EFFECT OF RIDGE WIDTH, HILL DISTANCE AND NITROGEN FERTILIZER RATES ON GROWTH, YIELD AND QUALITY OF STEVIA PLANT

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ABSTRACT

Two field experiments were laid out at El-Bakatoush Village, Kafr El-Sheikh Governorate, Egypt in 2005/2006 and 2006/2007 seasons to study the effect of two ridge width (40 and 50 cm), three hill distances (15, 20 and 25 cm) and three nitrogen fertilizer rates (0, 30 and 45 kg N/fed/cut) as well as their interactions on growth, yield and quality of stevia plant (*Stevia relebaudiana* Bertoni) c. v. Spanti. The experiments were laid out in split- split plot design with three replications.

The obtained results showed that plants sown on narrow ridge (40 cm) gave the highest values of leaf area index per plant, leaves dry weight cut/feddan, stevioside percentage at all cuts, total leaves dry weight per feddan and stevioside yield per feddan in both seasons. On the other hand, ridge width at 50 cm gave the highest number of leaves per plant at all cuts in both seasons.

The closer hill spacing (15 cm apart) exceeded the middl and widest hill spacing at (20 and 25 cm which) in all previously mentioned traits, except number of leaves per plant was higher at the wider hill spacing (25 cm apart) at all cuts in both seasons.

Increasing nitrogen fertilizer rates up to 45 kg N/fed/cut increased values of all studied characters at all cuts in both seasons.

Planting stevia plants on ridging width 40 cm and hill distance 15 cm gave the highest values of all studied characters at all cuts in both seasons, except number of leaves per plant.

Planting stevia plants on narrow ridge (40 cm) and fertilized with 45 kg N/fed/cut gave the highest averages of all studied characters at all cuts in both seasons, except number of leaves per plant was highest with 50 cm ridge width and 45 kg N/fed/cut.

Plants having the close hill (15 cm) and fertilized by 45 kg N/fed/cut gave the highest values of all studied parameters except, number of leaves in both seasons.

The highest total leaves dry weight per feddan and stevioside yield per feddan was recorded by sowing plants on narrow ridge (40 cm) and closer hill (15 cm) as well as fertilized by 45 kg N/fed/cut in both seasons.

INTRODUCTION

Nowadays, Egypt face a great problem concerned with the lake of sugar production to provide the demands of increasing population. So, increasing sugar production or reduction of the extremely high sugar consumption is necessary to meet demands of population. One of the approach to reduce of sugar consumption is to exploitation and substitution with natural sweeteners are quite important problems, especially artificial substances used at present days food industry such as saccharine, sorbine and aspartame. Therefore, they have not always meet the producers and consumers requests.

Stevia plants (Stevia rebaudiana Bertoni) is the most natural sweeteners and medicinal aid. The established uses for stevia products cover all those of artificial low-calorie (non-sucrose) sweeteners and most other purposes for which sugar can be used. The stevia herb in its natural form is approximately 10 to 15 times sweeter than common table sugar. Extract of stevia in the form of stevioside can range anywhere from 100 to 300 times sweeter than sucrose and has similar taste feel properties. The sweetener from stevia leaves has a good taste and suitable for use in food products. The necessary steps to expand stevia cultivation in Egypt are the development of seeds, care of seedlings and appropriate agricultural practices including information on optimized crop inputs.

Therefore, studying the effect of variations in inter and intra row spacing (row width and hill spacing) on stevia productivity for the first times under Egyptian conditions proved to be of vital importance. In this connection Katayama et al. (1976), Lee et al (1978), Bian (1981) and Shu and Wang (1988) found that narrow ridging increased leaf area index per plant, stevioside yeid percentage in dry leaves and total stevioside per hectar. Goenddi (1981), Jia (1984), Buona (1988) and Pude (2005) found that the wide ridging increased number of leaves per plant. Dinizfmonza (2003) stated that the wider hill distance had the increase in number of leaves per plant. Infoomfra (2003) showed that narrow hill distance returned to the increase in leaf area index per plant, dry weight leaves per hectar and total stevioside per hectar

Pude (2005) and Niir Board (2008) found that the narrowest hill spacing most gave the most increase in total dry weight leaves per hectar

Maximum stevia productivity in terms of leaves yield and stevioside depending on the growing temperature and nutritions elements supply. Nitrogen had a vital role on the vegetative growth and physiological processes of any plant. Nitrogen requirement of stevia varies from one region to another around the world. In this respect Das et al. (2007) and Niir Board (2008) found that increasing N fertilizer rate increased number of leaves per plant, stevioside percentage, and total dry weight leaves per hectar

. Anand (2004) and Colombus (2004) found that the increase in N fertilizer rates increased leaf area index per plant and total leaves dry weight per hectar and total stevioside per hectar.

This investigation was carried out to study the response of stevia crop growth ,yield and plant distribute on patterns through ridge width and hill spacing and N fertilization der under Kafr El-Sheikh Governorate, Egypt.

MATERIALS AND METHODS

Two field experiments were carried out at El-Bakatoush village, Kafr El-Sheikh Governorate, Egypt in 2005/2006 and 2006/2007 seasons to study the effect of two ridge width (40 and 50 cm), three hill distance (15, 20 and 25 cm) and three nitrogen fertilizer rates (0, 30 and 45 kg N/feddan/cut) on growth, yield and quality of stevia (Stevia rebaudina Bertoni) c.v. Spanti. The experiments were laid out in split-split plot design with three replications. The

two ridge width were collected in the main plots, hill distance were assigned in the sub-plots and nitrogen fertilizer rates were devoted in sub sub-plots. The sub-sub plot area was 10.5 m² (3.0 m width x 3.5 m long). Seeds of stevia planted on 15th March in both seasons in wood boxes (40 cm length 30 cm width) contain a mixture of sand, peternos and silt clay soil (1: 1: 1). On 15th May in both seasons seedlings at two months age were transplanted into permanent experiment site.

Mechanical and chemical analysis of soil at the experimental sites

are presented in Table (1).

Variables	2005/2006season	2006/2007 season
	Mechanical analysis	
Sand %	15.10	14.36
Silt %	30.41	32.35
Clay %	54.49	53.29
Soil textural class	clay	clay
	chemical analysis	
Soil pH	7.45	7.37
EC-ds	2.57	2.81
Organic matter%	1.96	2.06
Available N(ppm)	12.07	13.17
Available p(ppm)	7.35	7.15
Available k(ppm)	283.00	277.35

The soil of the permanent experimental site was prepared as usually, phosphorus fertilizer in the form of superphosphate 15%

 P_2O_5 was added at the rate of 100 kg superphosphate during land preparation. Nitrogen fertilizer at the previously studied rates was applied in the form of urea (46% N) in two equal half after each cut. The first half was applied just before the first irrigation, while, the second half was added before the second irrigation. Five cuts were taken each two months intervals during the growing seasons. The studied traits were measured at first cut (15/7 Mid July), second cut (15/9-Mid September) third cut (15/11-Mid November), fourth cut (15/1-Mid January) and fifth cut (15/3-Mid March) in both seasons.

