SUMMARY

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Two field experiments were carried out at Zarzora region during the two seasons of 1997/98 and 1998/99 to study the effect of pre-summer crops and nitrogen levels on growth, yield and quality of Elane sugar beet cultivar.

The study included four preceding summer crops (cowpea, maize, sorghum and sunflower) and four N- levels (0, 30, 60 and 90 Kg N/fad). The results can be summarized as follows:

A- Effect of preceding crops:

a- Soil properties:

1. Soil porosity percentage was affected by preceding summer crops. Growing sugar beet after cowpea increased the soil porosity compared with that after maize, sunflower and sorghum.
2. Total nitrogen content was affected by preceding summer crops. Total nitrogen increased by growing sugar beet after cowpea in the soil in the two seasons.
3. Total phosphorus was affected by preceding summer crops. Cowpea and sorghum increased the phosphorus content of the soil.
4. Total potassium was not affected by preceding summer crops.
5. Total organic matter content of the soil was affected by preceding summer crops. ~~Sorghum and maize as preceding crops.~~ Sorghum and maize as preceding crops increased the organic matter content of the soil.

5. Relative Growth Rate (RGR) was significantly affected by preceding summer crops at both periods, i.e. 100-121 and 121-142 days from sowing. The RGR value after cowpea and sorghum was higher than that after maize or sunflower.

c. Root character:

1. Root length was significantly affected by preceding summer crops in one season. The highest value of root length was obtained from growing sugar beet after cowpea in the first and second seasons.
2. Root diameter was significantly affected by preceding crops in both seasons. The maximum value of root diameter was recorded when growing sugar beet after cowpea.
3. Root weight was not significantly affected by preceding summer crops.

d. Yield:

1. Top yield (tons/fad) was not significantly affected by preceding summer crops in both seasons.
2. Root yield (tons/fad) was significantly affected by preceding summer crops. Sugar beet preceded by cowpea gave heaviest root yield (23.0 and 24.50 ton/fad, respectively in both seasons.
3. Biological yield (Tons/fad) was significantly affected by preceding summer crops in both seasons. It could be concluded that cowpea is the best preceding crop for sugar beet for producing the highest biological yield. On the other hand, sugar beet preceded by sorghum produced the lowest biological yield.

4. Sugar yield (Tons/fad) was significantly affected by preceding summer crops in both seasons. Cowpea as preceding crop for sugar beet gave the maximum the sugar yield /fad (3.96 and 4.28 tons) in the first and second seasons, respectively. While, sorghum was the worst preceding crop for sugar beet in this respect.

e. Technological characters:

1. Total soluble solids (T.S.S), sucrose and purity percentages were significantly affected by preceding summer crops. Cowpea as a preceding crop for sugar beet gave the highest T.S.S, sucrose and purity percentages in juice of roots in both seasons.

B. Effect of nitrogen levels:

a. Growth parameters.

1. Leaf area per plant (L.A) and leaf area index (L.A.I) were significantly increased with increasing nitrogen level up to 90 Kg/fad at all growth stages. The highest values were obtained by applying 90 Kg N/ fad at age of 163 days after sowing.
2. Total dry weight (gm) was significantly increased with increasing nitrogen level. The maximum value was obtained at 90 Kg N/ fad, and this result was true for all growth stages.
3. Crop growth rate (CGR) was significantly increased as nitrogen level increased up to 90 Kg N/fad at the three growth periods.
4. Net assimilation rate (NAR) was significantly decreased as nitrogen level increased up to 60 Kg N/fad at the first and second growth periods.

5. Relative growth rate (RGR) was significantly increased by increasing nitrogen level up to 60 Kg N/ fad, but excess nitrogen over this level decreased it.

b. Root characters.

1. Root length was significantly increased by increasing nitrogen fertilizer level up to 90 Kg N/fad.
2. Root diameter was significantly increased with increasing nitrogen level up to 60 Kg N/fad in both seasons.
3. Root weight was significantly affected by nitrogen levels in both seasons. Increasing nitrogen levels up to 90 kg/fad caused a gradual increase in root weight.

***c. Yield*:**

1. Top yield (tons/fad) was significantly affected by nitrogen level in both seasons. Increasing nitrogen application to sugar beet up to 90 kg N/fad consistently increased top yield/fad.
2. Root yield (tons/fad) was significantly increased by increasing nitrogen level up to 90 kg N/fad in both seasons. The increase in root yield of sugar beet was about 9.81 and 11.49 tons/fad in the first and second seasons, respectively.
3. Biological yield (Tons/fad) responded to nitrogen fertilization in both seasons. Increasing nitrogen level increased significantly the biological yield of sugar beet. The highest nitrogen level (90 kg/fad) produced the highest biological yields (28.63 and 29.31 tons/fad) in the first and second seasons, respectively.

4. Sugar yield (tons/fad) was significantly affected by nitrogen level in both seasons. Nitrogen fertilization significantly increased the sugar yield /fad, and any increase in nitrogen applied was followed by a respective increment in sugar yield.

d. Technological characters:

1. Total soluble solids percentage (T.S.S.%) and sucrose percentages were significantly affected by nitrogen levels in both seasons. Increasing nitrogen level up to 90 kg N/fad significantly increased TSS and sucrose percentages in roots juice.
2. Purity percentage was not significantly affected by nitrogen levels in both seasons.

C. Interaction effect:

1. The effect of the interaction between preceding summer crops and nitrogen levels was significant on root yield, biological yield (in both seasons) and sugar yield (ton/fad) (in the first season). The maximum root, biological and sugar yield /fad were obtained from growing sugar beet after cowpea with the application of 90 kg N/fad. While, the minimum values of root and biological yields were produced from growing sugar beet after sorghum without nitrogen fertilization. On the other hand, the minimum value of sugar yield per feddan was produced from growing sugar beet after maize without nitrogen fertilization.