

EFFECT OF SOME TILLAGE PRACTICES AND PLANT SPACING ON SUGAR CANE: 1. GROWTH CHARACTERISTICS

**EL-GEDDAWY, I.H.¹ S.A. SHAFSHAK,² S.A.H. ALLAM ²AND
G.S. EL-SAYED¹**

1- SUGAR CROPS RES. INST, AGRIC. RES. CENTER, GIZA, EGYPT.

2-FAC. AGRIC., MOSHTOHOR, ZAGAZIG UNIV., EGYPT.

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Abstract

This investigation was carried out at Shandaweel Research Station (Sohag Governorate) in 1997/1998 and 1998/1999 seasons to study the effect of some tillage practices (ploughing and hoeing) and row spacing on growth characteristics of the plant cane.

The results showed that increasing ploughing number from two to three and four times increased sprouting percentage at 45 days in both seasons with a significant difference in the second season, number of stalks/m after 105 and 165 days from planting and stalk diameter at 150 and 210 days in the second season. Ploughing two or three times attained the highest stalk length throughout the different growth stages compared with four ploughings.

Spacing rows at 100 cm produced higher sprouting percentage and number of stalks/m after 105 and 165 days from planting in the 2nd season compared with planting at 125 cm. Row spacing of 125 cm significantly increased stalk diameter in the 2nd season at the various growth stages. Planting sugarcane in rows of 100 cm significantly increased stalk height at the different stages in the 2nd season compared with the wider row spacing (125 cm).

Hoeing frequency had no significant effect on number of stalks/m or stalk height at 105 and 165 days from planting and stalk diameter at all growth stages.

INTRODUCTION

Soil deep loosening techniques can improve soil structure and increase the soil aeration and water permeability. It can also substantially increase crop yields. Row spacing plays an important role in the amount of solar radiation intercepted and water transpired by crop canopy which in turn affect the photosynthesis processes and

ultimately the dry matter produced and sugar extracted by sugar cane plant. Moreover, planting density may affect cane diameter, length and weight of individual plants which contribute to cane yield. Prasad *at al.* (1983) stated that spacing of 90 cm gave thicker canes than 70 cm. Ismail (1991) found that hand hoeing twice gave the highest stalk length, stalk diameter, at different growth stages, compared with untreated control. Researchers from the Bureau of Sugar Experiment Stations showed little or no benefit from increasing the number of cultivations in plant or ratoon cane. (Braunack, 1994). Uniform deep ploughing became a routine practice to improve productivity that needs no more confirmation (Abou- Salama, 1996). Ahmed (1995) cleared that planting sugar cane by using double drills gave the highest values of stalk height. However, there was no clear cut difference between planting systems (double and 1.5 drills) in their effect on stalk diameter. Also double drills led to a significant increase in number of sugar cane plants/m over 1.5 drill. El-Sayed (1996) revealed that planting density had no significant effect on stalk height, and planting 1.5 drill significantly increased stalk diameter compared with planting two drills. Barbieri *at al.* (1997) revealed that the conventional tillage gave better results than the reduced tillage. Yadav and Prasad (1997) found that closer spacing increased cane yields by 8.9% over wider spacing due to an increased number and length of millable canes. Abd- El-Latif *at al.* (1998) FOUND that increasing row spacing from 80 to 120 cm significantly increased stalk height. Laila Saif *at al.* (1999) found that increasing plant population in terms of number of buds/fed significantly increased stalk height, and decreased stalk diameter. The present work was conducted to study the relative importance of ploughing times , hoeing frequency and row spaces on growth characteristics of sugar cane.

MATERIALS AND METHODS

Two field trials were conducted at Shandaweel Research Station (Sohag Governorate) in the two successive growing seasons of 1997/1998 and 1998/1999, to study the effect of some tillage practices (ploughing and hoeing) and row spacing on growth characteristics of cane plant. Each field experiment included twelve treatments representing the combination between the following studied factors:

A- Number of ploughings:

- 1- Two ploughings.

2- Three ploughings.

3- Four ploughings.

