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Effect of nutrient management and cultivars on quality of sugarcane juice and liquid Jaggery

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Abstract

An experiment was conducted to study the effect of fertilizers levels and cultivars on Sugarcane yield and economics crop at Agriculture Research Station, Kumta, Uttara Kannada of University of Agricultural Sciences, Dharwad during 2018-19 and 2019. The experiment consisted three main plots (Cultivars) viz., C₁-SNK635, C₂- Co-86032 and C₃ – Konanakatte and five sub plots (Fertilizers levels) F₁: 75% RDF, F₂ : 100% RDF, F₃ :125% RDF, F₄ : 150% RDF and F₅ : control. The experiment was laid out in Strip Block Design with three replication. The results indicated that the cane yield of plant cane was influenced significantly by RDF levels, and cultivars and their interactions. Juice extraction per cent, brix value, pol %, purity %, fibre % and juice pH did not differ significantly for RDF levels, cultivar and interaction effects in both plant and ratoon cane. The reducing sugars in juice differed significantly due to different cultivars in both plant and ratoon cane. The Cultivar SNK 635 recorded significantly lower reducing sugars (3.14 and 3.22%, respectively in plant and ratoon cane) than Konanakatte (3.55 and 3.66%, respectively in plant and ratoon cane) but on par with Co-86032 (3.27 and 3.32%, respectively in plant and ratoon cane). Higher reducing sugar was recorded in cultivar Konanakatte (3.50 and 3.66%, respectively in plant and ratoon cane). There was decreased reducing sugars with decreased levels of fertilizers. Application of 75% RDF recorded significantly lower reducing sugars (3.01 and 3.07%, respectively in plant and ratoon cane) and on par with 100% (3.14 and 3.18%, respectively in plant and ratoon cane). Similar trend of juice quality was reported in liquid jaggery also for reducing sugars content.

Keywords: Sugarcane, cultivars, fertilizers, juice quality and liquid jaggery quality

Introduction

Sugarcane, a complex hybrid of *Saccharum* spp., is one of the important cash crop of industrial importance, next only to cotton in India. Globally sugarcane is cultivated on an area of 26.54 million hectares with a production of 1861 million tonnes and productivity of 70.13 tonnes ha⁻¹ (Anon., 2019) [5]. The world sugar production was 179.64 MT (Anon., 2018) [4]. India is the second largest producer of sugarcane next to Brazil. The crop sustains with an area of 4.93 m ha, production of 348.45mt and productivity of 70.70 t ha⁻¹ (Anon., 2019) [5]. Karnataka state ranks 3rd in both area (0.44 m ha) production (27.38 million tonnes) with the productivity of 68.96 t/ha (Anon., 2019) [5]. Though sugarcane produce is utilized mainly for sugar production with enough number of sugar factories, nearly 40 per cent of sugarcane is being diverted to jaggery industry indicating its importance. There are three types of jaggery namely solid jaggery, liquid jaggery and granular jaggery. Liquid jaggery is alternative source to honey. Sugarcane crushing is the first step in liquid jaggery manufacturing process. It is an intermediate product collected during jaggery manufacturing and striking temperature of it ranges from 105°C to 108°C or generally it depends upon the varieties of sugarcane used. Liquid jaggery is used in many ayurvedic preparations from times immemorial. It is widely used as sweetening agent in Karnataka, Maharashtra, Tamil Nadu, Gujarat, Andhra Pradesh and Kerala states. It is commercially used in various food industries and pharmaceutical formulations (Chikkappaiah, 2017) [6]. In Uttara Kannada district, except Haliyala and Zoida Taluks, sugarcane is grown only for liquid jaggery (Joni bella) making. It is good source of nutrients and has extended shelf life (Patil *et al.*, 2004). In Malanadu areas, some paddy growers grow sugarcane on a small plot of their land and make jaggery for domestic use every year. They also produce liquid jaggery, which is known as “Joni bella”. The quality of liquid jaggery depends on juice quality, soil type, cultivars, nutrient management and processing methods. Major constraints with liquid jaggery making is poor quality and yield.

