

SEEDING RATES AND NUMBER OF HOEINGS IN RELATION TO YIELD AND QUALITY OF SUGARCANE VARIETY G 85-37

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Abstract

This study was conducted at EL-Mattana Agricultural Research Station, Qena governorate to study the effect of seeding rates and number of hoeings on yield and quality attributes of plant cane (2000/2001) and its two ratoon crops (2001/2002 & 2002/2003). Nine treatments, the combination between three seeding rates (25200, 37800 and 50400 buds/fed) and three hoeing treatments (one, two and/or three times) for sugar cane variety G. 85-37 were used. A split plot design, i.e. replications was used. Seeding rates allocated in the main plot, meanwhile the hoeing treatments were randomly assigned in the sub plots. The results indicated the following:-

The seeding rate of 50400 buds/fed. gave higher number of millable cane, millable cane length, cane and sugar yields compared with other seeding rates.

Practicing hoeing three times significantly affected the number of millable cane /m², millable cane height, millable cane diameter as well as cane and sugar yields. The percentages of sugar recovery was insignificant.

The interaction between seeding rates and hoeing treatments insignificantly affected brix and sucrose, as well as sugar recovery %, while number of millable cane/m², millable cane height, millable cane diameter as well as cane and sugar yields were significantly affected. Practice hoeing three times produced the highest yields of cane and sugar/fad.

INTRODUCTION

Sugar cane varieties genetically vary in length and thickness of internodes as well as stalk weight, so it is evident that quantity of seeding rates widely differ from variety to the other. The optimum seeding rate is important to obtain high yield of sugar cane. Many investigators reported that cane yield increases when seeding rate increases to an optimum level. Singh *et al.* (1991) and Yadav (1993) found that using the higher seeding rates gave the highest cane yield. Yousef *et al.* (1998) showed that Brix percentage and sugar yield was significantly affected by seeding rates. Yousef *et al.* (2000) indicated that millable cane height increased by increasing seeding rates. Ahmed (2003) showed that the seeding rate significantly affect number of millable

cane/m², however, there was no significant influence on sucrose and sugar recovery percentage_s

Botanically, almost sugar cane internodes are very short in the basal part and the suitable hoeing broadly improves plant growth and the final millable cane at harvest would be increased. In addition to the important role of agricultural process, Quintero and Rodriguez (1982) concluded that the highest yield of sugar was given by two hoeing (14.8 ton/ha.), however Mehra *et al.* (1990) found that hoeing twice gave the best results on growth of sugar cane and depressed weed growth. Ismail (1991) showed that hoeing sugar cane twice produced the highest stalk length, stalk diameter, purity %, sugar recovery %, number of millable cane and sugar yield, and sucrose %. Burgobain (1993) claimed that the greatest millable cane population (84,850/ha.) and cane yield (80.25 ton/ha.) were obtained with hoeing at 60 and 120 days after planting. More over, Cauhan and Singh (1993) cleared that hoeing three times (at 35, 65, and 95 days after planting) resulted in the greatest cane yield (73.8 ton/ha. EL-Sayed (2000) showed that increasing hoeing from twice to three times almost increased stalk diameter, however, this effect was insignificant with respect to stalk length and number of millable cane/fed, as well as purity % and sugar recovery in juice at harvest. He added that practicing three hoeing significantly increased brix % by 0.61 %, meanwhile sugar recovery percentage insignificantly affected by hoeing treatments.

The main purpose of this study is to determine the optimum seeding rate and hoeing number for the sugar cane variety G85-37.

MATERIALS AND METHODS

The present work was conducted at EL-Mattana agricultural Research Station Qena governorate to study the effect of seeding rates and number of hoeing on yield and quality attributes of plant cane (2000/2001) and its ratoon crops (2001/2002 & 2002/2003). This study included nine treatments which were the combinations three seeding rates (25200, 37800 and 50400 buds/fed) and three hoeing number (once, twice and three times) for sugar cane variety G.85-37. "

Planting took place during the 1st week of March (2000/2001) for the plant cane using seed setts included three bus in each, however, crop management of the 1st and 2nd ratoon crops (2001/2002 & 2002/2003) started during the 2nd week of March after harvesting the plant cane and the 1st ratoon successively.

A split plot design with three replications was used. seeding rates were allocated in the main plot , meanwhile the hoeing treatments were randomly assigned in the sub plots. The sub plot area was 56 m² represented eight rows, seven meter in length and one meter in width. All the cultural treatment practices were practiced.

