Bulletin of Environment, Pharmacology and Life Sciences
Bull. Env. Pharmacol. Life Sci., Vol 8 [3] February 2019 : 81-85
©2019 Academy for Environment and Life Sciences, India
Online ISSN 2277-1808
Journal's URL:http://www.bepls.com
CODEN: BEPLAD
Global Impact Factor 0.876
Universal Impact Factor 0.9804
NAAS Rating 4.95

ORIGINAL ARTICLE **OPEN ACCESS**

Evaluation of different midlate new genotypes of sugarcane under fertility levels on juice quality and economics

Satendra Kumar[1], M.L.Srivastav[1], S.P. Yadav[2], S.C.Singh[2] , Pratap Singh[1]
[1]Genda Singh Sugarcane Breeding and Research Institute, Seorahi, Kushinagar
[2]U.P. Council of Sugarcane Research, Shahjahanpur
[1]Email: satendrayadav.agro@gmail.com

ABSTRACT

Performance of the sugarcane crop mostly depends on the balance use of fertilizer, types of genotypes and also other factors. The most important factor is ability of genotypes to efficiently utilize the applied nutrients especially NPK. Main reasons for lower cane yield are lack of high potential varieties, limited irrigation resources, fertility and lack of awareness of technology. Field experiments was conducted at research farm of Genda Singh Sugarcane Breeding and Research Institute, Seorahi, Uttar pradesh during 2015-16, 2016-17 and 2017-18 in spring season to find out the fertility levels of newly released sugarcane varieties with economics. The experiment consisted of nine treatment combinations.. Three genotypes i.e. V_1- CoSe 11453, V_2- CoS 09232, V_3- CoSe 08452 and three fertility levels i.e. F_1-75% Recommended dose of NPK, F_2- 100% Recommended dose of NPK and F_3 - 125% Recommended dose of NPK were tested in factorial randomized block design. Recommended dose of fertilizers (RDF) was 180, 80, 60 (NPK) kg per ha and applied according to treatments. Two budded sugarcane setts were planted in furrows at 90 cm row to row distance. The experimental soil plots were medium in organic carbon and available phosphorus, low in potash with above neutral pH condition. On the basis of pooled data of three years, juice quality parameter like sucrose and CCS per cent were recorded significantly higher in genotype CoSe 08452 (18.39 and 12.74 per cent), respectively. Economics was proved better in genotype CoSe 11453 which gave the significantly higher net return (Rs.167273) and benefit: cost ratio (1.58).Net return and benefit: cost ratio increased by 14.32 and 15.33 per cent due to selection of genotype from tested genotypes. Performance of genotypes on cane yield, CCS per cent, sucrose per cent, CCS t/ha, gross income, net income, benefit: cost ratio increased with increased the fertility levels.

***Key words**: Sugarcane, Economics, Juice, Quality, Fertility level, Genotype*

Received 21.12.2018 Revised 03.01.2019 Accepted 11.01.2019

INTRODUCTION

Sugarcane is the most important agro-industrial crop next to cotton which is being cultivated in around 5.09 million hectares area with 70.3 t/ha productivity in India. Uttar predesh state occupies an area of 22.99 lakh hectare with average yield is 72.40 t/ha. 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. Sugarcane ethanol is considered to be economic and sustainable primarily because it is produced from a tropical perennial grass with high photosynthetic efficiency that can re-grow upto five times after the first harvest. In present Era of energy crises, sugarcane is also coming up as biofuel crop, mixing of ethanol by 10-15 per cent has already been recommended. 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. [4]. 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, better synthesis and storage of sugar [7]. Yadav, [8] and Yadav *et.al.* [9] 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. Moreover, the genotypes possess variable characters and potential for higher productivity of sugarcane. Sugarcane accounts for 60-70% of

the cost of sugarcane production and thus has a vital role to make sugar industry a commercially valuable venture [3]. 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. Nazir *et al.* [2] reported that higher cane yield is the function of higher genetic potential of a variety. Main reasons for lower cane yield are lack of high-potential varieties, limited irrigation resources and technology [1]. A large number of factors such as ambient temperatures, variety, period of storage, maturity status are responsible for the differences in post harvest deterioration [5]. However, the sugarcane yields have been increased over the years due to release of high yielding clones and due to agro management practices. However, the sugar recovery is stable and which mainly depends on cane quality, efficiency of mills, planting and harvesting dates as well as staling due to delay in crushing after harvest. Genetic potentials of a clone play a key role in determining the cane yield, sugar recovery and economics of farmer. Hence, the present investigation was conducted to evaluation of different midlate new genotypes of sugarcane under fertility levels on juice quality and economics.

