# EFFECT OF FOLIAR NUTRITION AND PACLOBUTRAZOL ON SUGAR BEET YIELD AND QUALITY (*BETA VULGARIS L.*)

## I.YIELD COMPONENTS AND JUICE QUALITY

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***Abstract***

Two field experiments of sugar beet were carried out at Sakha Agricultural Research Station (Kafr El-Sheikh Governorate) in the two growing seasons of 1997/1998 and 1998/1999, to investigate the effect of Yeast extract preparation, the growth retartends paclobutrazol and the two nutrient elements K and Mg, applied at different stages of growth on top, root, sugar yields and juice quality of sugar beet plants. The experiments were laid out in split plot design with three replications. Application dates were allocated in the main plots and foliar application of treatments were distributed randomely in the sub plots. Delaying the foliar application from 45 to 75 and 105 days from planting with studied treatments caused significant increses in top, root, biological and sugar yields of sugar beet. The higher concentration of nutrients and biological activators produced the highest values of yield compared with the lower levels. There was a significant interaction between time of foliar applications and the foliar nutrients treatments. Delaying foliar appliation to 105 days from sowing significantly increased juice quality and produced the highest values of TSS% (25.64), sucrose (17.09) and purity (66.59) and the lowest values were 25.32, 16.79 and 66.23 % for the same juice quality traits, respectively, when foliar spray was carried out after 45 days from sowing. The higher levels of YE, $PP_{333}$, K and Mg gave the highest values of TSS % 27.16, sucrose 18.81 % and purity 69.29%.

## INTRODUCTION

The effect of yeast extract (YE), Fathy *et al.* (2000) found that spraying tomato plants cv. Super strain B with yeast extract (YE) 25 and 50 ml/l at 20, 40, 60 and 80 days from transplanting significantly improved fruiting, total yield, improved sugar content and fruit quality.

Effect of paclobutrazol ($PP_{333}$), Tian *et al* (1993) reported that soaking sugar beet seeds in $PP_{333}$ increased the growth of leaves, roots, root yield and sugar content of sugar beet plants.

Potassium fertilizer effects, Marschner (1995) attributed the increment of plant fresh weight by increasing K dose may be due to the role of K element in improving enzyme activation and vegetative growth by increasing cell division. El-Maghraby *et al* (1998) stated that K application significantly increased root, biological and sugar yield of sugar beet plants. Also, they found that Mg application significantly increased root, biological and sugar yields/fed, sucrose and purity % of sugar beet plants. El-Taweel (1999) stated that K application significantly increased root, biological and sugar yields of sugar beet plants. Also, they found that Mg application significantly increased root, biological and sugar yields/fed, TSS, sucrose and purity% of sugar beet plants.

Regarding to the effect of magnesium fertilizer, Domska (1996) found that application of 100 kg N, 60 kg Mg as soil application and 40 kg foliar + 2 kg Mg + 0.6 kg B/ha to sugar beet plants gave the highest sugar yield and sugar content of sugar beet plants. El-Taweel (1999) stated that Mg application significantly increased root, biological and sugar yields/fed, TSS, sucrose and purity% of sugar beet plants.

The aimed of the investigation to study the effect of foliar nutrition and paclobutrazol on sugar beet yield and quality (*Beta vulgaris L.*).

## MATERIALS AND METHODS

Two field experiments of sugar beet were carried out at Sakha Research Station (Kafr El-Sheikh Governorate) in the two growing seasons of 1997/1998 and 1998/1999. The present study aimed to investigate the effect of Yeast extract, the growth retartends paclobutrazol and the two nutrient elements K and Mg, applied at harvest on top, root and sugar yields as well as juice quality of sugar beet plants. Every experiment included 33 treatments which were the combination of 11 treatments and 3 dates of foliar application. Floiar application dates were 45, 75 and 105 days after sowing. Nutrients and biological activators treatments were as follows:

1. Control treatments. 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 citrate 45%. 7. 250 ppm K citrate 45%. 8. 50 ppm Mg $MgSO_4$ 24%. 9. 250 ppm Mg $MgSO_4$ 24%. 10. 5 ppm $PP_{333}$ + 50 ppm K - 50 ml/l YE + 50 ppm K.