Data recorded

1. Number of millable cane/m²
A sample of twenty millable canes from each treatment was randomly taken to determine the following traits:-
2. Millable cane height (cm) was measured from soil surface up to the top visible dewlap.
3. Millable cane diameter (cm) was measured at the middle part of stalks.
4. Brix percentage in cane juice was determined by using Brix Hydrometer
5. Sucrose percentage in cane juice was determined by using Saccharemeter according to A.O.A.C. (1995).
6. Sugar recovery percentage was calculated according to the following equation.
Sugar recovery % = [sucrose % - 0.4(Brix % - sucrose %)] x 0.73.
7. Cane yield (tons/fed) was calculated based on plot area.
8. Sugar yield (tons/fed) was estimated as follows:
Sugar yield (tons/fed) = cane yield (tons/fed) x sugar recovery %.

The collected data were subjected to the proper statistical analysis according to the procedure outlined by Snedecor and Cochran (1981). Treatment means were compared by least significant difference (L.S. D.) at 5% level of probability.

RESULTS AND DISCUSSION

1- Number of millable cane/m² Data presented in Table 1 show that millable cane number/m² was broadly affected by seeding rates. This effect was significant for the plant crop and its ratoon crops. Planting sugar cane by using 54.400 buds/fed. surpassed the other two seeding rates in respect to this trait. This finding is in harmony with that reported by Ahmed (2003)

Table 1 clear that millable cane number/m² was also affected significantly by hoeing number in the plant cane as well as the 1st and 2nd ratoon crops The pronounced effect of hoeing treatments on this trait was mainly due to weed control in addition to the enhanced effect of the heaped soil on sprouting of the basal buds

and ,consequently more tillers and number of millable cane/ m² at harvest. These results are in harmony with EL-Geddawy and EL-Soghier (2003)

The interaction between seeding rate and hoeing treatments cleared that planting sugar cane by using rate of 50.400 buds/fed. and hoeing three times almost recorded the highest significant values of millable cane number/m² (17.42, 17.08 and 17.38) in the plant cane , 1st and 2nd ratoon crops, respectively.

Table 1. Effect of seeding rates and hoeing numbers on number of millable cane /m²

Seasons	Plant cane 2000/2001				1 st ratoon 2001/2002				2 nd ratoon 2002/2003			
	One	Two	Three	Mean	One	Two	Three	Mean	One	Two	Three	Mean
No. of buds/fed.												
25200	8.96	11.49	12.55	11.00	10.00	11.29	12.27	11.29	9.19	10.19	12.00	10.46
37800	11.53	13.29	15.90	13.57	12.33	13.06	14.34	13.24	11.14	13.00	15.05	13.06
50400	12.77	15.31	17.42	15.17	12.74	15.69	17.08	15.17	12.52	15.57	17.38	15.16
Mean	11.09	13.36	15.29		11.69	13.34	14.66		10.50	12.90	14.81	

LSD at 5 % level of significance

Seeding rate (s)	1.21	1.07	1.70
No,of hoeing(H)	0.93	1.04	0.80
S x H	1.06	1.81	1.39

2-Millable cane height Data given in Table 2 showed that seeding rates statistically affected millable cane height of plant cane and the 1st ratoon crops , while , this effect was not enough to reach the level of significance in the 2nd ratoon. Seeding rate of 50.400 buds/fed. gave the tallest millable cane. The increase in cane height could be due to the competition among plants on light . These results are in accordance with those obtained by yousef *et al.* (2000) who mentioned that millable cane height increased by increasing seeding rates.

Results shown in the same Table revealed that hoeing treatments significantly affected millable cane height of the planted cane and 1st ratoon crops. Hoeing three times gave the highest values of millable cane height i.e.274 and 275 cm. in the plant cane and ,1st ratoon crops , respectively. This result might be due to that hoeing process decreased the negative effect of weeds on plant growth and saved a good cover for the stools of cane plants which enhanced and increased tillering capacity, and in turn raised the number of cane plants per unit area which consequently increased plant height, and also might be due to the fact that plants

under the high dense seemed to be looking for light and therefore, they elongated more. These results are in agreement with those obtained by Ismail, (1991).

The interaction between seeding rate and hoeing treatments was significant in plant crop only. In general the tallest millable cane (282cm) was obtained by using seeding rate 50400 buds/fed and hoeing three times in plant cane and its 1st ratoon crop.