MATERIALS AND METHODS

Sugarcane (*Sachharum Spp* .Hybrid) in India is grown uder tropical and subtropical regions from 8^0 N to 32^0 N latitude in northern parts of country. Field experiment was conducted during 2015-16, 2016-17 and 2017-18 at research farm of Genda Singh Sugarcane Breeding and Research Institute, Seorahi, Uttar Pradesh. The experiment consisted of nine treatments combinations. Two budded sugarcane setts were planted in furrow at 90 cm distance row to row. Three genotypes i.e. V_1- CoSe 11453, V_2- CoS 09232, V_3- CoSe 08452 were planted under three fertility levels i.e. F_1-75 per cent Recommended dose of NPK, F_2-100 per cent Recommended dose of NPK and F_3-125 per cent Recommended dose of NPK in factorial randomized block design. The soil of experiment plot was medium in organic carbon, medium in available phosphorus and low in potash with above neutral pH. Recommended dose of fertilizers was 180, 80, 60 (NPK) kg per ha for spring planted sugarcane crop. Nitrogen, phosphorous and potassium were applied according to the experimental treatments in the form of Urea, SSP and MOP. Nitrogen was split applied in three equal doses i.e. at sowing, after germination and at tillering. All phosphorus and potash were applied at sowing in plant cane. Planking was done to break the clods in the field after final tilling. The improved crop management practices were followed during experimentation in three years. The crop was harvested from ground level and green and dry leaves were stripped off. CCS per cent and sucrose were determined as described by spencer and meade [6]. The commercial cane sugar was computed by multiplication of CCS per cent by cane yield. Table 01 showed that total of 815.60, 1071.80 and 1018.00 mm rain were recorded during 2015-16, 2016-17 and 2017-18 crop periods in 56, 83 and 68 days rainy days with highest 258.40, 397.40 and 399.40 mm in July months. The average forenoon and afternoon relative humidity during crop period was recorded ranged between 40.30 to 95.87 per cent. The maximum temperature was ranged from 16.49 to 36.06 Celsius whereas minimum temperature ranged from 6.28 to 25.96 Celsius during crop periods. The cost of cultivation per hector was worked out by considering the current price of the input/commodity used. Gross return was worked out keeping in view the yields of cane of sugarcane and their prevailing marketing price.Net return of individual treatment was calculated by deduction of cost of cultivation from the gross return of particular treatment. In order to find out net benefit: cost ratio, the net return from individual treatments was divided by their respective cost of cultivation.

RESULTS AND DISCUSSION

In Table 02 pooled data of three years shown that genotype CoSe 11453 produced significantly higher cane yield (97.39 t/ha) over remaining genotypes. It was increased by 7.85 and 5.95 per cent over CoSe 08452 and CoS 09232 genotypes, respectively. Effect on genotypes on CCS t/ha and gross income were obtained non significantly but maximum value recorded in genotype CoSe 11453 (11.86 t/ha and Rs.272682), respectively. Juice quality parameter like sucrose and CCS per cent were noted significantly higher in genotype CoSe 08452 (18.39 and 12.74 per cent) as compared to genotype CoSe 11453 (17.65 and 12.16 per cent), respectively. Net Return and benefit: cost ratio were obtained significantly higher in genotype CoSe 11453 (Rs. 167273 and 1.58/ha) over genotype CoSe 08452. Income of the farmer increased up to 14.32 per cent by selection of suitable genotype/variety from tested genotypes.

