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DIFFERENTIAL YIELD RESPONSE OF SOME SWEET SORGHUM CULTIVARS TO PLANTING DATES

Ramadan, B. S. H.
Agron. Dept. Fac. of Agric., Cairo Univ., Giza, Egypt

ABSTRACT

Two field experiments were conducted at the Agricultural Experimental and Research Station Cairo University, Giza, Egypt, during 2002 and 2003 seasons, to study the effect of sowing dates (April 10,May 1, May 21, June 10 and June 30) on the yield and quality of three sweet sorghum cultivars (Willy, Williams and Ramada).

Results of the study revealed that years had no significant effect on all studied traits except Brix and purity percentages.

Early planting date on May 1st produced the tallest, thickest plants, having higher and number of internodes as well as syrup yield, stalk yield and total juice sugar yield / fed, thereafter growth traits were gradually decreased as sowing was delayed up to the end of June. Delay in sowing date up to June 30, intensified the reduced Juice extraction, Brix, sucrose and purity percentages, while reducing sugar increased.

Ramada cultivar had significantly the tallest plants as well as the highest number of internodes/plant followed by Williams and Willy in a descending order, while Williams had the thickest stalks and Willy had the longest internodes. Williams cultivar surpassed the others in juice extraction%, Brix, sucrose% and purity% and had the lowest percentage of reducing sugars which is preferable for syrup production. It significantly surpassed the other ones in syrup yield either per ton of stalks or per feddan as well as total juice sugar yield/fed., followed by Ramada and Willy in a descending order, while Ramada outyielded the other cultivars in stalk yield / fed.

The interaction between sowing dates and cultivars had marked effects on number of internodes/plant, length of internode, juice extraction %, sucrose %, and Brix purity% reducing sugars. The highest stalk yield (37.76 tons/fed) resulted from Ramada with May 1st planting meanwhile the highest syrup yield/ton of stalks (19.05 gallon), syrup yield/fed (677.3 gallon/fed.) and total juice sugar yield (3.17 ton/fed) was obtained from Williams and May 1st planting.

In general, it can be concluded that the highest syrup yield gallon /fed could be obtained from Williams variety with May 1st planting .

INRODUCTION

The gab between sugar production and consumption in Egypt is increasing year after year and as a result the government imports a large quantity of sugar annually. Several attempts have been made in order to narrow this gab; one of which is by introducing new sugar crops to be grown in newly cultivated areas. Park and lee (1991) stated that sweet sorghum *(Sorghum bicolor,* L.) is a new sugar crop with a high potential for sugar and syrup production and could be used as bio- energy resource.

Hip *et al.* (1970) conducted severals experiments to determine the influence of date of planting and solar radiation on yield of sweet sorghum stalks and sugar. Results indicated that radiation received by the plants during the period between boot and early seed formation accounted for about