At each cut the following date were recorded:

- 1. Number of leaves per plant.
- Leaf area index per plant.
- 3. Dry weight of leaves (cot/ ton/fed).
- 4. Stevioside percentage in dry leaves, it determined by HPLS according to Nishiyama et al (1992).
- 5. Total leaves dry weight yield (t/fed).
- Total stevioside yield (Kg/fed).

The obtained data were analyzed of analysis of variance (ANOVA) and the least significant difference (LSD) calculated at 5% level as reported by Gomez and Gomez (1984).

RESULTS AND DISCUSSION

Average number of leaves per plant, leaf area index per plant, leaves dry weight (ton/fed per cut), stevioside percentage total leaves dry weight per feddan (tons/5 cuts) and stevioside yield (t/fed) as affected by ridge width, hill

distance, nitrogen fertilizer rates and their interactions at five cuts in 2005/2006 and 2006/2007 seasons are shown in Tables (2 to 11).

The obtained results showed that ridge width had a significant effect on all studied traits at all cuts in both seasons, except number of leaves per plant at fourth cut in the first season and at second and theird cut in the second seasons, leaf area index at third cut in the first season and at first, fourth and fifth cut in the second seasons, leaves dry weight per feddan at first cut in both seasons and at fourth cut in the first season as well as stevioside percentage at first cut in the first season and at third cut in the second season.

Stevia plants sown on ridge width 50 cm gave the highest number of leaves per plant at all cuts in both seasons. On the other hand, planting stevia plants on ridge width 40 cm gave the highest leaf area index per plant, leaves dry weight per feddan (ton/cut) and stevioside percentage at all cuts in both seasons. In this connection, the highest total leaves dry weight per feddan (2.80 and 3.25 ton/5 cuts) and stevioside yield per feddan (492.62 and 551.40 kg/5 cuts) wer recorded with plants sown on narrow ridge (40 cm width) in 2005/2006 and 2006/2007 seasons, respectively. These results are in harmony with those of lee atal (1978). Bian (1981) and Buana (1988)

The increase in number of leaves per plant due to the wider ridge may be attributed to the little competition between plants and plant shading which led to increasing net assimilation rate as well as increased number of leaves per plant. On the other hand, the increase in leaf area index per plant, leaves dry weight per feddan, stevioside percentage, yields per feddan of total leaves dry weight and stevioside owing to the narrow ridging might be attributed to the increase in number of plant per area unite resulted in increasing leaf area index which increased photosynthesis rate and dry matter translocated and stored in leaves, therefore, total yield of leaves dry weight per feddan and stevioside yield increased.

Data recorded in Tables (2 to 11) indicated that number of leaves per plant significantly affected by hill distance at all cuts, except at fourth cut in the first season and at second and their din the second season. However, the highest number of leaves per plant was found when plants sown on hill distance at 25 cm compared to other hill distances (15 and 20 cm) at all cuts in both seasons. The effect of hill distance on all studied characters was significant at all cuts in both seasons, with the exception, of leaf area index at first and fourth cut in both season, leaves dry weight per feddan at third cut in the first season and stevioside percentage at third and fourth cut in the first season and at first cut in the second seasons. Generally, the narrow hill distance (15 cm) exceeded the medium and wider hill (20 and 25 cm) in leaf area index per plant, leave dry weight per (ton/cot), stevioside percentage at all cuts, total leaves dry weight per feddan and stevioside yield per feddan in both seasons. These results are in agreement with those of Diria Zfronza (2003) and Board (2008)

The increase in number of leaves pr plant owing to the wider hill may be attributed to the lowest competition between plants which led to increasing plant growth such as number of leaves.

8.22 21.31

Ridge width Hill distance

Nitrogen

(R) (R) (R) (R) (R) (R)

Table (2): Effect of ridge width, hill distance, nitrogen fertilizer rate and their interaction on number of leaves ner plant at five cuts in 2005/2006 season.

_ 	r		utting	11 (1)	7		utting	121			Cutting	(3)		,	utting (A)			Cutting	(5)	
Ridge width	Hili distance:	Ni	trogen g/fed/c	rate	Mean	Nit	rogen g/fed/c	rate	Mean	N	itrogen kg/fed/c	rate	Mean	Ni	rogen i g/fed/c	rate	Mean	Ni	trogen (g/fed/c	rate	Mean
	i	0	30	45	1	0	30	45		0	30	45		0	30	45		0	30	45	1
	15 cm	45.88	69.6€	94.19	69.91	46.44	71.66	103.00	73.70	50,66	77.21	99.14	75.67	53.44	71.14	89 33	71.30	65.17	89.33	109.33	87.94
40 cm	20 cm	47.38	77.44	99.33	74.71	46.99	79.10	111,60	79.23	63,33	97.14	102.05	87.50	55.06	85.66	97.11	79.27	71.99	97.14	115.08	94,73
	25 cm	67.66	92.10	117.33	92.36	50.33	85.16	122.03	85.84	68.22	105.07	107.91	93.73	65.17	101.33	104.10	90.20	79.33	113.09	133,11	108.51
Mean		53.64	79.73	103.61	78.99	47.92	78.64	112.21	79.59	60.73	93.14	103.03	85.63	57.89	86.04	96.84	80.25	72.16	99.85	119.17	97.06
	15 cm	50.33	75.19	100,10	75.20	48.13	71.14	109,10	76.12	57.66	89.14	114.10	86.96	55.33	82.09	97 22	78.21	74.13	95.11	121.14	96.79
50 cm	20 cm	59.66	86.13	103.14	82.97	55.70	81.33	115.40	84.14	74.33	101,66	122.01	99.33	63.66	94.13	103.10	86.96	82.33	105.14	132.13	108.53
	25 cm	77.10	101.33	109,17	95.86	68.30	92.10	129.03	96.56	82.13	109.33	133.14	108.20	73,17	104.15	108.13	95.15	89.66	119.10	154.11	120.95
Mean		62.36	87.55	104.13	84.67	57.37	81.52	117.84	85.60	71.37	100.04	123.08	98.16	64.05	93.45	102.81	86.77	78.65	106.45	135.79	108.09
General means o hill distance	20 cm 25 cm	48.10 53.52 72.38	81.78 96.71	101.23 113.25	78.84 94.11	51.34 59.31	80.21 88.63	106.05 113.50 125.53	81.68 91.15	68.83 75.17	99.40 107.20	106.678 112.03 120.52	93.11	54.38 59.36 69.17	89.89	106.11	83.11 92.67	77.16 84.49	101.14 116.09	115.23 123.60 143.61	100.63 114.73
Mean		58.00	83.63	103.87	81.83	52.64	80.08	115.02	82.59	66.05	96.59	113.05	91.89	60.97	89,74	99.82	83.51	77.10	103.15	127.48	102.57
L.S.D.0	05% for:																				

N.S 23.69 26.72 29.09 R x H R x N 5.83 NJS 14.67 18.33 N.S 7.60 N.S 15.15 17.22 11.16 H x N RHN 21.09 16.06 20.33 13.23 17.70 24.16

3.66

11.46

N.S

13.14

6.14

16.60

Ñ.S

3.36

10.08

Table (3): Effect of ridge width, hill distance, nitrogen fertilizer rate and their interaction on number of leaves per plant at five cuts in 2006/2007 season.