TABLE 01: METROLOGICAL DATA

Months	Temperature (Celsius) Mean		Humidity (per cent) Mean		Total Rainfall (mm)	No. of rainy day
	Min	Max	Forenoon	Afternoon		
Feb-15	9.85	23.9	88.07	58.75	13.80	02
March-15	12.91	27.19	82.87	59.58	100.20	05
April-15	18.3	31.39	80.44	58.34	64.80	07
May-15	23.13	34.39	74.12	50.45	53.00	02
June-15	25.96	36.06	69.2	50.13	59.80	06
July-15	25.89	32.43	86.09	61.96	258.40	13
Agust -15	24.75	32.03	88.06	59.93	192.40	14
Sept-15	25.15	33.66	80.46	50.70	05.60	01
Oct-15	19.22	32.01	84.71	57.29	60.80	04
Nov-15	13.51	28.91	82.36	56.06	00.00	00
Dec-15	09.31	24.83	90.54	58.35	00.00	00
Jan-16	07.36	20.12	91.80	57.26	05.60	01
Feb-16	10.11	25.41	83.31	53.24	01.20	01
Average	**17.34**	**29.41**	**83.23**	**56.31**	**815.60**	**56.00**
Mar-16	14.46	30.05	72.38	43.93	00.80	01
April-16	23.72	36.02	66.13	40.30	00.00	00
May-16	23.03	34.90	81.35	53.45	187.6	11
June-16	24.94	33.90	80.56	58.16	73.20	14
July-16	24.85	30.61	92.06	69.35	397.4	22
Agust -16	25.41	32.43	88.00	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	26.00	01
Nov-16	12.60	28.89	93.80	59.46	00.00	00
Dec-16	09.04	21.25	95.55	62.93	00.00	00
Jan-17	06.94	21.30	93.94	60.16	17.20	02
Feb-17	09.02	24.89	91.07	55.07	00.00	00
Average	**18.22**	**29.82**	**86.67**	**57.94**	**1071.80**	**83.00**
Mar-17	12.23	27.97	85.55	56.33	29.60	04
April-17	21.00	33.79	76.17	53.60	06.40	01
May-17	22.09	33.73	78.65	57.84	75.40	08
June-17	25.90	34.90	47.67	52.90	67.20	07
July-17	24.84	32.35	90.68	67.59	399.4	19
Agust -17	25.43	31.72	94.58	70.94	230.8	17
Sept-17	25.52	32.92	91.40	58.37	184.8	08
Oct-17	21.65	32.21	90.91	57.16	19.80	03
Nov-17	13.34	28.57	93.46	59.30	00.00	00
Dec-17	07.34	22.84	94.97	65.58	00.00	00
Jan-18	06.28	16.49	95.87	69.83	04.60	01
Feb-18	09.91	24.67	90.25	52.19	00.00	00
Average	**17.96**	**29.35**	**85.85**	**60.14**	**1018.00**	**68.00**

Table02: Three years pooled data of juice quality and economics of sugarcane crop

Treatments	Cane yield (t/ha)	Sucrose Per cent	CCS %	CCS (t/ha)	Cost of cultivation (Rs./ha)	Gross Income (Rs./ha)	Net Income (Rs./ha)	B:C Ratio
Genotypes/Varieties								
V_1-CoSe 11453	97.39	17.65	12.16	11.86	105409	272682	167273	1.58
V_2-CoS 09232	91.92	18.35	12.67	11.65	107369	257373	150004	1.39
V_3-CoSe 08452	90.30	18.39	12.74	11.52	106529	252846	146317	1.37
SEm±	2.01	0.13	0.10	0.27	-	5694.11	5694.11	0.05
CD (5%)	6.04	0.38	0.29	NS	-	NS	17217.91	0.16
Fertility levels								
F_1=75% Recommended dose of NPK	81.04	18.01	12.45	10.12	104572	226920	122348	1.17
F_2=100% Recommended dose of NPK	95.17	18.01	12.41	11.77	106436	266468	160033	1.50
F_3=125% Recommended dose of NPK	103.40	18.37	12.70	13.13	108300	289514	181214	1.67
SEm±	2.01	0.13	0.10	0.27	-	5694.11	5694.11	0.05
CD (5%)	6.04	NS	NS	0.81	-	17217.91	17217.91	0.16
NS=Non Significant								

Data in Table 01 clearly indicated that cane yield, sucrose, CCS per cent, CCS t/ha, gross income, net income and B:C ratio were increased with increased the fertility doses. Effect of fertility levels on cane yield (103.40 t/ha), CCS (13.13 t/ha), gross income (Rs.289514/ha), Net profit (Rs.181214/ha) and B: C

ratio (1.67) recorded significantly higher in 125 per cent RDF over 75 per cent RDF treatment. Data in Table 03 indicated that genotype CoSe11453 with 125 Per cent RDF combination produced maximum B: C ratio (1.78) followed by CoSe 08452 under 125 per cent RDF and CoSe 11453 with 100 percent RDF combinations treatment. This might be due to different potentiality /capacity of the genotypes to express the ability in particular environment, higher 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 yield attributes, sugar recovery and economics. These results are in agreement with earlier findings of Singh *et al*. [4]. Nazir *et al.* [2] also noted that higher cane yield is the function of higher genetic potential of a variety.