75% of the variation in yield . Maximum solar radiation in the experimental location during June, July and August, consequently maximum yields were obtained from April, May and June plantings. Broadhead (1972) found that yields of stalks and sugar from May 1st planting were significantly higher than those from April and June 1S. In another study Ferraris and Edwards (1986) studied the effect of four sowing dates extending from late Sept. to mid Jan. on two sorghum cultivars. Results indicated that the concentration of sugars in one cultivar averaged 40% which was about 10 times the level in the other. The accumulation was near linear function of either time or radiation sun. The efficiency of light use for sugar production was greater in one cultivar than the other, and yield of sugars in one cultivar exceeded 19 t/ha when the crop was sown early in the season but was only 3 t/ ha with late –sown crops. Machado *et al.* (1987) grew sweet sorghum at 2 sites on various dates between Sept. 30 and Feb. 21 . They found that yield of stems increased with sowing up to early Nov. then decreased. The highest stem yield was given by crops of plants with a high number of internodes and large stem diameter of tall plants. Ghatode *et al.* (1991) planted sorghum on June 29, and July 6, 13 and 20 . They observed that the delay in sowing decreased stalk diameter, total soluble solids, reducing sugars and sugar content in juice. Petrini *et al.* (1993) reported that sowing dates significantly affected stalk and sucrose yields, sucrose content, and invert sugars in two sweet sorghum cultivars. Almodares *et al.* (1994) reported that May sowing date , resulted in higher stripped stalk yield, Brix value, pol and purity than June sowing. At both planting dates, the stalk and sugar yields were highest in some cultivars than others. Moreover, Brix value, pol and purity percentages were higher in some cultivars than others. The interactions between cultivar and date of planting were significant for stripped stalk yield, Brix value and pol%. Besheit *et al.* (1996) studeied the effect of three sowing dates (May 15, 30 and June, 15) on two sweet sorghum cultivars (Sucrosorgo 301 and 405). They reported that sowing sweet sorghum on May. 15 proved to be the best date for sowing both cultivars. Sowing sweet sorghum on May 15 produced the highest stalk weight, juice extraction, syrup extraction, Brix, sucrose and purity percentages. On the other hand reducing sugars % increased significantly as sowing was delayed till June 15. Almodares *et al.* (1997) planted 15 sweet sorghum cultivars and lines on March 10, April 10, May 10 or 10 June. They found that the highest stalk yield was obtained from Keller and Rio cvs. when sowen early. Sowing date had no effect on Brix value and sucrose percentage, while cultivars differed in both traits and Keller cv. showed the highest Brix value. while Keller and Rio cvs had the highest sucrose content.

Several investigators like Nour (1963), Atia, Nour El-Hoda (1990), Besheit *et al.* (1996) and Saleh (2004) reported varietal differences in average stalk weight, stripped stalk weight, stalk dimension and stalk yield. While Galani *et al.* (1991) found that juice extractioand juice quality were affected by sweet

genotypes. Abo El-Wafa and Abo El-Hamd (2001) tested the performance of seven sweet sorghum cultivars (Umbrela. Smith, Leati, Williams, Tracy, Planter and S.S. 301). Their results indicated a remarkable

variation amang cultivars, where SS 301 had the superiority over the other cultivars in TSS,sucrose and lowest reducing sugars percentages. Thakare *et al.* (2002) and Amaducci *et al.* (2004) found varietal differences in stalk juice, reducing sugar and sugar contents. While Sinare *et al.* (2004) studied the effect of three genotypes (Rssv-9, Gssv-306 and ssv-84). They reported that commercial cane sugar percent was not influenced significantly by genotype, the maximum total sugar percent (12.34) and reducing sugar (1.64) was observed in ssv-84. El-Shafai *et al.* (2005) tested the performance of two sweet sorghum varieties (Brands and Honey). The results indicated that Honey variety surpassed significantly Brands in stalk height , stalk diameter and forage yield/fed.

The objective of this article was to study the effect of sowing date on yield and qulity of some sweet sorghum cultivars

MATERIALS AND METHODS

Two field experiments were conducted at the Agricultural Experimental and Research station Cairo University, Giza, Egypt during 2002 and 2003 seasons . The soil texture of the experimental site was clay with 8.1 and 7.8 pH, 1.6 and 1.4 % organic matter, 0.12 and 0.09 % total nitrogen, and 1.92 and 0.93 E.C mmhos in both seasons, respectively.

A randomized complete block design in a split plot arrangement with four replications was used. Five planting dates (April 10^{th} , May 1^{st}, 21^{st} and June 10^{th} and 30^{th}) occupied the main plots. Whereas three varieties; namly Willy, Williams and Ramada were allocated to the sub plots. The sub plot consisted of 5 ridges 5 m long and 70 cm apart thus sub plot size was 17.5 m^2. Hills were 25 cm apart . Plants were thinned to two plants per hill after 21days from planting and received 90 kg N/fed as urea (46 % N). Before sowing 31 kg P_2O_5/ fed (in the form of superphostate 15.5 % P_2O_5) , and 24 kg k_{2O}/ fed as potassium sulphate (48 % k_2O) were added. Other cultural practices were carried out as recomended. Harvest was carried out when seeds were in the dough stage of maturity.