The commercial sugar beet variety Sultan was used. Planting was done on the 15th of November in both growing seasons. Harvest was followed after 7 months in both seasons. Nitrogen fertilizer was applied at 80 kg N/fed., as ammonium nitrate 33.5% N, Phosphours fertilizer at 30 kg $P_2O_5$/fed. as calcium superphosphate 15.5% $P_2O_5$/fed and potassium fertilizer at 48 kg $K_2O$/fed. as potassium sulphate 48% $K_2O$ in both seasons. Phosphoruis fertilizer was applied at seedbed preparation whereas nitrogen and potassic fertilizers were applied in split application in two equal doses, the first dose after thining and the second dose was applied one month later. The experiments were laid out in split plot design with three replications. Foliar application date were allocated in the main plots and nutrient elements were distributed randomely in the sub plots. Plot area was 14 $m^2$. Each plot contained 4 ridges which were 7 m in length and 50 cm in width. The preceding crop was barseem in both seasons. All cultural practices for growing sugar beet were done as recommended for the region. Mechanical and chemical analysis of experimental soil for 1997/1998 and 1998/1999 seasons are shown in Table (1).

**Harvest data**

At harvest, a sample of 5 plants was taken at random to determine juice quality and plants of four guarded ridges were uprooted and topped to estimate the following:

1. Yield of fresh roots (tons/fed.).
2. Yield of tops (tons/fed.).
3. Biological yield (tons/fed.) = Root yield + top yield.
4. Sugar yield (tons/fed.) which was calculated as:

Sugar yield (tons/fed.) = Root yield (tons/fed.) x sucrose %.

5. Harvest index was calculated = Root yield / Biological yield x 100 according to Gardner *et al* (1985).
6. Total soluble solids % which was determined using handl refractometer.
7. Sucrose% was determined according to Le Docte (1927).

8. Purity percentage, was calculated according to the following formula: discribed by Carruthers *et. al*. (1962).

Apparent purity % = Sucrose % / TSS % X 100.

Table 1. Mechanical and chemical analysis of experimental soil for 1997/1998 and 1998/1999 seasons.

| Seasons | 1997/1998 | | 1998/1999 | |
|---|---|---|---|---|
| Soil depth cms | 0-15 | 15-30 | 0-15 | 15-30 |
| Partial size distributrion | | | | |
| Sand% | 27.90 | 26.80 | 33.10 | 34.30 |
| Silt% | 41.30 | 40.90 | 40.90 | 37.90 |
| Clay% | 32.80 | 30.30 | 29.00 | 24.80 |
| Available N ppm | 38.00 | | 37.85 | |
| Chemical analysis in soil paste extraction: | | | | |
| a) Cations md/L. | | | | |
| Ca | 0.14 | 0.21 | 0.14 | 0.18 |
| Na | 0.14 | 0.30 | 0.36 | 0.48 |
| K | 0.11 | 0.05 | 0.11 | 0.20 |
| Anions mg/L. | | | | |
| Cl | 0.14 | 0.15 | 0.20 | 0.19 |
| $SO_4$ | 0.11 | 0.09 | 0.16 | 0.19 |
| $CO_3$ | 0.13 | 0.17 | 0.24 | 0.30 |
| Available B | 0.35 ppm | | 0.35 ppm | |
| Available Mn | 3.30 | 3.40 | 3.35 | 3.50 |
| Available Fe | 3.30 | 3.40 | 3.35 | 3.50 |

**Statistical analysis**

The data were exposed to the proper statistical analysis of variance of a split plot design according to Snedecor and Cochran (1967). For comparison among means, L.S.D. at 5% level of probability was used. A Combined analysis of the data of the two growing seasons was calculated according to Waller and Duncan (1969).