Hence, study was conducted on effect of fertilizers levels and cultivars on quality of sugarcane juice and liquid jaggery. The objective of study was to find optimum level of fertilizer for higher quality of sugarcane juice and liquid jaggery.

Material and Methods

An experiment was conducted to study the effect of fertilizers levels and cultivars on Sugarcane yield and economics crop at Agriculture Research Station, Kumta, Uttara Kannada of University of Agricultural Sciences, Dharwad during 2018-19 and 2019. It has lies in Coastal zone of Karnataka (Zone-10) and Region II of Agro-climatic zones of India. The experimental site is located at 14° 25' North latitude and 74° 25' East longitude with an altitude of 24.2 m above the mean sea level. The District is high rainfall area coming under malnad region. The average rainfall of the location for the past 23 years is 3722.28 mm, which is distributed over a period of six months from June to October with peaks during June, July and August (999.65, 1088.14 and 775.71 mm, respectively). The soil of the experimental site was sandy loam, belonged to the order alluvial soils.

The experiment consisted three main plots (Cultivars) viz., C₁-SNK635, C₂- Co-86032 and C₃ – Konanakatte and five sub plots (Fertilizers levels) F₁ : 75% RDF, F₂ : 100% RDF, F₃ : 125% RDF, F₄ : 150% RDF and F₅ : control. The experiment was laid out in strip block design with three replication. The plot size was 7.2 m X 14.1 m. The single eye budded setts of 10 months old cane were planted in furrows on 23rd march, 2018. A recommended dose of dolomite (500 kg/ha) during land preparation and farm yard manure 25 t ha⁻¹ were given. Nitrogen, phosphorus and potassium fertilizers were applied as per the treatments in the form of urea, rock phosphate and muriate of potash, respectively and micronutrient was applied in the form of ZnSO₄ @ 25 kg ha⁻¹ as soil application.

Observations recorded

Juice quality parameters

The juice samples extracted by means of a power driven sugarcane crusher from five canes selected at random from the net plot area at harvest were analysed for the following quality parameters.

Brix: The brix readings of the filtered juice samples were recorded with the help of brix hydrometer standardized for 27.5°C. The juice temperatures were also recorded for necessary temperature corrections.

Sucrose or Pol per cent of juice: The juice samples were clarified as per Horne's dry lead acetate clarification method (Meade, 1977) and filtered through Whatman number 1 filter paper. The pol per cent readings of the filtrates were recorded with the help of polariscope. The pol readings so recorded were corrected with observed degrees brix with the help of Schmitz table so as to get the values of pol per cent of juice which is synonymously used for sucrose per cent of juice.

Juice extraction per cent

$$\text{Juice extraction per cent (\%)} = \frac{\text{Juice weight}}{\text{Cane weight}} \times 100$$

Purity coefficient of juice: It is the ratio of pol per cent of juice to the corrected degrees brix expressed in percentage and the values were computed as per the following formula.

$$\text{Purity coefficient} = \frac{\text{Pol per cent of juice}}{\text{Brix corrected}} \times 100$$

Reducing sugars (%) : Percentage of reducing sugars was obtained by using the Lane and Eynon (original) method by using Fehling A and Fehling B solutions as explained by Varma (1988) [20].

Fibre (%): Cane fibre per cent was computed by using Washing method as explained by Varma (1988) [20].

Juice pH: Determining pH of sugarcane juice was done through potentiometric method (electrodes are used to measure the H⁺ ion concentration of the sugarcane juice).

Liquid jaggery quality parameters

Liquid Jaggery yield: Jaggery yield was calculated by using cane yield (t ha⁻¹) and jaggery recovery per cent was calculated by below formula.

