4. RESULTS AND DISCUSSION

4.1. FIRST EXPERIMENT.

Effect of surface drip irrigation regime on growth, chemical composition, fruit yield and quality of some sweet pepper cultivars.

4.1.1. Vegetative growth characteristics.

Data presented in Tables (9 and 10) show the effect of irrigation treatments, cultivars and their interaction on vegetative growth characters of pepper plants during 2006/2007 and 2007/2008 seasons.

4.1.1.a. Effect of irrigation regime.

Data presented in Table (9) indicate that all the studied growth parameters expressed as plant length, fresh and dry weight per plant as well as average leaf area were significantly and steadily increased with increasing the rate of irrigation water during the growing season. In this respect, the highest values in all aforementioned growth aspects were obtained as a result of applying the highest irrigation level 9000 m^3 water/fed. i.e., irrigation at soil moisture content (81.6% of F.C.) along the growing season compared with the medium 6000 m^3 water/fed. i.e., at soil moisture content 72.9% of F.C. and the lower irrigation level 3000 m^3 water/fed) i.e. irrigation at 58.2% soil moisture of F.C. Obtained results are true during both seasons of study. Such increments in plant growth aspects due to increasing the level of irrigation may be attributed to the role of water in accelerating the physiological processes and increasing the

4 Table (9): Effect of irrigation levels and cultivars on vegetative growth characteristics of sweet pepper plants.

Seasons / Treatments	2006-2007				2007-2008			
Irrigation levels (m^3/fed) / Cultivars	Plant length (cm)	Fresh weight /plant (g)	Dry weight/ plant (g)	Leaf area (cm^2)	Plant length (cm)	Fresh weight /plant (g)	Dry weight/ plant (g)	Leaf area (cm^2)
3000	73.3	300.75	37.99	95.8	76.2	298.50	37.50	96.4
6000	88.1	381.31	45.54	123.9	95.3	388.88	44.73	127.4
9000	104.1	489.25	48.48	155.8	111.4	483.00	51.64	157.6
L.S.D at 0.05	1.3	18.82	6.42	1.7	1.2	8.15	3.51	2.8
Zidenka	95.0	468.83	53.49	134.1	100.5	465.50	53.82	136.9
Inspiration	78.1	324.42	37.91	117.8	86.4	324.58	36.09	118.7
Hara	109.3	491.33	51.15	142.4	109.9	484.33	55.36	146.5
Flamenco	71.8	277.17	33.47	105.5	80.3	286.08	33.22	106.2
L.S.D at 0.05	2.3	22.47	5.87	3.3	2.5	7.71	3.25	2.2

solubility and up-take of macro-nutrients which constitute and incorporated in the formation of protoplasmic material necessary for cells formation and consequently increasing the plant growth. These results are in accordance with those reported by each of **Senanayake and Kirthisinghe (1983), El-Beltagy *et al.* (1984), Hassan *et al.* (1984), Saddiq *et al.* (1985), Hegde (1987a and b), Wiertz and Lenz (1987), Hegde (1988), Zhong and Kato (1988), Malash (1990), Ibrahim *et al.* (1996), El-Nemr (1997), Ali (1997), Aly (2000), De-Pascale *et al.* (2000), El-Kassas *et al.* (2002), Khan *et al.*(2005), Mahajan *et al.* (2007)** all working on pepper.

4.1.1.b. Effect of cultivars.

Concerning the effect of cultivars on vegetative growth parameters of pepper plants, the same data in Table (9) reveal that there were significant differences among the tested cultivars in all measured growth traits, i.e., plant length, fresh and dry weight of plant as well as average leaf area during both seasons of study. In this regard, cv. Hara exhibited the highest values in all studied growth aspects followed by cv. Zidenka and Inspiration. On the other hand, cv. Flamenco reflected the lowest values in all measured morphological parameters of plant. Obtained results are true during both seasons of growth. Such differences among the tested cultivars in growth aspects may be attributed to the genetic potential for such genotypes. In this respect, **Midan and Gabal (1986), Khalil *et al.* (1988), Midan (1995), Arisha *et al.* (2003), Attia (2004) and El-Kassas (2005)** mentioned that there were significant differences among the

tested pepper cultivars in growth parameters for different used genotypes.

4.1.1.c. Effect of the interaction.

Data in Table (10) indicate that there were a significant effect on all the studied growth parameters, i.e., plant length, fresh and dry weight per plant as well as average leaf area due to the interaction between the used levels of irrigation water and the tested genotypes. In this connection, using the highest level of irrigation (9000 m^3 water/fed.) with cv. Hara reflected the highest values in all measured growth aspects during both seasons of study. However, under the lowest level of irrigation (3000 m^3water/fed.) cv. Zidenka exhibited the highest values in plant length, fresh and dry weight of plant compared with the other tested cultivars.

4.1.2. Chemical composition of plant foliage.

Data recorded in Tables (11 and 12) show the effect of irrigation treatments, cultivars and their interaction on total nitrogen, phosphorus and potassium concentration in pepper plant foliage during 2006/2007 and 2007/2008 seasons.

4.1.2.a. Effect of irrigation regime.

Concerning the effect of irrigation levels on total nitrogen, phosphorus and potassium concentration of plant foliage It is evident from the recorded data that increasing the level of irrigation water from 3000 m^3 up to 9000 m^3 water/ fed. significantly decreased the concentration of total nitrogen, phosphorus and potassium in plant foliage. Obtained results were true during both seasons of study. In this respect, the reduction in N, P and K concentration in plant foliage as a result of increasing

Table (10):Effect of the interaction between irrigation levels and cultivars on vegetative growth characteristics of sweet pepper plants.

Seasons / Treatments		2006-2007				2007-2008			
Irrigation levels (m^3/fed)	Cultivars	Plant length (cm)	Fresh weight /plant (g)	Dry weight/ plant (g)	Leaf area (cm^2)	Plant length (cm)	Fresh weight /plant (g)	Dry weight/ plant (g)	Leaf area (cm^2)
3000	Zidenka	85.0	362.50	45.69	103.8	83.3	352.50	45.21	108.4
	Inspiration	61.5	271.50	34.07	84.3	68.5	274.00	33.61	83.4
	Hara	80.5	356.75	44.77	113.6	82.3	339.25	44.59	115.8
	Flamenco	66.3	212.25	27.44	78.9	70.8	228.25	26.59	77.9
6000	Zidenka	87.5	475.50	54.66	129.6	98.8	471.50	55.10	130.5
	Inspiration	79.0	329.50	38.98	116.3	82.5	327.25	33.58	118.3
	Hara	119.5	467.75	55.43	140.0	122.3	493.00	55.93	147.3
	Flamenco	66.5	252.50	33.09	109.8	77.8	263.75	34.31	113.4
9000	Zidenka	112.5	568.50	60.12	168.9	119.5	572.50	61.16	171.9
	Inspiration	93.8	372.25	40.66	152.9	108.3	372.50	41.09	154.5
	Hara	127.8	649.50	53.25	173.4	125.3	620.75	65.57	176.4
	Flamenco	82.5	366.75	39.88	128.0	92.5	366.25	38.75	127.4
L.S.D at 0.05		4.01	38.92	10.17	5.79	4.40	13.35	5.64	3.9

the irrigation rate may be due to the distribution of absorbed amounts of NPK on large vegetative weight of plant as indicated in Table (9) and consequently decreased it in this part of plant. Also the reduction of NPK concentration in plant foliage as a result of increasing the irrigation rate may be due to the increasing of absorbed and translocated water to the foliage plant parts, which in turn diluted such concentration of macro-nutrients in foliage cells of plants. Obtained results are in agreement with those reported by **Ferreira *et al.* (1985), Hegde (1989) El-Nemr (1997), Aly (2000), De-Pascale *et al* (2000), Costa and Gianquin to (2002),** all working on pepper, reported similar results. On the contrarily, **Malash (1990)** reported that leaves content of total nitrogen, phosphorus and potassium was increased with increasing the amount of irrigation water.

4.1.2.b. Effect of cultivars.

Concerning the effect of cultivars on macro-nutrient (NPK) concentration in plant foliage, the same data in Table (11) show clearly that all estimated macro-nutrients of plant foliage were significantly affected due to the different studied cultivars during both seasons of study. In this regard, cv Zidenka possessed the highest values of total nitrogen during both seasons and phosphorus during the second season only, while cv. Hara possessed the highest value of potassium during both seasons of study. However, no significant difference was found among cvs Zidenka and Hara in all estimated macro-elements in both seasons of growth. On the other hand, the lower values in such macro-nutrient concentration were noticed in case of cvs. Flamenco and Inspiration, respectively. Such differences in NPK

Table (11): Effect of irrigation levels and cultivars on N,P and K concentration (mg / 100 g dry weight) of sweet pepper plants foliage.

Seasons / Treatments	2006-2007			2007-2008		
Irrigation levels (m^3/fed) / Cultivars	N	P	K	N	P	K
3000	4143	708	4274	4221	712	4277
6000	3889	509	4054	3856	509	3935
9000	3689	299	3640	3683	317	3653
L.S.D at 0.05	4.5	20.9	0031	25	14	39.8
Zidenka	3976	562	4078	3985	588	4015
Inspiration	3873	463	3945	3894	468	3927
Hara	3938	571	4093	3957	573	4036
Flamenco	3840	426	3843	3844	423	3848
L.S.D at 0.05	49.7	12.1	57.2	35	14.3	33.2

concentration are connected with the differences in growth rate (Table 9) and the difference in their nutrient requirements and absorbing ability of different tested cultivars. Also it may be due to the difference in genetic potential for such tested genotypes. In this concept, **Pander and K'Drev (1979), Midan and Gabal (1986), Midan (1995), Arisha *et al.* (2003)** all working on pepper plants reported that there were significant differences in N,P and K content among the tested cultivars.

4.1.2.c. Effect of the interaction.