At harvest time a sample of ten stalks from each sub plot was taken at random. The leaves and heads were removed from the stalk samples to determine stalk length (cm) measured from soil surface to the node at the base of the top mest-panicle, number of internodes/stalk and stalk diameter (measured at the middle of the fourth internode from stalk bottom) (measured from soil surface to the node at the base of the top mest-panicle). Length of internod = stalk length/number of internodes per plant. Each sample was crushed in a roller mill to obtaine juice for analysis. Juice extraction% was determined by (dividing juice weight/stalk weight)x 100. Total soluble solid (Brix) was estimated by using ATAGO digital refractmeter. Sucrose% was estimated by using the direct polarization method (De-Whally, 1964). Purity percentage = (Sucrose % / Brix) x100 . Reducing sugars / 100 cm^3 juice was estimated by using Fehling solution according to Plews (1970). Syrup yield per ton of stalks was calculated as follows; ST = EB (2000) (0.90) / (11.25) (0.75) where ST = gallons of syrup per ton of stalks, E = percent juice extraction , B = Brix , 2000 = pounds of stalks, 0. 9 = factor for 10 %

Skimming loss , 11.25 = pounds per gallon of syrup , and 0.75 = Brix in syrup (Broadhead *et al.*, 1963). Total juice sugar yield (ton/fed.) was calculated by using the formula proposed by Soileau and Bradford (1985) as follows = fresh stalk yield x juice extraction % X Brix . Total weight of each plot after being stripped and removing leaves and heads was used to determine fresh stalk yield (ton/fed).

Combined analysis of the two seasons was calculated after testing the homogeneity of the variance and data were exposed to the proper statistical analysis of variance by using the computer package MSTATC. Treatment means were compared by the LSD test as given by Waller and Duncan (1969) at the 5% level of probability.

The average temperature during the growth period in 2002 and 2003 seasons, are reported in Table 1.

Table 1: Maximum and minimum monthly temperature at during study seasons.

Seasons / Months	2002		2003	
	Max.	Min.	Max.	Min.
April	28.6	14.6	28.8	13.4
May	32.5	17.6	34.2	17.9
June	36.1	19.6	35.9	21.4
July	40.7	23.6	35.6	20.7
August	35.4	25.7	34.8	24.2
September	34.3	21.2	32.8	20.2
October	29.3	17.8	29.6	17.6
November	28.3	14.9	25.3	13.7
December	27.1	14.0	24.1	13.2

RESULTS AND DISCUSSION

A: Growth traits:

Data presented in Table 2 revealed that years had no significant effect on stalk length, stalk diameter, number of internodes/plant and internode length.

Planting dates significantly affected growth traits (Table 3). Planting on May 1st produced the tallest and thickest plants having higher number of internodes, therafter growth traits were gradually decreased as sowing was delayed up to the end of June. It is worth mentioning that May 1st planting surpassed April 10th in growth traits with significant differences for stalk length and length of the internode.Thesuperiority of early sowing (May1^{t}) might have been due to the increase in maximum temperatures prevailing during the growth period which in turn favoured photosynthetic efficiency and consequently produced more vigorous plants. Similar results were obtained by Machado *et al.* (1987), Ghatode *et al.* (1991) and Saleh (2004).

Cultivars exhibited significant differences in growth traits (Table 3). Ramada cultivar had significantly the tallest plants as well as the highest number of internodes / plant followed by Williams and Willy in a descending

order, while Williams had the thickest stalks (3.08 cm) and Willy had the longest internodes (15.06 cm) with significant differences with the other cultivars.

