RESULTS AND DISCUSSION

4. RESULTS AND DISCUSSION

4.1. Field experiments:

Evaluation of some recently introduced tomato cultivars under different planting dates.

4.1.1. Vegetative growth:

Data presented in Table (2) show the vegetative characters of some tomato varieties as affected by planting date. It is clear that all the studied vegetative growth parameters, i.e., stem length, number of main shoots and fresh weight per plant were significantly increased with delaying planting date. In this regard, the highest values for all previously mentioned growth characteristics were obtained in the case of late planting (Feb. 1st). This was quite clear in both seasons of this work.

These results may be attributed to the important effects of prevailing daylength and temperatures during vegetative period on plant growth and photosynthetic assimilation. Increasing of both daylength and average day temperature during the vegetative period as a result of delaying planting date from Jan. 1st to Feb. 1st (Table, 1) might result in improving plant growth and photosynthetic assimilation in the case of late planting. Referring to the important effect of daylength in this respect, Hurd (1973) indicated that plant growth and photosynthetic rates

Table (2): Vegetative growth characters of some tomato varieties as affected by planting date during both seasons of 1988 and 1989.

Season		1988			1989		
Planting date	Vars.	Length of main stem. (cm)	No. of main shoots	Fresh weight g/plant	Length of main stem. (cm)	No. of main shoots	Fresh weight g/plant
Jan. 1st	Peto 86	52.68	4.44	385.73	52.80	4.56	380.15
	UC 97-3	55.10	4.56	411.15	55.33	4.88	399.25
	Castle	65.78	5.00	410.68	65.80	5.44	411.88
	VF 145-B	56.23	5.38	418.95	56.25	5.75	420.08
	Flora Dade	75.95	6.81	686.03	76.33	7.38	644.75
	Pakmor	82.00	7.25	726.73	84.23	7.50	742.50
Jan.15th	Peto 86	57.80	4.50	412.65	60.83	4.81	414.95
	UC 97-3	61.60	4.88	447.33	60.95	5.25	452.85
	Castle	63.63	5.50	485.95	64.28	5.88	476.18
	VF 145-B	67.00	5.63	514.18	68.78	6.13	492.10
	Flora Dade	81.45	7.44	709.80	82.35	7.81	706.18
	Pakmor	89.78	7.69	773.00	90.63	8.06	773.53
Feb. 1st	Peto 86	61.98	5.44	441.78	62.28	5.75	443.43
	UC 97-3	64.78	5.63	480.88	66.85	6.50	476.80
	Castle	67.58	6.00	537.15	69.48	6.56	531.15
	VF 145-B	68.03	7.19	543.80	70.35	7.38	564.55
	Flora Dade	82.95	8.88	746.95	84.40	8.56	765.83
	Pakmor	90.65	8.88	866.30	93.33	8.50	859.93
L.S.D. at 5%		n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Jan. 1st		64.62	5.57	506.54	65.12	5.92	499.77
Jan.15th		70.21	5.94	557.15	71.30	6.32	552.63
Feb. 1st		72.66	7.00	602.81	74.45	7.21	606.95
L.S.D. at 5%		2.64	0.41	18.94	0.81	0.60	17.36
	Peto 86	57.48	4.79	413.38	58.63	5.04	412.84
	UC 97-3	60.49	5.02	446.45	61.04	5.54	442.97
	Castle	65.66	5.50	477.93	66.52	5.96	473.07
	VF 145-B	63.75	6.06	492.31	65.13	6.42	492.24
	Flora Dade	80.12	7.71	714.26	81.03	7.92	705.58
	Pakmor	87.48	7.94	788.68	89.39	8.02	791.98
L.S.D. at 5%		4.10	0.53	29.02	3.69	0.48	22.71

were higher in longer daylength. Referring to the important effect of day temperature on plant growth, Abd El-Rahman and Bierhuizen (1959) and Calvert (1964a) indicated that the rate of stemlength increased with increasing temperature. In addition, Yoshioka et al (1977) reported that the recommended day temperature for growth is (18-20°C) and at temperature lower than 12°C, plant growth is seriously retarded. Moreover, Bugbee and White (1984) found that plants grown at 15°C had smaller leaves than at 25°C and the specific leaf area was 21% lower at 15°C. Concerning the effect of temperature on photosynthetic assimilation, Augustine et al (1979) showed that varieties vary in their temperature response of leaf net photosynthesis but most of them show an optimum between 25°C and 30°C. Obtained results are also in harmony with those reported by Shafshak (1961), Hashem (1977) and Indrea et al (1979).

With regard to the varietal differences, it is clear from the same data in Table (2), that the studied tomato varieties significantly differed in their vegetative growth parameters. In this regard, the maximum values for all previously mentioned growth characteristics were obtained by Pakmor variety followed by Flora Dade. These two varieties could be considered as semi-determinate vegetative growth varieties. However, VF 145-B and Castle Rock possessed intermediate vegetative growth, while the least values were connected with Peto 86 followed by UC 97-3.

Regardless such vegetative variations, these four varieties proved to be of determinate growth. These variations in vegetative growth of tomato varieties have been mentioned by many investigators, among them Mahmoud (1971), Omran (1973), El-Bar (1977) Hashem (1977) and Atherton and Rudich (1986) and could be referred to the growth habit of each cultivar.

Concerning the interactional effects of planting date and variety on plant growth, the same data in Table (2) show clearly that insignificant differences were detected for the studied growth characters. However, the largest vigorous vegetation were obtained by Pakmor variety when transplanted on Feb. 1st during both seasons.

The interaction effect of planting date and variety was previously reported by Sakr (1965) who mentioned that tomato varieties grown in Egypt may be succeed or fail in different growing seasons according to their different temperature requirements. In this regard, Harbaoui and Verlodt (1982) found that tomato varieties differed with respect to their suitable planting date.

4.1.2. Flowering behaviour and fruit-set percentage:

Concerning flowering time, data given in Table (3) show that there was a significant decrease in number of days till first flower opening as planting date delayed.

Table (3): Flowering behaviour and fruit set % of some tomato varieties as affected by planting date during both seasons of 1988 and 1989.

Season		1988			1989		
Planting date	Vars.	Days to first flowers opening	N.of inter-node to first cluster	Fruit set %	Days to first flower. opening	N.of inter-node to first cluster	Fruit set %
Jan. 1st	Peto 86	73.25	4.31	42.45	74.25	4.56	51.68
	UC 97-3	76.00	4.69	38.33	76.50	4.75	48.83
	Castle	79.50	5.25	36.95	81.00	5.00	40.30
	VF 145-B	84.00	5.81	33.23	85.00	6.00	30.78
	Flora Dade	84.50	6.69	27.88	85.25	6.94	27.45
	Pakmor	88.00	7.31	16.90	89.00	7.63	19.48
Jan.15th	Peto 86	71.50	4.49	53.88	72.50	4.88	59.13
	UC 97-3	75.00	4.75	42.43	75.25	5.06	51.88
	Castle	78.00	4.88	42.48	78.75	5.31	43.45
	VF 145-B	81.50	5.63	34.68	84.00	6.06	35.98
	Flora	82.25	6.75	31.78	83.00	6.69	33.98
	Pakmor	86.00	7.50	20.85	86.50	7.88	24.08
Feb. 1st	Peto 86	68.25	4.69	63.40	68.25	4.56	64.40
	UC 97-3	73.50	5.13	51.28	74.25	4.50	55.13
	Castle	76.25	5.38	48.88	77.00	5.06	46.33
	VF 145-B	79.75	5.88	44.30	80.00	6.00	42.88
	Flora	81.00	7.13	38.25	82.00	7.00	36.83
	Pakmor	85.00	8.25	28.25	86.00	8.00	29.00
L.S.D. at 5%		n.s.	n.s.	n.s.	3.30	n.s.	n.s.
Jan. 1st		80.88	5.68	32.62	81.83	5.81	36.42
Jan.15th		79.04	5.66	37.68	80.00	5.98	41.41
Feb. 1st		77.29	6.07	45.73	77.92	5.85	45.76
L.S.D. at 5%		0.53	n.s.	2.93	0.60	n.s.	2.19
	Peto 86	71.00	4.50	53.24	71.67	4.67	58.40
	UC 97-3	74.83	4.85	44.01	75.33	4.77	51.94
	Castle	77.92	5.17	42.77	78.92	5.13	43.36
	VF 145-B	81.75	5.77	37.40	83.00	6.02	36.54
	Flora	82.58	6.85	32.63	83.42	6.88	32.75
	Pakmor	86.33	7.69	22.00	87.17	7.83	24.18
L.S.D. at 5%		0.92	0.42	2.66	0.83	0.43	2.21

Late planting (Feb. 1st) induced the shortest flowering time compared with the two earlier plantings. This may be due to the higher prevailing temperature (23°C during April) compared with that in the case of early one (18.4°C during March) (Table, 1). In this repect, Calvert (1964a) showed that flowers developed rapidly at mean air temperature of 20°C than at 16°C. Obtained results are also in accordance with those of Calvert (1964b) who indicated that time of flowering varied widely with sowing date.

Referring to the position of the first cluster on the main stem as affected by planting date, data in Table (3) show that no significant differences were detected in this respect.

Concerning fruit-set percentage as affected by planting date, it is obvious from the same Table that it was significantly increased with delaying planting date. The late planting on Feb. 1st reflected the highest fruit-set percentage comparing with the two earlier plantings (Jan. 1st and Jan. 15th). Such results may be due to the more favourable temperatures prevailing during the flowering period in the case of late planting (Table, 1). The night temperature during the flowering period as average of both seasons was 11.2°C (during March) and 15.6°C (during April) in the case of earlist and the latest plantings, respectively. Referring to the important effect of temperature on fruit-set, Dempsey (1970) indicated that pollen germination is temperature dependant and the growth rate of pollen tube increased with temperature between 10°C and 35°C but was reduced outside this range. In addition, Van Ravestijn (1970) stated that if the night temperature is outside the range 17-24°C the adherence of pollen on the style may be reduceed. Obtained results are in general agreement with those reported by Indrea et al (1979) and Gautam et al (1982) who indicated that differences in planting date of tomato varieties led to differences in number of flowers and percentage of fruit set.

Concerning the varietal differences, it is obvious from the same data in Table (3) that the tested tomato varieties significantly differed in their flowering behaviour. Peto 86 variety was the earliest flowering one followed by UC 97-3, Castle Rock, VF 145-B, Flora Dade and Pakmor.

Referring to the position of the first cluster on the main stem, results showed that the early flowering varieties such as Peto 86 and UC 97-3 bear the first cluster at lower internode compared with the late ones (Flora Dade and Pakmor). This was quite clear in both years. These results may be due to the correlation between growth and flowering in tomato, where the formation and growth of stems and leaves continues while the plant is flowering and producing fruits. This may lead to a competition between vegetative and reproductive development for assimilates (soluble carbohydrates and related compounds) as mentioned by Leopold and Lam (1960) and Russell and Morris (1983). They indicated that leaves and shoots are in competition with the infloresences for assimilates. This may explain why the most vigorous vegetative growth-cultivars (Flora Dade and Pakmor) were the latest flowering ones as cleared from Tables (2 and 3).

Concerning the fruit set percentage, data shown at Table (3) reveal that cv. Peto 86 exhibited the highest fruit set percentage followed by cv. UC 97-3 and Castle Rock, while VF 145-B showed intermediate fruit set percentage and cvs. Flora Dade and Pakmor ranked last in this respect.

The variability between tomato varieties in their fruit set capacity would be expected since they vary in their ability to set fruits under low temperature (Abdel-Al, 1962). Furthermore, the potential number of pollen grains was found to be genetically determined (Alexander and Oakes, 1970). In addition, the viability of pollen grains varies with varieties (El-Beheidi et al., 1988a).

The obtained results are in harmony with those reported by Abdel-Al (1962), Georgieva (1970), Hashem (1977), Indrea et al. (1979), Gautam et al. (1982) and Saito (1986) who indicated that flowering behaviour and fruit set percentage varied with varieties. On the contrary, El-Beheidi et al. (1988a) working on three tomato cultivars (Pritchard, Marmand and V.F.N-8) mentioned that such cultivars did not reflect any differences in fruit set percentage.

Regarding to the interaction effects of planting date and variety on flowering behaviour, the results indicated that the position of the first cluster on the main stem as well as fruit set percentage were not significantly affected, while flowering time was significantly affected only in the second growning season. In this respect the earliest flowering time (68 days) was obtained by Peto 86 variety when transplanted on Feb. 1st. Obtained results concerning the interaction effect of planting date and variety are in agreement with those previously reported by Abdel-Al (1962) and Rudich et al (1977).