Γ	T) (utting (21	T	C	utting	3)	ŗ	C	utting	4)	T	(utting (5)	
Ridge					Mean	Ni	trogen	rate	Mean	Nit	rogen	rate	Mean	Nit	rogen	rate	Mean		trogen r		Mean
width	distance		(g/fed/c			13	cg/fed/c			(K	g/fed/c			(k	g/fed/c		Į. .,.		g/fed/c		
L		0	30	45		0	30	45		0	30	45	l	0	30	45		0	30	45	<u> </u>
	15 cm	51.88	85.55		79.92		76.66	101.66					70.89						96.99	116,33	
40 cm	20 cm	57.44				63.04						102.33					76.04			120.66	
l	25 cm	72.77	100.10	115.13	96.00	69.11	99.88	111.03	93.34	69.11	89.15	108.11	88.79	61.14	85.19	103 03	83.12	75,88	111.01	135.66	107.51
Mean		60.69	91.10	109.37	87.05	60.60	85.87	106.27	84.24	55.36	80.99	101.20	79.18	53.73	78,06	96.44	76.06	72.84	104.85	124.21	100.63
	15 cm	55.66	91.33	109.14	85.37	53.33	81.33	105.11	79.92	51,66	79.17	96.33	75.72	53.66	75.33	95.66	74.88	77.33	105.33	131,14	104.60
50 cm	20 cm	63,33	97.11	117.30	92.58	60 10	85.17	110.40	85.22	54.33	84.66	107.11	82.03	57.11	82 33	101.33	80.25	85.66	117.66	142.33	115.21
	₽5 cm	76.11	106 10	122.50	101.57	73.66			97.44	71.18	93.33	113.40	92.63	66 19	91.66	110.50	89 45				
Mean		65.03			93.17															143.04	
Genera	15 cm	53.77	00.44	40F 70	00.04	64.40	70.00	400.00	77.05	19.40	70.07	04.75	70.00	10.00	70.40		74.00	70.45	404.40	100 70	00.45
i	HS CIT		88.44	105.73	82.64			103.38					73.30	49.99	73.49	92.40				123.73	
of h	20 cm 25 cm			113.98		61.57		108.27													107.65
distanc	e 25 cm	74.44	103.10	118.81	98.78	71.38	100.60	114.18	95.39	70.14	91.24	110.75	90.71	63.66	88.42	106.76	86.28	83.49	122.35	145.66	717.16
Noan	······································	62.86	94.64	112.84	90.11	61.48	87.57	108.60	85.88	57.20	83.35	103.40	81.32	56.34	80,58	99.46	82.75	78.77	111.87	133.62	108.08
L.S.D	.0.05% fo	f:										_									
Ridge	width i	R)				1		N.S				N.S		T		4		T		*	
Hillds	lance	R) H)			5.27			4.57		- 1		N.S		į.	i,	.67		1	N	i.S	
Nitroge		N)	i		0.78	1		27.09		ì		24.15		ĺ		4.23		i	33	3.10	
1				N.S		1		6.31		1		0.57		i	20	.91					
!					23.67		į		0.36				¥.S				.05				
i	1 × 14				8.06			01.64		i		33.67				5.45		1		1.99	1
Ì	14 X 19				5.78			37.51				39 49		:		5.53		į.		80.8	i

Table (4): Effect of ridge width, hill distance, nitrogen fertilizer rate and their interaction on leaf area index per plant at five cuts in 2005/2006 season.

	1	C	atting [1]		ت	utting (Z[<u> </u>		i.iting {]		្វាម័យក្ន	41			uiting]
Ridge width	Hill distance		rogen r g/fed/ci		Mean	Nit (k	rogen r g/fed/ci	ate it)	Mean	Nit (k	rogen r g/ed/ci	ate at}	Mean		rogen (g/led/c		Mean	Nit (k	rogen r g/fed/ci	ate ut)	Mean
!	1	U	30	45	! .	0	30_	45	L	0	30	45	<u> </u>	<u>.</u>	30	45		0	30	45	L
40 cm	15 cm 20 cm 25 cm	0,40 0,38 0,41	0.89 0.69 0.68	0.95 0.91 0.86	0.75 0.66 0.65	0.49 0.40 0.35	0.84 0.64 0.54	1.09 0.87 0.71	0.80 0.64 0.53	0.35 0.31 0.25	0.57 0.45 0.37	0.85 0.65 0.54	0.50 0.47 0.39	0.36 0.30 0.28	0.61 0.48 0.40	0.73 0.61 0.52	0.57 0.48 0.40	0.47 0.37 0.31	0.99 0.84 0.81	0.92 0.86	0.85 0.71 0.68
Mean		0.33	0.75	0.91	0.68	0.41	0.67	0.89	0.66	0.33	0.46	0.63	0.48	0.32	0.50	0.62	0.48	0.38	0.88	0.98	8.74
50 cm	15 cm 20 cm 25 cm	0.45 0.48 0.43	0.77 0.73 0.66	0.92 0.83 0.71	0.71 0.68 0.60	0.41 0.34 0.36	0.72 0.55 0.52	0.74 0.59	0.69 0.55 0.52	0.33 0.26 0.26	0.54 0.42 0.35	0.65 0.55 0.51	0.51 0.41 0.38	0.33 0.26 0.24	0.53 0.42 0.36	0.63 0.54 0.50	0.49 0.41 0.37	0.54 0.52 0.47	0.84 0.81 0.72	0.96 0.89 0.75	0,75 0,74 0.64
Mean		0.45	0.72	0.82	0.55	0.37	0.60	C. 73	0.59	0.28	0.44	0.57	0.43	0.28	75.44	0.55	0.42	0.51	0.79	0.28	0.71
of hill	20 cm	0.43 0.43 0.42	0.63 0.71 0.67	0.93 0.87 0.78	0.73 0.67 0.62	0.45 0.37 0.35	0.78 0.60 0.53	1,01 0,81 0,70	0.75 0.59 0.53	0.34 0.26 0.25	0.55 0.43 0.37	0.75 0.60 0.52	0.55 0.44 0.38	0.34 0.28 0.26	0.57 0.45 0.38	0.68 0.57 0.51	0.53 0.43 0.38	0.51 0.44 0.39	0.91 0.82 0.76	1.05 0.90 0.31	0.80 0.72 0.65
Mean		0.42	0.74	0.36	0.67	0.39	0.64	0,84	0.62	0.29	0.45	0.52	0.45	0.30	0.47	0.59	0.45	9.45	0.83	0.91	0.72

L.S.D.0.05% for:

Ridge width	(R)		•	N.S	*	i •
Hill distance	(H)	N.S	6.07	0.06	N.S	0.11
Ni≆rogen	(N)	0,17	0.19	0.18	0 16	0.21
_	RxH	พ.ร	0.13	N.S	0.11	0.16
	R x N	6.18	N.S	0.11	0.10	0.17
į	НxN	0.10	0,16	0.15	C.13	0.11
1	RHN	0.14	0.15	0.12	0.19	0.16

Table (5): Effect of ridge width, hill distance, nitrogen fertilizer rate and their interaction on leaf area index per

plant at five cuts in 2006/2007 season.

