.	11.00	1.19	9.24	45.10
Cross-pollination with Balady mandarine pollen.	12.20	1.24	9.83	40.00
Cross-pollination with Suckarry orange pollen.	11.40	1.06	10.75	41.00
GA_3 1000 p.p.m.	12.00	1.28	9.37	47.63
GA_3 2000 p.p.m.	11.20	1.10	10.18	49.25
N.A.A 25 p.p.m.	11.00	0.86	12.79	42.16
N.A.A 50 p.p.m.	12.00	1.28	9.38	39.87
GA_3 1000 p.p.m. + N.A.A. 25 p.p.m.	11.40	0.91	12.53	44.10
GA_3 1000 p.p.m. + N.A.A. 50 p.p.m.	11.00	1.06	10.38	41.00
GA_3 2000 p.p.m. + N.A.A. 25 p.p.m.	11.20	0.95	11.79	44.06
GA_3 2000 p.p.m. + N.A.A. 50 p.p.m.	12.00	1.06	11.32	47.00
L.S.D. at 5%	No.s	0.16	0.93	4.93
1%	No.s	0.23	1.10	6.59

Table (10): Effect of different pollination treatments on seediness and seed development in Washington navel orange fruits (1985 season).

Treatments	Mean number of seeds per fruit	Range in number of normal seeds per fruit	Well developed seeds per fruit		Shrivel seeds per fruit		Pollination index (No of) well developed seeds per treated flowers
			No	%	No	%	
Open pollination.	0.00	0-0	0.00	0.00	0.00	0.00	0.00
Bagging only.	0.00	0-0	0.00	0.00	0.00	0.00	0.00
Emasculation and bagging	0.00	0-0	0.00	0.00	0.00	0.00	0.00
Cross-pollination with Balady lime pollen.	3.21	1-4	2.82	87.82	0.39	12.18	0.11
Cross-pollination with Marsh grapefruit pollen.	3.22	1-4	3.03	93.80	0.20	6.22	0.11
Cross-pollination with Balady mandarine pollem.	5.00	2-7	4.85	96.99	0.15	3.01	0.37
Cross-pollination with Suckarry orange pollen.	3.30	2-5	3.14	95.21	0.16	4.79	0.17
L.S.D.	0.97		0.83	9.05	0.16	9.05	0.17
	1.43		1.12	10.30	0.22	10.30	0.24

Table (11) : Effect of different pollination treatments on seediness and seed development in Washington navel orange fruits (1986 season).

Treatments	Mean number of seeds per fruit	Rangein number of normal seeds per fruit	Well developed seeds per fruit		Shrivel seeds per fruit		Pollination index (No of) well developed seeds per treated flowers
			No	%	No	%	
Open pollination.	0.00	0-0	0.00	0.00	0.00	0.00	0.00
Bagging only.	0.00	0-0	0.00	0.00	0.00	0.00	0.00
Emasculation and bagging	0.00	0-0	0.00	0.00	0.00	0.00	0.00
Cross-pollination with Balady lime pollen.	3.69	2-4	3.35	80.96	0.33	19.04	0.11
Cross-pollination with Marsh grapefruit pollem.	4.10	3-5	3.94	96.08	0.16	3.92	0.17
Cross-pollination with Balady mandarine pollem.	5.17	3-9	5.06	97.90	0.11	2.10	0.45
Cross-pollination with Suckarry orange pollen.	4.80	2-6	4.61	96.08	0.19	3.92	0.32
	0.89		1.09	10.86	0.13	10.86	0.29
L.S.D.	1.39		1.60	12.90	0.20	12.90	0.34

Table (12) : Effect of different pollination treatments on seediness and seed development in Washington navel orange fruits (1987 season).

Treatments	Mean number of seeds per fruit	Rangein number of normal seeds per fruit	Well developed seeds per fruit		Shrivel seeds per fruit		Pollination index (No of) well developed seeds per treated flowers
			No	%	No	%	
Open pollination.	0.00	0-0	0.00	0.00	0.00	0.00	0.00
Bagging only.	0.00	0-0	0.00	0.00	0.00	0.00	0.00
Emasculation and bagging.	0.00	0-0	0.00	0.00	0.00	0.00	0.00
Cross-pollination with Balady lime pollem.	3.81	2-3	3.55	83.30	0.26	16.70	0.04
Cross-pollination with Marsh grapefruit pollem.	4.00	2-5	3.76	94.00	0.24	6.00	0.09
Cross-pollination with Balady mandarine pollen.	5.00	3-11	4.85	97.09	0.15	2.91	0.28
Cross-pollination with Suckarry orange pollen.	4.40	3-8	4.17	94.81	0.23	5.19	0.19
L.S.D.	0.83		0.68	11.83	0.13	11.83	0.16
	1.10		0.99	12.76	0.24	12.76	0.29

2 - The effects on Jaffa orange

a) Effect of different pollination treatments and some growth regulators on fruit set, remaining after June drop and mature fruits in the Jaffa orange:-

Data in Tables (13),(14) and (15) and Figurs (4),(5) and (6) show the effect of different citrus pollen sources, bagging only, emasculation and bagging and some growth regulator treatmens on fruit set, Fruits remained after June drop and mature fruits (yield) in the Jaffa orange trees during the three successive seasons. It is clear from these tables and figures that bagging only treatment caused slight decrease in fruit set percentage, percentage of remaining fruits after June drop. Fruits remaining to maturity were highly significantly decreased during this study. Emasculation and bagging treatment caused highly significant decrease in fruit set and remaining fruits after June drop but no fruits remained to maturity (yield) in this treatment during the three successive seasons. The very low fruit set in the bagging only and emasculation and bagging treatments is evidently due to the lack of functional pollen for selfing in this variety. Bagging only or

emasculation of flowers could also exert a hormful effect on fruit set, remaining fruits after June drop and fruits remained to maturity (yield). These results are in agreement with those findings by Kitat et al (1980). Cross-pollination with Balady mandarin and Suckarry orange pollens gave significantly the highest percentage of fruit set, remaining fruits after June drop and fruits remaining to maturity compared to open pollination treatment (control) during this study. These results are in confirmity with the findings of EL-Tomi (1957), Khalil (1967), Lang and Viencent (1970), Weheda (1972), Kokaya (1978), Abo-EL-Komsan (1978) and Sherif (1983) as all showed that the artificial cross-pollination with foreign citrus pollen had increased fruit set in Washington navel orange and other citrus varieties. The highest fruit set,remaining fruits after June drop and fruits remaining to maturity resulting from cross-pollination with Balady mandarin pollen and cross-pollination with Suckarry orange pollen is due to its high pollen viability. The comparatively lower effect of Marsh grapefruit pollen on fruit set may be due to the fact that Marsh grapefruit produced pollen with low viability.

It is also clear from these tables that GA_3 at 1000 p.p.m or 2000 p.p.m and Ga_3 at 2000 p.p.m + N.A.A at 50 p.p.m treatments had resulted in a considerable significantly increase in fruit set, remaining fruits after June

drop and fruits remained to maturity (yield). However, GA_3 treatments seem to be more promising than N.A.A treatments in this respect. The effect of GA_3 on increasing fruit set and preventing fruit abscission and drop were reported by many investigators such as Iwasami (1954), Hield at al (1958), Coggins et al (1960), Randhawa et al (1962) Salem (1963), Hield at al (1965), Deidda (1971), Chundawat and Randhawa (1972), Canat et al (1974) and Kouka (1987). Moreover, N.A.A at 25 p.p.m treatment slightly decreased fruit set and sigificantly decreased remaining fruits after June drop and fruits remained to maturity (yield) than open pollination treatment (control) during this study which is in confirmity with the finding of Hield et al (1962). On the other hand, Bishr (1987) found that, the total yield of Balady mandarin was increased by using N.A.A at 750 p.p.m.

b) Effect of different pollination treatments and some growth regulators on physical properties of Jaffa orange fruits:-

Data in Tables (16),(17) and (18) show the physical properties of Jaffa orange fruits as affected by bagging only, emasculation and bagging, artificial cross-pollination with different pollen sources and some growth regulator treatments during 1985,1986 and

1987 seasons. It is clear from these Tables that bagging only treatment caused slight decrease in fruit weight as compared with open pollination treatment. Moreover, cross-pollination with Balady lime and Marsh grpefruit pollen had resulted in a slight increase in fruit weight during this study. While artificial cross-pollination with Balady mandarin and Suckarry orange pollens caused highly significant increase in fruit weight compared with open pollination treatment during the three seasons of this study. The increase in fruit weight of Jaffa orange or other citrus fruits as a result of artificial pollination by foreign pollen was reported earlier by Khalil (1967), Weheda (1972), Kawasmi and Oguma (1973) and Sherif (1983).

With regard to GA_3 at 1000 p.p.m, GA_3 at 2000 p.p.m, N.A.A at 25 p.p.m and GA_3 2000 p.p.m + N.A.A 25 p.p.m treatments, it is clear that these treatments caused highly significant increase in fruit weight while N.A.A at 50 p.p.m treatment caused significant decrease in fruit weight. On the other hand, GA_3 at 1000 p.p.m + N.A.A 50 p.p.m had no effect on fruit weight during the three seasons of this study. The effect of GA_3 on increasing fruit weight was reported by Damigella at al (1970), Deidda (1971), Chundawat and Randhawa (1972) Canat et al (1974) and Mawlood (1977) In addition the previous results of N.A.A treatments are in confirmity with the findings of Bisr (1987),

Regarding fruit height, it is obvious that bagging only and cross-pollination with Balady lime or cross-pollination with Marsh grapefruit had no effect on fruit height as compared with open pollination treatment during the three successive seasons of this study. On the other artificial cross-pollination with Balady mandarin pollen at 1985 and 1987 seasons and cross-pollination with Suckarry orange pollen at 1985 season had significantly increased fruit height. These results are in agreement with the findings of Khalil (1967), Weheda (1972) Sherif (1983) and Mohamed (1984). Furthermore, GA_3 at 1000 p.p.m or 2000 p.p.m, N.A.A at 25 p.p.m and the combination with GA_3 2000 p.p.m + N.A.A at 25 p.p.m or 50 p.p.m treatments on emasculated flowers caused highly significant increase in fruit height as compared with open pollination treatment.

concerning fruit diameter, it was found that cross-pollination with Balady lime pollen, cross-pollination with Marsh grapefruit pollen, cross-pollination with Balady mandarin and Cross-pollination with Suckarry orange pollen increased significantly fruit diameter than in the open pollination treatment. This results are in agreement with the findings of Khalil (1967), Weheda (1972) and Sherif (1983). Furthermore, GA_3 at 1000 p.p.m or 2000 p.p.m, N.A.A at 25 p.p.m and the combination with GA_3 at 2000 p.p.m. + 25 p.p.m or 50 p.p.m treatments showed varieability from one season to another. Some treatments such as GA_3 at 2000 p.p.m in 1985 season, N.A.A at 25 p.p.m in

1986 season, and the combination with GA_3 at 2000 p.p.m + N.A.A at 25 p.p.m in 1987 season) appeared to increase significantly fruit diameter than open pollination treatment. However, significant decrease in fruit diameter were detected, when N.A.A was applied at 50 p.p.m in 1985 season, GA_3 at 1000 p.p.m in 1986 season and N.A.A 50 p.p.m or N.A.A 50 p.p.m + GA_3 1000 p.p.m in 1987 season compared with open pollination treatment

Concerning fruit shape index (H/D ratio) it is obvious that either bagging only or cross-pollination treatments had varied from one season to another, the decrease was slight in 1985 season while cross-pollination with Balady lime, Balady mandarin and Suckarry orange pollens produced the lowest eleongated fruits and the differences were significant only in 1986 and 1987 seasons. These results are comfirmed with the findings of Khalil (1967), Weheda (1972), Sherif (1983).

Growth regulators treatments showed variability from one season to another with regard to fruit shape index, some treatments such as GA_3 at 1000 p.p.m or 2000 p.p.m N.A.A at 25 p.p.m, GA_3 at 2000 p.p.m + N.A.A 25 p.p.m and GA_3 at 2000 p.p.m + N.A.A 5o p.p.m) appeared to be significantly higher in fruit shape index than open pollination treatment during this study. The effect of GA_3 on increasing fruit shape index was reported by

EL-Khoreiby (1976) . Such results on N.A.A sprays and their effects on fruit shape coincided with that reported by Srivastava et al (1973) and Babu and Lavania (1986).

Regarding peel thickness, the data in previously mentioned Tables indicated that both bagging only or artificial cross-pollination treatments with Balady lime and Suckarry orange pollen did not affect peel thickness but cross-pollination with Marsh grapefruit and Balady mandarin pollen had highly significantly increased peel thickness during this study. Earlier findings of Sherif (1983) indicated that using Balady mandarin as a pollinator for Hamlin orange, Marsh grapefruit and Balady lime had resulted in increasing peel thickness. Moreover, the differences between growth regulators treatments and open pollination were not so great to be statistically significant except when GA_3 was applied at 1000 or 2000 p.p.m, GA_3 at 1000 p.p.m + N.A.A 15 p.p.m and GA_3 at 2000 p.p.m + N.A.A 50 p.p.m treatments as the increase in peel thickness were highly significant. The effect of GA_3 on increasing peel thickness was earliar reported by Goldschmidt et al (1983) .

Concerning juice weight and juice percent it is also clear that there is no significant differencess in fruit juice content between different pollination treatments and the open pollination treatment except

in the case of artificial cross-pollination with Balady mandarin pollen which increased significantly both juice weight and juice percent. This is in agreement with findings of Cameron (1960), Khalil (1967) on Washington navel orange and Sherif (1983) .

C) Effect of different pollination treatments and some growth regulators on the chemical properties of Jaffa orange fruits:

Tables (19),(20) and (21) indicated that bagging only and artifical cross-pollination with different pollen sources did not affected the percentage of T.S.S content in fruit juice which is in agreement with that reported by Cameron (1960) and Khalil (1967).

The effect of growth regulators treatments on percentage of total soluble solids was variable according growth regulators as GA_3 treatments had significantly increased T.S.S in fruit juice in 1985 and 1986 season than open pollination treatment. However, T.S.S was not affected by this treatment in 1987 season. On the other hand, N.A.A at 25 p.p.m or 50 p.p.m treatments caused highly significant increase of T.S.S in 1985 and 1987 seasons, respectively. However, all combination treatments between

GA_3 and N.A.A had not affected T.S.S in fruit juice compared to open pollination treatment during the study. The increase in T.S.S in fruit juice as a result of GA_3 treatments was reported by cutuli (1970), Deidda (1971), Kumar et al (1975) and Mazumdar and Bhatt (1977).

Regarding fruit juice acidity, Tables (19),(20) and (21) show a highly significant decrease in fruit juice acidity resulting from bagging only treatment compared to open pollination during the three seasons of this study. Moreover, most cross-pollination treatments had increased acidity in fruit juice during this study. However, acidity was significantly increased in cross-pollination with Balady lime and suckarry orange pollen in 1986 and 1987 seasons. These results agree with these reported by Khalil (1967), Lange and Vincent (1971) and Rokba (1976).

The effect of GA_3 at 1000 p.p.m or 2000 p.p.m,N.A.A at 50 p.p.m and combined treatments between GA_3 at 1000 p.p.m + N.A.A at 50 p.p.m had resulted in a significant increase in acidity of fruit juice over open pollination treatment. All other growth regulators treatments did not affect acid content in fruit juice during this study. The increase in acid content as a result of GA_3 treatments was reported by Salem (1963), Krezdorn and Kohen (1963) and Mawlood (1977).

T.S.S to acid ratio showed highly significant increase in bagging only treatment compared to open pollination treatment during this study. Artificial cross-pollination with Balady lime in three seasons, grapefruit in the season and Suckarry orange in the second and third seasons, showed highly significant decrease in T.S.S to acid ratio compared to open pollination treatment. However, All other cross-pollination treatments had not affected the T.S.S / acid ratio These results agree with those reported by Khalil (1967) and Atawa (1984).

The effect of growth regulators treatments is shown in previously mentioned tables, It is clear that GA_3 treatments had resulted in a highly significant decrease in T.S.S / acid ratio compared to open pollination treatment during the three successive seasons of this study. This is in agreement with the findings of Deidda (1971) Kumer (1975) and Mazumdar and Bhatt (1977).

Concerning ascorbic acid content in fruit juice,it is also evident from the same Tables that the ascorbic acid content was not affected by any treatment during this study except GA_3 at 1000 p.p.m, GA_3 at 1000 p.p.m+ N.A.A at 25 p.p.m and GA_3 at 2000 p.p.m + N.A.A at 50 p.p.m treatments only in the third year, these results are in agreement with the findings of Cutuli (1970), Kumer (1975) and Chundawat and Randhawa (1975). The effect of GA_3 on increasing ascorbic acid was reported by Mawlood (1977).

d) Effect of different pollination treatments and some growth regulators on seediness, seed development and pollination index of Jaffa orange fruits :-

The effects of different pollination treatments on the total number of seeds, well developed and shrivel seeds per fruit and pollination index are shown in Tables (22),(23) and (24) during 1985,1986 and 1987 seasons, respectively.

Data in Tables (22),(23) and (24) indicated that bagging only treatment caused slight decrease in the total number of seeds per fruit as compared to open pollination during the three seasons of this study. Moreover, cross-pollination with Balady mandarin pollen had significantly higher number of seeds than open-pollination treatment while the other cross-pollination treatments (Balady lime, grapefruit and Suckarry orange pollens) caused slight increase in the total number of seeds per fruit during this study.

On the other hand, Balady mandarin gave the highest total number of seeds per fruit (ranging 5 and 10) for the three seasons as compared with the other pollinators. Balady lime and Marsh grapefruit produced the lowest total number of seeds per fruit (ranging from 3 and 7) for the three seasons

of the study. These results are in agreement with the findings of Cost and Gagnard (1956).Cameron (1960), Weheda (1972), Lange and Vincent (1972) and Iwamasa and Oba (1980).

Regarding the number of well developed seeds per fruit, bagging only treatment caused slight decreased in number while cross-pollination with Balady mandarin and Suckarry orange pollens caused highly significant increase as compared to open pollination treatment during the three seasons of this study. Moreover, bagging only treatment produced the lowest percentage of well developed seeds while cross-pollination with different pollon sources caused slight increase compared to open pollination treatment and either Balady nandarin or Suckarry orange pollen caused significant increase in the percentage of well developed seeds during the study. The same findings were obtained by Majsuradze (1952) Klimenko and Klimenko (1952), EL-Tomi (1957), Minessy (1959), Ibrahim (1969) and Weheda(1972).

With respect to shrivelled seeds per fruit it is obvious that there were significant increase in the number of shrivelled seeds per fruit in cross-pollination treatments with different pollen sources during this study. In other words, the numbers and percentages of shrivel seeds in Jaffa orange fruit

were generally higher in bagging only treatment while the lowest number and percentage of shrivelled seeds were found with Balady mandarin and Suckarry orange pollens.

Regarding pollination index, the data showed that, there were slight decrease in this index in bagging only treatent while cross-pollination with different pollen sources caused slight increase except in Balady mandarin. The increase was highly significant during the three seasons of the study. The trend was generally towards increasing the pollination index of Balady mandarin while bagging only treatment was the lowest compared with open pollination treatment during the investigation. These results are in agreement with the findings of Mohamed (1984)

Table (13): Effect . different pollination treatments and some growth regulators on fruit set, remaining fruits after June drop and mature fruits in the Jaffa orange variety. (1985 season).

Treatments	No. of treated flowers	Fruit set		Remaining Fruits after June drop		Mature fruits	
		Total No.	Aver. %	Total No.	Aver. %	Total No.	Aver. %
Open pollination	923	164	17.77	98	10.62	58	6.28
Begging only	1146	167	14.57	93	8.12	61	5.32
Emasculation and begging	1180	115	9.75	73	6.19	-	-
Cross-pollination with Balady lime pollen.	964	174	18.05	114	11.80	62	6.43
Cross-pollination with Marsh grapefruit pollen.	1172	200	17.06	136	11.60	74	6.31
Cross-pollination with Balady mandarine pollen.	1061	297	27.99	151	14.23	122	11.50
Cross-pollination with Suckarry orange pollen.	983	205	20.85	124	12.61	97	9.87
GA_3 1000 p.p.m.	894	278	31.10	148	16.55	113	12.64
GA_3 2000 p.p.m.	915	310	33.88	198	21.64	164	17.92
N.A.A. 25 p.p.m.	989	156	15.77	81	8.19	47	4.75
N.A.A. 50 p.p.m.	1009	171	16.95	105	10.41	63	6.24
GA_3 1000 p.p.m.+ N.A.A. 25 p.p.m.	1121	192	17.13	118	10.53	75	6.69
GA_3 1000 p.p.m.+ N.A.A. 50 p.p.m.	994	158	15.90	97	9.76	58	5.84
GA_3 2000 p.p.m.+ N.A.A. 25 p.p.m.	1022	204	19.96	134	13.11	77	7.53
GA_3 2000 p.p.m.+ N.A.A. 50 p.p.m.	964	307	31.85	170	17.63	130	13.49
L.S.D. at 5%			2.95		1.53		0.96
L.S.D. at 1%			3.61		2.45		1.29

Table (14): Effect different pollination treatments and some growth regulators on fruit set, remaining fruits after June drop and mature fruits in the Jaffa orange variety. (1986 season).

Treatments	No. of treated flowers	Fruit set		Remaining Fruits after June drop		Mature fruits	
		Total No.	Aver. %	Total No.	Aver. %	Total No.	Aver. %
Open pollination	964	267	27.70	162	16.80	112	11.62
Begging only	1012	262	25.89	150	14.82	98	9.68
Emasculation and begging	871	174	19.98	92	10.56	-	-
Cross-pollination with Balady lime pollen.	913	255	27.93	157	17.20	109	11.94
Cross-pollination with Marsh grapefruit pollen.	795	215	27.04	131	16.48	87	10.94
Cross-pollination with Balady mandarine pollen.	981	321	32.72	207	21.10	160	16.31
Cross-pollination with Suckarry orange pollen.	1035	300	28.99	196	18.94	140	13.53
GA_3 1000 p.p.m.	961	279	29.03	175	18.21	142	14.78
GA_3 2000 p.p.m.	785	283	36.05	173	22.04	140	17.83
N.A.A. 25 p.p.m.	1079	269	24.93	160	14.83	105	9.73
N.A.A. 50 p.p.m.	1017	264	25.96	159	15.63	107	10.52
GA_3 1000 p.p.m.+ N.A.A. 25 p.p.m.	930	241	25.91	148	15.91	100	10.75
GA_3 1000 p.p.m.+ N.A.A. 50 p.p.m.	764	197	25.78	119	15.58	82	10.73
GA_3 2000 p.p.m.+ N.A.A. 25 p.p.m.	891	239	26.82	147	16.50	100	11.22
GA_3 2000 p.p.m.+ N.A.A. 50 p.p.m.	922	313	33.95	184	19.96	138	14.96
L.S.D. at 5%			3.53		2.29		1.84
L.S.D. at 1%			4.35		3.73		2.17

Table (15): Effect different pollination treatments and some growth regulators on fruit set, remaining fruits after June drop and mature fruits in the Jaffa orange variety. (1987 season).

