J. Plant Production, Mansoura Univ., Vol. 5 (5): 745-764, 2014

EFFECT OF SOWING DATES AND PHOSPHORUS FERTILIZER ON ROOT ROT AND QUALITY OF SOME SUGAR BEET VARIETIES

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ABSTRACT

The present investigation was carried out at the experimental farm of Malawi Agricultural Research Station, El-Minia Governorate, Egypt during 2009/2010 and 2010/2011 seasons to investigate the effect of sowing dates (15th October, 30th October and 15th November) and phosphorus fertilizer (0, 15 and 30) kg P_2O_5 /fed on root rot disease incidence, yield and its quality of three sugar beet varieties *i.e.* Farida, Kawemira and Montibianco. A split-split plot design with three replications was used, sowing dates were allocated in the main plots, phosphorus fertilizer was assigned in the sub plots while, sugar beet varieties were distributed in the sub- sub plots.

The results revealed that sowing date 15th October significantly reduced root rot disease incidence and increased all quality parameters, i.e. sucrose ,sex, Na, K, alpha amino N,SLM and extractability percentages except purity % as well as productivity traits (top and root yields) in the two growing seasons. The above varieties of sugar beet significantly differed in all studies traits in the two growing seasons. Phosphorus fertilizer significantly effected on all studies traits in both seasons, except sugar yield and (root yield and root fresh weight) in the first season only**.** Planting Kawemira sugar beet variety when received 30 kg P_2O_5 / fed in 15th October significantly increased yields of root and top (ton/fed) in the second season.

INTRODUCTION

Planting date is considered among the most important for all field crops generally, and sugar beet specially. It has an active role for growth, yield and root quality of sugar beet plants. The suitable date for sugar beet planting mainly depends on many factors such as the previous crop, weathering conditions, controlling conditions with sugar factories and cultivated cultivar. Under the environmental conditions of Egypt , there is a general agreement that early planting of sugar beet (September – October) produced the highest sucrose percentage as well as root and sugar yields per unit area (Helal, Samia *et. al.,* 2008,Yousef and Abdel-Mottaleb, 2009, El–Hosary *et. a.l,* 2010 and Enan *et al.,* 2011). Other study found that the planting in September gave the highest root diameter, root length, and weight and also technological characters TSS %, sucrose %, purity %, Na, sugar extractable and extractability percentages Naghizadeh *et. al.,* 2013. Banding phosphorus fertilizer results in more efficient uptake of this essential nutrient as a result, it is sometimes recommended that phosphorus application rate be decreased by 30 to 50 percent compared to broadcast rates when fertilizer is banded, Mesbah *et. al.,*2012. On the other hand, under study, El-Essawy (1996) showed that root, top and sugar yields and quality of sugar beet plants increased with the combination of 30 kg P_2O_5 + 24 kg K_2O/fed. Ibrahim, 1998 applied 0 and 15 kg P_2O_5/fed and 0, 24 and 48 kg K_2O/fed. He found that 15

kg P_2O_5 + 48 kg K_2O/fed gave significantly the maximum values of root length, diameter, fresh weight/plant, root and sugar yields while sucrose and purity percentages were significantly decreased. Jaszczolt, 1998 showed that phosphorus fertilizer amounts (400-640 kg/ha) did not significantly affect the crop yield, sugar yield or sugar content of beet. Kurakov *et al.* 1998 found that doubling or tribling the PK rate only increased root yield by 5-15% and did not increase sugar yield.

The technological quality of the roots was best with the lowest PK rate or with increased P or K rates. Root sugar content was highest with increased K and sugar output was greatest (15. 63-15. 69%) with increased P or K. Odrekhovskii *et al.* (1998) reported that increasing P_2O_5 + K_2O fertilizer rates from 50 up to 200 kg /fed gave root yield 39. 4 tons/fed. Sugar yield was highest with 100 kg P_2O_5 + 100 kg K_2O/ha. Higher fertilizer rates reduced the technological quality of the roots. Applying P fertilizer in addition to the 3 gal A-1 10-34-0 as either broadcast P fertilizer or additional amounts of 10-34-0 has never increased sugarbeet root yields above those achieved with 3 gals A-1 10-34-0 alone.

Under Egyptian conditions, sugar beet (*Beta vulgaris* L.) is susceptible to several foliar and soil borne diseases which are responsible for a considerable losses in the root yield and sugar content (Abada, 1994 and El-Mansoub *etal* 2010) Among the most important diseases affecting sugar-beet production are damping off and root rot caused by several pathogens *i.e. Rhizoctonia solani*, *Macrophomina phaseolina, Sclerotioum rolfsii* and *Fusarium* spp. (El-Kholi, 2000 and Husseien, Manal 2005). Yields can be reduced up to 10 tons per acre and sugar beet quality can be greatly affected (Abada, 1994). Root rot causal pathogens is a difficult disease to manage since the fungal propagules in soil and crop residues can survive for several years on the infected plants that considered as the secondary source of inoculum (Khalifa *et al.,* 2007).

Agricultural practices *i.e.* phosphorus fertilization and sowing dates may be useful in controlling root rot disease. Also, sugar-beet varieties with good resistance to the disease should be considered one of the applicable methods in controlling root rot disease in the fields with a chronic history of the disease inoculum (El-Fiki *et al.,* 2004 and Poindexter, 2012). Resistant sugar beet cultivars have been introduced to reduce disease occurrence Sugar beet seeds sown in Egypt are imported and hence beet varieties should be evaluated under the Egyptian conditions to select the best varieties in respect to yield and quality traits. Aly (2006) found that Marathon variety had almost the best values of root length, diameter and root fresh weight, as well as root and sugar yields/fed.

On the other hand, Kawimera variety was the highest one in sucrose%, extractable sugar and extractability percentages. Mohamed, Hanan (2008), El-Sheikh *et al.,* (2009) and Enan et al (2009) found that sugar beet varieties differed significantly in all studied traits except TSS% in both seasons. Sugar yield in the 1st season Farida variety gave a significant increase for sugar yield, juice quality (TSS, sucrose and purity%).While it recorded the lowest values of impurities (Na, K and N%). Abd El-Aal *et al.,* (2010) revealed that significant variation in yield productivity and root quality

among sugar beet varieties. Kawemira and Gloria varieties gave the highest sugar yield followed by Nejma, on the other hand Lola exhibited the lowest sugar yield. Oscar poly, Carola, Raspoly, Kawemera and Mont Bianko were more response to added nitrogen fertilizer. Mohamed *et al.* (2012) cleared that The differences between sugar beet varieties were significantly in root dimension, root, and sugar yields/fed sucrose% and α-amino N.