Data in Table (12) indicate that there is a significant effect on N, P and K concentration of plant foliage due to the interaction between the irrigation treatments and the used cultivars. In this regard, application of the lowest level of irrigation (3000 m^3 water/fed.) in case of cvs Hara and Zidenka, reflected the highest values of N,P and K concentration in plant foliage during both seasons of growth than other tested treatments.

4.1.3. Fruit yield and its components.

Data recorded in Tables (13 and 14) show the effect of drip irrigation regime, cultivars and their interaction on total fruit yield and its components, i.e., number of fruits and yield/plant, early and total yield/fed. as well as yield per square meter of net house during 2006/2007 and 2007/2008 seasons.

4.1.3.a. Effect of irrigation regime.

Data in Table (13) show the effect of drip irrigation regime on total fruit yield and its components expressed as number of fruit and yield per plant, early yield and total fruit yield per/fed. as well as per square meter of net house. Such data

Table (12): Effect of the interaction between irrigation levels and cultivars on N, P and K concentration (mg / 100 g dry weight) of sweet pepper plants foliage.

Seasons / Treatments		2006-2007			2007-2008		
Irrigation level (m^3/fed)	Cultivars	N	P	K	N	P	K
3000	Zidenka	4205	815	4315	4305	818	4318
	Inspiration	4078	633	4225	4215	628	4243
	Hara	4205	808	4345	4215	813	4300
	Flamenco	4083	575	4213	4148	590	4248
6000	Zidenka	3938	553	4108	3895	550	3917
	Inspiration	3893	468	4058	3818	483	3920
	Hara	3903	585	4165	3905	590	4020
	Flamenco	3823	433	3888	3808	415	3883
9000	Zidenka	3785	318	3813	3755	395	3810
	Inspiration	3650	288	3553	3650	293	3618
	Hara	3708	320	3768	3750	315	3788
	Flamenco	3615	270	3422	3578	265	3395
L.S.D at 0.05		86.0	31	79.4	59.9	27.3	61.3

Table (13): Effect of irrigation levels and cultivars on total yield and its components of sweet pepper plants.

Seasons / Treatments	2006-2007						2007-2008					
Irrigation levels (m^3/fed) / Cultivars	No. of fruits/ plant	Total yield /plant (kg)	Early yield ton/fed	Total yield (kg /m^2)	Total yield ton/fed	Water use efficiency (kg/m^3)	No. of fruits/ plant	Total yield/ plant (kg)	Early yield ton/fed	Total yield (kg/m^2)	Total yield ton/fed	Water use efficiency (kg/m^3)
3000	10.7	2.323	5.173	6.994	29.376	9.371	11.0	2.259	5.152	6.696	28.126	9.798
6000	12.0	2.751	6.866	8.280	34.777	5.750	12.0	2.748	7.056	8.219	34.522	5.796
9000	12.9	3.113	9.555	9.470	39.775	4.410	13.0	3.153	9.547	9.530	40.023	4.419
L.S.D at 0.05	0.1	0.026	0.131	0.067	0.271	0.082	0..2	0.023	0.216	0.059	24.6.05	0.089
Zidenka	11.9	2.940	7.654	8.796	36.945	7.089	11.9	2.926	7.765	8.824	37.062	7.125
Inspiration	12.3	2.686	6.449	8.126	34.131	6.168	12.7	2.640	6.500	7.793	32.731	6.572
Hara	11.6	2.793	8.292	8.466	35.561	6.904	11.4	2.833	8.416	8.622	36.215	6.834
Flamenco	11.7	2.497	6.398	7.603	31.934	5.874	12.0	2.481	6.327	7.354	30.886	6.153
L.S.D at 0.05	0.2	0.031	1.327	0.106	0.437	0.110	0.1	0.020	1.150	0.089	0.371	0.127

Table (14): Effect of the interaction between irrigation levels and cultivars on total yield and its components of sweet pepper plants.

Seasons / Treatments		2006-2007						2007-2008					
Irrigation levels (m^3/fed)	Cultivars	No. of fruits/ plant	Total yield /plant (kg)	Early yield ton/fed	Total yield (kg/m^2)	Total yield ton/fed	Water use efficiency (Kg/m^3)	No. of fruits/ plant	Total yield /plant(kg)	Early yield ton/fed	Total yield (kg/m^2)	Total yield ton/fed	Water use efficiency (Kg/m^3)
3000	Zidenka	10.6	2.500	5.738	7.529	31.623	10.282	10.5	2.458	5.624	7.347	30.861	10.541
	Inspiration	11.3	2.288	4.832	6.877	28.883	8.653	11.7	2.138	4.664	6.181	25.961	9.628
	Hara	10.5	2.370	5.584	7.129	29.940	9.942	10.4	2.318	5.744	7.105	29.841	10.006
	Flamenco	10.4	2.137	4.541	6.443	27.059	8.607	11.3	2.125	4.580	6.152	25.840	9.019
6000	Zidenka	12.2	2.925	7.382	8.724	36.640	6.195	12.3	2.918	7.627	8.850	37.172	6.106
	Inspiration	12.4	2.728	6.237	8.238	34.600	5.500	12.7	2.695	6.430	7.864	33.030	5.766
	Hara	11.6	2.823	7.791	8.437	35.436	6.103	11.3	2.868	8.009	8.725	36.648	5.906
	Flamenco	11.8	2.530	6.057	7.722	32.433	5.203	11.9	2.510	6.160	7.437	31.238	5.405
9000	Zidenka	12.8	3.395	9.843	10.136	42.573	4.790	13.0	3.403	10.048	10.275	43.155	4.730
	Inspiration	13.9	3.043	8.279	9.264	38.910	4.352	13.6	3.088	8.408	9.333	39.201	4.323
	Hara	12.7	3.188	11.503	9.835	41.307	4.682	12.6	3.315	11.495	10.037	42.157	4.589
	Flamenco	12.8	2.825	8.597	8.645	36.309	3.813	12.8	2.808	8.234	8.431	35.582	4.034
L.S.D at 0.05		0.30	0.054	0.229	0.204	0.756	0.901	0.3	0.035	0.260	0.153	0.643	0.202

reveal that there were progressive and consistent increments in total fruit yield and its components, i.e., number of fruits and yield per plant, early yield as well as produced yield per square meter under plastic house with increasing the amount of irrigation water from 3000 m^3 up to 9000 m^3/fed. during both seasons of this study. In this respect, the highest total produced yield and its components were connected with the heighest used level (9000 m^3 water/fed.) i.e., irrigation at 81.6% of soils moisture content (of F.C.) compared with medium (6000 m^3 water/fed.) and the lower level of irrigation water (3000 m^3 water/fed.) of irrigation in both seasons of growth. Such increases in total and early fruit yield are very tightly related with increasing in number of fruits and yield per plant as well as increasing in average fruit weight (Table 15). Also such increments in total fruit yield and its components due to increasing the amounts of irrigation water applied are connected with the enhancing effect of irrigation water on vegetative growth of plant (Table 9) which in turn affect on the yielding ability of plant. Obtained results showing the positive effect of irrigation produced yield and its components are coincided with those reported by **Vuelvas (1982), El- Beltagy *et al.* (1984), Hassan *et al.* (1984), Ferreyra *et al.* (1985), Lean and Montalov (1986), Hegde (1988) a and b), Zhong and Kato (1988), Malash (1990), Chartzoulakis and Drosos (1997), El-Nemr (1997), Aly (2000), Delfine *et al.,* (2000), De-Pascale *et al.,* (2000), Jamiez *et al.* (2000), Costa and Gianquinto (2000), El-Kassas *et al.* (2002), and Sezen *et al.,* (20006)** all working on pepper.

4.1.3.b. Effect of the cultivars.

Concerning the effect of cultivars on total fruit yield and its components, i.e., number of fruits and yield per plant, early yield/fed. as well as yield per squire meter under net house,the same data in Table (13) indicate that there were significant differences in total produced yield and its aforementioned components among the tested cultivars during both seasons of study. In this respect, cv. Inspiration exhibited the highest number of fruits produced per plant , while cv. Hara reflected the highest early yield in both seasons but cv. Zidenka was superior in total fruit yield either for plant, feddan or square meter under net house conditions during the two seasons of the experiment Such differences in fruit yield and its components among the tested cultivars may be due to the difference in vegetative growth (Table, 9).

While may affect on yielding ability of plants. In this respect, **Popover *et al.* (1985), Roach (1986), Midan and Gabal (1986), Stan and Savitchi (1987), Butu and Eister (1988), Khalil *et al.*, (1988) Youssef *et al.*, (1989), Midan (1995), Morra *et al.* (2000), Arisha *et al.*, (2003), El-Kassas (2005), Cesar *et al.*, (2007)** reported significant differences in yield and its components of studied genotypes.

4.1.3.c. Effect of the interaction.

Concerning the effect of the interaction, data in Table (14) show that there was a significant effect on total produced yield and its components during both seasons of study due to the interaction between the irrigation treatments and the tested cultivars. In this respect, application of the highest used level of

irrigation water (9000 m^3/fed.) combined with cv. Inspiration reflected the highest fruit number per plant, but under the same level of irrigation water cv. Hara produced the highest early fruit yield, while cv. Zidenka was superior in total produced yield either per plant or feddan as well as yield per square meter under net house condition. Obtained results are connected with the differences in vegetative growth traits which affect yielding ability of plant. Such results are similar in the two seasons of growth.

4.1.4. Water use efficiency:

4.1.4a. Effect of irrigation:

Data presented in Table (13) reveal that there were significant differences among the used irrigation levels in water use efficiency during both seasons of growth. In this respect, increasing the irrigation rate from 3000 up to 9000m^3 water/fed. significantly decreased the value of water use efficiency during both seasons of study. On the other hand, irrigation at the lowest rate of water (3000 m^3/fed.) i.e., irrigation when the soil moisture content reached of F.C.58.2% reflected the highest value of water use efficiency during the two growing season. In this respect, **Hegde (1987 and 1988b); Ibrahim *et al.* (1996); El-Nemr (1997); El-Kassas *et al.* (2002) and Cheng *et al.* (2008)** all working on pepper reported that increasing the amount used of irrigation water reduced the efficiency of using irrigation water i.e., reduced the produced units of yield per volume of irrigation water applied.

