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YIELD AND QUALITY OF STUBBLE CANE AS AFFECTED BY IRRIGATION, NITROGEN FERTILIZATION AND VARIETIES

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Abstract

The present work was conducted at El-Mattana Research Station (Upper Egypt) in the two successive seasons of 1996/97 (the 1st ratoon and 1997/98 (the 2nd ratoon) to evaluate three sugar cane varieties (G.T. 54-9, F.153 and G.74-96) grown under two irrigation systems (drip and furrow irrigation) and fertilized with three nitrogen levels (172.5, 207 and 242.5 kg N/fed). The obtained results showed that stalk height and cane yield were significantly affected by irrigation systems in the 1st and 2nd ratoon crops. Sugar yield was significantly affected by irrigation systems in the 2nd ratoon only. Irrgation systems failed to reach the level of significance in their effect on sugar recovery %, juice purity %. Sugarcane variety G.T. 54-9 attained a significant superiority in stalk height, stalk diameter, cane and sugar yields over F.153 and G.74-96 varieties. Sugar recovery and purity percentages were not affected by the tested varieties. There was a significant and gradual increase in stalk height, stalk diameter, cane and sugar yields as N levels were increased up to 241.5 kg N/fed for both ratoons. Sugar recovery % and purity % were statistically and negatively affected by increasing N level in the 2nd ratoon only.

INTRODUCTION

Water plays an important role in building up plant parts and photochemical processes of plants. Water is the carrier of soil solutes from soil to growing plant tissues through roots and translocates mineral nutrients and sugar within the plant. It is also essential for digestion of starch to sugar, five percent of water is reagent for hydrolytic process utilized for the physiochemical functions of which less than one percent of the absorbed water is utilized chemically in photosynthesis. Nitrogen is considered one of the most important elements which has a direct effect on plant growth, yield and juice quality. Ingram (1983) reported that using drip irrigation with sugar cane plants increased cane and sugar yields. Georeg (1985) found that the excess water in cane field caused a reduction in sucrose content in cane plants. Soopramanien *et al.* (1989) found that drip irrigation gave higher stalk elongation and thickness. Abd El-Gawad *el al.* (1992-a) mentioned that application of nitrogen fertilizer up to 240 kg N/fed. resulted in a significant increase in stalk length. They added that application of 180 kg

N/fed. was enough to attain the highest values of stalk diameter. Abd El-Gawad *et al.* (1992-b) obtained a negative response of sugar recovery and juice purity percentages due to the increase in N doses up to 240 kg N/fed. Shrestha and Gopalakrishman (1993) reported that drip irrigation increased the yield by about 1.7 tons of sugar/ acre. Abd El-Hadi *et al* (1994) found that application of nitrogen fertilizer at rates of (150, 175 and 200 kg/fed.) gave a significant increase in sugar yield. Azzazy (1995) revealed that using drip irrigation system increased cane yield by 13.38 and 9.16% over that of the surface irrigation in the 1st and 2nd season, respectively. Also, he mentioned that irrigation systems had an insignificant effect on sugar yield. He added that application of nitrogen fertilizer up to 210 kg N/fed. increased stalk, length, cane and sugar yield in both seasons, but decreased sugar recovery and purity percentages. He stated that sugar cane variety G.T. 54-9 surpassed the other two varieties (F. 153 and G. 74-96) in stalk height and diameter. This research aimed to rationalize water consumption and nitrogen fertilizer as well as to maximize cane and sugar yields of ratoon crops.

MATERIALS AND METHODS

The present work was conducted at El-mattana Research Station (Upper Egypt) in the two successive seasons of 1996/1997 (1st ratoon) and 1997/1998 (2nd ratoon) to evaluate the relative effect of two irrigation systems and three levels of nitrogen fertilization, on cane stubbles of some sugar cane varieties. Each trial included eighteen treatments representing the combinations between two irrigation systems (drip and furrow irrigation), three nitrogen levels (172.5, 207.0 and 242.5 kg N/ha) and three sugar cane varieties (G.T. 54-9, F.153 and G.74-96). A split plot design with four replications was used. Irrigation systems were arranged in the main plots and the combination between sugar cane varieties and nitrogen levels were allocated in the sub-plots. Sub-plot area was 70 m2 with 8 rides of 7 meters in length and 1.25 m apart. Nitrogen fertilizer was added as urea (46% N). Under the furrow irrigation, nitrogen fertilizer was applied into two equal doses; the first dose was applied after two months from harvesting of the plant cane crop (1st April) and the second one was added one month later (1st May). Whereas, plants grown under the drip irrigation, nitrogen fertilizer was supplied through drip irrigation network. Water applied was broadly varied under the two irrigation systems. The calculated amounts of water under the drip irrigation system were 6500 and 7000 m3/fed. in the 1^{st} and 2^{nd} season, respectively, being 8850 and 9700 m3/fed. representing 20 and 22 irrigations under the furrow irrigation system. Water was measured through a water meter of 0.1 cubic meter accuracy, fixed and hooked tightly where the wide inlet towards the main permanent canal and the outlet towards the lateral temporary field canal of the irrigated plots. At harvest,