Ploughing was done by a (Chisel Plough) which is 7 blade- mounted type. The distance between every 2 blades was 50 cm. It stirs the soil for a depth of 15 cm. Compacting was done after each ploughing by a wooden block.

B- Row spacing:

1- 100 cm.

2- 125 cm.

C- Hand hoeing treatments:

1- Hand hoeing twice, after 30 and 60 days from planting.

2- Hand hoeing three times, after 30, 60 and 90 days from planting.

Sugar cane variety G.T.54-9 was planted during the first week of April and harvested twelve months later. One and half drills of three-budded cane cuttings were used in sugar cane planting (37800 buds/fed in case of spacing rows at 100 cm and 30240 buds/fed in case of 125 cm rows spacing). A split split plot design with four replications was used in both seasons where, treatments of ploughing number were allocated in the main plots whereas the sub plots were assigned for row spacing treatments and hoeing frequency treatments were randomly distributed in the sub-sub plots. The experimental unit area was 70 m², 7 m in length and 10 m in width, including 10 rows (in case of spacing at 100 cm) and 8 rows (in case of spacing at 125 cm).

Data Recorded

1- Sprouting percentage was determined at 45 days from planting.

2- Number of plants per meter, was recorded twice, at 105 days from planting and 60 days later.

3- The following growth characteristics were periodically determined for ten labeled plants:

a- Stalk diameter (cm) at the middle part of the stalk at 150, 210, 270 and 330 days from planting.

b- Stalk height (cm) from land level till dewlap at 150, 210, 270 and 330 days from planting. The collected data were statistically analysed according the procedures outlined by Snedecor and Cochran (1981).

RESULTS AND DISCUSSION

1- Sprouting percentage

Increasing ploughing number from two to three and four times increased sprouting percentage by 6.06 and 2.99 % in the 1st season, being 8.63 and 3.77 % in the 2nd one (Table 1). The effect of ploughing number on sprouting percentage was significant in the 2nd season only. The highest value of germination percentage (34.9% and 40.07% in the 1st and 2nd seasons, respectively) at 45 day from planting was attained by carrying out the ploughing process three times.

The results showed that using the lower row spacing (100 cm) produced higher sprouting percentage in both season compared with the wider row spacing (125 cm). The increase in germination percentage was 5.43 and 1.26 in the 1st and 2nd seasons, respectively. These increases were significant in the 2nd season only.

Data in Table (1) showed that with 2 and 3 ploughings, the wider row spacing produced higher germination percentage compared with the narrower spacing, whereas with 4 ploughings an opposite trend was observed where the narrower spacing (100 cm) produced a marked significant increase in sprouting percentage . The maximum sprouting % in 1998/1999 season was 40.87% resulting from 3 ploughing combined with 125 cm row spacing (Table 1). The increase in germination percentage resulting from 3 ploughings in both seasons of experimentation indicates that this practice in soil tillage is quite suitable for improving physical soil characters which in turn was reflected in increasing sprouting percentage. Further increase in ploughing intensity to 4 times negatively affected germination % perhaps due to negative effects on soil structure. The results obtained by Barbieri *at al.* (1997) revealed that the conventional tillage gave better results than the reduced tillage.

Table 1. Effect of number of ploughings and row spacing on sprouting percentage of sugar cane at (45 days from planting) (1997/98 and 1998/99 seasons)

Number of ploughing	Row spacing	1997/98 season	1998/1999 season
2	100 cm	32.932	30.552
	125 cm	24.785	32.338
Average		28.858	31.445
3	100 cm	35.517	39.283
	125 cm	34.325	40.868
Average		34.921	40.076
4	100 cm	35.300	39.873
	125 cm	28.365	32.735
Average		31.832	36.304
Row spacing	100 cm	34.583	36.569
x Hoeing	125 cm	29.158	35.314
Total Average		31.871	35.942

L S D at 5 % level :

Ploughing (P)	NS	*
Row spacing (R)	NS	*
P x R	NS	2.053

2- Number of stalks / m

Results given in Tables (2 and 3) show the effects of number of ploughings, row spacing, hoeing and their interactions on the number of stalks/m at 105 and 195 days from planting in the 1st and 2nd seasons. Regarding the effect of number of ploughings, the results showed that increasing ploughing number from two to three and four times tended to increase number of stalks/m by 14.19 % and 15.23 % after 105 days from planting, being 3.8 % and 9.05 % after 165 days from planting in the 1st season.