Hill distance	- Nit	J/fed/€	nte ut)	Mean	-Nit	g/fea/c	rate ut}	Mean	N.7	g/fed/cu	ate ɪt)	Mean	Nit	q/fed/c	ate ut)	Mean	Nit	g/fed/c	rate ut)	Mean
15.60	71.61			ויים אות -	70 61			- דאח	ח 2.4			773	1178-	775		77.69	080			0.91
20 cm 25 cm	0.43 0.46	0.77 0.76	0.94	0.71	0.47	0.73	0.91	0.70 0.64	0.38 0.32	0.53	0.81 0.67	0.57 0.48	0.37	0.60	0.72	0.56 0.48	0.48 0.41	0.72 9.66	0.95	0.72 0.68
		0.81	0.99	0.76	0.49	0.76	0.97					0.59	0.39	9.61						0.77
15 cm 20 cm 25 cm	0.54 0.54 0.47	0.83 0.80 0.71	1.10 0.97 0.78	0.83 0.77 0.65	0.47 0.48 0.40	0.77 0.63 0.58	0.88	0.58 0.58	0.40 0.32 0.30	0.65 0.53 0.48	0.87 0.68 0.56	0.64 0.51 0.45	0.41 0.31 0.29	0.631 0.51 0.47	0.83 0.65 0.55	0.49	0.55 0.46 0.41	0.87 0.86 0.71	1.24 0.97 0.80	0.89 0.76 0.64
	0.52	0.78	0.95	0.75	0.45	0.66	0,92	0.68	0.34	0.55	0.70	0.53	0.34	0.54	0.68	0.52	0.47	0.81	1.01	0.76
15 cm 20 cm 25 cm	0.58 0.48 0.46	0.86 0.79 0.73	1,14 0,95 0.81	9.86 9.74 0.67	0.54 0.47 0.40	0.81 0.68 0.64	1.14 0.89 0.79	0.83 0.68 0.61	0.45 0.35 0.31	0.67 0.53 0.46	0.94 0.74 0.61	0.68 0.54 0.45	0.44 0.34 0.31	0,69 0,56 0,48	0.84 0.68 0.59	0.66 0.53 0.48	0.58 0.47 0.41	0.92 0.79 0.68	1.19 0.96 0.89	0.90 0.74 0.66
	0.51	0.79	0.97	0.76	0.4?	0.71	0.947	0.77	0.37	0.55	0.76	0.35	0.36	0.58	0.70	0.55	0,48	0.80	1.02	0.77
05% for	:																			
fin (i ice (i	R) H) N) R x H R x N H x N			NS 0.11 0.14 0.19 0.11		· - - ·-	0.11 0.19 0.19 0.11 0.13				0.10 0.15 0.14 0.19 0.N				N.S 0.11 0.19 0.17 0.15			0000	1.10 1.16 1.12 1.19 1.17	
	### ### ##############################	III	Mitrogen Mitrogen	Mitrogen Fate Mitrogen Pate Mitrogen Fate Mitrogen Pate Mitrogen Pat	Mean Stronger rate Mean Mean	Mitrogen rate Mean Mitrogen Mean Mean	Milrogen rate Mean Nitrogen rate (koffedict) Mean Nitrogen rate (koffedict) Mean Nitrogen rate (koffedict) Mean Nitrogen rate Mean Mean Nitrogen rate Nitr	Mitrogen rate Mean Mitrogen rate Mitrogen rate Mitrogen rate Mitrogen rate Mean Mitrogen rate Mean Mitrogen rate Mitroge	Mitrogen Fate Mean Mitrogen Fate Mitroge	Mitrogen rate Mean Mitrogen rate Mitr	Mitrogen rate Mean Mitrogen rate Mitrogen rate Mitrogen rate Mean Mitrogen rate Mitrogen rate Mean Mitrogen rate Mit	Mitrogen rate Mitrogen rate Mean Mitrogen rate (kg/fed/cut)	Mitrogen rate Mean Mitrogen rate Mean	Mitrogen rate Mean Nitrogen rate Mean (kg/fed/cut) Mean Mitrogen rate Mean (kg/fed/cut) Mean Mitrogen Mean Magnot Magn	Mitrogen rate Mean Nitrogen rate Mean (kg/fed/cut) Mean (kg/fed/cut) (kg/fed/cut) Mean (kg/fed/cut) (kg/fed/cut) Mean (kg/fed/cut) (kg/fed/cut) Mean (kg/fed/cut) Mean (kg/fed/cut) Mean (kg/fed/cut) Mean Mitrogen rate Mean (kg/fed/cut) Mean Mitrogen rate Mitrogen rate Mitrogen rate Mitr	Mitrogen rate Mean Mitrogen rate Mitrogen rate Mean Mitrogen rate M	Mitrogen rate Mean Mean Mitrogen rate Mitrogen rate Mean Mitrogen rate Mean Mitrogen rate Mitrogen rate rate Mitrogen rate Mi	Mitrogen rate Mean Mitrogen rate Mitrogen rate Mitrogen rate Mean Mitrogen rate Mitrogen	Mitrogen rate Mean Mitrogen rate rate Mean Mitrogen rate rate Mean Mean Mitrogen rate rate Mean Mitroge	Mitrogen Fate Mean Mitrogen Fate Mitrog

Table (6): Effect of ridge width, hill distance, nitrogen fertilizer rate and their interaction on leaves dry weight per feddan (ton/cut) in 2005/2006 season.