Jaggery recovery (%)

$$\text{Jaggery recovery (\%)} = \frac{\text{Jaggery yield (t)}}{\text{Cane weight (t)}} \times 100$$

Sucrose (non-reducing sugar) per cent in jaggery: The sucrose content in 0.5 N solution of jaggery samples i.e., 13 g of jaggery dissolved in 100 ml of water were determined polarimetrically as done for the sugarcane juice sucrose (Somogyi, 1952) [18]. The values so obtained were expressed in per cent jaggery (undissolved) basis based on dilution factor.

$$\text{Sucrose per cent jaggery} = \frac{\text{Sucrose content (\% in 0.5 N solutions)}}{13} \times 100$$

Reducing sugars (RS) per cent in jaggery: The reducing sugars were estimated by titrating the jaggery solution (10 g dissolved in 100 ml of water and clarified with lead sub acetate of activated charcoal) with 10 ml of Fehlings A + B solution according to Lane and Eynon volumetric method (Miller, 1998) [22].

$$\text{R.S. per cent jaggery} = \frac{0.05 \times \text{volume of jaggery solution (ml)}}{\text{T.V.} \times \text{Weight of jaggery (g)}} \times 100$$

Where

T.V. is the titrable value

Ash per cent in jaggery: The minerals originally present in the cane juice as well as additions during the preparation of jaggery constitute the ash which in excess affects the taste and refining quality of jaggery. The ash content in jaggery samples were estimated by igniting 5 g of jaggery in silica crucibles over a burner and then ashing them in muffle furnace at 500°C and recording the ash weight. The ash contents were expressed on per cent jaggery basis as indicated below.

$$\text{Ash content of jaggery (\%)} = \frac{\text{Weight of ash}}{\text{Weight of jaggery sample}} \times 100$$

Jaggery grading based on net rendament (NR) value:

Net rendament values were calculated by substituting the jaggery quality values in the formula given below.

Net rendament value = Sucrose (%) – [Reducing sugars (%) + (3.5 × ash%)]

Based on the NR values, the jaggery samples were classified and graded according to scale proposed by Khanna and Chakravarthi (1954)^[9].

NR values	Grade	Quality
> 65	A ₁	Excellent
60 -65	A ₂	Good
45 – 60	B	Medium
< 45	C	Poor

Estimation of protein : For the digestion of samples, the Pelican digestion unit was used. The distillation was carried out in Gerhardt nitrogen distillation. The protein content of the dried sample was estimated as per cent total nitrogen by the Micro-kjeldahl method (Anon., 1980)^[3] and computed by multiplying the per cent nitrogen using conversion factor 6.25.

Estimation of fat: Fat was estimated as crude ether extract of the dry material. The dry sample was weighed (10 g) accurately into a thimble and plugged with cotton. The thimble was then placed in a Soxhlet apparatus and extracted with anhydrous ether for about 3 hr, then evaporated and the flask with the residue was dried in an oven at 80-100°C, cooled in a desiccator and weighed (Anon., 1980)^[3].

Moisture content (%): Jaggery (5 g) with few drops of absolute alcohol was dried to constant weight at 70°C in a hot-air oven (Mandal *et al.*, 2006)^[13].

Jaggery pH (1:1): Jaggery pH was determined by using a digital pH meter. Ten grams of sample was blended with 10 ml of distilled water and the pH of the suspension was determined by dipping the electrode in the suspension (Khan *et al.*, 2014)^[8].

Colour of the jaggery: Using colorimeter, the percentage transmittance of 0.5 N solution of jaggery was recorded at 540 nm (Mandal *et al.*, 2006)^[13].

Results and Discussion

Juice extraction (cf. Table 1 and 2)

Juice extraction in plant and ratoon cane did not differ significantly for RDF levels, cultivar and interaction effects. The juice extraction per cent was higher with Konanakatte cultivar than SNK-635 and C0-86032. Whereas, Co-86032 cultivar had lower juice extraction *per cent*. However, in

interaction effect juice extraction *per cent* ranged from 62.66 to 66.23% and 62.56 to 66.16%, respectively in plant and ratoon cane.

Brix (cf. Table 1 and 2)

Brix value did not differ significantly due to RDF levels, cultivars and their interaction effects in both plant and ratoon cane at harvest. Brix value was numerically higher with SNK-635 (21.73 and 21.29, respectively in plant and ratoon cane) followed by C0-86032 (21.56 and 21.27, respectively in plant and ratoon cane). Lower value was recorded in Konanakatte (20.89 and 20.56, respectively in plant and ratoon cane). In interaction effect, brix value ranged from 20.83 to 21.99 in plant cane and 20.49 to 21.99 in ratoon cane.