The present investigation aimed to find out the relative effect of three sowing dates and phosphorus fertilizer on root rot disease incidence, yield and its quality of three sugar beet varieties.

MATERIALS AND METHODS

Two field experiments were conducted the experimental farm of Malawi Agricultural Research Station, El-Minia. Governorate, Egypt during 2009/2010 and 2010/2011 seasons to study the performance of three sugar beet varieties (Farida, Kawemira and Montibianco) to phosphorus fertilizer application (0,15 and 30kg/fed) under three sowing dates (15^{th} October, 30^{th} October and 15^{th} November). The field soil was naturally heavily infested with root rot causal pathogens. A split-split plot design with three replications in the two seasons. Whereas sowing dates were allocated in the main plots, phosphorus fertilizer was assigned in the sub plots and sugar beet varieties were allocated in the sub-sub plot. Plot area was 12 m^2 including five rows of 60-cm width and 4-m long. Thinning was done after 45 days from planting to obtain one plant/hill (35000 plans/fed.). Phosphorus fertilizer was added during seed bed preparation, in the form of calcium superphosphate (15.5% P_2O_5), while potassium fertilization was applied at the rate of 48 kg K_2O/fed, as potassium sulphate (48% K_2O) in the two equal doses the first at seed bed preparation and the second after thinning. Nitrogen fertilizer was applied in the form of ammonium sulphate (20.5% N) in four equal doses, the first was applied after thinning and the others were applied at 2-weeks interval. Sugar beet was planted at distance of 20 cm in both seasons .Other agricultural practices were applied as recommended for growing sugar beet.

Physical and chemical properties of the experimental soil site are presented in Table (1) that carried out according to Page (1982).

At harvest, the three guarded central rows of each plot were harvested to estimate the following traits from random five plants:

1- Growth traits:

1.1. Root length (cm).

1.2. Root fresh weight (g/plant)

2- Sugar beet yields (ton/ fed):

The above mentioned was calculated by using a bulk sample which included all sugar beet plants of the three central rows of each plot (7.2 m^2)

2.1. Root yield (ton/fed).

2.2. Sugar yield (ton/fed) was calculated using the following equation:

Sugar yield (ton/fed) = Root yield X sugar extraction %.

2.3.Top yield (ton/fed)

3- Quality traits:

Juice quality and some technological parameters were determined using an automatic French system (HYCEL).

3.1.Sucrose percentage (Pol. %) was polarimetrically determined on a lead acetate extract of fresh macerated root according to the method of Le-Docte (1927).

3.2. Impurities (K, Na and α-amino nitrogen) were determined in the digested extract of root dry matter as follows:

3.2.1 Sodium and Potassium percentages were determined using the Flame photometer according to A.O.A.C (2005).

3.2.2. α-amino nitrogen was determined (Hydrindnation method) according to Carruthers *et al* (1962).

Table 1: Physical and chemical properties of the experimental soil site

Properties	2009/2010	2010/2011
Texture analysis:		
Clay %	44.20	47.40
Silt %	32.20	28.60
Sand %	23.60	24.00
Texture grade:	Clay	Clay
pH (1:1 suspention)	7.50	7.50
Ec m.mohs (1:1)	1.32	1.15
Organic matter %	1.18	1.24
Soluble cations:		
$Ca^{++} + Mg^{++}$ meq/100g soil	0.96	0.84
Na^{+} meq/100g soil	0.37	0.44
K^{+} meq/100g soil	0.09	0.11
Soluble anions:		
CO_3+ HCO_3 meq/100g soil	0.33	0.36
Cl^{-} meq/100g soil	0.84	0.91
Available N mg / kg soil	21.1	19.35
Available P (ppm)	8.50	7.85
Available K mg kg soil	175	180

*** Each value represents the mean of 5 samples**

3.3. Purity percentage.

Purity, sugar lost in molasses and extractable sugar (rendement or recovery) percentages were calculated according to the following formulas:

-Purity % = 99.36 - 14.27 (V1 + V2 + V3)/ V4 (Devillers, 1988).

-Sugar lost in molasses (SLM%) = 0.14 (V1 + V2) + 0.25 (V3) + 0.50 (Devillers, 1988).

-Sugar extraction % = pol% – SLM% - 0.6 (Dexter, *et al.*, 1967).

-Extractability % = Sugar extraction/ pol%

Where: V_1 = Sodium, V_2 = Potassium, V_3 = α-amino nitrogen, V_4 =Pol %

Root rot infection and its severity using the scale devised by Engelkes and Windels,1996 was estimated after harvest according to the 0-7 grades as follows:

0= no visible lesions.

1= arrested lesions at point of inoculation.

2= less than 5% shallow, dry rot canker.
3= 5 to 24% deep, dry rot canker.
4= 25 to 49% extensive rot.
5= 50 to 89% rot extensive into interior root.
6= 90 to less than 100%, most dead foliage.
7= 100% dead plants

The collected data were statistically analyzed according to Snedecor and Cochran (1981). treatment means were compared using L.S.D at 5% level of probability.

RESULTS AND DISCUSSION

A- Growth characters and root rot disease control :

The tabulated results in Tables (2 & 3) indicated that sowing date had a significant effect on root length (cm) in both growing seasons 2009/2010 and 2010/2011, respectively. and root fresh weight in the second season only. It could be noticed that, Planting sugar beet plants in 15th October scored the least percentage of root rot disease incidence and highest values of root dimensions, root length and root fresh weight in the two seasons (8.24%, 37.07 cm and 763.6 gm/plant) and (9.15%, 34.95 cm and 787.0 gm) respectively. The increment of growth attributes gained by early sowing date may be due to developing dimensions by increasing division or elongation of cells and also photosynthesis process (Naghizadeh *et. al.* 2013) he reported that root dimensions of sugar beet increased gradually as the early sowing date (September). Also, planting sugar beet plants in 15th October recorded the least percentage of root rot disease incidence. Sowing date play an important role for decreasing soil borne diseases. These results are in agreement with Khalifa, 1997. Phosphorus fertilizer levels (15 and 30kg/fed) had significant effect reducing the incidence of root rot disease and on root length (cm) in both growing seasons as well as root fresh weight only in the second season. High level of phosphorus fertilizer (30 kg P_2O_5) significantly decreased root rot incidence and increased root length and root fresh weight in both seasons analysis, these results are in harmony with that obtained by El-Essawy (1996). Improvement in sugar beet root rot disease control was affected by 15 and 30kg/fed of phosphorus fertilizer especially at the high level (30 kg P2O5). Phosphorus is one of the vital elements required for crop growth and controlling several soil borne diseases (Khalifa *et. al.,* 2010). These results are in agreement with Khalifa, 1997, Mahmoud, *et. al.,* 2008 and Khalifa *et. al.,* 2010. Concerning the evaluated sugar beet varieties ,data in Tables (2 & 3) indicated that varieties of sugar beet had a significant effect on decreasing root rot incidence root length and fresh weight of sugar beet varieties in the two growing seasons 2009/2010 and 2010/2011, respectively. It could be noticed that Kawimera variety was the best one in this regard in the two growing seasons. This result might be due to the action of gene make-up, which plays an important role in plant structure and morphology. These findings are in the same line with that reported by Mohamed, Hanan (2008). The resistance to root rot infection might be chemical in nature, this opinion was supported with El-Fiki *et. al.* (2004).

