List of contents

SUMMARY AND CONCLUSION

Two field experiments were carried out at El-Serw Agricultural Research Station, North East Delta in 1996/97 and 1997/98 growing seasons. The main objectives of this investigation were to determine the requirements of nitrogen levels for some sugar beet varieties and the suitable plant position on ridges to produce the maximum root and sugar yields. The present work included 45 treatments representing the combination of the following factors:

I. Three sugar beet varieties (i.e. Betty, Pleno and Trios).

II. Planting position on ridges:

1. In the bottom of ridges of 60 cm apart.
2. On the upper third height of ridges of 60 cm apart.
3. On the top position site of ridges of 60 cm apart.
4. Two rows on the upper third height of ridges, 120 cm apart
5. Two rows on the top position site of ridges, 120 cm apart

III. Nitrogen fertilization levels (40, 55 and 70 kg N/fed).

The treatments were distributed in a split-split plot design with three replications. The main plots were assigned for the three sugar beet cultivars. Plant positions were distributed in the sub-plots while nitrogen levels were randomly distributed in the sub-sub plots.

The obtained results could be summarized as follows:

1. Growth:

1.1. Root length (cm):

The results clarified that the tested sugar beet varieties significantly differed in their root length in both seasons. Sugar beet variety Pleno markedly surpassed Trios variety in this character in both seasons.

The results showed that, situating sugar beet plants on the upper third of the row 60 cm apart (36.22 and 36.0 cm). (the 2nd position) produced the longest roots compared with the other studied positions.

Increasing nitrogen fertilizer levels from 40 to 55 and 70 kg N/fed was accompanied by significant increase in root length.

The results indicated that the interaction between varieties and nitrogen levels significantly affected root length in both seasons. The maximum root length were recorded under the treatment combination of planting Pleno variety with application 70 kg N/fed. A significant effect on root length due to the interaction between plant positions on ridge and nitrogen levels studied in both seasons. The maximum root length were (38.78 and 39.11 cm) was recorded when sowing seeds of sugar beet on the upper third of the row 60 cm apart and adding 70 kg N/fed Root length was significantly influenced by the interaction between the three studied factors in both seasons. The maximum values (39.67 cm) which was recorded when planting Pleno variety on the upper third of the row 60 row apart (2nd position) and application of 70 kg N/fed.

1.2. Root diameter (cm):

The results revealed that sugar beet varieties were markedly varied in root diameter. Trios variety markedly surpassed Betty and Pleno varieties in this character in the first and second seasons.

Plant positions on ridge had a significant effect on root diameter. Situating sugar beet plants in the upper third site on ridge (the 2nd position) significantly attained thicker roots (8.57 and 8.84 cm) compared with the other studied positions in the first and second seasons.

Raising nitrogen levels from 40 to 55 and 70 kg N/fed resulted in an ascendant and significant increase in root diameter in both seasons.

The first order interaction among the studied varieties and nitrogen levels significantly affected root diameter in both seasons. The maximum root diameter (8.93 and 8.83 cm) were recorded under the treatment combination of planting Trios variety and adding 70 kg N/fed. The results showed that the interaction between plant positions on ridge and N levels significantly affected root diameter in both seasons. The maximum values (9.67 and 10.19 cm) were recorded when sowing seeds of sugar beet on the upper third of the row 60 cm apart and adding 70 kg N/fed. Root length was significantly influenced by the interaction between the three studied factors in both seasons. The maximum values (10.33 and 10.58 cm) were recorded when planting Trios variety on the upper third of the row 60 cm apart (2nd position) and application of 70 kg N/fed.

1.3. Root fresh weight (g/plant):

Varieties performance indicated significant variation in both seasons. The Betty variety significantly surpassed the other tested varieties.

The results showed significant differences in root fresh weight as a result of planting beet plants in the five studied positions on the ridge. Planting sugar beet seeds on the upper third site on ridge (184.2 and 186.1 g/plant) statistically improved root fresh weight compared with the rest of seed position. The results showed that root fresh weight (g/plant) was gradually and significantly increased as the applied nitrogen level was increased from 40 through 70 kg N/fed in both seasons.

Highly significant interaction was recorded between varieties and plant positions on ridge. The maximum root fresh weight g/plant (877.8 and 858.9 g/plant) were recorded planting Trios variety the upper third of the row 60 cm apart (2^{nd} position). Highly significant interaction was recorded between varieties and nitrogen fertilization. The maximum root fresh weight g/plant (850.0 and 838.0 g/plant) were recorded when planting seeds of sugar beet variety Betty and application 70 kg N/fed.

1.4. Foliage fresh weight (g/plant):

The results showed that sugar beet variety Betty significantly surpassed the other tested varieties in foliage fresh weight (g/plant) in the second season.

