

Assessment of some Varieties of Squash under the Desert Conditions of Basrah

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Abstract

The experiment was conducted in a farm at Al- Haddama area/Safwan district/ Al Zubair region/ Basrah province, during seasons of 2007/2008 and 2008/2009 to test three hybrid cultivars of summer squash (Kriti F₁, Amjad F₁ and Arti F₁).

These cultivars were compared with the local cv. Mulla Ahmed in characteristics of vegetative growth (plant height, spreading area, leaf and peduncle area, fresh and dry weights of the leaf, total chlorophyll) and yield (days from cultivation to Horticultural maturation, number of fruits/plant, mean weight of the fruit and its length, yield per plant, total productivity). In addition to the qualitative characteristics of leaves and fruits which included fat, protein, carbohydrates, nitrogen, phosphorous, potassium and refractive index of oil in seeds

Randomized Complete Block Design (RCBD) with three replications was used . Means were compared through least modified differences test (L.S.D.) at a probability level of 0.05.

Results showed a variation in the response of the cultivated cvs. due to the environmental surroundings, where Kriti F₁ superiority in fresh and dry weight of leaves in the first season, the content of nitrogen, phosphor, potassium and protein percentage in leaves and fruits in the second season. In addition, the number of fruits, yield per plant, total productivity and refractive index of oil in seeds for both seasons. Amjad cv. provided the highest content of carbohydrates in leaves and highest number of fruits per plant for the first season, and highest yield per plant and total productivity for the second season, and superiority in the leaf area and fruit contents of carbohydrates for both seasons. Results also showed that the superiority of Arti F₁ cv. in fresh and dry weights of leaves and the mean weight of fruit for the

second season, height of plant and spreading area for both seasons. Mulla Ahmed cv. surpassed in leaves content of total chlorophyll for both seasons, and an increase in carbohydrate content in the first season, phosphorus in second season and fruits content of carbohydrates in the same season. The three cv. recorded an increase in the leaves and fruits content of potassium for both seasons as compared to the cv. Mulla Ahmed.

Keywords: Cultivars, Summer Squash, Season.

Introduction

Summer squash (*Cucurbitapepo*L.) is a vegetable crop of Cucurbitaceae family; all its cvs. are affiliated to species pepo. Its economic importance comes after melon and cucumber (1).

There are several evidences that North America is the home of the five major species of genus *Cucurbita* which are pepo, maxima, moschata, argyrosperma and ficifolia, it is also evident from the oldest artifacts that species pepo was widely spread in North Mexico and South Western American States (2).

Summer squash is one of the vegetables that are widely demanded by consumer, as its fruits used for different purposes. Small or medium-sized ones of some cvs. are cooked in several ways or used in to prepare pickles. They might also be cultivated

to produce a ripe seeds that are directly eaten or for medical purposes as it enhances nerves and heart, diuretic, relieves coughing, laxative as its fruits easily digested. The pulp of the fruit is externally used to treat heartburn of limbs due to fever or as compresses for abscesses (3, and 4). Its importance comes from its high nutritious value as every 100 g. of ripe fruit contain 19 calories, 1.1g. of protein, 0.1g. of fat, 4.2g. of carbohydrates, 0.6 g. of fibers, 0.6g. of ash, 28 mg of calcium, 29 mg of phosphorus, 0.4 mg of iron, 1 mg of sodium, 2.2 mg of potassium, 16 mg of magnesium, 410 IU of vitamin A, 0.5 mg of thiamin, 0.09 mg of riboflavin, 1 mg of niacin, 22 mg of ascorbic acid, 0.36 of ienthonic acid, and 0.8 mg of pyridoxine (5).

