# SUMMARY AND CONCLUSION

## Effect of nutrition and paclobutrazol (PGR) on sugar beet yield and quality. *(Beta vulgaris, L.).*

Two field experiments were conducted at Sakha Research Station, Kafr El- Sheikh Governorate, during 1997/1998 and 1998/1999 seasons. The present study aimed to investigate the effect of foliar spray of yeast extract, growth regulators ($PP_{333}$), Potassium, Magnesium and some of their mixtures applied at different stages of growth on top, root and sugar yields of sugar beet and its quality.

The soil was a silty clay loam of Ph 7.8, 2.00 % organic matter content, % CaCo3 and available NPK were 29.5, 12 and 290 mg/kg soil. The saturation soil extract had an EC of 3.4 ds/m (2176 ppm).

Every experiment included 33 treatments which were the combination of 11 treatments (Biological activators & nutrients) Two factors and their interactions were under study as follows:

### A- Foliar application dates:

1- 45 days after sowing.
2- 75 days after sowing.
3- 105 days after sowing.

### B- Biological activators and nutrients:

1- control treatments (distilled water).
2- 50 ml/l yeast extract.

3- 250 ml/l yeast extract.

4- 5 ppm paclobutrazol ($PP_{333}$, Cultar, 23%).

5- 25 ppm paclobutrazol ($PP_{333}$, Cultar, 23%).

6- 50 ppm K (potassium citrate, 45 %K).

7- 250 ppm K (potassium citrate, 45 %K).

8- 50 ppm Mg (MgSO4, 24 % Mg).

9- 250 ppm Mg (MgSO4, 24 % Mg).

10- 5 ppm PP333 + 50 ppm K (mixture 1).

11- 50 ml/l YE + 50 ppm K. (mixture 2).

Asplit-plot design with three replications was used. The main plots were assigned for three foliar application dates (45, 75 and 105 days from planting). Eleven treatments (biological activators and nutrients) were randomly distributed among the sub-plots. The sub-plot area was 14 $m^2$ (1/300 fed). It consisted of 4 ridges (0.5 x 7 $m^2$)

Sugar beet cv. Viz Sultan seeding date was Noivember 15$^{th}$ in both seasons.The distance between hills was 20 cm, plants were thinned to one plant/hill before the 1$^{st}$ irrigation. Nitrogen 80 kg N/fed and potassium (50 kg $K_2$0/fed fertilizer were applied in two equal doses, one before the 1$^{st}$ irrigation and the other before the 2$^{nd}$ irrigation. Calcium superphosphate (15.5 % $P_2O_5$) was applied at a rate of 150 kg/fed during seedbed preparation. The normal cultural practices for growing sugar beet were used.

At harvest, top, roots, biological yields and harvest index were recorded on two guarded ridges. Also, the following data were determined from 10 plant random samples: TSS %, sucrose %, purity %, total soluble sugars, reducing sugars, non reducing sugars in roots and NPK % and their uptake in leaves and roots. Total

carbohydrate (mg/g) and cruder protein % in leaves and roots were also determined.

**The results of the combined analysis showed the following:**

**I- Top, root, biological and sugar yields/fed**

1- Delaying the foliar application from 45 to 75 and 105 days from planting with different treatments caused a significant continous increase in fresh fodder yield (top yield), root yield, biological yield and sugar yield of sugar beet.

2- There were a significant effect on the studied yield characters by foliar application with K, Mg, YE and $PP_{333}$ treatments.

3- Potassium application looks to be the most efficient treatments among the others. Mg application ranked second in its effect on top, root, biological and sugar yields. YE ranked the third after K and Mg application in its effect on sugar beet yield. PP333 (Plant growth regulator) ranked the forth.

4- The higher concentration of different nutrients and biological activators produced the highest values of yield compared with the lower levels. Application of K significantly increased top, root, biological and sugar yields over the different treatments. Application of 250 ppm K level increased the same respective traits over the check treatments.

5- The same trend was obtained on harvest index. Applying 250 ppm K gave the highest harvest index (91.60 %) and the lowest one (90.90%) produced by the unfertilized treatment.