Ridge width	Hill distance	Nit	utting (rogen r g/fed/ci	ate	Mean	Nit	utting (rogen r g/fed/c	ate	Mean	Nit	utting (rogen / g/fed/ci	els	Mean	N#	utting (rogen r g/fed/ci	ate	Mean	Nit	utting (rogen : g/ted/ci	ate	Mean
į		0	30	45		0	30	45	1	0	30	45		n	30	45	ì	0	30	45	į
	15 cm	0,51	0.86	0.99	0.82	0.39	0.77	0.85	0.67	0.41	0.60	0.96	0.65	0.39	0.56	0.92	0.62	0.55	1.01	1.02	0.86
40 cm	20 cm	0.45	9.55	0.92	0.54	0.26	0.39	0.52	0.39	0.22	0.49	0.65	0.45	0.27	0.37	0.60	0.41	0.52	0.85	0.98	0.78
Ĺ	25 cm	0 35	0.52	0.69	0.52	0.24	0.32	0.47	0.34	0.20	0.47	0.59	0.42	0.26	0.35	0.57	0.39	0.48	0.82	0.90	0.73
Mean		0.44	0.64	0.86	0.66	0.29	0.49	0.61	0.46	0.28	0.52	0.73	0.51	0.30	0.42	0.69	0.47	0.51	9.89	9.56	0.79
	15 cm	0.52	G.73	0.96	0.74	0.32	0 48	0.72	0.51	0.26	0.48	0.81	0.52	0.28	J., 2	0.83	0.56	0.54	0.81	0.87	0.74
50 cm	20 cm	0.48	0.62	0.84	0.65	0.28	0.36	0.61	0.42	0.24	0.38	0.56	0.39	0.25	9.49	0.58	0.44	0.51	0.79	0.85	0.71
Ĺ	25 cm	0.41	0.44	0.59	0.48	0.25	0.31	0.50	0.35	0.22	0.28	0.42	0.31	0.24	0.47	0.54	0.41	0.49	0.67	0.73	0.63
Mean		0.47	0.59	0.79	0.62	C.28	0.38	0.61	0.43	0.24	0.38	0.60	0.41	0.26	0.49	0.67	0.47	0.51	0.75	0.81	0.69
means	i a cm	0,52 0,46	0.79 0.58	0.97 0.88	0.78 0.64	0.35 0.27	0.62 0.37	0.78 0.56	0.59 0.40	0.34 0.23	0.54 0.43	0.88 0.60	0.58 0.42	0.33 0.26	0.54 0.43	0,90 0.59	0.59 0.42	0.54 0.51	0.91 0.82	0.94 0.92	0.80 0.74
distance	25 cm	0.38	0.48	0.64	0.50	0.25	0.32	0.48	0.35	0 21	0.37	0.51	0.36	0.25	0.41	0.56	0,40	0.48	0.74	0.81	0.67
Mean	-	0.46	5.61	0.83	0.64	0.28	0.43	0.61	0.44	0.26	0.45	0.66	0.45	0.28	0.46	0.58	0.47	0.51	0.82	0.88	0.74
L.S.D.O	.05% for	57																			

_								
Æ	Ridge width	(R)	T		· · · · · · · · · · · · · · · · · · ·	N.S		
H	fill distance	(H)	0.09	0.09	N.S	0.05	0.04	
N	iitrogen	(N)	0.07	0.08	0.06	0.04	0.67	
	•	ŘáH	0.04	N.S	0.08	0.01	0.03	
		RXN	0.03	. 0.02	0.03	0.02	0.95	
ĺ		HXH	0.07	0.04	0.05	0.01	0.97	
ı		RHN	0.10	0.08	0.06	0.04	0.09	

Effect of ridge width, hill distance, nitrogen fertilizer rate and their interaction on leaves fresh weight Table (7): per feddan (tons/cut) in 2006/2007 season.

				. A	7713700				2043	-											
Ridge	Hili	Nit	utting (rogen :	ate	Mean		uting (roger: i		Mean	Nit	utting (rogen *	Ste	Mean	Nit	utting (rogen r	ate	Mean	Мh	utting (rogen i	ate	Mean
width	distance	a <u>(</u> k	g/led/c	ut)	143-26211	(k	g/ted/c		2814-6221	(k	gffedic	17	Int Court	k	g/fed/ci	.12)	130000	(k	g/ted/c	(11)	mean
	J	O	30	45]	0	30	45	<u> </u>	0	30	45		0	30	45	l .	0	30	_45]
	15 cm	1.09	2.15	3.01	2.08	0.81	1.39	1.88	1.35	0.55	1.04	1,96	1.18	0.58	0.95	1.73	1.08	0.84	1.66	2.39	1.63
40 cm	20 cm	0.96	1.42	1.96	1.45	0.66	1.07	1.47	1.07	0.62	1.27	1/3	1.20	0.45	0.89	1.40	0.91	0.61	1.26	1.76	1.21
	25 cm	0,93	1.23	1.76	1.30	0.57	0.90	1.34	0.93	0.51	0.99	1.53	1.01	0.44	0.90	1.20	0.85	0.61	1.04	1,48	1.04
Меал		6.99	7.60	2.24	1.61	0.68	1.12	1.56	1.12	0.56	1.1C	1.74	1.13	0.49	0.91	1.44	0.95	0.69	1.32	1.88	1.29
	15 cm	1.28	1.84	2.47	1.86	0.69	1.18	1.77	1.20	0.66	1.12	1.63	1.14	0.43	1,05	1 49	0.99	0.82	1.28	1.87	1.32
50 cm	2 0 cm	1.00	1 4 2	1.98	1.46	0.60	1.02	1.44	1.02	9.56	1.23	1.73	1.17	0.39	0.79	1.23	0.80	0.58	1.02	1.57	1.05
	25 cm	0.93	1,41	1.66	1.34	0.55	0.88	1 30	0.91	0.56	1.00	1.14	0,90	0.42	0.92	1 10	0.81	0.50	0.90	1.34	0.91
Mean		1.07	1.56	2.03	1.55	0.61	1.02	1.48	1.04	0.59	1.12	1.50	1.07	0.41	0.92	1.27	0.87	0.63	1.06	1.59	1.10
General means	15 cm	1.13	2.00	2.74	1.97	0.75	1.29	1.80	1.28	0.60	1.08	1.79	1.16	0.50	1.00	1.61	1.04	0.83	1.47	2.13	1.48
of hil distance	25 cm	0.98	1.42	1.97 1.71	1.45 1.32	0.63	1,05 0.89	1.45 1.32	1.04 0.92	0,59 0,53	1.25 0.99	1.73 1.33	1,19 0.95	0.42 0.43	0.84	1.31 1.15	0.86	0.59 0.55	0.97	1.66	1.13 0.97
Mean		1.03	1.58	2.14	1.58	0.65	1.07	1.52	1.08	0.57	111	1.62	1.10	0.45	0.91	1.35	0.97	0.86	1.19	1.73	1.19
1.8.0.0	.05% to	r:																			·
เรีย ดการ	etti:	74)		Y			r_					· · · ·				N.S		T		*	
Hidi dista	7.09	(H)			N.S		i	С	11	i		0.11			:	2.03		1	Û	.12	
i lateogian	:	.74)			0.10		!	9	06	1		0.09				: F7			٥	.07	
4.		er i u			1.15		ĺ	fs -	63	i		1000						:		13	

1.3.0.0.03%						
Ridge statis	(4)				N.S	*
Hilli distance	(H)	N.S	C 11	0.11	0.03	0.12
# Micog÷n	M_0	0.19	90.0	0,09	ti fîž	0.07
1	R×H	14.8	0.03	N.S	14.S	ō.13
	拉莱尔	6.45	0,09	0.06	\$ t_ x	0.05
	₽ . 2 B.	0.18	ยาง	0.57	0.98	9,53
	1.14	e 10	5,11	6.18	3.13	0.7

Table (8): Effect of ridge width, hill distance, nitrogen fertilizer rate and their interaction on fresh weight plants yield per feddan (tons) in 2005/2006 season.