Pol% (cf. Table 1 and 2)

Pol *per cent* was not differed significantly by RDF levels, cultivars and their interaction effects in both plant and ratoon cane at harvest. Pol *per cent* was numerically higher with SNK-635 (19.44 and 19.77%, respectively in plant and ratoon cane) followed by C0-86032 (19.43 and 19.76%, respectively in plant and ratoon cane). Lower value was recorded in Konanakatte (19.34 and 19.67%, respectively in plant and ratoon cane). In interaction effect, pol *per cent* ranged from 19.22 to 19.58% and 19.55 to 19.91%, respectively in plant and ratoon cane.

Purity% (cf. Table 1 and 2)

Purity *per cent* was not differed significantly by RDF levels, cultivars and their interaction effects in both plant and ratoon cane at harvest. Purity *per cent* was numerically higher with Konanakatte (92.57 and 95.72%, respectively in plant and ratoon cane) followed by C0-86032 (90.17 and 93.08%, respectively in plant and ratoon cane). Lower value was recorded in SNK 635 (89.68 and 93.03%, respectively in plant and ratoon cane). In interaction effect, Purity *per cent* ranged from 87.69 to 92.93% and 89.37 to 96.01%, respectively in plant and ratoon cane. The adverse effect in sucrose content and purity from additional N was greater in variety NCo376 than in either N52/219 or J59/3 (Moberly, 1982). Meyer and Wood (2001) reported that under the conventional sucrose based payment system, reduction in cane quality with increasing amounts of N between 50 and 150 kg N/ha, averaged 0.38 units% cane for each additional 50 kg N/ha applied to NCo376, while quality was largely unaffected in the other two cane varieties.

Table 1: Juice extraction and juice quality parameters of plant cane as influenced by fertilizer levels and cultivars

Vertical strips [Nutrient management practice (NMP)]		Parameters															
		Juice extraction (%)				Brix				Pol (%)				Purity (%)			
		Horizontal strips (Cultivars)															
		C ₁	C ₂	C ₃	Mean	C ₁	C ₂	C ₃	Mean	C ₁	C ₂	C ₃	Mean	C ₁	C ₂	C ₃	Mean
F ₁	75% of RDF	63.25	62.74	65.48	63.82	21.75	21.75	20.93	21.48	19.58	19.58	19.45	19.54	90.04	89.93	92.93	90.98
F ₂	100% of RDF	63.68	62.94	65.51	64.04	21.74	21.52	20.89	21.38	19.48	19.52	19.38	19.46	89.61	90.81	92.79	91.08
F ₃	125% of RDF	63.65	63.00	65.55	64.07	21.60	21.27	20.89	21.25	19.44	19.45	19.37	19.42	90.01	91.56	92.73	91.44
F ₄	150% of RDF	63.82	63.05	66.23	64.37	21.59	21.26	20.83	21.23	19.38	19.30	19.28	19.32	89.87	90.84	92.64	91.13
F ₅	Control	63.08	62.66	65.31	63.68	21.99	21.99	20.93	21.64	19.32	19.28	19.22	19.27	88.88	87.69	91.75	89.25
	Mean	63.50	62.88	65.62		21.73	21.56	20.89		19.44	19.43	19.34		89.68	90.17	92.57	
		S.Em±			CD @ 0.05	S.Em±			CD @ 0.05	S.Em±			CD @ 0.05	S.Em±			CD @ 0.05
	Cultivars (C)	3.59			NS	0.91			NS	0.87			NS	3.01			NS
	RDF levels	3.21			NS	1.15			NS	0.98			NS	4.30			NS
	Cultivars at same level of fertilizers	4.84			NS	2.12			NS	1.60			NS	7.78			NS
	Cultivars at same or different levels of fertilizers	4.37			NS	2.09			NS	1.57			NS	7.83			NS

C₁ - SNK 635 C₂ - CO 86032 C₃ - Konanakatte DAP - Days after Planting RDF: Recommended Dose of Fertilizer (186: 125: 125 NPK Kg ha⁻¹)