In 1998/99 season, the results cleared that increasing ploughing number from two to three times increased number of stalks/ m by 4.5 % and 17.61 % after 105 and 165 days from planting , respectively. However, raising ploughing number from two to four times decreased number of stalks/m by 5.77 % and 2.81 % after 105 and 165 days from planting, respectively. Ploughing sugar cane field three times attained a significant increase in the number of plant/m at 165 day in the 2nd season only, compared with 2 or 4 ploughings..

The results indicate clearly that 3 ploughings is fair enough for producing higher number of stalks. Four ploughing negatively affected number stalks/m in both seasons. Two ploughings seemed to ensure a good seedbed for growing cane and improved soil physical, chemical and biological characters. The results obtained by Pear *at al.* (1992) showed no significant differences between a plot cultivated in the traditional manner and a low tillage plot.

Table 2. Effect of some tillage practices and row spacing on number of stalks /m of sugar cane at different stages of growth in 1997/98 season

Number of Ploughing	Row spacing	105 days		Average	165 days		Average
		2 hoeings	3 hoeings		2 hoeings	3 hoeings	
2	100 cm	4.92	5.35	5.13	11.90	12.09	11.99
	125 cm	7.54	7.71	7.62	13.11	13.95	13.53
Average		6.23	6.53	6.38	12.50	13.02	12.76
3	100 cm	7.49	6.06	6.78	12.92	12.38	12.65
	125 cm	7.81	7.78	7.79	13.64	14.06	13.85
Average		7.65	6.92	7.28	13.28	13.22	13.25
4	100 cm	8.07	6.99	7.53	15.23	13.47	14.35
	125 cm	6.92	7.42	7.17	13.59	13.37	13.48
Average		7.49	7.21	7.35	14.41	13.42	13.91
Row spacing x Hoeing	100 cm	6.83	6.13	6.48	13.35	12.64	13.00
	125 cm	7.42	7.64	7.53	13.44	13.79	13.62
Total Average		7.128	6.89	7.00	13.40	13.22	13.31

L S D at 5 % level :

Ploughing (P)	NS	NS
Row spacing (R)	*	NS
Hoeing (H)	NS	NS
P x R	NS	NS
P x H	NS	NS
R x H	NS	NS
P x R x H	NS	NS

Data given in Tables (2 and 3) clearly that row spacing had marked effect on number of stalks /m . The results indicated that 100 cm row spacing increased the number of stalks/m after 105 and 165 days from planting by 3.5 % and 21.8 % in 1998/99 season, respectively, compared with that of 125 cm. This increase reached the level of significance after 165 days. On the contrary, increasing the row distance to 125 cm in the 1st season increased the number of stalks/m after 105 and 165 days from planting by 16.19 and 4.78 % respectively, compared with planting at 100 cm. This effect reached the level of significance at 105 days.

The results of the second season are logic since narrower spaces would increased number of stems under high soil fertility. The first season results indicate that under wider spacing tillering has been encouraged compensating the lower number of buds, hence greater number of stalks were recorded at 105 as well as at 165 from planting. It is worth noting also that no marked difference is observed in the two studied spacings (100 and 125 cm) and both distances may be suitable for growing sugar cane in Sohag.

Positive results were also reported by growing sugar cane at narrower spacing (Usman, 1989 and Devi *at al.*, 1990). On the other hand, results obtained by Mali and Singh (1986), showed better effect of wider spacings on growth and yield of cane.

