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STUDIES ON GROWTH, YIELD AND QUALITY PARAMETER OF EARLY SUGARCANE GENOTYPES WITH VARYING FERTILITY LEVELS AND ROW SPACING'S

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Abstract

Sugarcane is being a C4 plant, performance of the crop depends on the establishment methods, balance use of fertilizer and types of genotypes. The most important factor is ability of genotypes to efficiently utilize the applied nutrients especially NPK. Field experiment was conducted during 2016-17 at research farm of Genda Singh Sugarcane Breeding and Research Institute, Seorahi, Uttar Pradesh under AICRP. The experiment consisted of twenty four treatment combinations. six genotypes i.e. V1-CoP 11436, V2- CoP 11437, V3- CoP 11438, V4- CoSe 11451 and two check varieties V5- Bo- 130 and V6- CoSe 95422 , two fertility levels i.e. F_1- 100% Recommended dose of NPK, F_2 - 125% Recommended dose of NPK and two row spacing i.e. S1-90 cm row spacing, S2-120 cm row spacing were tested in factorial randomized block design with three replications. Recommended dose of N: P: K ratio was 180: 80:60 kg per ha and applied as per treatments requirement. The experimental field was medium in organic carbon (0.50 per cent), medium in available phosphorus (14.43 kg/ha) and low in potash (83.90 kg/ha) with pH 8.11. Sugarcane crop was planted on 26 Feb. -2016 in spring planting season and harvested on 23 Feb-2017. In early group all test genotype produced significantly higher germination per cent, Shoot population, NMC and cane yield as compared to check varieties. CoP 11438 genotype recorded significantly higher Shoot population (185.28 thousand/ha), NMC (143.31 thousand/ha) and cane yield (111.24 t/ha) as compared with remaining test genotype and check varieties. Genotype CoSe 11451 and CoP 11437 obtained significantly higher sucrose per cent (18.17 and 18.11 per cent, respectively) over check variety CoSe 95422 (17.01per cent). Effect of fertility levels on shoot population, NMC and cane yield were resulted significantly higher in 125 per cent RDF treatment as compared to 100% RDF treatments. Effect of row spacing on Shoot population, NMC and cane yield were recorded significantly higher in 90 cm row spacing treatment. Effect of spacing and fertilizer level treatments were not affected significantly on germination and sucrose per cent but recorded maximum value of sucrose per cent in 125 per cent RDF and 120 cm row spacing treatments

Key words : Spacing, performance, sugarcane, fertility levels, genotypes.

Introduction

Sugarcane is an important cash crop of India grown in an area of 5.09 Mha with an annual production of 357.67 million tones and average yield is 70.3 t/ha. In Uttar Pradesh, it occupies an area of 22.99 lakh ha with the production of 1665.00 lakh tones and productivity is 72.40 t/ha. Main reasons for lower cane yield are lack of high-potential varieties, limited irrigation resources and technology (Bahadar *et al*., 2002). According to Glaz (2000) sugarcane production could never be improve until and unless promising varieties and technologies are adopted on large scale. Similarly, Nazir *et al*. (1997) reported that higher cane yield is the function of higher genetic potential of a variety. Efforts are made to increase cane production by introducing high yielding varieties and adoption of improved crop production techniques (Gill, 1995). There are number of reasons for lower cane yield and one of those is the planting of low yielding varieties. Therefore, it is need of the time to introduce new high yielding varieties in the country (Chattha and Ehsanullah, 2003). Variety plays a key role in both increasing and decreasing per unit area sugar yield, while use of unapproved, inferior quality cane varieties affect sugarcane production negatively as situation prevails today