Table 2: Juice extraction and juice quality parameters of ratoon cane as influenced by fertilizer levels and cultivars

Vertical strips [Nutrient management practice (NMP)]		Parameters															
		Juice extraction (%)				Brix				Pol (%)				Purity (%)			
		Horizontal strips (Cultivars)															
		C ₁	C ₂	C ₃	Mean	C ₁	C ₂	C ₃	Mean	C ₁	C ₂	C ₃	Mean	C ₁	C ₂	C ₃	Mean
F ₁	75% of RDF	63.22	62.74	65.41	63.79	21.41	21.41	20.60	21.14	19.91	19.91	19.78	19.87	93.58	93.08	96.01	94.22
F ₂	100% of RDF	63.62	62.87	65.44	63.98	21.19	21.41	20.56	21.05	19.81	19.86	19.71	19.79	93.58	92.75	95.96	94.10
F ₃	125% of RDF	63.58	62.90	65.45	63.98	20.93	20.93	20.56	20.81	19.77	19.78	19.70	19.75	94.45	94.63	95.77	94.95
F ₄	150% of RDF	63.72	62.98	66.16	64.29	20.93	21.26	20.49	20.89	19.72	19.63	19.62	19.65	94.15	92.65	95.87	94.23
F ₅	Control	63.04	62.56	64.64	63.42	21.99	21.32	20.59	21.30	19.65	19.62	19.55	19.61	89.37	92.28	95.00	92.21
	Mean	63.44	62.81	65.42		21.29	21.27	20.56		19.77	19.76	19.67		93.03	93.08	95.72	
		S.Em±		CD @ 0.05	S.Em±	CD @ 0.05		S.Em±	CD @ 0.05		S.Em±	CD @ 0.05		S.Em±	CD @ 0.05		
	Cultivars (C)	2.47		NS	0.72	NS		1.02	NS		3.99	NS			NS		
	RDF levels	2.60		NS	1.28	NS		0.96	NS		8.15	NS			NS		
	Cultivars at same level of fertilizers	3.45		NS	1.33	NS		1.63	NS		8.27	NS			NS		
	Cultivars at same or different levels of fertilizers	3.41		NS	1.64	NS		1.50	NS		10.50	NS			NS		

C₁ - SNK 635 C₂ - CO 86032 C₃- Konanakatte DAP- Days after Planting RDF: Recommended Dose of Fertilizer (186: 125: 125 NPK Kg ha⁻¹)

Reducing sugars%, Fibre% and Juice pH (cf. Table 3 and 4)

The reducing sugars differed significantly due to different cultivars in both plant and ratoon cane. The Cultivar SNK 635 recorded significantly lower reducing sugars (3.14 and 3.22%, respectively in plant and ratoon cane) than Konanakatte (3.55 and 3.66%, respectively in plant and ratoon cane) but on par with Co-86032 (3.27 and 3.32%, respectively in plant and ratoon cane). Higher reducing sugar was recorded in cultivar Konanakatte (3.50 and 3.66%, respectively in plant and ratoon cane). Different RDF levels treatments (F₁ to F₄) recorded significantly higher reducing sugars than control treatment. Significantly lower reducing sugar was recorded in control treatment (3.07 and 3.10%, respectively in plant and ratoon cane) and on par with 75% RDF (3.01 and 3.07%, respectively in plant and ratoon cane). There was decreased reducing sugars with decreased levels of fertilizers. Application of 75% RDF recorded significantly lower reducing sugars (3.01 and 3.07%, respectively in plant and ratoon cane) than 125% RDF (3.59 and 3.79%, respectively in plant and ratoon cane) and 150% RDF (3.81 and 4.03%, respectively in plant and ratoon cane) but on par with 100% (3.14 and 3.18%, respectively in plant and ratoon cane). The reducing sugar content in juice was not differed significantly due to interaction of cultivars and RDF levels. However, reducing sugars (%) ranged from 3.04 to 4.01 per cent in plant cane and 3.07 to 4.25 per cent in ratoon cane among the interactions of RDF levels and cultivars.