Treatments	No. of treated flowers	Fruit set		Remaining Fruits after June drop		Mature fruits	
		Total No.	Aver. %	total No.	Aver. %	Total No.	Aver. %
Open pollination	866	120	13.86	66	7.62	47	5.42
Begging only	983	116	11.80	57	5.80	41	4.17
Emasculation and begging	1032	99	9.59	46	4.46	-	-
Cross-pollination with Balady lime pollen.	991	154	15.54	80	8.07	65	6.56
Cross-pollination with Marsh grapefruit pollen.	1065	148	13.90	85	7.98	58	5.45
Cross-pollination with Balady mandarine pollen.	867	165	19.03	103	11.88	81	9.34
Cross-poll9nation with Suckarry orange pollen.	872	143	16.40	78	8.94	60	6.88
GA_3 1000 p.p.m.	764	153	20.03	100	13.09	68	8.90
GA_3 2000 p.p.m.	923	212	22.97	138	14.95	102	11.05
N.A.A. 25 p.p.m.	1093	132	12.08	74	6.77	43	3.93
N.A.A. 50 p.p.m.	988	128	12.96	73	7.39	40	4.05
GA_3 1000 p.p.m.+ N.A.A. 25 p.p.m.	1016	142	13.98	76	7.48	47	4.63
GA_3 1000 p.p.m.+ N.A.A. 50 p.p.m.	1054	137	13.00	74	7.02	50	4.74
GA_3 2000 p.p.m.+ N.A.A. 25 p.p.m.	961	144	14.98	96	9.99	58	6.04
GA_3 2000 p.p.m.+ N.A.A. 50 p.p.m.	883	193	21.86	122	13.82	87	9.85
L.S.D. at 5%			2.37		1.41		1.00
L.S.D. at 1%			3.84		2.15		1.30

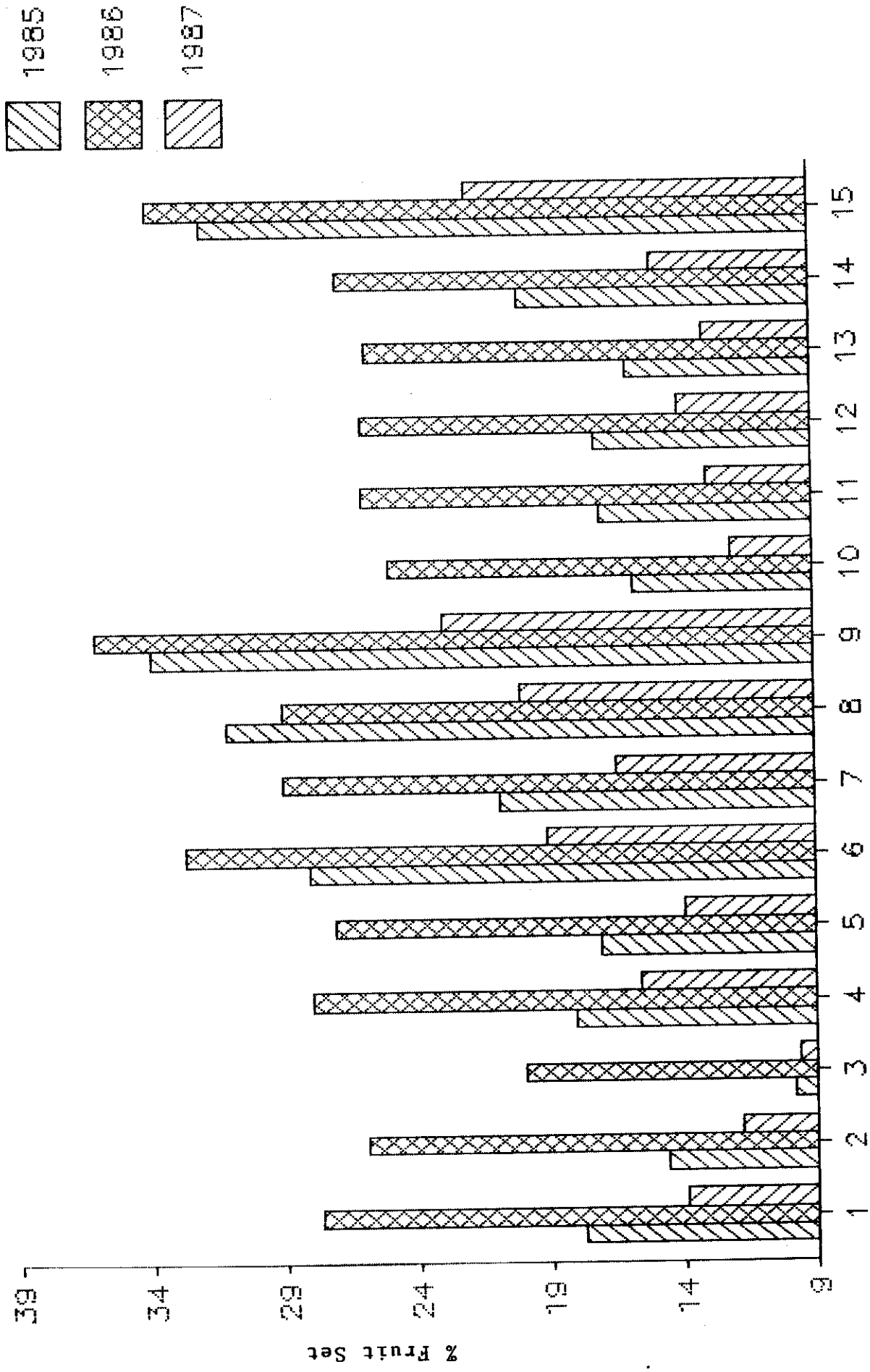

Fig. (4) Effect of Different Pollination Treatments and Some Growth Regulators on Fruit Set in the Jaffa Orange Variety

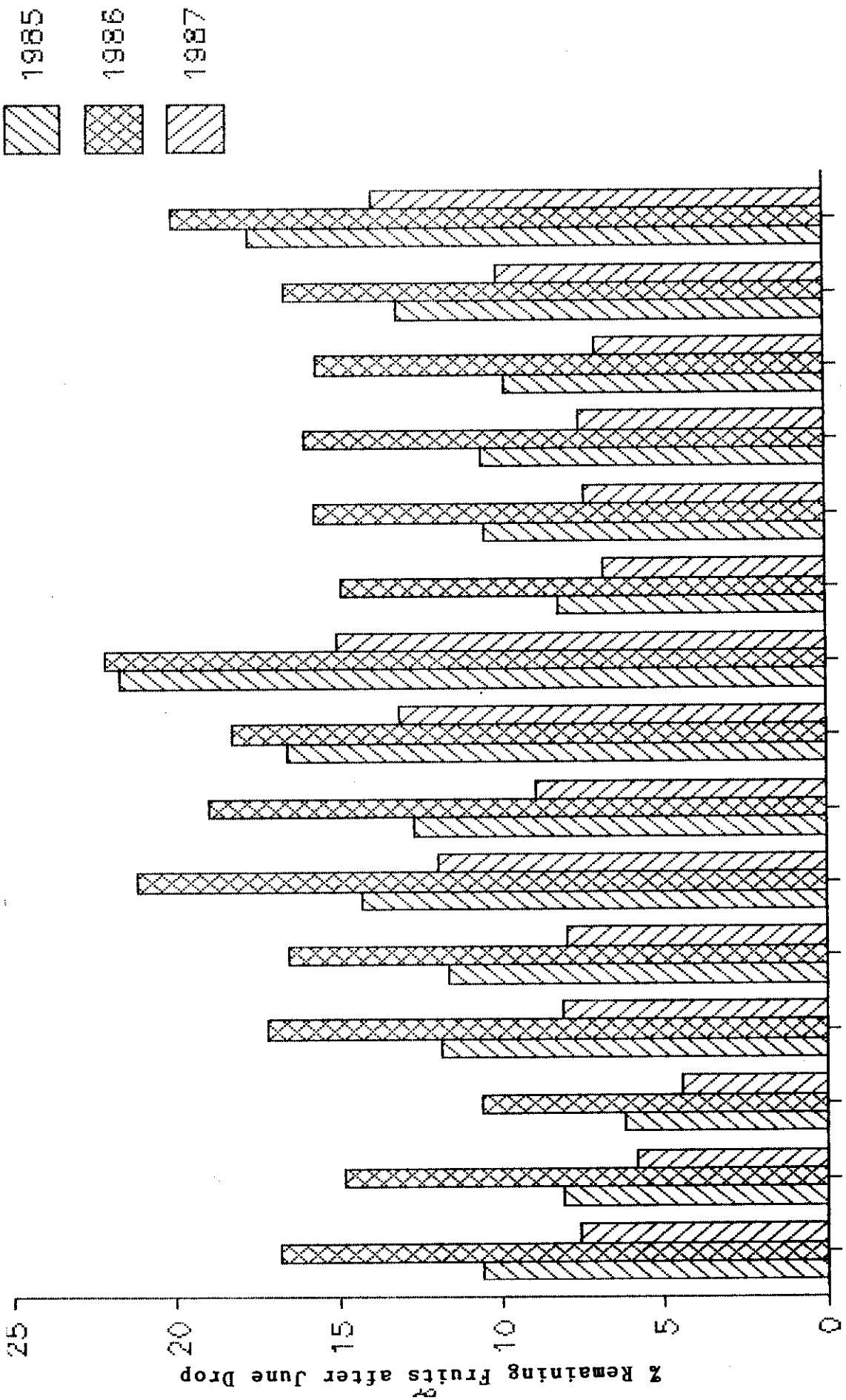

Fig. (5) Effect of Different Pollination Treatments and Some Growth Regulators on Remaining Fruits after June Drap in the Jaffa Orange Variety

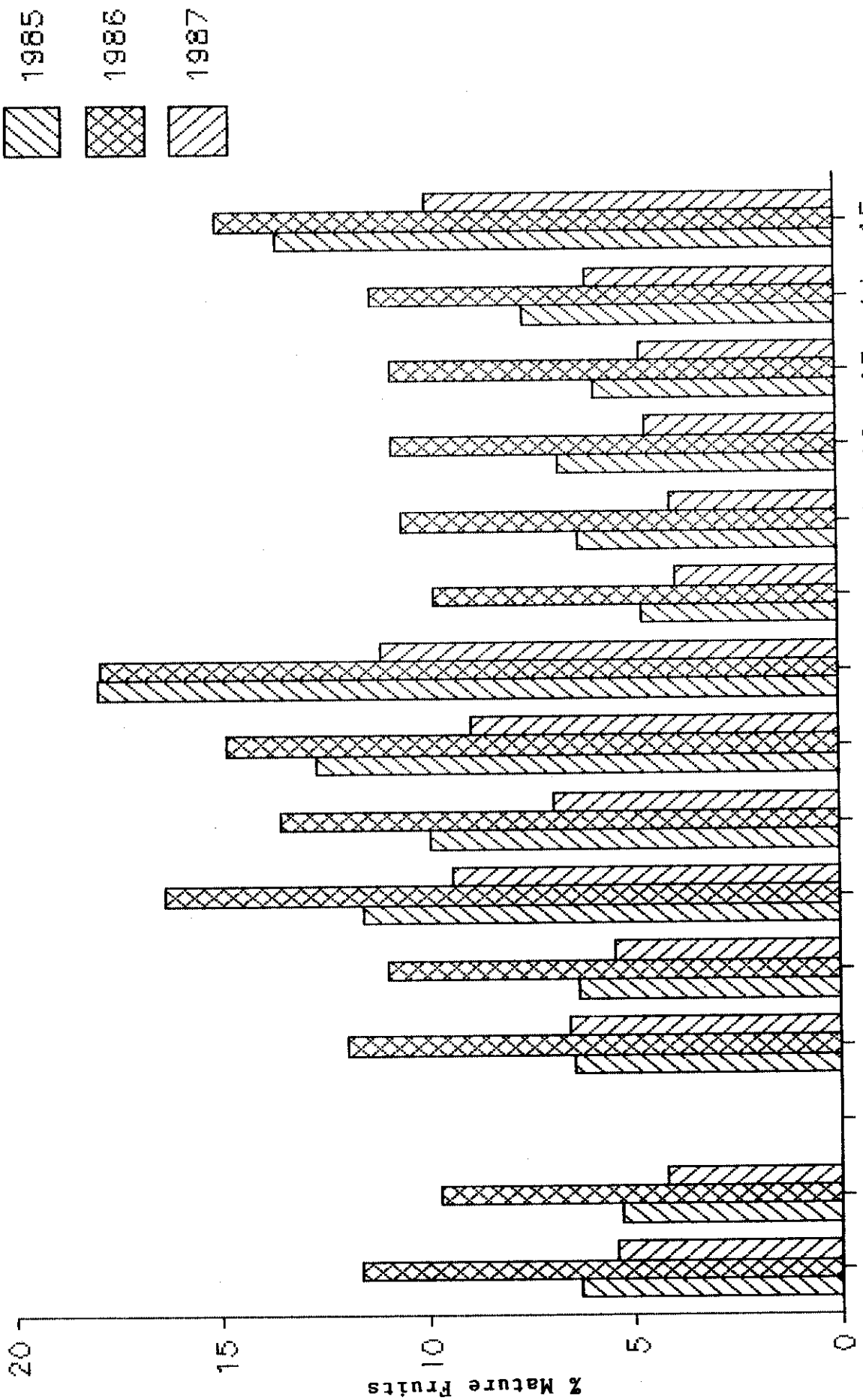

Fig. (6) Effect of Different Pollination Treatments and Some Growth Regulators on Mature Fruits in the Jaffa Orange Variety

Table (16) : Effect of different pollination treatments and some growth regulators on fruit physical properties in the Jaffa orange variety . (1985 season).

Treatments	Fruit weight gm.	Fruit height cm.	Fruit diameter cm.	Shape inex	Peel thickness mm.	Juice weight gm.	Juice %
Open pollination	187.00	6.47	6.32	1.02	0.55	89.17	47.68
Bagging only.	185.16	6.81	6.62	1.03	0.54	90.00	48.61
Emasculation and bagging.	-	-	-	-	-	-	-
Cross-pollination with Balady lime pollen.	189.35	6.41	6.39	1.00	0.55	91.00	48.06
Cross-pollination with Marsh grapefruit pollen.	189.00	6.38	6.40	0.99	0.60	88.10	46.61
Cross-pollination with Balady mandarine pollen.	197.10	6.98	7.61	0.92	0.65	97.00	49.21
Cross-pollination with Suckarry orange pollen.	193.60	7.10	7.43	0.96	0.55	90.60	46.80
GA_3 1000 p.p.m.	194.93	6.94	6.14	1.13	0.60	92.60	47.50
GA_3 2000 p.p.m.	195.22	7.85	6.71	1.17	0.61	99.30	50.87
N.A.A. 25 p.p.m.	200.00	8.20	7.62	1.08	0.55	96.00	48.00
N.A.A. 50 p.p.m.	180.00	6.11	5.99	1.02	0.57	89.13	49.52
GA_3 1000 p.p.m. + N.A.A. 25 p.p.m.	186.11	6.90	6.60	1.05	0.60	89.00	47.82
GA_3 1000 p.p.m. + N.A.A. 50 p.p.m.	186.00	6.84	6.62	1.03	0.56	90.86	48.85
GA_3 2000 p.p.m. + N.A.A. 25 p.p.m.	198.00	7.76	6.55	1.18	0.54	91.72	46.32
GA_3 2000 p.p.m. + N.A.A. 50 p.p.m.	190.43	7.00	6.20	1.13	0.63	94.00	49.36
L.S.D. at 5%	5.89	0.47	0.31	0.06	0.05	3.34	2.20
L.S.D. at 1%	7.88	0.64	0.42	0.11	0.07	4.47	3.16

Table (17) : Effect of different pollination treatments and some growth regulators on fruit physical properties in the Jaffa orange variety. (1986 season).

Treatments	Fruit weight gm.	Fruit height cm.	Fruit diameter cm.	Shape index	peel thickness mm.	Juice weight gm.	Juice %
Open pollination.	165.00	7.39	6.84	1.08	0.43	70.00	42.42
Bagging only	163.00	7.53	6.84	1.10	0.52	73.00	44.79
Emasculation and bagging.	-	-	-	-	-	-	-
Cross-pollination with Balady lime pollen.	168.00	7.15	7.33	0.98	0.47	69.00	41.07
Cross-pollination with Marsh grapefruit pollen.	166.91	7.62	7.58	1.00	0.48	69.18	41.67
Cross-pollination with Balady mandarine pollen.	180.11	7.35	7.78	0.94	0.60	78.89	43.80
Cross-pollination with Suckarry orange pollen.	173.00	7.06	7.12	0.99	0.49	73.00	43.93
GA_3 1000 p.p.m.	170.99	7.82	6.55	1.19	0.57	73.18	42.80
GA_3 2000 p.p.m.	172.10	7.85	6.71	1.14	0.56	78.86	45.82
N.A.A. 25 p.p.m.	180.00	7.80	7.43	1.05	0.40	75.10	41.72
N.A.A. 50 p.p.m.	159.00	7.66	6.71	1.14	0.49	69.00	42.86
GA_3 1000 p.p.m. + N.A.A. 25 p.p.m.	170.00	7.15	6.68	1.07	0.58	72.16	42.45
GA_3 1000 p.p.m. + N.A.A. 50 p.p.m.	166.00	7.41	6.90	1.07	0.49	70.0	42.17
GA_3 2000 p.p.m. + N.A.A. 25 p.p.m.	181.00	7.63	6.71	1.14	0.50	74.13	40.96
GA_3 2000 p.p.m. + N.A.A. 50 p.p.m.	169.00	7.65	6.67	1.15	0.59	70.00	41.42
L.S.D. at 5%	5.86	0.34	0.28	0.04	0.11	3.61	2.05
L.S.D. at 1%	7.84	0.46	0.39	0.10	0.16	4.83	3.29

Table (18) : Effect of different pollination treatments and some growth regulators on fruit physical properties in the Jaffa orange variety. (1987 season).

Treatments	Fruit weight gm.	Fruit height cm.	Fruit diameter cm.	Shape index	Peel thickness mm.	Juice weight gm.	Juice %
Open pollination.	162.93	6.92	6.53	1.06	0.40	67.91	41.68
Bagging only	160.00	6.87	6.77	1.01	0.41	69.00	43.13
Emasculation and bagging.	-	-	-	-	-	-	-
Cross-pollination with Balady lime pollen.	164.85	6.95	7.30	0.96	0.50	69.10	41.92
Cross-pollination with Marsh grapefruit pollen.	164.00	6.87	6.90	1.00	0.63	69.00	42.07
Cross-pollination with Balady mandarine pollen.	187.00	7.90	8.20	0.96	0.65	83.52	44.66
Cross-pollination with Suckarry orange pollen.	169.20	7.00	6.96	1.00	0.50	71.13	42.04
GA_3 1000 p.p.m.	175.00	7.66	6.74	1.14	0.71	69.00	39.43
GA_3 2000 p.p.m.	177.50	7.67	6.79	1.13	0.55	71.83	40.58
N.A.A. 25 p.p.m.	167.00	7.74	6.70	1.16	0.50	68.00	40.72
N.A.A. 50 p.p.m.	157.00	6.66	6.06	1.10	0.45	64.20	40.89
GA_3 1000 p.p.m. + N.A.A. 25 p.p.m.	162.90	7.26	6.39	1.14	0.58	65.00	40.12
GA_3 1000 p.p.m. + N.A.A. 50 p.p.m.	164.86	6.96	6.09	1.14	0.54	65.00	39.63
GA_3 2000 p.p.m. + N.A.A. 25 p.p.m.	184.00	7.42	7.43	1.00	0.53	80.71	43.86
GA_3 2000 p.p.m. + N.A.A. 50 p.p.m.	165.10	7.41	6.54	1.13	0.57	70.68	39.93
L.S.D. at 5%	3.97	0.43	0.30	0.05	0.14	3.63	2.15
L.S.D. at 1%	5.32	0.68	0.41	0.09	0.21	4.86	2.96

Table (19) : Effect of different pollination treatments and some growth regulators on fruit chemical characteristics in the Jaffa orange variety. (1985 season).

Treatments	T.S.S %	Tetratable acidity %	T.S.S/acid Ratio	Ascorbic acid mg/100 ml Juice
Open pollination	10.80	1.23	8.78	48.60
Bagging only	11.20	1.10	10.18	46.39
Emasculatrion and bagging	-	-	-	-
Cross-pollination with Balady lime pollen.	10.60	1.35	7.85	46.10
Cross-pollination with Marsh grapefruit pollen.	10.00	1.14	8.77	44.90
Cross-pollination with Balady mandarine pollen.	10.20	1.33	7.67	49.00
Cross-pollination with suckarry orange pollen.	11.00	1.36	8.09	49.00
GA_3 1000 p.p.m.	12.00	1.47	8.16	47.36
GA_3 2000 p.p.m.	12.20	1.54	7.92	48.11
N.A.A 25 p.p.m.	11.40	1.32	8.64	45.89
N.A.A 50 p.p.m.	11.80	1.33	8.87	44.16
GA_3 1000 p.p.m. + N.A.A. 25 p.p.m.	10.20	1.56	6.54	46.18
GA_3 1000 p.p.m. + N.A.A. 50 p.p.m.	12.40	1.49	8.32	44.96
GA_3 2000 p.p.m. + N.A.A. 25 p.p.m.	10.70	1.29	8.29	48.77
GA_3 2000 p.p.m. + N.A.A. 50 p.p.m.	11.60	1.10	10.55	50.33
L.S.D. at 5%	0.69	0.14	0.56	No.s
1%	0.92	0.19	0.73	No.s

Table (20) : Effect of different pollination treatments and some growth regulators on fruit chemical characteristics in the Jaffa orange variety. (1986 season).

Treatments	T.S.S %	Tetratable acidity %	T.S.S/acid Ratio	Ascorbic acid mg/100 ml Juice
Open pollination.	11.00	1.38	7.97	36.10
Bagging only.	10.80	1.23	8.78	38.71
Emasculation and bagging.	-	-	-	-
Cross-pollination with Balady lime pollen.	10.80	1.50	7.20	38.69
Cross-pollination with Marsh grapefruit pollen.	10.20	1.32	7.73	39.10
Cross-pollination with Balady mandarine pollen.	10.80	1.39	7.77	37.10
Cross-pollination with Suckarry orange pollen.	10.60	1.53	6.93	36.36
GA_3 1000 p.p.m.	11.00	1.51	7.28	38.40
GA_3 2000 p.p.m.	11.89	1.53	7.77	36.16
N.A.A. 25 p.p.m.	10.80	1.33	8.12	35.18
N.A.A. 50 p.p.m.	11.20	1.46	7.67	37.60
GA_3 1000 p.p.m. + N.A.A. 25 p.p.m.	10.40	1.48	7.03	35.71
GA_3 1000 p.p.m. + N.A.A. 50 p.p.m.	10.20	1.50	7.47	36.24
GA_3 2000 p.p.m. + N.A.A. 25 p.p.m.	10.60	1.41	7.52	39.13
GA_3 2000 p.p.m. + N.A.A. 50 p.p.m.	10.40	1.39	7.59	40.10
L.S.D. at 5%	0.89	0.09	0.29	No.s
L.S.D. at 1%	1.19	0.12	0.50	No.s

Table (21) : Effect of different pollination treatments and some growth regulators on fruit chemical characteristics in the Jaffa orange variety. (1987 season).