Table 2: Combined analysis of variance for several studied traits.

Source of variation	d.f	Stalk length (cm)	Stalk diamater (cm)	No. of internods per plant	Length of internod (cm)
Year (Y)	1	154.13	0.28	2.95	6.48
R (Y)	6	71.16	0.12	1.18	2.17
Planting date (D)	4	9633.76 **	2.17 **	41.48 **	8.02 **
YD	4	397.70 **	0.15 *	0.52	1.7
Error	24	67.36	0.04	1.36	1.4
Cultivars (C)	2	1975.98 **	3.10 **	20.27 **	3.40 **
YC	2	66.79	0.08 *	0.009	2.33 *
DC	8	91.01	0.03	2.39 **	3.15 **
YDC	8	85.50	0.04	0.20	0.30
Error	60	64.19	0.02	0.31	0.59

Table 3: Means of stalk length, stalk diameter, number of internodes/plant and length of internode as affected by years, planting dates and cultivars.

Traits / Treatments	Stalk length cm	Stalk diameter cm	No.of internodes per plant	Length of internode cm
Years				
2000	229.7	2.82	15.29	15.02
2001	227.5	2.91	15.60	14.58
F. test	NS	NS	NS	NS
Planting dates				
April 10	243.6	3.08	16.07	15.16
May 1	248.4	3.15	16.08	15.44
May 21	236.4	2.99	15.15	15.60
June 10	211.0	2.67	15.01	14.06
June 30	203.8	2.44	15.01	13.58
LSD at 0.05	4.1	0.10	0.58	0.58
Cultivars				
Willy	221.2	2.55	14.69	15.06
Williams	229.4	3.08	15.69	14.62
Ramada	235.2	2.97	15.99	14.71
LSD at 0.05	3.0	0.05	0.20	0.28

Differences among sweet sorghum cultivars in growth traits were reported by Nour (1963), Atia Nour El-Hoda (1990), Besheit *et al.* (1996) and El-Shafai *et al.* (2005).

B – Juice quality traits :

Data presented in Table 4 indicated that differences between years for juice quality traits in terms of juice extraction, sucrose and reducing sugar percentages were not significant, while Brix and purity were significant. The differences among planting dates in juice quality traits were significant (Table 5). Planting on May 1st had the highest percentages of juice extraction (42.25%), Brix (18.52), sucrose (13.37%) and purity (72.19%), followed by May 21, June 10th and June 30 plantings in a descending order. It is worthy to mention that April 10th was lower in juice extraction %, Brix and sucrose % than May 1st , while the difference between April 10th and May 1st in purity was negligible.

Table 4 : Summary of mean square for extraction, sucrose, Brix , purity and reducing sugar percentages of combined data over years (combined analysis over the two seasons).

Source of variation	d.f	Extraction %	Brix	Sucrose %	Purity %	Reducing sugars%
Year (y)	1	5.66	5.80**	1.15	125.23**	0.33
R (Y)	6	12.79	0.21	0.21	1.65	0.16
Planting date (D)	4	587.13**	27.57**	25.45**	88.92**	20.42**
YD	4	1.14	0.08	0.10	2.09	0.02
Error	24	1.92	0.42	0.34	18.82	0.08
Cultivars (C)	2	211.19**	23.35**	21.24**	187.13**	1.49 **
YC	2	0.29	0.98**	0.03	15.78	0.05
DC	8	16.93**	1.62**	1.13**	46.04	0.29 **
YDC	8	2.02	0.15	0.20	5.51	0.02
Error	60	2.38	0.19	0.12	5.76	0.06

Table 5: Juice extraction, Brix, sucrose, purity and reducing sugars percentages as affected by years, planting dates and cultivars (combined analysis over the two seasons).