Summer squash in Iraq is planted in autumn and spring as open cultivation in addition to covered cultivation during winter. The cultivated area of summer squash in Iraq was 9996 ha. in 2011 with a total productivity of 165239 tons, i.e., 16.5305 ton/ha. in mean (6) . The decrease in productivity is due to the degradation of local and adapted compositions due to genetic breeding or interbreeding, despite of modern techniques in agriculture, bad management, disease and pest infections. The productivity of this yield can be increased by using modern scientific techniques, provide an improvement of local cvs. and incorporate new hybrids (7). Its variation in cvs.production can be attributed to the factors affecting the quality and quantity characteristics of the yield. This is due to either the nature of the cv. and its adaptance to common environmental conditions in certain region or its genetic factors. Hassan (2) mentioned that summer squash is herbal and annual plant; its cvs. grow upright or spreading. The growth of the upright cvs.might reach 9-120 cm, whereas spreading ones reach 6-9 m. most of which are

monoecious with pulpy fruits (pepo) and are different in shape, texture, both internal and external colors in accordance with the difference in cvs. Its seeds are oval in shape.

From the studies carried out on this plant in Iraq (7) when cultivating Amjad cv. in Baghdad, it gain a good vegetative growth where the plant height reached 51.76 cm, leaves area 1.16 m², leaves percentage of total chlorophyll was 40.4%. As for the quantitative characteristics of squash, it was obtained 4.43 fruits per plant, 0.83 kg of fruit per plant, 5.55 ton.ha⁻¹ of early product and 27.65 ton.ha⁻¹ as total production. A mean length of fruit was 11.33 cm and 3.17 cm in diameter contained 4.84% of total soluble solids . The study done by Al-Musawy (8) in Baghdad showed that comparing Mulla Ahmed cv. with Tokay cv., the latter surpassed in the length of plant (122.47, 99.58) cm, leaf area 1.1, 0.97 m² dry weight of the vegetative part 242.97, 181.69 g./plant, leaf content of total chlorophyll 63.20, 60.04 mg.100 g., their nitrogen percent 2.63, 2.42 %, length of fruit 14.60, 13.18 cm, number of fruits per plant 7.23, 4.84,

plant yield 1.521, 1.054 kg, total productivity 37.18, 25.764 ton/ha. and fruits content of carbohydrates 3.56, 3.38 mg.g⁻¹ for each cv. respectively. On the other hand, Mulla Ahmed cv. surpassed in the number of branches per plant 1.51, 1.47, number of leaves per plant 44.44, 42.89, fruit's diameter 4.20, 3.86 cm, a mean weight of fruit 217.617, 210.272 g. for each cv. respectively.

Boras *et al.* (9) in Syria indicated that the superiority of Beiruity cv. over Mabroka in the number of fruits (16, 13), plant yield was 2.152, 1.775 kg, and productivity 5165, 4260 kg/donum for each cv. Respectively . AL-Badran (10) obtained the highest early and total yield for the plant when cultivating Kriti cv. in Basrah which they reached 0.819 and 3.614 kg for plant yield and productivity respectively.

In order to increase the productivity of summer squash and to test some new cvs. to common environmental and climate conditions in Basrah, the experiment carried out under desert region conditions of Basrah to compare three hybrid cvs. of summer squash with the common

MullaAhmed cv. using plastic tunnels methods.

Materials and Methods

An experiment was conducted in a farm at Al- Haddama area affiliated to Safwan district in Al- Zubair region, Basrah province during the growing seasons of 2007/2008 and 2008/2009 to evaluate three hybrid cvs. in a mixed sand soil having a pH of 7.20, E.C. of 4.10 Des.m⁻¹ and organic matter content of 0.37%.

Randomized Complete Block Design (RBCD) was used in designing the experiment with three replications and the means were compared by using the least significant difference at a 0.05 level of probability (11). The experiment involved measurements of field and quality of vegetative growth with included the height of the plant (cm), spreading area (cm²), as the diameter of the lower leaves was measured to know the area and space occupied by the plant, the area of the leaf and peduncle (cm²) as mentioned by (12), fresh and dry weights of the leaf (g.), an estimation of total chlorophyll pigment (mg/100g) in leaves according to the method

mentioned by (13). Readings of the yield involved counting the days from cultivation to horticultural maturation, number of fruits/plant, a mean weight of the fruit (g) its length (cm), yield per plant (kg) and total productivity ($\text{ton}\cdot\text{ha}^{-1}$). The fat percentage in fruits was done by soxhlet extraction method mentioned by (14) and the refractive index of the oil in the seeds according to (15). In addition to the qualitative characteristics of leaves and fruits which included carbohydrates ($\text{mg}\cdot\text{g}^{-1}$) by the method of (16), protein percentage (17), nitrogen by the method of (18), phosphorous by (19) and potassium (mg/g) by (20).