Table 2. Effect of seeding rates and hoeing numbers on number of millable cane height

Seasons	Plant cane 2000/2001				1 st ratoon 2001/2002				2 nd ratoon 2002/2003			
	One	Two	Three	Mean	One	Two	Three	Mean	One	Two	Three	Mean
No. of buds/fed.												
25200	246	256	261	254	250	255	246	250	190	190	231	204
37800	262	272	279	270	259	264	278	267	258	252	271	260
50400	271	276	282	276	262	270	300	277	263	239	247	250
Mean	260	268	274		257	263	275		237	277	250	

LSD at 5 % level of significance

Seeding rate (s)	11.0	17.0	N.S
No,of hoeing (H)	6.0	13.0	N.S
S x H	10.0	N.S	N.S

3- Millable cane diameter Data in Table 3 showed that the millable cane diameter was significantly affected by seeding rates in the three sugar cane crops. Results pointed out that the lower seeding rate (25200 buds/fed.) gave the thicker millable cane than the other two seeding rates. This result may be attributed to the great inter-plant competition on light and nutrients as well as mutual shading in case of higher seeding rate. Similar result were obtained by Singh *et al.* (1991).

In respect to hoeing treatments, the lower the number of hoeing (one time) produced the thicker millable cane (2.93, 2.97 and 2.74) in plant cane ,1st and 2nd ratoon crops, respectively. This observation may be attributed to that increasing number of hoeing enhanced tillering of cane plants as aforementioned which may affect negatively the stalk diameter and vice versa. This result partially in line with EL-Sayed (2000) who claimed that increasing hoeing from two to three times almost increased stalk diameter.

The effect of the interaction between seeding rates and hoeing number was significant in the plant cane only. It is evident that the thicker millable cane, was produced from the lowestfirst seeding rate (25200 buds/fed.) and hoeing one time.

4- Brix percentage data in Table 4 revealed that the highest values of Brix percentage were obtained by using the highest seeding rate. However, the significant influence of seeding rates on this trait was only recorded in the 2nd ratoon crop. Similar results were obtained by yousef *et al.* (1998) who found that increasing seeding rates was accompanied by a gradual increase in Brix percentage.

Table 3. Effect of seeding rates and hoeing numbers on millable cane diameter

Seasons	Plant cane 2000/2001				1 st ratoon 2001/2002				2 nd ratoon 2002/2003			
	Hoeing	One	Two	Three	Mean	One	Two	Three	Mean	One	Two	Three
No. of buds/fed.												
25200	3.03	2.93	2.96	2.98	3.00	3.00	2.93	2.98	2.90	2.83	2.77	2.83
37800	2.92	2.88	2.83	2.88	3.03	2.93	2.84	2.93	2.67	2.70	2.60	2.66
50400	2.83	2.75	2.68	2.75	2.87	2.74	2.60	2.74	2.67	2.67	2.58	2.64
Mean	2.93	2.85	2.82		2.97	2.89	2.79		2.74	2.73	2.65	

LSD at 5 % level of significance

Seeding rate (s)	0.09	0.09	0.12
No,of hoeing(H)	0.07	0.06	0.07
sS x H	0.13	N.S	N.S

Results also showed that hoeing plant cane crop three times was necessary to produce the highest values of brix percentage. This finding may indicate that even the agricultural treatment could be changed based on the vigorous and the plant population.

Brix percentage was insignificantly affected by the interaction among the two studied factors.

Table 4. Effect of seeding rates and hoeing numbers on Brix percentage

Seasons	Plant cane 2000/2001				1 st ratoon 2001/2002				2 nd ratoon 2002/2003			
	Hoeing	One	Two	Three	Mean	One	Two	Three	Mean	One	Two	Three
No. of buds/fed.												
25200	22.09	21.88	22.69	22.22	21.91	21.95	21.87	21.91	21.40	22.11	21.94	21.82
37800	22.36	21.44	23.12	22.30	21.75	21.46	21.77	21.66	22.01	22.07	22.21	22.09
50400	22.47	22.09	23.21	22.59	22.18	21.57	21.85	21.87	22.13	22.14	22.22	22.16
Mean	22.31	21.80	23.01		21.94	21.66	21.83		21.84	22.11	22.12	

LSD at 5 % level of significance

Seeding rate (s)	N.S	N.S	0.29
No,of hoeing(H)	0.56	N.S	N.S
S x H	N.S	N.S	N.S

5- Sucrose percentage results in table 5 cleared that sucrose percentage was significantly affected by seeding rates. This results was true in the first ratoon crop. The highest values of sucrose percentage (16.87-16.88 %) were recorded by using second and/or third seeding rates, respectively.

The interaction effect of seeding rates and number of hoeing treatments on this trait was insignificant.

Data in Table 5 also showed that hoeing treatments had significant influence on sucrose percentage of sugar cane stalks. This finding was only true for the second ratoon crop . These results are in agreement with those obtained by Ismail (1991). They indicated that hoeing sugar cane twice produced the highest value of sugar recovery %.