	<u> </u>	C	utting (1)			utting (]		utting (utting (utting (]
Ridge width	Hill distance		rogen r g/fed/ci		Mean		rogen i g/fed/c		Mean		rogen r g/fed/c		Mean		rogen r g/fed/ci		Mean		rogen i g/fed/c		Mean
	1 1	0	30	45		0	30	45	1	0	30	45		0	30	45		0	30	45	<u> </u>
	15 cm	1.80	2.99	3.20	2.66	1.27	2.10	2.66	2.01	0.89	1.40	2.53	1.60	0.76	1.17	2.02	1.31	1.25	2.13	2.76	2.05
40 cm	20 cm	1.49	2.07	2.82	2.13	1.03	1.63	2.14	1.60	0.95	1.62	1.97	1.51	0.64	1.02	1.48	1.05	1.05	1.57	1.96	1.53
	25 cm	1.44	1.83	2.50	1.92	0.90	1.29	1.76	1.32	0.85	1.29	1.84	1.32	0.67	1.00	1.40	1.02	0.92	1.37	1.95	1.41
Меал		1.58	2.29	2.84	2.24	1.07	1.67	2.19	1.68	0.90	1.44	2.11	1.48	0.69	1.06	1.63	1.13	1.08	1.69	2.22	1.66
	15 cm	1,96	2.56	3.21	2.58	1.11	1.88	2.46	1.82	1.04	1.43	2.06	1.51	0.71	1.23	1.75	1.23	1.17	1.64	2.31	1.71
50 cm	20 cm	1.61	2.01	2.58	2.07	0.95	1,43	2.05	1.47	0.99	1.58	2.02	1.53	0.55	1.08	1.39	1.01	0.89	1.33	1.83	1.35
	25 cm	1.48	1.99	2.19	1.88	0.84	1.22	1.71	1.25	0.93	1.28	1.70	1.30	0.56	0.92	1.24	0.94	0.73	1.26	1.61	1.20
Mean	1	1.68	2.19	2.66	2.18	0.87	1.51	2.07	1.51	0.99	1.43	1.92	1.45	0.61	1.08	1.46	1.05	0.93	1.41	1.92	1.42
General means	15 cm	1.88	2.77	3.20	2.62	1.19	1.99	2.56	1.91	0.97	1.41	2.29	1.56	0.74	1.20	1.88	1.27	1.21	1.89	2.53	1.88
	20 cm 25 cm	1.55 1.46	2.04 1.91	2.70 2.34	2.10 1.90	0.99 0.87	1.53 1.26	2.10 1.73	1.54 1.29	0.97 0.89	1.60 1.28	1.99 1.77	1.52 1.31	0.59 0.62	1.05 0.96	1.44 1.32	1.03 0.97	0.97 0.82	1.45 1.31	1.89 1.78	1.44 1.31
Mean	1	1.63	2.24	2.75	2.21	1.01	1.59	2.13	1.58	0.94	1.43	2.02	1.46	0.65	1.07	1.55	1.09	1.01	1.55	2.07	1.54

	L.S.D.0.05% to							
	Ridge width	(R)	1	*	N.S	•	*	
	Hill distance	(H)	0.19	O.18	N.S	N.S	N.S	
	Nitrogen	(N)	0.31	0.28	0.24	N.S	0.42	
	_	ŔxĦ	N.S	0.11	0,18	0,15	0.14	
		RxN	0.15	N.S	0.17	0.13	0.10	
•	}	HxN	0.11	0.17	0.16		0.21	
ı		RHN	0.27	0.13	0.15		0,23	

Table (9): Effect of ridge width, hill distance, nitrogen fertilizer rate and their interaction on fresh weight plants yield per feddan (tons) in 2006/2007 season.

[[Č	utting (1	·····	C	utting (2)	T	C	utting (3)		Cutting (4)		,	Cutting (5)				
Ridge width	Hill distance	Nitrogen rate		Mean	Nitrogen rate (kg/fed/cut)			Mean													
		0	30	45		0	30	45	l	0	30	45		0	30	45		0	30	45	<u> </u>
40 cm	15 cm 20 cm 25 cm	1.89 1.58 154	3.19 2.28 2.01	3.96 3.12 2.81	3.01 2.32 2.12	1.36 1.13 1.02	2.30 1.83 1.47	3.01 2.44 2.07	2.22 1.80 1.52	0.99 1.06 0.96	1.60 1.82 1.48	2.76 2.24 2.14	1.78 1.70 1.53	0.88 0.74 0.79	1.35 1.15 1.18	2.31 1.78 1.71	1.51 1.22 1.23	1.35 1.20 1.02	2.32 1.77 1.58	3.06 2.25 2.22	2.24 1.74 1.61
Mean	F	1.67	2.49	3.29	2.48	1.17	1.86	2.51	1.85	1.00	1.63	2.38	1.67	0.80	1.23	1.93	1.32	1.19	1.89	2.51	1.86
50 cm	15 cm 20 cm 25 cm	2.05 1.70 1.48	2.75 2.21 2.20	3.80 2.85 2.43	2.85 2.26 2.03	1.20 1.05 0.95	2.07 1.62 1.45	2.75 2.32 2.01	2.01 1.66 1.47	1.15 1.10 1.03	1.73 1.77 1.51	2.39 2.32 1.96	1.76 1.73 1.50	0.82 0.65 0.67	1.49 1.28 1.11	2.04 1.69 1.52	1.45 1.21 1.10	1.27 1.00 0.83	1.84 1.53 1.46	2.62 2.14 1.87	1.91 1.55 1.39
Mean		1.75	2.38	3.02	2.38	1.06	1.72	2.36	1.71	1.09	1.67	2.22	1.66	0.71	1.30	1.75	1.25	1.03	1.61	2.21	7.52
General means of hii distance	20 cm	1.97 1.64 1.51	2.97 2.24 2.10	3.88 2.98 2.62	2.94 2.29 2.08	1.28 1.09 0.98	2.18 1.73 1.46	2.88 2.38 2.04	2.11 1.73 1.49	1.07 1.08 0.99	1.66 1.79 1.49	2.57 2.28 2.05	1.77 1.72 1.51	0.85 0.70 0.73	1.42 1.22 1.15	2.17 1.73 1.61	1.48 1.21 1.16	1.31 1.10 0.93	2.08 1.65 1.52	2.84 2.19 2.05	2.07 1.64 1.50
Mean		1.71	2.44	3.76	2.43	1.12	1.79	2.43	1.78	1.04	1.65	2.30	1,66	0.76	1.25	1.84	1.29	1.11	1.75	2.36	1.74
.S.D.0.05% for:																					