## RESULTS AND DISCUSSION

### I. Yield and yield components

#### 1. Top yield (tons/fed)

Results in Table (2) represent the effect of foliar application dates, nutrients and bological activators treatments on top yield of sugar beet. Delaying foliar application from up to 105 days from sowing caused a significant increase in top fresh sugar beet yield. Top yield increase due to delaying foliar spraying date may be due to increase plant height, number of leaves/plant, leaf area index, fresh and dry weight of different plant organs as well as dry matter accumulation. Similar results were also obtained by Fathy *et. al*. (2000).

Regarding nutrients treatments, applying yeast extract, plant growth paclobutrazol potassium and magnesium nutrients significantly increased top fresh yield in sugar beet.

Application of K gave significantly the highest values of top yield. Such increase due to applying 50 and 250 ppm K over the control treatment were 68.1 and 75.5%, respectively. The increment of top yield of sugar beet plants by adding K may be due to the role of K element in improving enzyme activation by (Marschner 1995). Therefore, the effect of K nutrient on top yield may be due to increasing photosynthetic area which resulted in increasing photosynthetic gains, water relations and vegetative growth by increasing cell division (Marschner 1995).

Magnesium application of 50 and 250 ppm Mg stimulated top yield above other treatments except K treatments. Increases in top yield due to applying Mg over the unfertilized treatment were 54.6 and 64.8%, respectively. The soil analysis showed that soil contained only 0.09 mg/l $Mg^{++}$ which is considered as a low level. Therefore, application 250 ppm Mg increased top yield asserting the jenvilal need for Mg application to sugar beet production in the soil. Mg is essential element. It has a great role as its emplying in the cholorphyll molecule struction and the activity of many enzymes (Marschner 1995).

Foliar application with 50 and 250 ml/l yeast extraxt increased top yield over the check treatment by 31.1 and 39.2%, respectively. Such increases in top yield may be due to that yeast extract contain phytohormones, macro and micro nutrients, amino acids, enzymes and many vitamins as a biological activators.

These results are in line with those reported by Tian *et al.* (1993) they reported that soaking sugar beet seeds in $PP_{333}$ increased the growth of leaves and roots as well as root yield. Also, a higher levels of studied treatments produced the highest top yield compared with the lower levels. On the same line, application of mixtures of 5 ppm $PP_{333}$ + 50 ppm K and 50 ml/l YE + 50 ppm K treatments increased green top yield over the check treatment by 45.1 and 53.5%, respectively.

Moreover, the interaction between foliar spray dates and nutrient treatments was significant on top yield of sugar beet. The highest top yield 4.76 (tons/fed) was shown by foliar application with 250 ppm K at 75 days from planting and the control treatment gave the lowest yield 2.66 (tons/fed). These results may be due to delaying foliar application stimulating response for K.

**2. Root yield (tons/fed)**

Data in Table (2). Indicated that nutrient floiar application at 105 days gave the high estimate of root yield that reached 43.49 (tons/fed) which ranked the first, followed by the application at 75 days that was 38.78 (tons/fed) and the least was 34.91 (tons/fed) hat obtained from the application at 45 days. Foliar spray at 105 days after sowing significantly increased the yielded beet root either when compared with that obtained at 45 or 75 days after sowing. Foliar application with yeast extract (YE), $PP_{333}$, K, Mg, 5 ppm $PP_{333}$ + 50 ppm K and 50 ml/l YE + 50 ppm K treatments significantly increased root yield of sugar beet over the check treatment by 32.22, 19.17, 71.96, 59.77, 45.09 and 53.70%, respectively.

Table 2. Effect of foliar application dates of some nutrients treatments and their interactions on top, root and biological yields (tons/fed) of sugar beet plants at harvest. (combined analysis of the two growing seasons 1997/1998 and 1998/1999).