Table 5. Effect of seeding rates and hoeing numbers on sucrose percentage

Seasons	Plant cane 2000/2001				1 st ratoon 2001/2002				2 nd ratoon 2002/2003			
	One	Two	Three	Mean	One	Two	Three	Mean	One	Two	Three	Mean
No. of buds/fed.												
25200	16.65	16.65	16.71	16.59	16.43	16.32	15.91	16.22	16.49	16.65	15.80	16.31
37800	16.19	16.68	16.66	16.48	17.08	16.78	16.75	16.87	16.33	16.49	16.50	16.44
50400	16.69	16.53	16.57	16.60	16.97	17.11	16.56	16.88	16.75	16.85	15.90	16.50
Mean	16.42	16.59	16.65		16.83	16.73	16.41		16.52	16.66	16.07	

LSD at 5 % level of significance

Seeding rate (s)	N.S	0.48	N.S
No,of hoeing(H)	N.S	N.S	0.38
S x H	N.S	N.S	N.S

6- Sugar recovery percentage results in Table 6 indicated that sugar recovery percentage was insignificantly affected by the seeding rates.

Practicing two hoeings attained a significant advantage in the values of sugar recovery percentage , however, this effect was significantly and was in agreement with those concluded by EL-Sayed (2000).

The interaction effect between the two studied factors was insignificant.

Table 6. Effect of seeding rates and hoeing numbers on sugar recovery percentage

Seasons	Plant cane 2000/2001				1 st ratoon 2001/2002				2 nd ratoon 2002/2003			
	One	Two	Three	Mean	One	Two	Three	Mean	One	Two	Three	Mean
No. of buds/fed.												
25200	10.31	10.63	10.46	10.47	10.39	10.27	9.87	10.18	10.60	10.56	9.74	10.30
37800	10.05	10.68	10.28	10.34	11.11	10.88	10.63	10.87	10.17	10.41	10.38	10.32
50400	10.09	10.78	10.16	10.34	10.87	11.19	10.55	10.87	10.66	10.65	9.76	10.36
Mean	10.15	10.70	10.30		10.79	10.78	10.35		10.48	10.54	9.96	

LSD at 5 % level of significance

Seeding rate (s)	N.S	NS	N.S
No,of hoeing(H)	N.S	N.S	0.484
S x H	N.S	N.S	N.S

7- Cane yield (Tons/fed.) the results presented in Table (8) showed that increasing seeding rates was accompanied by significant increase in net cane yield in plant cane , 1st and 2nd ratoon crops. The highest net cane yield was obtained by using the highest seeding rate (47.117, 45.533 and 36.047tons/fed.) for the plant cane and 1st and 2nd ratoon crops respectively. Similar results were obtained by Yousef *et al.* (2000) and Ahmed (2003)

The pronounced influence of the increase in the seeding rates on the produced net cane yield was mainly due to the distinct effect of seeding rates on the number of millable cane/fed. at harvest Table 1 .

Data revealed in Table 7 showed that cane yield significantly increased as the number of hoeing increased. This result hold fairly true in the plant cane crop and its two ratoons. Increasing the hoeing number up to three times/season relatively attained an increment in the values of cane yield amounted by 36.73 % and 10.23 % for the plant crop, 23.47 % and 8.41 % for the 1st ratoon and 19.95 % and 19.42 % for the 2nd ratoon compared with hoeing once or twice /season respectively. The appreciable effect of increasing heavy hoeing on cane yield may be due to the elimination of weed competition as well as to its positive effect on cane plant tillering which resulted in more number millable cane/m² Table 1 as well as stalk height Table 2. These results are in agreement with those reported by Cauhan and singh (1993).

Cane yield was significantly affected by the interactions between the studied factors in the three crops. The highest cane yield was obtained by planting 50400 buds/fed sugarcane and hoeing three times / season.

Table 7. Effect of seeding rates and hoeing numbers on cane yield

Seasons	Plant cane 2000/2001				1 st ratoon 2001/2002				2 nd ratoon 2002/2003				
	Hoeing	One	Two	Three	Mean	One	Two	Three	Mean	One	Two	Three	Mean
No. of buds/fed.													
25200	33.867	36.600	41.067	37.178	33.667	36.100	40.867	36.878	25.970	27.767	36.420	30.052	
37800	37.433	41.533	49.267	42.744	36.933	42.200	46.867	42.000	28.139	29.133	33.283	30.185	
50400	43.400	46.600	51.350	47.117	38.000	47.533	51.067	45.533	31.610	36.443	40.087	36.047	
Mean	38.233	41.578	47.228		36.200	41.944	46.267		28.573	31.114	36.597		

LSD at 5 % level of significance

Seeding rate (s)	0.706	0.691	3.606
No,of hoeing(H)	0.484	0.714	1.998
S x H	0.838	1.239	N.S

8- Sugar yield (Tons/fed.) results given in Table 8 indicated that increasing seeding rate from 25200 up to 45500 buds/fed. significantly increase sugar yield /fed of the plant cane , 1st and 2nd and ratoon crops Table 8.