£.3.D.0.05%							
Ridge width	(R)	N.S	•	N.S	N.S		
Hill distance	(H)	0.21	N.S	N.S	0.16	0.33	1
Nitrogen	(N)	0.29	i0.26	0.23	019	0.39	
	ŘхН	N.S	0.15	0.19	N.S	031	-
	RxN	0.26	0.14	0.15	0.12	0.27	
	HxN	0.34	0.21	0.27	0.22	N.S	I
	RHN	0.42	0.25	0.21	0.19	0.43	i

Table (10): Effect of ridge width, as a hill distance, nitrogen fertilizer rate and their interaction on total leaves dry weight per feddan (tons) total overall cuts in 2005/2006 and 2006/2007 seasons

Ridge			2005/2006		Mean		Mean			
width	Hill distance	Ni Ni	trogen fertilizati	on		Ni				
WIGHT		0	30	45	1	Ó	30	45	7	
	15 cm	2.15	3.40	4.60	3.38	2.93	4.16	4.41	3.83	
40 cm	20 cm	1.72	2.65	3.42	2.61	2.33	3.52	4,13	3.32	
	25 cm	1.53	2.48	3.22	2.41	1.67	2.52	3.64	2.62	
Mean		1.80	2.84	3.76	2.80	2.31	3.40	4.07	3.25	
	15 cm	1.92	3.02	4.25	3.06	2.39	3.92	4.32	3,54	
50 cm	20 cm	1.76	2.64	3.44	2.61	2.11	3.31	4.02	3.14	
	25 cm	1.60	2.17	2.78	2.18	1.64	2.63	3.40	2.55	
Viean		1.76	2.61	3.49	2.62	2.05	3.28	3.91	3.07	
	15 cm	2.03	3.21	4.42	3.22	2.66	4.04	4,36	3,68	
General means of	20 cm	1.74	2.64	3.45	2.61	2.22	3.41	4.07	3.23	
nill distance	25 cm	1.56	2.32	3.00	2.29	1.65	2.52	3.54	2.58	
Vlean		1.77	2.72	3,62	2.71	2.17	3.34	3.99	3.16	

L.S.D.0.05% for:

Ridge width (R)
Hill distance (H) 0.15 0.21
Nitrogen (N) 0.26 0.29
R.X.H 0.10 0.17
R.X.N 0.23 0.24
H.X.N 0.11 0.15
R.HN 0.30 0.36

Table (11): Effect of ridge width, hill distance, nitrogen fertilizer rate and their interaction on stevioside yield per feddan (kg) as a total overall cuts in 2005/2006 and 2006/2007 seasons

Ridge			2005/2006		Mean		Mean		
width	Hill distance	N	trogen fertilizatio	on		Ni			
WIGGI		0 .	30	45		0	30	45	1
	15 cm	335.67	602.21	925.14	621.00	400.17	721.50	932.38	684.68
40 cm	20 cm	250.41	459.42	647.05	452.29	327.20	575.00	745.30	549.16
	25 cm	224.84	412.36	576.54	404.58	233.26	395.29	632.53	420.36
Mean		270.30	491.33	716.24	492.62	320.21	562.93	770.07	551.40
	15 cm	288.80	508.11	788.50	528.47	343.22	640.27	785.80	569,76
50 cm	20 cm	258.88	432.32	624.68	440.29	296.99	506.74	668.69	490.80
	25 cm	219.57	334.03	458.68	337.42	204.40	386.57	561.50	384.15
Vlean		255.75	426.48	623.95	435.39	281.53	511.19	671.99	488.24
2000col	15 cm	312.23	555.16	356.82	574.73	371.63	680 88	859.09	637.22
General means of	20 cm	254.64	448.37	635.86	446.21	312.09	540.87	705.99	519.98
nill distance	25 cm	222.20	373.19	517,61	371.00	218.83	390.93	597.01	402.25
Mean		263.05	458.90	670.09	464.00	300.87	537.50	721.03	519.82

L.S.D.0.05%	6 for:					
Ridge width	(R)			i		
Hill distance		1	53.10	,	66.30	
Nitrogen	(N)	1	77.13	ļ	81.11	
	Řхн	1	50.60	<u> </u>	102.00	
	RxN	i	113.04	į.	117.20	
1	il x N	1	58 12	ì	72.04	
	RHN	i	1 : 1.00	į	94.50	
			The second secon			·

On the contrary, the raising effect of close hill on leaf are index, leaves dry weight per feddan and stevioside yield per feddan may be attributed to the closer hill caused increasing plant population per area unit which increased leaf area index per plant resulted in increasing net assimilation rate as well as enhancing dry matter production and stored in leaves, hence, leaves dry weight and stevioside yield per feddan increased.

Results presented in Tables (2 to 11) show clearly that the effect of nitrogen fertilizer rates was significant on all studied parameters at all cuts in both seasons. Plants fertilized by 45 kg N/feddan/cut gave the highest values of number of leaves per plant, leaf area index per plant, leaves dry weight per feddan and stevioside percentage compared to other nitrogen rates used at all cuts in both seasons. In addition, plants received 45 kg N/feddan/cut caused 104.52% and 83.87% increase in total leaves dry weight per feddan and 154.74% and 139.65% increase in stevioside yield pier feddan/5 as compared with unfertilized plants (no added N) in 2005/2006 and 2006/2007 seasons, respectively these results are in the same Das etal (2007).

The increase in total leaves dry weight per feddan caused by the highest rate of nitrogen may be due to raising effect of nitrogen on number of leaves per plant and leaf area index per plant which led to increasing total leave dry weight per feddan. In this connection, the increase in stevioside yield per feddan may be attributed to nitrogen increased stevioside percentage, whereas stevioside yield is a function of leaves dry weight per feddan multiply stevioside percentage, since these two traits increased by increasing nitrogen rate therefore stevioside yield per feddan increased.

The interaction effect between ride width and hill distance was significant on all studied characters, except, number of leaves per plant at first, fourth and fifth cut in the first season as ell as at second cut in the second season, leaf area index per plant at first and third cut in 2005/2006 season as well as at second cut in 2006/2007 season, leaves dry weight per feddan at second cut in the first season as well as at second and fourth cut in the second season and stevioside percentage at second and fourth cut in 2005/2006 season and at first and fifth cut in 2006/2007 season Plants sown on wider ridge (50 cm apart) and largest hill (25 cm apart) gave the highest number of leaves per plant compared to all other treatments at all cuts in both seasons. On the other hand, plants sown on narrow ridge (40 cm width) and closer hill (15 cm spaced) gave the highest leaf area index per plant, leaves dry weight per feddan/cut, stevioside percentage, total leaves dry weight per feddan and stevioside yield per feddan in both seasons. This treatment (40 x 15 cm) increased total leaves dry weight per feddan by 55.05% and 50.20% and stevioside yield per feddan by 84.04% and 78.23% compared to the widest ride and hill (50 cm x 25 cm) in 2005/2006 and 2006/2007 seasons. respectively.