Table 3. Effect of some tillage practices and plant spacing on number of stalks /m of sugar cane at different stages of growth in 1998/99 season

Number of ploughing	Row spacing	105 days		Average	165 days		Average
		2 hoeings	3 hoeings		2 hoeings	3 hoeings	
2	100 cm	7.78	7.76	7.77	14.90	15.23	15.07
	125 cm	7.50	6.71	7.10	12.23	12.23	12.23
Average		7.64	7.23	7.43	13.57	13.73	13.65
3	100 cm	8.14	8.18	8.16	17.52	18.09	17.80
	125 cm	7.71	7.04	7.38	13.76	14.85	14.30
Average		7.92	7.61	7.77	15.64	16.47	16.05
4	100 cm	6.78	6.57	6.67	13.95	14.71	14.33
	125 cm	7.23	7.45	7.34	12.61	11.80	12.21
Average		7.01	7.01	7.01	13.28	13.25	13.27
Row spacing x Hoeing	100 cm	7.56	7.50	7.53	15.45	16.01	15.73
	125 cm	7.48	7.07	7.27	12.87	12.96	12.91
Total Average		7.52	7.28	7.40	14.16	14.48	14.32

L S D at 5 % level :

Ploughing (P)	NS	1.45
Row spacing (R)	NS	*
Hoeing (H)	NS	NS
P x R	NS	NS
P x H	NS	NS
R x H	NS	NS
P x R x H	NS	NS

The effect of hoeing intensity on number of stalks /m was not significant in both seasons either at 105 or at 165 days from planting. This result indicates that no relevance has been detected between hoeing intensity and number of stalks/m.

It seems that 2 hoeings were quite effective in controlling weeds under the prevailing conditions. Similar results were also reported by Mehra *at al.* (1995) who found that hoeing twice gave the best results on growth and yield of sugar cane and positively depressed weed growth.

As for the interaction effects among the studied factors, the results obtained in Tables (2 and 3) clearly show that none of the various combinations between the studied factors recorded a significant effect on the number of plants/m. These observations were true in both growing seasons. On the other hand, it could be observed that the highest values of this trait were attained by carrying out ploughing process four times + planting sugar cane at 100 cm row spacing and hoeing twice in the 1st season, and/or by ploughing sugar cane field three times + planting seed sets at 100 cm row spacing and hoeing 3 times in the second season.

The maximum numbers of stalks/m were 8.07 and 8.19 after 105 days from planting in the first and second season, respectively. At 165 days from planting, the highest stalk numbers were 15.23 and 18.09 in the first and second season, respectively.

3- Stalk diameter

Data presented in Tables (4 and 5) show that increasing ploughing number from 2 - 4 times insignificantly increased stalk diameter (cm) by 1.63, 0.55, 2.49 and 6.21% at 150, 210, 270 and 330 days from planting, respectively, in the 1st season. On the other hand, the effect of ploughing number on stalk diameter in the 2nd season was significant at 150 and 210 days from planting. The results in Table (5) indicate that increasing the intensity of ploughing from 2 - 4 times significantly increased stalk diameter in 1998/99 season by 15.28 and 13.84 % at 150 and 210 days, respectively. These increases were significant. At 270 and 330 days from planting no significant increases in stalk diameter were recorded in the 2nd season. It could be concluded that increasing ploughing intensity encourages sugar cane growth expressed as stalk diameter particularly at the early stages of growth. The positive effect of ploughing on sugar cane growth was also reported by Barbieri *at al.* (1997). On the other hand Braunack (1994) found that reducing the number of tillage operations did not affect final yield of sugar cane.

Results given in Tables (4 and 5) reveal that row spacing of 125 cm significantly increased stalk diameter in the 2nd season at various growth stages. The results indicated that wider row space of 125 cm significantly increased stalk thickness by 11.19 %, 9.32 %, 7.58 % and 8.2 % at 150, 210, 270 and 330 days from planting, respectively. However, effect of row spacing on this trait was not significant at the different growth stages in the 1st season except at 150 days. These results are in agreement with those obtained by Prasad *at al.* (1983) who found that spacing of 90 cm gave thicker canes than 70 cm. Also El-Sayed (1996) revealed that planting 1.5 drill significantly increased stalk diameter compared with planting two drills.