6- There was a significant interactions between foliar application dates and biological activators and nutrients. Foliar application with 250 ppm K at 105 days from sowing gave the highest significant

values of top, roots, biological and sugar yields as well as harvest index. Whereas the unfertilized treatment had the lowest values.

**II- Juice quality in beet roots at harvest:**

1-Delaying the foliar spray from 45 up to 105 days from sowing significantly increased juice quality in beet roots, namely, total soluble solids, sucrose and purity %. Foliar application with different treatments at 105 days from sowing produced the highest values of TSS (25.64 %, sucrose % (17.09 %) and purity % (66.59 %). Whereas the lowest percentages (25.32, 16.79 and 66.23 %, for the same respective trait) were obtained as a result of foliar spray the different treatments at 45 days from sowing.

2-Applying YE, $PP_{333}$, K, Mg treatments significantly increased juice quality in beet roots compared with the check treatment. Foliar application with K produced the highest values of juice quality compared with the other treatments. Also, the higher levels of YE, $PP_{333}$, K, and Mg treatments had the highest values and the lower concentration gave the lowest % of juice traits. Applying 250 ppm K gave the highest TSS % (27.16 %), sucrose % (18.81 %) and purity % (69.29 %) and the check treatment had the lowest % i.e. 23.49, 14.61 and 62.25 %, respectively. The interaction between the two factors on juice quality characters was not significant.

**III- Chemical composition on leaves and roots sugar beet plants at harvest:**

1-Delaying foliar application from 45, 75 and 105 days from sowing significantly increased TSS, reducing sugars, non reducing sugars mg/g in both leaves and roots of sugar beet. Foliar appliaction at 105

days with different nutration treatments produced the highest values and foliar spray at 45 days gave the lowest %.

2-Application with 25 ppm $PP_{333}$ significantly increased TSS, reducing sugars and non reducing sugars mg/g in sugar beet leaves over the other ten treatments applying a higher level of K gave the highest mg/g of the same respective characters in sugar beet roots.

3-Delaying foliar application with different nutrition treatments at 105 days significantly increases NPK, total carbohydrate, Na and crude protein % in both leaves and roots over the other dates.

4- Folia application with 50 ml/l YE + 50 ppm K sigbnificantly increased NPK in leaves and N % in roots, Na, total carbohydrate and crude protein % in leaves and roots of sugar beet at harvest. While, applying a higher K level 250 ppm produced the higher % of P and K in sugar beet roots.

5- Delaying foliar sray with different nutrtion treatments from 45, 75 up to 105 days from sowing significantly increased NPK-uptake in leavesand roots of sugat beet. Foliar application at 105 days gave the highestvalues of NPK uptake and the least were obtained by foliar application at 45 days from sowing.

6-Applying 50 ml/l YE + 50 ppm K treatment significantly increased NP uptake in leaves and N uptake in roots of sugar beet at harvest. On the same line, foliar application with a higher K level 250 ppm produced the highest values of P and K uptake in roots and K uptake in leaves of sugar beet plants at harvest.

## General conclusion

1- There was a number of significant interactions between foliar spray dates and biological activators and nutrients factors on most of

studied traits. Foliar application with a higher level of K 250 ppm at 105 days from sowing produced the highest top, root, biological and suga yield/fed, juice quality, TSS, reducing sugars, non reducing sugars, P and K uptake in roots, K uptake in leaves.

2- Also, applying 50 ml/l YE + 50 ppm K treatment had the highest values of NPK % in leaves, N % in roots, Na, crude protein and total carbohydrates mg/g in leaves and roots and NPK uptake in leaves of sugar beet at harvest. On the other hand, the check treatment had the lowest values of all studied characters.

3- The practical application indicate a necessity of foliar application with YE, $PP_{333}$, K, Mg, 5 ppm $PP_{333}$ + 50 ppm K and 50 ml/l + 50 ppm K treatments at 105 days from sowing. Foliar application with these treatments at a higher level produced the highest values of yield, juice quality and chemical composition of sugar beet. Foliar application with 250 ppm K produced the highest values of yield and its quality of sugar beet. In all cases, consideration should be given to the actual available contents of the nutriewnts in the soil itself.