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B- Productivity traits :

Data in Tables (4 & 5) clarified that sowing date of sugar beet had a significant effect on top, root and sugar yields of sugar beet in the two growing seasons 2009/2010 and 2010/2011, respectively. It could be noticed from two seasons early sowing date (15th October) of sugar beet increased top and root yields by (10.38 and 31.18 ton, respectively) in the first season, meanwhile, the latest sowing date (15thNovember) recorded the highest sugar yield in the first season only 3.115 ton/fed. On the other hand, early sowing date (15th October) increased all parameters i.e. top, root and sugar yields of sugar beet (10.21, 29.78 and 2.613 ton/fed, respectively) in the second one. This results might be due to the increase in root dimension as well as quality parameters of sugar beet with the early sowing date. Similar results were obtained by El–Hosary *et. al* 2010 , Enan *et. al.* 2011 and Naghizadeh *et. al.* 2013. Concerning the evaluated phosphorus fertilizer, data presented in Tables (4 & 5) revealed the phosphorus fertilizer had a significant effect on top, and root yields in the second season and top yield only in the first one however soil application of 30 kg P_2O_5 /fed gave the highest value of top and root yields of sugar beet by (10.51 and 31.06 ton/fed, respectively) at the first season. However, gave the highest value of top, root and sugar (10.34, 30.21 and 2.608 ton/fed, respectively) compared to the check with no P fertilizer application. There was no difference in sugar yield among treatments with 0-15- 30 applied at various rates at the two tested seasons. These results are in harmony with those obtained by. Sims 2004 and Mesbah *et. al.,* 2012. Regard for the evaluated sugar beet varieties, data in Tables (4 & 5) indicated that the studied varieties of sugar beet revealed differed significantly effect on top, root and sugar yields in the two tested seasons. Kawemira variety scored the highest value (9.98 , 29.66 ton/fed) of top and root yields in the first season as well as (9.81 and 28.33 ton/fed) in the second one, while the difference between Kawemira and Montbianco varieties was insignificant for sugar yield in the first season and the difference in this trait among the examined varieties was insignificant in the second season. Similar results were obtained by Mohamed, Hanan (2008). A significant interaction was found between sowing date and phosphorus fertilizer (AB) with regard to top yield in both seasons in addition to root yield in the second one only (Tables 4 & 5). The highest value (10.48 and 10.30 tons/fed) of top yield in the first and second season respectively were obtained by sowing date at 15th October and soil application of 15 kg P_2O_5/fed. Also a significant interaction between sowing date and sugar beet varieties (AC) of top, root and sugar yields in both seasons with some exception. In general, it can be concluded from the results that Montbianco variety with early sowing date (15th October) scored the highest value of top, root and sugar yields, could be recommended for maximizing sugar beet productivity .

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C- Quality parameters.

Results in Tables (6-11) indicated that sowing date of sugar beet had a significant effect on Na %, K% and alpha amino N %, as well as sucrose %, sex % (sugar extraction %) and purity % in addition to SLM % and extractability % in the two growing seasons except extractability % only in the second season. It could be noticed from two seasons analysis that planting sugar beet in 15th October increased all quality traits except purity % was increased by planting sugar beet in 15th November. These findings are in agreement with that reported by Naghizadeh *et. al.* 2013, P fertilizer levels had significant effect on all juice quality traits in both seasons, except extractability % in the second season. High level of phosphorus fertilizer (30kg P_2O_5) Significantly increased all juice quality traits in both seasons analysis, except purity % was decreased by 6.22 % and 6.47 % in first and second seasons respectively compared with control (0 kg P_2O_5 /fed) these results are in harmony with that obtained by El-Essawy, 1996. Sugar beet varieties had significant effect on all juice quality traits in both seasons, except extractability % in the second season. Kawemira variety scored the highest value of all juice quality traits in both seasons, except purity %, while the difference between Kawemira and Farida sugar beet varieties was insignificant for sugar extraction % in the second season.

A significant interaction was found between sowing date and phosphorus fertilizer (AB) with regard to all quality traits in both seasons except k %, sex % , SLM % and extractability % in the second season only, (Tables 6 - 11). It could be noticed from two seasons analysis that planting sugar beet in 15th November and soil application of 30 kg P_2O_5/fed increased all quality traits except impurities , SLM,sucrose and sex percentage were increased by planting sugar beet in 15th october. Also a significant interaction between sowing date and sugar beet varieties (AC) of all quality traits in both seasons with some exception i.e K and SLM percentage only in the second season , it can be noticed from two seasons analysis that Montbianco variety with early sowing date (15th October) scored the highest value of juice quality traits except purity % ,these results are in harmony with that obtained by Enan *et. al.* 2011. Asignificant interaction between phosphorus fertilizer and sugar beet varieties (BC) as well as interaction between sowing dates , phosphorus fertilizer and sugar beet varieties (ABC) of all quality traits in both seasons with some exception only in the second season.

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تأثير مواعيد الزراعة والسماد الفوسفاتى على عفن الجذور وجودة بعض اصناف بنجر السكر

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معهد بحوث المحاصيل السكرية – مركز البحوث الزراعية – الجيزة – مصر

اقيمت تجربتان حقليتان بالمزرعة التجريبية لمحطة بحوث ملوى بمحافظة المنيا خلال موسمى الزراعة ٢٠٠٩/ ٢٠١٠ و ٢٠١٠ /٢٠١١ لدراسة تاثير مواعيد الزراعة (١٥ اكتوبر ، ٣٠ اكتوبر و ١٥ نوفمبر) والسماد الفوسفاتى (بدون اضافة ، ١٥ و ٣٠) كجم فو٢ا٥ على عفن الجذور وصفات الجودة لثلاث اصناف من بنجر السكر (فريدا ، كواميرا ومونتبيانكو). وقد استخدم فى ذلك تصميم القطع المنشقة مرتين فى ثلاث مكررات بحيث كانت مواعيد الزراعة فى القطع الرئيسية ووزع السماد الفوسفاتى والاصناف عشوائيا فى القطع الشقية وتحت الشقية .