4.1.3. **Yield and its components**:

Data in Table (4) illustrate the yield and its components of some tomato cultivars as affected by planting date. The various comparisons indicated that early, total as well as marketable yields were significantly increased with delaying planting date in both growing seasons. Thus, maximum values for all studied yield parameters were obtained in the case of late planting (Feb. 1st). Such

Table (4): Yield and its components of some tomato varieties as affected by planting date during both seasons of 1988 and 1989 (ton/fad.).

Season		1988				1989			
Planting date	Vars.	Early yield	Total yield	Early y. / Total y. %	Marketable yield	Early yield	Total yield	Early y. / Total y. %	Marketable yield
Jan. 1st	Peto 86	9.20	19.01	48.68	16.08	9.00	18.58	48.40	15.84
	UC 97-3	8.17	17.65	46.44	13.44	8.61	16.60	52.20	13.71
	Castle	7.33	16.26	45.08	10.35	7.51	15.06	50.49	10.39
	VF 145-B	4.66	12.29	38.18	7.36	4.83	12.51	39.72	7.02
	Flora	3.67	11.71	31.13	6.14	3.90	11.00	35.05	6.13
	Pakmor	2.23	9.45	23.89	5.03	1.91	9.49	21.30	5.21
Jan. 15th	Peto 86	9.84	23.61	41.60	19.43	9.59	22.07	44.19	20.22
	UC 97-3	8.81	21.48	40.97	16.92	8.90	19.63	45.33	17.09
	Castle	7.96	19.75	40.43	15.77	7.27	18.94	38.65	15.32
	VF 145-B	4.40	15.86	27.81	10.43	4.01	13.94	29.75	10.51
	Flora	3.08	15.88	19.54	8.55	2.73	14.27	19.53	8.21
	Pakmor	2.84	12.96	22.24	7.24	2.20	12.34	18.13	6.75
Feb. 1st	Peto 86	10.61	25.13	42.43	20.57	9.98	23.66	42.40	20.54
	UC 97-3	9.83	23.15	42.57	19.06	9.94	23.47	42.30	19.35
	Castle	8.88	21.91	40.66	17.92	8.58	22.76	37.87	17.78
	VF 145-B	5.73	20.23	28.32	16.37	5.28	19.15	27.56	16.43
	Flora	4.48	19.93	22.53	14.37	4.03	18.07	22.99	14.43
	Pakmor	3.58	18.28	19.30	11.69	3.56	17.56	20.33	11.81
L.S.D. at 5%		n.s.	n.s.	n.s.	1.74	n.s.	n.s.	n.s.	2.12
Jan. 1st		5.88	14.39	38.90	9.73	5.96	13.87	41.19	9.72
Jan. 15th		6.16	18.26	32.10	13.06	5.78	16.87	32.60	13.01
Fab. 1st		7.18	21.44	32.63	16.66	6.89	20.78	32.24	16.72
L.S.D. at 5%		0.74	1.37	5.83	0.89	1.08	0.99	6.87	1.50
	Peto 86	9.88	22.59	44.24	18.69	9.52	21.43	45.00	18.87
	UC 97-3	8.94	20.76	43.32	16.48	9.15	19.90	46.61	16.71
	Castle	8.05	19.30	42.05	14.68	7.79	18.92	42.33	14.50
	VF 145-B	4.93	16.12	31.44	11.38	4.71	15.20	32.34	11.32
	Flora	3.74	15.84	24.40	9.69	3.55	14.45	25.86	9.59
	Pakmor	2.88	13.56	21.81	7.99	2.56	13.13	19.92	7.92
L.S.D. at 5%		0.71	1.11	4.03	0.98	1.03	1.34	7.05	1.12

results were directly owing to the earliest flowering time and the highest fruit set percentage (Table, 3) in case of late planting.

On the other hand, the highest ratio of early to total yield was obtained by early planting (Jan. 1st) with insignificant differences between the second and third planting dates in both growing seasons. The effect of planting date on yield and its components of tomato varieties was previously reported by Hashem (1977), Indrea et al (1979), Gautam et al (1982) and Atherton and Rudich (1986).

With regard to the varietal differences, it is clear from data in Table (4) that the studied tomato cultivars differed significantly in their yielding ability. The maximum values for either early or total yield, and their ratio as well as marketable yield were obtained by Peto 86 whereas the least values were obtained by Pakmor cultivar. This was quite clear in both years of this work.

Concerning variations between cultivars under investigation according to their early yield per faddan, it is clear that early yield of cv. Peto 86 reached more than threefold that of cv. Pakmor. In this respect, studied cultivars may be classified into two groups: early group included Peto 86, UC 97-3 and Castle Rock and late one as VF 145-B, Flora Dade and Pakmor. Such enormous early yield productivity may be due to the early flowering and consequently fruit set of these early varieties compared with late ones (Table, 3). This explanation is in confirmity with those reported by Georgieva (1970) who stated that early flowering of tomato plants was being associated with early fruiting and Tsei (1972) who found that the correlation (r) between earliness and yield was 0.11.

In this respect, Pachelintseva (1972) indicated that varieties frequently are classified as early medium and late referring to time elapsed from planting to maturity; but there are no sharpy differences between the variety groups. Obtained results are also in harmony with the findings of Riad (1974), Hashem (1977), Hassanen (1983) regarding fruit earliness of different tomato cultivars.

Concerning variations between varieties under investigation according to their total yield, it is obvious from the same data in Table (4) that Peto 86 ranked first followed by UC 97-3 and Castle Rock, meanwhile VF 145-B and Flora Dade had intermediate fruit yield, whereas Pakmor ranked last in this respect. The total yield of cv. Peto 86 was 66% higher than that of Pakmor.

The superiority of the variety Peto 86 in total yield could be referred mostly to its higher fruit set percentage (Table, 3) and its higher tolerance to low temperature prevailing during early summer plantation compared with other tested varieties. In this connection, Liptay et al (1982) indicated that tomato cultivars differ in their ability to cold tolerance.

Differences in total yield between varieties found in this study agree with those of Brizataga (1962), Bernal et al. (1967), Gheta et al. (1970), Campell (1970 and 1972), El-Shall and Khalf-Allah (1973), Affran (1976) and El-Beheidi et al (1988a).

As for the interaction effects of planting date and variety on yield and its components, obtained results indicated that early yield, total yield and their ratio were not significantly affected, while marketable yield was significantly affected in both growing seasons. In this respect, the highest marketable yield was obtained by Peto 86 cv. when transplanted on Feb. 1st reaching 20.57 ton/fad. in the first season and nearly the same in the second one.

Generally, referring to the yield capacity, it is noticed that when the six studied cultivers are transplanted on Feb. 1st, which proved to be the most suitable planting date for early summer production, they produced high total yield ranged from 18.28-25.13 and17.56-23.66 tons/fad. in 1988 and 1989 seasons, respectively. These results may lead to a conclusion that such recent tomato cultivars seemed to be among the cold tolerant varieties which thrive well under the prevailing low temperatures during early summer plantation. Such cultivars may have a special interest, because of their high cach value as exportation crops. Peto 86 cv. was situated at the top in this respect followed by UC 97-3, not only concerning total yield, but also early as well as marketable yields.

Obtained results concerning the interaction effects coincide with those of Gautam et al (1982) who evaluated some tomato varieties under different planting dates and found that yielding ability varied with variety as well as with planting date. This may be due to the great variation concerning the ability to cold tolerance among varieties (Liptay et al, 1982).

4.1.4. Fruit quality:

A: Physical properties:

Data presented in Table (5) show the physical fruit properties expressed as weight, shape index, flesh thickness, number of locules, juice % and firmness of studied tomato cultivars as affected by planting date.

Concerning. fruit size, determined by weight, the various comparisons indicate that it was significantly increased with delaying the planting date in both growing seasons. The largest fruit size was connected with the latest planting date (Feb. 1st). Such a result may be

Table (5): Physical fruit properties of some tomato varieties as affected by plantin date during both seasons of 1988 and 1989.

Season		1988						1989					
Planting date	Vars.	Fruit weight (gm)	Shape index	Flesh thick-ness	N. of locules	Juice %	Firmn-ess lb/in^2	Fruit weight (gm)	Shape index	Flesh thick-ness	N. of locules	Juice %	Firmn-ess lb/in^2
Jan. 1st	Peto 86	83.88	1.41	0.64	2.10	61.98	10.90	91.20	1.42	0.67	2.15	61.20	11.25
	UC 97-3	86.33	1.03	0.58	2.15	68.60	10.60	95.00	1.06	0.63	2.20	68.08	10.60
	Castle	96.25	1.47	0.48	3.80	70.90	12.95	98.18	1.42	0.54	4.10	68.25	12.90
	VF 145-B	102.08	1.07	0.35	4.15	72.78	9.55	106.28	1.06	0.35	4.35	70.55	9.15
	Flora	129.38	0.88	0.35	5.10	78.83	9.40	137.48	0.88	0.35	5.05	78.45	9.25
	Pakmor	179.00	0.73	0.28	6.90	83.40	7.45	184.15	0.83	0.30	6.95	80.55	7.20
Jan. 15st	Peto 86	94.45	1.47	0.73	2.15	65.43	11.65	95.58	1.34	0.77	2.25	67.65	11.75
	UC 97-3	94.00	1.09	0.66	2.35	71.13	11.35	99.68	1.09	0.68	2.25	70.00	11.45
	Castle	99.75	1.49	0.60	3.90	72.68	14.05	104.70	1.61	0.63	4.00	72.10	13.95
	VF 145-B	113.30	1.08	0.37	4.45	74.60	10.10	115.23	1.08	0.44	4.45	76.58	9.80
	Flora	139.33	0.93	0.35	5.05	80.38	10.20	145.70	0.90	0.36	5.10	79.28	10.00
	Pakmor	194.08	0.76	0.29	6.80	85.33	8.20	197.10	0.78	0.32	6.90	84.48	7.60
Feb. 1st	Peto 86	97.15	1.48	0.70	2.15	69.20	11.05	99.73	1.49	0.71	2.20	71.78	11.10
	UC 97-3	99.35	1.10	0.60	2.20	75.63	11.05	101.68	1.10	0.63	2.35	73.43	11.00
	Castle	110.25	1.54	0.60	3.85	76.05	13.60	107.68	1.60	0.61	3.85	74.05	13.10
	VF 145-B	141.43	1.05	0.35	4.40	76.95	9.65	136.30	1.07	0.40	4.40	74.83	9.30
	Flora	153.90	0.89	0.32	4.70	84.63	9.50	149.53	0.92	0.34	5.30	83.28	9.35
	Pakmor	201.83	0.78	0.29	7.50	89.53	7.75	199.30	0.76	0.30	7.00	85.83	7.45
L.S.D. at 5%		n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Jan. 1st		112.82	1.10	0.44	4.03	72.75	10.14	118.71	1.11	0.47	4.13	71.18	10.06
Jan. 15th		122.48	1.13	0.50	4.12	74.92	10.93	126.33	1.13	0.53	4.16	75.01	10.76
Feb. 1st		133.98	1.14	0.48	4.13	78.66	10.43	132.37	1.15	0.50	4.18	77.20	10.22
L.S.D. at 5%		6.81	n.s.	0.02	n.s.	2.69	n.s.	3.45	n.s.	0.02	n.s.	2.19	n.s.
	Peto 86	91.83	1.45	0.69	2.13	65.53	11.20	95.50	1.42	0.71	2.20	66.88	11.37
	UC 97-3	93.23	1.07	0.61	2.23	71.78	11.00	98.78	1.08	0.65	2.27	70.50	11.02
	Castle	102.08	1.50	0.56	3.85	73.21	13.53	103.52	1.54	0.59	3.99	71.47	13.32
	VF 145-B	118.93	1.06	0.36	4.33	74.78	9.77	119.27	1.07	0.39	4.40	73.98	9.42
	Flora	140.87	0.90	0.34	4.95	81.28	9.70	144.23	0.90	0.35	5.15	80.33	9.53
	Pakmor	191.63	0.76	0.28	7.07	86.08	7.80	193.52	0.79	0.31	6.95	83.62	7.42
L.S.D. at 5%		6.81	0.08	0.03	0.41	3.83	0.68	4.73	0.09	0.04	0.39	3.52	0.69

attributed to the higher night temperature prevailing during the fruit development phase at late planting compared with earlier ones.

The night temperature during the fruit development was 15.6°C (April) and 18.0°C (May) in the case of early planting and the late one, respectively (Table, 1). The higher prevailing temperature connected with late planting may enhance the import of assimilates by the fruit. In this regard, Yoshioka and Takahashi (1981) stated that the high night temperature (18°C) enhanced the import of assimilates by the fruit while at temperature lower than 12°C the export of assimilates from the leaves is greatly retarded. Obtained results are in general agreement with those reported by Hashem (1977) who indicated that the winter season gave the smallest fruit weight compared with the fruits of the fall and summer seasons.