plants of six guarded rows of each treatment were harvested to determine yield, yield components and juice quality.

Data recorded:

At harvest, a sample of 30 stalks representing each treatment was taken at random and the following data were recorded:

1. Stalk height (cm).
2. Stalk diameter (cm).
3. Cane yield (tons/fed.).
4. Purity percentage was calculated according to the following equation:

Purity % = Sucrose % / Brix % x 100

5. Sugar recovery percentage was calculated as follows:

Sugar recovery % = richness % x purity %

6. Sugar yield (tons/fed.) was estimated according to the following equation:

Raw sugar production = cane yield (tons/fed.) x sugar recovery %

The collected data were statistically analyzed according to the procedure outlined by Sndercor and Cochran (1981).

RESULTS AND DISCUSSION

1. Stalk height:

Data presented in Table 1 showed that stalk height of cane stubbles was significantly affected by irrigation systems in 1st and 2nd ratoon crops. Drip irrigation system surpassed the other one by 10.39 and 12.39 cm in the 1st and 2nd ratoon, respectively. This finding may be due to that cane stubble under drip irrigation was taller than that under furrow one. This advantage of drip irrigation system may be due to the continuous providing of water and available nutrients around root system of the plants. These results are in accordance with those found by Soopramanien *et al.* (1989).

Regarding the effect of the used varieties on stalk height, it could be noticed that C.T. 54-9 variety attained a significant superiority in plant height by 17.00 and 35.58 cm over F. 153 and G.74-96 variety, respectively, in the 1st season, and by 18.84 and 34.38 cm in the 2nd ratoon. This result is similar to that reported by Azzazy (1995).

The results in Table 1 cleared that there was a significant increase in plant height caused by the increase in nitrogen doses up to 242.5 kg N/fed. in the 1st and 2nd ratoons. This increase in stalk height due to increasing N-level could be attributed

to the important role of nitrogen in encouraging the meristemic activity in plant, in addition to cell elongation. These results are in line with those found by Azzazy (1995).

Except for the interaction between irrigation systems and cane varieties in the 2nd ratoon crop, there was no significant interaction effect on this trait.

Table 1. Effect of irrigation systems and nitrogen fertilizer on stalk height (cm) of stubble cane of three sugar cane varieties at harvest in 1996/1997 and 1997/1998 seasons.

Irrigation Systems	Cane Variety	1996/1997 (1st ratoon) Nitrogen (kg N/fed.)				1997/1998 (2nd ratoon) Nitrogen (kg N/fed.)			
		171.5	207	242.5	Average	171.5	207	242.5	Average
Drip Irrigation	G.T 54-9	290.00	305.00	324.00	306.33	277.50	292.50	307.00	292.50
	F. 153	279.00	239.00	288.00	286.66	270.00	287.50	293.50	283.66
	G. 74-96	255.00	267.50	268.00	263.50	247.50	257.50	260.00	255.00
Average		274.66	288.50	293.33	285.50	265.00	279.16	278.00	277.05
Surface Irrigation	G.T 54-9	280.00	288.00	300.00	289.33	265.00	285.00	305.00	285.00
	F. 153	262.50	277.50	285.00	275.00	251.00	247.50	270.00	256.16
	G. 74-96	254.00	261.50	267.50	261.00	242.50	255.00	261.00	252.83
Average		265.30	275.66	284.16	275.11	252.83	262.50	278.66	264.66
V x N	G.T 54-9	285.00	296.50	312.00	297.83	271.25	288.75	306.25	288.75
	F. 153	270.75	285.25	286.50	280.83	290.50	267.50	281.75	269.91
	G. 74-96	254.50	264.50	267.75	262.25	245.00	256.25	260.50	253.91
Average of nitrogen		270.08	282.08	288.75	280.30	285.91	270.83	282.83	270.68