Fibre per cent of sugarcane in both plant and ratoon cane did not differed significantly due to cultivars, RDF levels and their interaction at harvest. However, in the interactions, fibre

content was ranged from 14.12 to 14.27% and 13.99 to 14.25%, respectively in plant and ratoon cane.

The pH of juice did not differ significantly among cultivars, RDF levels practices and combination of cultivars and RDF levels at harvest in both plant and ratoon. However, pH of juice in interaction effect ranged from 5.09 to 5.16 and 5.03 to 5.12, respectively in plant and ratoon cane.

Findings of the present study are in tune with Rakkiyappan *et al.* (2001) [16], Esther *et al.* (2012), Umesh *et al.* (2013) [19] and Kuri (2014) [11] who analysed that juice quality mainly depends upon genetic nature of the cultivar although nutrient management practices cause less considerable variation in juice brix, sucrose and purity per cent. But reducing sugar% was significantly influenced by RDF levels. Dagade (1978) [7] conducted an experiment to study the effects of nitrogen and stated that increasing levels of nitrogen have increased the nitrogen uptake in juice and thereby giving the higher N/P ratio damaging the quality of cane juice. The optimum level of nitrogen would be 125 kg N/ha for obtaining a high quality of juice when no nitrogen was applied (0 kg H/ha) the uptake of the cane was affected badly and resulting low brix in juice. Findings of Usha Rani (2013) [21] showed that application of N and P chemical fertilizers as recommended dose significantly increased cane yield over control to an extent of 39.8%. Such an improvement in cane yield due to application of 75% RDF of N and P fertilizers was observed to be 24.8% only. Juice quality was not affected by P levels. Yanam *et al.*, 1997 also reported that the use of NPK fertilizers does not have any significant influence on juice quality parameters. But heavy application of nitrogen had significant on juice quality (Mahima Begum *et al.*, 2017) [12].

Table 3: Juice quality parameters of plant cane as influenced by fertilizer levels and cultivars

Vertical strips [Nutrient management practice (NMP)]		Parameters												Juice pH			
		Reducing sugars (%)				Fibre (%)											
		Horizontal strips (Cultivars)															
		C ₁	C ₂	C ₃	Mean	C ₁	C ₂	C ₃	Mean	C ₁	C ₂	C ₃	Mean	C ₁	C ₂	C ₃	Mean
F ₁	75% of RDF	2.88	3.01	3.15	3.01	14.18	14.19	14.15	14.17	5.13	5.12	5.10	5.12				
F ₂	100% of RDF	2.91	3.04	3.47	3.14	14.15	14.19	14.14	14.16	5.13	5.13	5.10	5.12				
F ₃	125% of RDF	3.43	3.56	3.78	3.59	14.13	14.16	14.13	14.14	5.14	5.13	5.12	5.13				
F ₄	150% of RDF	3.64	3.77	4.01	3.81	14.13	14.14	14.12	14.13	5.16	5.15	5.12	5.14				
F ₅	Control	2.82	2.96	3.10	2.96	14.27	14.26	14.20	14.24	5.11	5.12	5.09	5.11				
	Mean	3.14	3.27	3.50		14.17	14.19	14.15		5.13	5.13	5.11					
		S.Em±		CD @ 0.05	S.Em±	CD @ 0.05		S.Em±	CD @ 0.05		S.Em±	CD @ 0.05					
	Cultivars (C)	0.09		0.34	0.75	NS		0.19	NS			NS					
	RDF levels	0.07		0.23	0.68	NS		0.24	NS			NS					
	Cultivars at same level of fertilizers	0.15		NS	1.25	NS		0.27	NS			NS					
	Cultivars at same or different levels of fertilizers	0.16		NS	1.14	NS		0.29	NS			NS					

C₁ - SNK 635 C₂ - CO 86032 C₃- Konanakatte DAP- Days after Planting RDF: Recommended Dose of Fertilizer (186: 125: 125 NPK Kg ha⁻¹)

Table 4: Juice quality parameters of ratoon cane as influenced by fertilizer levels and cultivars