Treatments Treatments	T.S.S %	Tetratable acidity %	T.S.S/acid Ratio	Ascorbic acid mg/100 ml Juice
Open pollinaton	11.00	1.30	8.46	43.00
Bagging only	11.00	0.99	11.11	45.10
Emasculation and bagging.	-	—	-	-
Cross-pollination with Balady lime pollen.	10.80	1.41	7.66	45.20
Cross-pollination with Marsh grapefruit pollen.	11.20	1.35	8.30	46.09
Cross-pollination with Balady mandarine pollen.	11.00	1.27	8.66	47.30
Cross-pollination with Suckarry orange pollen.	10.80	1.50	7.20	45.33
GA_3 1000 p.p.m.	10.00	1.49	6.71	44.19
GA_3 2000 p.p.m.	10.40	1.39	6.98	48.63
N.A.A. 25 p.p.m.	12.40	1.37	8.92	45.18
N.A.A. 50 p.p.m.	11.20	1.30	8.61	45.00
GA_3 1000 p.p.m. + N.A.A. 25 p.p.m.	10.00	1.51	6.62	49.16
GA_3 1000 p.p.m. + N.A.A. 50 p.p.m.	10.00	1.63	6.13	44.09
GA_3 2000 p.p.m. + N.A.A. 25 p.p.m.	11.00	1.35	8.15	42.50
GA_3 2000 p.p.m. + N.A.A. 50 p.pm.	11.40	1.30	8.77	48.11
L.S.D. at 5%	1.02	0.10	0.21	3.36
1%	1.37	0.13	0.47	4.49

Table (22) : Effect of different pollination treatments on seediness and seed development in Jaffa orange frutis. (1985 season).

Treatments	Mean number of seeds per fruit	Rangein number of normal seeds per fruit	Well developed seeds per fruit		Shrivel seeds per fruit		Pollination index (No of) well developed seeds per treated flowers
			No	%	No	%	
Open pollination.	4.00	1-6	3.59	89.66	0.41	10.34	0.23
Bagging only.	3.10	1-4	2.43	78.31	0.67	21.69	0.13
Emasculation and bagging.	-	-	-	-	-	-	-
Cross-pollination with Balady lime pollen.	6.00	3-8	5.56	92.74	0.44	7.26	0.36
Cross-pollination with Marsh grapefruit pollen.	6.00	3-7	5.55	92.57	0.45	7.43	0.35
Cross-pollination with Balady mandarine pollen.	8.00	6-11	7.61	95.08	0.39	4.92	0.80
Cross-pollination with Suckarry orange pollen.	6.32	4-9	5.93	93.80	0.39	6.20	0.58
L.S.D. at 5%	2.81		2.10	3.14	0.17	3.14	0.40
L.S.D. at 1%	3.96		3.00	4.80	0.22	4.80	0.53

Table (23) : Effect of different pollination treatments on seediness and seed development in Jaffa orange fruits. (1986 season).

Treatments	Mean number of seeds per fruit	Range in number of normal seeds per fruit	Well developed seeds per fruit		Shrivel seeds per fruit		Pollination index (No of) well developed seeds per treated flowers
			No	%	No	%	
Open pollination.	4.11	1-5	3.78	91.96	0.33	8.04	0.44
Bagging only.	2.00	1-3	1.41	70.41	0.59	29.59	0.14
Emasculation and bagging.	-	-	-	-	-	-	-
Cross-pollination with Balady lime pollen.	5.00	3-7	4.75	95.05	0.25	4.95	0.57
Cross-pollination with Marsh grapefruit pollen.	4.22	3-7	4.00	94.82	0.22	5.18	0.44
Cross-pollination with Balady mandarine pollen.	7.00	5-10	6.84	97.77	0.16	2.23	1.12
Cross-pollination with Suckarry orange pollen.	5.16	3-8	4.96	96.12	0.20	3.88	0.67
L.S.D. at 5%	1.59		1.42	3.86	0.29	3.86	0.51
L.S.D. at 1%	2.81		2.37	5.11	0.40	5.11	0.62

Table (24) : Effect of different pollination treatments on seediness and seed development in Jaffa orange fruits. (1987 season).

Treatments	Mean number of seeds per fruit	Range in number of normal seeds per fruit	Well developed seeds per fruit		Shrivel seeds per fruit		Pollination index (No of) well developed seeds per treated flowers
			No	%	No	%	
Open pollination.	4.00	2-6	3.47	86.70	0.53	13.30	0.19
Bagging only.	2.96	1-3	2.05	69.42	0.90	30.58	0.09
Emasculation and bagging.	-	-	-	-	-	-	-
Cross-pollination with Balady lime pollen.	5.99	3-7	5.45	91.00	0.54	9.00	0.36
Cross-pollination with Marsh grapefruit pollen.	5.86	3-7	5.33	90.88	0.53	9.12	0.29
Cross-pollination with Balady mandarine pollen.	8.13	4-9	7.62	93.78	0.51	6.22	0.71
Cross-pollination with Suckarry orange pollen.	6.00	4-7	5.50	91.67	0.50	8.33	0.38
L.S.D. at 5%	2.64		1 .98	4.96	0.29	4.96	0.39
L.S.D. at 1%	3.80		2.91	6.30	0.39	6.30	0.50

3) The effects on Mazizy orange

a) Effect of different pollination treatments and some growth regulators on fruit set, remaining fruits after June drop and mature fruits in the Mazizy orange:

Data in Tables (25),(26) and (27) and Figures (7),(8) and (9) show the fruit set percent and yield of Mazizy orange fruits as affected by bagging only, emasculation and bagging, artific ial cross-pollination with balady lime, cross-pollination with Marsh grapefruit, cross-pollination with Balady mandarin and Cross-pollination with Suckarry orange pollens and some growth regulators treatments druing the three successive seasons of (1985,1986 and 1987). It is clear that both bagging only and emascolation and bagging treatments caused highly significant decrease fruit set percent, remaining fruits after June drop and fruits reamained to maturity(yield). Thise finding may be attributed to the lake of functional pollen for selfing in this variety . Bagging or emasculation of flowers could also exert a harmful effect on fruit set. On the other hand, cross-pollination using different pollen sources had significantly resulted in increasing fruit set, remaining fruits after June drop and

mature fruits compared with open pollination treatment. Moreover, different kinds of pollen varied in their effects cross-pollination with Balady mandarin and cross-pollination with suckarry orange being the highest paternal pollen and Cross-pollination Marsh grapefruit and cross-pollination with Balady lime as lowest. This shows that fruit set is greatly increased by the use of functional foreigen pollen. This results agree with the findings of EL-Tomi (1957), EL-Menshawi (1977) Abo-EL-Komsan (1978) Sherif (1983) and Mohamed (1984). Moreover, the high effect of Balady mandarin and Suckarry orange pollens on fruit set may be due to its high pollen viability. The comparative lower effect of Marsh grapefruit pollen on fruit set may be due to the fact that Marsh grapefruit produced pollen with low viability. On the other hand, Musahib-Ud-Din and Kamil (1963) reported that cross-pollination resulted in poor fruit setting in C.sinensis and Lange and Viencent (1970) who reported that, self pollination gave the highest fruit set in Washington navel orange but the percentage of mature fruit, was highest by cross-pollination with corresponding pollen variety.

Concerning the effects of growth regulators treatments. It is noticed from Tables (25),(26) and (27) that GA_3 at 1000 p.p.m or 2000 p.p.m and N.A.A at 25 p.p.m or 50 p.p.m had resulted in a considerable increases in fruit set, remaining fruits after June drop and mature fruits in Mazizy orange than open pollination

during this study. This confirms an earlier report by Kwasami (1954), Hield et al (1958), Coggins et al (1963), Salem (1963), Hield et al (1965),Diedda (1971) Chundawat and Randhawa (1972), Mohamed (1978) and Bredell (1986).

The combined effect of N.A.A at 25 p.p.m + GA_3 at 1000 p.p.m treatment caused significant increase in fruit set, remaining fruits after June drop and mature fruits. The effect of N.A.A on incresing fruit set and yield was reported by Sandhu et al (1986).

b) Effect of different pollination treatments and some growth regulators on physical properties of Mazizy orange fruits:-

Data in Tables (28),(29) and (30) show the physical properties of Mazizy orange fruits as affected by bagging only, emasculation and bagging, artificial cross-pollination with different pollen sources and some growth regulators treatments during 1985, 1986 and 1987 seasons. It is obvious that bagging only treatment had not affected fruit weight compared with open pollination during this study. On the other hand, emasculation and bagging treatment caused highly significant decrease in fruit weight in the second season while no fruits

had reached maturity in the first and third season. Moreover, artificial cross-pollination with Balady lime, Cross-pollination with Marsh grapefruit, cross-pollination with Balady mandarin and cross-pollination with Suckarry orange caused significantly higher fruit weight than open pollination during 1985 , 1986 and 1987 seasons with the exception of the first and second seasons in the case of cross-pollination with Marsh grapefruit. The general trend of the increase in weight which was obtained when using artificial cross-pollination with different pollen sources during the course of this investigation agreed with results obtained by Khalil (1967), Weheda (1972), Kawasmi and Oguma (1973) Sherif (1983) and Mohamed (1984).

With respect to growth regulators, GA_3 at 1000 p.p.m or 2000 p.p.m significantly increased the fruit weight compared with the open pollination treatment during this study. The same findings were obtained by Deidda (1971) and Mawlood (1977). N.A.A at 25 p.p.m and 50 p.p.m treatments caused slight decrease in fruit weight during the second and the third seasons while the decrease in fruit weight was significant during the first season compared with open pollination treatment. The combination treatments between GA_3 + N.A.A had not affected fruit weight except in N.A.A at 50 p.p.m + GA_3

at 2000 p.p.m combination treatment, where the increase in fruit weight was significant.

With respect to fruit height, fruit diameter and fruit shape, it is noticed that bagging only treatment was not affected compared with open pollination treatment during this study. Emasculation and bagging treatment decreased fruit height and diameter in the second season while no fruits remained to maturity in the first and third season.Moreover, artificial cross-pollination with different pollen sources caused highly significant increase in fruit height and diameter during the three seasons of study except in the second and third seasons when Marsh grapefruit was used as a pollinator, However, the increase was slight. These resultes agree with the findings of Khalil (1967), Weheda (1972), Sherif (1983).

With respect to growth regulators GA_3 at 1000 p.p.m and 2000 p.p.m treatments had caused significant increase in fruit height, diameter and shape index during this study. This is in agreament with the findings of Khalil (1967), EL-Khoreiby (1976) and Atawia (1984). On the other had, N.A.A treatments had no effect fruit dimensions and fruit shape index. This result is in agreement with the findings by Mawlood (1977) and Hussain (1979). The results show also that, increase of N.A.A at 50 p.p.m + GA_3 at 2000 p.p.m the increase of fruit

height was significant during this study. These results on N.A.A effect on fruit height, diameter and shape index coincided with those reported by Hield at al (1962) and Bishr (1987).

Concerning peel thickness, it is noticed that bagging only treatment increased the peel thickness but the differences were so slight to be significant during the first and the third seasons while it was significant in the second season as compared with the open pollination treatment. Moreover, artificial cross-pollination with different pollen sources: Marsh grapefruit, Balady mandarin and Suckarry orange caused highly significant increase in peel thickness while the increase was slight when Balady lime was used as a pollinator compared with open pollination treatment during this study. These results are in confirmity with the findings of Sherif (1983).

Applied GA_3 at 1000 p.p.m to emasculated flowers significantly increased the peel thickness as compared with open pollination treatment while GA_3 at 2000 p.p.m had no effect in this regard. These results agree with the obtained by Chundawat and Randhawa (1975) EL-Khoreiby (1976), Goldschmid et al (1983) and Lima and Davies (1984). On the other hand, using N.A.A at 25p.p.m in 1986 and 1987 increased peel thickness while using N.A.A at 50 p.p.m and the combination between N.A.A +GA_3

treatment on emasculated flowers had no effect on peel thickness compared with open pollination treatment in this study.

With respect to fruit juice, it is also evident from the Tables (28),(29) and (30) that there is no significant differences in fruit juice content between bagging only treatment and open pollination while emasculation and bagging treatment had resulted in a significant decrease in fruit juice content compared with open pollination. The different pollen sources caused highly significant increase in fruit juice content as compared with open pollination, Similar results were obtained by Cameron (1960), Khalil (1967) and Sherif (1983). Moreover, GA_3 at 1000 p.p.m or 2000 p.p.m treatments caused significantly higher fruit juice content than open pollination during this study. The increase in juice content as a result of GA_3 treatment was reported by Deidda (1971), Mawlood (1977) and Moustafa (1985). N.A.A at 25 p.p.m or 50 p.p.m applied to emasculated flowers had no effect on fruit juice compared with open pollination treatment during the three seasons of this study. On the other hand, only the combined N.A.A at 50 p.p.m + GA_3 at 2000 p.p.m treatment had resulted in a significant increase in fruit juice content which may be attributed to the effect of GA_3 alone.

c) Effect of different pollination treatments and some growth regulators on the chemical properties of Mazizy orange fruits:-

Table (31),(32) and (33) show that, bagging only treatment had significantly increased T.S.S in fruit juice in 1986 and 1987 seasons than open pollination treatment . Emasculation and bagging treatment resulted in a significant decrease in T.S.S in fruit juice in 1986 compared to open pollination treatment.

Cross-pollination with different pollen sources had not affected T.S.S in fruit juice during this study. These results are in agreement with those reported by Cameron (1960), Khalil (1967), Weheda (1972) and Rokba (1976). On the other hand, GA_3 treatment had resulted in a slight decrease in T.S.S of fruit juice compared to open pollination treatment. These results are in agrement with the findings reported by Cogging et al (1963), EL-Khoreiby (1976) and Mawlood (1977). The same trend was noticed with N.A.A at 25 p.p.m or 50 p.p.m and the combination between GA_3 and N.A.A in this respect.

Regarding fruit juice acidity, bagging only treatment showed slight increase in fruit juice acidity during this study. The same was true with emasculation

and bagging treatment in 1986 season only. Moreover, the same Tables show a significant increase in fruit juice acidity from artificial cross-pollination with Balady lime, Balady mandarin and Suckarry orange pollen in 1985, 1986 and 1987 seasons compared to open pollination treatment . These results are in confirmity with those obtained by Deidda (1966), Khalil (1967) Lange and Vincent (1971) and Atawia (1984).

Concerning growth regulator treatments, it is clear that GA_3 at 1000 p.p.m or 2000 p.p.m treatments and N.A.A at 25 p.p.m or 50 p.p.m combined with GA_3 at 2000 p.p.m had significantly increased the fruit juice acidity during the three successive seasons of this study. These results are in confirmity with the findings of Krezdorn and Kohen (1963), Salem (1963) and Mawlood (1977). On the other hand, N.A.A at 25 p.p.m or 50 p.p.m treatments during the study resulted in the decrease of juice acidity which is in agreement with the findings obtained by Lal and Thakur (1978).

Regarding, the juice T.S.S/acid ratio, it is clear that it is significantly increased in bagging only treatment in the third season only. Cross-pollination treatments resulted in highly significant

decrease in T.S.S/ acid ratio in the three seasons of this study. This result is in agreement with the findings by Rokba et al (1976).

Growth regulators treatments had resulted in highly significant decrease in T.S.S/acid ratio as a result of GA_3 treatments while N.A.A. treatments resulted in sli-slight increase in T.S.S/acid ratio. These results Atawia (1984) and Bishr (1987).

With respect to Ascorbic acid content in fruit juice was not affected by any treatment. This result is in agreement with the findings by Salem (1963), Sharma and Randhawa (1968), Weheda (1972) and Rokba et al (1976).

d)Effect of different pollinators and some growth regulators on seediness, seed development and pollination index of Mazizy orange : -

The effect of different pollination treatments on the total number of seeds, well developed and shrivel seeds per fruit and pollination index are tablulated in Tables (34),(35) and (36) during the three successive seasons of investigation for Mazizy orange variety.

The data indicated that, cross-pollination with Balady mandarin, cross-pollination with Balady lime and cross-pollination with Suckarry orange pollens caused a significant increase in the total number of seeds per fruit than open pollination treatment.On the other hand, Balady mandarin as a pollinator gave the highest total number of seeds per fruit (ranging between 3 to 9) for the three seasons as compared with the other pollinators. Marsh grapefruit produced the lowest total number of seeds per fruit (ranging from 2 and 6). These results are similar to those reported by Cost and Gagnard (1956),Cameron (1960), Weheda (1972), Lange and Vincent (1972), Iwamasa and Oba (1980) and Atawia (1984).

Concerning the number of well developed seeds per fruit, cross-pollination with Balady mandarin and cross-pollination with Suckarry orange pollens produced the highest number of well developed seeds per fruit, while cross-pollination with Marsh grapefruit caused slightly higher number of well developed seeds per fruit compared to open pollination treatment. cross-pollination with Balady mandarin pollen produced the highest percentage of well developed seeds while bagging only treatment gave the lowest number seeds compared to open pollination treatment and other treatments. These results are in agreement with

those reported by Majsuradze (1952), Klimenko and Klimenko (1952), EL-Tomi (1957), Minessy (1959) Ibrahim (1969) and Weheda (1972).

Concearning shrivelled seeds per fruit, the data indicated that, there were no differences between different treatments. On the other hand, the numbers and percentages of shrivel seeds in Mazizy orange variety was significantly increased in bagging only treatment. Thes results are similar to those reported by Rokba et al (1976).

Concerning pollination index, the statistical analysis showed that there was a slight decrease with bagging only treatment. Cross-pollination with different pollen sources caused slight increase except Balady mandarin which caused highly significant increase compared to open pollination treatment during this study. The trend was generally towards increasing the pollination index of Balady mandarin while bagging only treatment was the lowest compared to open pollination treatment during this study which agree with results reported by Mohamed (1984).

Table (25): Effect of different pollination treatments and some growth regulators on fruit set, remaining fruits after June drop and mature fruits in the Mazizy orange variety. (1985 season).

Treatments	No. of treated flowers	Fruit set		Remaining Fruits after June drop		Mature fruits	
		Total No.	Aver. %	Total No.	Aver. %	Total No.	Aver. %
Open pollination	1165	131	11.24	75	6.44	56	4.81
Begging only	1192	107	8.98	36	3.02	27	2.27
Emasculation and begging	1216	73	6.00	30	2.47	-	-
Cross-pollination with Balady lime pollen.	1133	135	11.92	80	7.06	63	5.56
Cross-pollination with Marsh grapefruit pollen.	1095	119	10.86	76	6.94	54	4.93
Cross-pollination with Balady mandarine pollen.	1236	198	16.02	142	11.48	103	8.33
Cross-pollination with Suckarry orange pollen.	987	147	14.89	84	8.51	58	5.88
GA_3 1000 p.p.m.	1136	142	12.50	74	6.51	55	4.84
GA_3 2000 p.p.m.	994	128	12.88	69	6.94	56	5.63
N.A.A. 25 p.p.m.	975	140	14.36	82	8.11	63	6.46
N.A.A. 50 p.p.m.	893	133	14.89	74	8.29	59	6.61
GA_3 1000 p.p.m.+ N.A.A. 25 p.p.m.	816	139	17.03	89	10.91	67	8.21
GA_3 1000 p.p.m.+ N.A.A. 50 p.p.m.	1108	133	12.00	75	6.77	58	5.23
GA_3 2000 p.p.m.+ N.A.A. 25 p.p.m.	1124	135	12.01	72	6.41	62	5.52
GA_3 2000 p.p.m.+ N.A.A. 50 p.p.m.	1207	133	11.02	75	6.21	56	4.64
L.S.D. at 5%			2.80		1.62		0.92
L.S.D. at 1%			3.41		2.17		1.23

Table (26): Effect of different pollination treatments and some growth regulators on fruit set, remaining fruits after June drop and mature fruits in the Mazizy orange variety. (1986 season).

Treatments	No. of treated flowers	Fruit set		Remainig Fruits after June drop		Mature fruits	
		Total No.	Aver. %	Total No.	Aver. %	Total No.	Aver. %
Open pollination	1206	175	14.51	72	5.97	67	5.56
Begging only	1269	142	11.19	58	4.57	50	3.94
Emasculation and begging	1258	106	8.43	37	2.94	14	1.11
Cross-pollination with Balady lime pollen.	1067	175	16.40	80	7.50	73	6.84
Cross-pollination with Marsh grapefruit pollen.	1146	184	16.06	82	7.16	74	6.46
Cross-pollination with Balady mandarine pollen.	1083	235	21.70	145	13.39	109	10.06
Cross-pollination with Suckarry orange pollen.	1121	212	18.91	118	10.53	90	8.03
GA_3 1000 p.p.m.	984	189	19.21	91	9.25	67	6.81
GA_3 2000 p.p.m.	977	197	20.16	105	10.75	79	8.09
N.A.A. 25 p.p.m.	893	187	20.94	100	11.20	73	8.17
N.A.A. 50 p.p.m.	965	212	21.97	104	10.78	79	8.19
GA_3 1000 p.p.m.+ N.A.A. 25 p.p.m.	822	206	25.06	107	13.02	95	11.56
GA_3 1000 p.p.m.+ N.A.A. 50 p.p.m.	911	136	14.93	62	6.81	58	6.37
GA_3 2000 p.p.m.+ N.A.A. 25 p.p.m.	933	125	13.40	55	5.89	46	4.93
GA_3 2000 p.p.m.+ N.A.A. 50 p.p.m.	986	151	15.31	71	7.20	65	6.59
L.S.D. at 5%			2.33		1.38		1.08
L.S.D. at 1%			3.11		2.86		1.44

Table (27): Effect of different pollination treatments and some growth regulators on fruit set, remaining fruits after June drop and mature fruits in the Mazizy orange variety. (1987 season).