Referring to juice percent, the same data indicate that it was increased with delaying planting date. The highest juice percent was connected with the late planting.

Concerning fruit shape index determined as length/diameter ratio, as well as number of locules and fruit firmness no significant differences were detected due to planting date (Table, 5).

As for flesh thickness, the highest values were connected with the medium planting data (Jan. 15th).

With regard to varietal differences, it is clear from data given in Table (5) that tomato cultivars were significantly differed in the studied physical fruit characters.

Data on average fruit weight showed that the studied varieties can be divided fairly, into the following four gropus: Peto 86 and UC 97-3 as small fruited (< 100 g), Castle Rock and V.F. 145-B as medium fruited (100-120 g), Flora Dade as large fruited (140-150 g) and Pakmor as extra large fruited variety (> 190 g). Such variations among the studied cultivars may be due to their genetical properties which are considered the main factors in this respect.

These results are in general agreement with those of Attia and Moursi (1965), Bernal et al. (1967), Gheta et al. (1970), El-Shall and Khalaf-Allah (1973), Hashem (1977), Hassanen (1983) and Khalifa et al. (1988). They indicated that the different tomato varieties show great variations in fruit size. In this connection, Esquinas-Alcazar (1981) divided tomato fruits produced from different varieties according to their size, determined by diameter, into the following five groups: Very small (< 3 cm), small (3-5 cm), medium (5-8 cm), large (8-10 cm) and very large (> 10 cm).

It is worthy to mention herein that in spite of Peto 86 gave the lowest average fruit weight, it was the best variety regarding total fruit yield (Table, 4). Similar results were obtained by El-Beheidi et al. (1988a) concerning cv. Marmand. Moreover, small fruited varieties could cover a certain demand in some European countries. Peto 86 and UC 97-3 would be the best varieties in this respect.

It is also obvious from the data in Table (5) that there are clear varietal differences with regard to fruit shape index. As fruit shape index is determined by length/diameter ratio, the studied varieties can be divided into the following four groups: Peto 86 and Castle Rock were of oblong shape fruits (S.I. > 1.40), UC 97-3 and VF 145-B were of about round shape fruits (S.I. 106-1.08). Flora Dade was of slightly flattened shape fruits (S.I. 0.9) and Pakmor was of flattened shape fruits (S.I. 0.7). Such results are in accordance with those of Esquinas-Alcazar (1981), who classified tomato fruits produced from different varieties according to their fruit shape into the following groups: Flattened, slightly flattened, round, high round, heart-shaped, lengthened cylindrical, pear-shaped and plum-shaped. Furthermore, Khalifa et al (1988) found that the shape of tomato fruits produced from different varieties were between deep oblate and pear shaped, however, the majority were of global shape fruits.

Fruits of different varieties were of different flesh thickness, ranged from 3 mm for Pakmor to 7 mm for Peto 86. Similar results were obtained by Hashem (1977) and Hassanen (1983). This is due to that flesh thickness may be mainly controlled by genetical factors.

Concerning juice %, fruits of Pakmor and Flora Dade are juicy, where percent is more than 80%, whereas those of Peto 86 are the most fleshy ones which produced the least juice percent (66%) followed by UC 97-3, Castle Rock and VF 145-B where juice percent ranged from 70 to 73% and were not significantly differed. This was quite clear in both seasons of this work. Hashem (1977) and Hassanen (1983) came to similar conclusion.

Data at Table (5) also show that fruits of different varieties contain different number of locules ranged from 2 for Peto 86 and UC 97-3 varieties to 7 locules for cv. Pakmor. This variation is variety dependent. Shafshak and Winsor (1964) indicated that fruits of Moneymaker variety were mainly bi-locular while those of Potentate were mainly tri-locular. Hashem (1977) found that number of locules per fruit ranged from 2 for the cv. Red Cherry Small to 9 for Heinze 1370. Khalifa et al (1988) stated that the genetic potential is present for determine the number of locules which varies greatly among the varieties. It is also clear that a positive correlation may be noticed between the fruit size and the number of the locules. In this respect Imanishi and Hiura (1977) and Maisonneuve and Philouze (1982a) mentioned that the final size of tomato fruit is closely correlated with the number of seeds and the number of locules.

The firmness readings in Table (5) show considerable variations among varieties. Fruits of Castle Rock are being the firmest and those of Pakmor being the softest. Fruit firmness values of both Peto 86 and UC 97-3 were significantly higher than those of both Flora Dade and VF 145-B. This was quite clear in both seasons of this work. Obtained results coincide with those of Hamson (1952), Shafshak and Winsor (1964), Kaminura et al (1974), Hashem (1977) and Radwan et al (1980) who found that there were highly significant differences among cultivars regarding fruit firmness. It is obvious to emphasize that Peto 86, UC 97-3 and Castle Rock varieties which showed the highest fruit firmness are having the highest flesh thickness and the lowest juice percentage. The same correlation were reported by Hassanen (1983) who found that varieties of thicker fruit flesh and less juice % are those of harder fruits.

It is worthy to mention here that after visual appearance, the most important factor in tomato quality is firmness. Most consumers prefer firm fruits which do not loose too much juice when sliced. Moreover, firmness affects susceptibility of tomatoes to physical damage and consequently their shipping ability.

Generally, it is obvious from data presented in Table (5) that the effect of variety on the studied physical fruit properties was more pronounced than the effect of planting date. This may be due to that such properties are primarily, genetically determined and consequently are variety dependant.

As for the interactive effect of both planting date and variety, no significant differences are detected for all the studied physical fruit properties. This may be due to that the large effect of variety tends to disappear the little effect of planting date. However, the results indicate that the highest average fruit weight, number of locules/fruit and juice percentage were obtained by Pakmor variety when transplanted on Feb. 1st. While the highest flesh thickness and fruit firmness were obtained by Peto 68, UC 97-3 and Castle Rock when transplanted on Jan. 15th.

B: Chemical fruit constituents:

Data presented in Table (6) show the chemical fruit constituents of some tomato varieties as affected by planting date. Such data reveal that all the studied chemical constituents, i.e., dry matter, vitamin C, acidity and total soluble solids contents were significantly increased with delaying the planting date in both growing seasons. In this regard the highest values for all previously mentioned chemical fruit parameters were

Table (6): Chemical fruit constituents of some tomato varieties as affected by planting date during both seasons of 1988 and 1989.

Season		1988				1989			
Planting date	Vars.	Dry matter (gm)	Vit. C mg/ 100 gm F.W.	Acidity mg/ 100 gm	T.S.S. %	Dry matter (gm)	Vit. C mg/ 100 gm F.W.	Acidity mg/1 100 gm	T.S.S. %
Jan. 1st	Peto 86	7.04	30.25	546.25	6.28	7.10	29.50	550.00	6.31
	UC 97-3	7.03	29.48	570.00	5.96	6.97	29.80	565.00	6.36
	Castle	6.31	27.98	556.25	4.83	6.40	28.40	560.00	4.95
	VF 145-B	5.80	26.88	460.00	5.13	5.70	27.85	427.50	5.40
	Flora Dade	5.30	24.88	363.75	5.18	5.10	25.98	372.50	5.33
	Pakmor	4.32	22.03	355.00	4.25	4.21	23.60	381.25	4.34
Jan. 15th	Peto 86	8.35	32.08	581.25	6.58	8.34	32.10	587.50	6.51
	UC 97-3	8.24	30.93	575.00	6.49	8.41	31.10	576.25	6.73
	Castle	7.71	29.05	575.00	5.48	7.42	29.45	591.25	5.58
	VF 145-B	7.00	28.05	505.00	5.61	7.14	28.35	535.00	5.66
	Flora Dade	6.36	26.95	380.00	5.59	6.39	27.00	402.50	5.84
	Pakmor	5.85	24.30	370.00	4.75	5.96	24.55	367.50	4.94
Feb. 1st	Peto 86	8.04	32.63	582.50	6.85	7.95	32.53	546.25	6.99
	UC 97-3	7.78	31.40	588.75	6.74	7.75	31.68	585.00	6.81
	Castle	7.35	29.85	586.25	5.79	7.22	30.15	585.00	5.81
	VF 145-B	6.68	28.13	505.00	6.01	6.67	28.70	505.00	5.95
	Flora Dade	6.03	27.05	390.00	6.00	6.00	27.40	437.50	6.30
	Pakmor	5.30	24.35	395.00	5.13	5.23	24.63	415.00	5.19
L.S.D. at 5%		n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	41.63	n.s.
Jan. 1st		5.97	26.91	475.21	5.27	5.91	27.52	476.04	5.45
Jan. 15th		7.25	28.56	497.71	5.75	7.27	28.76	510.00	5.88
Feb. 1st		6.86	28.90	507.92	6.09	6.80	29.18	512.29	6.18
L.S.D. at 5%		0.31	0.89	20.26	0.20	0.31	1.04	11.15	0.26
	Peto 86	7.81	31.65	570.00	6.57	7.79	31.38	561.25	6.60
	UC 97-3	7.69	30.60	577.92	6.40	7.71	30.86	575.42	6.63
	Castle	7.12	28.96	572.50	5.36	7.01	29.33	578.75	5.45
	VF 145-B	6.49	27.68	490.00	5.58	6.50	28.30	489.17	5.67
	Flora Dade	5.89	26.29	377.92	5.59	5.83	26.79	404.17	5.82
	Pakmor	5.16	23.56	373.33	4.71	5.13	24.26	387.92	4.82
L.S.D. at 5%		0.30	0.92	27.80	0.39	0.36	1.01	24.67	0.38

connected with the late planting on Feb. 1st. These results may be attributed to the more suitable prevailing temperature and daylength for the formation of photosynthetic products and their translocation to the fruits during fruit development in the case of February planting compared with earlier planting (Table, 1). Such photosynthetic products, which accumulate in the fruits, are the origin of the most chemical fruit constituents.

In this respect, Popovskaya (1952) showed that, the increase in concentration of sugars in tomato fruits led to the increase in ascorbic acid content.

Since the fruit acids result as intermediate products through respiration, which increase with temperature, the increasing in titratable acidity in fruits with delaying planting date could be expected. Moreover, the response of the chemical fruit constituents to climatic conditions (temperature and light) was previously reported by several investigators. Perterscu et al (1969) reported that dry matter, ascorbic acid and sugar fruit content are significantly responded to climatic conditions. In addition, Strekalova and Kormeichuck (1973) found a positive correlation between such chemical fruit constituents and temperature. Obtained results are in general agreement with those reported by Shafshak (1961), Hashem (1977), Indrea et al (1979) and El-Sheikh (1985), who found that planting time affected fruit chemical composition.

Regarding to the varietal differences, the same data clearly show that the tested chemical fruit constituents significantly differed according to variety. In this regard, fruits of Peto 86 showed the highest values followed by UC 97-3, Castle Rock, VF 145-B, Flora Dade and Pakmor variety. As averages of both seasons, fruit dry matter content ranged from 5.15% for Pakmor to 7.80% for Peto 86. In addition, corresponding values of vitamin C were 23.9 and 31.5 mg/100 g and that for titratable acidity were 380 and 566 mg/100 g and the values for T.S.S. were 4.76 and 6.59% for Pakmor and Peto 86, respectively. It is obvious from data given in Tables (5 and 6) that a negative correlation seemed to be existed between either dry matter or vitamin C content and fruit size. The smallest fruited variety (Peto 86) showed the highest dry matter and vitamin C content whereas the largest fruited variety (Pakmor) showed the lowest contents. These results are in general agreement with those reported by Mac-Gillivary and Clemente (1956) and Hashem (1977) concerning dry matter and Hasley (1963) concerning vitamin C. However, the negative correlation between the T.S.S. and vitamin C which was previously reported by Prodan (1975) and Khalifa et al (1988) was not in quite confirmity with the results of the present study.

The varietal differences in fruit chemical components have been mentioned by many investigators. Concerning fruit dry matter content, highly significant differences proved to be existed among the different varieties (Terada and Takahashi, 1957; Bernal et al, 1967; Vladimirov and Stamboliev, 1967; Stevens, 1972; Alpateve and Ermolova, 1973 and Hashem, 1977). The varietal differences were most pronounced in respect of dry matter content, followed by sugar and ascorbic acid contents and finaly by acidity (Strekalova and Kormeichuck, 1973).

Varietal differences in vitamin C content were reported by several investigators among them Scott and Walls, 1947; Gardner, 1953; Halsey, 1963 and Hashem, 1977 all working on tomato.