L.S.D. at 5% level for:		
Irrigation systems (I)	3.48	11.4
Cane varieties (V)	7.08	7.86
Nitrogen level (N)	7.08	7.86
I x V	NS	11.12
I x N	NS	NS
N x V	NS	NS
I x V x N	NS	NS

2. Stalk diameter:

Data illustrated in Table 2 revealed that irrigation systems failed to reach the level of significance in their effect on stalk diameter in both ratoon crops. However, it could be shown that cane stubble thickness was better under drip irrigation system. This result is in agreement with that reported by Azzazy (1995).

The results indicated that stalk diameter varied signifcantly from variety to another in both ratoons. the highest value of stalk diameter was recorded by G.T. 54-9 variety which surpassed F.153 and G. 74-96 varieties by 25 and 27 mm in the 1st ratoon, and by 15 and 19 mm in the 2nd ratoon, respectively. This result may assure that stalk diameter is a genetically controlled character.

The results in Table 2 demonstrated a significant and positive response of stalk diameter to the increase in N-level. Increasing N-level up to 242.5 kg/fed. increased stem diameter by 16 and 14 mm compared with that of 171.5 kg N/fed. in the 1st and 2nd ratoon, respectively. This result is in accordance with that found by Abd El-Gawad *et al.* (1992-a).

The interaction effect between the studied factors on stalk diameter was not significant.

Table 2. Effect of irrigation systems and nitrogen fertilizer on stalk diameter (cm) of stubble cane of three sugar cane varieties at harvest in 1996/1997 and 1997/1998 seasons.

Irrigation Systems	Cane Variety	1996/1997 (1st ratoon) Nitrogen (kg N/fed.)				1997/1998 (2nd ratoon) Nitrogen (kg N/fed.)			
		171.5	207	242.5	Average	171.5	207	242.5	Average
Drip Irrigation	G.T 54-9	3.03	3.01	3.24	3.09	2.88	2.96	3.00	2.95
	F. 153	2.66	2.75	2.78	2.73	2.67	2.72	2.85	2.75
	G. 74-96	2.70	2.72	2.77	2.71	2.67	2.75	2.82	2.75
Average		2.79	2.83	2.93	2.85	2.74	2.81	2.89	2.81
Surface Irrigation	G.T 54-9	2.84	2.89	3.06	2.93	2.84	2.87	2.92	2.78
	F. 153	2.70	2.73	2.83	2.75	2.72	2.75	2.76	2.74
	G. 74-96	2.66	2.77	2.86	2.77	2.55	2.70	2.83	2.70
Average		2.73	2.79	2.92	2.81	2.70	2.77	2.84	2.77
V x N	G.T 54-9	2.93	2.95	3.15	3.01	2.86	2.91	2.96	2.91
	F. 153	2.68	2.74	2.80	2.76	2.70	2.74	2.80	2.76
	G. 74-96	2.68	2.74	2.82	2.74	2.61	2.72	2.83	2.72
Average of nitrogen		2.76	2.81	2.92	2.83	2.72	2.79	2.86	2.79

L.S.D. at 5% level for:		
Irrigation systems (I)	NS	NS
Cane varieties (V)	0.06	0.04
Nitrogen level (N)	0.06	0.04
I x V	NS	NS
I x N	NS	NS
N x V	NS	NS
I x V x N	NS	NS

3. Cane yield:

Data presented in Table 3 indicated a significant influence for irrigation systems on cane stubble yield (tons/ha). Drip irrigation system attained increases in cane yield amounted to 5.857 and 5.119 tons/fed over the furrow one in the 1st and 2nd ratoon, respectively. The relative advantage of drip irrigation system may be due to the cotinuous providing of water and available nutrients around root system of the plants and improving water efficiency which reflected on better growth and cane yield.

There was a significant difference among the used varieties in their stalk yield. Sugarcane variety G.T.54-9 recorded he highest cane yield compared with the other

two varieties where it outyielded F. 153 and G. 74-96 varieties by 6.61 and 7.85 tons/fed in the 1st ratoon and by 5.30 and 6.92 tons/fed in the 2nd ratoon, respectively. This finding throw some light on the importance of gene make-up i.e., varietal selection.