Vertical strips [Nutrient management practice (NMP)]		Parameters								Juice pH			
		Reducing sugars (%)				Fibre (%)							
		Horizontal strips (Cultivars)											
		C ₁	C ₂	C ₃	Mean	C ₁	C ₂	C ₃	Mean	C ₁	C ₂	C ₃	Mean
F ₁	75% of RDF	2.90	3.01	3.32	3.07	14.11	14.17	14.13	14.14	5.10	5.08	5.06	5.08
F ₂	100% of RDF	2.93	3.04	3.57	3.18	14.14	14.17	14.07	14.13	5.10	5.09	5.07	5.09
F ₃	125% of RDF	3.61	3.66	4.08	3.79	14.12	14.14	13.99	14.08	5.11	5.10	5.09	5.10
F ₄	150% of RDF	3.86	3.97	4.25	4.03	14.11	14.13	13.97	14.07	5.12	5.12	5.09	5.11
F ₅	Control	2.77	2.92	3.10	2.93	14.25	14.24	14.17	14.22	5.07	5.08	5.03	5.06
	Mean	3.22	3.32	3.66		14.14	14.17	14.07		5.10	5.10	5.07	
		S.Em±			CD @ 0.05	S.Em±			CD @ 0.05	S.Em±		CD @ 0.05	
	Cultivars (C)	0.09			0.34	0.73			NS	0.21		NS	
	RDF levels	0.08			0.27	0.64			NS	0.23		NS	
	Cultivars at same level of fertilizers	0.15			NS	1.26			NS	0.44		NS	
	Cultivars at same or different levels of fertilizers	0.16			NS	1.13			NS	0.42		NS	

C₁ - SNK 635 C₂ - CO 86032 C₃- Konanakatte DAP- Days after Planting RDF: Recommended Dose of Fertilizer (186: 125: 125 NPK Kg ha⁻¹)

Liquid jaggery yield (cf. Table 5 and 6)

The liquid jaggery yield of plant cane differed significantly due to influence of RDF levels, cultivars and their interactions. Among cultivars, SNK-635 recorded significantly higher liquid jaggery yield (18.53 t ha⁻¹) than Konanakatte (10.75 t ha⁻¹) but on par with Co-86032 (16.65 t ha⁻¹). Cultivar Co-86032 also had significantly higher liquid jaggery yield than Konanakatte. Significantly lower liquid jaggery yield was recorded with Konanakatte (10.75 t ha⁻¹). Swamy Gowda *et al.* (2014) conducted varietal trial at VC Farm Mandya and reported that, the genotype, VCF 0517 possessed higher cane sugar and jaggery yield potential. It was superior compared to standard checks Co 62175 and Co 86032. The estimated jaggery yield was also higher in VCF 0517 (22.6 t ha⁻¹) compared to Co 62175 (16.9 t ha⁻¹), Co 86032 (17.9 t ha⁻¹) in plant crop. Sunilkumar nooli (2019) revealed that cultivars SNK 07680 and SNK 09211 recorded higher jaggery recovery and jaggery yield. Significant liquid jaggery yield was due to increased cane yield and increased jaggery recovery%. Different RDF level treatments (F₁ to F₄) recorded significantly higher liquid jaggery yield than control treatment. There was increased liquid jaggery yield with increased levels of fertilizers. Application of 150% RDF recorded significantly higher liquid jaggery yield (19.27 t ha⁻¹) than control (9.27 t ha⁻¹) and 75% RDF (12.63 t ha⁻¹) and 100% RDF (15.83 t ha⁻¹) but on par with 125% (17.88 t ha⁻¹). Different RDF levels treatments (F₁ to F₄) recorded significantly higher cane yield than control treatment. In plant cane, increased in cane yield of 75, 100, 125, 150% RDF levels were 35.4, 64.5, 81.0 and 93.8%, respectively over control. Application of 75% RDF obtained lower liquid jaggery yield but on par with 100% RDF. The liquid jaggery yield was not increased significantly after 100% RDF level. Liquid jaggery yield was differed significantly due to combination of different levels of RDF and cultivars. Significantly higher liquid jaggery yield was recorded with C₁F₄ (cultivar SNK-635 with 150% RDF) (23.24 t ha⁻¹) and on par with C₁F₃ (21.68 t ha⁻¹) and C₂F₄ (20.27 t ha⁻¹). Significantly lower liquid jaggery yield was recorded in C₃F₅ (6.58 t ha⁻¹), C₂F₇ (9.08 t ha⁻¹) and C₃F₁ (8.10 t ha⁻¹). Similar trend of plant cane was obtained in ratoon cane also for liquid jaggery yield. This is in conformity with the findings of Aluri

(2013)^[2], Kumara (2014)^[10] and Satwant *et al.* (2012)^[17].