Planting sugar beet plants on the upper third side of ridge significantly resulted in the maximum top weight (g/plant) (184.4 and 186.1 g) in the first and second seasons, respectively.

Increasing nitrogen application increased top fresh weight g/plant as the applied nitrogen dose increased from 40 to 55 and 70 kg N/fed in both seasons.

The results pointed out that foliage fresh weight (g/plant) was markedly influenced by the interaction between beet varieties and nitrogen levels in both seasons. The maximum values (187.1 and 189.3 g/plant) were recorded when planting Pleno variety and application nitrogen at the rate of 70 kg N/fed. A highly significant interaction between positions on ridge and nitrogen levels in both seasons. The maximum values (216.6 and 222.4 g/plant) were recorded when planting sugar beet seeds on the upper third of the row 60 cm apart and application of 70 kg N/fed. A significantly interaction between plant position on ridge and nitrogen levels in both seasons.

1.5. Root/top ratio:

The results revealed that varieties of sugar beet significantly varied in root/top ratio in both seasons. Trios variety showed the maximum value of this ratio and the most superiority over the other two varieties concerning this growth character.

The results also clarified that root/top ratio was markedly influenced by the studied planting positions in both seasons. Plants situated in the 1st position (bottom of ridge) significantly attained the highest values (4.75 and 4.84) compared with the rest of plant position.

Application of N fertilizer at 55 kg N/fed markedly improved root/top in both seasons compared with addition of 40 or 70 kg N/fed.

A highly significant interaction between sugar beet varieties and plant position on ridge in both seasons. Root/top ratio was markedly influenced by the interaction between varieties and nitrogen levels in

both seasons. The maximum values (4.77 and 4.67 g/plant) were recorded when planting Trios variety on the upper third of the row 60 cm apart (2nd position). The maximum values (4.72 and 4.88 g/plant) were recorded when planting Betty variety and adding 55 kg N/fed. Root/top ratio was significantly affected by the interaction between planting positions x nitrogen levels in both seasons.

Root/top ratio was significantly affected by the interactions among the three studied factors in both seasons. A highly significant interaction between plant position on ridge and nitrogen levels in both seasons. The maximum values (5.56 and 5.76 g/plant) were recorded when planting seed of sugar beet in the bottom of row 60 cm apart and adding 70 kg N/fed.

2. Yields:

2.1. Foliage yield (t/fed):

The examined sugar beet varieties did not significantly differ in top yield in the first season. In the second season, a significant variance among the studied varieties was detected. Betty variety recorded the most marked increase in foliage yield (t/fed) compared with the other sugar beet cultivars.

The results pointed out that the studied five positions of beet plants on ridge had a significant effect on top yield in the first and second seasons. Planting sugar beet on the upper third side of ridges markedly increased foliage yield (t/fed) if compared with the rest of hill position on ridges with the exception of 4th position in the first season which significantly surpassed the overall sites.

Application of nitrogen increased top yield as N-level increased in both seasons. The results revealed that, the interaction between the studied sugar beet varieties and nitrogen levels had appreciable influence in both seasons. The maximum values (9.861 and 9.973 ton/fed) were recorded when planting Pleno variety and adding 70 kg N/fed. A significant interaction between nitrogen levels and plant position on ridge in both seasons. The maximum values (11.413 and 11.720 ton/fed) were recorded when planting seeds of sugar beet on the upper third of the row 60 cm apart and adding 70 kg N/fed.

2.2. Root yield (t/fed):

The results showed no appreciable differences between sugar beet varieties in root yield in both growing seasons.

The results also showed that the plant positions of beet plants had a significant effect on root yield in both seasons. Situating sugar beet plants hills on the upper third site of ridges 60 cm apart markedly produced the maximum root yield (22.158 and 22.989 t/fed in the first and second seasons, respectively).

Increasing nitrogen dose up to 70 kg N/fed applied to sugar beet plants was associated with a significant increase in root yield in both growing seasons.

The results showed that root yield was markedly influenced by the interaction between sugar beet varieties and nitrogen fertilizer levels in both seasons. The maximum values (22.611 and 24.223 ton/fed) were recorded when planting Betty variety and adding 70 kg N/fed. A significantly effect on the interaction between nitrogen levels and plant position on ridge in both seasons. The maximum values (26.596 and

29.498 ton/fed) were recorded when planting seeds of sugar beet on the upper third of the row 60 cm apart and adding 70 kg N/fed.

2.3. Sugar yield (t/fed):

The results revealed that the sugar beet varieties were not significantly differed in sugar yield (t/fed) in the first and second growing seasons.