Seeds of local cv. Mulla Ahmed were used, which were produced locally in Karballa province. CVS.Kriti F₁ and Amjad F₁ produced by American Petoseeds Co., and Arti F₁ produced by American Harris Moran Co.

The soil was prepared by plowing adjustment, divided by lines of 34 m each, leaving one meter at the beginning and end of each line, separated by 2 meters and an a mean of 80 plants per line. Decomposed manure was added with a mean of 120

kg per line(as area of $11 \text{ ton}\cdot\text{ha}^{-1}$). Seeds were planted directly into the soil on Sept. 10th 2007 and Sept. 13th 2008 for both seasons, respectively with a mean of 3 seeds per hole. Absent plants were compensated ten days after planting. Plant in each holl reduced into one plant after complete germination . Drip irrigation method was used by having one dropper per hole in a distance of 40cm. Transparent polyethylene cover was added on Dec. 10th 2007 and Dec. 13th 2008. Plants were fertilized by compact magnum fertilizer with 18% nitrogen and with 44% phosphor. The acidic fertilizer has an acidity degree of 2.5. The potassium nitrate fertilizer with 13% nitrogen and 44% potassium was added. The addition of fertilizer was done at three stages, the first after 4 true leaves stage of plant, 1 g. of each fertilizer was added into one liter of water and into the soil right after 2 hours. This addition took place three times with 15 days intervals. The second stage was after 45 days with using 2 g. of each fertilizer on the same way. 2.5 g. of each fertilizer was added on the same way in the third growth stage that was after 90 days of

planting. With each stage, potassium humate fertilizer was added at a rate of 1g.L^{-1} which is an organic fertilizer comprising 85% of potassium. Plants were sprayed with the fungicide Aviso, that produced by the German Company BASF at a rate of 2.5 g.L^{-1} . The fungal control started in Nov. 15th 2007 and Nov. 13th 2008 until the end of experiment for both seasons.

Manual pollination was implemented in the early morning for all tested cv. by collecting the staminate flowers and shaking them over the stigmas of pistilate flowers, in addition to the pollination that can be done by insects sometimes, especially ants. The sex expression ratio for the cv. (1:1) gave staminate flowers at the beginning which might be due to the high temperature and then gave pistilate flowers. Harvesting fruits started after about 45 days of cultivation and continued until the middle of March for both seasons.

Results and Discussion

The result showed that Arti cv. has a significant superiority in plant height and spreading for both seasons, whereas, there is no significant differences noted between Amjad and

Kriticvs. as regard to these characteristics, except for the superiority of Kriti cv. in plant height in the second season. Mulla Ahmed cv. gave less height and spread of the plants for both seasons. It is also noted from the same table the superiority of Amjad cv. on leaf area, followed by a significant difference in Arti, Mulla Ahmed and kriticvs. for both seasons, respectively. Also Table (1) showed that Kriti cv. had a significant superiority in the fresh and dry weights of leaves, followed by Arti and Mulla Ahmed cvs. with a non-significant difference. Amjad cv. gave less fresh and dry weights for leaves in the first season, Whereas in the second season, Arti cv. hold a significant superiority in fresh weight of leaves over other cvs. in the experiment, which have no significant difference among them as regard to this characteristic. The same cv. also hold a significant difference over other cvs. in dry weight, and the least weight was noticed in the leaves of Kriti cv.

Mulla Ahmed cv. gave the highest content of total chlorophyll in leaves for both seasons. Amjad and

MullaAhmed cvs.surpassed in leaves content of carbohydrates, followed by Arti and Kriticvs. with a non significant difference in the first season. CVS. Has no any significant impact on this characteristic in the second season. Results of the same table indicated no significant differences among cvs. in protein percentage in leaves for the first season, whereas Kriti cv. surpassed significantly with this parameter in the second season, followed by Amjad, Arti and Mulla Ahmed cvs. with significant differences, respectively.