4.1.4.b. Effect of cultivars:

As for the effect of cultivars, the same data in Table (13) indicate that the highest value of water use efficiency was recorded by cv. Zidenka (70.89 and 7.125 kg fruits/m^3) followed by cv. Hara (6.904 and 6.834 kg fruits/m^3),Inspiration (6.168 and 6.572 kg fruits/m^2) and flamenco (5.874 and 6.153 kg fruits/m^2) during both seasons of growth. Such results are connected with the total produced yield. Obtained results may be due to the differences in efficiency in water absorption and ability of such genotypes in assimilation of absorbed water in building plant tissues and increasing the vegetative growth which in turn affect yield and productivity of plant.

4.1.4.c. Effect of the interaction:

As for the effect of the interaction, data in Table (14) show clearly that using the lower rate of irrigation water (3000 m^3/fed.) i.e., irrigation at (58.2%) of moisture content in case of cv. Zidenka reflected the highest value of water use efficiency followed by using the same rate of irrigation water in case cv. Hara during the two seasons of study. On the contrary by using the highest rate of irrigation water (9000 m^3/fed.) in case of all tested cultivars have a negative effect on the using efficiency of irrigation water.

4.1.5.Fruit quality.

4.1.5.a. Physical fruit quality

Data presented in Tables (15 and 16) show the effect of irrigation levels, cultivars as well as their interaction on physical fruit quality expressed as average fruit weight, fruit length,

diameter, pericarp thickness and dry weight during 2006/2007 and 2007/2008 seasons.

4.1.5.a.1. Effect of irrigation regime.

Data in Table (15) indicate that irrespective of fruit dry weight which was decreased with increasing the irrigation rate from 3000 up to 9000 m^3 water/fed.,each of average fresh fruit weight, fruit length, fruit diameter as well as preicarp thickness of fruit were increased during both seasons of growth. Such inhancing effect of increasing the irrigation water on physical fruit characters may be attributed to the clear effective role of irrigation water on increasing the plant vegetative growth (Table, 9) as well as the main role of water on increasing number and size of fruit cells which in turn may affect on fruit size and weight.

Similar results were reported by **Hegde (1986 and 1989), Malash and Ahmed (1990) Ibrahim *et al.*, (1996), Aly (2000), Gulshan Mahjan *et al.*, (2007) and Khah *et al.*, (2007)** all working on pepper.

4.1.5.a.2. Effect of cultivars.

Regarding the effect of cultivars on physical fruit traits, the same Data in Table (15) indicate that there were significant differences among the studied cultivars in all measured fruit parameters, i.e., average fruit weight, length, diameter, dry matter content as well as pericarp thickness of fruits. In this respect, cv. Hara exhibited the highest values in all measured physical fruit traits followed by cvs. Zidenka, Inspiration and Flamenco in descending order. Obtained results are similar in both seasons of the experiment. In this regard, **Midan and**

Table (15) : Effect of irrigation levels and cultivars on physical characteristics of sweet pepper fruits.

Seasons / Treatments	2006-2007					2007-2008				
Irrigation levels (m^3/fed) / Cultivars	Fruit fresh weight(g)	Fruit dry weight (g)	Fruit length (cm)	Fruit diameter (cm)	Preicarp Thickness (cm)	Fruit fresh weight(g)	Fruit dry weight(g)	Fruit length (cm)	Fruit diameter (cm)	Preicarp Thickness (cm)
3000	211.6	7.0	6.800	6.550	0.465	197.8	7.2	6.744	6.375	0.477
6000	229.1	6.5	7.738	7.406	0.579	228.0	6.6	7.694	7.344	0.580
9000	242.1	6.1	9.056	8.494	0.665	243.0	6.2	8.975	8.544	0.662
L.S.D at 0.05	3.4	0.1	0.074	0.067	0.016	3.3	0.07	0.141	0.128	0.013
Zidenka	241.4	6.6	8.250	8.141	0.626	237.6	6.7	8.125	8.033	0.627
Inspiration	217.6	6.5	7.042	6.650	0.523	207.3	6.6	6.875	6.442	0.534
Hara	237.9	6.6	9.33	8.433	0.624	240.6	6.7	9.050	8.600	0.628
Flamenco	213.6	6.4	7.133	6.708	0.504	206.4	6.6	7.166	6.608	0.503
L.S.D at 0.05	4.2	0.09	0.109	0.130	0.017	2.5	0.16	0.098	0.108	0.012

0.

Gabal (1986), Khalil *et al.*, (1988), Youssef *et al.*, (1989) Midan (1995) and El-Kassas (2005) all working on pepper plants mentioned that there were significant differences in fruit physical parameters among the tested cultivars.

4.1.5.a.3. Effect of the interaction.

As for the effect of the interaction on physical fruit characters, i.e., average fruit weight, length, diameter, dry weight as well as pericarp thickness, data in Table (16) show clearly that the highest values in average fruit length, diameter and pericarp thickness in the first season and average fruit fresh weight, fruit length and diameter in the second season were recorded as a result of the interaction between the highest irrigation level (9000 m^3 water/fed.) and cv. Hara. But, the highest value in average fresh fruit weight in the first season and pericap thickness in the second season was noticed in case of the highest irrigation rate combined with cv. Zidenka. On the other hand, the highest fruit dry weight was found as a result of using the lower level of irrigation water (3000 m^3 water/fed.) in case of cv. Hara during both seasons of growth.

4.1.5.b. Chemical fruit quality.

Data recorded in Tables (17 and 18) show the effect of drip irrigation regime, cultivars and their interaction on chemical quality of produced fruits expressed as mineral constituents. i.e., N,P,K and NO_3-N and organic constituents, i.e., vitamin C, total acidity, total sugars and total soluble solids as well as total carotenoides concentration in both seasons of growth.

Table (16):Effect of the interaction between irrigation levels and cultivars on physical characteristics of sweet pepper fruits.

Seasons / Treatments		2006-2007					2007-2008				
Irrigation Level (m^3/fed)	Cultivars	Fruit fresh weight (g)	Fruit dry weight (g)	Fruit length (cm)	Fruit diameter (cm)	Preicarp Thickness (cm)	Fruit fresh weight (g)	Fruit dry weight (g)	Fruit length (cm)	Fruit diameter (cm)	Pricarp Thickness (cm
3000	Zidenka	220.4	7.0	7.050	6.975	0.525	213.6	7.2	7.025	6.850	0.530
	Inspiration	201.9	7.0	6.175	5.975	0.408	182.2	7.2	6.075	6.625	0.420
	Hara	218.7	7.1	7.700	7.200	0.548	207.9	7.3	7.600	7.175	0.560
	Flamenco	205.8	6.9	6.275	6.050	0.380	187.6	7.0	6.275	5.850	0.398
6000	Zidenka	239.0	6.5	8.075	7.975	0.640	237.3	6.7	7.925	7.900	0.635
	Inspiration	220.3	6.5	7.050	6.650	0.540	212.3	6.6	6.900	7.275	0.548
	Hara	243.3	6.7	8.600	8.175	0.608	251.3	6.7	8.625	8.325	0.620
	Flamenco	214.1	6.4	7.225	6.825	0.533	211.1	6.6	7.325	6.725	0.517
9000	Zidenka	264.7	6.2	9.625	9.475	0.718	262.1	6.2	9.425	9.350	0.715
	Inspiration	230.7	6.1	7.900	7.325	0.623	227.5	6.2	7.650	7.275	0.635
	Hara	251.9	6.2	10.800	9.925	0.720	262.5	6.2	10.925	10.300	0.703
	Flamenco	221.00	6.0	7.900	7.250	0.600	220.0	6.1	7.900	7.250	0.595
L.S.D at 0.05		7.26	0.17	0.190	0.226	0.030	4.32	0.28	0.171	0.187	0.017

4.1.5.b.1. Effect of irrigation regime.

Data in Table (17) show the effect of drip irrigation rate on macro-element concentration (N,P,K and NO_3-N) and organic constituents, i.e., vitamin C, total acidity, total sugars, total soluble solids and carotenoides concentration of pepper fruits. Such data reveal that increasing the rate of irrigation water applied from 3000 up to 9000m^3 water/fed. led to a decrease in all assayed mineral and organic constituents of produced fruits, Obtained results are true during both seasons of study. Such retarding effect on both mineral and organic constituents with increasing the rate of irrigation water may be due to the increase in water uptake by plant and translocation to fruit which causes the dilution of the concentration of such constituents in fruit tissues. Obtained results are in conformity with those reported by **Hedge (1986 and 1989), Malash (1990), Ibrahim *et al.* (1996), Aly (2000) and El-Kassas (2002)** on pepper, **Ibrahim (2005)** on tomato.

4.1.5.b.2. Effect of cultivars.

Data in the same table show clearly that there were a significant difference in all assayed mineral and organic constituents of the produced fruits among the tested cultivars during both seasons of growth. Such data indicate that cv. Zidenka reflected the highest constituents of total nitrogen, vitamin C. total acidity, total sugars and carotenoides concentrations during the first season and vitamin C, total acidity, total sugars and carotenoids during the second one, while cv. Hara exhibited the highest values of phosphors, potassium, and nitrate nitrogen concentration during the first season and

Table (17) : Effect of irrigation levels and cultivars on mineral and organic constitutes (mg/ 100 g dry weight) in dry matter of sweet pepper fruits.