اوضحت النتائج زيادة معنوية لصفات الجودة مثل السكروز ، نسبة السكر المستخلص ، الصوديوم، البوتاسيوم ، الالفا امينو نيتروجين ، السكر المفقود فى المولاس ونسبة الاستخلاص وكذلك صفات الانتاجية من محصولى السكر والجذور مع خفض نسبة الاصابة بعفن الجذور عند الزراعه فى ١٥ اكتوبر لكلا موسمى الزراعة. استجابت الاصناف تحت الدراسة معنويا لجميع الصفات فى كلا موسمى الدراسة، كما اثرت اضافة السماد الفوسفاتى معنويا على جميع الصفات تحت الدراسة عدا محصول السكر والجذر والوزن الغض للجذر فى الموسم الاول فقط. ولذلك ادى زراعة الصنف كواميرا فى الميعاد ١٥ اكتوبر مع اضافة ٣٠ كجم فو٢ا٥ الى زيادة معنوية فى محصولى الجذور والعروش (طن / فدان) فى كلا موسمى الزراعة.

Table 2: Effect of sowing dates and phosphorus fertilizers on root rot disease%, root length (cm) and root fresh weight (g/plant) of three sugar beet varieties in 2009/2010 season.

Treatments		Root rot disease%			Mean	Root length (cm)			Mean	Root fresh weight (g/plant)			Mean
Sowing dates (A)	Phosphorus fertilizer (B)	Varieties (C)*				Varieties (C)				Varieties (C)			
		V1	V2	V3		V1	V2	V3		V1	V2	V3	
15th October	Zero	8.79	8.36	7.77	8.30	34.63	37.15	39.41	37.07	679.0	556.1	871.3	702.1
	15kg/fed	8.28	7.79	7.29	7.79	34.91	37.44	39.62	37.33	690.3	841.0	890.7	807.3
	30kg/fed	8.87	8.72	8.35	8.65	34.41	36.91	39.16	36.83	671.3	821.3	851.7	781.4
Mean		8.64	8.29	7.80	8.24	34.65	37.17	39.40	37.07	680.2	739.5	871.2	763.6
30th October	Zero	10.14	9.71	8.77	9.54	33.63	35.41	37.16	35.40	651.0	769.3	801.0	740.4
	15kg/fed	9.64	9.19	8.64	9.16	33.91	35.64	37.41	35.66	662.7	782.3	810.0	751.7
	30kg/fed	10.84	10.30	9.58	10.24	33.41	34.49	36.90	34.94	641.7	758.7	790.7	730.3
Mean		10.21	9.73	9.00	9.65	33.65	35.18	37.16	35.33	651.8	770.1	800.6	740.8
15thNovember	Zero	10.72	10.25	9.34	10.10	31.16	33.64	35.41	33.41	621.3	710.7	741.7	691.1
	15kg/fed	10.44	9.84	9.41	9.90	31.40	33.91	35.64	33.65	632.7	721.3	751.7	701.9
	30kg/fed	11.18	10.63	10.20	10.67	30.90	33.41	35.41	33.25	612.0	701.3	732.3	681.9
Mean		10.78	10.24	9.65	10.22	31.16	33.66	35.49	33.44	621.9	711.1	741.9	691.6
Mean of phosphorus fertilizer	Zero	9.88	9.46	10.30	9.88	33.14	33.41	32.91	33.15	650.3	661.9	641.7	651.3
	15kg/fed	9.44	8.94	9.89	9.42	35.40	35.67	34.94	35.34	678.7	781.6	760.4	740.2
	30kg/fed	8.63	8.45	9.37	8.82	37.33	37.56	37.16	37.35	804.7	817.4	791.6	804.6
Mean		9.32	8.95	9.85	9.37	35.29	35.55	35.00	35.28	711.2	753.6	731.2	732.0

*** Varieties i.e. V1, V2 and V3 were Farida, Kawemira and Montibianco, respectively.**

LSD 0.05 for:	Sowing dates (A)	Phosphorus fertilizer (B)	Varieties (C)	A X B	A X C	B X C	ABC Interaction
Root rot disease%	0.15	0.09	0.09	0.16	0.16	0.16	NS
Root length	0.17	0.13	0.13	NS	0.21	NS	NS
Root fresh weight	NS	NS	87.1	NS	NS	NS	NS

Table 3: Effect of sowing dates and phosphorus fertilizers on root rot disease%, root length (cm) and root fresh weight (g/plant) of three sugar beet varieties in 2010/2011 season.

2010/2011 season.													
Treatments		**Root rot disease%**			**Mean**	**Root length (cm)**			**Mean**	**Root fresh weight (kg/plant)**			**Mean**
Sowing dates (A)	**Phosphorus fertilizer (B)**	**Varieties (C)**				**Varieties (C)**				**Varieties (C)**			
		V1	**V2**	**V3**		**V1**	**V2**	**V3**		**V1**	**V2**	**V3**	
15th October	Zero	9.57	9.14	8.62	9.11	2.17	35.01	37.26	34.93	673.0	825.0	8637	787.2
	15kg/fed	9.21	8.70	8.24	8.72	2.28	35.43	37.51	35.23	684.0	832.7	884.7	800.4
	30kg/fed	10.13	9.56	9.21	9.63	2.23	34.75	37.01	34.68	663.0	814.0	842.3	773.1
Mean		9.64	9.13	8.69	9.15	2.23	35.06	37.26	34.95	673.3	823.9	863.6	787.0
30th October	Zero	11.20	10.56	10.22	10.66	2.10	33.26	35.01	33.27	643.7	765.0	792.7	733.8
	15kg/fed	10.63	10.19	9.65	10.16	2.13	33.51	35.26	33.51	653.3	774.7	803.7	743.9
	30kg/fed	11.70	11.13	10.56	11.13	2.07	33.02	34.75	33.01	633.7	754.7	785.0	724.4
Mean		11.18	10.63	10.14	10.65	2.10	33.27	35.01	33.26	643.6	764.8	793.8	734.4
15thNovember	Zero	11.66	11.14	10.61	11.14	1.91	31.52	33.25	31.26	615.0	704.3	734.3	684.6
	15kg/fed	11.18	10.74	10.41	10.78	1.96	31.75	33.51	31.50	625.0	716.0	745.0	695.3
	30kg/fed	12.09	11.60	11.24	11.64	1.88	31.26	33.34	31.12	606.0	694.7	722.3	674.3
Mean		11.64	11.16	10.75	11.19	1.92	31.51	33.37	31.30	615.3	705.0	733.9	684.5
Mean of phosphorus fertilizer	Zero	10.81	10.34	11.31	10.82	1.72	31.25	30.76	31.01	643.9	654.1	634.2	644.1
	15kg/fed	10.28	9.88	10.77	10.31	2.20	33.56	33.01	33.28	764.8	774.4	754.4	764.6
	30kg/fed	9.81	9.43	10.34	9.86	2.32	35.43	35.03	35.21	796.9	811.1	783.2	797.7
Mean		10.30	9.88	10.80	10.33	2.08	33.42	32.93	33.17	735.2	746.6	724.0	735.4