Results showed that the leaves content have a significant major elements in the planted cvs. (nitrogen, phosphorous and potassium), where no significant difference was noticed among the cvs. in its leaves content of nitrogen and phosphor in the first season, except its content of potassium as Amjad cv. gave the least percentage compared with the other three cvs which has on significant difference in this characteristic. In the second season plants of Kriticv. surpassed in the leaves content of nitrogen, followed by the plants of

Amjad and Kriticvs. with non significant difference. The least content of nitrogen was noticed in the leaves of Mulla Ahmed cvs. which surpassed also in its phosphorous content with a non significant difference from the leaves of Kriti cv.. Plants of Kriti and Articvs.gave the highest content of potassium in the leaves with a non significant difference from the leaves of Mulla Ahmed cv., which have no significant difference from the leaves of Amjad cv. that gave the least content of potassium in the leaves.

Table (2) showed that Mulla Ahmed cv. maturation was early in both seasons as compared with other cvs. in the experiment. Kriti cv. gave the highest number of fruits for the plants of both seasons with non significant difference from Amjad cv. in the first season, whereas Arti and Mulla Ahmed cvs. gave less number of fruits for both seasons. It is also noted from the same table that there is no significant difference among the cvs. in the length of the fruit and its mean weight for both seasons except for the mean weight of the fruit in the second season, where Arti cv.

Table (1) Characteristics of vegetable growth of cultivated summer squash cvs. under desert conditions of Basrah on 2007/2008 and 2008/2009 season

First season 2007/2008											
Cultivar	Plant height (cm)	Spread area (cm ²)	Leaf area (cm ²)	Fresh weight of leaves (g)	Dry weight of leaves (g)	Chlorophyll (mg/100g)	Carbohydrates (mg.g ⁻¹)	Protein (%)	N (mg.g ⁻¹)	P (mg.g ⁻¹)	K (mg.g ⁻¹)
Mulla Ahmed	40.00	70.00	310.98	22.67	2.68	0.198	46.88	13.26	21.21	0.124	55.76
Kriti	50.00	75.00	183.11	25.71	2.96	0.182	40.34	13.27	21.23	0.097	57.65
Amjad	50.00	75.00	488.90	18.65	2.21	0.154	48.66	14.83	23.73	0.080	44.81
Arti	70.00	110.00	479.58	23.38	2.70	0.171	42.97	14.47	23.10	0.127	57.65

L.S.D 0.05	4.58	4.94	5.68	2.19	0.03	0.009	4.33	2.81 N .S	4.49 N .S	0.055 N . S	8.84
Second season 2008/2009											
Mulla Ahmed	39.00	72.00	300.83	18.71	2.29	0.167	44.99	13.81	22.10	0.121	53.34
Kriti	51.00	74.00	187.32	18.45	2.09	0.161	42.14	17.56	28.10	0.117	59.32
Amjad	49.00	76.00	488.97	19.37	2.65	0.144	47.61	15.77	25.23	0.087	47.28
Arti	67.00	98.00	480.96	23.65	2.73	0.159	45.11	14.42	23.07	0.108	57.52
L.S.D 0.05	3.87	6.32	5.19	2.98	0.033	0.022	5.61 N .S	0.53	0.86	0.013	6.44

Table (2) Crop characteristics and its components for studied summer squash cultivated in desert region conditions in Basrah for 2007/2008 and 2008/2009 seasons.

First season 2007/2008													
Cultivar	No. days of horticultural maturation	No. of fruits/plant	Length of fruit (cm)	Weigh of fruit (g)	Productivity per plant (kg)	Total productivity (ton. ha ⁻¹)	Carbohydrates (mg.g ⁻¹)	Protein (%)	Fat (%)	Refractive index of oil in seeds (%)	N (mg. g ⁻¹)	P (mg. g ⁻¹)	K (mg. g ⁻¹)
Mulla Ahmed	28.00	9.00	18.00	230.88	2.00	5.50	61.77	8.19	0.350	1.34507	13.11	0.110	34.46
Kriti	34.00	17.00	17.00	251.27	4.25	11.69	55.16	10.06	0.389	1.34807	16.10	0.087	35.63
Amjad	32.00	14.00	18.00	252.78	3.50	9.63	68.95	8.67	0.367	1.34710	13.87	0.072	27.70
Arti	34.00	6.00	18.00	262.50	1.50	4.13	57.85	8.83	0.346	1.34510	14.12	0.113	35.63
L.S.D	4.58	4.04	3.83	105.8 N.S	0.62	1.71	2.82	1.89 N.S	0.209 N.S	0.0005	3.03 N.S	0.049 N.S	5.07