Traits / Treatments	Extraction %	Brix	Surose %	Purity %	Reducing sugars %
Years					
2000	36.24	16.97	12.16	71.66	3.20
2001	36.67	17.41	12.36	70.99	3.30
F. test	NS	*	NS	*	NS
Planting dates					
April 10	35.97	17.54	12.78	72.86	3.58
May 1	42.25	18.52	13.37	72.19	2.08
May 21	40.41	17.67	12.69	71.81	2.48
June 10	33.52	16.39	11.70	71.38	3.93
June 30	30.15	15.83	10.76	67.97	4.18
LSD at 0.05	0.68	0.32	0.29	2.14	0.14
Cultivars					
Willy	33.87	16.43	11.54	70.23	3.38
Williams	38.27	17.96	13.00	72.39	3.03
Ramada	37.23	17.17	12.25	71.35	3.34
LSD at 0.05	0.57	0.16	0.13	0.88	0.09

On the other hand, May 1st planting was the lowest one in reducing sugars % with significant differences from the other planting dates, reflecting the highest sucrose and Brix percentages accompanying May 1st planting. These finding are in agreement with those of Ghatode *et al.* (1991) and Aimodares *et al.* (1997) who reported that the delay in sowing decreased juice quality traits.

Cultivars significantly differed in juice quality traits. The cultivar Williams surpassed the other cultivars in juice extraction%, Brix, sucrose% and purity% and had the lowest percentage of reducing sugars which is preferable for syrup production. Also the Ramada cultivar surpassed Willy in this respect.This result is confirmed with the results obtained by Galani *et al.* (1991), Abo El-Wafa and Abo El-Hamd (2001), Thakare *et al.* (2002) and Sinare *et al.* (2004)

C: Yield of stalks, syrup and sugar :

Data presented in Table 6 revealed insignificant effect of years on syrup yield (gallons) per ton of stalks, syrup yield (gallon/ fed), stalk yield (ton/fed) and total juice sugar yield (ton/fed).

Table 6: Mean square for syrup yield in gallons per ton stalks, per fed, analysis stalk yield and total juice sugar yield ton/fed (combined over the two seasons).

Source of variation	d.f	Syrup yield Per ton of stalk	Syrup yield Per fed	Stalk yield/fed	Total juice sugar yield/fed
Year (y)	1	7.85	23016.9	20.67	0.51
R (Y)	6	1.95	4797.0	4.48	0.11
Planting data(D)	4	167.56 **	322716.51 **	56.11 **	7.09 **
YD	4	0.36	3027.44 *	4.97	0.07 *
Error	24	0.54	759.57	1.82	0.02
Cultivars (C)	2	85.10 **	263376.40 **	324.58 **	5.78 **
YC	2	0.69	601.88	0.55	0.01
DC	8	6.39 **	17020.43 **	9.50 **	0.37 **
YDC	8	0.30	286.12	2.01	0.01
Error	60	0.61	1009.83	1.92	0.02

May 1st planting significantly outyilded the other planting dates in syrup yield, stalk yield and total juice sugar yield/ (ton/fed) (Table 7). Thereafter the delay in planting up to the end of june was accompanied with a gradual reduction in yields of stalks syrup and sugar / fed. The superiority of May 1st planting may be due to better growth characters in terms of stalk length, stalk diameter, number of internodes/stalk and internode length as well ae the better juice quality traits as mentioned befor. Some workers like Ferraris and Edwards (1986), Petrini *et al.* (1993) reported that early sowing increased stalk and syrup yield.

Table 7 : Effect of year, planting date and cultivar on stalk and syrup yield (combined analysis over the two seasons).