Seasons / Treatments	2006-2007									2007-2008								
Irrigation levels (m^3/fed) / Cultivars	N	P	K	NO_{3-N}	V.C mg/ 100g D.W.	Acidity Cm^3/L	Total sugar mg/ 100g D.W.	TSS (%)	Carotenoids mg/ 100g D.W.	N	P	K	NO_{3-N}	V.C mg/ 100g D.W.	Acidity Cm^3/L	Total sugar mg/ 100g D.W.	TSS (%)	Carotenoids mg/ 100g D.W.
3000	2513	324	3028	2247	115.4	4612	3876	7.0	0.9037	**2508**	**323**	**3027**	2254	113.8	4604	**3873**	**6.9**	**0.9306**
6000	2394	274	2701	2137	120.6	4411	3609	6.6	0.8756	**2327**	**278**	**2694**	2079	119.9	4417	**3635**	**6.6**	**0.8850**
9000	2207	236	2454	2017	126.1	4105	3455	6.0	0.8344	**2177**	**245**	**2430**	1984	126.8	4096	**3413**	**5.7**	**0.8150**
L.S.D at 0.05	0137	14	61	174.3	1.17	6.05	43.70	0.17	0.0163	**20.7**	**13.4**	**37.5**	57.9	2.23	5.47	**43.4**	**0.1**	**0.0140**
Zidenka	2451	290	2762	2142	135.0	48145	3721	6.5	0.8950	**2360**	**293**	**2773**	2113	133.9	4825	**3713**	**6.4**	**0.8967**
Inspiration	2351	263	2712	2129	109.7	4119	3586	6.6	0.8725	**2315**	**270**	**2718**	2080	109.3	4109	**3557**	**6.4**	**0.8825**
Hara	2375	300	2774	2143	131.4	4561	3693	6.5	0.8450	**2362**	**305**	**2781**	2118	130.7	4544	**3702**	**6.4**	**0.8517**
Flamenco	2304	258	2663	2120	106.7	4009	3586	6.6	0.8725	**2310**	**260**	**2596**	2112	106.7	4012	**3591**	**6.5**	**0.8767**
L.S.D at 0.05	121.7	19.2	56	161.8	1.58	13.42	47.06	0.23	0.205	**21.5**	**18.3**	**50.5**	29.6	1.87	7.18	**37.1**	**0.13**	**0.0199**

total nitrogen, phosphorus, potassium and nitrate-N during the second one. In addition, cvs. Inspiration and flamenco reflected the highest value of total soluble solids during first and second season, respectively. In this respect, **Midan and Gabal (1986), Khalil *et al.,* (1988), Youssef *et al.,* (1989), Midan (1995) El-Kassas (2005) and Bernalte *et al.,* (2007)** found significant differences in fruit chemical composition a monge the tested cultivars.

4.1.4.b.3. Effect of the interaction.

As for the effect of the interaction, data in Table (18) show that, application of the lowest rate of irrigation water (3000 m^3 water/fed.) exhibited the highest values in all determined mineral and organic constituents in fruits for different tested cultivars during both seasons of growth.

In this respect, the interaction of such irrigation rate with cv. Hara reflected the highest concentration of N,P,K and NO_3-N during the first season and P and NO_3-N during the second one. Also the same rate of irrigation interacted with cv. Zidenka showed the highest concentration of vitamin C, total acidity, total sugars and carotenoides during the first season and total nitrogen, vitamin C, total acidity, total sugars and carotenoides during the second one while the same rate of irrigation combined with cv. Flamenco possesed the highest value of TSS during both seasons and potassium during the second one only.

Table (18):Effect of the interaction between irrigation levels and cultivars on mineral and organic constitutes (mg/ 100g dry weight) in dry matter of sweet pepper fruits.

Seasons / Treatments		2006-2007									2007-2008								
Irrigation levels (m^3/fed)	Cultivars	N	P	K	NO_{3-N}	V.C mg/ 100g D.W.	Acidity Cm^3/L	Total sugar mg/ 100g D.W.	TSS (%)	Carotenoids mg/ 100g D.W.	N	P	K	NO_{3-N}	V.C mg/ 100g D.W.	Acidity Cm^3/L	Total sugar mg/ 100g D.W.	TSS (%)	Carotenoids mg/ 100g D.W.
3000	Zidenka	2545	335	3058	2253	127.6	5127	3998	6.9	0.9450	2553	335	3117	2260	126.0	5147	3968	7.0	0.9600
	Inspiration	2525	305	2990	2250	105.0	4346	3845	7.1	0.9000	2495	302	3063	2253	104.2	4336	3817.0	7.0	0.9350
	Hara	2550	360	3098	2249	125.9	4846	3909	7.0	0.8675	2525	360	3108	2262	122.6	4818	3947	6.9	0.9100
	Flamenco	2432	298	2968	2235	103.1	4121	3751	7.1	0.9025	2458	293	3820	2237	102.5	4118	3762	7.0	0.9175
6000	Zidenka	2590	288	2748	2146	135.9	4847	3667	6.6	0.9025	2345	293	2750	2104	135.0	4862	3680	6.5	0.9025
	Inspiration	2335	260	2695	2130	109.9	4118	3539	6.6	0.8700	2320	268	2665	2030	108.0	4119	3525	6.6	0.8900
	Hara	2343	293	2735	2139	131.4	4569	3653	6.6	0.8600	2338	295	2750	2099	131.7	4566	3674	6.6	0.8675
	Flamenco	2308	255	2625	2130	105.3	4111	3576	6.7	0.8700	2305	260	2610	2083	105.1	4121	3662	6.7	0.8800
9000	Zidenka	2218	250	2480	2026	141.5	4471	3438	5.9	0.8375	2183	253	2450	1975	140.9	4467	3491	5.6	0.8275
	Inspiration	2193	225	2450	2008	114.4	3894	3374	6.2	0.8475	2130	240	2428	1954	115.7	3874	3328	5.7	0.8225
	Hara	2233	248	2490	2038	136.8	4260	3519	5.9	0.8075	2223	260	2485	1994	138.1	4248	3486	5.6	0.8775
	Flamenco	2185	220	2395	1994	111.6	3795	3430	6.0	0.8450	2168	0228	2358	2014	112.5	3797	3348	5.7	0.8325
L.S.D at 0.05		210.8	13.3	78.6	2802	2.75	23.3	81.02	0.39	0.0329	40.6	13.9	74.9	5126	3.25	7.18	54.943	0.219 5	0.0227

4.2. SECOND EXPERIMENT:

Effect of organic and inorganic nitrogen fertilizer on growth, chemical composition, yield and quality of two sweet pepper cultivars.

4.2.1. Vegetative growth characteristics.

Data recorded in Tables (19 and 20) show the effect of cultivars, organic and inorganic fertilizers as well as their interaction on vegetative growth characters of sweet pepper plants.

4.2.1.a. Effect of cultivars.

Concerning the effect of cultivars, data recorded in Table (19) reveal that there were significant differences in all measured morphological growth traits among the tested cultivars during both seasons of growth. In this regard, cv. Zidenka exhibited the highest values in all determined growth parameters expressed as plant length, fresh and dry weight per plant as well as average leaf area compared with cv. Inspiration during both seasons of study. In this connection, such differences between the tested cultivars may be due to the genetic potential for such genotypes. In this respect, **Midan and Gabal (1986), Arisha *et al.*, (2003), El-Kassas (2005) and Khan *et al.*, (2007)** found significant differences among the tested pepper cultivars in all measured morphological growth traits.

4.2.1.b. Effect of Fertilization.

With regard to the effect of fertilization on morphological growth parameters of pepper plant, the same data in Table (19) show clearly that application of nitrogen fertilizer at the

Table (19): Effect of cultivars and fertilization levels on vegetative growth characteristics of sweet pepper plants.

Season / Treatments	2006-2007				2007-2008			
Cultivars / Fertilization level	Plant length (cm)	Fresh weight/ plant (g)	Dry weight/ plant (g)	Leaf area (cm2)	Plant length (cm)	Fresh weight/ plant (g)	Dry weight/ plant (g)	Leaf area (cm2)
Zidenka	105.6	526.41	53.28	142.8	107.8	531	53.25	143.6
Inspiration	88.1	355.09	36.32	110.8	87.8	355.31	37	112.8
L.S.D at 0.05	0.8	1.66	1	1.9	1.3	0.867	0.86	1.6
Chemical fertilizer (200 kg N/fed)	95.8	415.75	39.50	124.3	94.8	424.13	40.60	126.4
Compost manure (200 kg N/fed)	91.4	436.13	46.49	117.6	98.9	438	45.69	118.1
Poultry manure (200 kg N/fed)	89.3	423.75	43.75	112.3	91.9	430.12	42.96	112.9
Chemical fertilizer + Compost manure (1/2 + 1/2)	97.5	436.12	44.50	136.9	97.9	439.38	44.59	137.8
Chemical fertilizer + Poultry manure (1/2 + 1/2)	95.9	430.38	43.39	132.4	96.4	434.12	43	133.6
Chemical fertilizer + Compost manure (1/3 + 2/3)	103.5	460.75	46.53	124.4	105.8	459.87	47.26	128
Chemical fertilizer + Poultry manure (1/3 + 2/3)	100.3	451.25	44.91	122.8	102.8	450.25	44.53	123.5
Chemical fertilizer + Compost manure + Poultry manure (1/3+1/3+1/3)	101	471.88	49.31	144.1	100.1	469.37	51.15	143.8
L.S.D at 0.05	1.4	3.38	0.99	1.8	1.4	2.81	1.15	1.9

recommended dose (200kg-N/fed.) in either the mineral form as ammonium nitrate or organic form as either compost or poultry manure or as well as mixture of inorganic and organic nitrogen forms in different combination led to significant effect on the all measured growth parameters of pepper plants during both seasons of study.