5%			N .S										
Second season 2008/2009													
Mulla Ahmed	30.00	7.00	16.00	266.67	1.85	5.09	63.53	8.48	0.385	1.34447	13.57	0.108	33.04
Kriti	33.00	15.00	17.00	233.56	3.48	9.58	57.52	12.33	0.457	1.34813	19.73	0.105	36.75
Amjad	31.00	11.00	16.00	268.41	2.93	8.07	67.38	9.09	0.403	1.34727	14.54	0.073	28.62
Arti	35.00	5.00	15.00	322.78	1.58	4.35	63.27	8.82	0.335	1.34510	14.10	0.096	35.55
L.S.D 5%	4.36	2.88	3.46 N .S	76.40	0.62	1.71	5.96	1.14	0.229 N .S	0.0004	1.82	0.007	4.01

difference for both seasons. Also it can be seen from the results that Amjad cv. surpassed carbohydrates content, followed with a significant difference by Mulla Ahmed cv. The least content was in the fruits of Arti and Kriti cv. with no significant difference for the first season. Whereas in the second season, Mulla Ahmed and Arti cv. surpassed with no significant difference from Arti cv. which hold no significant difference from Kriti cv. that gave the least content of carbohydrates in fruits. It is also noted from the same table that there are significant differences among the studied cvs. in the protein percentage in fruits during the first season where Kriti cv. surpassed in its fruits content of both cvs. with no significant difference from other three cvs. It is also noted that there are no significant differences among the cvs. fruits in fat percentage for both seasons. Kriti cv. surpassed in refractive index of oil in seeds and followed with a significant difference by Amjad and Articvs. respectively. The least refractive index was in the seeds of Mulla Ahmed cv. for both seasons.

surpassed in this characteristic, with no significant difference from Amjad and Mulla Ahmed cvs. Kriti cv. gave the least mean for the fruit with no significant difference from the two mentioned cvs. In addition, the results showed the superiority of Kriti cv. in plant yield and total productivity for both seasons, and no significant difference from Amjad cv. in the second season whereas the less productivity for both characteristics was in the fruits of Arti and Mulla Ahmed cvs. with no significant difference for both seasons, and no significant difference from Amjad cv. in the second season, The least productivity for both characteristics was in the fruits of Arti and Mulla Ahmed cvs. with no significant

Results of the same table expressed that there were no significant differences in fruits content of nitrogen and phosphorous in the first season, whereas Kriti cv. surpassed in these characteristics in the second season followed with no significant difference by the other three cvs. in their fruits content of nitrogen, and with no significant difference from Mulla Ahmed cv. in its fruits' content of phosphorous. This was followed with a significant difference by Articv. The least content of phosphorous was noted in Amjads fruits cv. These fruits showed the least content

of potassium compared with the other cvs. which hold no significant difference among them in this characteristic for both seasons.

Results showed variations among the cvs. in the studied characteristics in general. This might be due to the difference in their genetic composition, their adaptation and response against the surrounding climate conditions (9). The superiority of Arti cv. in plant height gave a positive indicator on the plant's ability to absorb major elements and nutrition to meet the requirements of the vegetative growth, which are water, nutritious elements and especially major elements (N, P, and K) (21). The height of the plant might be due to the introduction of nitrogen into the composition of proteins and enzymes that are important for several vital processes within the plant, and the role of these materials in organizing the plant hormones controlling growth and division of meristimatic cells and stimulating the vital processes which were positively reflected in the spread area and dry weight of the plant (22). The superiority of the same cv. and Kriti cv. in fresh and dry weights might be due to their suitability to the conditions of the region where the plants take their need of water and nutrition. Leaves content of chlorophyll can be explained based on their content of nitrogen. The early maturation of Mulla Ahmed cv. can be due to its nature and compatibility to the surrounding climate conditions of temperature and light, providing the growing fruits with what their need of nutritious requirement for growth and development. The difference in the mean weight of fruit can be related to the few number of formed fruits. Subsequently getting larger quantity of nutrition stuff that increasing the mean weight of the fruit. This can be attribute to the role of phosphorous in stimulating plant to grow and form fruits (23). The superiority of Kriti cv. in the yield characteristics for both seasons might be due to the cv. compatibility to the climate conditions, and the ability of its plants to deliver their needed of nutrition growth and development which reflected on the number of fruits, plant yield and total productivity. Superiority cv. in refractive index can be due to the cv. ability to form non saturated fat acids or increase forming fat acids that related with high degree of non-saturation such as oliec and linoleic, which would increase the refractive index of oil, or can be due to the of evaporation some oil by high temperature which would help in decreasing the concentration of non