The available results in Tables (4 and 5) point out that increasing hoeing from 2-3 times almost increased stalk diameter in both seasons at all growth stages except at 330 days in the second season. These increments were significant at 330 days in the 1st season and at 150, 210 and 270 days in the 2nd season. These increases were 0.27 and 3.39 % at 150 and 330 days from planting, respectively, in the 1st season and in the 2nd season, the corresponding increases in stalk diameter due to raising hoeing number from 2-3 were 3.44, 2.34 and 2.39 at 150, 210 and 270 days from planting, respectively in the second season.

Tables (4 and 5) show the interaction effects between number of ploughings, row spacing and hoeing on stalk diameter in both seasons. The results indicated that the only significant interactions were those between ploughing intensity and row spacing at 270 and 330 days from planting in 1998/99 season.

The results showed that the thickest stalks were those resulting from 2 ploughings + 125 cm row spacing at 270 DFP, being 2.60 cm. Whereas at 330 DFP, the thickest stalks recorded 2.98 cm resulting from 3 ploughings and 125 cm row spacing.

4- Stalk height

Regarding the effect of number of ploughing on stalk height, the results obtained showed that there was no general tendency due to the effect of ploughing number on stalk height. However, it could be noticed that ploughing two or three times attained the tallest stalk length in both seasons and throughout the different growth stages compared with four ploughings.

A general view to the results given in Tables (6 and 7) with respect to the last two growth stages i.e. when the plants aged 270 and 330 days, it could be noticed

that almost there were no significant differences between ploughing sugar cane field twice or three times with respect to their influence on stalk height. These findings were true in both seasons for the two growth stages.

However, both treatments significantly surpassed ploughing treatment 4 times. Ploughing sugar cane field twice increased stalk height at 270 days by 4.33 % and 4.84% in the 1st and 2nd seasons, respectively, compared with ploughing 4 times. Meanwhile at 330 days from planting ploughing sugar cane field twice produced a significant increase in stalk height of 5.22% and 3.35% in the 1st and 2nd seasons, respectively, compared with ploughing 4 times. It could be concluded that 2 ploughings were effective as far as sugar cane growth is concerned. Excessive ploughing to 4 times reduced sugar cane plant height at later stages of growth. Braunack (1994) reported that little or no benefit was obtained from increasing the number of cultivations in plant or ratoon cane. The results in Tables (6 and 7) show that using row spacing of 100 cm significantly increased stalk height by 4.46, 4.45, 2.74 and 3.35 % at 150, 210, 270 and 330 days respectively, in the 2nd season compared with the wider row spacing (125 cm). Moreover, in the 1st season, rows spacing of 100 cm increased stalk height by 1.76, 1.45, 0.85 and 0.88 % at 150, 210, 270 and 330 days, respectively, compared with 125 cm rows spacing. These increases did not reach the level of significance in the last three growth stages. The present results indicate that at narrower spacing sugar cane plants tended to elongate compared with plants grown at wider spacing. The elongation of cane plants is due to the increase in competition for light among growing plants at narrower spaces. Similar results were also obtained by Ahmed (1995) who found that using double drills increased stalk height compared with 1.5 drills.

The results in Tables (6 and 7) point out that practicing two or three hoeings, insignificantly affected stalk height of sugar cane plant in both seasons. There were no significant differences in stalk height throughout the growth stages in both seasons due to hoeing number. Similar results were obtained by Ismail (1991) who found that hoeing twice produced the highest stalk length.

Results given in Tables (6 and 7) indicate some significant effects of ploughing X row spacing, ploughing X hoeing, row spacing X hoeing and ploughing X row spacing X hoeing on stalk height of sugar cane at some growth stages.

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Table 4. Effect of some tillage practices and plant spacing on stalk diameter (cm) of sugar cane at different stages of growth in 1997/98 season.