In this respect, addition of the recommend dose of nitrogen fertilizer (200kg-N/fed.) in the form of mixture as ammonium nitrate, compost and poultry manure at a rate of one third from each of them ($^1/_3$+$^1/_3$+$^1/_3$) exhibited the highest values of fresh and dry weight per plant as well as the average leaf area compared with other tested fertilization treatments during both seasons of growth. However, application of nitrogen fertilizer at (200 kg-N/fed.) as a mixture of mineral form plus compost manure at ratio of 1:2, respectively reflected the highest value of plant length, also such treatment ranks the second regarding other studied growth parameters followed by the treatment of mineral nitrogen plus poultry manure at the same ratio. In addition, application of organic manure at rate of (200 kg-N/fed.) as compost or poultry manure in a single form or in combination with mineral fertilizer at 50% for each significantly increased both fresh and dry weight per plant compared with the application of nitrogen fertilizer in mineral form only. However, the inorganic - N form reflected higher values in case of plant length and average leaf area compared with the addition of nitrogen in the organic form only. Such results are true during both seasons of growth. In this respect, the improving effect for organic fertilizer in a single form or in combination with mineral

fertilizer on plant growth may be attributed to the main role of organic fertilizer as slow release source of macro- and micro-nutrients for plant which necessary for cell formation and photosynthetic product assimilation which in turn may affect plant growth.

Obtained results are in agreement with those reported by **Corrales *et al.*, (1991), Eissa (1996), Adam *et al.*, (2001), El-Zawily *et al.*, (2002), Sallam (2002), Arisha *et al.*, (2003) Shehata *et al.*, (2004), and Shams (2009),** in case of organic manure and **Ismail *et al.*, (1990), Ahmed and Tanki (1991), Olsen *et al.*, (1993), Mishriky and Al Phonse (1994), Shaheen *et al.*, (1999) Gaber *et al.*,(2001) Mohamed and Shaker (2001), Hassan *et al.*, (2004) El-Kassas (2005) and Shams (2009),** in case of mineral nitrogen fertilizer on pepper.

4.2.1.c. Effect of the interaction.

As for the effect of the interaction, data in Table (20) indicate that there were significant differences in all measured growth parameters during both seasons of growth due to the interaction between the different studied treatments. In this respect, supplementing cv. Zidenka plants with nitrogen fertilizer at the recommended dose (200 kg-N/fed.) either in the form of ammonium nitrate plus compost manure plus poultry manure at the rate of ($^1/_3$+$^1/_3$+$^1/_3$) for each of them or as a mixture of ammonium nitrate plus compost manure only at a ratio ($^1/_3$+$^2/_3$), respectively, reflected the highest values in the different growth traits (plant length, fresh and dry weight per plant as well as average leaf area.) during the two seasons of growth. On the other hand, the lowest values were recorded in case of cv.

Table (20):Effect of the interaction between cultivars and fertilization levels on vegetative growth characteristics of sweet pepper plants.

Season / Treatments		2006-2007				2007-2008			
cultivars	Cultivars fertilization level	Plant length (cm)	Fresh weight/ plant (g)	Dry weight/ plant (g)	Leaf area (cm^2)	plant length (cm)	Fresh weight/ plant (g)	Dry weight/ plant (g)	Leaf area (cm^2)
Zidenka	Chemical fertilizer (200 kg N/fed)	106.5	489.75	43.53	136.3	105.0	505.25	44.93	137.0
	Compost manure (200 kg N/fed)	99.8	522.75	57.48	129.7	103.5	525.00	55.85	132.0
	Poultry manure (200 kg N/fed)	96.5	502.75	51.90	124.2	102.0	513.25	50.55	127.0
	Chemical fertilizer + Compost manure (1/2 + 1/2)	105.8	516.00	52.75	155.7	102.8	424.50	52.22	156.0
	Chemical fertilizer + Poultry manure (1/2 + 1/2)	104.8	506.50	51.45	151.6	106.8	516.00	51.35	153.0
	Chemical fertilizer + Compost manure (1/3 + 2/3)	113	557.50	55.68	141.0	115.5	555.50	56.30	142.2
	Chemical fertilizer + Poultry manure (1/3 + 2/3)	109	546.25	53.68	139.5	112.8	554.75	53.43	138.5
	Chemical fertilizer + Compost manure + Poultry manure (1/3+1/3+1/3)	109.3	570.50	59.78	154.5	108.8	563.75	61.33	162.7
Inspiration	Chemical fertilizer (200 kg N/fed)	85.0	341.75	35.48	112.2	84.5	343.00	36.28	115.8
	Compost manure (200 kg N/fed)	83.0	349.50	35.50	105.5	82.3	351.00	35.53	104.3
	Poultry manure (200 kg N/fed)	82.0	345.50	35.60	100.3	41.8	347.00	35.38	98.8
	Chemical fertilizer + Compost manure (1/2 + 1/2)	89.3	356.25	36.25	118.0	87.8	354.25	36.93	119.5
	Chemical fertilizer + Poultry manure (1/2 + 1/2)	87.0	354.25	35.33	113.0	86.0	352.25	34.65	113.8
	Chemical fertilizer + Compost manure (1/3 + 2/3)	94.0	364	37.38	107.7	96.0	364.25	38.22	113.8
	Chemical fertilizer + Poultry manure (1/3 + 2/3)	91.5	356.25	36.15	106.0	92.8	35.75	35.63	108.5
	Chemical fertilizer + Compost manure + Poultry manure (1/3+1/3+1/3)	92.8	373.25	38.85	123.7	91.5	375.00	40.98	124.8
	L.S.D at 0.05	2.0	4.78	1.4	2.01	1.9	3.97	1.63	2.18

Inspiration plants fertilized with (200 kg-N/fed.) as mineral form only, without using organic fertilizer.

4.2.2. Chemical compositions of plant foliage.

Data presented in Tables (21 and 22) show the effect of cultivars, organic and inorganic nitrogen fertilizer as well as their interaction on total nitrogen, phosphorus and potassium concentration of plant foliage during 2006/2007 and 2007/2008 seasons.

4.2.2.a Effect of cultivars.

With regard to the effect of cultivars, data recorded in Table (21) indicate that there were significant differences in the concentration of assayed macro-elements among both tested cultivars during both seasons of growth.In this connection, the highest values in total nitrogen phosphorus and potassium concentration were noticed in case of cv. Zidenka compared with cv. Inspiration in both seasons of the experiment. Such differences in the content of macro-nutrients are connected to the differences in vegetative growth (Table 19) in which plants of cv. Zidenka showed more vigorous growth and in turn absorbed higher amounts of the essential macro-elements, especially N,P and K elements. In this respect, **Midan (1995) and Arisha *et al.*, (2003)** reported that there were significant differences in the uptake and content of total nitrogen, phosphorus and potassium among the tested pepper cultivars.

4.2.2.b. Effect of fertilization.

As for the effect of fertilization the same data in Table (21) show that total nitrogen, phosphorus and potassium concentrations in plant foliage were significantly affected due to

Table (21): Effect of cultivars and fertilization levels on N,P and K concentration (mg/100g dry weight) of sweet pepper plant foliage.

Season / Treatments	2006-2007			2007-2008		
Cultivars / Fertilization level	N	P	K	N	P	K
Zidenka	4034	818	3888	3948	803	391
Inspiration	3864	599	3521	3780	605	3599
L.S.D at 0.05	44	12	86	42.6	12	112
Chemical fertilizer (200 kg N/fed)	3801	690	3736	3784	683	3664
Compost manure (200 kg N/fed)	3881	716	3700	3843	698	3773
Poultry manure (200 kg N/fed)	3944	696	3695	3810	688	3754
Chemical fertilizer + Compost manure (1/2 + 1/2)	3971	720	3698	3828	708	3776
Chemical fertilizer + Poultry manure (1/2 + 1/2)	4051	700	3650	3881	704	3703
Chemical fertilizer + Compost manure (1/3 + 2/3)	3955	711	3706	3851	723	3795
Chemical fertilizer + Poultry manure (1/3 + 2/3)	3935	716	3728	3918	709	3770
Chemical fertilizer + Compost manure + Poultry manure (1/3+1/3+1/3)	4055	714	3721	4000	721	3768
L.S.D at 0.05	86	19	16	97	17	96

the application of nitrogen fertilizer at the recommended dose (200 kg-N/fed.) either in the form of ammonium nitrate, compost or poultry manure solely or as a mixture of them in different combinations. Obtained results are true during both seasons of study. In this respect, the highest values were recorded as a result of applying nitrogen in the form of mixture for ammonium nitrate plus compost and poultry manure at ($^1/_3$+$^1/_3$+$^1/_3$) for each, respectively followed by treatments included mineral nitrogen combined with either compost or poultry manure at rate of 1/3 of nitrogen amount as mineral fertilizer and 2/3 as organic fertilizer. On the other hand, the lowest values were noticed in case of using nitrogen in mineral form only as ammonium nitrate fertilizer.

In this regard, the enhancing effect of applying nitrogen in the form of organic manure combined with mineral nitrogen may be due to the main role of organic manures (compost and poultry manure) as slow release source which may supply the plants with macro-nutrients through the growing season. Furthermore, the improving effect of such organic fertilizers on physical and chemical properties of the soil as well as lowering the pH of the soil which in turn may affect nutrient availability for absorption and uptake by plant roots and consequently increased its concentration in plant tissues.

In this regard, **El-Sirafy *et al.* (1989), Eissa (1996), Abd El-Aty (1997), El-Kassas *et al.*, (1997), Hassan (2002), Arisha *et al.*, (2003), Shehata *et al.* (2004),** found that addition of organic manure increased chemical constituents of the foliage of pepper plant. In addition, application of nitrogen fertilizer as a

mineral at different studied levels increased N, P and K concentrations in different plant organs **(Midan, 1995, Gomez *et al.*, 1996, Shaheen *et al.*, 1999;. El- Zawily *et al.*, 2002; Metwally, 2004, Hassan *et al.*, 2004, and Shams, 2009)**.

4.2.2.c. Effect of the interaction.

Referring to the effect of the interaction, data in Table (22) show that the total nitrogen, phosphorus and potassium concentrations in plant foliage were significantly affected due to the interaction between the tested cultivars and fertilization treatments. In this respect, the highest total nitrogen concentration was noticed in case of cv. Zidenka fertilized with 200kg-N/fed. as ammonium nitrate plus compost and poultry manure at ($^1/_3$) for each of them, during both seasons of growth. While the highest values of phosphorus were recorded due to the same treatment in the second season and application of nitrogen at 200kg-N/fed as compost only to the same cultivar in the first season. In addition, the highest potassium concentration was found in case of fertilizing cv. Zidenka plants with 200kg-N/fed. as compost only or with 200kg-N/fed. as mineral fertilizer plus poultry manure at ($^1/_3$+$^2/_3$) during first and second season, respectively.