Traits / Treatments	Syrup yield (gallon*)		Stalk yield Ton/ fed	Total juice sugar ton/fed
	Per ton of stalk	Per/ fed		
Years				
2000	13.23	419.98	31.19	1.97
2001	13.74	447.68	32.02	2.10
F. test	NS	NS	NS	NS
Planting dates				
April 10	13.47	455.28	33.68	2.13
May 1	16.76	582.60	34.38	2.73
May 21	15.28	492.67	31.98	2.31
June 10	11.73	346.69	29.41	1.63
June 30	10.19	291.92	28.60	1.37
LSD at 0.05	0.36	13.61	0.67	0.07
Cultivars				
Willy	11.92	340.74	28.40	1.60
Williams	14.81	489.61	32.59	2.30
Ramada	13.73	471.13	33.84	2.21
LSD at 0.05	0.29	11.69	0.51	0.05

Gallon = 3.78 liters

Williams cultivar significantly surpassed the other ones in syrup yield either per ton of stalks or per feddan as well as total juice sugar yield / fed, followed by Ramada and Willy in a descending order, while Ramada outyielded the other cultivars in stalk yield / fed. The superiority of Williams in syrup production might have resulted from its better juice quality traits in terms of percentages of juice extraction, Brix, sucrose and purity. It is worth mentioning that the higher stalk yield of Ramada could not compensate for its lower juice quality traits and finally syrup yield was lower than Williams. Differences among sweet sorghum cultivars in stalk and syrup yield were reported by Almodares *et al.* (1997) ,Sinare *et al.* (2004) and Amaducci *et al.* (2004).

D- Interaction effects :

Data presented in Table 8 revealed that the highest number of internodes/plant resulted from Ramada planted on May 1st and the longest internodes was obtained from Willy planted on May 21.

From data in Table 9 it was clear that the best juice quality traits in terms of juice extraction %, sucrose %, and Brix resulted from Williams which was planted on May 1st , while, purity % was maximized when Williams was sown on April 10. The highest percentage of reducing sugars was obtained from Willy with May 1st planting. The highest stalk yield (37.76 tons) resulted from Ramada with May 1st planting meanwhile the highest syrup yield / ton of stalks (19.05 gallon), syrup yield / fed (677.3 gallon) and total juice sugar yield (3.17 ton) were obtained from Williams and May 1st planting

Table 8: Number of internodes/plant and length of internode as affected by the interaction between cultivars and planting dates.

Varieties	Planting dates									
	April 10	May 1	May 21	June 10	June 30	April 10	May 1	May 21	June 10	June 30
	No. of internodes / plant					length of internod (cm)				
Willy	16.58	15.53	14.39	14.04	12.51	14.06	15.15	15.87	14.63	14.63
Williams	16.16	16.65	16.43	15.59	13.38	15.31	14.95	14.62	13.53	13.52
Ramada	16.40	16.95	16.74	16.01	13.76	15.50	15.10	14.42	13.64	13.64
LSDat.05	0.46					0.63				

Table 9: Juice quality traits, yield of stalks and syrup as affected by the interaction between cultivars and planting dates.

Cultivars	Planting dates									
	April 10	May 1	May 21	June 10	June 30	April 10	May 1	May 21	June 10	Sune 30
	Extraction %					Sucrose %				
Willy	33.73	38.31	36.05	31.48	29.80	12.35	12.42	11.70	10.67	10.56
Williams	37.53	45.02	43.33	35.32	30.16	13.19	14.36	13.73	12.38	11.33
Ramada	36.65	43.42	41.85	33.76	30.49	12.81	13.33	12.64	12.05	10.40
LSD at 0.05	1.27					0.28				
	Brix					Purity %				
Willy	17.27	17.04	16.80	16.02	15.04	69.57	71.09	67.70	64.68	68.02
Williams	17.89	19.83	18.69	16.89	16.51	73.88	72.50	73.47	73.30	68.80
Ramada	17.45	18.68	17.52	16.26	15.95	73.45	71.37	72.14	74.19	65.23
LSD at 0.05	0.36					1.97				
	Reducing sugars %					Stalk yield ton /fed.				
Willy	4.04	4.39	3.96	2.47	2.06	30.72	29.88	28.52	25.66	27.23
Williams	3.86	3.90	3.05	2.40	1.94	35.01	35.49	33.39	30.36	28.69
Ramada	3.90	4.26	3.73	2.57	2.24	35.32	37.76	34.03	32.20	29.88
LSD at 0.05	0.20					1.14				
	Syrup yield gallon / ton stalks					Syrup yield gallon / fed.				
Willy	12.44	13.93	12.92	10.75	9.56	382.2	416.7	368.6	276.1	260.3
Williams	14.32	19.05	17.28	12.73	10.64	501.7	677.3	576.2	387.1	305.8
Ramada	13.65	17.30	15.65	11.71	10.36	481.9	653.8	533.2	376.9	309.7
LSD at 0.05	0.64					26.1				
	Total juice sugar yield (ton/fed.)									
Willy	1.79	1.95	1.73	1.29	1.22					
Williams	2.35	3.17	2.70	1.81	1.43					
Ramada	2.26	3.07	2.50	1.77	1.45					
LSD at 0.05	0.14									