| Traits | Top yield (tons/fed) Days after sowing | | | | Root yield (tons/fed) Days after sowing | | | | Biological yield (tons/fed) Days after sowing | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Treatments | 45 days | 75 days | 105 days | Mean | 45 days | 75 days | 105 days | Mean | 45 days | 75 days | 105 days | Mean |
| Control (distilled water) | 2.66 | 2.77 | 2.77 | 2.73 | 26.56 | 27.69 | 27.61 | 27.28 | 29.22 | 30.46 | 30.38 | 30.01 |
| Yeast extract (YE) 50 ml/l | 3.20 | 3.57 | 3.99 | 3.58 | 31.90 | 35.64 | 39.85 | 35.80 | 35.10 | 39.21 | 43.84 | 39.38 |
| Yeast extract (YE) 250 ml/l | 3.39 | 3.77 | 4.25 | 3.80 | 33.85 | 37.66 | 42.44 | 37.98 | 37.24 | 41.43 | 46.69 | 41.78 |
| Paclobutrazol ($PP_{333}$) 5 ppm | 2.83 | 3.16 | 3.53 | 3.17 | 28.25 | 31.56 | 35.26 | 31.69 | 31.08 | 34.72 | 38.78 | 34.86 |
| Paclobutrazol ($PP_{333}$) 25 ppm | 2.96 | 3.33 | 3.72 | 3.33 | 29.61 | 33.26 | 37.11 | 33.33 | 32.57 | 36.58 | 40.85 | 36.67 |
| Potassium 50 ppm | 4.08 | 4.57 | 4.31 | 4.33 | 40.76 | 45.73 | 52.04 | 46.18 | 44.84 | 50.30 | 56.37 | 50.50 |
| Potassium 250 ppm | 4.29 | 4.76 | 4.33 | 4.46 | 42.89 | 47.62 | 54.24 | 48.24 | 47.17 | 52.38 | 58.56 | 52.70 |
| Magnesium 50 ppm | 3.76 | 4.24 | 4.15 | 4.05 | 37.58 | 42.40 | 46.90 | 42.32 | 41.34 | 46.64 | 51.13 | 46.37 |
| Magnesium 250 ppm | 4.00 | 4.42 | 4.28 | 4.23 | 39.97 | 44.23 | 51.64 | 45.28 | 43.96 | 48.65 | 55.92 | 49.51 |
| 5 ppm $PP_{333}$ + 50 ppm K | 3.52 | 3.93 | 4.43 | 3.96 | 35.19 | 39.28 | 44.27 | 39.58 | 38.71 | 43.20 | 48.70 | 43.54 |
| 50 ml/l YE + 50 ppm K | 3.75 | 4.15 | 4.69 | 4.19 | 37.43 | 41.50 | 46.87 | 41.93 | 41.17 | 45.64 | 51.55 | 46.12 |
| Total mean | 3.50 | 3.88 | 4.04 | | 34.91 | 38.78 | 43.49 | | 38.57 | 42.66 | 47.50 | |
| L.S.D. at 0.05 level of significance | | | | | | | | | | | | |
| Days after sowing (A) | | | | 0.26 | | | | 2.44 | | | | 2.50 |
| Elements (B) | | | | 0.24 | | | | 2.42 | | | | 2.45 |
| A x B | | | | 0.46 | | | | 4.64 | | | | 4.75 |

It was observed that applying K produced the highest root yield compared with other treatments.

Also, spraying high concentration of YE, $PP_{333}$, K and Mg treatments gave the highest root yield compared with the lower concentrations. Applying 250 ppm K gave the highest root yield 47.91 (tons/fed) asserting the vital need for K application to sugar beet production in the soil. Agood supply of K will lead to more better root growth and more metabolic activity in plants leading in turn to a high root yield. The present results are in agreement with those obtained by El-Maghraby *et al* (1998) and El-Taweel (1999) who stated that K application significantly increased root, biological and sugar yield of sugar beet plants. Also, they found that Mg application significantly increased root, biological and sugar yields/fed.

The interaction between foliar spray dates and nutrient treatments was significant on root yield of sugar beet. The highest root yield 54.24 (tons/fed) was shown by foliar application with 250 ppm K at 105 days from sowing. These results may be due to delaying foliar application stimulating response for K.

**3. Biological yield (tons/fed)**

The obtained data in Table (2) at 210 days after sowing (i.e. at harvest time) showed that foliar application at 105 days gave the highest estimate of biological yield that was 47.50 (tons/fed) which ranked the first, followed by the application at 75 days that was 42.66 (tons/fed) and the least was obtained from the application at 45 days that was 38.57 (tons/fed). Foliar spray at 105 days after sowing significantly increased the biological yield when compared with the values obtained at 45 and 75 days after sowing. Here, it could be concluded that delaying foliar spray up to 105 days after sowing significantly increased the assimilates that were translocated from the tops to the roots.