Differences in fruit acidity existed among different varieties were mentioned by Lococo (1945), Scott and Walls (1947), Bradley (1964), Lambeth et al (1965), Jardanov et al (1966), Simandel et al (1966), Terada and Takahashi (1957) and Stevens (1972).

As for T.S.S. %, which is the main factor in the fruit flavour, varietal differences were also reported by Lambeth et al (1965), Whiter and Alban (1967) and Hashem (1977).

It may be worthy to mention here that dry matter content is financially important, primarily in processed products. Vitamin C is also important for the nutritional value of tomato fruits. Sugars and acids are of special importance to sweetness, sourness and overall flavour intensity (Stevens et al, 1977). High sugars and relatively high acids are required for best flavour, whereas when both sugars and acids are low the result is a tasteless, insipid tomato. Therefore, fruit quality is also greatly dependent on such chemical fruit constituents.

Concerning the interactional effects of planting date and variety on chemical fruit constituents, insignificant differences were obtained in this respect. However, the results indicate that fruits of cultivars Peto 86 and UC 97-3 showed the highest dry matter content in the case of medium planting on Jan. 15th and the highest vitamin C and T.S.S. contents in the case of late planting on Feb. 1st. Regarding fruit acidity cvs of UC 97-3 and Castle Rock showed the highest values when transplanted on Feb. 1st.

Generally, from the foregoing discussion, it could be concluded that, among the recent varieties under evaluation, Peto 86, UC 97-3 and Castle Rock surpassed the standard variety VF 145-B and the other ones concerning early, marketable and total fruit yield as well as fruit quality expressed as preferable fruit size for exportation, flesh thickness, firmness and fruit contents of dry matter, vitamin C and T.S.S. Moreover late planting on Feb. 1st is recommended for the early summer plantation. At such planting date each of studied varieties produced its highest yield of fruits with best desired quality.

Storage studies:

4.2. Storage ability of some tomato cultivars as affected by length of storage period, storage conditions and planting date:

4.2.1. Decay:

Data presented in Table (7) show that the percentage of decayed fruits of different tomato varieties increased gradually with the prolongation of storage period either at normal (33°C) or cold room (10°C), whether the fruits were harvested from early planting (Jan. 15th) or the late one (Feb. 1st). However, such increments were not in the same pattern.

Generally, infection by pathogenic organisms and the biochemical changes occuring after harvest which lead to senescence were the main factors for the increase of fruit decay. The progressive increase in the percentage of decayed fruits with the advance of storage was reported by several investigators (Shafshak, 1961; Abou-Elhamed, 1981 and khalifa et al., 1988).

The tested varieties showed significant differences in their susceptability to decay as shown by the decay percent and the period at which the decay started. Decay percentages, after 32 days storage at normal room (as average of both seasons) ranged from 29.2% for Peto 86 cv. to 76.2% for Pakmor cv. In varieties Peto 86, UC 97-3 and

Table (7): Decay percentage as affected by, variety, planting date and storage period in both normal and cold rooms.

Items	1988 season												1989 season											
	Room storage, days					Cold storage, days							Room storage, days					Cold storage, days						
	*(8)	16	24	32	Mean	16	24	32	40	48	56	Mean	(8)	16	24	32	Mean	16	24	32	40	48	56	Mean
Varieties:																								
Peto 86	0.00	0.00	11.18	30.20	10.34	0.00	0.00	9.21	14.21	17.38	30.39	10.17	0.00	0.00	9.90	28.16	9.51	0.00	0.00	2.59	7.63	12.24	25.46	6.84
UC 97-3	0.00	0.00	18.49	33.79	13.07	0.00	0.00	9.00	16.21	20.22	33.60	11.29	0.00	0.00	13.24	33.78	11.75	0.00	0.00	6.30	12.35	15.29	31.34	9.33
Castle Rock	0.00	0.00	20.96	41.28	15.56	0.00	0.00	10.73	19.02	28.22	46.89	14.98	0.00	0.00	19.02	45.28	16.08	0.00	0.00	8.68	15.66	23.66	37.43	12.21
VF 145-B	0.00	8.25	29.65	59.69	24.40	0.00	6.87	16.47	28.16	35.99	63.30	21.54	0.00	7.71	25.12	58.17	22.75	0.00	5.15	11.74	22.73	37.94	53.42	18.71
Flora Dade	0.00	14.69	39.32	70.64	31.16	0.00	13.68	25.15	31.75	44.01	73.51	26.87	0.00	12.30	34.44	68.70	28.86	0.00	10.21	21.65	28.19	43.41	64.70	24.03
Pakmor	0.00	17.61	41.63	77.17	34.08	0.00	15.71	30.73	37.31	53.56	79.05	30.91	0.00	14.95	37.19	75.29	31.86	0.00	12.66	26.65	32.67	53.71	75.77	28.77
Average	0.00	6.74	26.87	52.13	--	0.00	6.04	16.88	24.44	33.23	54.46	--	0.00	5.83	23.15	51.56	--	0.00	4.67	12.93	19.87	31.04	48.02	
L.S.D. at 5% for																								
Varieties (V)					1.55				1.22						1.37						1.08			
Storage period (S)					1.27				1.22						1.12						1.08			
V x S					3.11				3.00						2.73						2.64			
Planting date:																								
Jan. 15th	0.00	8.03	29.09	55.05	23.04	0.00	8.57	18.63	27.19	38.88	56.38	20.71	0.00	7.25	24.74	55.11	21.78	0.00	5.92	14.87	21.89	32.50	51.26	18.06
Feb. 1st	0.00	5.46	24.64	49.20	19.83	0.00	4.88	15.14	21.70	29.80	52.54	17.73	0.00	4.40	21.55	48.01	18.49	0.00	3.42	10.99	17.85	29.58	44.77	15.23
L.S.D. at 5% for																								
Planting date (P)					0.90				0.71						0.79						0.62			
P x S					1.79				1.73						1.58						1.52			

* (number between brackets at normal room is also involved at cold storage).

Castle Rock decay started 24 days after storage at room temperature whereas for the standar variety VF 145-B, Flora Dade and Pakmor decay started 16 days after storage. This was quite clear in both seasons. It is also clear that fruits of cvs Pakmor and Flora Dade were more susceptable to decay as shown by the higher decay percent compared with the standard variety.

Varieties Peto 86, UC 97-3 and Castle Roch gave relatively, small, firm and fleshy fruits of less moisture content, whereas VF 145-B, Flora Dade and Pakmor gave large softy and juicy fruits of more moisture contents (Tables, 5, 6 and 8). This many help to explain the better storage ability of the first three varieties compared with the latter ones.

Varietal differences in storage ability were found by many investigators among them (Abou-Aziz et al, 1975; Hassanen, 1983 and Khalifa et al, 1988). In addition, Abou-Aziz et al (1975) found that small fruited varieties had longer shelf life than normal sized ones.

Regarding effect of storage conditions on fruit decay percent, it is obvious from the same data that decay at cold room (10°C) was retarded and showed much lower values than at room temperature (33°C). After 32 days storage at cold room, decay percentages reached 5.9 and 28.7% for the varieties Peto 86 and Pakmor respectively, whereas they were 29.20 and 76.20%, after the same period, at normal room for the same varieties respectively.

The increase in either the metabolic activity of fruits and or the spread of disease with increasing storage temperature may be the main factor inducing higher decay percent at normal rooms. These results are in general agreements with those obtained by Ashrae (1962), Ragheb et al (1971), Abou-Aziz et al (1975) and Abd-El-Kader et al. (1978).

As for the effect of planting data on decay percent, fruits harvested from the late planting (Feb. 1st) showed significant lower values than those harvested from the early planting (Jan. 15th), either at normal or cold room. This was quite clear in both seasons. The highest chemical fruit constituents, especially dry matter content connected with the late planting on Feb 1st (Tables, 6 and 8), due to the more suitable prevailing temperature and day length for the formation of photosynthetic products and their translocation to the fruits, might account much for the improvement of storage ability of fruits harvested from the late planting. In addition, it is well known that most pathological disorders found during storage originate in the field before harvested due to unadequate climatic conditions. Obtained results are in harmony with those of Kabeel (1959) and Shafshak (1961) who reported that differences in planting date led to differences in decay % during storage.

The interaction effect of storage periods and either varieties or planting date was significant either at normal or cold room in both seasons of this work.

4.2.2. Weight loss:

The results reported in Table (8) indicate a progressive increase in the percentage of loss in fruit weight of different tomato varieties during storage either at normal or cold room and whether the fruits were harvested from early or late planting. This might be due to the loss in moisture through transpiration and loss in dry matter content through respiration processes.

The tested varieties showed significant differences in their fruit weight loss. Fruits of cvs Peto 86, UC 97-3 and Castle Rock exhibited the least loss while fruits of both Flora Dade and Pakmor showed the highest weight loss, whereas those of the standard variety VF 145-B were in between. Varietal differences in fruit weight loss were reported by many investigators (Favorov et al, 1974; Kasmire, and Abd El-Kader, 1978 and Hassanen, 1983).

The percentage of loss in fruit weight increased at a more rapid rate in normal rooms than in cold ones, owing to the higher temperature and lower air humidity in normal room. The aforementioned results are in harmony with those obtained by Ashrae (1962), Regheb et al (1971), Abou-Aziz et al (1975) and Abd El-Kader et al (1978) who reported

Table (8): Loss in fruit weight percentage as affected by variety, planting date and storage period in both normal and cold rooms.

Items	1988 season												1989 season											
	Room storage, days					Cold storage, days							Room storage, days					Cold storage, days						
	(8)	16	24	32	Mean	16	24	32	40	48	56	Mean	(8)	16	24	32	Mean	16	24	32	40	48	56	Mean
Varieties:																								
Peto 86	2.00	6.70	11.41	17.10	9.30	3.21	4.77	6.56	9.12	14.22	16.27	8.02	1.65	5.63	9.74	16.52	8.38	2.32	3.86	5.92	8.35	11.73	14.88	6.17
UC 97-3	2.80	8.19	14.36	20.18	11.38	4.49	6.46	8.48	11.94	16.03	18.35	8.58	2.00	7.32	12.03	19.03	10.09	3.45	5.40	7.57	7.87	13.17	17.30	7.20
Castle Rock	4.20	10.58	16.51	22.67	13.49	5.21	7.88	10.38	13.83	18.87	19.96	11.47	3.45	9.58	14.78	21.27	12.27	4.37	7.40	9.24	12.61	16.30	18.84	9.16
VF 145-B	5.00	13.22	19.35	24.90	15.62	6.96	10.79	15.62	17.41	21.38	23.50	15.09	4.30	11.60	17.16	23.73	14.20	5.66	9.18	13.63	15.28	18.22	21.78	11.23
Flora Dade	5.60	17.19	23.42	26.94	18.29	9.96	14.11	17.07	19.66	24.61	26.52	16.79	4.70	16.17	20.56	27.17	17.15	7.92	13.24	15.36	17.63	21.46	25.26	13.53
Pakmor	6.75	19.81	24.32	29.10	19.99	11.27	15.07	18.39	21.00	25.91	28.05	18.06	5.50	17.78	22.71	29.56	18.89	10.05	13.59	16.82	19.55	23.79	26.66	14.94
Average	4.39	12.61	18.23	23.48	--	6.85	9.84	12.75	15.49	20.25	22.94	--	3.60	11.35	16.16	22.88	--	5.63	8.78	11.42	13.55	17.44	20.79	--
L.S.D. at	5% for																							
	Varieties (V)				1.21					0.77					1.09						0.81			
	Storage period (S)				0.98					0.83					0.89						0.88			
	V x S				2.41					2.03					2.17						2.15			
Planting date:																								
Jan. 15th	5.00	14.52	19.24	25.28	16.01	8.09	11.41	14.18	16.47	22.17	23.55	14.41	4.38	13.12	18.75	24.76	15.25	7.14	10.77	13.09	14.76	19.87	22.67	11.86
Feb. 1st	3.78	10.70	17.22	21.68	13.34	5.61	8.27	11.32	14.51	18.33	22.33	12.02	2.82	9.57	13.57	20.99	11.74	4.11	6.78	9.75	12.33	15.01	18.90	8.88
L.S.D. at	5% for																							
	Planting date (p)				0.70					1.17					0.63						0.47			
	P x S				1.39					n.s.					1.25						1.24			

* (number between brackets at normal room is also involved at cold storage).

that fruit weight loss was directly proportional to the storage temperature.

Regarding effect of planting date on fruit weight loss, the fruits of late planting showed significant lower values than those of early planting either at normal or cold room. This was quite clear in both seasons. The effect of planting date on fruit weight loss during storage was previously reported by Kabeel (1959) and Shafshak (1961).