Treatments	No. of treated flowers	Fruit set		Remaining Fruits after June drop		Mature fruits	
		Total No.	Aver. %	Total No.	Aver. %	Total No.	Aver. %
Open pollination	986	208	21.10	82	8.32	60	6.09
Begging only	894	161	18.01	49	5.48	30	3.36
Emasculation and begging	977	127	13.00	36	3.68	-	-
Cross-pollination with Balady lime pollen.	1120	244	21.79	100	8.93	70	6.25
Cross-pollination with Marsh grapefruit pollen.	995	215	21.61	86	8.64	59	5.93
Cross-pollination with Balady mandarine pollen.	769	230	29.91	112	14.56	87	11.31
Cross-pollination with Suckarry orange pollen.	784	195	24.87	90	11.48	76	9.69
GA_3 1000 p.p.m.	890	196	22.02	81	9.10	71	7.98
GA_3 2000 p.p.m.	911	219	24.04	103	11.31	79	8.67
N.A.A. 25 p.p.m.	966	242	25.05	105	10.87	88	9.11
N.A.A. 50 p.p.m.	935	270	28.88	111	11.87	88	9.41
GA_3 1000 p.p.m.+ N.A.A. 25 p.p.m.	1011	334	33.04	170	16.82	137	13.55
GA_3 1000 p.p.m.+ N.A.A. 50 p.p.m.	1161	232	19.98	92	7.92	70	6.03
GA_3 2000 p.p.m.+ N.A.A. 25 p.p.m.	986	199	20.18	78	7.91	58	5.88
GA_3 2000 p.p.m.+ N.A.A. 50 p.p.m.	933	196	21.01	76	8.14	56	6.00
L.S.D. at 5%			2.76		2.06		1.93
L.S.D. at 1%			3.69		2.76		2.58

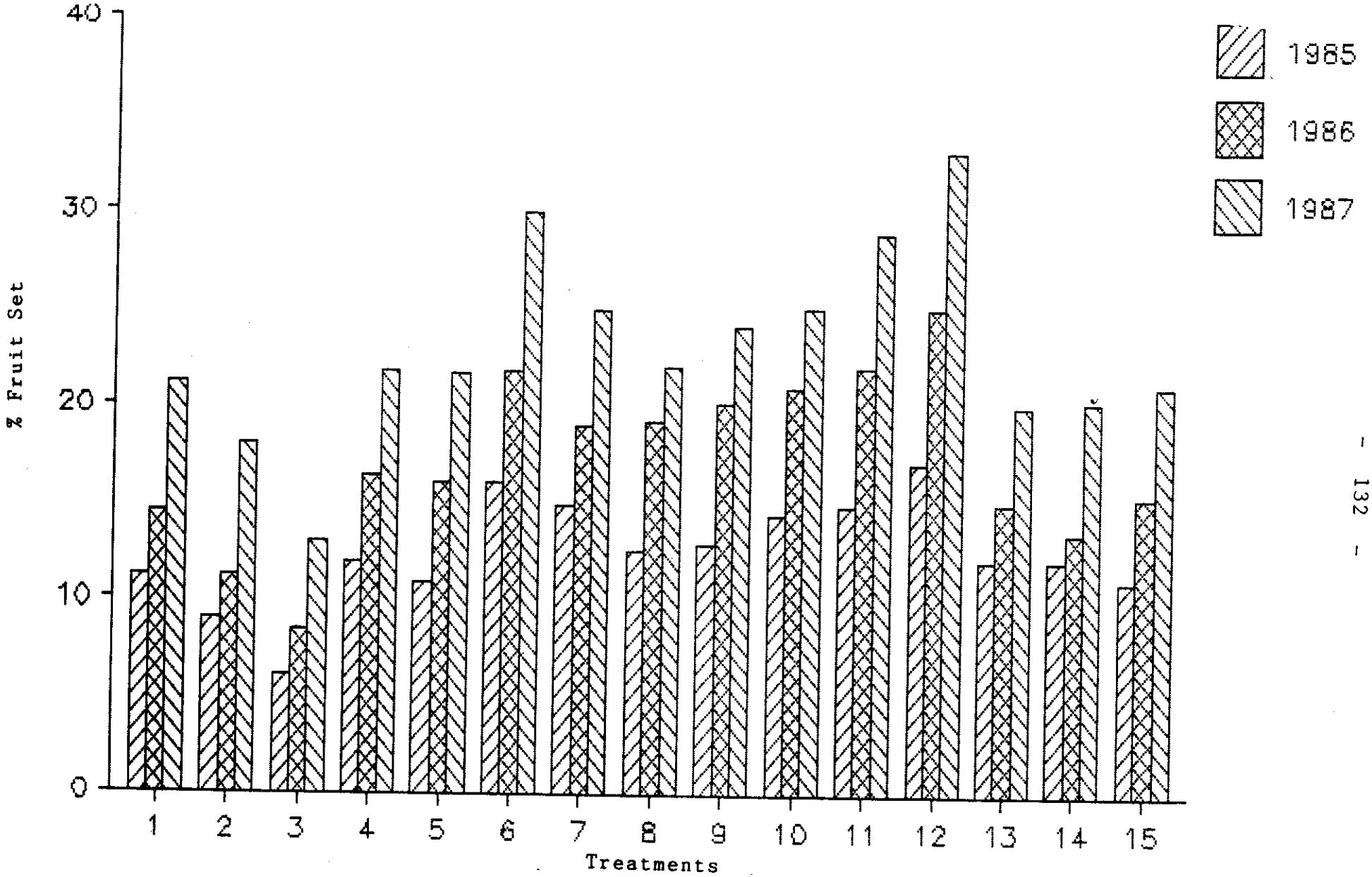

Fig. (7) Effect of Difrerent Pollination Treatments and Some Growth Regulators on Fruit Set in the Mazizy Orange Variety

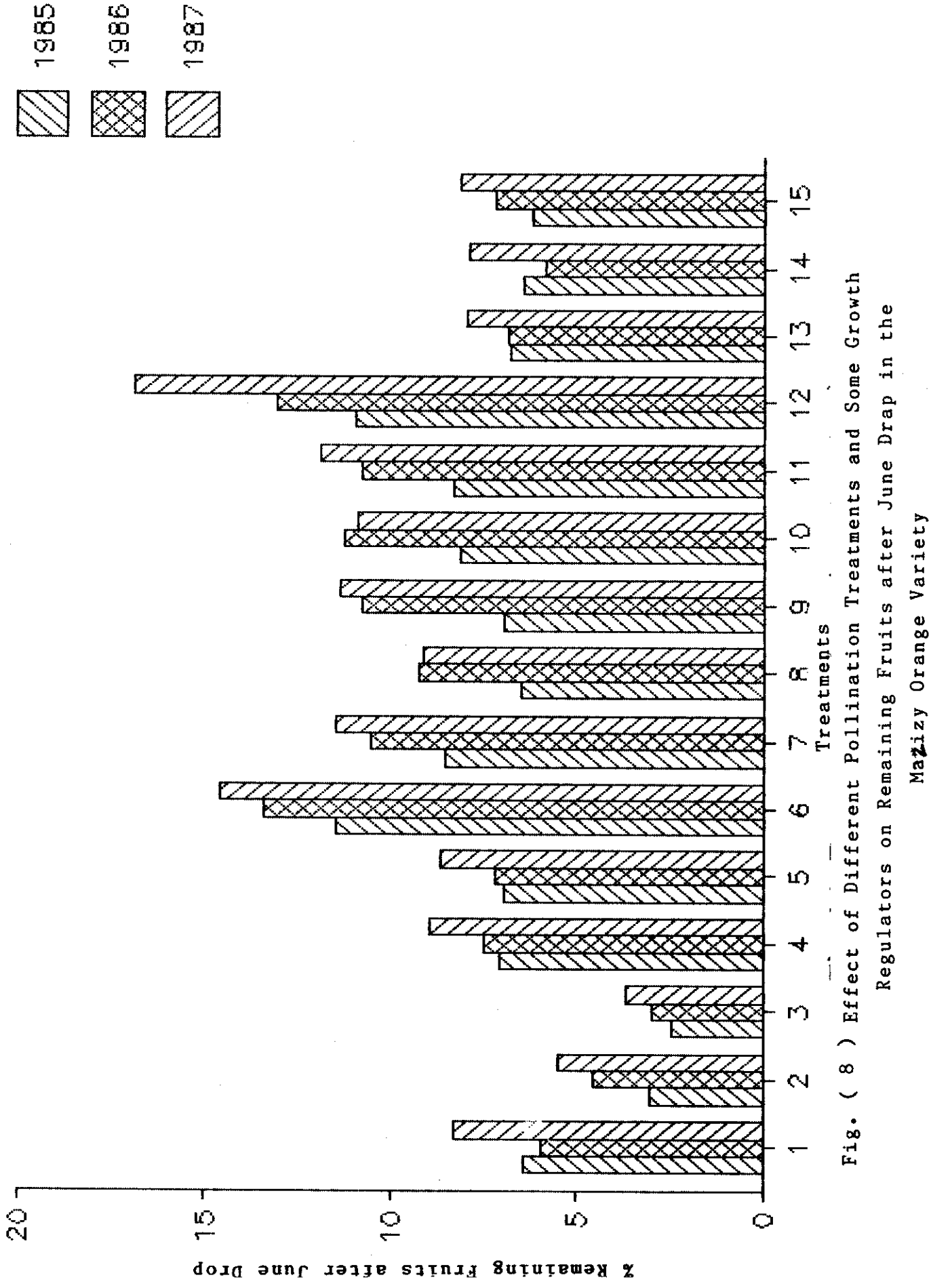

Fig. (8) Effect of Different Pollination Treatments and Some Growth Regulators on Remaining Fruits after June Drap in the Mazizy Orange Variety

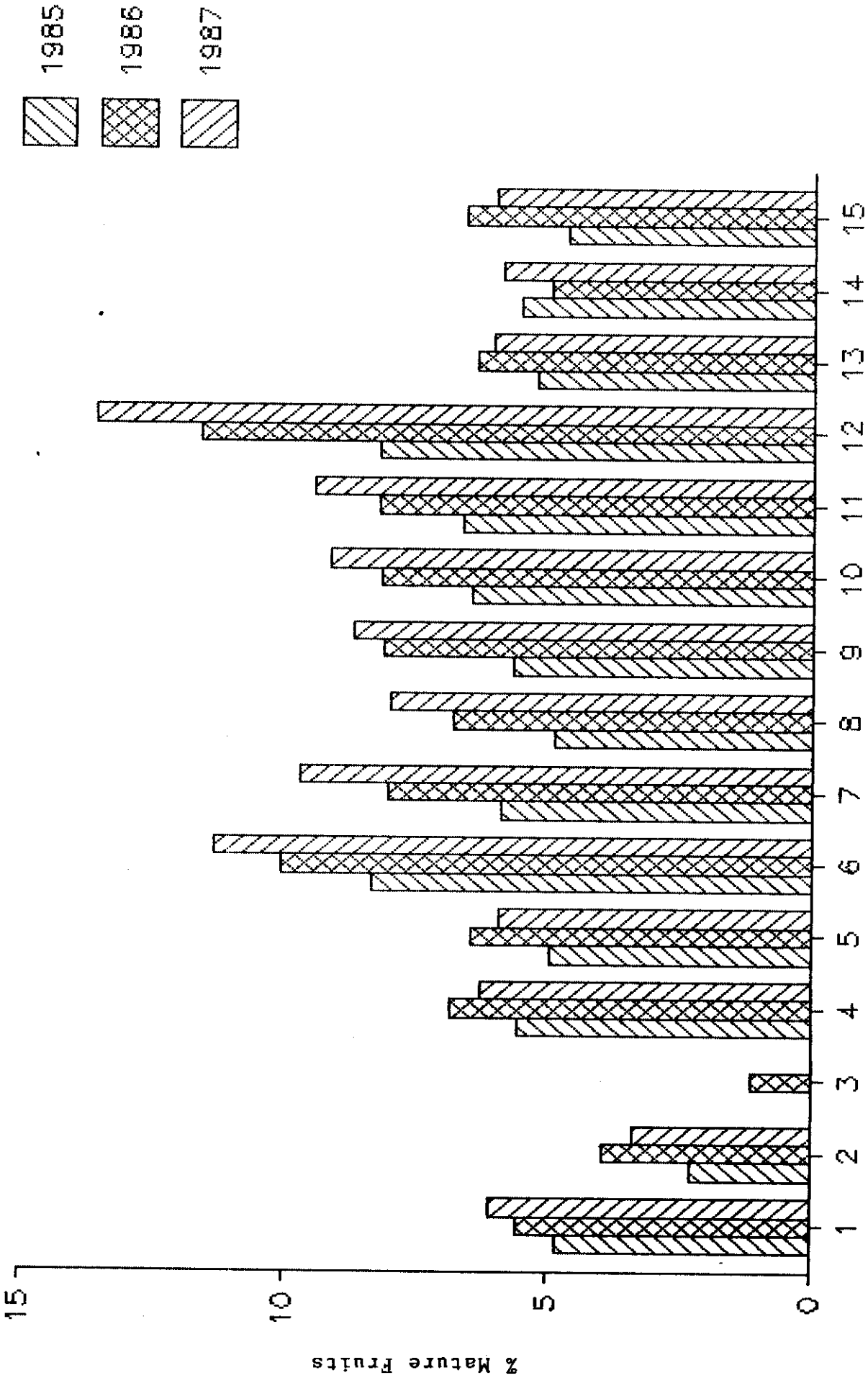

Fig. (9) Effect of Different Pollination Treatments and Some Growth Regulators on Mature Fruits in the Mazizy Orange Variety

Table (28) : Effect of different pollination treatments and some growth regulators on fruit physical properties in the Mazyzy orange variety. (1985 season).

Treatments	Fruit weight gm.	Fruit height cm.	Fruit diameter cm.	Shape index	Peel thickness mm.	Juic weight gm.	Juice %
Open pollination.	117.00	4.96	4.88	1.02	0.33	41.00	35.04
Bagging only.	115.00	4.83	4.71	1.03	0.39	43.00	38.39
Emasculation and bagging.	-	-	-	-	-	-	-
Cross-pollination with Balady lime pollen.	127.00	5.12	5.45	0.94	0.33	44.00	34.65
Cross-pollination Marsh grapefruit pollen.	120.10	5.63	5.63	1.00	0.40	43.00	34.10
Cross-pollination with Balady mandarine pollen.	132.69	5.86	5.93	0.99	0.60	46.10	34.74
Cross-pollination with Suckarry orange pollen.	126.00	5.74	5.86	0.98	0.65	45.00	35.71
GA_3 1000 p.p.m.	141.00	6.27	5.34	1.17	0.68	55.00	39.01
GA_3 2000 p.p.m.	133.00	5.81	5.22	1.11	0.34	48.00	36.09
N.A.A. 25 p.p.m.	111.56	5.00	4.94	1.01	0.38	39.00	43.96
N.A.A. 50 p.p.m.	100.00	5.00	4.73	1.06	0.33	38.60	36.00
GA_3 1000 p.p.m. + N.A.A. 25 p.p.m.	108.00	5.13	4.99	1.03	0.38	39.20	36.11
GA_3 1000 p.p.m. + N.A.A. 50 p.p.m.	106.00	4.89	4.94	0.99	0.35	39.00	36.79
GA_3 2000 p.p.m. + N.A.A. 25 p.p.m.	112.99	4.97	4.83	1.03	0.30	38.00	33.63
GA_3 2000 p.p.m. + N.A.A. 50 p.p.m.	129.00	5.71	5.47	1.04	0.35	52.00	40.31
L.S.D. at 5%	4.60	0.66	0.25	0.08	0.07	2.94	3.89
L.S.D. at 1%	6.15	0.88	0.34	0.14	0.10	3.94	5.10

Table (29) : Effect of different pollination treatments and some growth regulators on fruit physical properties in the Mazizy orange variety. (1986 season).

Treatments	Fruit weight gm.	Fruit height cm.	Fruit diameter cm.	Shape index	Peel thickness mm.	Juice weight gm.	Juice %
Open pollination.	132.00	5.03	5.10	0.99	0.41	57.00	43.18
Bagging only.	133.00	5.18	5.26	0.98	0.50	59.00	44.36
Emasculation and bagging.	87.00	4.55	4.66	1.06	0.41	39.10	44.94
Cross-pollination with Balady lime pollen.	139.00	5.63	5.67	0.99	0.43	61.80	44.46
Cross-pollination with Marsh grapefruit pollen.	133.80	5.17	5.13	1.01	0.46	56.00	41.85
Cross-pollination with Balady mandarine pollen.	147.00	6.11	6.35	0.96	0.53	64.96	44.19
Cross-pollination with Suckarry ornage pollen.	140.10	6.06	6.27	0.97	0.54	62.38	43.10
GA_3 1000 p.p.m.	151.00	6.81	5.84	1.17	0.58	75.28	49.85
GA_3 2000 p.p.m.	146.00	6.15	5.65	1.09	0.43	69.70	47.74
N.A.A. 25 p.p.m.	130.60	5.13	5.11	1.01	0.45	58.93	54.12
N.A.A. 50 p.p.m.	133.00	5.15	5.12	1.01	0.40	59.00	44.36
GA_3 1000 p.p.m. + N.A.A. 25 p.p.m.	136.00	5.29	5.07	1.04	0.40	57.10	41.99
GA_3 1000 p.p.m. + N.A.A. 50 p.p.m.	126.00	4.98	5.14	0.97	0.41	54.60	43.33
GA_3 2000 p.p.m. + N.A.A. 25 p.p.m.	138.00	5.27	5.31	0.99	0.40	57.00	41.30
GA_3 2000 p.p.m. + N.A.A. 50 p.p.m.	144.00	6.10	5.83	1.05	0.43	68.60	47.64
L.S.D. at 5%	4.52	0.30	0.22	0.09	0.04	4.22	4.41
L.S.D. at 1%	6.05	0.40	0.30	0.17	0.06	5.64	6.55

Table (30) : Effect of different pollination treatments and some growth regulators on fruit physical properties in the Mazizy orange variety. (1987 season).

Treatments	Fruit weight gm.	Fruit height cm.	Fruit diameter cm.	Shape index	Peel thickness mm.	Juice weight gm.	Juice %
open pollination.	120.00	6.54	6.18	1.06	0.39	51.00	42.50
Bagging only.	121.00	6.48	6.20	1.05	0.40	49.00	40.50
Emasculation and bagging.	-	-	-	-	-	-	-
Cross-pollination with Balady lime pollen.	150.10	6.34	6.61	0.96	0.44	59.30	39.51
Cross-pollination with Marsh grapefruit pollen.	123.60	6.40	6.53	0.98	0.46	53.70	42.75
Cross-pollination with Balady mandarine pollen.	166.00	7.79	7.84	0.99	0.60	69.30	41.75
Cross-pollination with Suckarry orange polen.	160.00	7.63	7.55	1.01	0.53	68.00	42.50
GA_3 1000 p.p.m.	163.11	7.89	6.89	1.15	0.50	78.00	47.82
GA_3 2000 p.p.m.	140.00	7.11	6.45	1.10	0.39	66.30	47.36
N.A.A. 25 p.p.m.	121.00	6.08	6.06	1.00	0.50	52.00	42.98
N.A.A. 50 p.p.m.	113.70	5.89	5.72	1.03	0.40	50.70	44.59
GA_3 1000 p.p.m. + N.A.A. 25 p.p.m.	119.00	6.19	6.00	1.03	0.41	47.80	40.17
GA_3 1000 p.p.m. + N.A.A. 50 p.p.m.	115.22	5.93	5.81	1.02	0.42	49.20	42.70
GA_3 2000 p.p.m. + N.A.A. 25 p.p.m.	120.00	6.18	5.76	1.04	0.39	50.63	42.19
GA_3 2000 p.p.m. + N.A.A. 50 p.p.m.	136.00	6.69	6.34	1.06	0.43	66.00	48.53
L.S.D. at 5%	4.14	0.54	0.46	0.04	0.06	3.21	4.76
L.S.D. at 1%	5.54	0.72	0.62	0.09	0.08	4.30	5.98

Table (31) : Effect of different pollination treatments and some growth regulators on fruit chemical characteristics in the Mazizy orange variety. (1985 season) .

Treatments	T.S.S %	Tetratable acidity %	T.S.S/acid Ratio	Ascorbic acid mg/100 ml Juice
Open pollinatio	11.40	0.97	11.75	43.61
Bagging only	10.20	1.00	10.20	45.13
Emasculation and bagging	-	-	-	-
Cross-pollination with Balady lime pollen.	12.20	1.35	9.04	45.00
Cross-pollination with Marsh grapefruit pollen.	10.00	1.12	8.93	44.11
Cross-pollination with Balady mandarine pollen.	10.80	1.36	7.94	46.87
Cross-pollination with Suckarry orange pollen.	10.20	1.48	6.89	45.93
GA_3 1000 p.p.m.	10.00	1.52	6.58	46.37
GA_3 2000 p.p.m.	11.00	1.66	6.63	46.19
N.A.A. 25 p.p.m.	9.80	0.73	13.42	44.85
N.A.A. 50 p.p.m.	10.00	0.86	11.63	43.91
GA_3 1000 p.p.m. + N.A.A. 25 p.p.m.	10.80	0.94	11.49	42.88
GA_3 1000 p.p.m. + N.A.A. 50 p.p.m.	10.40	0.73	14.25	45.16
GA_3 2000 p.p.m. + N.A.A. 25 p.p.m.	11.00	1.39	7.91	46.00
GA_3 2000 p.p.m. + N.A.A. 50 p.p.m.	10.20	1.27	8.03	44.80
L.S.D. at 5%	No.s	0.19	1.03	No.s
1%	No.s	0.26	1.65	No.s

Table (32) : Effect of different pollination treatments and some growth regulators on fruit chemical characteristics in the Mazizy orange variety. (1986 season).

Treatments	T.S.S %	Tetratable acidity %	T.S.S/acid Ratio	Ascorbic acid mg/100 ml Juice
Open pollination	10.00	1.12	8.93	47.03
Bagging only	11.40	1.24	9.19	45.11
Emasculation and bagging	9.00	1.18	7.63	44.10
Cross-pollination with Balady lime pollen.	10.40	1.50	6.93	48.00
Cross-pollination with Marsh grapefruit pollen.	10.00	1.33	7.52	47.32
Cross-pollination with Balady mandarine pollen.	10.20	1.41	7.23	46.70
Cross-pollination with Suckarry orange pollen.	9.60	1.53	6.27	46.38
GA_3 1000 p.p.m.	9.60	1.72	5.58	44.83
GA_3 2000 p.p.m.	9.40	1.51	6.23	48.11
N.A.A. 25 p.p.m.	9.60	1.12	8.57	46.70
N.A.A. 50 p.p.m.	10.00	1.00	10.00	48.10
GA_3 1000 p.p.m. + N.A.A. 25 p.p.m.	11.00	0.99	11.11	46.10
GA_3 1000 p.p.m. + p.p.m. 50 p.p.m.	10.80	1.01	10.69	46.39
GA_3 2000 p.p.m. + p.p.m. 25 p.p.m.	11.00	1.63	6.75	46.14
GA_3 2000 p.p.m. + p.p.m. 50 p.p.m.	9.80	1.49	6.58	47.34
L.S.D. at 5%	1.34	0.22	1.00	No.s
1%	1.80	0.29	1.32	No.s

Table (33) : Effect of different pollination treatments and some growth regulators on fruit chemical characteristics in the Mazizy orange variety. (1987 season).

Treatments	T.S.S %	Tetratable acidity %	T.S.S/acid Ratio	Ascorbic acid mg/100 ml Juice
Open pollination.	10.80	0.89	12.13	41.75
Bagging only.	12.80	0.94	13.62	43.00
Emasculation and bagging.	-	-	-	-
Cross-pollination with Balady lime pollen.	11.80	1.05	11.24	44.60
Cross-pollination with Marsh grapefruit pollen.	10.60	0.94	11.28	44.00
Cross-pollination with Balady mandarine polle.	11.00	1.09	10.09	42.11
Cross-pollination with Suckarry orange pollen.	10.40	1.03	10.10	45.00
GA_3 1000 p.p.m.	9.80	1.04	9.42	45.10
GA_3 2000 p.p.m.	10.00	1.08	9.26	44.16
N.A.A. 25 p.p.m.	10.40	0.72	14.44	41.60
N.A.A. 50 p.p.m.	11.2	0.81	13.83	41.60
GA_3 1000 p.p.m. + N.A.A. 25 p.p.m.	10.60	0.80	13.25	44.73
GA_3 1000 p.p.m. + N.A.A. 50 p.p.m.	10.80	0.90	12.00	40.86
GA_3 2000 p.p.m. + N.A.A. 25 p.p.m.	10.60	0.99	10.71	42.34
GA_3 2000 p.p.m. + N.A.A. 50 p.p.m.	10.40	1.03	10.10	44.93
L.S.D. at 5%	1.20	0.13	0.99	No.s
1%	1.80	0.20	1.63	No.s

Table (34) : Effect of different pollination treatments on seediness and seed development in Mazizy orange fruits. (1985 season).