In addition, significant differences among treatments of nutrients were recorded as shown shown in Table (2). Biological yield the total dry matter being accumulated in different plant organs top and root.

Foliar application with YE, $PP_{333}$, K, Mg, 5 ppm $PP_{333}$ + 50 ppm K and 50 ml/l YE + 50 ppm K treatments significantly increased biological yield over the check treatment by 35.22, 19.18, 71.94, 59.75, 44.99 and 53.71 (tons/fed), respectively. Applying K produced the highest values, which ranked the first, followed by Mg application and the least was obtained by $PP_{333}$ application. Other treatments was in between. Also, the higher levels produced the highest values compared with the lowest levels in the single foliar spray. It could be concluded that spraying 250 ppm K produced the highest biological yield 52.70 (tons/fed) and the lowest yield 30.01 (tons/fed) was obtained by the control treatment 30.01 (tons/fed). Such increases due to delaying foliar application dates may be due to increases the assimilates that were translocated from the tops to the roots. The increment of plant fresh weight by increasing K dose may be due to the role of K element in improving enzyme activation and vegetative growth by increasing cell division Marschner (1995).

Interaction between foliar spray dates and nutrient treatments was significant on biological yield of sugar beet. The highest biological yield 58.56 (tons/fed) was shown by foliar application with 250 ppm K at 105 days from sowing. These results may be due to delaying foliar application stimulating response for K.

**4. Harvest index**

Delaying foliar application with different nutrition treatments up to 105 days from sowing increased harvest index. Foliar application with YE, $PP_{333}$, K, Mg and some their mixtures significantly increased harvest index over the check treatments Table (3).

Applying the highest K level 250 ppm K had the highest harvest index 90.61%. These results most certainly due to the higher level of K significantly prduced the highest root and biological yields Table (2).

Moreover, the interaction betwēen foliar spray dates and nutrient treatments was significant on harvest index of sugar beet. The highest harvest index 90.92% was shown by foliar application with 250 ppm K at 45 days from sowing. These results may be due to delaying foliar application stimulating response for K.

**5. Sugar yield (tons/fed)**

Data obtained at Table (3) samples at 210 days after sowing i.e. at harvest time showed that foliar application at 105 days gave high mean values of sugar yield that was 7.52 (tons/fed), which ranked the first, followed by the application at 75 days that gave 6.64 (tons/fed) and the least that was 5.93 (tons/fed) obtained from the application at 45 days. Delying foliar application with different treatments from 45 to 75 and 105 days from sowing significantly increased sugar yield by 118.38 and 94.25%, respectively.

A higher level of different treatments significantly increrased sugar yield compared with the lower levels of treatments. Obtained samples at 210 days after sowing i.e. at harvest time showed that foliar application at 105 days gave high mean values of sugar yield that was 7.52 (tons/fed), which ranked the first followed by the application at 75 days that gave 6.64 (tons/fed) and the least was 5.93 (tons/fed) obtained from the application at 45 days. Therefore, delaying single foliar spray up to 105 days after sowing significantly increased sugar yield more than the other two applications dates.

Interaction between single foliar spray treatments at harvest time were significant. The highest values was of 10.07 (tons/fed) resulted from beets at harvest after foliar spray at 105 days after sowing with 250 ppm of K, while the least value 3.42 (tons/fed) resulted from untreated treatment. The other treatments occupied inbetween positions. These results are agreement with those obtained by Domska (1996); El-Maghraby *et al.* (1998); El-Taweel (1999); Shadia *et al.* (1998) and Fathy *et . al.* (2000).