4.2.3. <u>Fruit firmness</u>:

Data reported in Table (9) show rapid softening of the fruits during storage for all studied varieties either at normal or cold room and whether they were harvested from early or late planting. Softening in fruits during storage was attributed to the change of protopectin to soluble pectin as reported by Mohamed et al (1966). These results are in general agreement with those of Hall (1960), Shafshak and Winsor (1964) and Hassanen (1983).

It is also clear from data presented in Table (9) that the reductions in fruit firmness during storage were not the same for the tested varieties or for the storage conditions. The amount of reduction in fruit firmness after 24 days at normal room (as average of both seasons) was 41.6 and 62.1% for the cvs. Peto 86 and Pakmor, respectively while at cold storage after the same period it was

Table (9): Fruit firmness (lb/in^2) as affected by variety, planting date and storage period in both cold and normal rooms.

Items	1988 season												1989 season											
	Room storage, days					Cold storage, days							Room storage, days					Cold storage, days						
	(0)	8	16	24	Mean	8	16	24	32	40	48	Mean	(0)	8	16	24	Mean	8	16	24	32	40	48	Mean
Varieties:																								
Peto 86	12.00	9.75	8.20	7.05	9.25	11.68	10.30	9.45	8.60	8.05	7.35	9.63	11.55	9.50	7.90	6.70	8.91	11.20	9.80	9.00	8.25	7.85	7.14	9.25
UC 97-3	10.75	9.05	7.60	6.55	8.49	10.10	9.40	8.65	8.15	7.65	6.95	8.80	10.25	8.50	7.28	6.30	8.08	9.75	8.90	8.35	7.70	7.25	6.75	8.42
Castle Rock	13.75	8.85	6.60	5.35	8.64	11.15	9.20	8.10	7.40	6.45	6.05	8.87	13.35	8.60	6.35	5.10	8.35	10.85	8.90	7.85	6.80	6.05	5.45	8.46
VF 145-B	9.45	7.25	5.10	4.10	6.48	8.45	7.55	6.75	5.60	4.90	4.55	6.75	8.90	6.90	4.75	3.60	6.04	8.10	7.25	6.30	5.15	4.50	4.15	6.34
Flora Dade	9.20	6.25	4.65	3.45	5.89	8.25	7.00	5.85	5.00	4.65	3.95	6.27	8.65	6.00	4.25	3.15	5.51	7.95	6.50	5.55	4.70	4.10	3.55	5.86
Pakmor	8.10	5.95	4.40	3.15	5.40	7.40	6.55	5.55	4.70	4.10	3.50	5.70	7.70	5.65	3.96	2.85	5.04	7.00	6.15	5.15	4.30	3.70	3.25	5.32
Average	10.54	7.85	6.09	4.94	--	9.50	8.33	7.39	6.58	5.97	5.39	--	10.07	7.53	5.75	4.62	--	9.14	7.92	7.03	6.15	5.58	5.05	--
L.S.D. at 5% for,																								
Varieties (V)	0.30					0.19							0.25					0.17						
Storage period (S)	0.25					0.19							0.21					0.17						
V x S	0.61					0.48							0.51					0.41						
Planting date:																								
Jan. 15th	10.43	8.43	6.82	5.70	8.10	10.32	9.08	8.12	7.42	6.77	6.17	8.33	10.93	8.15	6.52	5.33	7.73	9.98	8.63	7.78	6.95	6.45	5.95	8.09
Feb. 1st	10.65	7.27	5.37	4.18	6.62	8.69	7.58	6.67	5.73	5.17	4.62	7.02	9.20	6.90	4.98	3.90	6.29	8.30	7.20	6.28	5.35	4.70	4.15	6.46
L.S.D. at 5% for																								
Planting date (P)	n.s.					n.s.							n.s.					n.s.						
P x S	n.s.					n.s.							n.s.					n.s.						

* (number between brackets at normal room is also involved at cold storage).

21.7 and 32.2% for the same cultivars respectively. From the previous values, it could be concluded that, the reduction in fruit firmness was not the same for the tested varieties but in general it was higher at room temperature compared with cold storage. The varietal differences are mainly due to genetical differences and as reported by Hall (1964) and Shafshak and Winsor (1964). The higher depression in fruit firmness during storage at normal room may be due to that the high temperature increase the biological processes leading to fruit softness. Obtained results are in harmony with those of Tucker (1975), Abd-El-Kader and Morris (1976) and Abd El-Hady (1977).

Regarding effect of planting date on fruit firmness during storage, the same data show that no significant differences were detected in this respect. Such a result may be due to that the differences in prevailing temperatures between the two studied planting dates were not high enough to cause signficant differences in fruit firmness at the time of harvest, i.e., at the start of the trial. Similar results was previously obtained in the field experiments.

4.2.4. Chemical fruit constituents:

Fruit dry matter content:

Data presented in Table (10) indicated that dry matter content of tomato fruits decreased gradually up to the end of storage period at normal room, whereas at cold room

Table (10): Dry matter percentage as affected by variety, planting date and storage period in both normal and cold rooms.

1988 season

Items	Room storage, days					Cold storage, days						
	(0)	8	16	24	Mean	8	16	24	32	40	48	Mean
Varieties:												
Peto 86	7.60	7.45	6.55	5.55	6.79	7.80	8.00	7.65	7.30	6.90	6.50	7.39
UC 97-3	7.45	7.25	6.25	5.20	6.54	7.65	7.85	7.45	7.00	6.70	6.25	7.19
Castle Rock	6.85	6.50	5.40	4.25	5.75	7.15	7.30	6.90	6.40	5.90	5.40	6.56
VF 145-B	6.10	5.65	4.70	3.70	5.04	6.35	6.55	6.10	5.70	5.35	4.95	5.87
Flora Dade	5.75	5.30	4.35	3.40	4.70	6.00	6.30	5.80	5.30	4.95	4.45	5.51
Pakmor	5.05	4.45	3.75	3.00	4.06	5.20	5.40	5.00	4.65	4.35	3.90	4.79
Average	6.47	6.10	5.17	4.18	--	6.69	6.90	6.48	6.06	5.69	5.24	--
L.S.D. at 5% for, Varieties (V)					0.45				0.30			
Storage period (S)					0.37				0.30			
V x S					n.s.				n.s.			
Planting date:												
Jan. 15th	6.15	5.82	4.98	3.98	5.23	6.38	6.60	6.20	5.87	5.52	5.02	5.96
Feb. 1st	6.78	6.38	5.35	4.38	5.73	7.00	7.20	6.77	6.25	5.87	5.47	6.48
L.S.D. at 5% for, Planting date (P)					0.26				0.17			
P x S					n.s.				n.s.			

1989 season

Items	Room storage, days					Cold storage, days						
	(0)	8	16	24	Mean	8	16	24	32	40	48	Mean
Varieties:												
Peto 86	7.85	7.65	6.95	5.85	7.08	8.10	8.30	8.00	7.70	7.30	6.80	7.72
UC 97-3	7.60	7.30	6.40	5.35	6.66	7.90	8.20	7.75	7.25	7.00	6.50	7.45
Castle Rock	7.20	6.80	5.80	4.55	6.09	7.40	7.50	7.15	6.75	6.25	5.80	6.87
VF 145-B	6.40	5.85	4.95	3.90	5.28	6.55	6.70	6.55	6.15	5.85	5.25	6.21
Flora Dade	6.05	5.45	4.50	3.50	4.88	6.40	6.45	6.05	5.60	5.15	4.55	5.75
Pakmor	5.25	4.80	4.05	3.15	4.31	5.50	5.70	5.40	5.10	4.75	4.25	5.14
Average	6.73	6.31	5.44	4.38	--	6.98	7.14	6.82	6.43	6.05	5.53	--
L.S.D. at 5% for, Varieties (V)					0.35				0.29			
Storage period (S)					0.28				0.29			
V x S					n.s.				n.s.			
Planting date:												
Jan. 15th	6.45	6.10	5.28	4.20	5.51	6.70	6.85	6.60	6.25	5.90	5.30	6.30
Feb. 1st	7.00	6.52	5.60	4.57	5.92	7.25	7.43	7.03	6.60	6.20	5.75	6.75
L.S.D. at 5% for, Planting date (P)					0.20				0.17			
P x S					n.s.				n.s.			

* (number between brackets at normal room is also involved at cold storage).

it showed little increase up to 16 days after storage but subsequently it decreased up to the end of storage period. Similar results were obtained by Thompson et al (1962), Sayre et al (1963) and Hall (1967). In addition, Nizhardze et al (1975) indicated that at the end of storage period of 21 days, the dry matter content of tomato fruits dropped from 5.93 to 5.17%.

However, the reduction in fruit dry matter content during storage were not the same for the different tested varieties or the storage conditions. At the end of storage period of 24 days at normal room, dry matter content (as average of both seasons) dropped from 7.73 to 5.70% (i.e. 28%) for cv. Peto 86 and from 5.15 to 3.07% (i.e. 40%) for cv. Pakmor, while, no reduction occurred in dry matter content after the same period at cold room for the same varieties; whereby at the end of storage period of 48 days, it dropped from 7.73 to 6.65% (i.e. 14%) for Peto 86 and from 5.15 to 4.07% (i.e. 21%) for Pakmor. From the previous values, it could be concluded that the reductions in fruit dry matter content were not the same for the tested varieties but in general they were higher at room temperature than at cold storage. Varietal differences in dry matter content were reported by Bernal et al (1967) and Strekalova and Kormeichuk (1973).

The higher reduction in fruit dry matter content during storage at normal room than at cold storage could be due to the higher respiration rate at higher storage temperature which leads to decrease in sugar content and consequantly reduce the fruit dry matter content. These results agree with those of Strekalova and Kormeichuck (1973) and Hassanen (1983).

Concerning the effect of planting date on fruit dry matter content during storage, the fruits harvested from the late planting showed little higher values than those harvested from the early planting either at the start of the trail or at the end of the storage period. Such a result may be due to the higher initial fruit dry matter content connected with the late planting (Table, 6). Obtained results are in harmony with those of Saimbhl (1971) who indicated that fruits of different varieties harvested from the spring crop contained, higher total solids as compared with those harvested in autumn.

The interaction effect of storage period and either varieties or planting data was not significant either at normal or cold room in both seasons of this work.

Fruit total soluble solids:

Data presented in Table (11) show that fruit T.S.S. content of all studied varieties increased during the early period of storage and reached a peack after 8 days at normal room and 16 days at cold one. After then, it decreased

Table (11): Total soluble solids (T.S.S.) percentage as affected by variety, planting date and storage period in both normal and cold rooms.

1988 season

Items	Room storage, days (0)	8	16	24	Mean	Cold storage, days 8	16	24	32	40	48	Mean
Varieties:												
Peto 86	5.65	6.05	5.55	5.05	5.58	6.05	6.30	6.05	5.85	5.40	5.25	5.80
UC 97-3	5.45	5.75	5.25	4.80	5.31	5.70	5.95	5.60	5.45	5.15	4.95	5.47
Castle Rock	5.20	5.60	4.80	4.35	4.99	5.35	5.70	5.45	5.10	4.56	4.50	5.12
VF 145-B	4.45	4.75	4.25	3.45	4.23	4.70	5.05	4.75	4.40	4.00	3.75	4.44
Flora Dade	4.25	4.65	4.00	3.00	3.98	4.50	4.70	4.35	4.00	3.60	3.25	4.10
Pakmor	4.05	4.25	3.70	2.75	3.69	4.20	4.35	4.05	3.75	3.25	2.90	3.79
Average	4.84	5.18	4.59	3.90	--	5.08	5.34	5.04	4.76	4.33	4.10	--
L.S.D. at 5% for,												
Varieties (V)					0.25							0.21
Storage period (P)					0.20							0.21
V x S					n.s.							n.s.
Planting date:												
Jan. 15th	4.62	4.92	4.18	3.62	4.33	4.80	5.03	4.68	4.42	4.05	3.82	4.47
Feb. 1st	5.07	5.43	5.00	4.18	4.92	5.37	5.65	5.40	5.10	4.60	4.38	5.08
L.S.D. at 5% for,												
Planting date (P)					0.14							0.12
P x S					n.s.							n.s.