Nitrogen fertilizer level had a positive and significant effect on cane yield in both ratoon crops. Applying the highest dose of nitrogen fertilizer (242.5 kg N/fed.) resulted in increasing cane yield by 4.300 and 7.580 tons/fed. compared with the medium rate of (207 kg N/fed.) and the lowest N level (171.5 kg N/fed.), respectively in the 1st ratoon and by 4.530 and 6.620 tons/fed. in the 2nd one.

Interaction effects between the studied factors on stubble cane yield were not significant in both growing seasons.

Table 3. Effect of irrigation systems and nitrogen fertilizer on cane yield (tons/fed.) of stubble cane of three sugar cane varieties at harvest in 1996/1997 and 1997/1998 seasons.

Irrigation Systems	Cane Variety	1996/1997 (1st ratoon) Nitrogen (kg N/fed.) 171.5	207	242.5	Average	1997/1998 (2nd ratoon) Nitrogen (kg N/fed.) 171.5	207	242.5	Average
Drip Irrigation	G.T 54-9	50.00	54.47	58.27	54.25	45.17	48.13	52.30	48.53
	F. 153	43.60	47.37	50.50	47.15	41.37	39.92	46.55	42.89
	G. 74-96	42.22	43.07	49.17	44.82	38.37	39.50	44.80	40.34
Average		45.27	48.30	52.65	48.74	41.64	42.52	47.88	44.01
Surface Irrigation	G.T 54-9	45.87	50.30	55.10	50.42	41.62	45.50	49.32	45.48
	F. 153	41.82	42.82	48.52	44.29	38.37	39.70	44.37	40.81
	G. 74-96	40.52	44.30	47.62	44.15	35.30	40.00	42.60	39.30
Average		42.64	45.80	50.17	46.28	38.43	41.73	45.43	41.86
V x N	G.T 54-9	47.93	52.38	56.68	52.33	43.40	46.81	50.81	47.01
	F. 153	42.56	45.10	49.51	45.72	39.87	39.81	45.46	41.71
	G. 74-96	41.37	43.68	48.40	44.48	36.83	39.75	43.70	40.09
Average of nitrogen		43.95	47.05	51.53	47.51	40.03	42.12	46.65	42.94

L.S.D. at 5% level for:		
Irrigation systems (I)	1.77	2.11
Cane varieties (V)	2.31	2.28
Nitrogen level (N)	2.31	2.28
I x V	NS	NS
I x N	NS	NS
N x V	NS	NS
I x V x N	NS	NS

4. Purity percentage:

Data illustrated in Table 4 revealed that purity % of both sugar cane ratoons was not significantly affected by irrigation systems and/or the tested cane varieties. The results showed a negative response of purity % to the increase in the applied N doses in the 1st ratoon. This response was significant in the 2nd ratoon where the highest N level (242.5 kg N/fed) attained the lowest Purity %.

No significant interaction effect between the studied factors was detected regarding purity % in both ratoons except that of irrigation systems x cane varieties in the 1st stubble crop.

Table 4. Effect of irrigation systems and nitrogen fertilizer on purity percentage of stubble cane of three sugar cane varieties at harvest in 1996/1997 and 1997/1998 seasons.

Irrigation Systems	Cane Variety	1996/1997 (1st ratoon) Nitrogen (kg N/fed.)				1997/1998 (2nd ratoon) Nitrogen (kg N/fed.)			
		171.5	207	242.5	Average	171.5	207	242.5	Average
Drip Irrigation	G.T 54-9	81.10	78.60	78.60	79.43	78.80	76.91	73.39	76.36
	F. 153	77.38	78.72	74.67	76.92	82.80	78.55	78.50	79.95
	G. 74-96	85.97	73.80	76.90	78.89	81.80	78.15	75.73	78.86
Average		81.48	77.04	76.72	78.41	81.13	77.87	75.87	78.29
Surface Irrigation	G.T 54-9	76.76	70.26	74.08	73.70	76.20	77.30	69.32	74.27
	F. 153	85.08	77.60	78.28	80.32	84.68	75.75	73.05	77.82
	G. 74-96	71.85	74.25	72.45	72.51	81.10	74.00	72.55	75.88
Average		77.89	74.03	74.60	75.51	80.66	75.68	71.64	76.00
V x N	G.T 54-9	78.93	74.43	76.34	76.56	77.50	77.10	71.36	75.32
	F. 153	81.23	78.16	76.47	78.62	83.74	77.15	85.77	78.88
	G. 74-96	78.91	74.02	74.17	75.70	81.45	76.07	74.14	77.22
Average of nitrogen		79.69	75.53	75.76	76.96	80.89	76.77	73.75	77.14