Treatments	Mean number of seeds per fruit	Range in number of normal seeds per fruit	Well developed seeds per fruit		Shrivel seeds per fruit		Pollination index (No of) well developed seeds per treated flowers
			No	%	No	%	
Open pollination	3.16	2-4	2.91	92.09	0.25	7.91	0.14
Bagging only.	2.00	1-3	1.81	80.74	0.19	19.26	0.04
Emasculation and bagging.	-	-	-	-	-	-	-
Cross-pollination with Balady lime pollem.	5.00	3-6	4.73	94.60	0.27	5.40	0.26
Cross-pollination with Marsh grapefruit pollen.	4.38	2-5	4.12	94.09	0.26	5.91	0.20
Cross-pollination with Balady mandarine pollen.	5.71	4-8	5.54	97.11	0.17	2.89	0.46
Cross-pollination with Suckarry orange pollen.	5.42	3-7	5.14	94.90	0.28	5.10	0.30
L.S.D. at 5%	1.89		1.75	3.11	.19	3.11	.30
L.S.D. at 1%	2.93		2.09	4.98	.25	4.98	0.41

Table (35) : Effect of different pollination treatments on seediness and seed development in Mazizy orange fruits. (1986 season).

	Mean number of seeds per fruit	Range in number of normal seeds per fruit	Well developed seeds per fruit		Shrivel seeds per fruit		Pollination index (No of) well developed seeds per treated flowers
			No	%	No	%	
Open pollination.	3.00	2-6	2.83	94.33	0.17	5.67	0.15
Bagging only.	2.10	1-3	1.41	86.21	0.29	13.79	0.08
Emasculation and bagging.	0.00	0-0	0.00	0.00	0.00	0.00	0.00
Cross-pollination with Balady lime pollen.	4.62	2-7	4.41	95.25	0.22	4.75	0.30
Cross-pollination with Marsh grapefruit pollen.	4.00	2-6	3.80	94.93	0.20	5.07	0.25
Cross-pollination with Balady mandarine pollen.	5.00	3-7	4.84	96.88	0.16	3.12	0.49
Cross-pollination with Suckarry orange pollen.	4.76	2-8	4.52	95.09	0.23	4.91	0.36
L.S.D. at 5%	1.93		1.71	2.55	0.15	2.55	0.26
L.S.D. at 1%	2.71		2.03	3.80	0.27	3.80	0.32

Table (36) : Effect of different pollination treatments on seediness and seed development in Mazizy orange fruits. (1987 season).

	Mean number of seeds per fruit	Range in number of normal seeds per fruit	Well developed seeds per fruit		Shrivel per fruit		Pollination index (No of) well developed seeds per treated flowers
			No	%	No	%	
Open pollination	2.00	1-5	1.87	93.33	0.13	6.67	0.11
Bagging only	1.07	0-3	0.98	81.49	0.09	18.51	0.02
Emasculation and bagging.	-	-	-	-	-	-	-
Cross-pollination with Balady lime pollen.	4.00	2-7	3.86	96.43	0.14	3.57	0.24
Cross-pollination with Marsh grapefruit pollen.	3.72	2-6	3.56	95.89	0.15	4.11	0.21
Cross-pollination with Balady mandarine pollen.	4.68	3-9	4.57	97.79	0.10	2.21	0.52
Cross-pollination with Suckarry orange pollen.	4.00	2-7	3.88	96.88	0.12	3.12	0.28
L.S.D. at 5%	1.83		1.42	3.36	0.09	3.36	0.18
L.S.D. at 1%	2.64		1.99	4.71	0.14	4.71	0.26

4 - THE EFFECTS ON CLEMENTINE TANGARINE

a) Effect of different pollination treatments and some growth regulators on fruit set, remaining fruits after June drop and mature fruits in the Clementine tangarine.

Tables (37),(38) and (39) and Figures (10), (11) and (12) show the effect of bagging only, emasculation and bagging, artificial cross-pollination with different pollinizers and some growth regulators treatments on fruit set, remaining fruits after June drop and yield of Clementine tangarine trees. Both bagging only and emasculation and bagging treatments gave significantly lower percentages of fruit set, remaining fruits after June drop and fruits remaind to maturity (yield) . Mareover, emasculation and bagging treatment did not give any fruit which reached the maturity in the three successive seasons compared with open pollination treatment. The very low fruit set in bagging only treatment is evidently due to that self-incombatibility in this variety. Emasculation and bagging treatment of flowers could also exert a harmful effect on fruit set and so resulted in no fruits which reached the maturity stage. These results are similar to that achieved by Kitat et al

(1980) . However, cross-pollination using different pollen sources had greatly increased fruit set, remaining fruits after June drop and fruits remaining to maturity. However, these treatments varied in their effects from season to another, In the second season of 1986, the effect of pollinzers was not very clear except in the case of Balady mandarin pollen which increased fruit set and yield, but in both other seasons the effect of pollinizers was very clear in increasing fruit set, remaining fruits after June drop and mature fruits. These results are in agreement with that reported by (Minessy (1959). The different Kinds of pollen varied in their effects with balady mandarin being the highest paternal pollen and Marsh grapefruit as the lowest. Moreover, the slightly better effect of open pollination treatment on fruit set compared with bagging only and emasculation and bagging treatments could be due to cross-pollination by honey bee with pollen from other fertile varieties in the same grove. Thus, fruit set and yield in Clementine tangarine were greately increased by the use of other functional foreign pollen. These results are similar to that reported by Carlos and Krezdorn (1958), Minessy (1959), Deidda (1966) and Mohamed (1984) on Clemantine tangarine. The high effect of Balady mandarin , Suckarry and Balady lime pollen on fruit set is due to the high viability of such pollens. The comparatively lower effect of Marsh grapefruit pollen on fruit set may be due the fact that Marsh

grapefruit produced pollen with low viability.

Concerning growth regulators treatment, it is clear from the same Tables that GA_3 at 1000 p.p.m or 2000 p.p.m applied alone or combined with N.A.A at 25 p.p.m or 50 p.p.m caused highly significant increase in fruit set, remaining fruits after June drop and fruits remaining to maturity (yield). However, GA_3 at 2000 p.p.m + N.A.A at 50 p.p.m treatment caused significant decrease in fruit set, remaining fruits after june drop and yield during the three studied seasons, N.A.A at 25 p.p.m or 50 p.p.m applied alone caused significant decrease in fruit set on the first and the third season but did not affect the second season. The effect of GA_3 on increasing fruit set and preventing fruit abscission and drop was reported by many investigators such as Samoladas ((1963), Cutuli (1970), Ashkenazy et al (1971) Cunat et al (1974), Blondel (1975) and EL-Hamady et al (1976). On the hand, the effect of N.A.A on decreasing fruit set was reported by Hield et al (1962) and Leopld (1964).

b) Effect of different pollination treatments and some growth regulators on physical properties of Clementine tangarine fruits:

Data in Tables (40),(41) and (42) show the physical characteristices of Clementine tangarine fruits as

affected by bagging only, emasculation and bagging, artificial cross-pollination with different pollen sources and some growth regulators treatments druing 1985, 1986 and 1987 seasons, it is clear from these Tables that fruit weight was not affected by bagging only treatment as compared with open pollination treatment while emasculation and bagging treatment did not give any fruits. Moreover, the artificial cross-pollination with Balady lime, cross-pollination with marsh grapefruit, cross-pollination with Balady mandarin and cross-pollination with Suckarry orange had incresed fruit weight significantly except in the case of cross-pollination with Marsh grapefruit in 1987. The increase in fruit weight of Clementine tangarine as a result of artificial pollination by different pollinizer was reported earlier by Soost (1956), Khalil (1967) Weheda (1972) Lange and Vincent (1971 & 1972) Sherif (1983). Atawia (1984) and Mohamed (1984).

Fruit height, fruit diameter and fruit shape index were not affected by bagging only treatment, but in 1985 season it caused significant increase in fruit height and fruit shape index compared with open pollination treatment. Moreover, artificial cross-pollination with Balady lime, cross-pollination with Marsh grapefruit, cross-pollination with Balady mandarin and cross-pollination with Suckarry orange has no effect on fruit height.

Cross-pollination with Balady mandarin, cross-pollination with Marsh grapefruit and cross-pollination with Suckarry ornage treatments had resulted in a highly significant increase in fruit diameter and the fruits resulting from pollination seemed to be more flattened as shown by shape index. However, the differences were not significant. This is in agreement with the findings of Soost (1956), Khalil (1967), Weheda (1972) and Sherif (1983) .

Concerning growth regulators, it is clear that GA_3 at 1000 p.p.m or 2000 p.p.m, N.A.A at 25 p.p.m or 50 p.p.m had increased fruit height, fruit diameter and shape index significantly as compared to open pollination treatment during the three seasons of this study. Moreover, the combination between GA_3 and N.A.A treatments were slightly affected with the exception of GA_3 at 2000 p.p.m+ N.A.A at 50 p.p.m treatment which had significantly decreased fruit height, fruit diameter and fruit shape index as compared with open pollination treatment. The increase in fruit height, fruit diameter and fruit shape index as a result of GA_3 treatment was reported by EL-Khoreiby (1976), Mawlood (1977) and Hussin (1979).

Peel thickness data showed that bagging only treatment caused highly significant decrease as compared to open pollination treatment during this study. Moreover,

artificial cross-pollination with Marsh grapefruit,cross-pollination with Balady mandarin and cross-pollination with Suckarry orange appeared to be significantly higher than open pollination in peel thickness. However, peel thickness was not affected by using Balady lime as a pollinator during this study. Earlier findings of Dhillon (1960), Weheda (1972) and Sherif (1983) indicated that using Balady mandarin as a pollinator for Hamlin orange, Marsh grapefruit and Balady lime had resuted in increasing peel thickness . It is also clear from the Tables (40),(41) and (42) that GA_3 at 1000 p.p.m or 2000 p.p.m and GA_3 at 1000 p.p.m + N.A.A at 25 p.p.m treatments caused highly significant increase in peel thickness compared to open pollination treatment during the three seasons of this study.GA_3 at 2000 p.p.m + N.A.A at 50 p.p.m appeared to cause significant decrease in peel thickness than open pollination treatment. Other treatments with growth regulotors were not affected with regard to peel thickness the increase in peel thicknes as a result of GA_3 treatments was reported by EL-Khoreiby (1976) , Hussin (1979), Goldschmidt (1983) and Lima and Davis (1984).

Regarding to juice content in Clementine fruits, data in the previous Tables showed that juice content was not affected by bagging only treatment as compared to open pollination. Artificial cross-pollination with

different pollen sources increased fruit juice significantly. This is in agreement with Rokba at al (1976) who used Duncan grapefruit as a pollinator for Washington navel orange and found an increase in juice weight per fruit. However, this is in contrasting with the findings of Cameron (1960), Khalil (1967) on Washington navel orange and Sherif (1983) on Hamlin orange.

Tables (40),(41) and (42) show clearly that all GA_3, N.A.A and the combination treatments appeared to have no effect on fruit juice weight except N.A.A at 25 p.p.m treatment which gave highly significant increase in fruit juice weight compared with open pollination treatment during the three seasons of this study. This is in agreement with the findings by Hussin (1979) on Amoun orange.

c) Effect of different pollination treatments and some growth regulators on fruit Chemical properties in Clementine tangarine:-

Tables (43),(44) and (45) show variable responses of T.S.S in fruit juice from one season to another. Bagging only and artificial cross-pollination with different pollinizers treatments had significantly increased T.S.S in fruit juice in 1985 and 1987 seasons than open pollination treatment, while in 1986 season T.S.S in fruit juice was not affected. These results are in agreement with that reported by Deidda (1966) Sherif (1983) and Atawia (1984).

Concerning the effect of different growth regulators treatments. It is obvious that all growth regulators treatments did not affect T.S.S in fruit juice compared to open pollination treatment. The only exception to this was N.A.A at 50 p.p.m in 1985 and 1987 seasons and GA_3 at 1000 p.p.m in 1987 season which caused highly significant increase in T.S.S. The increase in T.S.S as a result of GA_3 treatment. was reported by Cutuli (1970).

With respect to fruit juice acidity, it is clear that all treatments had no significant effects during 1986 and 1987 seasons. However, GA_3 at 1000 p.p.m or 2000 p.p.m and GA_3 at 1000 p.p.m + N.A.A at 50 p.p.m treatments in the first season as the increase in acidity was significant compared to open pollination treatment. Similar results were obtained by Salem (1963) and Mawlood (1977).

Concerning juice T.S.S / acid ratio was slightly increased in response to bagging only treatment compared to open pollination but the differences were not significant. However, cross-pollination with different pollen sources caused slightly significant increase in T.S.S / acid ratio in 1985 season compared with open pollination treatment. These results are in agreement with those findings by Deidda (1966).

The effect of growth regulators treatments on T.S.S acid ratio show that, GA_3 at 1000 p.p.m or 2000 p.p.m decreased it significantly in 1985 season. N.A.A at 25 p.p.m or 50 p.p.m caused significant increase T.S.S /acid ratio during 1985 and 1987 seasons. Moreover, the combined effect of GA_3 at 2000 p.p.m + N.A.A at 50 p.p.m had resulted a highly significant decrease in T.S.S / acid ratio as compared with open pollination treatment during 1985 and 1987 seasons. Other growth regulators treatments had no affected this ratio which agree with the findings of Atawia (1984). and Bishr (1987).

Regarding the ascorbic acid content in fruit juice, it is clear from the previous data that it was not affect significantly by bagging only, artificial cross-pollination or any growth regulators treatments. These results are in agreement with the findings by Salem (1963), Sharma and Randhawa (1968) and Weheda (1972).

d) <u>Effect of different pollination treatments and some growth regulators on seediness, seed development and pollination index in Clementine tangarine fruits:-</u>

The effects of different pollination treatments on the number of seeds, well developed and shrivel seeds per fruit and pollination index are shown in Tables (46),(47) and (48) during 1985, 1986 and 1987 seasons respectively.

Data indicated that the total number of seeds per fruit in bagging only treatment was significantly lower than open pollination treatment during this study. On the other hand, cross-pollination with either Balady mandarin and Suckarry orange pollens gave significantly higher increase in the total number of seeds per fruit while cross-pollination with Balady lime and cross-pollination with Marsh grapefruit pollens caused slight increase in the total number of seeds compared with open pollination treatment during this study. Moreover, Balady mandarin as a pollinator gave the highest total number of seeds per fruit (ranging from 10 to 23) for the three seasons as compared with other pollinators while Balady lime produced the lowest total number of seeds per fruit (ranging from 7 to 13) during this study. These results are in agreement with that reported by Cost and Gagnard (1956), Cameron (1960), Weheda (1972), Lange and Vincent (1972) and Iwamasa and Oba (1980).

Regarding the number of well developed seeds per fruit, bagging only treatment caused highly significant decrease compared to open pollination treatment during this study. Cross-pollination with either Balady mandarin and Suckarry orange gave significantly higher number of well developed seeds per fruit as

comared to open pollination treatment during this study. On the other hand, cross-pollination with Balady lime and cross-pollination with Marsh grapefruit pollen gave a slight increase in the number of well developed seeds per fruit during this study. This is in agreement with the findings obtained by Majrodize (1952), Klimenko and Klimenko (1952), and Weheda (1972).

Data in Tables (46),(47) and (48) indicated that the number of shrivelled seeds per fruit was higher in the bagging only treatment but it was lower in cross-pollination with Balady mandarin pollen during this study which is in confirmity with the findings of Rokba et al (1976).

Concerning pollination index, data in Tables (46),(47) and (48) showed that, cross-pollination with Balady mandarin pollen caused highly significant increase in pollination index compared to open pollination treatment while the other cross-pollination treatments caused slight increase druing the three seasons of this study. The trend was generally towards increasing the pollination index of cross-pollination with Balady mandarin pollen while bagging only treatment was the lowest during this study. This is in confirmity with those obtained by Mohamed (1984).

Table (37): Effect of different pollination treatments and some growth regulators on fruit set, remaining fruits after June drop and mature fruits in the Clementine tangerine variety. (1985 seasons).

Treatments	No. of treated flowers	Fruit set		Remaining Fruits after June drop		Mature fruits	
		Total No.	Aver. %	Total No.	Aver. %	Total No.	Aver. %
Open pollination	964	650	67.42	180	18.67	134	13.90
Begging only	853	261	30.59	99	11.61	58	6.80
Emasculation and begging	991	190	19.17	72	7.27	-	-
Cross-pollination with Balady lime pollen.	878	657	74.83	191	21.75	142	16.77
Cross-pollination with Marsh grapefruit pollen.	869	633	72.84	182	20.94	138	15.88
Cross-pollination with Balady mandarine pollen.	912	705	77.30	222	24.34	181	19.85
Cross-pollination with Suckarry orange pollen.	846	626	74.0	193	22.81	146	17.26
GA_3 1000 p.p.m.	794	589	74.18	187	23.55	155	19.52
GA_3 2000 p.p.m.	835	635	76.05	210	25.15	180	21.56
N.A.A. 25 p.p.m.	786	474	60.31	139	17.68	80	10.18
N.A.A. 50 p.p.m.	719	528	70.38	150	20.86	105	14.60
GA_3 1000 p.p.m.+ N.A.A. 25 p.p.m.	658	526	79.94	215	32.67	135	20.52
GA_3 1000 p.p.m.+ N.A.A. 50 p.p.m.	733	579	78.99	216	29.47	134	18.28
GA_3 2000 p.p.m.+ N.A.A. 25 p.p.m.	814	562	69.04	166	20.39	121	14.86
GA_3 2000 p.p.m.+ N.A.A. 50 p.p.m.	875	527	60.23	122	13.94	90	10.3
L.S.D. at 5%			6.28		3.89		2.68
L.S.D. at 1%			8.38		5.53		3.24

Table (38): Effect of different pollination treatments and some growth regulators on fruit set, remaining fruits after June drop and mature fruits in the Clementine tangarine variety. (1986 seasons).

Treatments	No. of treated flowers	Fruit set		Remaining Fruits after June drop		Mature fruits	
		Total No.	Aver. %	Total No.	Aver. %	Total No.	Aver. %
Open pollination	1204	878	70.92	317	26.33	249	20.68
Begging only	983	493	50.15	147	14.95	108	10.99
Emasculation and begging	1123	337	30.00	76	6.77	-	-
Cross-pollination with Balady lime pollen.	971	712	73.33	262	26.98	207	21.32
Cross-pollination with Marsh grapefruit pollen.	1154	842	72.96	292	25.30	241	20.88
Cross-pollination with Balady mandarine pollen.	892	685	76.79	265	29.71	212	23.77
Cross-pollination with Suckarry orange pollen.	976	739	75.72	267	27.36	211	21.62
GA_3 1000 p.p.m.	761	566	74.38	205	26.94	158	20.76
GA_3 2000 p.p.m.	854	649	76.00	236	27.63	187	21.90
N.A.A. 25 p.p.m.	922	652	70.72	242	26.25	190	20.61
N.A.A. 50 p.p.m.	698	525	75.21	188	26.93	152	21.78
GA_3 1000 p.p.m.+ N.A.A. 25 p.p.m.	712	555	77.94	213	29.92	171	24.02
GA_3 1000 p.p.m.+ N.A.A. 50 p.p.m.	834	637	76.38	231	27.70	184	22.06
GA_3 2000 p.p.m.+ N.A.A. 25 p.p.m.	683	507	74.23	184	26.94	141	20.64
GA_3 2000 p.p.m.+ N.A.A. 50 p.p.m.	963	628	65.21	228	23.68	176	18.28
L.S.D. at 5%			4.72		2.47		2.22
L.S.D. at 1%			6.32		3.30		2.98

Table (39): Effect of different pollination treatments and some growth regulators on fruit set, remaining fruits after June drop and mature fruits in the Clemantine tangarine varitey (1987 season).

Treatments	No. of treated flowers	Fruit set		Remainin Fruits after June drop		Mature fruits	
		Total No.	Aver. %	Total No.	Aver. %	Total No.	Aver. %
Open pollination	983	588	59.82	124	12.61	96	9.77
Begging only	793	301	37.96	66	8.32	47	5.93
Emasculation and begging	1097	233	21.24	61	5.56	-	-
Cross-pollination with Balady lime pollen.	1150	748	65.04	183	15.91	147	12.78
Cross-pollination with Marsh grapefruit pollen.	748	479	64.04	110	14.71	76	10.16
Cross-pollination with Balady mandarine pollen.	1014	709	69.92	207	20.41	169	16.67
Cross-pollination with Suckarry orange pollen.	736	513	69.70	138	18.75	113	15.35
GA_3 1000 p.p.m.	880	589	66.93	140	15.91	123	13.98
GA_3 2000 p.p.m.	675	456	68.89	137	20.30	108	16.00
N.A.A. 25 p.p.m.	921	495	53.75	92	10.00	82	8.90
N.A.A. 50 p.p.m.	748	405	54.28	91	12.17	68	9.09
GA_3 1000 p.p.m.+ N.A.A. 25 p.p.m.	515	363	70.49	107	20.78	80	15.53
GA_3 1000 p.p.m.+ N.A.A. 50 p.p.m.	579	400	69.08	99	17.10	73	12.61
GA_3 2000 p.p.m.+ N.A.A. 25 p.p.m.	613	380	61.99	84	13.70	50	8.16
GA_3 2000 p.p.m.+ N.A.A. 50 p.p.m.	894	491	54.92	94	10.51	65	7.27
L.S.D. at 5%				4.99		2.71	2.44
L.S.D. at 1%				6.69		3.63	3.26

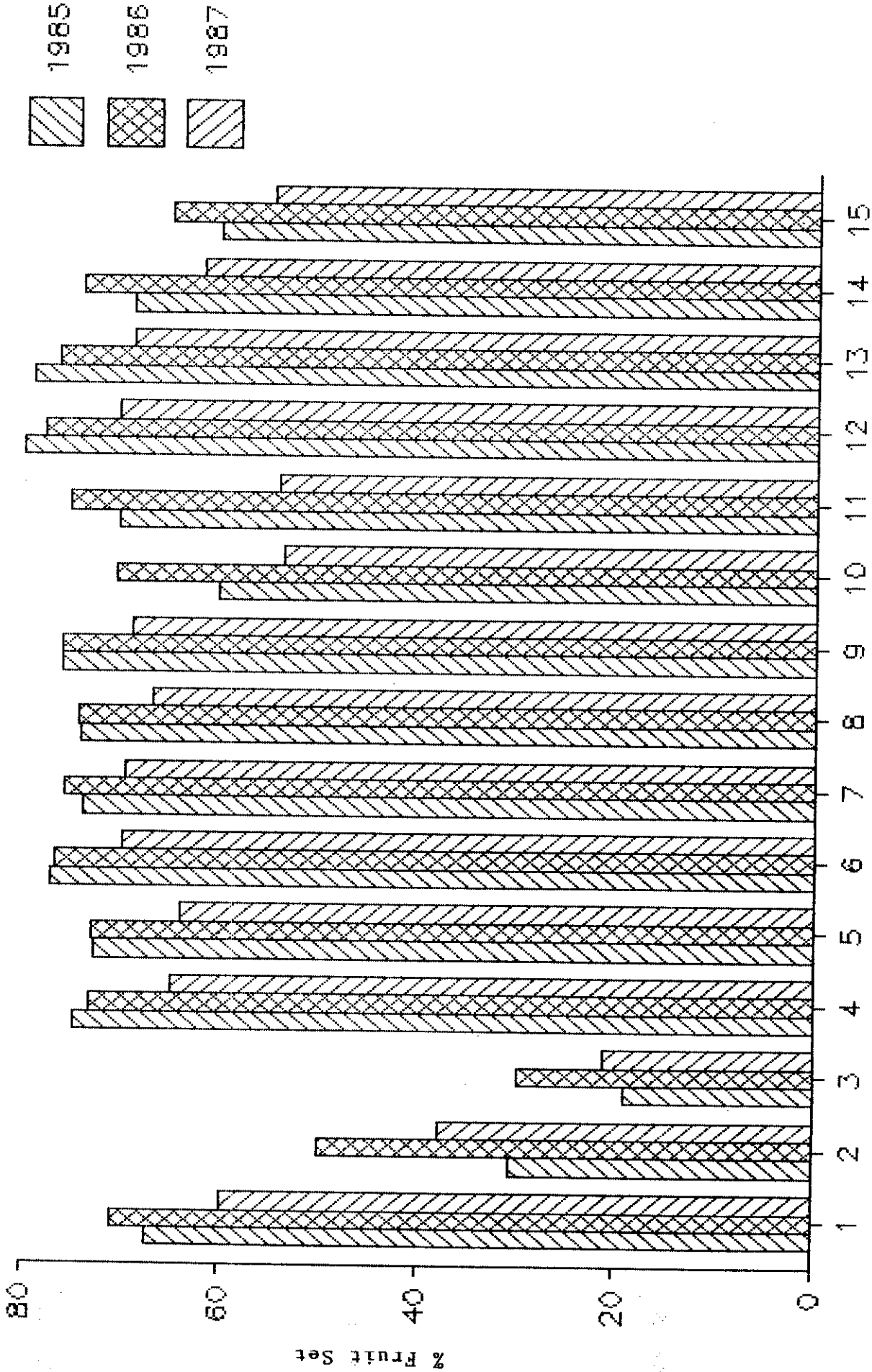

Fig. (10) Effect of Different Pollination Treatments and Some Growth Regulators on Fruit Set in the Clementine Tangarine Variety