On the contrarily, the lowest values of all determined macro elements were recorded as a result of fertilizing cv. Inspiration plants with 200kg-N/fed. as ammonium nitrate only without addition of organic fertilizer during the two seasons of the experiment.

Table (22): Effect of the interaction between cultivars and fertilization levels on N,P and K concentration (mg/100g dry weight) of sweet pepper plant foliage.

Season / Treatments		2006-2007			2007-2008		
cultivars	Cultivars fertilization level	N	P	K	N	P	K
Zidenka	Chemical fertilizer (200 kg N/fed)	3835	805	3925	3870	793	3743
	Compost manure (200 kg N/fed)	3890	835	3923	3928	785	3970
	Poultry manure (200 kg N/fed)	4048	810	3878	3900	793	3838
	Chemical fertilizer + Compost manure (1/2 + 1/2)	4118	825	3840	3913	805	3970
	Chemical fertilizer + Poultry manure (1/2 + 1/2)	4178	813	3808	3995	800	3853
	Chemical fertilizer + Compost manure (1/3 + 2/3)	4045	813	3870	3930	820	3933
	Chemical fertilizer + Poultry manure (1/3 + 2/3)	3968	823	3910	3988	810	3983
	Chemical fertilizer + Compost manure + Poultry manure (1/3+1/3+1/3)	4193	818	3950	4065	820	3920
Inspiration	Chemical fertilizer (200 kg N/fed)	3768	575	3548	3698	573	3585
	Compost manure (200 kg N/fed)	3873	598	3478	3758	610	3575
	Poultry manure (200 kg N/fed)	3840	583	3513	3720	583	3670
	Chemical fertilizer + Compost manure (1/2 + 1/2)	3825	615	3555	3743	610	3583
	Chemical fertilizer + Poultry manure (1/2 + 1/2)	3925	588	3493	3768	608	3553
	Chemical fertilizer + Compost manure (1/3 + 2/3)	3865	610	3543	3773	625	3658
	Chemical fertilizer + Poultry manure (1/3 + 2/3)	3903	610	3545	3848	608	3558
	Chemical fertilizer + Compost manure + Poultry manure (1/3+1/3+1/3)	3918	615	3493	3935	623	3615
	L.S.D at 0.05	121	26	86	137	24	136

4.2.3. Fruit yield and its components.

4.2.3.a Effect of cultivars.

Data recorded in Table (23) show that there were significant differences among the tested cultivars in all measured yield parameters i.e., number of fruits and yield per plant, early and total yield per feddan as well as yield per square meter under net house condition in both seasons of growth. In this regard, cv. Zidenka reflected the highest values in all aforementioned yield traits compared with cv. Inspiration during both seasons of study.

Such superiorly of cv. Zidenka in produced yield and its constituents are connected with the vigorous vegetative growth (Table, 19) and the higher uptake of macro-nutrients N, P and K (Table, 21) which in turn affect positively the producing ability of plants. In this respect, **Midan (1995) Morra *et al.*, (2000), Arisha *et al*, (2003) and El-Kassas (2005)** all working on pepper, reported differences among the tested genotypes in total produced yield and its components.

However, **Cesar *et al.*, (2007),** did not found significant differences in productivity between the studied cultivars.

4.2.3.b Effect of Fertilization.

Concerning the effect of fertilization on total fruit yield and its components, the same data in Table (23) show that application of nitrogen fertilizer at the recommended does (200kg.N/fed.) either as mineral nitrogen, organic nitrogen and or as a mixture of mineral and organic nitrogen in different combinations significantly affected total fruit yield and its components expressed as number of fruit and yield per plant,

Table (23):Effect of cultivars and fertilization levels on total yield and its components of sweet pepper plants.

Season / Treatments	2006-2007					2007-2008				
Cultivars fertilization level	No. of fruits/ plant	Total yield Kg/ plant	Early yield ton/fed	Total yield kg/m^2	Total yield ton/fed	No. of fruits/ plant	Total yield kg/ plant	Early yield ton/fed	Total yield kg/m^2	Total yield ton/fed
Zidenka	13	3.381	8.737	9.987	42.744	13.1	3.417	8.691	10.159	42.722
Inspiration	12.9	2.915	7.728	8.680	36.473	12.8	2.878	7.737	8.641	36.304
L.S.D at 0.05	0.2	0.15	2.437	0.581	0.255	0.1	0.013	0.020	0.061	0.316
Chemical fertilizer (200 kg N/fed)	13.8	3.260	8.947	9.744	40.902	14	3.279	8.926	9.676	40.662
Compost manure (200 kg N/fed)	12.3	2.994	7.709	9.065	38.100	12.3	3.006	7.749	8.991	37.776
Poultry manure (200 kg N/fed)	12.2	2.966	7.555	9.040	37.983	12.3	3.013	7.593	9.050	38.029
Chemical fertilizer + Compost manure (1/2 + 1/2)	13.7	3.319	8.460	9.859	41.408	13.7	3.286	8.447	9.686	40.695
Chemical fertilizer + Poultry manure (1/2 + 1/2)	13.3	3.256	8.269	9.564	4.191	13.4	3.210	8.252	9.653	40.561
Chemical fertilizer + Compost manure (1/3 + 2/3)	12.4	3.006	7.959	9.012	37.867	12.1	2.988	7.940	8.969	37.683
Chemical fertilizer + Poultry manure (1/3 + 2/3)	12.3	2.981	7.834	8.204	37.627	12.1	2.965	7.804	8.971	37.836
Chemical fertilizer + Compost manure + Poultry manure (1/3+1/3+1/3)	13.6	3.400	9.116	10.182	42.982	13.8	3.436	9.001	10.201	42.861
L.S.D at 0.05	0.3	0.018	6.467	0.792	0.725	0.1	0.021	0.056	0.083	310.64

early and total yield per fed. as well as yield per square meter under net house conditions. Such results are true during both seasons of study. In this respect, application of nitrogen at the recommended dose (200kg-N/fed.) as a mixture of inorganic and organic fertilizer consists from $^1/_3$ of nitrogen amount as ammonium nitrate $+^1/_3$ as compost manure$+^1/_3$ as poultry manure such treatment reflected the highest values of total produced yield and its components followed by treatment in which the half of nitrogen amount was added as ammonium nitrate and other half as compost followed by the treatment of mineral fertilizer only in a descending order. In addition, the same data show also that application of nitrogen fertilizer at recommended dose as compost only or combined with ammonium nitrate had more positive effect on total produced yield and its components compared with using nitrogen as poultry manure solely or combined with ammonium nitrate. **Eissa (1996), Abdel–Aty (1997), Aliyu (2000), Sallam (2002), El-Aidy *et al.*, (2003), Shehata *et al.*, (2004) and Bernalte *et al.*,(2007)** reported similar results on organic fertilizer. Moreover, **Shehata *et al.*, (2004)** found that addition of NPK+ chicken manure + compost at a rate of ($^1/_3+^1/_3+^1/_3$) containing 165 kg-N/fed. increased total yield of pepper fruit.

4.2.3.c Effect of the interaction.

Data recorded in Table (24) show clearly that there were significant differences in total fruit yield and its components, i.e, number of fruits per plant, fruit yield per plant and per feddan as well as early yield and produced yield per square meter due to the interaction between the tested cultivars and used nitrogen

Table (24): Effect of the interaction between cultivars and fertilization levels on total yield and its components of sweet pepper plants.

Season / Treatments		2006-2007					2007-2008				
cultivars	Cultivars fertilization level	No. of fruit/ plant	Total yield Kg/ plant	Early yield ton/fed	Total yield kg/m^2	Total yield ton/fed	No. of fruit/ plant	Total yield Kg/ plant	Early yield ton/fed	Total yield kg/m^2	Total yield ton/fed
Zidenka	Chemical fertilizer (200 kg N/fed)	13.6	3.455	9.628	10.35	43.408	13.9	3.485	9.495	10.137	42.595
	Compost manure (200 kg N/fed)	12.5	3.235	8.259	9.74	41.163	12.6	3.273	8.259	9.710	40.798
	Poultry manure (200 kg N/fed)	12.4	3.213	8.056	9.87	41.476	12.6	3.303	8.024	9.870	41.475
	Chemical fertilizer + Compost manure (1/2 + 1/2)	14.4	3.675	8.859	11.15	46.861	14.7	3.725	8.852	11.055	46.450
	Chemical fertilizer + Poultry manure (1/2 + 1/2)	13.8	3.608	8.612	10.66	44.776	14.3	3.620	8.589	10.880	45.720
	Chemical fertilizer + Compost manure (1/3 + 2/3)	11.9	3.130	8.415	9.24	38.802	11.5	3.110	8.391	9.267	38.948
	Chemical fertilizer + Poultry manure (1/3 + 2/3)	11.9	3.088	8.329	7.78	38.996	11.6	3.085	8.350	9.350	39.572
	Chemical fertilizer + Compost manure + Poultry manure (1/3+1/3+1/3)	13.6	3.643	9.735	11.06	46.465	13.7	3.738	9.568	11	46.217
Inspiration	Chemical fertilizer (200 kg N/fed)	14.1	3.065	8.267	9.14	38.395	14	3.073	8.357	9.1215	38.728
	Compost manure (200 kg N/fed)	12.1	2.753	7.159	8.34	35.036	12	2.740	7.239	8.272	34.755
	Poultry manure (200 kg N/fed)	12.0	2.720	7.055	8.21	34.489	12	2.723	7.163	8.230	34.583
	Chemical fertilizer + Compost manure (1/2 + 1/2)	13.1	2.963	8.060	8.59	35.955	12.7	2.848	8.042	8317	34.941
	Chemical fertilizer + Poultry manure (1/2 + 1/2)	12.9	2.505	7.926	8.47	35.605	12.5	2.800	7.915	8.425	35.403
	Chemical fertilizer + Compost manure (1/3 + 2/3)	12.9	2.883	7.503	8.79	36.932	12.7	2.865	7.490	8.670	36.418
	Chemical fertilizer + Poultry manure (1/3 + 2/3)	12.7	2.875	7.358	8.63	36.257	12.6	2.845	7.258	8.593	36.100
	Chemical fertilizer + Compost manure + Poultry manure (1/3+1/3+1/3)	13.5	3.158	8.498	9.31	39.114	13.8	3.135	8.435	9.403	39.505
	L.S.D at 0.05	0.4	0.254	0.091	1.12	1.025	0.2	0.029	0.079	1.123	0.439