L.S.D. at 5% level for:		
Irrigation systems (I)	NS	NS
Cane varieties (V)	NS	NS
Nitrogen level (N)	NS	2.67
I x V	5.31	NS
I x N	NS	NS
N x V	NS	NS
I x V x N	NS	NS

5. Sugar recovery percentage:

The results in Table 5 showed that the used irrigation systems and cane varieties had an insignificant influence on sugar recovery % in the 1st and 2nd ratoon crops. Sugar recovery % was not significantly affected by the applied N levels in the 1st ratoon. However, this trait was statistically and negatively affected by increasing N level in the 2nd ratoon crop. Sugar recovery percentage was not significantly affected by the interactions among the studied factors.

Table 5. Effect of irrigation systems and nitrogen fertilizer on sugar recovery percentage of stubble cane of three sugar cane varieties at harvest in 1996/1997 and 1997/1998 seasons.

Irrigation Systems	Cane Variety	1996/1997 (1st ratoon) Nitrogen (kg N/fed.)				1997/1998 (2nd ratoon) Nitrogen (kg N/fed.)			
		171.5	207	242.5	Average	171.5	207	242.5	Average
Drip Irrigation	G.T 54-9	11.5	10.53	10.35	10.79	10.35	9.90	9.27	9.84
	F. 153	10.19	10.02	9.64	9.95	10.95	9.70	9.45	10.03
	G. 74-96	9.71	9.32	9.74	9.59	10.40	10.30	9.40	10.04
Average		10.46	9.96	9.91	10.11	10.56	9.96	9.37	9.97
Surface Irrigation	G.T 54-9	10.65	10.11	9.90	10.22	9.95	9.90	9.16	9.67
	F. 153	10.50	10.38	10.55	10.47	10.70	9.70	9.40	9.93
	G. 74-96	10.58	9.81	10.18	10.19	10.35	9.45	9.32	9.70
Average		10.58	10.10	10.21	10.29	10.33	9.68	9.29	9.97
V x N	G.T 54-9	11.07	10.32	10.12	10.50	10.15	9.90	9.21	9.75
	F. 153	10.34	10.20	10.09	10.21	10.82	9.70	9.42	9.98
	G. 74-96	10.14	9.56	9.96	9.80	10.37	9.87	9.36	9.87
Average of nitrogen		10.52	10.03	10.06	9.87	10.45	9.82	9.33	10.20

L.S.D. at 5% level for:		
Irrigation systems (I)	NS	NS
Cane varieties (V)	NS	NS
Nitrogen level (N)	NS	0.15
I x V	NS	NS
I x N	NS	NS
N x V	NS	NS
I x V x N	NS	NS

6. Sugar yield:

The results collected in Table 6 indicated insignificant effect on sugar yield due to irrigation systems in the 1st ratoon. However, sugar yield was significantly affected by irrigation systems in the 2nd ratoon. Applying drip irrigation system increased sugar yield by 0.340 and 0.766 ton/fed compared with the furrow one in the 1st and 2nd ratoon, respectively.

The tested sugarcane varieties differed significantly in their sugar yield. Sugarcane variety G.T. 54-9 surpassed F. 153 and G. 74-96 varieties in sugar yield by 2.002 and 2.547 tons/ha in the 1st ratoon and by 0.699 and 1.423 ton/ha in the 2nd ratoon, respectively.

Increasing N level up to 242.5 kg/fed. increased sugar yield significantly. Applying the highest dose of nitrogen fertilizer (242.5 kg N/fed.) and the lowest N level (171.5 kg N/fed.), respectively, in 1st ratoon. Meanwhile, N levels had no significant influence on sugar yield in the 2nd ratoon.

No significant effects due the interaction between the studied factors were

obtained in their effect on stubble sugar yield except that of irrigation systems x varieties in the 1st ratoon.