*** Varieties i.e. V1, V2 and V3 were Farida, Kawemira and Montibianco, respectively.**

LSD 0.05 for:	**Sowing dates (A)**	**Phosphorus fertilizer (B)**	**Varieties (C)**	**A X B**	**A X C**	**B X C**	**ABC Interaction**
Root rot disease%	**0.08**	**0.06**	**0.05**	**NS**	**NS**	**NS**	**NS**
Root length	**0.04**	**0.03**	**0.03**	**0.05**	**0.06**	**0.06**	**0.10**
Root fresh weight	**0.80**	**0.60**	**0.80**	**1.10**	**1.40**	**1.40**	**2.50**

Table 4: Effect of sowing dates and phosphorus fertilizers on top, roots and sugar yields (ton/fed) of three sugar beet varieties in 2009/2010 season.

2009/2010 season.													
Treatments		Top yield (ton/fed)			Mean	Root yield (ton/fed)			Mean	Sugar yield (ton/fed)			Mean
Sowing dates (A)	Phosphorus fertilizer (B)	Varieties (C)				Varieties (C)				Varieties (C)			
		V1	V2	V3		V1	V2	V3		V1	V2	V3	
15th October	Zero	9.22	10.82	11.10	10.38	28.23	32.02	33.25	31.17	3.282	2.968	2.954	3.068
	15kg/fed	9.31	10.91	11.21	10.48	28.52	32.24	33.54	31.44	3.309	2.946	2.942	3.066
	30kg/fed	9.12	10.71	11.00	10.28	28.02	31.71	33.06	30.93	3.278	2.977	2.980	3.078
Mean		9.22	10.82	11.11	10.38	28.26	31.99	33.29	31.18	3.289	2.964	2.959	3.071
30th October	Zero	8.91	10.20	10.51	9.88	27.11	29.59	27.96	28.22	3.192	2.999	2.709	2.967
	15kg/fed	9.02	10.32	10.60	9.98	27.27	29.71	31.54	29.51	3.196	2.965	3.008	3.056
	30kg/fed	8.81	10.11	10.41	9.78	26.82	29.25	31.13	29.07	3.156	2.984	3.054	3.065
Mean		8.92	10.21	10.51	9.88	27.07	29.52	30.21	28.93	3.181	2.982	2.924	3.029
15thNovember	Zero	8.62	9.61	9.92	9.39	26.23	27.19	29.42	27.55	3.102	3.050	3.140	3.097
	15kg/fed	8.71	9.71	10.02	9.48	26.09	27.54	30.46	28.03	3.088	3.044	3.190	3.107
	30kg/fed	8.51	9.52	9.81	9.28	26.00	27.03	29.16	27.40	3.121	3.151	3.151	3.140
Mean		8.61	9.62	9.92	9.38	26.04	27.26	29.68	27.66	3.104	3.081	3.159	3.115
Mean of phosphorus fertilizer	Zero	8.92	9.01	8.82	8.91	27.12	27.30	26.95	27.12	3.192	3.198	3.185	3.191
	15kg/fed	10.22	10.32	10.12	10.22	29.60	29.83	29.33	29.59	3.005	2.985	3.034	3.009
	30kg/fed	10.51	10.61	10.41	10.51	30.21	31.85	31.12	31.06	2.934	3.047	3.061	3.014
Mean		9.88	9.98	9.78	9.88	28.98	29.66	29.13	29.26	3.044	3.076	3.094	3.071

***Varieties i.e. V1, V2 and V3 were Farida, Kawemira and Montibianco, respectively.**

LSD 0.05 for:	Sowing dates (A)	Phosphorus fertilizer (B)	Varieties (C)	A X B	A X C	B X C	ABC Interaction
Top yield (ton/fed)	0.01	0.01	0.01	0.01	0.01	0.01	NS
Root yield (ton/fed)	0.89	NS	0.61	NS	1.06	NS	NS
Sugar yield (ton/fed)	NS	NS	0.058	NS	0.058	NS	NS

Table 5: Effect of sowing dates and phosphorus fertilizers on top, roots and sugar yields (ton/fed) of three sugar beet varieties in 2010/2011 season.