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اختلاف أستجابة محصول بعض اصناف الذ رة السكرية لميعاد الزراعة

بدوى سيد حسانين رمضان
كلية الزراعة جامعة القاهرة – جيزة– مصر

اجريت تجربتان حقليتان فى محطة البحوث الزراعية بجامعة القاهرة خلال موسمى٢٠٠٢و٢٠٠٣ لدراسة تاثير مواعيد الزراعة (١٠ ابريل، ١ مايو ،٢١ مايو ،١٠يونية و ٣٠ يونية) على محصول وجودة بعض اصناف الذرة السكرية (ولى ووليامز ورامادا).

اوضحت الدراسه عدم وجود اختلاف معنوى للسنوات على جميع الصفات تحت الدراسة ماعدا صفتى البركس (المواد الصلبة الذائبة فى العصير) و نقاوة العصير . كما بينت ايضا ان الزراعة فى الأول من مايواعطت اعلى طول وقطر وعدد سلاميات للساق وايضا نتج منها اعلى محصل من السيقان والعسل و محصول العصير (طن/فدان). كما ادى تاخير الزراعة حتى ٣٠يونية الى انخفاض كل من البركس والسكروز بينما ادت الى زيادة السكريات الاحادية.

كما اوضحت النتائج ان الصنف رامادا اعطى اكبر طول وعدد سلاميات للنبات يليه الصنف وليامز ثم ولى بينما اعطى الصنف وليامز اكبر قطر للساق كما اعطى الصنف ولى اطول السلاميات وكذلك تفوق الصنف وليامز عن الاصناف الاخرى فى نسب الاستخلاص والبركس والسكروز وايضا النقاوة بينما اعطى اقل نسبة فى صفة السكريات الاحادية وايضا تفوق الصنف وليامز عن الاصناف الاخرى فى محصول العسل لكل طن عيدان وايضا للفدان ومحصول السكر فى العصير للفدان وتبعه الصنف رامادا ثم ولى فى الترتيب بينما نتج اعلى محصول عيدان للفدان من الصنف رامادا.

كان التفاعل بين مواعيد الزراعة والاصناف معنويا فى صفة عدد السلاميات وطولها ونسبة استخلاص العصير والسكروز والبركس والنقاوة والسكريات الاحادية ونتج اعلى محصول من السيقان النظيف (٣٧,٧٦طن/فدان) من الصنف رامادا بزراعته فى الاول من مايو. بينما تفوق الصنف وليامز عند زراعته فى الاول من مايو واعطى اعلى محصول العسل (٤٨٩,٦١جالون /فدان) ومحصول العسل لكل طن سيقان(١٩,٠٥جالون) واعلى محصول من السكر فى العصير(٣,١٧ طن).

وتوصى الدراسة بزراعة الصنف وليامز فى الاول من مايو للحصول على اعلى محصول من العسل بالجالون/فدان وذلك تحت ظروف منطقة الزراعة.