**1. Total soluble solids (TSS%)**

Table (4) foliar application at 105 days gave the highest mean values of TSS% that reached 25.64% which ranked first, followed by 75 days that was 25.46% and the least was obtained from 45 days which was 25.32%. Also, it could be noticed that foliar spray at 105 days after sowing significantly increaseed TSS% compared with those obtained by 45 or 75 after sowing. The existed enhancement of TSS% with single foliar spray at 105 days after sowing could be interpreted on the basis that more assimilates were translocated from the photosynthetic tops of the plant (source) to the

storage roots (sink). Hence, enhancement of plant growth strongly could be reflected upon the next growth stage i.e. storage one. On the other hand, earlier treatments i.e. at 45 and 75 days appeared to enhance other stages of growth i.e. top growth. Thereby, enhancement of beet growth with different applied treatments at 45, 75 days after sowing being gradually minimized with the advancing of plant age. That could be more acceptable especially when values obtained from plants were treated either at 45 or 75 days of plant age wrere considered. Since, treatments at 105 days was more pronounced and effective compared with the other two dates regarding different estimated aspects.

Moreover, significant differences among treatments were existed in Table (4). The treatment of 250 ppm K nutrition gave the highest value followed by 50 ppm K, 250 ppm Mg, 50 ppm Mg respectively. in a descending order. Applying 250 ppm K was 27.16% which ranked the first and the least was 23.50% of untreated plants.

The interaction between foliar spray dates and other treatments were not significant. The highest values of TSS% that was 27.33% resulted from foliar spray at 105 days after sowing with 250 ppm K, while the lowest value resulted from intreated plants that reached 23.32%. The other treatments ranked inbetween.

**2. Sucrose percentage**

As shown in Table (4) taken samples at 210 days after sowing at harvest exhibited that foliar application at 105 days gave the highest mean values that was of 17.09%, which ranked the first, followed by the application at 75 days that was 16.93% and the least was obtained from the application at 45 days that reached 16.79%. Also, these data revealed that foliar spray at 105 days after sowing significantly increased sucrose% compared with that obtained at 45 or 75 days after sowing that was true for each treatment. In addition, delaying foliar spray up to 105 days after sowing significantly increased sucrose% more than the other two dates of treatments. This could be of interest as the econimic value is considered. In addition, significant differences among biological activators and nutrients treatments of elements in sucrose% were also existed in Table (4).

In this respect, the application of 250 ppm K gave the highest value of sucrose% followed by 50 ppm K, 250 ppm Mg and 50 ml/l YE + 50 ppm K of mixture in a descending order. Meanwhile, 250 ppm of K gave the value of 18.81% which ranked the first and the lowest was 14.61% that of untreated plants. The highest value of sucrose% that was 18.92% resulted from beets at garvest after foliar spray with 250 ppm K at 105 days after sowing. While the lowest value resulted from untreated treatments.

Interaction between foliar spray dates and other treatments were not significant.

**3. Purity percentage**

As indicated in Table (4) taken samples at 210 days after sowing i.e. at harvest time exhibited that foliar application at 105 days caused the highest mean values of purity% that reached 66.59%, whichg ranked the first, followed byt the application at 75 days that was 66.43% and the lowest was obtained from the application at 45 days that was 66.23%.

Furthermore, signficant differences am,ong biological activators and nutrients treatments of elements for the purity% were existed as shown in Table (4). The treatment of K that reached 69.29% and 68.25% with 50 ppm of the same element, yet it was 62.25% in control plants. The other threatments gave mean value of purity ranked in between.

In general, the highest value of purity% was of 69.43% resulted from beet roots at harvest time (i.e. at 210 days after sowing) after foliar spray at 45 days after sowing + 250 ppm K treatment. While, the lowest of purity% was of 62.09% resulted from untreated treatment at the harvest time of different dates. The other treatments ranked inbetween.

The interaction between foliar spray dates and other treatments were not significant. These resulted are agreement with those obtained by Tian *et al.* (1993), Domska (1996), El Maghraby *et al.* (1998); El Taweel (1999) and Fathy *et al.*(2000).