Number of Ploughing	Row spacing	150 days			Average	210 days			Average	270 days			Average	330 days		
		2 hoeings	3 hoeings	Average		2 hoeings	3 hoeings	Average		2 hoeings	3 hoeings	Average		2 hoeings	3 hoeings	Average
2	100 cm	1.82	1.87	1.85	2.15	2.21	2.18	2.47	2.49	2.48	2.76	2.77	2.76			
	125 cm	1.85	1.80	1.82	2.15	2.12	2.13	2.43	2.39	2.41	2.74	2.65	2.69			
Average		1.83	1.83	1.83	2.15	2.16	2.16	2.45	2.44	2.44	2.75	2.71	2.73			
3	100 cm	1.82	1.83	1.82	2.11	2.13	2.12	2.39	2.43	2.41	2.79	2.86	2.82			
	125 cm	1.81	1.84	1.82	2.12	2.20	2.16	2.37	2.50	2.43	2.70	2.84	2.77			
Average		1.81	1.83	1.82	2.11	2.16	2.14	2.38	2.46	2.42	2.74	2.85	2.80			
4	100 cm	1.84	1.85	1.85	2.13	2.13	2.13	2.46	2.52	2.49	2.76	3.01	2.89			
	125 cm	1.90	1.87	1.88	2.21	2.21	2.21	2.44	2.60	2.52	2.82	3.01	2.91			
Average		1.87	1.86	1.86	2.17	2.17	2.17	2.45	2.56	2.50	2.79	3.01	2.90			
Row spacing X Hoeing	100 cm	1.83	1.85	1.84	2.13	2.15	2.14	2.44	2.48	2.46	2.77	2.88	2.82			
	125 cm	1.85	1.84	1.84	2.16	2.17	2.17	2.41	2.49	2.45	2.75	2.83	2.79			
Total Average		1.84	1.84	1.84	2.14	2.16	2.15	2.43	2.49	2.46	2.76	2.86	2.81			

L S D at 5 % level :

Ploughing (P)	NS	NS	NS	NS
Row spacing (R)	0.0618	*	NS	NS
Hoeing (H)	NS	NS	NS	0.0683
P x R	NS	NS	NS	NS
P x H	NS	NS	NS	NS
R x H	NS	NS	NS	NS
P x R x H	NS	NS	NS	NS

Table 5. Effect of some tillage practices and plant spacing on stalk diameter (cm) of sugar cane at different stages of growth in 1998/99 season.

Number of ploughing	Row spacing	150 days		Average	210 days		Average	270 days		Average	330 days		Average
		2 hoeings	3 hoeings		2 hoeings	3 hoeings		2 hoeings	3 hoeings		2 hoeings	3 hoeings	
2	100 cm	1.55	1.61	1.58	1.77	1.86	1.82	2.36	2.45	2.40	2.73	2.76	2.75
	125 cm	1.76	1.81	1.79	1.96	2.07	2.02	2.54	2.65	2.59	2.91	2.96	2.93
Average		1.65	1.71	1.68	1.87	1.97	1.92	2.45	2.53	2.50	2.82	2.86	2.84
3	100 cm	1.72	1.74	1.73	1.97	2.01	1.99	2.27	2.36	2.29	2.72	2.67	2.70
	125 cm	1.91	2.05	1.98	2.21	2.25	2.23	2.51	2.55	2.53	2.98	2.96	2.97
Average		1.82	1.89	1.86	2.09	2.13	2.11	2.39	2.43	2.41	2.85	2.82	2.83
4	100 cm	1.86	1.90	1.88	2.12	2.12	2.12	2.35	2.39	2.37	2.78	2.68	2.73
	125 cm	1.97	2.04	2.00	2.24	2.25	2.24	2.46	2.50	2.48	2.91	2.97	2.94
Average		1.92	1.97	1.94	2.18	2.19	2.18	2.40	2.44	2.42	2.84	2.83	2.83
Row spacing X Hoeing	100 cm	1.71	1.75	1.73	1.96	2.00	1.98	2.33	2.38	2.36	2.74	2.70	2.72
	125 cm	1.88	1.97	1.92	2.14	2.19	2.16	2.50	2.57	2.53	2.93	2.96	2.95
Total Average		1.80	1.86	1.83	2.05	2.09	2.07	2.42	2.47	2.44	2.84	2.83	2.84

L S D at 5 % level :

Ploughing (P)	*	*	NS	NS
Row spacing (R)	*	*	*	*
Hoeing (H)	0.0171	0.0130	0.0199	NS
P x R	NS	NS	0.0466	0.0192
P x H	NS	NS	NS	NS
R x H	NS	NS	NS	NS
P x R x H	NS	NS	NS	NS

Table 6. Effect of some tillage practices and plant spacing on stalk height (cm) of sugar cane at different stages of growth in 1997/98 season.