The obtained results indicated that all measured characters significantly affected by interaction effect among ridge width and nitrogen fertilizer rates at all cuts in both seasons, except in number of leaves per plant at third cut as well as at first and fourth cut in 2005/2006 as well as 2006/2007 seasons, respectively and in leaf area index per plant at second

cut in the first seasons. Increasing nitrogen fertilizer rate from 0 to 45 kg N/feddan/cut for plants sown on ridge width 40 or 50 cm increased values of all studied traits at all cuts in both seasons Plants sown on narrow ridge (40 cm width) and received 45 kg N/fed/cut gave the highest total leaves dry weight per feddan 3.76 and 4.07 ton and stevioside yield per feddan 716.24 and 770.07 kg compared to other treatments in this interaction in 2005/2006 and 2006/2007 seasons, respectively.

The interaction effect among hill distance and nitrogen fertilizer rate was significant on all studied traits at all cuts in both season, except in leaf area index per plant at third cut in the second season, leaves dry weigh per feddan/cut at fourth cut in the second season and stevioside percentage at fifth cut in the first season. At all hill spacings, increasing nitrogen rate increased values of all studied characters at all cuts in both seasons. Fertilized plants sown on hill 25 cm apart by 45 kg N/fed/cut gave the highest number of leaves per plant at all cuts in both seasons. On the other hand, applying nitrogen at the rate of 45 kg N/fed/cut to plants sown on hill distance 15 cm gave the highest leaf area index per plant, leaves dry weight per feddan/cut, stevioside percentage, total leaves dry weight per feddan and stevioside yield per feddan in both seasons.

Data recorded in Tables (2-11) indicate that all studied parameters significantly affected by the interaction between ridge width, hill distance and nitrogen fertilizer rates at all cut sin both seasons, with exception, at firth cut in the second season for leaf area index per plant, at first and third cut in the second season for leaves dry weight per fed/cut and at third cut in the second seasons for stevioside percentage.

Sowing stevia plants on ride width 40 cm, hill distance 15 and fertilized by 45 kg N/fed/cut gave the averages of all studied characters at all cuts in both seasons, except number of leaves per plant. The highest total leaves dry weight per feddan 4.60 and 4.41 ton and the highest stevioside yield per feddan 925.14 and 932.38 kg were found with plants sown on narrow ridge (40 cm) and closer hill (15 cm as well as fertilized by 45 kg N/fed/cut compared to all other treatments in 2005/2006 and 2006/2007 seasons, respectively.

Generally, it could be recommended that planting stevia plants on ridge width 40 cm and hill distance 15 cm as well as application 45 kg N/feddan/cut recorded the greatest yield of leave dry weight and stevioside per feddan under Kafr El-Sheikh condition.

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تأثير عرض الخط والمسافة بين الجور ومعدلات التسميد الازوتسى علسى النمسو والمحصول وجودته في نبات الاستيفيا

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أجريت تجربتين حقليتين بقربه البكانوش بمحافظ من كفرالسشيخ فسى موسسمى ٢٠٠٦/٢٠٠٥ و المريد الجريد تجربتين حقليتين بقربه البكانوش بمحافظ من وثلاثة مسافات بسين الجسور (١٥، ٢٠، ٢٠ ما ٢٠ ما ٢٠٠٨) وثلاثة معدلات للتسميد الازوتى (بدن اضافة ، ٣٠، ٤٥ كجم ن/فدان/حشه) وتفاعلاتها على النمسو والمحصول وجودته في نبات الاستيفيا (صنف سبانتي). وصممت التجربة في قطع منشقة مرتين في شهلات مكررات.

وتتلخص أهم النتائج المتحصل عليها فيما يلى:

- اعطى عرض الخط ٤٠ سم اعلى قيمة لكــلا مــن دليــل مــساحه الاوراق/نبــات الــوزن الجــاف
 للاوراق/فدان/حشه والنسبة المثوية للاستيفيوسيد والوزن الكلى الجــاف لــــلاوراق/فــدان ومحــصول
 الاستيفيوسيد/فدان في كلا موسمي الدراسة. بينا أعطى عرض الخط ٥٠ سم اعلى قيمة لعــدد الأوراق
 للنبات في جميع الحشات في كلا الموسمين.
- أعطت النباتات المنزرعة على مسافات جور ضيقة (١٥ سم بين النباتات) اعلى قسيم لكل السصفات المنزوسة سابقة الذكر ما عدا عدد الاوراق للنبات والذي كان مرتفعا مع مسافة ٢٥ سم بين الجور فسى كل الحشات في كلا الموسمين.
- أدت زيادة التسميد الازوتي حتى ٤٥ كجم ن/فدان/حشه الى زيادة في قيم جميع الصفات المدروسة فسي كل الحشات في كلا الموسمين.
- اعطت النباتات المنزرعة على خطوط عرضها ٤٠ سم والمسافة بين الجور ١٥ سم اعلى قسيم لكل الصفات المنزوسة في كل المشات في كلا الموسمين ، ما عدا عدد الاوراق على النبات.
- أظهرت النتائج ان تسميد النباتات المنزرعة على خطوط عرضها ٤٠ سم بمعدل ٤٥ كجم ن/فدان/حشه اعطى اعلى متوسطات لكل الصفات المدروسة في كلا الموسمين ما عدا عدد الاوراق على النبات حيث كانت اعلى عند عرض خط ٥٠ سم ، ٤٥ كجم ن/فدان/حشه.
- ادت اضسافة ٤٥ كجسم ن/فسدان/حسشه للنباتسات المنزرعسة علسى مسمافات جسور ضسيقة (١٠٧ سم) الى زيادة جميع الصفات المدروسة فى كلا موسمى الدراسة ما عدا عدد الاوراق على النباتات والتى اعطت اعلى قيم عند الزراعة على مسافة جور ٢٥ سم مع اضافة ٤٥ كجم ن/فدان/حشه.
- اوضحت النتائج أن أعلى محصول الفدان من الوزن الجاف للأوراق ومحصول الاستيفيوسيد يمكن الحصول عليه من زراعة نباتات الاستيفيا على خطوط عرضها ٤٠ سم ومسمافات جسور ١٥ سم وتسميدها بمعدل ٤٠ كجم ن/فدان/حشه مقارنة بكل المعاملات الاخرى في كلا موسمي الدراسة.