2010/2011 season.													
Treatments		Top yield (ton/fed)			Mean	Root yield (ton/fed)			Mean	Sugar yield (ton/fed)			Mean
Sowing dates (A)	Phosphorus fertilizer (B)	Varieties (C)				Varieties (C)				Varieties (C)			
		V1	V2	V3		V1	V2	V3		V1	V2	V3	
15th October	Zero	9.13	10.63	10.63	10.23	26.21	31.05	32.28	29.85	2.607	2.571	2.577	2.585
	15kg/fed	9.13	10.73	10.73	10.30	26.86	31.26	32.76	30.20	2.896	2.555	2.586	2.679
	30kg/fed	8.93	10.53	10.53	10.09	26.07	29.73	32.07	29.29	2.642	2.486	2.596	2.575
Mean		9.06	10.63	10.63	10.21	26.29	30.68	32.37	29.78	2.715	2.537	2.586	2.613
30th October	Zero	8.72	10.03	10.03	9.69	25.06	28.53	30.03	27.87	2.564	2.559	2.584	2.569
	15kg/fed	8.83	10.14	10.14	9.80	25.27	28.75	30.43	28.15	2.569	2.537	2.587	2.564
	30kg/fed	8.61	9.94	9.94	9.60	24.74	28.26	29.73	27.58	2.525	2.541	2.602	2.556
Mean		8.72	10.03	10.03	9.70	25.02	28.51	30.06	27.87	2.553	2.546	2.591	2.563
15thNovember	Zero	8.43	9.43	9.43	9.23	23.72	27.10	28.28	26.37	2.445	2.657	2.658	2.587
	15kg/fed	8.53	9.62	9.62	9.33	24.08	27.31	28.54	26.64	2.468	2.645	2.642	2.585
	30kg/fed	8.34	9.34	9.34	9.10	23.52	26.74	27.76	26.01	2.441	2.713	2.637	2.597
Mean		8.43	9.47	9.47	9.22	23.78	27.05	28.19	26.34	2.451	2.672	2.646	2.590
Mean of phosphorus fertilizer	Zero	8.76	8.83	8.83	8.74	25.00	25.31	24.78	25.03	2.539	2.645	2.536	2.573
	15kg/fed	10.03	10.16	10.16	10.04	28.89	29.11	28.24	28.75	2.596	2.579	2.580	2.585
	30kg/fed	10.36	10.43	10.43	10.34	30.20	30.57	29.86	30.21	2.606	2.605	2.612	2.608
Mean		9.72	9.81	9.81	9.71	28.03	28.33	27.63	28.00	2.580	2.610	2.576	2.589

***Varieties i.e. V1, V2 and V3 were Farida, Kawemira and Montibianco, respectively.**

LSD 0.05 for:	Sowing dates (A)	Phosphorus fertilizer (B)	Varieties (C)	A X B	A X C	B X C	ABC Interaction
Top yield (ton/fed)	0.01	0.01	0.01	0.01	0.01	0.01	0.02
Root yield (ton/fed)	0.03	0.03	0.04	0.06	0.07	0.07	0.12
Sugar yield (ton/fed)	NS	NS	0.071	NS	NS	NS	NS

Table 6: Effect of sowing dates and phosphorus fertilizers on juice impurities (Na, K and α-aminoN%) of three sugar beet varieties in 2009/2010 season.

2009/2010 season.													
Treatments		*Na%			Mean	K%			Mean	α-amino N)%			Mean
Sowing dates (A)	Phosphorus fertilizer (B)	Varieties (C)				Varieties (C)				Varieties (C)			
		V1	V2	V3		V1	V2	V3		V1	V2	V3	
15th October	Zero	1.350	1.913	1.980	1.748	3.540	4.350	4.450	4.113	2.270	2.800	2.900	2.658
	15kg/fed	1.380	1.940	1.990	1.770	3.617	4.387	4.470	4.158	2.290	2.820	2.950	2.691
	30kg/fed	1.320	1.870	1.950	1.713	3.510	4.307	4.420	4.078	2.240	2.770	2.890	2.637
Mean		1.350	1.908	1.973	1.744	3.556	4.348	4.447	4.117	2.269	2.800	2.917	2.662
30th October	Zero	1.263	1.620	1.770	1.551	3.407	4.157	4.263	3.942	2.160	2.630	2.750	2.516
	15kg/fed	1.280	1.670	1.860	1.603	3.450	4.177	4.263	3.963	2.180	2.670	2.760	2.542
	30kg/fed	1.220	1.610	1.710	1.513	3.313	4.033	4.203	3.850	2.110	2.610	2.710	2.478
Mean		1.254	1.633	1.780	1.556	3.390	4.122	4.243	3.919	2.153	2.639	2.743	2.512
15thNovember	Zero	1.170	1.420	1.540	1.377	3.237	3.800	4.080	3.708	2.050	2.400	2.520	2.339
	15kg/fed	1.220	1.463	1.547	1.410	3.267	3.857	4.107	3.743	2.830	2.420	1.857	2.369
	30kg/fed	1.180	1.433	1.510	1.374	3.210	3.747	4.007	3.654	2.020	2.350	2.490	2.291
Mean		1.190	1.439	1.532	1.387	3.238	3.801	4.067	3.702	2.056	2.393	2.540	2.330
Mean of phosphorus fertilizer	Zero	1.261	1.293	1.240	1.265	3.394	3.444	3.344	3.394	2.163	2.187	2.128	2.159
	15kg/fed	1.651	1.691	1.638	1.660	4.102	4.140	4.029	4.090	2.612	2.641	2.579	2.611
	30kg/fed	1.763	1.780	1.723	1.762	4.267	4.280	4.210	4.252	2.727	2.774	2.699	2.733
Mean		1.559	1.594	1.534	1.562	3.921	3.955	3.861	3.912	2.501	2.534	2.469	2.501

*Sodium (Na), Potassium (K) and Nitrogen (N)

LSD 0.05 for:	Sowing dates (A)	Phosphorus fertilizer (B)	Varieties (C)	A X B	A X C	B X C	ABC Interaction
Na%	0.005	0.004	0.007	0.006	0.012	0.012	0.020
K%	0.008	0.007	0.008	0.012	0.014	0.014	0.024
α-amino N)%	0.004	0.003	0.004	0.005	0.006	0.006	0.011

Table 7: Effect of sowing dates and phosphorus fertilizers on juice impurities (Na, K and α-amino N%) of three sugar beet varieties in 2010/2011 season.

2010/2011 season.													
Treatments		Na			Mean	K			Mean	α-amino N%			Mean
Sowing dates (A)	Phosphorus fertilizer (B)	Varieties (C)				Varieties (C)				Varieties (C)			
		V1	V2	V3		V1	V2	V3		V1	V2	V3	
15th October	Zero	0.980	1.520	1.613	1.371	2.257	3.147	3.247	2.883	1.607	2.407	2.490	2.168
	15kg/fed	1.010	1.550	1.627	1.396	3.067	3.180	3.287	3.178	1.887	2.410	2.537	2.278
	30kg/fed	0.930	1.303	1.637	1.290	2.303	3.103	3.203	2.870	1.833	2.357	2.503	2.231
Mean		0.973	1.458	1.626	1.352	2.542	3.143	3.246	2.977	1.776	2.391	2.510	2.226
30th October	Zero	0.880	1.250	1.400	1.177	2.203	2.933	3.017	2.718	1.747	2.227	2.333	2.102
	15kg/fed	0.900	1.307	1.470	1.226	2.250	2.950	3.057	2.752	1.770	2.267	2.357	2.131
	30kg/fed	0.857	1.220	1.337	1.138	2.107	2.787	3.013	2.636	1.700	2.200	2.307	2.069
Mean		0.879	1.259	1.402	1.180	2.187	2.890	3.029	2.702	1.739	2.231	2.332	2.101
15thNovember	Zero	0.800	0.930	1.160	0.963	2.020	2.603	2.877	2.500	1.643	1.980	2.117	1.913
	15kg/fed	0.827	1.100	1.200	1.042	2.057	2.643	2.900	2.533	1.683	2.013	2.180	1.959
	30kg/fed	0.800	1.077	1.130	1.002	2.007	2.537	2.807	2.450	1.613	1.947	2.087	1.882
Mean		0.809	1.036	1.163	1.003	2.028	2.594	2.861	2.494	1.647	1.980	2.128	1.918
Mean of phosphorus fertilizer	Zero	0.887	0.912	0.862	0.887	2.160	2.458	2.139	2.252	1.666	1.780	1.716	1.720
	15kg/fed	1.233	1.319	1.200	1.251	2.894	2.924	2.809	2.876	2.204	2.230	2.168	2.201
	30kg/fed	1.391	1.432	1.368	1.397	3.047	3.081	3.008	3.045	2.313	2.358	2.299	2.323
Mean		1.170	1.221	1.143	1.178	2.700	2.821	2.652	2.724	2.061	2.123	2.061	2.081