fertilization treatments. In This respect, the highest number of fruits and fruit yield per plant as well as total fruit yield/fed. and square meter under net house conditions were obtained as a result of using nitrogen at the recommended dose (200kg-N/fed.) in the form of half of the amount as ammonium nitrate and the other half as compost in case of cv. Zidenka followed by using nitrogen in the form of ammonium nitrate + compost + poultry manure ($^1/_3$+$^1/_3$+$^1/_3$) in case of cv. Inspiration during both season of study. In addition, the highest value of early yield was obtained as a result of using nitrogen fertilizer as ammonium nitrate + compost + poultry manure at ($^1/_3$+$^1/_3$+$^1/_3$), in case of both tested cvs. during the two seasons of growth.

4.2.4. Fruit quality:

4.2.4.1. Physical fruit quality:

4.2.4.1.a. Effect of cultivars:

Data recorded in Table (25) show that there were significant differences among both studied cultivars in all measured fruit quality, i.e., average fruit weight, length, diameter, pericarp thickness as well as dry weight of fruit during both seasons of study. In this respect, cv. Zidenka exhibited the highest values in all aforementioned fruit physical parameters compared with cv. Inspiration. Obtained results are connected with the differences in growth habit and the geneticial performance of both studied genotypes. In this respect, **Midan and Gabal (1986), Youssef *et al.*, (1989), Midan (1995) and El-Kassas (2005)** reported similar results between the studied genotypes.

Table (25): Effect of cultivars and fertilization levels on physical characteristics of sweet pepper fruits.

Season / Treatments	2006-2007					2007-2008				
Cultivars / Fertilization level	Fruit fresh Weight (g)	Fruit Dry weight (g)	Fruit Length (cm)	Fruit diameter (cm)	Pericarp Thickness (cm)	Fruit fresh Weight (g)	Fruit Dry weight (g)	Fruit Length (cm)	Fruit diameter (cm)	Pericarp thickness (cm)
Zidenka	259	6.5	9.6	9.3	0.7	260.7	6.7	9.5	9.4	0.7
Inspiration	226	6.5	7.7	7.3	0.6	224.7	6.6	7.7	7.4	0.6
L.S.D at 0.05	0.5	0.02	0.1	0.1	0.01	1.5	0.1	0.1	0.1	0.02
Chemical fertilizer (200 kg N/fed)	235.9	6.4	8.5	8.1	0.6	235	6.4	8.2	8.2	0.6
Compost manure (200 kg N/fed)	243.9	6.5	8.6	8.2	0.6	243.2	6.5	8.7	8.4	0.6
Poultry manure (200 kg N/fed)	242.9	6.5	8.4	8.1	0.6	243.8	6.7	8.4	8.2	0.6
Chemical fertilizer + Compost manure (1/2 + 1/2)	240.7	6.4	8.6	8.3	0.6	239.4	6.6	8.6	8.4	0.7
Chemical fertilizer + Poultry manure (1/2 + 1/2)	238.5	6.5	8.4	8.2	0.6	237.3	6.7	8.5	8.3	0.6
Chemical fertilizer + Compost manure (1/3 + 2/3)	244	6.5	8.9	8.4	0.7	247.5	6.6	8.8	8.5	0.7
Chemical fertilizer + Poultry manure (1/3 + 2/3)	242.6	6.5	8.7	8.3	0.7	245.7	6.7	8.6	8.5	0.7
Chemical fertilizer + Compost manure + Poultry manure (1/3+1/3+1/3)	251.2	6.7	9.2	8.6	0.7	249.7	6.9	8.2	8.7	0.7
L.S.D at 0.05	2	0.08	0.01	0.01	0.01	2.2	0.1	0.1	0.1	0.02

4.2.4.1.b. Effect of fertilization:

Data presented in Table (25) show clearly that there were significant differences in all measured fruit physical quality parameters among the studied fertilizers treatments. In this respect, the highest values in average fruit fresh weight, fruit length, fruit diameter, pericarp thickness and dry weight were recorded as a result of fertilization with mineral and organic fertilizers (compost and poultry manure) at a ratio of $(\frac{1}{3}+\frac{1}{3}+\frac{1}{3})$ for each followed by the treatment treated with mineral fertilizer + compost at a ratio $\frac{1}{3}+\frac{2}{3}$ for each, respectively. Obtained results are true during both seasons of study. On the other hand, the lowest values were recorded as a result of fertilizing with the recommended dose of nitrogen either in the form of poultry manure or using mineral fertilizer only. The positive effect of using mineral fertilizer combined with organic manure (compost + poultry) on physical fruit quality may be attributed to the enhancing effect of such treatment on vegetative growth parameter which affect consequently physical quality of produced fruits. Obtained results are in agreement with those reported by **Midan (1995), Abd El-Aty (1997), Hassan, (2002) and Arafa and Shalabey (2007)** all working on pepper menthioned that, using organic fertilizer enhanced physical fruit parameter for produced fruit. Also **Aliyu and Yusuf (1991) Olsen *et al.,* (1993) Maya *et al.,* (1997), Mohamed and Shaker (2001) and Hassan *et al.,* (2004)** concerning chemical fertilization.

4.2.4.1.c. Effect of the interaction:

Data recorded in Table (26) indicate that fertilizing both the tested cultivars with the recommended nitrogen dose (200 kg-N/fed.) in as a mixture of mineral nitrogen fertilizer combined with compost and poultry manure at a ratio of ($\frac{1}{3}+\frac{1}{3}+\frac{1}{3}$) for each reflected the highest fruit parameters during both seasons of growth compared with all other treatments.

4.2.4.2. Chemical fruit quality:

4.2.4.2.a. Effect of cultivars:

Data in Table (27) show clearly that irrespective of both potassium and total soluble solids which were higher in fruits produced by cv. Inspiration, cv. Zidenka produced fruits with higher chemical fruit quality expressed as total nitrogen, phosphorus, nitrate-nitrogen vitamin C, total acidity, total sugars and total carotenoids content during both seasons of experiment. Such increasing in the content of estimated mineral and organic constituents of produced fruits were connected with higher chemical constituents of plant foliage (Tables, 21 and 22) which in turn affected fruit chemical composition. Obtained results are similar to those reported by **Midan and Gabal (1986), Youssef *et al.*, (1989) Midan (1995) and El-Kassas (2005)** who reported that there were differences in fruit content for assayed constituents and among the studied cultivars.

4.2.4.2.b. Effect of fertilization.

The same data recorded in Table (27) show that there were significant differences among the studied fertilizers treatments in all assayed mineral and organic constituents. In this

Table (26): Effect of the interaction between cultivars and fertilization levels on physical characteristics of sweet pepper fruits.

Season / Treatments		2006-2007					2007-2008				
Cultivars	Cultivars fertilization level	Fruit fresh weight (g)	Fruit dry weight (g)	Fruit length (cm)	Fruit diameter (cm)	Thickness of fruit meat (cm)	Fruit fresh weight (g)	Fruit dry weight (g)	Fruit length (cm)	Fruit diameter (cm)	Thickness of fruit meat (cm)
Zidenka	Chemical fertilizer (200 kg N/fed)	254.1	6.3	9.4	9.1	0.7	251.4	6.4	9.2	9.2	0.7
	Compost manure (200 kg N/fed)	259.3	6.4	9.4	9.2	0.7	258.9	6.6	9.5	9.3	0.7
	Poultry manure (200 kg N/fed)	258.6	6.5	9.3	9.1	0.7	261.7	6.8	9.2	9.1	0.7
	Chemical fertilizer + Compost manure (1/2 + 1/2)	225.2	6.4	9.5	9.1	0.7	254	6.6	9.5	9.4	0.7
	Chemical fertilizer + Poultry manure (1/2 + 1/2)	252.3	6.6	9.4	9.2	0.7	251.5	6.8	9.4	9.2	0.7
	Chemical fertilizer + Compost manure (1/3 + 2/3)	263.3	6.5	9.8	9.4	0.7	270	6.6	9.7	9.6	0.7
	Chemical fertilizer + Poultry manure (1/3 + 2/3)	258.7	6.5	9.7	9.4	0.7	265.7	6.7	9.5	9.5	0.7
	Chemical fertilizer + Compost manure + Poultry manure (1/3+1/3+1/3)	269.3	6.7	10.4	9.6	0.7	272.9	6.8	10.3	9.8	0.7
Inspiration	Chemical fertilizer (200 kg N/fed)	217.7	6.4	7.6	7.1	0.6	218.7	6.5	7.3	7.2	0.6
	Compost manure (200 kg N/fed)	228.5	6.5	7.8	7.3	0.6	227.4	6.5	8	7.4	0.6
	Poultry manure (200 kg N/fed)	227.3	6.5	7.6	7.1	0.6	225.9	6.6	7.6	7.3	0.6
	Chemical fertilizer + Compost manure (1/2 + 1/2)	226.3	6.4	7.7	7.3	0.6	224.9	6.6	7.7	7.5	0.6
	Chemical fertilizer + Poultry manure (1/2 + 1/2)	224.8	6.5	7.5	7.2	0.6	223.2	6.6	7.6	7.4	0.6
	Chemical fertilizer + Compost manure (1/3 + 2/3)	224	6.5	8	7.4	0.6	225	6.5	7.9	7.5	0.6
	Chemical fertilizer + Poultry manure (1/3 + 2/3)	226.6	6.6	7.8	7.3	0.6	225.6	6.7	7.8	7.4	0.6
	Chemical fertilizer + Compost manure + Poultry manure (1/3+1/3+1/3)	233.1	6.8	8.1	7.6	0.7	226.5	6.9	8.2	7.7	0.7
	L.S.D at 0.05	2.9	0.1	0.2	0.1	0.04	3	0.1	0.2	0.2	0.04

Table (27): Effect of cultivars and fertilization levels on mineral and organic constitutes (mg/100g dry weight) in dry matter of sweet pepper fruits.