solid compounds that is accompanied with an increase in the concentration of oxygen compounds, increasing by that the refractive index (24). From the discussion above we can be conclude that there is a variation among the planted cvs. in their response and compatibility to the surrounding climate conditions. Kriti cv. showed highest response that was reflected on the yield and its content, and followed by Amjad cv. we can recommend that including other cvs. of summer squash in different groups and seasons to increase production, in addition to study fruits quality.

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تقويم بعض أصناف قرع الكوسة Squash تحت ظروف المنطقة الصحراوية في البصرة

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المستخلص

اجريت التجربة في احدى مزارع منطقة الهدامة/ ناحية سفوان/ قضاء الزبير/ محافظة البصرة للموسمين 2007/2008 و 2008/2009 لاختبار ثلاثة اصناف هجينة من قرع الكوسة (كريتي Kriti F1 وامجد Amjad F1 وآرتي Arti F1 مقارنة بالصنف المحلي ملا احمد Mulla Ahmad في صفات النمو الخضري (ارتفاع النبات ومساحة الافتراش ومساحة الورقة والوزنين الطري والجاف والكلوروفيل الكلي) والحاصل (عدد الايام من الزراعة الى النضج البستاني وعدد الثمار ومعدل وزن الثمرة وطول الثمرة وحاصل النبات الواحد والانتاجية الكلية) والنسبة المئوية للدهن والبروتين ومحتوى الكربوهيدرات وعناصر النتروجين والفسفور والبوتاسيوم في الاوراق والثمار ومعامل انكسار الزيت في البذور. استعمل تصميم القطاعات العشوائية الكاملة بثلاثة مكررات لتصميم التجربة وقورنت المتوسطات بموجب اختبار اقل فرق معنوي معدل عند مستوى احتمال 0,05 .

اظهرت النتائج تفاوت الاصناف المزروعة في استجابتها للظروف البيئية المحيطة إذ تفوق الصنف كريتي في الوزنين الطري والجاف للاوراق في الموسم الاول, وفي محتوى الاوراق والثمار من عناصر النتروجين والفسفور والبوتاسيوم ونسبة البروتين في الموسم الثاني, وفي عدد الثمار وحاصل النبات الواحد والانتاجية الكلية ومعامل انكسار الزيت في البذور لكلا الموسمين . في حين اعطى الصنف أمجد اعلى محتوى من الكربوهيدرات في الاوراق واعلى عدد للثمار على النبات في الموسم الاول , وأظهر اعلى حاصل للنبات الواحد والانتاجية الكلية في الموسم الثاني , وتفوق في مساحة الورقة ومحتوى الثمار من الكربوهيدرات لكلا الموسمين . كما أشارت النتائج الى تفوق الصنف آرتي في الوزنين الطري والجاف للاوراق في وزن الثمرة في الموسم الثاني , وفي ارتفاع النبات ومساحة الافتراش لكلا الموسمين . وتفوق الصنف ملا احمد في محتوى الاوراق من الكلوروفيل الكلي لكلا الموسمين , وزيادة محتواها من الكربوهيدرات في الموسم الاول ومن الفسفور في الموسم الثاني وزيادة محتوى الثمار من الكربوهيدرات في الموسم ذاته . وسجلت الاصناف الثلاثة زيادة في محتوى الاوراق والثمار من البوتاسيوم لكلا الموسمين مقارنة بالصنف ملا احمد .

الكلمات المفتاحية : الاصناف, قرع الكوسة, الموسم.