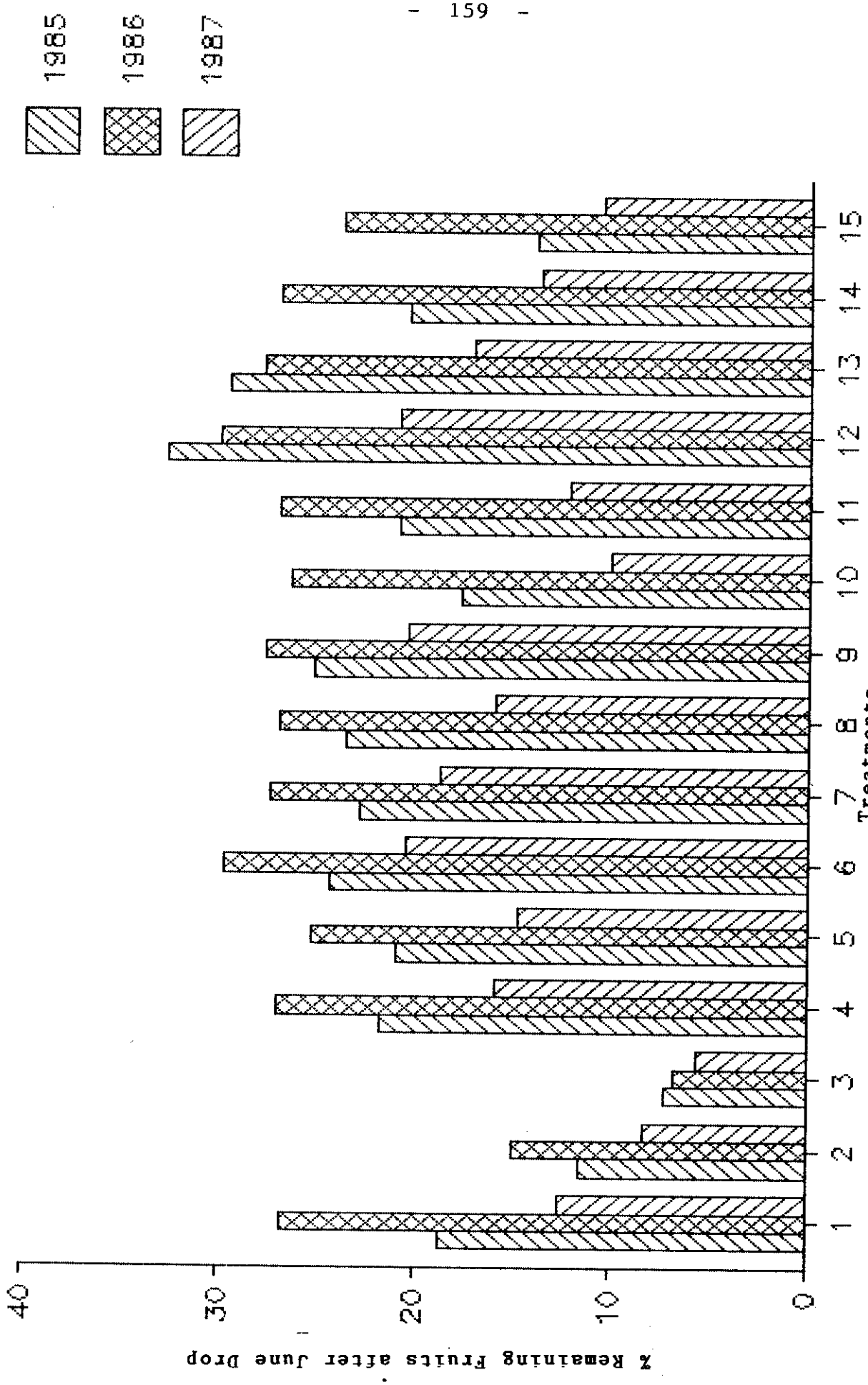

Fig. (11) Effect of Different Pollination Treatments and Some Growth Regulators on Remaining Fruits after June Drap in the Clementine Tangarine Variety

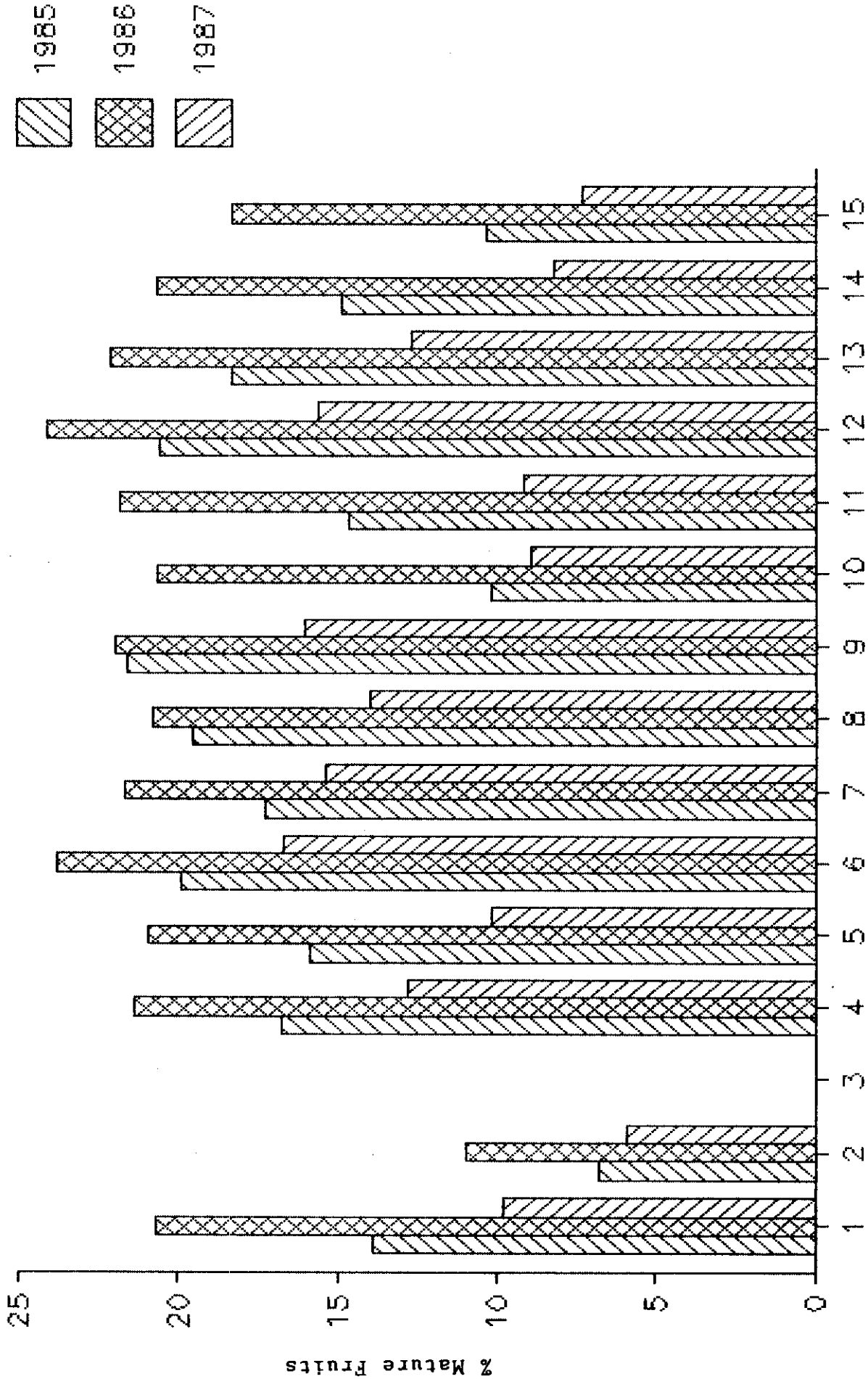

Fig. (12) Effect of Different Pollination Treatments and Some Growth Regulators on Mature Fruits in the Clementine Tangarine Variety

Table (40) : Effect of differeent pollination treatments and some growth regulators on fruit physical properties in the Clementine tangarine. (1985 season).

Treatments	Fruit weight gm.	Fruit height cm.	Fruit diameter cm.	Shape index	Peel thickness mm.	Juice weight gm.	Juice %
Open pollination.	60.40	4.45	4.58	0.97	0.24	27.00	44.70
Bagging only.	62.00	4.95	4.55	1.08	0.20	28.00	45.16
Emasculation and bagging.	-	-	-	-	-	-	-
Cross-pollination with Balady lime pollen.	69.09	4.44	4.59	0.98	0.25	32.90	47.62
Cross-pollination with Marsh grapefruit pollen.	66.30	4.69	4.93	0.95	0.29	35.00	52.79
Cross-pollination with Balady mandarine pollen.	82.00	4.73	5.11	0.93	0.28	42.00	51.22
Cross-pollination with Suckarry orange pollen.	73.33	4.37	4.67	0.94	0.28	39.10	53.32
GA_3 1000 p.p.m.	69.30	4.93	4.60	1.07	0.28	30.96	44.68
GA_3 2000 p.p.m.	61.60	4.83	4.58	1.05	0.29	27.00	43.83
N.A.A. 25 p.p.m.	70.00	4.76	4.96	0.96	0.26	32.10	45.86
N.A.A. 50 p.p.m.	65.12	4.79	5.23	0.92	0.21	27.60	42.38
GA_3 1000 p.p.m. + N.A.A. 25 p.p.m.	59.50	4.67	4.65	1.00	0.32	25.00	42.02
GA_3 1000 p.p.m. + N.A.A. 50 p.p.m.	61.25	4.37	4.67	0.94	0.25	27.30	44.57
GA_3 2000 p.p.m. + N.A.A. 25 p.p.m.	64.50	4.25	4.66	0.91	0.24	29.60	45.89
GA_3 2000 p.p.m. + N.A.A. 50 p.p.m.	55.30	3.65	3.97	0.92	0.20	21.00	37.97
L.S.D. at 5%	3.27	0.29	0.24	0.06	0.04	4.00	5.71
L.S.D. at 1%	4.38	0.38	0.32	0.09	0.06	5.36	7.18

Table (41) : Effect of different pollination treatments and some growth regulators on fruit physical properties in the Clementine tangarine. (1986 season).

Treatments	Fruit weight gm.	Fruit height cm.	Fruit diameter cm.	Shape index	Peel thickness mm.	Juice weight gm.	Juice %
Open pollination.	71.40	4.43	4.72	0.93	0.25	27.80	38.94
Bagging only.	73.16	4.45	4.92	0.90	0.18	30.00	41.01
Emasculation and bagging.	-	-	-	-	-	-	-
Cross-pollination with Balady lime pollen.	87.55	4.42	4.78	0.92	0.25	33.70	38.49
Cross-pollination with Marsh grapefruit pollen.	75.60	4.53	5.06	0.90	0.29	33.96	44.92
Cross-pollination with Balady mandarine pollen.	97.00	5.10	5.38	0.95	0.34	44.87	46.26
Cross-pollination with Suckarry orange pollen.	89.00	4.70	4.93	0.95	0.34	35.00	39.33
GA_3 1000 p.p.m.	79.00	4.78	4.94	0.97	0.32	30.14	38.15
GA_3 2000 p.p.m.	73.00	4.57	4.76	0.96	0.32	25.00	34.25
N.A.A. 25 p.p.m.	88.00	4.85	5.20	0.93	0.29	33.04	37.55
N.A.A. 50 p.p.m.	76.30	4.76	5.02	0.95	0.26	28.60	37.48
GA_3 1000 p.p.m. + N.A.A. 25 p.p.m.	70.68	5.06	5.28	0.95	0.30	26.00	36.79
GA_3 1000 p.p.m. + N.A.A. 50 p.p.m.	72.36	4.45	4.60	0.97	0.25	25.86	35.74
GA_3 2000 p.p.m. + N.A.A. 25 p.p.m.	70.80	4.42	4.72	0.94	0.20	25.00	35.31
GA_3 2000 p.p.m. + N.A.A. 50 p.p.m.	65.00	4.01	4.07	0.99	0.19	23.10	35.54
L.S.D. at 5%	3.70	0.25	0.22	0.03	0.04	3.10	4.99
L.S.D. at 1%	4.95	0.33	0.31	0.05	0.06	4.14	6.93

Table (42) : Effect of different pollination treatments and some growth regulators on fruit physical properties in the Clementine tangarine. (1987 season).

Treatments	Fruit weight gm.	Fruit height cm.	Fruit diameter cm.	Shape index	Peel thickness mm.	Juice weight gm.	Juice %
Open pollination.	56.77	4.46	4.78	0.93	0.27	24.00	42.28
Bagging only.	58.00	4.51	4.80	0.94	0.17	23.20	40.00
Emasculation and bagging.	-	-	-	-	-	-	-
Cross-pollination with Balady lime pollen.	67.96	4.24	4.73	0.90	0.26	25.50	37.52
Cross-pollination with Marsh grapefruit pollen.	56.90	4.66	4.99	0.93	0.31	24.5	43.06
Cross-pollination with Balady mandarine pollen.	79.50	4.59	4.89	0.94	0.30	38.50	48.43
Cross-pollination with Suckarry orange pollen.	76.00	4.51	4.80	0.94	0.31	36.00	47.37
GA_3 1000 p.p.m.	72.51	5.01	5.08	0.99	0.31	28.93	39.90
GA_3 2000 p.p.m.	58.76	4.94	5.05	0.98	0.31	25.00	42.55
N.A.A. 25 p.p.m.	74.10	5.01	5.32	0.94	0.29	28.50	38.46
N.A.A. 50 p.p.m.	70.00	4.71	4.96	0.94	0.28	26.50	37.86
GA_3 1000 p.p.m. + N.A.A. 25 p.p.m.	56.98	4.60	4.72	0.97	0.35	25.50	44.75
GA_3 1000 p.p.m. + N.A.A. 50 p.p.m.	57.00	4.85	5.05	0.96	0.28	23.80	41.75
GA_3 2000 p.p.m. + N.A.A. 25 p.p.m. p.p.m.	60.19	4.65	4.97	0.94	0.26	25.50	42.37
GA_3 2000 p.p.m. + N.A.A. 50 p.p.m. p.p.m.	52.50	4.27	4.46	0.96	0.20	20.10	38.29
L.S.D. at 5%	3.30	0.22	0.16	0.02	0.03	3.12	4.86
L.S.D. at 1%	4.55	0.29	0.21	0.05	0.04	4.18	6.10

Table (43) : Effect of different pollination treatments and some growth regulators on fruit chemical characteristies in the Clementine tangarine. (1985 season).

Treatments	T.S.S %	Tetratable acidity %	T.S.S/acid Ratio	Ascorbic acid mg/100 ml Juice
Open pollination.	10.40	0.96	10.83	63.52
Bagging only.	11.20	0.95	11.79	66.10
Emasculation and bagging.	-	-	-	-
Cross-pollination with Balady lime pollen.	12.00	1.00	12.00	65.43
Cross-pollination with Marsh grapefruit pollen.	11.20	0.94	11.91	64.70
Cross-pollination with Balady mandarine polle.	11.40	1.13	10.09	66.40
Cross-pollination with Suckarry orange pollen.	11.40	0.97	11.75	64.60
GA_3 1000 p.p.m.	11.00	1.13	9.73	66.23
GA_3 2000 p.p.m.	10.80	1.10	9.82	65.70
N.A.A. 25 p.p.m.	10.90	0.90	12.11	66.10
N.A.A. 50 p.p.m.	11.20	0.94	11.91	66.54
GA_3 1000 p.p.m. + N.A.A. 25 p.p.m.	10.00	0.98	10.10	63.86
GA_3 1000 p.p.m. + N.A.A. 50 p.p.m.	10.40	1.13	9.20	64.30
GA_3 2000 p.p.m. + N.A.A. 25 p.p.m.	11.00	0.96	11.46	66.22
GA_3 2000 p.p.m. + N.A.A. 50 p.p.m.	10.60	0.99	10.71	66.10
L.S.D. at 5%	0.65	0.13	0.55	No.s
1%	0.87	0.17	0.72	No.s

Table (44) : Effect of different pollination treatments and some growth regulators on fruit chemical characteristies in the Clementine tangarine. (1986 season).

Treatments	T.S.S %	Tetratable acidity %	T.S.s/acid Ratio	Ascorbic acid mg/100 ml Juice
Open pollination.	10.20	1.10	9.27	57.60
Bagging only.	10.80	1.13	9.56	60.24
Emasculation and bagging.	-	-	-	-
Cross-pollination with Balady lime pollen.	10.40	1.15	9.04	59.32
Cross-pollination with Marsh grapefruit pollen.	11.20	1.10	10.18	58.91
Cross-pollination with Balady mandarine pollen.	10.00	1.12	8.93	56.04
Cross-pollination with Suckarry orange pollen.	10.40	1.11	9.37	57.00
GA_3 1000 p.p.m.	10.60	1.17	9.06	59.82
GA_3 2000 p.p.m.	10.60	1.12	9.46	60.00
N.A.A. 25 p.p.m.	10.60	1.07	9.91	59.14
N.A.A. 50 p.p.m.	11.80	1.12	10.54	60.00
GA_3 1000 p.p.m. + N.A.A. 25 p.p.m.	10.40	1.10	9.45	59.60
GA_3 1000 p.p.m. + N.A.A. 50 p.p.m.	11.00	1.13	9.73	61.01
GA_3 2000 p.p.m. + N.A.A. 25 p.p.m.	11.00	1.14	9.65	59.40
GA_3 2000 p.p.m. + N.A.A. 50 p.p.m.	11.50	1.16	9.91	61.03
L.S.D. at 5%	No.s	No.s	No.s	No.s
1%	No.s	No.s	No.s	No.s

Table (45) : Effect of different pollination treatments and some growth regulators on fruit chemical characteristies in the Clementine tangarine. (1987 season).

Treatments	T.S.S %	Tetratable acidity %	T.S.S/acid Ratio	Ascorbic acid mg/100 ml Juice
Open pollination.	10.60	0.90	11.78	54.63
Bagging only.	11.80	0.96	12.29	54.81
Emasculation and bagging.	-	-	-	-
Cross-pollination with Balady lime pollen.	12.20	1.05	11.62	54.76
Cross-pollination with Marsh grapefruit pollen.	11.20	0.92	12.17	53.62
Cross-pollination with Balady mandarine pollen.	12.00	1.07	11.21	54.70
Cross-pollination with Suckarry orange pollen.	12.40	0.94	13.19	53.80
GA_3 1000 p.p.m.	11.80	0.99	11.92	56.83
GA_3 2000 p.p.m.	11.00	0.94	11.70	56.91
N.A.A. 25 p.p.m.	11.40	0.84	13.57	54.16
N.A.A. 50 p.p.m.	12.20	0.89	13.71	53.78
GA_3 1000 p.p.m. N.A.A. 25 p.p.m.	11.00	1.01	10.89	54.66
GA_3 1000 p.p.m. N.A.A. 50 p.p.m.	11.40	0.90	12.67	52.56
GA_3 2000 p.p.m. N.A.A. 25 p.p.m.	11.40	0.89	12.81	55.78
GA_3 2000 p.p.m. N.A.A. 50 p.p.m.	11.60	0.94	12.34	55.83
L.S.d at 5%	1.08	NO.s	0.86	No.s
1%	1.45	No.s	1.06	No.s

Table (46) : Effect of different pollination treatments on seediness and seed development in Clementine tangarine fruits. (1985 season) .

Treatments	Mean number of seeds per fruit	Range in number of normal seeds per fruit	Well developed seeds per fruit		Shrivel per fruit		Pollination index (No of) well developed seeds per treated flowers
			No	%	No	%	
Open pollination	8.36	6-13	7.68	91.88	0.68	8.12	1.07
Bagging only.	5.12	4-7	3.69	72.05	1.43	27.95	0.25
Emasculation and bagging.	-	-	-	-	-	-	-
Cross-pollination with Balady lime pollen.	10.64	7-12	9.91	93.18	0.73	6.82	1.60
Cross-pollination with Marsh grapefruit pollen.	10.61	7-11	9.86	92.96	0.75	7.04	1.57
Cross-pollination with Balady mandarine pollen.	14.22	11-20	13.80	97.05	0.42	2.95	2.74
Cross-pollination with Suckarry orange pollen.	11.03	9-13	10.52	95.40	0.51	4.60	1.82
L.S.D. at 5%	2.80		2.60	3.90	0.50	3.90	1.00
L.S.D. at 1%	3.19		3.10	5.22	0.63	5.22	1.54

Table (47) : Effect of different pollination treatments on seediness and seed development in Clementine tangarine fruits. (1986 season).

Treatments	Mean number of seeds per fruit	Range in number of normal seeds per fruit	Well developed seeds per fruit		Shrivel per fruit		Pollination index (No of) well developed seeds per treated flowers
			No	%	No	%	
Open pollination	10.92	8-14	10.22	93.56	0.70	6.44	2.11
Bagging only.	6.89	4-9	5.52	80.11	1.37	19.89	0.61
Emasculation and bagging.	-	-	-	-	-	-	-
Cross-pollination with Balady lime pollem.	13.86	9-15	13.22	95.40	0.64	4.60	2.82
Cross-pollination with Marsh grapefruit pollen.	13.90	8-16	13.28	95.52	0.62	4.48	2.77
Cross-pollination with Balady mandarine pollen.	17.46	13-22	17.17	98.33	0.29	1.67	4.08
Cross-pollination with Suckarry orange pollin.	15.33	11-19	14.73	96.11	0.60	3.89	3.19
L.S.D. at 5%	2.89		2.70	2.10	0.43	2.10	1.26
L.S.D. at 1%	3.80		3.16	3.97	0.59	3.97	1.83

Table (48) : Effect of different pollination treatments on seediness and seed development in Clementine tangarine fruits. (1987 season).