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(Mian, 2006). The solution of low cane yield and sugar recovery problem lies in the planting of improved cane varieties (Chattha *et al.*, 2006). Success of variety depends upon its adaptability to agro-climatic conditions of the area. Selection of a proper variety to be sown in a particular agro-ecological zone is a primary requisite to explore its yield and sugar recovery potential. India would need to produce 415 MT of sugarcane with a recovery of 11 per cent to meet per capita requirement of 35 kg sweeteners by 2020 A.D. (Singh *et al*., 2002). The productivity of sugarcane in India is quite low owing to several factors *viz*. poor management of crop, poor soil condition, abiotic and biotic stresses etc. Adoption of balanced and judicious use of all needed nutrients can help in improving cane productivity and enhancement in sugar recovery by rendering resistance against biotic and abiotic stresses and better synthesis and storage of sugar (Yadav *et al*., 1993). Balanced use of plant nutrients is essential for sustaining productivity of crop and soil. Yadav (1990) and Yadav *et al*. (2014) explored that among various inputs in sugarcane production, fertilizers contribute maximum to the crop yield. The role of nitrogen in plant is of prime importance due to its presence as integrated structural constituent of the protein molecule. Phosphorus is essential for cell division which accounts for stalk and root elongation resulting in growth of the plant. It is also involved in the regulation of sugar synthesis and storage. The sugarcane genotypes show variable performance under different agronomic practices. The most important factor is ability of genotypes to efficiently utilize the applied nutrients especially NPK. Moreover, the genotypes possess variable characters and potential for higher productivity of sugarcane. Keeping this in view the present study was carried out on studies on growth, yield and quality parameter of early sugarcane genotypes with varying fertility levels and row spacing's.

Materials and Methods

Field experiments were conducted during 2016-17 at research farm of Genda Singh Sugarcane Breeding and Research Institute, Seorahi, Uttar Pradesh, India. The experiment consisted of twenty four treatment combinations. Six genotypes *i.e.* V1-CoP 11436, V2- CoP 11437, V3-CoP 11438, V4-CoSe 11451and two check varieties V5- Bo- 130 and V6- CoSe 95422, two fertility levels *i.e.* F_1- 100 per cent Recommended dose of NPK, F2 – 125 per cent Recommended dose of NPK and two row spacing i.e. S1-90 cm row spacing, S2-120 cm row spacing were tested in factorial randomized block design with three replications. The soil of experiment plot was medium in organic carbon, low in available phosphorus and medium in potash with nearby pH 8.01. Recommended dose of fertilizers was 180, 80, 60 (NPK) kg per ha for spring planted sugarcane crop. The nitrogen 1/3 and full dose of P and K were applied at the time of planting and remaining nitrogen was applied in two equal split doses as top dressing before the onset of monsoon season. Sources of nitrogen, phosphorus and potash were urea, single super phosphate and muriate of potash, respectively. Table 2 showed that total of 1073.00 mm rain was recorded during the crop growing season in 84 days rainy days with highest 397.4 mm in July month. The average forenoon and afternoon relative humidity during crop period was recorded ranged between 95.55 to 40.30 per cent. The maximum temperature was ranged between 21.25 to 36.02 celsius in Dec. and April months, respectively whereas minimum temperature ranged between 6.94 to 25.41 celsius in Jan and August months. The improved crop management practices were followed during experimentation periods. Shoot population and number of millable cane were recorded from each net plot and the data were computed in thousands on hectare basis. The crop was harvested from ground level and green and dry leaves were stripped off. The weight of millable cane from each net plot was recorded and calculated on hectare basis.

Results and Discussion

Effect of genotypes

Effect of genotypes on germination per cent was noted significantly higher in all tested genotypes as compared to both the checks varieties. Genotype V3 exposed significantly germination per cent followed by V4, V2, and V1. The data presented in table 01 indicated that In early group all test genotype produced significantly higher germination per cent, Shoot population, NMC and cane yield as compared to check varieties. CoP 11438 genotype recorded significantly higher Shoot population (185.28 thousand/ha), NMC (143.31 thousand/ha) and cane yield (111.24 t/ha) as compared with remaining test genotype and check varieties. Genotype CoSe 11451 and CoP 11437 obtained significantly higher sucrose per cent (18.17 and 18.11 per cent, respectively) over check variety CoSe 95422 (17.01per cent). Increased the cane yield *i.e.* 26.81, 32.85, 69.26 and 44.06 per cent high over check variety Bo-130 and 17.51, 23.11, 56.85 and 33.50 high as compared with check variety CoSe 95422 in V1-CoP 11436, V2- CoP 11437, V3- CoP 11438 and V4- CoSe 11451 tested genotypes, respectively. It may be due to different potentiality /capacity of the genotypes to express in particular environment.

Table 1 : Effect of early genotypes, different fertility levels and spacing treatments on germination, shoots, NMC, cane yield and sucrose per cent.