1989 season

Items	Room storage, days (0)	8	16	24	Mean	Cold storage, days 8	16	24	32	40	48	Mean
Varieties:												
Peto 86	5.80	6.20	5.85	5.40	5.81	6.23	6.35	6.20	6.05	5.70	5.60	5.99
UC 97-3	5.65	6.00	5.65	5.25	5.64	5.95	6.20	6.05	5.85	5.43	5.40	5.79
Castle Rock	5.30	5.70	5.35	4.65	5.25	5.70	5.90	5.75	5.60	5.15	4.80	5.46
VF 145-B	4.75	5.05	4.35	3.80	4.49	5.05	5.25	4.90	4.50	4.25	3.95	4.66
Flora Dade	4.45	4.75	3.90	3.25	4.09	4.80	4.85	4.45	4.15	3.70	3.50	4.27
Pakmor	4.25	4.50	3.75	3.00	3.88	4.50	4.60	4.15	3.95	3.55	3.25	4.04
Average	5.03	5.37	4.81	4.23	--	5.37	5.53	5.25	5.02	4.63	4.42	--
L.S.D. at 5% for,												
Varieties (V)					0.25							0.18
Storage period (P)					0.20							0.18
V x S					n.s.							n.s.
Planting date:												
Jan. 15th	4.82	5.12	4.57	4.02	4.63	5.20	5.27	4.95	4.63	4.40	4.17	4.78
Feb. 1st	5.25	5.62	5.05	4.43	5.09	5.54	5.78	5.55	5.40	4.86	4.67	5.29
L.S.D. at 5% for,												
Planting date (P)					0.14							0.11
P x S					n.s.							n.s.

* (number between brackets at normal room is also involved at cold storage).

gradually up to the end of storage period. The increase in T.S.S. during the early storage period may be due to the higher loss in moisture through transiperation which leads to concentration of solids in the juice of the fruits. In addition, there are increases in T.S.S. during progression in fruit ripening stage while turns from mature green to red stage. Meanwhile; the decrease in T.S.S. during the end of storage period may be due to the higher respiration rate which leads to decrease the T.S.S. Obtained results agree with those of Kabeel (1959), Winsor et al (1962) and Abd El-Ghaffar (1973), who found that T.S.S. increased initially then decreased at the end of storage.

The same data show also that there were significant differences in T.S.S. content among the different used cultivars during the whole periods of storage. The highest values occurred in fruits of cvs. Peto 86 followed by UC 97-3 and Castle Rock, while the lowest values occurred in those of both Pakmor and Flora Dade. Meanwhile, fruits of the standard cultivar VF 145-B lie in between in this respect. Varietal differences in fruit T.S.S. were reported by Lambeth et al (1965), Whiter and Alban (1967) and Hashem (1977). In addition, Saimbhl (1971) showed that changes in T.S.S. during ripenning varied in different varieties.

The percentage of T.S.S. decreased at a more rapid rate, at the end of storage period at normal room than at cold storage. This could be due to the higher respiration rate at the higher storage temperature which leads to decrease in T.S.S. Similar results were obtained by Hall (1965) and Abd El-Kader and Morris (1978).

Regarding effect of planting date on fruit T.S.S. changes during storage, the fruits harvested from the late planting showed higher values than those harvested from the early planting either at the start of the trail or at any storage period. Such a result may be due to the higher initial T.S.S. connected with the late planting due to the more favourable climatic conditions during fruit development (Table, 6).

The interaction effect of storage periods and either varieties or planting date was not significant either at normal or cold room in both seasons.

Fruit total sugars content:

The results presented in Table (12) indicate that total sugars content showed little changes during the early period of storage up to 8 days at normal room and 24 days at cold room, but subsequently it decreased up to the end of storage period. These results are in harmony with those obtained by Winsor et al (1962), Nizharadze et al (1975) and Hassanen (1983) who found significant decrease in sugar content of tomato fruits stored at room temperature.

Table (12): Total sugars percentage as affected by variety, planting date and storage period in both normal and cold rooms.

Items	1988 season												1989 season											
	Room storage, days					Cold storage, days							Room storage, days					Cold storage, days						
	(0)	8	16	24	Mean	8	16	24	32	40	48	Mean	(0)	8	16	24	Mean	8	16	24	32	40	48	Mean
Varieties:																								
Peto 86	3.60	3.55	3.15	2.85	3.29	3.70	3.80	3.85	3.50	3.35	3.15	3.56	3.70	3.70	3.48	3.05	3.48	3.80	4.05	3.85	3.75	3.60	3.40	3.74
UC 97-3	3.20	3.25	2.75	2.40	2.90	3.35	3.50	3.50	3.30	3.10	2.90	3.34	3.35	3.50	3.00	2.60	3.11	3.60	3.80	3.70	3.50	3.25	3.00	3.46
Castle Rock	3.05	3.00	2.35	2.05	2.61	3.10	3.25	3.10	2.85	2.65	2.45	2.92	3.20	3.20	2.70	2.30	2.85	3.50	3.55	3.30	3.10	2.80	2.65	3.16
VF 145-B	2.45	2.55	2.25	1.75	2.25	2.60	2.95	2.75	2.55	2.30	2.05	2.52	2.55	2.75	2.45	2.00	2.44	2.80	3.05	2.85	2.80	2.45	2.25	2.68
Flora Dade	2.60	2.70	2.15	1.55	2.25	2.80	3.00	2.60	2.40	2.10	1.85	2.48	2.70	2.80	2.43	1.75	2.42	3.05	3.19	2.75	2.50	2.25	2.05	2.64
Pakmor	2.35	2.25	1.90	1.50	2.00	2.55	2.75	2.45	2.20	2.00	1.75	2.29	2.30	2.50	2.10	1.65	2.14	2.70	2.85	2.65	2.35	2.15	2.00	2.43
Average	2.88	2.88	2.43	2.02	--	3.02	3.21	3.04	2.80	2.58	2.36	--	2.97	3.08	2.69	2.23	--	3.24	3.41	3.18	3.00	2.75	2.56	--
L.S.D. at 5% for, Varieties (V)					0.16				0.18						0.16						0.13			
Storage period (S)					0.13				0.18						0.13						0.13			
V x S					n.s.				n.s.						n.s.						n.s.			
Planting date:																								
Jan. 15th	2.72	2.58	2.22	1.93	2.36	2.83	3.08	2.87	2.60	2.42	2.20	2.67	2.83	2.78	2.44	2.10	2.54	3.10	3.28	3.03	2.82	2.55	2.37	2.86
Feb. 1st	3.03	3.18	2.63	2.10	2.74	3.20	3.33	3.22	2.98	2.75	2.58	3.01	3.10	3.37	2.94	2.35	2.94	3.38	3.55	3.33	3.18	2.95	2.75	3.18
L.S.D. at 5% for, Planting date (P)					0.09				0.10						0.10						0.08			
P x S					0.18				n.s.						n.s.						n.s.			

* (number between brackets at normal room is also involved at cold storage).

However such reductions were not the same for the tested six varieties. At the end of storage period of 24 days at normal room, fruit total sugars content (as average of both seasons) dropped from 3.65 to 2.95% (i.e. 19.2%) for cv. Peto 86 and from 2.33 to 1.58% (i.e. 32.2%) for cv. Pakmor.

Regarding effect of storage conditions in this respect, it is obvious that reduction in sugars at normal room was much higher compared with that occurred at cold room. Moreover, the reduction in total sugars content was retarded at cold room and became obvious only at the later periods of cold storage. These results are in general agreement with those obtained by Chinnaswami (1967) and Abd El-Kader and Morris (1978) who reported that tomato fruits suffer losses in storage and the loss was directly proportional to storage temperature.

Regarding effect of planting date, it is clear that fruits harvested from the late planting showed higher total sugars content than those harvested from the early planting either at the start of the trail or at any storage period. This was quite clear in both seasons.

All the interaction effects were not significant except that of planting date and storage periods at normal room in the first season only.

Fruit total acidity:

Data presented in Table (13) show that titratable acidity increased in the early period of storage and reached its peak after 8 days at normal room and 16 days at cold storage, then it decreased gradually up to the end of storage period. The increase in titratable acidity during the early period was probably associated with ripening of the fruits until they reach red stage of ripening. The decrease in total acidity during the later storage periods may be due to superiority of utilization of organic acids over their synthesis. These results are in harmony with those obtained by Abd-El-Gaffar (1973) and Nizharadze et al. (1975), who reported that, at ripening progress, the acidity increased while it decreased with advance of storage.

Concerning the varietal differences, maximum values were found in fruits of UC 97-3 after 8 and 16 days at normal and cold rooms respectively, followed by Castle Rock, Peto 86, VF 145-B, Pakmor and finally Flora Dade. These results are in accordance with those of Saimbhl (1971), who indicated that change in acidity during ripening varied in different varieties. In addition, Hassanen (1983) stated that significant differences in fruit total acidity existed among four tested tomato varieties during storage.

Regarding the effect of storage conditions, it is obvious that the rate of changes in total acidity was much

Table (13): Titratable acidity (mg/100 g f.w.) as affected by variety, planting date and storage period in both normal and cold rooms.

Items	1988 season												1989 season											
	Room storage, days					Cold storage, days							Room storage, days					Cold storage, days						
	(0)	8	16	24	Mean	8	16	24	32	40	48	Mean	(0)	8	16	24	Mean	8	16	24	32	40	48	Mean
Varieties:																								
Peto 86	605	633	505	490	558	630	650	603	570	560	553	596	623	655	555	528	590	655	680	628	593	575	570	618
UC 97-3	638	683	593	543	614	668	685	668	650	638	620	653	653	690	625	578	636	693	710	678	658	658	640	670
Castle Rock	625	673	573	538	602	643	675	643	620	625	600	633	640	675	605	560	620	665	690	670	640	643	620	653
VF 145-B	595	618	493	480	546	618	635	588	555	545	540	582	615	638	538	510	575	638	655	618	573	600	573	610
Flora Dade	550	590	450	413	500	568	588	520	500	500	485	530	565	595	485	455	525	583	605	568	538	540	528	561
Pakmor	570	608	468	428	518	590	613	558	525	535	510	557	588	625	500	468	545	618	633	585	555	553	540	581
Average	597	634	513	482	--	619	641	596	570	567	551	--	614	646	551	516	--	642	662	624	593	595	578	--
L.S.D. at 5% for,																								
Varieties (V)	17					12							12					12						
Storage period (S)	14					12							10					12						
V x S	n.s.					n.s.							24					n.s.						
Planting date:																								
Jan. 15th	581	623	451	452	527	602	622	555	532	573	579	578	602	636	484	481	551	627	647	585	551	600	610	603
Feb. 1st	613	645	576	512	587	637	660	638	608	561	523	605	626	657	618	552	613	657	678	663	634	589	547	628
L.S.D. at 5% for,																								
Planting date (P)	10					7							7					7						
P x S	19					17							14					17						

* (number between brackets at normal room is also involved at cold storage).

higher at room temperature than at cold storage. It is noticed that at the end of storage period of 24 days under normal room condition, the reduction in titratable acidity reached 17.6% whereas, very little changes could be detected at the same period in cold room, but began to decrease slightly with the advance of storage. These results agree with those of Hall (1967). In addition, the slight decrease in acidity, at the later period of storage, under cold room agree with those of Abd-El-Kader and Morris (1978), however, the higher reductions in fruit acidity at normal room in this study disagree with their results. The high reduction in fruit acidity at normal room was due to the higher temperature which might accelerate the rate of organic acid utilization.

Regarding effect of planting date in this respect, it is clear that fruits harvested from the late planting showed higher total acidity than those harvested from the early planting either at the start of the trail or at storage period up to 24 days at normal room and 32 days at cold storage. The higher acidity observed in fruits of early planting at 40 and 48 days after storage may be due to fermentation.

The interaction effect of varieties and storage periods was significant only in the second season, whereas the interaction effect of planting date and storage periods was significant in both seasons.

Fruit vitamin C content:

Data presented in Table (14) show an increase in fruit vitamin C content at the beginning of storage period up to 8 days at normal room and 16 days at cold room followed by a decrease up to the end of storage period.

The increase in vitamin C during the early period was probably associated with ripening of the fruits until they reach red stage of ripening. Whereas the decrease in vitamin C during the later storage periods might be a result of the greater amount of ascorbic acid used in respiration in comparison with its synthesis. These results are in harmony with those obtained by Shafshak (1961), Aboud (1974), Markakis et al (1975) and Hassanen (1983). They found that ascorbic acid increased slightly in the early period of storage and then decreased.

Concerning the varietal differences, the same data also show significant differences among the six varieties tested during storage. Compared with fruits of the standard cultivar VF 145-B, fruits of cv. Peto 86 significantly kept higher concentrations of vitamin C throughout the storage periods, followed by cvs. UC 97-3 and Castle Rock. Meanwhile, fruits of both Pakmor and Flora Dade kept lower values in this respect. These results agree with those obtained by several investigators among them Hussein et al (1967), Matthews et al (1975) and Hassanen (1983).