Treatments	Mean number of seeds per fruit	Range in number of normal seeds per fruit	Well developed seeds per fruit		Shrivel per fruit		Pollination index (No of) well developed seeds per treated flowers
			No	%	No	%	
Open pollination.	9.69	7-12	8.62	88.92	1.07	11.08	0.84
Bagging only.	5.31	4-6	3.74	70.40	1.57	29.60	0.22
Emasculation and bagging.	-	-	-	-	-	-	-
Cross-pollination with Balady lime pollen.	11.26	7-13	10.31	91.60	0.95	8.40	1.32
Cross-pollination with Marsh grapefruit pollen.	11.20	8-12	10.17	90.83	1.03	9.17	1.03
Cross-pollination with Balady mandarine pollen.	13.60	10-19	12.94	95.17	0.66	4.83	2.16
Cross-pollination with Suckarry orange pollen.	11.96	8-13	11.16	93.34	0.80	6.66	1.71
L.S.D. at 5%	1.91		1.86	2.97	0.39	2.97	0.89
L.S.D. at 1 %	2.99		2.90	4.73	0.50	4.73	1.20

5) The effects on Agami lime

a) Effect of different pollination treatments and some growth regulators on fruit set, remaining fruits after June drop and mature fruits in the Agami lime variety:-

Tables (49),(50) and (51) and Figures (13), (14) and (15) show the effect of different citurs pollen sources as well as effect bagging only, emasculation and bagging and some growth regulators treatments on fruit set and yield of Agami lime trees. Both bagging only and emasculation and bagging treatments gave the lowest percentages of fruit set, remaining fruits after June drop and the fruits remained to maturity (yield), this decrease was expected as emasculation and bagging treatment did not give any mature fruits druing this study. The very low fruit set in bagging only and emasculation and bagging treatments is evidently due to the lack of functional pollen for selfing in this variety as reported by Frost 1943. Bagging or emasculation of flowers could also exert a harmful effect on fruit set while the slightly better effect of open pollination of fruit set could be due to the cross-pollination with honey bees with pollen from other fertile varieties in the same grove. Artificial cross-pollination with

foreign citrus pollen had increased fruit set, remaining fruits after June drop and remaining fruits to maturity (yield) compared with open pollination treatment during this study. These results agree with those reported by EL-Tomi (1957), Khalil (1967), Lange and Viencent (1970). Weheda (1972), Kokaya (1977), Abo-EL-Komsan (1978), Sherif (1983), Mohamed (1984) and Venkatesvarlu and Lavania (1985) The high effect of Balady mandarin, Balady lime and Suckarry orange pollen on fruit set is due to its high pollen viability. The comparatively lower effect of Marsh grapefruit pollen on fruit set may be due to the fact that Marsh grapefruit produced poll: with low viability.

In the contrary, Musahib-Ud-Din and Kamil (1963) reported that, cross-pollination resulted in poor fruit setting. Cekvava (1986) reported that, cross-pollination with trifoliate orange pollen gave low fruiting percentage in lemons as compared with self-pollination Abbas (1983) who reported that open pollination treatment increased fruit set or fruiting in all studied varieties than the artificail cross-pollination treatments with exception of Dancy tangarine when used as a pollinator for Carter navel orange.

Concerning the effect of different growth regulators, it is clear from the same Tables that GA_3 at 1000 p.p.m and 2000 p.p.m applied to emasculated flowers caused highly significant increase in fruit set, remaining fruits after June drop and remained fruits to maturity in most cases compared with open pollination treatment during this study. the effect of GA_3 on increasing fruit set and preventing fruit abscission and drop was reported by many investigators such as Ashkenazy et al (1971), EL-Hammady et al (1976) Moustafa (1985) and Babu and Lavania (1986).

The combination of N.A.A at 25 p.p.m + GA_3 at 1000 p.p.m had significantly increased fruit set, remaining fruits after June drop and yield compared with open pollination treatment. These findings may be attributed to the effect of GA_3 alone. On the other hand, dipping emasculated flowers in a solution of N.A.A at 50 p.p.m resulted in dropping all fruits after June drop. The same dropping had happened for emasculated flowers treated by GA_3 at 2000 p.p.m + N.A.A. at 50 p.p.m during the three successive seasons. These results are in agreement with the findings by Mohamed et al (1978). These results are in accordance with the known characteristics of some of the used growth regulators. Leopold (1964) had considered I.A.A and all auxin like substances as abscisson factors while GA_3 was considered as an anti

abscission factors. The results in this study agree quite well with these facts. Thus, GA_3 had prevented fruit drop while N.A.A at 50 p.p.m resulted in dropping all fruits.

b) <u>Effect of different pollination treatments and some growth regulators on physical properties of Agami lime fruits:-</u>

Data in Tables (52),(53) and (54) show the physical characteristices of Agami lime fruits as affected by bagging only, emasculation and bagging, artificial cross-pollination with different pollen sources and some growth regulators treatments. It is obvious that bagging only treatment had decreased fruit weight significantly as compared to open pollination treatment. However, emasculation and bagging treatment did not give any fruits at maturity. Moreover, cross-pollination with Balady lime, cross-pollination with Suckarry orange pollen had resulted in a highly significant increase in fruit weight while cross-pollination with Marsh grapefruit pollen did not cause any appreciable increase in this respect in any of the three seasons. The increase in fruit weight as a result of artificial pollination by foreign pollen was reported by Dhillon (1963), Weheda (1972) Sherif (1983) and Mohamed (1984).

Concerning growth regulators treatments it is clear that GA_3 at 1000 p.p.m or 2000 p.p.m applied on emasculated flowers had increased fruit weight significantly as compared to open pollination treatment during this study. Moreover, N.A.A at 25 p.p.m had resulted in a slight decrease in fruit weight while N.A.A at 50 p.p.m did not give any fruits. GA_3 at 1000 p.p.m + N.A.A at 25 p.p.m treatment caused significant decrease in fruit weight while GA_3 at 1000 p.p.m + N.A.A at 50 p.p.m had increased fruit weight significantly than open pollination treatment during this study. The effect of GA_3 on increasing fruit weight was reported by Franciosi and Ponce (1970), Cunat et al (1974), Chundawat and Randhawa (1975), Mowlood (1977) and Resk (1984). The effects of N.A.A on decreasing fruit weight was reported by Babu and Lavania (1986) and Bisher (1987).

Concerning fruit height, fruit diameter and fruit shape index it is clear from the previous Tables that bagging only treatment had caused a slight decrease. Artificial cross-pollination with balady lime, cross-pollination with Balady mandarin pollen and cross-pollination with Suckarry orange pollen had increased fruit height and fruit diameter significantly while cross-pollination with Marsh grapefruit pollen had not affected on shape index in the three successive seasons of this study. Fruit shape index was slightly affected by different

pollen sources and the fruits resulting from pollination seem to be more flattend. However, the differences were not significant in most cases. This is in agreement with the finding of Soost (1956), Khalil (1967), Hearn et al (1986), Weheda (1972) and Rokba et al (1976).

Concerning growth regulators treatments it is clear that GA_3 at 1000 p.p.m or 2000 p.p.m and GA_3 at 1000 p.p.m p.p.m + N.A.A at 50 p.p.m treatments had increased fruit height and fruit diameter significantly as compared to open pollination treatment while all other growth regulators treatments did not cause any appreciable increase. It is also evident from the previously mentioned Tables fruits resulting from GA_3 treatments were elongated which is in agreement with the findings of Khalil (1967) and Atawia (1984).

With respect to peel thickness Tables (52),(53) and (54) show that, bagging only treatment had decreased peel thickness significantly as compared to open pollination treatment while emasculation and bagging treatment did not give any fruits. It is clear from these tables that artificial cross-pollination with Balady lime and cross-pollination with Balady mandarin appeared to be significant increase in peel thickness than open pollination treatment. However, cross-pollination with Marsh grapefruit and cross-pollination with Suckarry orange pollen

did not cause any appreciable increase in this respect in any of the seasons. This is in agreement with the findings obtained by Dhillon (1960), Weheda (1972) and Sherif (1983).

Concerning growth regulators treatments, it is clear that GA_3 at 1000 p.p.m or 2000 p.p.m treatments appeared cause significantly higher peel thickness than open pollination treatment during this study. N.A.A at 25 p.p.m treatment had no effect in this regard. However, N.A.A at 50 p.p.m and GA_3 at 2000 p.p.m + N.A.A at 50 p.p.m treatments caused fruit drop at June drop, the effect of GA_3 on increasing peel thickness was reported by Chundawat and Randhawa (1975) EL Khoreiby (1976), Hussin (1979) and Lima and Davies (1984).

Concerning fruit juice content, it is also evident from the same tables (52),(53) and (54) that bagging only treatment had decreased fruit juice content significantly while artificial cross-pollination with different pollinizers caused high increase in fruit juice content. However, when using Marsh grapefruit pollen, the increase was slight during this study. These findings agree with those of Rokba (1976). However, it is in contractiction with Cameron (1960), Khalil (1967) and Sherif (1983).

With respect to growth regulators, it is clear that GA_3 at 2000 p.p.m treatment had resulted in highly significant increase in fruit juice content, while all other growth regulators treatments did not cause any appreciable increase in fruit juice content during this study. The increase in fruit juice content as a result of GA_3 was reported by Coggins and Hield (1958), Cu tuli (1970) and Deidda (1971).

C) **Effect of different pollination treatments and some growth regulators on the Chemical properties of Aga mi lime fruits:**

Data in Tables (55),(56) and (57) show the chemical characteristics of Agami lime fruits as affected by bagging only, artificial cross-pollination with different pollen sources and some growth regulators treatments during three successive seasons. It is clear from these tables that both bagging only and cross-pollination with different pollen sources treatments had no effect on T.S.S in fruit juice during this study compared with open pollination treatment . Cross-pollination with balady mandarin pollen treatment had increased significantly T.S.S in fruit juice. These results are in agreement with those reported by Deidda (1966) and Sherif (1983).

GA_3 at 1000 p.p.m or 2000 p.p.m , N.A.A at 25 or 50 p.p.m and the combination between them had no effect on T.S.S in fruit juice. N.A.A at 25 p.p.m or 50 p.p.m combined with GA_3 at 1000 p.p.m had significantly increased T.S.S in fruit juice compared to open pollination treatment during this study.

Regarding fruit juice acid content, it is clear from tables (55),(56) and (57) that bagging only treatment had not affected on juice acid content compared with open pollination treatment during this study. On the other hand, all artificial cross-pollination with different pollen sources had significantly increased acidity on fruit juice during 1985 , 1986 and 1987 seasons compared with open pollination. Thes findings are in agreement with those reported by Khalil (1967), Lange and Vincent (1972) and Rokba (1976).

The effect of growth regulators treatments on fruit juice acidity was shown in Tables (55),(56) and (57). GA_3 at 1000 p.p.m had resulted in a significant increase in acidity of fruit juice over open pollination treatment. These results are in agreement with the findings by Salem (1963), Krezdorn and Kohen (1963) and Mawlood (1977), but GA_3 at 2000 p.p.m and N.A.A at 25 p.p.m had no effect on fruit juice acidity content. However, N.A.A at 25 p.p.m or 50 p.p.m combined with GA_3 at 1000

p.p.m caused significant increase in fruit acidity compared with open pollination treatment during this study.

Data in tables (55),(56) and (57) indecate that the juice T.S.S/acid ratio was decreased significantly in response to different cross-pollination treatments during this study. These results are in confirmity with those reported by Khalil (1967), Rokba et al (1976) and Atawia (1984) In addition, all growth regulators treatments with both GA_3 or N.A.A did not affect on T.S.S/ acid ratio in fruit juice for the three seasons of this study except GA_3 at 1000 p.p.m treatment which caused high significant decrease in T.S.S/acid ratio and GA_3 at 2000 p.p.m + N.A.A at 25 p.p.m which caused.significant increase in T.S.S/acid ratio in fruit juice.

Concerning ascorbic acid content in fruit juice it is clear from Tables (55),(56) and (57) that bagging only and all pollination treatments did not affect ascorbic acid content fruit juice and that is in agreement with the findings of Cameron et al (1960), Khalil (1967) Weheda (1972) and Atawia (1984). On the other hand, all growth regulators treatments did not affect ascobic acid content except GA_3 at 1000 p.p.m treatment which had significantly increased ascorbic acid content of fruit juice compared with open pollination treatment during this study. This confirms an earlier report by Cutuli (1970), Chundawat and Randhawa (1975) and Kumer (1975).

The effect of GA_3 on increasing ascorbic acid in fruit juice was reported by Mawlood (1977).

d) Effect of different pollination treatments and some growth regulators on seediness, seed development and pollination index of Agami lime fruits:-

The effects of different pollination treatments on the number of seeds, well developed and shrivel seeds per fruit and pollination index are shown in Tables (58),(59) and (60) during 1985,1986 and 1987 seasons,respectively.

Data indicate that, the total number of seeds per fruit in cross-pollination with Balady mandarin pollen was increased significantly compared with open pollination treatment during the three seasons of this study. Moreover, the other cross-pollination treatments with different pollen sources caused slight increase in the total number of seeds per fruit. On the other hand, Balady mandarin as a pollinator gave the highest total number of seeds per fruit (ranging between 3 to 9) for the three seasons as compared with the other pollination treatments. Marsh grapefruit produced the lowest total number of seeds per fruit (ranging from 1 to 5) during this study. These results are in agreement with that reported by Cost and Gagnard (1956) Cameron (1960)

Weheda (1972), Lange and Vincent (1972), Iwamasa aand Oba (1980) and Resk (1984).

Regarding the number of well developed seeds per fruit, cross-pollination with different pollen sources caused significantly higher number of well developed seeds per fruit. The same findings were obtained by Majsuradze (1952), Klimenko and Klimenko (1952) Ibrahim (1969) and Weheda (1972).

With respect to shrivel seeds per fruit, these data indicate that there were slight decrease in the shrivel seeds per fruit between all cross-pollination treatments and open pollination treatment druing the first and third season of this study while the decrease was significant in the second season. The percentage of shrivelled seeds per fruit in Agami lime was significanly higher by cross-pollination treatments during this investigation. These results are in confirmity with the findings of Rokba et al (1976b).

Concerning pollination index, the data in tables (58),(59) and (60) showed slight increase in all cross-pollination treatments with the exception of cross-pollination with Balady mandarin pollen which caused highly significant increase of pollination index as compared to open pollination treatment

during the three successive seasons of this study. The trend was generally towards increasing the pollination index of cross-pollination with Balady mandarin treatment while cross-pollination with Marsh grapefruit pollen gave the lowest pollination index. These results are in agrement with those reported by Mohamed (1984).

Table (49): Effect of different pollination treatments and some growth regulators on fruit set, remaining fruits after June drop and mature fruits in the Agami lime variety . (1985 season).

Treatments	No. of treated flowers	Fruit set		Remaining Fruits after June drop		Mature fruits	
		Total No.	Aver. %	Total No.	Aver. %	Total No.	Aver. %
Open pollination	1891	125	6.61	69	3.65	55	2.91
Begging only	1823	77	4.2	36	1.97	25	1.37
Emasculation and begging	1607	41	2.55	14	0.87	-	-
Cross-pollination with Balady lime pollen.	1893	225	11.89	156	8.24	88	4.65
Cross-pollination with Marsh grapefruit pollen.	1912	166	8.68	103	5.39	74	3.87
Cross-pollination with Balady mandarine pollen.	1807	728	40.34	562	31.10	216	11.95
Cross-pollination with Suckarry orange pollen.	1986	312	15.71	191	9.62	109	5.49
GA_3 1000 p.p.m.	1974	171	8.66	117	5.93	87	4.41
GA_3 2000 p.p.m.	1893	165	8.72	113	5.97	85	4.49
N.A.A. 25 p.p.m.	1820	127	6.98	78	4.29	58	3.19
N.A.A. 50 p.p.m.	1942	114	5.87	57	2.94	-	-
GA_3 1000 p.p.m.+ N.A.A. 25 p.p.m.	1867	115	6.16	65	3.48	47	2.52
GA_3 1000 p.p.m.+ N.A.A. 50 p.p.m.	1741	161	9.23	119	6.84	96	5.51
GA_3 2000 p.p.m.+ N.A.A. 25 p.p.m.	1593	90	5.65	51	3.20	39	2.45
GA_3 2000 p.p.m.+ N.A.A. 50 p.p.m.	1730	102	5.90	36	2.08	-	-
L.S.D. at 5%			2.03		1.55		0.88
L.S.D. at 1%			3.72		2.07		1.47

Table (50): Effect of different pollination treatments and some growth regulators on fruit set, remaining fruits after June drop and mature fruits in the Agami lime variety. (1986 season).

Treatments	No. of treated flowers	Fruit set		Remaining Fruits after June drop		Mature fruits	
		Total No.	Aver. %	Total No.	Aver. %	Total No.	Aver. %
Open pollination	1591	115	7.23	75	4.71	49	3.10
Begging only	1153	58	5.03	24	2.08	9	0.78
Emasculation and begging	1243	30	2.41	10	0.80	-	-
Cross-pollination with Balady lime pollen.	1091	199	18.24	118	10.81	67	6.14
Cross-pollination with Marsh grapefruit pollen.	879	130	14.79	70	7.96	49	5.57
Cross-pollination with Balady mandarine pollen.	978	298	30.47	170	17.38	120	12.26
Cross-pollination with Suckarry orange pollen.	1013	209	20.63	126	12.44	80	7.90
GA_3 1000 p.p.m.	1264	133	10.52	90	7.12	74	5.85
GA_3 2000 p.p.m.	1107	118	10.66	83	7.50	65	5.87
N.A.A. 25 p.p.m.	994	86	8.65	52	5.23	41	4.12
N.A.A. 50 p.p.m.	1950	111	5.69	80	4.10	-	-
GA_3 1000 p.p.m.+ N.A.A. 25 p.p.m.	1520	102	6.71	70	4.61	45	2.96
GA_3 1000 p.p.m.+ N.A.A. 50 p.p.m.	1671	182	10.89	144	8.62	115	6.88
GA_3 2000 p.p.m.+ N.A.A. 25 p.p.m.	1894	122	6.44	72	3.80	47	2.48
GA_3 2000 p.p.m.+ N.A.A. 50 p.p.m.	1623	91	5.61	63	3.88	-	-
L.S.D. at 5%			3.07		2.61		2.28
L.S.D. at 1%			5.77		3.16		2.97

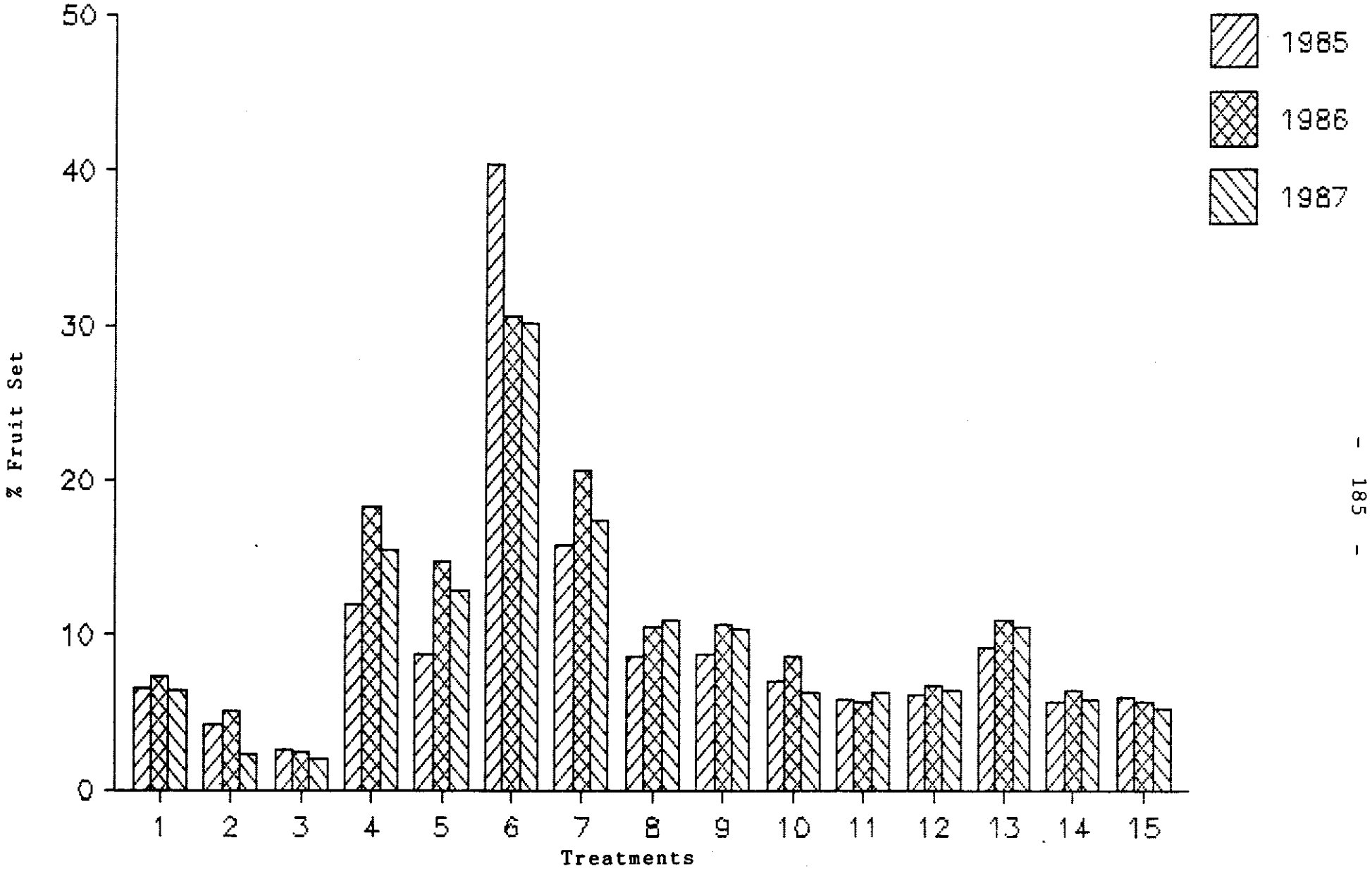

Fig. (13) Effect of Different Pollination Treatments and Some Growth Regulators on Fruit Set in the Agami Lime Variety