Number of ploughing	Row spacing	150 days		Average	210 days		Average	270 days		Average	330 days		Average
		2 hoeings	3 hoeings		2 hoeings	3 hoeings		2 hoeings	3 hoeings		2 hoeings	3 hoeings	
2	100 cm	216.2	209.8	213.0	277.2	265.0	271.1	307.9	301.7	304.8	339.4	340.0	339.7
	125 cm	199.3	197.8	198.5	265.2	261.7	263.4	300.4	291.1	295.7	339.9	315.0	327.4
Average		207.7	203.8	205.7	271.2	263.3	267.2	304.1	296.4	300.3	339.7	327.5	333.6
3	100 cm	216.5	210.8	213.6	271.1	256.1	263.6	306.8	288.6	297.7	345.0	314.4	329.7
	125 cm	199.6	217.2	208.4	248.9	276.1	262.5	298.3	315.9	307.1	322.2	344.6	331.9
Average		208.0	214.0	211.0	260.0	266.1	263.0	302.6	302.2	302.4	333.6	328.0	330.8
4	100 cm	202.2	199.6	200.9	253.9	257.2	255.5	294.9	289.2	292.0	318.9	313.9	316.4
	125 cm	205.0	214.4	209.7	255.0	251.0	253.0	281.6	286.7	284.1	316.1	319.4	317.7
Average		203.6	207.0	205.3	254.4	254.1	254.2	288.3	287.9	288.1	317.5	316.6	317.0
Row spacing X Hoeing	100 cm	211.6	206.7	209.1	267.4	259.4	263.4	303.2	293.2	298.2	334.4	322.7	328.6
	125 cm	201.3	209.8	205.5	256.3	262.9	259.6	292.4	297.9	295.6	326.1	325.3	325.7
Total Average		206.4	208.2	207.3	261.8	261.1	261.5	298.3	295.5	296.9	330.2	324.0	327.1

L S D at 5 % level :

Ploughing (P)	NS	*	*
Row spacing (R)	2.603	NS	NS
Hoeing (H)	NS	NS	NS
P x R	4.508	NS	NS
P x H	NS	NS	NS
R x H	5.655	NS	6.603
P x R x H	NS	NS	11.437

Table 7. Effect of some tillage practices and plant spacing on stalk height (cm) of sugar cane at different stages of growth in 1998/99 season.

Number of ploughing	Row spacing	150 days		Average	210 days		Average	270 days		Average	330 days		Average
		2 hoeings	3 hoeings		2 hoeings	3 hoeings		2 hoeings	3 hoeings		2 hoeings	3 hoeings	
2	100 cm	188.0	194.5	191.3	224.6	231.1	227.9	287.2	293.7	290.5	329.600	338.067	333.833
	125 cm	185.5	184.3	184.9	217.8	219.2	218.5	281.1	281.6	281.3	321.100	314.167	317.633
Average		186.8	189.4	188.1	221.2	225.2	223.2	284.1	287.6	285.9	325.350	326.117	325.733
3	100 cm	196.6	201.6	199.1	235.7	241.4	238.5	291.2	287.0	294.1	330.500	326.133	326.817
	125 cm	188.4	185.4	186.9	226.8	224.4	225.6	281.3	279.7	280.5	315.667	315.000	315.333
Average		192.5	193.5	193.0	231.3	232.9	232.1	286.3	288.3	287.3	323.083	319.067	321.075
4	100 cm	201.2	201.9	201.5	231.3	227.7	229.5	281.7	266.6	274.2	311.333	313.933	312.633
	125 cm	198.2	191.4	194.8	225.4	218.9	222.1	277.2	270.6	273.9	306.667	310.767	308.717
Average		199.7	196.6	198.1	228.3	223.3	225.8	279.5	268.6	274.0	309.000	312.350	310.675
Row spacing X Hoeing	100 cm	195.2	199.3	197.3	230.5	233.4	232.0	286.7	285.7	286.2	323.811	325.044	324.428
	125 cm	190.7	187.0	188.8	223.3	220.8	222.1	279.9	277.3	278.6	314.478	313.311	313.894
Total Average		193.0	193.2	193.1	226.9	227.1	227.0	283.3	281.5	282.4	319.144	319.178	319.161