Table: 03 Economics of different treatment combinations

Treatments	Total cost of cultivation (Rs/ha^{-1})	Cane yield ($t\ ha^{-1}$)	Gross return (Rs/ha^{-1})	Net return (Rs/ha^{-1})	B:C ratio
V_1F_1	103545	85.45	239266	135721	1.31
V_1F_2	105409	100.18	280502	175093	1.66
V_1F_3	107273	106.53	298280	191007	1.78
V_2F_1	105505	82.59	231241	125736	1.19
V_2F_2	107369	93.26	261118	153749	1.43
V_2F_3	109233	99.91	279761	170528	1.56
V_3F_1	104665	75.09	210253	105588	1.01
V_3F_2	106529	92.07	257785	151256	1.42
V_3F_3	108393	103.75	290502	182109	1.68
Sale price 280/qtl, labor cost 174/labour,Urea 601/qtl, SSP=800/qtl, MOP=1100/qtl, FYM =30/qtl, (Rupees) in 2017 year					

CONCLUSION

On the basis of pooled data of three years above investigation, it may be concluded that juice quality parameter like CCS and Sucrose per cent were affected significantly by various genotypes but non significantly result produced by fertility levels. Net income was increased up to 14.32 per cent by selection of genotype CoSe 11453 from tested genotypes. Performance of genotypes increased with increased the fertilizer doses.

ACKNOWLEDGEMENT

Authors are highly thankful to the Director, UPCSR Shahajanpur and Joint director, GSSBRI Seorahi for provided the all the facilities timely. We are also thankful to Dr.K.K.Sahu, Dr Anil Mishra, Mr. Ajay Rao and Mr.Shakir Ali at GSSBRI Seorahi for timely help.

REFERENCES

1. Bahadar, K., M. Jamal, M. Sadiq, M. Sulaman, H. Azim and M.S. Balouch, (2002).Genetic variation and ecological suitability of new sugarcane genotypes under the agro-climatic conditions of Bannu (NWFP). *Pakistan Sugar J.,* 17: 15–7.
2. Nazir, M.S., Ali H. Saeed, M. Ghafar and M. Tariq (1997). Juice quality of different sugarcane genotypes as affected by pure and blend plantation. *Pakistan Sugar J.,* 12: 12–4
3. Singh, A.K., Lal, M. and Prasad, S.R. (2002). Enhancing productivity of early maturing high sugar genotypes through management of crop geometry and nitrogen nutrition. *Indian Journal of Sugarcane Technology*, 17(12):43-46.
4. Singh, A.K., Lal, M. and Singh, S.N. (2011). Agronomic performance of new sugarcane genotypes under different planting geometry and nitrogen levels. *Indian Journal of Sugarcane Technology*. 26(1):6-9.
5. Solomon, S.; Srivastava, A.K and Yadav R.L. (2007). Strategies to minimize post-harvest sucrose losses in sugarcane. *An overview Proceedings of 68th Annual Convention of STAI, 22-24th* August. 112-121.
6. Spencer,G.L. and G.P.Meade (1955).Cane sugar hand book. A manual for cane sugar manufactures and their chemists,London:Willey,Inc. N.Y. Chapman and Hall Ltd..
7. Yadav, R.L. (1990). India sugar industry work to meet R and D challenges for 2000 AD. *Sugar Azucar,* 85980: 11-16.
8. Yadav, R.L. (1993). Agronomy of sugarcane: Principle and Practice. 1st Edn. International Book Distributing Co. Lucknow, India.

9. Yadav, S.P., Singh, S.C. and Bakshi Ram (2014). Effect of different plant nutrients on yield and quality of sugarcane. *National symposium on "Bio-energy for sustainable Development- the potential role of sugarcan*e" held at Coimbatore (TN), India on 23-25 June, 2014, pp. 170.

CITATION OF THIS ARTICLE

Satendra Kumar, M.L.Srivastav, S.P. Yadav, S.C.Singh , Pratap Singh. Evaluation of different midlate new genotypes of sugarcane under fertility levels on juice quality and economics. Bull. Env. Pharmacol. Life Sci., Vol 8 [3] February 2019: 81-85