Table (14): Vitamin C (mg/100 g f.w.) as affected by variety, planting date and storage period in both normal and cold rooms.

1988 season

Items	Room storage, days					Cold storage, days						
	(0)	8	16	24	Mean	8	16	24	32	40	48	Mean
<u>Varieties</u>:												
Peto 86	31.25	34.40	23.90	17.95	26.88	36.15	35.45	31.90	27.20	26.20	21.90	30.01
UC 97-3	30.00	33.11	22.15	16.05	25.33	34.90	34.05	30.05	26.50	22.35	20.20	28.29
Castle Rock	28.20	29.20	17.85	12.85	22.03	29.88	29.55	27.00	23.20	19.95	17.85	24.09
VF 145-B	26.20	27.60	16.40	11.00	20.30	28.29	27.55	24.80	21.05	18.65	14.65	23.03
Flora Dade	25.15	26.30	14.35	10.00	18.95	27.85	25.85	22.60	18.60	16.40	12.33	21.25
Pakmor	22.79	25.50	12.55	9.05	17.47	26.30	23.00	20.60	17.25	15.25	10.95	19.45
Average	27.26	29.35	17.87	12.82	--	30.56	29.24	26.16	22.30	19.80	16.31	--
L.S.D. at 5% for,												
Varieties (V)					1.28				1.06			
Storage period (S)					1.04				1.06			
V x S					n.s.				n.s.			
<u>Planting date</u>:												
Jan. 15th	25.83	28.80	16.15	11.38	20.54	29.46	26.73	23.20	19.97	17.60	14.65	22.50
Feb. 1st	28.70	29.90	19.58	14.25	23.11	31.66	31.75	29.12	24.63	22.00	17.98	26.54
L.S.D. at 5% for,												
Planting date (P)					0.74				0.61			
P x S					n.s.				1.50			

1989 season

Items	Room storage, days					Cold storage, days						
	(0)	8	16	24	Mean	8	16	24	32	40	48	Mean
<u>Varieties</u>:												
Peto 86	31.25	36.95	25.55	19.25	28.25	37.60	37.00	33.05	29.25	26.75	23.60	31.21
UC 97-3	30.40	34.40	23.95	17.85	26.65	35.50	34.85	30.70	28.15	23.30	21.30	29.17
Castle Rock	28.75	30.50	19.60	14.15	23.25	32.20	29.36	27.34	24.40	20.95	18.60	25.95
VF 145-B	27.35	28.50	17.05	11.85	21.19	30.25	28.50	25.44	22.00	19.70	16.30	24.22
Flora Dade	26.60	28.20	15.71	11.15	20.42	28.95	26.93	22.95	19.80	17.65	14.20	22.44
Pakmor	23.15	24.90	14.60	9.50	19.29	26.35	24.35	21.40	19.20	17.00	13.65	20.73
Average	27.92	30.58	19.41	13.96	--	31.81	30.16	26.81	23.80	20.89	17.94	--
L.S.D. at 5% for,												
Varieties (V)			1.44						1.05			
Storage period (S)			1.18						1.05			
V x S			n.s.						n.s.			
<u>Planting date</u>:												
Jan. 15th	27.27	28.00	17.90	12.80	21.94	29.85	28.35	24.88	22.10	18.95	16.20	23.94
Feb. 1st	28.57	33.16	20.92	15.12	24.44	33.77	31.97	28.74	25.50	22.83	19.68	27.29
L.S.D. at 5% for,												
Planting date (P)			0.83						0.60			
P x S			n.s.						n.s.			

* (number between brackets at normal room is also involved at cold storage).

Concerning the effect of storage conditions on the vitamin C content the same data show that the reduction in vitamin C content at the later periods of storage was higher at normal room than at cold one. These results are in harmony with those of Clutter and Miller (1961), who reported that under higher temperatures losses in vitamin C were rapid.

Regarding effect of planting date on the vitamin C content, it is obvious also from data presented in Table (14) that fruits harvested from the late planting showed higher vitamin C content than those harvested from the early planting either at the start of the trial or at any storage period. Such a result may be due to the higher preharvest vitamin C content, connected with late planting (Table, 6), due to the more favourable climatic conditions for the reactions which produced the precursors of ascorbic acid and the biological reactions in the fruits which result in the conversation of precursors to ascorbic acid.

The interaction effect of varieties and storage periods either at normal or cold room was not significant in both seasons. Meanwhile, the interaction effect of planting date and storage periods was significant only at cold room in the first season.

The interaction between varieties and planting date did not reflect any significant effect on the different storage characters of tomato fruits. From that the data were unfasten and neglected.

Generally, from the foregoing discussion, it could be concluded that among the recent varieties under investigation, Peto 86, UC 97-3 and Castle Rock proved to be of better storage ability compared with the standard variety VF 145-B as detected by the lower decay and weight loss percent as well as by keeping higher firmness and chemical fruit constituent values throughout the storage periods. Meanwhile, fruits of both Flora Dade and Pakmor existed worse keeping quality than those of the standard vairety. It may be also concluded that holding fruit at cold storage of 10°C decreased decay, weight loss softening and helped maintaining better chemical quality of tomato fruits.

4.3. Effect of post harvest application of some preservatives on storage ability of some tomato cultivars:

4.3.1. Decay:

Data presented in Table (15) clearly indicate that tomato cultivars showed significant differences in decay percentage during storage. Fruits of cv. Pakmor exhibited the greatest values, whereas those of VF 145-B showed the lowest decay percentage. Fruits of Flora Dade lie in between.

The same data also show that all the various concentrations of the three tested preservatives significantly decreased the decay percentage during storage compared with the untreated fruits. The most effective treatments were Tecto at 1000 ppm and Bavistin at 100 ppm which reduced decay by 50 and 45% respectively compared with untreated control. As for Rovral, the most favourable concentration was 500 ppm which reduced decay by 32% (average of both seasons). Such a result may be due to that the major causes of decay during storage, as found in the present studies, were fungal diseases, principally Alternaria, Penicillium and Rhizopus rots, and the increase in relative air humidity during storage (85-90%) stimulated their spread. In this respect, it was found that such fungal diseases would be controlled by treating fruits with Tecto (Crivelli, 1966; Brown et al, 1967 and Paul et al, 1967 on citrus fruits and Zerbini, 1987 on pear) or Rovral (Nguyen et al, 1988 on peach) or Bavistin (El-Sheikh, 1989 on banana). Thus

Table (15): Effect of cultivar and preservatives on storage ability of tomato fruits.

Items	1988 Decay %	1988 Weight loss %	1988 Firmness	1988 Dry matter %	1989 Decay %	1989 Weight loss %	1989 Firmness	1989 Dry matter %
Cultivars:								
VF 145-B	12.30	10.80	7.37	5.88	10.90	8.20	7.65	6.26
Flora Dade	14.60	12.30	6.64	5.62	12.70	10.50	7.01	5.84
Pakmor	17.00	13.50	5.90	4.96	15.20	11.60	6.24	5.26
L.S.D. at 5%	0.34	0.70	0.11	0.15	0.47	0.82	0.18	0.15
Preservatives:								
Tecto 250 ppm	14.48	12.05	6.55	5.54	12.79	10.24	6.93	5.78
500 ppm	11.84	11.53	6.72	5.60	10.55	9.72	7.07	5.85
1000 ppm	10.88	10.77	6.98	5.72	9.06	9.04	7.41	6.08
Rovral 250 ppm	16.72	12.74	6.45	5.30	14.83	10.45	6.76	5.60
500 ppm	14.00	11.92	6.67	5.48	12.53	9.98	6.03	5.79
1000 ppm	16.35	12.54	6.48	5.32	14.76	10.62	6.78	5.62
Bavis-tin 100 ppm	11.40	11.29	6.83	5.64	9.98	9.42	7.23	5.98
200 ppm	14.48	12.04	6.59	5.46	11.90	10.07	6.84	5.75
300 ppm	16.55	12.62	6.45	5.36	14.65	10.80	6.66	5.65
Control	20.28	12.29	6.63	5.47	18.60	10.53	6.98	5.76
L.S.D. at 5%	0.60	0.75	0.11	0.13	0.54	0.75	0.14	0.14
Storage periods at 10°C, days:								
0	0.00	0.00	9.37	6.00	0.00	0.00	9.80	6.23
8	0.00	3.27	8.75	6.34	0.00	2.28	9.10	6.57
16	0.00	7.24	7.71	6.13	0.00	4.81	8.17	6.39
24	5.42	10.52	6.63	5.88	3.40	8.62	6.98	6.10
32	15.33	14.00	6.00	5.41	12.79	12.10	6.22	5.81
40	25.04	16.86	5.27	5.05	22.31	14.48	5.64	5.47
48	31.51	20.95	4.83	4.73	29.11	17.12	5.10	4.98
56	39.79	23.01	4.52	4.37	36.12	21.30	4.73	4.72
L.S.D. at 5%	0.55	0.75	0.12	0.12	0.60	0.75	0.16	0.14

the beneficial effect of treating tomato fruits with such preservatives may be expected. Regarding the effect of Tecto on reducing decay percentage during storage, obtained results are in general agreement with those of Leach (1970, 1971 and 1975) on potato tubers and Abdel-Satar et al (1983) on garlic bulbs. With respect to the favourable effect of Rovral, obtained results are in accordance with those of Singh and Bhatnagar (1982) on muskmelon, Raju et al (1984) on chilli (capsicum) and El-Boghdady (1988) on garlic bulbs. As for Bavistin obtained results are in harmony with those of Baraka (1978) and Khaled (1978) on onion bulbs. In addition, in a recent study, Abd El-Rahman (1990) emphasized that all the various concentrations of the three applied preservatives decreased the decay percentage of pepper fruits during storage, whereby Tecto at 1000 ppm was the best. It is also obvious from the same data that as a general trend there was a gradual increase in the percentages of decay in all the examined fruits till the end of storage. Decay started in fruits after 24 days of storage during both seasons and began low (4.4%), however the increase in decayed fruits being approximately threefold after 32 days and sevenfold after 48 days and ninefold after 56 days of storage.

It is obvious from data presented in Table (16) that the interaction effect of cultivars and the applied preservatives was significant in both seasons of this work.

Table (16): The interaction effect of preservatives and cultivars on storage ability of tomato fruits.

Items		1988 Decay %	1988 Weight loss %	1988 Firmness	1988 Dry matter %	1989 Decay %	1989 Weight loss %	1989 Firmness	1989 Dry matter %
VF 145-B									
Tecto	250	12.90	10.30	7.29	6.00	11.60	8.10	7.61	6.25
	500	10.70	9.50	7.48	6.05	9.50	7.80	7.77	6.34
	1000	9.40	8.60	7.70	6.09	8.40	7.30	8.15	6.56
Rovral	250	13.60	11.30	7.19	5.64	12.10	8.70	7.37	6.05
	500	10.40	10.30	7.42	5.87	9.50	8.10	7.69	6.24
	1000	13.00	10.80	7.29	5.72	11.60	8.40	7.46	6.08
Bavis-tin	100	10.00	9.30	7.54	6.00	9.00	7.70	7.96	6.44
	200	12.60	10.30	7.29	5.86	10.60	8.40	7.48	6.25
	300	14.00	10.90	7.11	5.75	12.7	9.00	7.30	6.14
Control		16.20	10.60	7.39	5.84	14.50	8.50	7.70	6.23
Flora Dade									
Tecto	250	14.40	12.30	6.56	5.65	12.30	10.50	6.94	5.80
	500	11.80	11.80	6.74	5.69	10.50	10.00	7.06	5.91
	1000	10.10	11.10	7.00	5.86	8.50	9.30	7.46	6.15
Rovral	250	16.40	12.70	6.50	5.49	14.30	11.10	6.94	5.72
	500	14.10	12.30	6.64	5.61	12.70	10.60	7.12	5.91
	1000	17.20	13.10	6.42	5.39	15.20	11.50	6.76	5.72
Bavis-tin	100	10.90	11.60	6.82	5.76	9.60	9.60	7.26	6.06
	200	14.60	12.20	6.60	5.61	11.70	10.20	6.89	5.71
	300	15.60	12.90	6.46	5.53	13.80	11.00	6.69	5.60
Control		20.80	12.50	6.62	5.61	18.90	10.80	6.99	5.82
Pakmor									
Tecto	250	16.10	13.50	5.80	4.97	14.50	12.10	6.22	5.29
	500	13.00	13.30	5.94	5.05	11.70	11.40	6.37	5.31
	1000	11.30	12.60	6.24	5.22	10.30	10.50	6.61	5.52
Rovral	250	20.10	14.30	5.65	4.76	18.10	11.60	5.97	5.04
	500	17.5	13.20	5.95	4.95	15.40	11.20	6.27	5.21
	1000	18.90	13.70	5.73	4.84	17.50	12.00	6.12	5.06
Bavis-tin	100	13.20	13.00	6.12	5.16	11.40	10.90	6.45	5.42
	200	16.20	13.60	5.87	4.91	13.30	11.60	6.16	5.29
	300	20.00	14.10	5.79	4.79	17.40	12.40	5.99	5.20
Control		23.80	13.70	5.87	4.95	22.50	12.20	6.24	5.22
L.S.D. at 5%		1.03	n.s.	n.s.	n.s.	0.97	1.38	n.s.	n.s.