Treatments	Germination %	Shoot (000/ha)	NMC (000/ha)	Cane Yield(t/ha)	Sucrose %
Genotypes					
Vl	47.60	155.67	123.09	83.34	17.59
V2	52.19	165.62	128.31	87.31	18.11
V3	54.01	185.28	143.31	111.24	17.78
V4	52.35	173.86	128.90	94.68	18.17
Check Varieties					
V5	46.26	122.33	97.89	65.72	17.80
V6	46.37	135.94	106.67	70.92	17.01
SEm±	0.93	1.19	2.62	2.01	0.34
CD(P=0.05)	2.58	3.31	7.24	5.53	0.94
Fertility levels					
F1	49.50	148.50	116.38	83.46	17.70
F2	50.09	164.40	126.36	87.61	17.79
SEm±	0.54	0.69	1.51	1.15	0.19
CD(P=0.05)	NS	1.91	4.18	3.19	NS
Spacing					
S1	50.04	176.36	127.18	90.77	17.68
S2	49.55	136.54	115.56	80.30	17.81
SEm±	0.54	0.69	1.51	1.15	0.19
CD(P=0.05)	NS	1.91	4.18	3.19	NS

Table 2 : Metrological data for crop period.

Months	Temperature		Humidity		Rainfall	No. of rainy day
	Min	Max	Forenoon	Afternoon		
Feb-16	10.11	25.41	83.31	53.24	1.2	01
Mar-16	14.46	30.05	72.38	43.93	0.8	01
April-16	23.72	36.02	66.13	40.30	00	00
May-16	23.03	34.90	81.35	53.45	187.6	11
June-16	24.94	33.90	80.56	58.16	73.2	14
July-16	24.85	30.61	92.06	69.35	397.4	22
Agust -16	25.41	32.43	88.0	62.06	95.4	13
Sept-16	24.38	31.25	94.58	70.46	274.2	19
Oct-16	20.28	32.35	90.58	59.96	26	01
Nov-16	12.6	28.89	93.80	59.46	00	00
Dec-16	9.04	21.25	95.55	62.93	00	00
Jan-17	6.94	21.30	93.94	60.16	17.2	02
Feb-17	9.02	24.89	91.07	55.07	00	00
	17.59	**29.48**	**86.41**	**57.58**	**1073**	**84**

Effect of fertility levels

The data presented in table clearly showed that effect of fertility levels on shoot population, number of millable cane and cane yield were recorded significant where as germination and sucrose per cent were noted non significant and data indicated also that cane yield was increased with increased fertility levels. 125 per cent recommended dose of fertilizer treatment produced significantly higher shoot population (164.40 thousand per ha), NMC (126.36 thousand per ha) and cane yield (87.61 t/ha) over 100 125 per cent recommended dose of fertilizer treatment. Cane yield was increased upto 4.99 per cent as compared to 100 per cent RDF. Germination (50.09) and sucrose (17.79) per cent were obtained maximum in 125 per cent RDF application. Results showed that shoot population, NMC and cane yield increased with increasing doses of fertilizers. This might be due higher to conversion of shoots into the millable canes, increased protein synthesis and promoted root development which resulted in increased nutrient uptake and photosynthesis that enhanced the growth and yield attributes. These results are in agreement with earlier findings of Singh *et al*. (2011) and Dev *et al*. (2011).

Effect of row spacing

Clearly indicated in table that germination per cent, shoot population and cane yield were decreased with increased the row spacing but in case sucrose per cent inverse relation. Effect of row spacing on germination and sucrose per cent were found non significant but

maximum value (50.04) obtained in 90 cm row spacing but in case of sucrose content lowest value (17.68 per cent). Shoot population, number of millable cane and cane yield were produced significantly higher in 90 cm row spacing as compared to 120 cm row spacing treatment. It is obtained 29.16,10.05 and 13.04 per cent higher in 90 cm row spacing plot over 120 cm row spacing planted cane, respectively. Cheema *et al*. (2002) and Rasker and Bhoi (2003) also recorded significantly higher cane yield with a 90 cm row spacing compared with 60 cm row spacing. The results are in agreement with Kathirisan and Narayanasamy (1991), who reported that sugarcane planted in 80 cm spaced rows produced more sucrose than in 60 cm row spaced.

Conclusion

On the basis of above investigation, it may be concluded that among test genotype, maximum sucrose per cent value produced CoSe 11451 genotype. CoP 11438 genotype recorded significantly higher cane yield over check varieties and remaining test genotypes. Cane yield increased up to 125 per cent recommended dose of fertilizer. 90 cm spacing treatment produced significantly higher yield as compared to 120 cm row spacing treatment. Sucrose per cent was not affected significantly with different treatments of fertility levels.

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