Sodium (Na), Potassium (K) and Nitrogen (N)

LSD 0.05 for:	Sowing dates (A)	Phosphorus fertilizer (B)	Varieties (C)	A X B	A X C	B X C	ABC Interaction
Na%	0.003	0.003	0.005	0.004	0.008	0.008	0.015
K%	0.165	0.165	0.123	NS	NS	NS	NS
α-amino N)%	0.003	0.005	0.004	0.007	0.007	0.007	0.012

Table 8: Effect of sowing dates and phosphorus fertilizers on SLM%, sex% and purity% of three sugar beet varieties in 2009/2010 season.

2009/2010 season.													
Treatments		Sucrose %				Sugar extraction%				Purity%			
Sowing dates (A)	Phosphorus fertilizer (B)	Varieties (C)			Mean	Varieties (C)			Mean	Varieties (C)			Mean
		V1	V2	V3		V1	V2	V3		V1	V2	V3	
15th October	Zero	14.00	17.21	17.80	16.34	8.60	10.79	11.25	10.22	83.80	76.57	75.72	78.70
	15kg/fed	14.10	17.41	17.99	16.50	8.62	10.94	11.40	10.32	83.45	76.23	75.60	78.42
	30kg/fed	13.90	17.01	17.61	16.18	8.55	10.65	11.09	10.10	84.20	77.15	76.12	79.15
Mean		14.00	17.21	17.80	16.34	8.59	10.80	11.25	10.21	83.81	76.65	75.81	78.76
30th October	Zero	13.72	16.01	16.61	15.45	8.50	9.87	10.31	9.56	84.90	80.56	78.53	81.33
	15kg/fed	13.81	16.20	16.80	15.60	8.53	10.02	10.49	9.68	84.70	79.87	77.25	80.61
	30kg/fed	13.61	15.81	16.41	15.28	8.50	9.81	10.19	9.50	85.42	80.58	79.33	81.78
Mean		13.71	16.09	16.61	15.44	8.51	9.90	10.33	9.58	85.01	80.34	78.37	81.24
15thNovember	Zero	13.40	14.61	15.40	14.48	8.39	8.92	9.37	8.89	86.05	83.06	81.64	83.58
	15kg/fed	13.51	14.81	15.62	14.65	8.45	9.05	9.55	9.02	85.37	82.50	81.56	83.14
	30kg/fed	13.31	14.21	15.20	14.24	8.33	8.58	9.26	8.73	85.88	82.82	81.98	83.56
Mean		13.41	14.55	15.41	14.46	8.39	8.85	9.40	8.88	85.77	82.79	81.73	83.43
Mean of phosphorus fertilizer	Zero	13.71	13.81	13.61	13.71	8.50	8.54	8.46	8.50	84.92	84.51	85.17	84.86
	15kg/fed	15.95	16.14	15.68	15.92	9.86	10.01	9.68	9.85	80.07	79.53	80.18	79.93
	30kg/fed	16.61	16.81	16.41	16.61	10.31	10.48	10.18	10.33	78.63	78.14	79.14	78.64
Mean		15.42	15.59	15.23	15.41	9.56	9.67	9.44	9.56	81.20	80.72	81.50	81.14

LSD 0.05 for:	Sowing dates (A)	Phosphorus fertilizer (B)	Varieties (C)	A X B	A X C	B X C	ABC Interaction
Sucrose%	0.01	0.01	0.01	0.01	0.01	0.01	0.02
Sex%	0.01	0.01	0.01	0.02	0.02	0.02	0.03
Purity%	0.07	0.05	0.10	0.09	0.17	0.17	0.30

Table 9: Effect of sowing dates and phosphorus fertilizers on SLM%, sex% and purity% of three sugar beet varieties in 2010/2011 season.

2010/2011 season.													
Treatments		Sucrose %				Sugar extraction%				Purity%			
Sowing dates (A)	Phosphorus fertilizer (B)	Varieties (C)			Mean	Varieties (C)			Mean	Varieties (C)			Mean
		V1	V2	V3		V1	V2	V3		V1	V2	V3	
15th October	Zero	13.95	17.14	17.72	16.27	10.05	12.08	12.53	11.55	87.75	80.96	79.73	82.81
	15kg/fed	14.06	17.34	17.92	16.44	9.28	12.24	12.67	11.40	88.15	80.56	79.58	82.76
	30kg/fed	13.86	16.93	17.51	16.10	9.87	11.96	12.36	11.39	88.53	84.00	79.35	83.96
Mean		13.96	17.14	17.72	16.27	9.73	12.09	12.52	11.45	88.14	81.84	79.55	83.18
30th October	Zero	13.64	15.91	16.52	15.36	9.77	11.15	11.62	10.85	89.13	84.60	82.54	85.42
	15kg/fed	13.75	16.13	16.71	15.53	9.84	11.33	11.76	10.98	88.90	83.80	81.58	84.76
	30kg/fed	13.55	15.73	16.30	15.19	9.80	11.12	11.43	10.78	89.37	84.88	83.44	85.90
Mean		13.65	15.93	16.51	15.36	9.80	11.20	11.60	10.87	89.13	84.43	82.52	85.36
15thNovember	Zero	13.35	14.53	15.31	14.39	9.70	10.20	10.64	10.18	90.09	88.83	85.82	88.25
	15kg/fed	13.45	14.72	15.51	14.56	9.76	10.32	10.80	10.29	89.75	86.44	85.28	87.16
	30kg/fed	13.26	14.13	15.11	14.17	9.64	9.86	10.53	10.01	90.07	86.67	86.18	87.64
Mean		13.35	14.46	15.31	14.37	9.70	10.13	10.66	10.16	89.97	87.31	85.76	87.68
Mean of phosphorus fertilizer	Zero	13.64	13.75	13.56	13.65	9.84	9.62	9.77	9.75	88.99	88.93	89.32	89.08
	15kg/fed	15.86	16.06	15.60	15.84	11.14	11.30	10.98	11.14	84.79	83.60	85.18	84.53
	30kg/fed	16.52	16.71	16.31	16.51	11.60	11.74	11.44	11.59	82.70	82.14	82.99	82.61
Mean		15.34	15.51	15.15	15.34	10.86	10.89	10.73	10.83	85.49	84.89	85.83	85.41