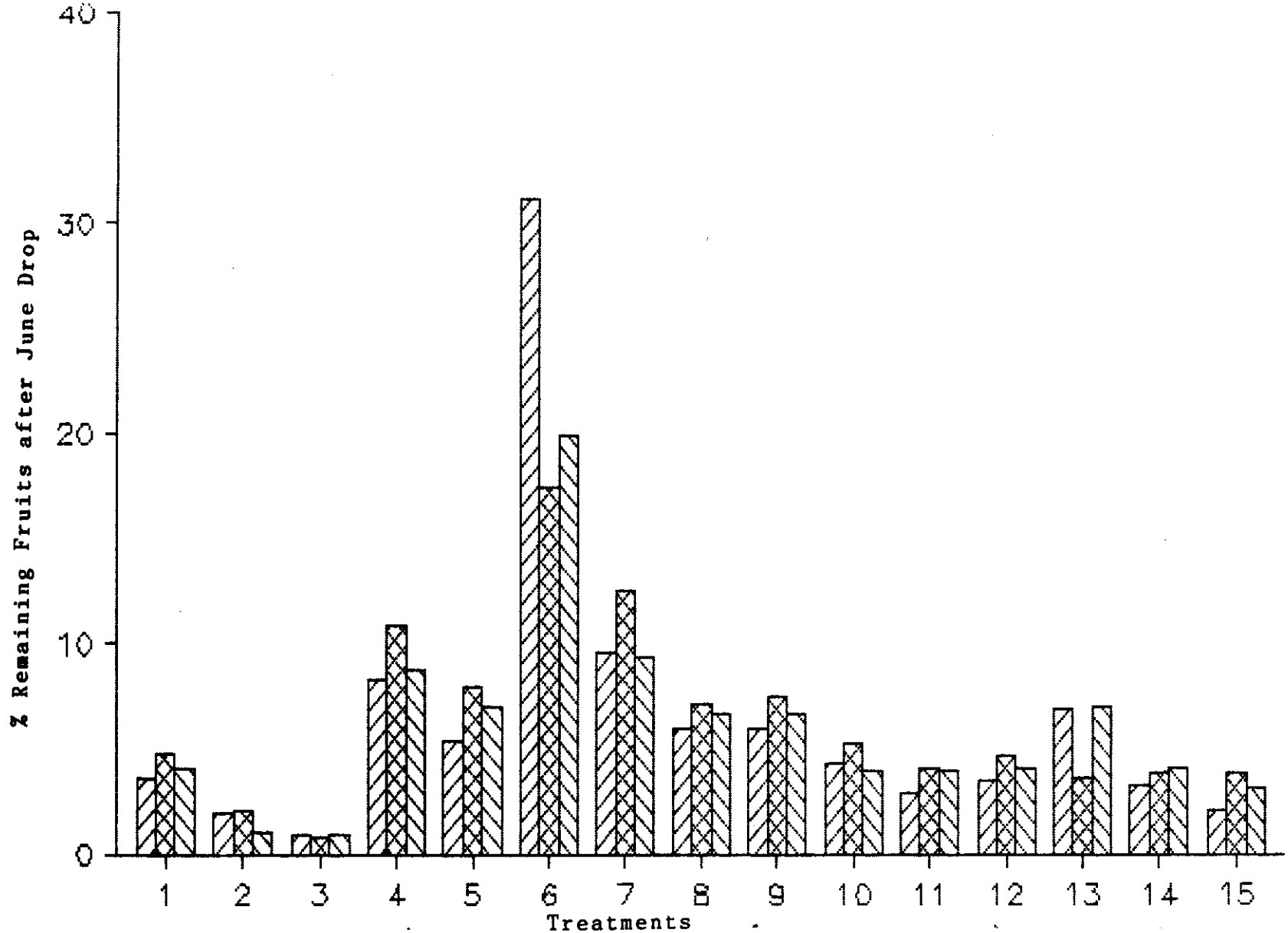

Fig. (14) Effect of Different Pollination Treatments and Some Growth Regulators on Remaining Fruits after June Drap in the Agami Lime Variety

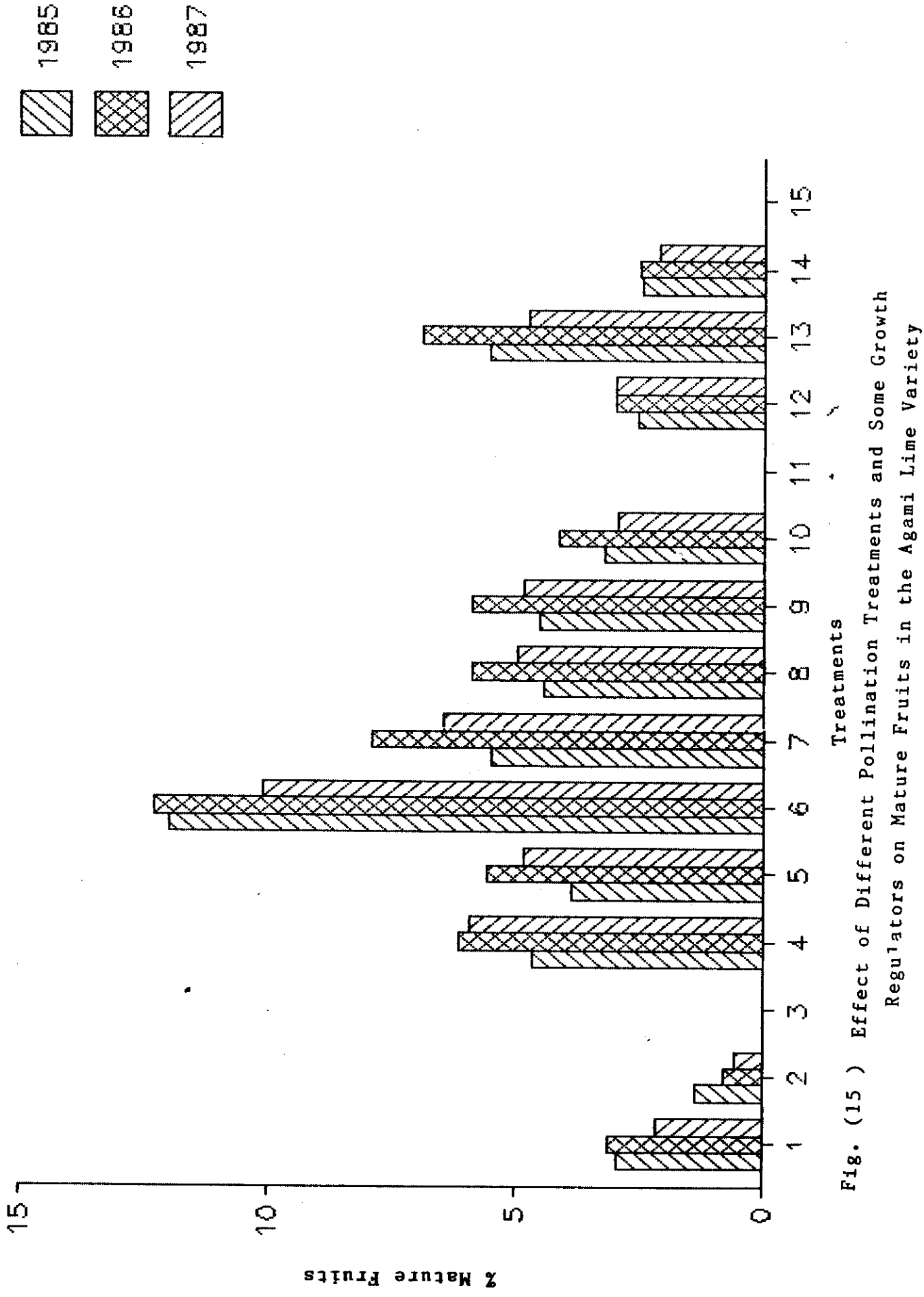

Fig. (15) Effect of Different Pollination Treatments and Some Growth Regulators on Mature Fruits in the Agami Lime Variety

Table (51): Effect of different pollination treatments and some growth regulators on fruit set, remaining fruits after June drop and mature fruits in the Agami lime variety. (1987 season).

Treatments	No. of treated flowers	Fruit set		Remaining Fruits after June drop		Mature fruits	
		Total No.	Aver. %	Total No.	Aver. %	Total No.	Aver. %
Open pollination	2184	141	6.46	90	4.12	47	2.15
Begging only	2012	65	2.23	20	0.99	11	0.55
Emasculation and begging	2241	46	2.05	21	0.94	-	-
Cross-pollination with Balady lime pollen.	1845	285	15.45	161	8.73	109	5.91
Cross-pollination with Marsh grapefruit pollen.	1822	235	12.90	128	7.03	88	4.83
Cross-pollination with Balady mandarine pollen.	1634	493	30.17	321	19.65	165	10.10
Cross-pollination with Suckarry orange pollen.	2019	351	17.38	189	9.36	136	6.74
GA_3 1000 p.p.m.	1781	194	10.89	118	6.63	88	4.94
GA_3 2000 p.p.m.	2132	220	10.32	142	6.66	103	4.83
N.A.A. 25 p.p.m.	1697	106	6.25	67	3.95	50	2.95
N.A.A. 50 p.p.m.	1964	122	6.21	77	3.92	-	-
GA_3 1000 p.p.m.+ N.A.A. 25 p.p.m.	2193	139	6.34	88	4.01	65	2.96
GA_3 1000 p.p.m.+ N.A.A. 50 p.p.m.	1978	208	10.52	138	6.98	94	4.75
GA_3 2000 p.p.m.+ N.A.A. 25 p.p.m.	2164	127	5.87	87	4.02	45	2.08
GA_3 2000 p.p.m.+ N.A.A. 50 p.p.m.	1889	100	5.29	58	3.07	-	-
L.S.D. at 5%			3.75		2.84		2.39
L.S.D. at 1%			6.34		4.46		3.85

Table (52) : Effect of different pollination treatments and some growth regulators on fruit physical properties in the Agami lime. (1985 season).

Treatments	Fruit weight gm.	Fruit height cm.	Fruit diameter cm.	Shape index	Peel Thickness mm.	Juice weight gm.	Juice %
Open pollination.	30.76	3.28	3.16	1.04	0.15	16.10	52.34
Bagging only.	26.54	3.20	3.04	1.05	0.11	11.62	43.78
Emasculation and bagging	-	-	-	-	-	-	-
Cross-pollination with Balady lime pollen.	36.12	3.28	3.56	0.92	0.20	22.17	61.38
Cross-pollination with Marsh grapefruit pollen.	30.98	3.29	3.27	1.01	0.18	16.76	54.10
Cross-pollination with Balady mandarine pollen.	40.86	3.96	3.99	0.99	0.23	24.52	60.01
Cross-pollination with Suckarry orange pollen.	38.17	3.27	3.40	0.96	0.15	23.11	60.54
GA_3 1000 p.p.m.	34.95	3.36	3.29	1.02	0.20	17.65	50.50
GA_3 2000 p.p.m.	38.00	3.60	3.22	1.19	0.21	20.60	54.21
N.A.A. 25 p.p.m.	29.11	3.20	3.10	1.03	0.14	15.09	51.84
N.A.A. 50 p.p.m.	-	-	-	-	-	-	-
GA_3 1000 p.p.m. + N.A.A. 25 p.p.m.	26.03	3.12	3.04	1.03	0.17	14.72	56.55
GA_3 1000 p.p.m. + N.A.A. 50 p.p.m.	35.81	3.30	3.28	1.01	0.23	19.28	53.84
GA_3 2000 p.p.m. + N.A.A. 25 p.p.m.	28.20	3.26	3.13	1.04	0.19	15.32	54.33
GA_3 2000 p.p.m. + N.A.A. 50 p.p.m.	-	-	-	-	-	-	-
L.S.D. at 5%	3.82	No.s	0.12	0.08	0.04	2.16	6.93
L.S.D. at 1%	5.11	No.s	0.17	0.11	0.06	2.90	8.11

Table (53) : Effect of different pollination treatments and some growth regulators on fruit physical properties in the Agami lime. (1986 season).

Treatments	Fruit weight gm.	Fruit heigh cm.	Fruit diameter cm.	Shape index	Peel thickness mm.	Juice weight gm.	Juice %
Open pollination.	26.53	3.20	2.88	1.11	0.20	14.53	54.77
Bagging only.	20.97	2.98	2.71	1.10	0.14	10.27	48.97
Emasculation and bagging.	-	-	-	-	-	-	-
Cross-pollination with Balady lime pollen.	30.94	3.35	3.40	0.99	0.28	19.30	62.38
Cross-pollination with Marsh grapefruit pollen.	26.82	3.22	2.89	1.08	0.20	15.50	57.79
Cross-pollination with Balady mandarine pollen.	35.17	3.88	3.94	0.98	0.30	22.59	64.32
Cross-pollination with Suckarry orange pollen.	32.64	3.70	3.83	0.97	0.22	20.04	61.40
GA_3 1000 p.p.m.	34.26.	3.49	2.99	1.17	0.26	17.83	52.04
GA_3 2000 p.p.m.	32.82	3.74	3.12	1.20	0.29	21.10	66.31
N.A.A. 25 p.p.m.	24.13	2.17	2.76	1.15	0.20	13.92	57.69
N.A.A. 50 p.p.m.	-	-	-	-	-	-	-
GA_3 1000 p.p.m. + N.A.A. 25 p.p.m.	22.06	3.13	2.86	1.09	0.20	12.96	57.19
GA_3 1000 p.p.m. + N.A.A. 50 p.p.m.	31.84	3.16	2.91	1.12	0.25	16.23	50.97
GA_3 2000 p.p.m. + N.A.A. 25 p.p.m.	23.10	2.98	2.87	1.04	0.21	13.72	59.39
GA_3 2000 p.p.m. + N.A.A. 50 p.p.m.	--	-	-	-	-	-	-
L.S.D. at 5%	4.39	0.14	0.11	0.09	0.05	3.02	5.36
L.S.D. at 1%	6.09	0.19	0.15	0.13	0.07	4.05	7.84

Table (54) : Effect of different pollination treatments and some growth regulators on fruit physical properties in the Agami lime. (1987 season).

Treatments	Fruit weight gm.	Fruit heigh cm.	Fruit diameter cm.	Shape index	Peel thickness mm.	Juice weight gm.	Juice %
Open pollination .	32.04	3.41	3.26	1.05	0.17	19.23	60.02
Bagging only.	28.10	3.24	3.11	1.04	0.13	15.60	53.61
Emasculation and Bagging.	-	-	-	-	-	-	-
Cross-pollination with Balady lime pollen.	39.64	3.82	3.86	0.99	0.23	24.13	60.87
Cross-pollination with Marsh grapefruit pollen.	33.17	3.38	3.39	1.00	0.17	20.19	60.87
Cross-pollination with Balady mandarine pollen.	42.39	4.26	4.48	0.95	0.26	29.88	70.49
Cross-pollination with Suckarry orange pollen.	40.73	3.84	3.90	0.98	0.18	27.16	66.68
GA_3 1000 p.p.m.	37.44	3.98	3.66	1.09	0.25	21.46	57.32
GA_3 2000 p.p.m.	39.12	4.29	3.66	1.17	0.27	23.80	60.84
N.A.A. 25 p.p.m.	29.14	3.32	3.10	1.07	0.16	18.17	62.35
N.A.A. 50 p.p.m.	-	-	-	-	-	-	-
GA_3 1000 p.p.m. + N.A.A. 25 p.p.m.	28.10	3.40	3.12	1.09	0.16	16.89	60.11
GA_3 1000 p.p.m. + N.A.A. 50 p.p.m.	37.66	3.69	3.45	1.07	0.23	24.55	65.19
GA_3 2000 p.p.m. + N.A.A. 25 p.p.m.	30.19	3.39	3.25	1.04	0.19	18.74	62.07
GA_3 2000 p.p.m. + N.A.A. 50 p.p.m.	-	-	-	-	-	-	-
L.S.D. at 5%	3.39	0.23	0.15	0.09	0.04	2.99	5.13
L.S.D. at 1%	4.54	0.31	0.20	0.12	0.06	4.00	6.94

Table (55) : Effect of different pollination treatments and some growth regulators on fruit chemical characteristies in the Agami lime . (1985 season).

Treatments	T.S.S %	Tetratable acidity %	T.S.S/acid Ratio	Ascorbic acid ma/100 ml Juice
Open pollination	8.42	7.45	1.13	49.44
Bagging only.	8.20	7.94	1.03	50.23
Emasculation and bagging.	-	-	-	-
Cross-pollination with Balady lime pollen.	7.20	7.99	0.90	48.72
Cross-pollination with Marsh grapefruit pollen.	8.20	8.65	0.95	50.12
Cross-pollination with Balady mandarine polle.	9.20	8.34	1.10	51.64
Cross-pollination with Suckarry orange pollen.	8.60	8.55	1.01	48.73
GA_3 1000 p.p.m.	8.20	7.99	1.03	55.12
GA_3 2000 p.p.m.	8.00	7.27	1.10	53.00
N.A.A. 25 p.p.m.	9.00	7.83	1.15	46.40
N.A.A. 50 p.p.m.	-	-	-	-
GA_3 1000 p.p.m. + N.A.A. 25 p.p.m.	10.00	8.53	1.17	48.69
GA_3 1000 p.p.m. + N.A.A. 50 p.p.m.	9.20	8.12	1.13	53.18
GA_3 2000 p.p.m. + N.A.A. 25 p.p.m.	8.60	7.30	1.18	51.28
GA_3 2000 p.p.m. + N.A.A. 50 p.p.m.	-	-	-	-
L.S.D. at 5%	0.76	0.54	0.05	3.53
1%	1.49	1.10	0.12	5.65

Table (56) : Effect of different pollination treatments and some growth regulators on fruit chemical characteristies in the Agami lime. (1986 season).

Treatments		T.S.S %	Tetratable acidity %	T.S.S/acid Ratio	Ascorbic acid mg/100 ml Juice
Open pollination.		7.80	7.45	1.05	48.96
Bagging only.		7.00	7.15	0.98	47.30
Emasculation and bagging.		-	-	-	-
Cross-pollination with Balady lime pollen.		8.00	8.15	0.96	48.83
Cross-pollination with Marsh grapefruit pollen.		7.40	8.21	0.90	49.10
Cross-pollination with Balady mandarine polle.		8.70	8.46	1.03	49.65
Cross-pollination with Suckarry orange pollen.		7.80	8.21	0.95	48.00
GA_3 1000 p.p.m.		8.20	8.61	0.95	53.00
GA_3 2000 p.p.m.		7.60	7.33	1.04	50.80
N.A.A. 25 p.p.m.		8.00	7.11	1.13	48.11
N.A.A. 50 p.p.m.		-	-	-	-
GA_3 1000 p.p.m. + N.A.A. 25 p.p.m.		8.80	8.62	1.02	48.95
GA_3 1000 p.p.m. + N.A.A. 50 p.p.m.		9.60	8.54	1.12	48.95
GA_3 2000 p.p.m. + N.A.A. 25 p.p.m.		8.20	6.27	1.31	50.78
GA_3 2000 p.p.m. + N.A.A. 50 p.p.m.		-	-	-	-
L.S.D	5%	0.81	0.69	0.09	2.76
	1%	1.63	1.15	0.21	4.oo

Table (57) : Effect of different pollination treatments and some growth regulators on fruit chemical characteristies in the Agami lime. (1987 season).

Treatments	T.S.S %	Tetratable acidity %	T.S.S/acid Ratio	Ascorbic acid mg/100 ml Juice
Open pollination.	7.96	6.63	1.20	46.11
Bagging only.	8.11	6.99	1.16	45.63
Emasculation and bagging	-	-	-	-
Cross-pollination with Balady lime pollen.	8.10	7.63	1.06	46.17
Cross-pollination with Marsh grapefruit pollen.	7.90	7.90	1.00	48.67
Cross-pollination with Balady mandarine pollem.	9.89	7.64	1.29	47.16
Cross-pollination with Suckarry orange pollen.	8.80	8.91	0.99	46.90
GA_3 1000 p.p.m.	8.90	8.40	1.10	51.73
GA_3 2000 p.p.m.	8.60	7.00	1.23	50.86
N.A.A. 25 p.p.m.	8.70	6.94	1.25	47.10
N.A.A. 50 p.p.m.	-	-	-	-
GA_3 1000 p.p.m. + N.A.A. 25 p.p.m.	10.40	9.01	1.15	46.08
GA_3 1000 p.p.m. + N.A.A. 50 p.p.m	10.80	9.45	1.14	50.38
GA_3 2000 p.p.m. + N.A.A. 25 p.p.m.	8.86	6.46	1.27	49.14
GA_3 2000 p.p.m. + N.A.A. 50 p.p.m.	-	-	-	-
L.S.D. at 5%	1.01	0.91	0.07	4.75
L.S.D. at 1%	1.92	1.76	0.17	5.59

Table (58) : Effect of different pollination treatments on seediness and seed development in Agami lime fruits. (1985 season).

Treatments	Mean number of seeds per fruit	Range in number of normal seeds per fruit	Well developed seeds per fruit		Shrivel per fruit		Pollination index (No of) well developed seeds per treated flowers
			No	%	No	%	
Open pollination.	2.16	1-3	1.91	88.24	0.25	11.76	0.06
Bagging only.	0.00	0-0	0.00	0.00	0.00	0.00	0.00
Emasculation and Bagging.	-	-	-	-	-	-	-
Cross-pollination with Balady lime pollen.	3.57	2-5	3.42	95.86	0.15	4.14	0.16
Cross-pollination with Marsh grapefruit pollen.	2.49	1-3	2.35	94.57	0.14	5.43	0.09
Cross-pollination with Balady mandarine pollen.	6.00	3-7	5.88	97.99	0.12	2.01	0.70
Cross-pollination with Suckarry orange pollen.	3.96	2-6	3.79	95.83	0.17	4.17	0.21
L.S.D. at 5%	2.00		1.81	5.14	0.14	5.14	0.41
L.S.D. at 1%	3.10		2.90	7.21	0.22	7.21	0.55

Table (59) : Effect of different pollination treatments on seediness and seed development in Agami lime fruits. (1986 season).

	Mean number of seeds per fruit	Range in number of normal seeds per fruit	Well developed seeds per fruit		Shrivel per fruit		Pollination index (No of) well developed seeds per treated flowers
			No	%	No	%	
Open pollination.	3.12	1-4	2.52	80.77	0.60	19.23	0.07
Bagging only.	0.00	0-0	0.00	0.00	0.00	0.00	0.00
Emasculation and bagging.	-	-	-	-	-	-	-
Cross-pollination with Balady lime pollen.	4.00	3-6	3.60	89.93	0.40	10.07	0.22
Cross-pollination with Marsh grapefruit pollen.	3.60	2-5	3.22	89.77	0.37	10.23	0.18
Cross-pollination with Balady mandarine pollen.	5.00	3-8	4.65	93.00	0.35	7.00	0.57
Cross-pollination with Suckarry orange pollen.	4.53	2-7	4.11	90.88	0.41	9.12	0.32
L.S.D. at 5%	1.22		1.00	7.96	0.31	7.96	0.39
L.S.D. at 1%	2.61		2.18	9.80	0.40	9.80	0.50

Table (60) : Effect of different pollination treatments on seediness and seed development in Agami lime fruits. (1987 season).

Treatments	Range in mean number of seeds per fruit	Range in number of normal seeds per fruit	Well developed seeds per fruit		Shrivel seeds per fruit		Pollination index (No of) well developed seeds per treated flowers
			No	%	No	%	
Open pollination.	3.00	1-4	2.57	85.82	0.43	14.18	0.06
Bagging only.	0.00	0-0	0.00	0.00	0.00	0.00	0.00
Emasculation and bagging.	-	-	-	-	-	-	-
Cross-pollination with Balady lime pollen.	4.37	3-6	4.06	93.07	0.30	6.93	0.24
Cross-pollination with Marsh grapefruit pollen.	4.37	2-5	3.60	90.06	0.40	9.94	0.17
Cross-pollination with Balady mandarine pollen.	6.14	3-9	5.89	95.95	0.25	4.05	0.59
Cross-pollination with Suckarry orange pollen.	4.56	3-6	4.57	94.10	0.29	5.90	0.31
L.S.D. at 5%	2.19		1.99	6.34	0.22	6.34	0.28
L.S.D. at 1%	3.42		2.61	8.21	0.30	8.21	0.42