The least decay percentages (9.4 and 8.4% in the first and second seasons, respectively) were produced by Tecto treated fruits at 1000 ppm of cv. VF 145-B, whereas apart from control treatment the highest values (20.1 and 18.1% in the same order) were produced by Rovral treated fruits of cv. Pakmor at 250 ppm.

Data in Table (17) show that decay percentage was significantly affected by the interaction between cultivars and storage periods. Although decay started in fruits after 24 days of storage it was continuously existed and gradually increased with the extend of the storage periods for the three tested cultivars. In this connection, fruits of cv. VF 145-B exhibited the least decay percentages during the various storage periods, whereas those of cv. Pakmor showed the highest values in this respect. Fruits of Flora Dade lie in between. After 32 days storage the decayed fruits reached 9.86, 14.17 and 18.13 for VF 145-B, Flora Dade and Pakmor cvs. respectively (as average of both seasons). Thus storing fruits of VF 145-B for a period of 32 days is considered as an economical period for storage under cool room condition.

Data presented in Table (18) show that the interaction effect of preservatives and storage periods on decay percent was significant. It is obvious that decay started firstly after 32 days of storage in fruits treated with Tecto at 500 or 1000 ppm and in those treated with Bavistin at

Table (17): The interaction effect of cultivars and storage period on storage ability of tomato fruits.

Varieties	Storage period (days)	1988 Decay %	1988 Weight loss %	1988 Firmness lb/in^2	1988 Dry matter %	1989 Decay %	1989 Weight loss %	1989 Firmness lb/in^2	1989 Dry matter ..%
VF 145-B	0	0.00	0.00	10.10	6.40	0.00	0.00	10.50	6.60
	8	0.00	2.15	9.32	6.65	0.00	1.30	9.66	6.88
	16	0.00	4.50	8.69	6.47	0.00	3.10	9.01	6.73
	24	2.44	8.19	7.61	6.30	1.90	6.10	7.93	6.50
	32	10.92	12.44	6.45	5.99	8.80	9.90	6.74	6.34
	40	22.22	14.37	5.83	5.48	20.00	12.00	6.02	6.12
	48	25.87	18.58	5.62	5.08	24.50	13.80	5.85	5.56
	56	36.40	21.21	5.33	4.69	32.30	19.20	5.49	5.32
Flora Dade	0	0.00	0.00	9.70	6.10	0.00	0.00	10.30	6.40
	8	0.00	3.34	9.25	6.55	0.00	2.20	9.47	6.74
	16	0.00	7.90	7.47	6.28	0.00	4.80	8.13	6.58
	24	5.81	11.19	6.45	6.06	3.80	10.00	6.80	6.26
	32	15.43	14.16	6.12	5.38	12.90	12.70	6.23	5.80
	40	24.42	17.33	5.36	5.22	21.40	14.90	5.74	5.49
	48	32.18	21.25	4.53	4.86	28.50	18.00	4.91	4.85
	56	38.91	22.92	4.22	4.52	35.30	21.20	4.51	4.62
Pakmor	0	0.00	0.00	8.30	5.50	0.00	0.00	8.60	5.70
	8	0.00	4.32	7.68	5.83	0.00	3.30	8.17	6.10
	16	0.00	9.31	6.96	5.64	0.00	6.60	7.37	5.87
	24	7.51	12.17	5.82	5.29	4.50	9.80	6.21	5.55
	32	19.65	15.40	5.42	4.85	16.60	13.70	5.70	5.30
	40	28.48	18.89	4.63	4.45	25.50	16.40	5.17	4.79
	48	36.47	23.01	4.35	4.24	34.30	19.60	4.52	4.53
	56	44.05	24.89	4.00	3.89	40.70	23.40	4.20	4.22
L.S.D. at 5%		1.30	1.30	0.28	n.s.	1.44	1.82	0.38	0.34

Table (18): The interaction effect of preservatives and storage periods on decay percent.

Name	ppm	1988								1989							
		Storage period, (days)								Storage period, (days)							
		0	8	16	24	32	40	48	56	0	8	16	24	32	40	48	56
Tecto	250	0.0	0.0	0.0	6.77	16.14	26.50	30.83	35.57	0.0	0.0	0.0	5.40	13.07	23.53	28.07	32.23
	500	0.0	0.0	0.0	0.00	11.63	23.10	28.10	31.89	0.0	0.0	0.0	0.00	9.40	20.80	24.40	29.80
	1000	0.0	0.0	0.0	0.00	8.63	20.90	25.07	27.67	0.0	0.0	0.0	0.00	7.13	17.73	22.13	25.47
Rovral	250	0.0	0.0	0.0	8.33	17.90	26.63	34.73	46.17	0.0	0.0	0.0	5.63	15.57	24.27	32.00	41.20
	500	0.0	0.0	0.0	7.00	15.13	22.73	29.83	37.30	0.0	0.0	0.0	4.77	12.97	20.70	28.23	33.60
	1000	0.0	0.0	0.0	8.27	17.57	26.50	34.67	43.77	0.0	0.0	0.0	6.30	15.27	24.07	32.30	40.17
Bavis-tin	100	0.0	0.0	0.0	0.00	11.20	22.03	27.17	30.77	0.0	0.0	0.0	0.00	9.27	19.43	23.87	27.27
	200	0.0	0.0	0.0	7.23	15.73	25.57	30.43	36.80	0.0	0.0	0.0	0.00	13.27	22.93	26.93	32.03
	300	0.0	0.0	0.0	7.73	19.07	27.70	35.23	42.63	0.0	0.0	0.0	5.40	15.60	24.90	32.10	39.17
Control		0.0	0.0	0.0	8.87	20.30	28.73	39.00	65.30	0.0	0.0	0.0	6.47	16.33	24.73	41.07	60.23
L.S.D. at 5%						2.67								2.55			

100 ppm, whereas decayed fruits started after 24 days in untreated fruits or those treated with Rovral at its different concentrations. Moreover fruits treated with Tecto at 1000 ppm exhibited the least decay percentages during the various storage periods followed by those treated with Bavistin at 100 ppm.

4.2.2. **Loss in weight**:

The data in Table 15 also demonestrate that fruits of the tested cultivars showed significant differences in their weight loss. The fruits of cv. Pakmor exhibited the greatest loss, while those of cv. VF 145-B showed the least loss in weight. Fruits of Flora Dade lie in between in this respect.

The same data also show that treating tomato fruits with Tecto at 1000 or 500 ppm and Bavistin at 100 ppm significantly decreased the loss in weight. The most effective treatment in this respect was Tecto at 1000 ppm which reduced loss in weight by 13.3% compared with the untreated fruits. However, Rovral did not significantly affect loss in weight. These results are in harmony with those of Shanan et al (1978) with Tecto on cucumber and Abd El-Rahman (1990) with Tecto on pepper. However, the previously reported increment of the losses in fruit pepper weight as a result of treating fruit with both Rovral and

Bavistin (Abd El-Rahman, 1990) was not quite confirmed with the present study.

The data in Table (15) also revealed that the loss in fruit weight begain somewhat low after 8 days of storage (2.8%) then it increased gradually throughout the storage periods leading to a sum of loss reached about (22%) (average of both seasons) at the end of storage period, i.e. 56 days.

The interaction effect of cultivars and the applied preservatives was significant only in the second season but did not reach the level of significance in the first one. The least loss percent (8% as average of both seasons) was produced from fruits of cv. VF 145-B that were treated with Tecto at 1000 ppm followed by those treated with Bavistin at 100 ppm (Table, 16).

Data in Table (17) show that loss in weight was significantly affected by the interaction between cultivars and storage periods. Fruits of cv. VF 145-B exhibited the least weight loss during the various storage periods, whereas those of cv. Pakmor showed the highest values. Fruits of Flora Dade lie in between in this respect.

The interaction between preservatives and storage period did not reflect any significant effect on weight loss percentage. Thus, data were neglected.

4.3.3. Firmness:

THe firmness readings in Table (15) show a considerable range among cultivars. Fruits of VF 145-B being the firmest and and those of Pakmor being the softest. This was quite clear in both seasons of this work.

As for the effect of preservatives on fruit firmness, the same data show that treating tomato fruits with Tecto at 1000 ppm and Bavistin at 100 ppm kept the fruits more firmer during storage compared with the untreated fruits. However, no obvious trend could be detected in favour of treatment with Rovral. Similar results were obtained by Shera (1975) on cucumber and Bhargava and Singth (1975) on guava, both working with Tecto and Abd El-Rahman (1990) working with Rovral and Bavistin on pepper. However in consistent results were obtained by Abd El-Rahman (1990) regarding the effect of Tecto on firmness of pepper fruits.

The same data also reveal that a gradual continuous reduction in fruit firmness happened throughout the storage period in both seasons. The softening of the fruits being approximatly twofold at the end of the storage period (56 days).

Data presented in Table (16) show that fruit firmness was not significantly affected by the interaction of cultivars and the applied preservatives. However, the firmest fruits were obtained from cv. VF 145-B treated with Tecto at 1000 ppm, while the softest ones were obtained from cv. Pakmor treated with Rovral at 250 ppm.

Data in Table (17) demonestrated that the interaction effect of cultivars and storage periods on fruit firmness was significant. Although all stored fruits became less firm with the prolongation of storage time and turned to soften texture, fruits of cv. VF 145-B were the most firm ones during the whole storage periods in both seasons. At the start of trail fruits of cv. Pakmor were soften than those of the other two cultivars; but after storage of 56 days fruits of cvs. Flora Dade and Pakmor appeared to be equally soft. The decrease in the firmness of the fruits may be due to the gradual breakdown of protopectin to lower molecular weight fractions which are more soluble in water and this was correlated directly with the rate of softening of fruit (Wills et al, 1981).

As for the interaction between preservatives and storage period, data did not reflect any significant differences regarding firmness and therefore data were omited.

4.3.4. Dry matter content:

Data presented in Table (15) also demonestrate that tomato cultivars showed significant differences in dry matter changes during storage. Fruits of VF 145-B showed the highest dry matter content while those of Pakmor contained the least values. The varietal differences in dry matter content as well as in decay %, fruit weight loss % and firmness were previously mentioned and discussed in the first storage study of the present work.

Regarding the effect of preservatives on dry matter changes during storage, the same date show that treating fruits with Tecto at 500 or 1000 ppm and Bavistin at 100 ppm significantly increased fruit dry matter content, whereas treating with Rovral at 250 or 1000 ppm slightly decreased this content. Other preservative treatments did not significantly affect the dry matter content compared with control. These results, to some extent, agree with those reported by Cano et al (1987) on apple who mentioned that treatment with Bavistin increased carbohydrate content and consequently increased the fruit dry matter content.

The same data also reveal an increase in fruit dry matter content during the early period of storage followed by a decrease up to the end of storage period. The increase in dry matter content during the early period was probably associated with ripening of the fruits until they reach red stage of ripening. Meanwhile, such reduction during the latter storage periods might be a result of the greater amount of sugars used in respiration in comparison with its synthesis which consequently reduce the fruit dry matter content. Similar results were obtained by Hall (1967) and Nizharadze et al (1975).

Data in Table (16) show that fruit dry matter changes during storage was not significantly affected by the interaction of cultivars and the applied preservatives. However, fruits of cv. VF 145-B treated with Tecto at the three used concentrations or with Bavistin at 100 ppm kept more dry matter content during storage than other stored fruits.

Data presented in Table (17) indicate that the interaction effect of cultivars and storage periods on dry matter content during storage was only significant in the second season. Fruits of cv. Pakmor exhibited higher rate of reduction in dry matter content than those of other two varieties during the whole storage periods.

The interaction between preservatives and storage periods did not reflect any significant effect on dry matter content. From that data were discarded.

Generally, from the foregoing discussion, it could be concluded that the post harvest application of Tecto at 1000 ppm and Bavistin at 100 ppm were the most effective preservatives for improving the storage ability of tomato fruits, i.e. reducing decay and loss in weight as well as keeping the fruits firm and of higher dry matter content.