Table 6. Effect of irrigation systems and nitrogen fertilizer on sugar yield (tons/fed.) of stubble cane of three sugar cane varieties at harvest in 1996/1997 and 1997/1998 seasons.

Irrigation Systems	Cane Variety	1996/1997 (1st ratoon) Nitrogen (kg N/fed.)				1997/1998 (2nd ratoon) Nitrogen (kg N/fed.)			
		171.5	207	242.5	Average	171.5	207	242.5	Average
Drip Irrigation	G.T 54-9	5.705	5.697	6.018	5.807	4.670	4.758	4.722	4.717
	F. 153	4.550	4.758	4.837	4.715	4.535	4.337	4.385	4.419
	G. 74-96	4.162	4.017	4.777	4.319	3.977	4.083	4.210	4.090
Average		4.806	4.824	5.211	4.947	4.394	4.393	4.439	4.409
Surface Irrigation	G.T 54-9	4.867	5.188	5.600	5.218	4.135	4.475	4.510	4.373
	F. 153	4.333	4.453	5.098	4.628	4.315	3.847	4.087	4.083
	G. 74-96	4.285	4.567	4.842	4.565	3.660	3.780	3.970	3.803
Average		4.495	4.736	5.180	4.804	4.037	4.034	4.189	4.087
V x N	G.T 54-9	5.286	5.442	5.809	5.512	4.402	4.616	4.616	4.545
	F. 153	4.441	4.605	4.968	4.671	4.425	4.092	4.236	4.251
	G. 74-96	4.224	4.292	4.810	4.442	3.819	3.931	4.090	3.947
Average of nitrogen		4.650	4.780	5.195	4.875	4.215	4.213	4.314	4.248

L.S.D. at 5% level for:		
Irrigation systems (I)	NS	0.204
Cane varieties (V)	0.403	0.199
Nitrogen level (N)	0.403	NS
I x V	0.570	NS
I x N	NS	NS
N x V	NS	NS
I x V x N	NS	NS

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محصول وجودة القصب الخلفة وتأثرهما بنظم الري والتسميد الازوتي واصناف القصب

ناصر عزازي - عبد الله الشافعي- إبراهيم الجداوي

معهد بحوث المحاصيل السكرية - مركز البحوث الزراعية بالجيزة.

أقيمت تجربتان حقليتان بمحطة بحوث المطاعنة بمحافظة قنا في الموسمين المتتاليين /١٩٩٧ ١٩٩٦ (قصب خلفة اولى) و ١٩٩٧/١٩٩٨ (قصب خلفة ثانية) لتقييم ثلاثة اصناف من قصب السكر (جيزة - تايوان ٥٤-٩، اف ١٥٣ وجيزة ٧٤-٩٦) النامية تحت نظامين للري (الري بالتنقيط والري السطحي) والمسمدة بثلاث مستويات من السماد الازوتي (١٧٢,٥، ٢٠٧ و ٢٤٢,٥ كجم/فدان).

اوضحت النتائج ان طول العود ومحصول العيدان للخلفة الاولى والثانية قد تأثرا معنويا بنظامي الري المستخدمين - كما تأثر محصول السكر للخلفة الثانية معنويا بنظامي الري - في حين لم يتأثر سمك العيدان والنسبة المئوية للسكريات المختزلة والنقاوة بنظامي الري.

تفوق الصنف جيزة ٥٤-٩ معنويا على الصنفين الاخرين (اف ١٥٣ وجيزة ٧٤-٩٦) في ارتفاع وسمك العيدان ومحصول العيدان والسكر - في حين لم تختلف الاصناف معنويا.

أوضحت النتائج وجود زيادة معنوية في ارتفاع وسمك ومحصول العيدان والسكر بزيادة مستوى السماد الازوتي حتى ٢٤٢,٥ كجم ن/فدان للخلفتين الاولي والثانية - في حين تأثرت النسبة المئوية للنقاوة ونسبة ناتج السكر معنويا وسلبيا بزيادة مستوى السماد الازوتي في الخلفة الثانية فقط.

يوصي هذا البحث باستخدام الري بالتنقيط مع اضافة ٢٤٢,٥ كجم نيتروجين/الفدان للقصب الخلفة وذلك للحصول على اعلى محصول للعيدان والسكر مع توفير كمية من المياه (٦٣,١٥ و ٣٨,٥٧٪) مقارنة بالري السطحي في الخلفة الاولى والثانية على التوالي.