It is evident that the highest seeding rate (54400 buds/fed) produced the highest sugar yield (4.877, 4.943 and 3.604 T/fed.) in plant cane , 1st and 2nd ratoon crops respectively. Yousef *et al.* (2000) and Ahmed (2003) results are in agreement with these results.

Data presented in Table 8 indicated that sugar yield was increased as the the number of hoeing increased up to three times/ season. This observation hold true in the plant crop , the 1st and 2nd ratoon crops. The increase could be attributed to cane yield (Table 7). This finding is in line with that reported by EL-Sayed (2000).

The interaction effect between seeding rates and the number of hoeings significantly affected sugar yield in plant cane and first ratoon crops. In general the highest sugar yield was obtained by planting sugarcane by 50400 buds/fed. and hoeing three times per season.

Table 8. Effect of seeding rates and hoeing numbers on sugar yield

Season s	Plant cane 2000/2001				1 st ratoon 2001/2002				2 nd ratoon 2002/2003				
	Hoeing	One	Two	Three	Mean	One	Two	Three	Mean	One	Two	Three	Mean
No. of buds/fed.													
	25200	3.499	3.873	4.227	3.866	3.841	3.851	4.334	4.009	2.766	3.931	3.548	3.082
	37800	3.882	4.429	4.903	4.405	4.112	3.932	4.981	4.342	2.863	2.925	3.798	3.195
	50400	4.369	5.030	5.231	4.877	4.128	5.323	5.379	4.943	3.010	3.886	3.919	3.604
	Mean	3.916	4.444	4.787		4.027	4.369	4.898		2.880	3.247	3.793	

LSD at 5 % level of significance

Seeding rate (s)	0.706	0.691	0.323
No,of hoeing(H)	0.484	0.714	0.351
S x H	0.838	1.234	N.S

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معدلات التقاوي وعدد مرات العزق وعلاقتها بالمحصول والجودة لصنف قصب السكر جيزة ٨٥-٣٧

ابراهيم حنفى الجداوى - أحمد زكى أحمد و عبد اللاهى محمد أحمد

معهد بحوث المحاصيل السكرية - مركز البحوث الزراعية- جيزة- مصر

أجريت هذه الدراسة بمحطة البحوث الزراعية بالمطاعنه محافظة قنا لمعرفة تأثير معدلات التقاوي وعدد مرات العزق على صفات المحصول والجودة لقصب السكر لمحصول الغرس (٢٠٠١/ ٢٠٠٠) والخلفة الأولى (٢٠٠٢/٢٠٠١) و الخلفة الثانية (٢٠٠٢/٢٠٠٣). اشتملت الدراسة على عدد تسع معاملات هي التوافق بين ثلاث معدلات تقاوي (٢٥٢٠٠- ٣٧٨٠٠ و ٥٤٤٠٠ برعم للقدان) و ثلاث عزقات عميقة (عزقة ، عزقتان ، ثلاث عزقات). صممت التجربة بنظام القطع المنشقة مرة واحدة حيث وضعت معدلات التقاوي في القطع الرئيسية بينما شغلت معاملات العزق القطع الشقية. وفيما يلي أهم النتائج المتحصل عليها:

- أعطى معدل التقاوي ٥٠٤٠٠ أعلى القيم في صفات عدد العيدان القابلة للعصير بالمتري المربع، طول العود و محصولي العيدان والسكر
- أثرت معاملات العزق معنويا في كل من عدد العيدان القابلة للعصير بالمتري المربع، طول وسمك العيدان وأيضا محصولي العيدان والسكر ، بينما لم يظهر تأثير في ناتج السكر النظري.
- أدى التفاعل بين معاملات العزق و معدلات التقاوي تحت الدراسة إلى تأثيرات غير معنوية على قياسات جودة العصير ، ونسبة النقاوة بينما كان التأثير معنويا على كل من عدد العيدان القابلة للعصير بالمتري المربع ، وطول وسمك العيدان و محصولي العيدان والسكر.
- أوضحت النتائج أن إجراء العزق ثلاث مرات بالموسم و معدل التقاوي ٥٠٤٠٠ برعم للقدان أعطى أعلى محصول من العيدان والسكر.