LSD 0.05 for:	Sowing dates (A)	Phosphorus fertilizer (B)	Varieties (C)	A X B	A X C	B X C	ABC Interaction
Sucrose%	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Sugar extraction%	0.16	0.13	0.12	NS	0.21	0.21	NS
Purity%	0.18	0.13	0.13	0.23	0.23	0.23	0.39

Table 10: Effect of sowing dates and phosphorus fertilizers on sugar lost to molasses % (SLM %) and extractability % (Ex%) of three sugar beet varieties in 2009/2010 season.

2009/2010 season.									
Treatments		**SLM %**				**EX%**			
Sowing dates (A)	**Phosphorus fertilizer (B)**	**Varieties (C)**			**Mean**	**Varieties (C)**			**Mean**
		V1	**V2**	**V3**		**V1**	**V2**	**V3**	
15th October	Zero	4.796	5.819	5.952	5.522	61.45	62.70	63.20	62.45
	15kg/fed	4.882	5.865	5.988	5.578	61.13	62.87	63.38	62.46
	30kg/fed	4.756	5.761	5.916	5.478	61.48	62.61	63.00	62.36
Mean		4.812	5.815	5.952	5.526	61.35	62.73	63.19	62.42
30th October	Zero	4.624	5.541	5.699	5.288	61.92	61.64	62.08	61.88
	15kg/fed	4.676	5.580	5.715	5.323	61.80	61.85	62.42	62.02
	30kg/fed	4.512	5.411	5.621	5.181	62.44	61.99	62.10	62.18
Mean		4.604	5.511	5.678	5.26	62.05	61.83	62.20	62.03
15thNovember	Zero	4.410	5.100	5.434	4.983	62.59	61.01	60.84	61.48
	15kg/fed	4.458	5.167	5.474	5.033	62.56	61.08	61.12	61.59
	30kg/fed	4.382	5.037	5.341	4.920	62.58	60.35	60.93	61.29
Mean		4.418	5.101	5.416	4.98	62.58	60.81	60.96	61.45
Mean of phosphorus fertilizer	Zero	4.612	4.672	4.550	4.611	61.99	61.83	62.17	61.99
	15kg/fed	5.486	5.537	5.403	5.475	61.78	61.93	61.65	61.79
	30kg/fed	5.695	5.725	5.626	5.682	62.04	62.31	62.01	62.12
Mean		5.264	5.312	5.193	5.256	61.94	62.02	61.94	61.97

Sugar Lost to Molasses%(SLM%)- Extractability%(EX%)

LSD 0.05 for:	**Sowing dates (A)**	**Phosphorus fertilizer (B)**	**Varieties (C)**	**A X B**	**A X C**	**B X C**	**ABC Interaction**
SLM %	**0.009**	**0.008**	**0.008**	**0.013**	**0.014**	**0.014**	**0.024**
Extractability % (Ex%)	**0.05**	**0.05**	**0.05**	**0.09**	**0.08**	**0.08**	**0.150**

Table 11: Effect of sowing dates and phosphorus fertilizers on sugar lost to molasses % (SLM %) and extractability % (Ex%) of three sugar beet varieties in 2010/2011 season.

2010/2011 season.									
Treatments		***SLM %**				**EX%**			
Sowing dates (A)	**Phosphorus fertilizer (B)**	**Varieties (C)**			**Mean**	**Varieties (C)**			**Mean**
		V1	**V2**	**V3**		**V1**	**V2**	**V3**	
15th October	Zero	3.296	4.461	4.595	4.117	72.08	70.47	70.68	71.08
	15kg/fed	4.180	4.499	4.649	4.443	66.01	70.59	70.71	69.10
	30kg/fed	3.392	4.375	4.558	4.108	71.19	70.62	70.55	70.79
Mean		3.622	4.445	4.601	4.223	69.76	70.56	70.65	70.32
30th October	Zero	3.263	4.165	4.296	3.908	71.67	70.06	70.36	70.70
	15kg/fed	3.318	4.200	4.352	3.957	71.51	70.25	70.37	70.71
	30kg/fed	3.152	4.007	4.277	3.812	72.31	70.71	70.09	71.04
Mean		3.244	4.124	4.308	3.892	71.83	70.34	70.27	70.81
15thNovember	Zero	3.043	3.729	4.068	3.613	72.71	70.20	69.50	70.80
	15kg/fed	3.093	3.801	4.113	3.669	72.54	70.11	69.62	70.76
	30kg/fed	3.022	3.674	3.987	3.561	72.69	69.75	69.65	70.70
Mean		3.053	3.734	4.056	3.614	72.64	70.02	69.59	70.75
Mean of phosphorus fertilizer	Zero	3.201	3.530	3.188	3.306	72.15	70.02	72.06	71.41
	15kg/fed	4.118	4.167	4.019	4.101	70.24	70.32	70.36	70.31
	30kg/fed	4.320	4.371	4.274	4.322	70.18	70.23	70.10	70.17
Mean		3.879	4.023	3.827	3.910	70.86	70.19	70.84	70.63

* **Sugar Lost to Molasses%(SLM%)- Extractability%(EX%).**

LSD 0.05 for:	**Sowing dates (A)**	**Phosphorus fertilizer (B)**	**Varieties (C)**	**A X B**	**A X C**	**B X C**	**ABC Interaction**
SLM %	**0.165**	**0.130**	**0.123**	**NS**	**NS**	**NS**	**NS**
Extractability % (Ex%)	**NS**	**NS**	**NS**	**NS**	**0.150**	**NS**	**NS**