L S D at 5 % level :

Ploughing (P)	*	*	*	*
Row spacing (R)	*	*	*	*
Hoeing (H)	NS	NS	NS	NS
P x R	NS	NS	5.080	NS
P x H	NS	3.879	5.227	NS
R x H	3.148	NS	NS	NS
P x R x H	NS	NS	NS	NS

تأثير بعض عمليات الخدمة والكثافة النباتية على قصب السكر

١ - صفات النمو

ابراهيم حنفي الجداوى^١، صلاح الدين شفشق^٢، صلاح علام^٢، جمال سعد السيد^١

١ - معهد بحوث المحاصيل السكرية - مركز البحوث الزراعية - وزارة الزراعة

٢ - كلية الزراعة - بمشتهر - جامعة الزقازيق

أجريت هذه الدراسة بمحطة بحوث شندويل (محافظة سوهاج) في موسمی ١٩٩٧/٩٨ و ١٩٩٨/٩٩ لدراسة تأثير بعض عمليات الخدمة (الحرث والعزيق) ومسافات التخطيط على صفات نمو محصول قصب السكر. أوضحت النتائج أن زيادة عدد مرات الحرث من إثنين إلى ثلاث و أربع مرات أدى إلى زيادة نسبة الانبات بعد ٤٥ يوما في كلا الموسمين مع اختلافات معنوية في الموسم الثاني فقط.

كما ان زيادة عدد مرات الحرث من مرتين إلى ثلاث وأربع مرات أدت إلى زيادة عدد النسبانات/م بعد ١٠٥ و ١٦٥ يوما من الزراعة. كما ان زيادة عدد مرات الحرث إلى أربعة مرات أدى إلى زياده معنويه في سمك ساق القصب في عمر ١٥٠ و ٢١٠ يوما من الزراعة في الموسم الثاني. كما أعطت معاملة الحرث مرتين و ثلاث مرات أعلى زياده في طول ساق قصب السكر وذلك في مراحل النمو المختلفه بالمقارنه بالحرث اربع مرات.

حققت مسافة ١٠٠ سم بين الخطوط أعلى نسبة إنبات للقصب بالمقارنه بمسافة ١٢٥ سم و كانت الزيادة معنويه فقط في الموسم الثاني ولقد أدت مسافة التخطيط ١٠٠ سم إلى زياده عدد النسبانات/م بعد ١٠٥ و ١٦٥ يوما من الزراعة في الموسم الثاني بالمقارنه بمسافة ١٢٥ سم. ولقد أدت مسافة التخطيط ١٢٥ سم أدى إلى زياده سمك ساق القصب معنويا في الموسم الثاني في مراحل النمو المختلفه. زراعة قصب السكر في خطوط على بعد ١٠٠ سم بين الخطوط الى زياده معنويه في طول ساق قصب السكر في مراحل النمو المختلفه في الموسم الثاني بالمقارنه بمسافة ١٢٥ سم.

لم يكن هناك تأثيرا معنويا لعدد مرات العزيق على عدد نباتات القصب/م بعد عمر ١٠٥ و ١٦٥ يوما من الرواعه في كلا الموسمين، كما ادت زيادة عدد مرات العزيق الى ثلاث مرات الى زياده سمك الساق في كلا الموسمين في مراحل النمو المختلفه. ولم تؤثر معاملات العزيق معنويا على طول الساق في مراحل النمر المختلفه في كلا الموسمين.