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# تاثير التغذية الورقية والباكلوبترازول على حاصل وجودة بنجر السكر
## ١- الحاصل والجودة

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اجريت تجربتان حقليتان فى محطة البحوث الزراعية بسخا بمحافظة كفر الشيخ خلال موسمى ١٩٩٨/١٩٩٧ و ١٩٩٩/١٩٩٨ وذلك لدراسة مواعيد الاضافة بالرش لكلا من مستخلص الخميرة والباكلوبترازول والبوتاسيوم والماغنسيوم على محصول وجودة الناتج النهائى (الحاصل البيولوجى) ممثلا فى الجذور والاوراق وحاصل السكر لنبات بنجر السكر صنف (فيز سلطان).

وشملت الدراسة المعاملات الاتية: أ- الرش بمستخلص الخميرة بمعدلى ٥٠ و ٢٥٠ ملى/لتر ب- الرش بالباكلوبترازول بمعدلى ٥ و ٢٥ جزء فى المليون ج- الرش بالبوتاسيوم بمعدلى ٥٠ و ٢٥٠ جزء فى المليون د- الرش بالماغنسيوم بمعدلى ٥٠ و ٢٥٠ جزء فى المليون هـ- الرش بمخلوط من الباكلوبترازول بمعدلى ٥ جزء فى المليون + ٥٠ جزء فى المليون من البوتاسيوم هـ- الرش بمخلوط من مستخلص الخميرة بمعدل ٥٠ ملى/لتر + ٥٠ جزء فى المليون من البوتاسيوم. فضلا على معاملة المقارنة وتم الرش فيها بماء مقطر.

وقد اضيفت العناصر مرة واحدة بالرش فى ثلاثة مواعيد مختلفة من عمر النبات هى ٤٥ و ٧٥ و ١٠٥ يوما.

اتبع تصميم القطع المنشقة مرة واحدة فى ثلاث مكررات حيث تم توزيع مواعيد الرش فى القطع الرئيسية ومعاملات التغذية الورقية فى القطع المنشقة والتى تبلغ مساحتها ١٤ متر مربع وقد تم اتباع المعاملات الزراعية العادية اثناء النمو كما هو متبع لمحصول بنجر السكر، وتم حصاد المحصول بعد ٢١٠ يوم من الزراعة.

وتلخص اهم نتائج التحليل التجميعى لموسمى الدراسة فى الاتى:

١- ادى تاخير التغذية الورقية الى ١٠٥ يوم من الزراعة الى الحصول على زيادة معنوية لحاصل العرش والجذر والسكر والحاصل البيولوجى مقارنة بالتغذية الورقية عند ٤٥ يوم من الزراعة.

٢- احتلت التغذية الورقية بالبوتاسيوم المركز الاول يليها التغذية بالماغنسيوم ثم مستخلص الخميرة ثم منظم النمو من حيث التاثير على صفات الحاصل.

٣- اعطى التركيز المرتفع لمعاملات التغذية الورقية اعلى القيم مقارنة بالتركيزات المنخفضة وقد ادت التغذية الورقية بتركيز ٢٥٠ جزء فى المليون بوتاسيوم اعلى القيم مقارنة بباقى المعاملات.

٤- كان التفاعل بين مواعيد الرش ومعاملات التغذية معنويا على حاصل العرش والجذر والبيولوجى ودليل الحاصل والسكر حيث ادت التغذية الورقية بالتركيز العالى من البوتاسيوم بعد ١٠٥ يوم من الزراعة الى الحصول على اعلى القيم بينما اعطت معاملة المقارنة اقل القيم.

٥- زادت صفات الجودة معنويا بتاخير ميعاد التغذية الورقية (١٠٥ يوم من الزراعة) وكانت اعلى القيم ٢٥,٦٤ % للمواد الصلبة الذائبة الكلية و ١٧,٠٩ % للسكروز و ٦٦,٥٩ % للنقاوة بينما كانت اقل القيم ٢٥,٣٢و ١٦,٧٩و ٦٦,٣٣ % لنفس صفات الجودة على التوالى.

٦- ادت التغذية الورقية الى زيادة معنوية لصفات العصير وقد ادى التركيز المرتفع للبوتاسيوم ٢٥٠ جزء فى المليون الى الحصول على اعلى القيم لصفات الجودة مقارنة بمعاملات التغذية الاخرى.