The results recorded significant differences in sugar yield (t/fed) due to the studied hill positions of sugar beet plants on the ridge in both seasons. Planting sugar beet on the upper third site of each ridge 60 cm apart markedly improved sugar yield (ton/fed) compared with the rest of hill position on ridges.

The results clarified that, sugar yield was appreciably and positively increased as the N-level applied to sugar beet plants was raised from 40 to 55 and to 70 kg N/fed.

The results showed that sugar yield was markedly influenced by the interaction between sugar beet varieties and nitrogen fertilization levels. The maximum values (4.238 and 4.174 ton/fed) were recorded when planting Trios and Betty varieties and adding 70 kg N/fed in the first and second seasons, respectively.

A highly significant interaction between plant position on the ridge and nitrogen levels in both seasons. The maximum values (5.050 and 5.192 ton/fed) were recorded when planting seeds of sugar beet on the upper third of the ridge 60 cm apart an adding 70 kg N/fed.

A highly significant interaction between varieties, plant position on ridge and nitrogen levels in both seasons. The maximum values (4.427,

and 6.299 ton/fed) were recorded when planting seeds of Betty variety on the upper third of the ridge 60 cm apart an adding 70 kg N/fed.

3. Quality characters

3.1. Total soluble solids percentage:

The results clarified that the evaluated sugar beet varieties did not significantly differ in total soluble solids percentage in the first and second seasons.

The results showed that total soluble solids percentage was markedly influenced by the studied plant positions on ridges. Situating sugar beet plants on the upper third side of the ridge markedly resulted in the highest increase in TSS % (22.43 and 22.39%) if compared with the rest of other plant positions on ridge in both seasons.

The results pointed out that the applied levels of nitrogen fertilization had a significant effect on TSS % which was markedly increased as N-level was raised from 40 to 55 and 70 kg N/fed.

A significant interaction between sugar beet varieties and plant position in both seasons. The maximum values (22.50 and 22.67 %) were recorded when planting Pleno variety on the upper third of the row 60 cm apart (2^{nd} position). The results revealed that TSS % was markedly influenced by the interactions between sugar beet varieties and nitrogen levels in both seasons. The maximum values (22.50 and 22.60%) were recorded when planting Pleno and Trios varieties in the first and second seasons, respectively and adding 70 kg N/fed. Highly significant effect on the interaction between plant position on ridge and N-level in both seasons. The maximum values (20.23 and 24.11%) were recorded when

planting seeds on the upper third of the row 60 cm apart (2nd position) and adding 70 kg N/fed.

3.2. Sucrose percentage:

The results pointed out that varieties markedly differed in sucrose percentage in the second season only. Pleno variety markedly attained the highest sucrose % (19.74 %) compared with the other varieties.

The results also pointed out that the studied plant positions on ridge had a significant influence on sucrose percentage in both seasons. Planting sugar beet in the bottom of ridges produced the highest value (20.56 and 20.53%) of this character compared with the other of plant position.

Increasing N-level from 40 to 55 kg N/fed significantly raised sucrose percentage by 4.59 % in the first season, corresponding to 2.18 %, in the second one. Increasing nitrogen fertilization level from 55 to 70 kg N/fed was associated with a reduction in sucrose percentage amounted to 11.21 and 11.38 % in the first and second seasons, respectively.

The results revealed that sucrose % was markedly influenced by the interaction between sugar beet varieties and plant position on ridges in both seasons. The maximum values (20.83 and 20.58 g/plant) were recorded when planting Betty variety in the bottom of the row 60 cm apart. Sucrose percentage was significantly affected by the interaction between plant positions on ridges and nitrogen rates in both seasons. The maximum values (21.02 and 21.01%) were recorded when planting seeds of sugar beet in the bottom of the row 60 cm apart (2nd position) and adding 70 kg N/fed.

3.3. Purity percentage:

The results showed that purity percentage of the sugar beet varieties were insignificant in the first and second growing seasons.

The results showed that plant positions on ridge significantly influenced purity percentage in both seasons. The highest values of purity percentage (94.05%) was markedly obtained by situating sugar beet plants in the bottom of ridge of 60-cm width (1st position).

Applied nitrogen fertilizer levels had a marked effect on purity percentage in both seasons. Purity percentage was significantly decreased with each increasing nitrogen levels. A highly significant effected on the interaction between sugar beet varieties and nitrogen fertilization rates in both seasons. The maximum values (54.58 and 99.00%) were recorded when planting Pleno variety and adding 70 kg N/fed.

CONCULSION

It can be concluded that, under conditions of this study which was carried out at El-Serw Agricultural Research Station, North East Delta, maximum sugar yield could be produced by sowing Betty variety hills on the upper third site of ridge 60 cm apart with the application of 70 kg N/fed.