Season / Treatments	2006-2007									2007-2008								
Cultivars / Fertilization level	N	P	K	NO_{3-N}	VC mg/ 100g D.W.	Acidity cm^3/l	Total sugar mg/100g D.W.	TSS %	Carotenoids mg/100g D.W.	N	P	K	NO_{3-N}	VC mg/ 100g D.W.	Acidity cm^3/l	Total sugar mg/100 g D.W.	TSS %	Carotenoids mg/100g D.W.
Zidenka	2260	313	3085	1892	126.46	4406	3547	5.8406	0.8244	2256	318	3015	1858	125.98	4388	3555	5.8125	0.8288
Inspiration	2245	256	3150	1844	107.67	3712	3349	6.2438	0.8231	2234	253	3112	1848	106.57	3825	3346	6.2937	0.8241
L.S.D at 0.05	27	23	151	1359	1.2472	379	19	0.0715	0.0107	43	13	60	1222	1.2338	21	12	0.0618	0.117
Chemical fertilizer (200 kg N/fed)	2421	258	3134	2051	114.38	4156	3331	6.0625	0.8175	2351	278	2989	2071	114.41	4149	3306	0.0250	0.8188
Compost manure (200 kg N/fed)	2200	289	3104	1865	119.09	3656	3509	5.9125	0.8388	2219	278	3030	1851	119.61	4106	3532	5.8750	0.8538
Poultry manure (200 kg N/fed)	2256	289	3126	1901	116.46	4119	3439	6.3625	0.8225	2250	284	3005	1868	115.73	4126	3440	6.4125	0.8213
Chemical fertilizer + Compost manure (1/2 + 1/2)	2214	286	3141	1842	117.50	4121	3495	5.9625	0.8250	2223	299	3090	1817	116.11	4112	3499	5.8125	0.825
Chemical fertilizer + Poultry manure (1/2 + 1/2)	2253	291	2921	1859	115.94	4142	3422	6.1375	0.8075	2239	283	3110	1858	115.19	4133	3429	6.2125	0.8125
Chemical fertilizer + Compost manure (1/3 + 2/3)	2235	283	3165	1810	117.44	4102	3456	5.7750	0.8275	2219	290	3100	1815	115.66	4072	3460	5.7875	0.8213
Chemical fertilizer + Poultry manure (1/3 + 2/3)	2240	286	3170	1826	115.41	4109	3434	6.0875	0.8113	2243	280	3085	1815	114.20	4111	3425	6.2000	0.8080
Chemical fertilizer + Compost manure + Poultry manure (1/3+1/3+1/3)	2200	293	3178	1790	120.28	4069	3496	6.0375	0.8400	2219	291	3099	1730	119.25	4042	3510	6.1000	0.8425
L.S.D at 0.05	29	14	139	2377	1.7081	483	17	0.0912	0.103	34	11	118	1279	1.5372	1315	15.6	0.0936	0.113

respect, application of the recommended dose of nitrogen fertilizer as mineral form only significantly increased total nitrogen, nitrate nitrogen and total acidity for produced fruits. On the other hand, application of recommended dose of nitrogen as mineral and organic fertilizer (Compost manure and poultry manure) at a ratio of ($\frac{1}{3}+\frac{1}{3}+\frac{1}{3}$) reflected the highest fruit content of phosphorus, potassium, vitamin C, total sugars and carotenoids content compared with the other studied fertilizers treatments. In addition, application of recommended dose of nitrogen as poultry manure (200kg-N/fed) exhibited the highest values of TSS in produced fruits during both seasons of study. In this respect, **Midan (1995), Eissa (1996), Abd El- Aty (1997), Adam *et al.,* (2001), Sallam (2002), Hassan (2002) on organic manure and, Gabal (1980) Doikova *et al.,* (1986), Shaheen *et al.,*(1999) Abd El-Baky (2000), Aliyu (2000), Gaber *et al.,* (2001) Hassan *et al.,* (2004)** on mineral fertilizers reported that there were differences in all fruit chemical constituents as a result of different tested fertilizers treatments.

4.2.4.2.c. Effect of the interaction.

Data in Table (28) indicate that application of recommended dose of nitrogen (200kg-N/fed.).as mineral form only increased each of total nitrogen, nitrate-nitrogen and total acidity. In addition, application of nitrogen at the recommended dose as a mixture of mineral and organic fertilizer (compost) at ratio of ($\frac{1}{2}+\frac{1}{2}$) increased phosphorus content of produced fruits. Moreover, addition of nitrogen fertilizer at recommended dose (200kg-N/fed) in the form of poultry manure or poultry manure

Table (28): Effect of the interaction between cultivars and fertilization levels on mineral and organic constitutes (mg/100g D.W.) in dry matter of sweet pepper fruits.

Season / Treatments		2006-2007									2007-2008								
cultivars	Cultivars fertilization level	N	P	K	NO_{3-N}	VC mg/ 100g D.W.	Acidity cm^3/l	Total sugar mg/100g D.W.	TSS %	Carotenoids mg/100g D.W.	N	P	K	NO_{3-N}	VC mg/ 100g D.W.	Acidity cm^3/l	Total sugar mg/100g D.W.	TSS %	Carotenoids mg/100g D.W.
Zidenka	Chemical fertilizer (200 kg N/fed)	2460	253	3165	2075	123.70	4426	3368	5.8500	0.8150	2413	300	2843	2088	123.28	4437	3367	5.7250	0.8125
	Compost manure (200 kg N/fed)	2220	318	3100	1864	128.15	4406	3630	57000	0.8350	2223	313	2955	1858	130.05	4381	3672	5.5500	0.8575
	Poultry manure (200 kg N/fed)	2275	320	3097	1929	124.70	4416	3565	6.2000	0.8275	2263	313	3048	1868	124.53	4390	3555	6.2750	0.8300
	Chemical fertilizer + Compost manure (1/2 + 1/2)	2205	328	3118	1887	126.63	4389	3673	5.7250	0.8200	2230	335	3060	1805	126.25	4374	3626	5.5000	0.8375
	Chemical fertilizer + Poultry manure (1/2 + 1/2)	2038	325	3138	1887	125.45	4408	3511	5.9750	0.8100	2238	315	3093	1870	124.78	4391	3521	6.0750	0.8200
	Chemical fertilizer + Compost manure (1/3 + 2/3)	2248	318	3148	1830	127.73	4416	3543	5.5500	0.8300	2215	313	3010	1810	125.33	4371	3559	5.4000	0.8200
	Chemical fertilizer + Poultry manure (1/3 + 2/3)	2238	323	3140	1851	124.88	4396	3516	5.9000	0.8150	2263	323	3005	1829	123.80	4108	3512	6.0750	0.8075
	Chemical fertilizer + Compost manure + Poultry manure (1/3+1/3+1/3)	2195	318	3208	1827	130.43	4393	3617	5.8250	0.8325	2208	330	3105	1738	129.60	4358	3629	5.9000	0.8450
Inspiration	Chemical fertilizer (200 kg N/fed)	2383	263	3103	2027	105.05	3887	3295	6.2750	0.8200	2900	355	3135	2054	105.55	3862	3245	6.3250	0.8250
	Compost manure (200 kg N/fed)	2180	260	3108	1865	110.03	2906	3387	6.1250	0.8425	2215	243	3105	1844	109.18	3832	3393	6.2000	0.8500
	Poultry manure (200 kg N/fed)	2238	258	3155	1873	108.23	3822	3314	6.5250	0.8275	2238	255	3963	1868	106.92	3863	3326	6.5500	0.8125
	Chemical fertilizer + Compost manure (1/2 + 1/2)	2223	245	3165	1809	108.37	3853	3363	6.2000	0.8300	2215	263	3120	1829	105.98	3851	3372	6.1250	0.8275
	Chemical fertilizer + Poultry manure (1/2 + 1/2)	2268	258	3138	1831	106.43	3877	3333	6.3000	0.8050	2240	250	3128	1846	105.60	3875	3338	6.3500	0.8050
	Chemical fertilizer + Compost manure (1/3 + 2/3)	2223	248	3183	1791	107.15	3788	3370	6.0000	0.8250	2223	268	3190	1820	105.80	3774	3362	6.1750	0.8225
	Chemical fertilizer + Poultry manure (1/3 + 2/3)	2243	250	3200	1801	105.95	3822	3352	6.2750	0.8050	2223	238	3165	1802	104.60	3814	3338	6.3250	0.8100
	Chemical fertilizer + Compost manure + Poultry manure (1/3+1/3+1/3)	2205	268	3148	1754	110.12	3746	3376	6.2500	0.8475	2230	253	3093	1722	108.90	3726	3390	6.3000	0.8400
	L.S.D at 0.05	41	20	197	3362	2.4156	684	24	0.1289	0.0145	48	15	166	1809	2.1739	1859	2237	0.1323	0.134

combined with mineral fertilizer at a ratio of ($\frac{2}{3}:\frac{1}{3}$) increased potassium and TSS content. Also the same data indicate that addition of nitrogen fertilizer at the recommended dose (200kg-N/fed) as organic fertilizer (compost) reflected the highest values of vitamin C, total sugars and carotenoids content. Obtained data are true during both seasons of growth.