Jaggery recovery per cent (cf. Table 5 and 6)

Jaggery recovery in plant and ratoon cane did not differ significantly due to cultivars, RDF levels and interaction effect. However, Jaggery recovery *per cent* was higher in cultivar SNK 635 (13.77 and 13.74%, respectively in plant and ratoon cane jaggery) than Co-86032 (13.61 and 13.51%, respectively in plant and ratoon cane jaggery) and Konanakatte (13.06 and 13.00%, respectively in plant and ratoon cane jaggery). In the interaction, jaggery recovery *per cent* ranged from 12.64 to 14.23% and 12.91 to 13.83%, respectively in plant and ratoon cane liquid jaggery.

Grading of jaggery through Net Rendament (NR) Value (cf. Table 5 and 6)

Net rendament (NR) value of liquid jaggery produced from plant and ratoon cane was influenced by cultivars, RDF levels and their interaction treatments. Among cultivars, SNK-635 recorded significantly higher NR value (53.09) than Co-86032 (47.45) and Konanakatte (46.96). NR value of Cultivar Co-86032 was on par with Konanakatte. Lower NR value was recorded with Konanakatte (46.96). The liquid jaggery of all three cultivars fell under medium quality grade. Same trend of plant cane was observed in ratoon cane. Among nutrient treatments, significantly higher NR value was recorded with 75% RDF (52.68) than 125% RDF (46.83) and 150% RDF (43.59) but on par with 100% RDF (50.54) and control (52.19). There was decreased NR value with increased levels of fertilizers. Lowest NR value was recorded in 150% RDF treatment. Similar report was made with ratoon cane liquid jaggery. The NR value was significantly influenced by the interaction effect of different RDF levels and cultivars. Significantly higher NR value was recorded with C₁F₁ (cultivar SNK-635 with 75% RDF) (56.57) and on par with C₁F₂ (54.37), C₁F₃ (50.69), C₁F₅ (56.34), C₂F₁ (51.00), C₃F₁ (50.48) and C₃F₅ (49.81). Lower NR value was recorded in C₃F₄ (41.43), C₂F₄ (41.87) and C₃F₃ (44.53) and these jaggery grouped under poor quality. Liquid jaggery of remaining interactions were categorized under medium quality jaggery. Liquid jaggery of ratoon cane also showed similar trend of plant cane.

Table 5: Liquid jaggery yield, recovery and net rendament value (NRV) of plant cane as influenced by fertilizer levels and cultivars

Vertical strips [Nutrient management practice (NMP)]		Jaggery yield (t ha ⁻¹)				Recovery (%)				NRV			
		Horizontal strips (Cultivars)											
		C ₁	C ₂	C ₃	Mean	C ₁	C ₂	C ₃	Mean	C ₁	C ₂	C ₃	Mean
F ₁	75% of RDF	15.93	13.87	8.10	12.63	13.35	13.20	12.69	13.08	56.57	51.00	50.48	52.68
F ₂	100% of RDF	19.64	16.27	11.58	15.83	13.81	13.60	13.05	13.49	54.37	48.70	48.54	50.54
F ₃	125% of RDF	21.68	18.78	13.18	17.88	14.16	14.03	13.37	13.86	50.69	45.26	44.53	46.83
F ₄	150% of RDF	23.24	20.27	14.30	19.27	14.23	14.11	13.56	13.97	47.48	41.87	41.43	43.59
F ₅	Control	12.16	9.08	6.58	9.27	13.27	13.11	12.64	13.01	56.34	50.43	49.81	52.19
	Mean	18.53	15.65	10.75		13.77	13.61	13.06		53.09	47.45	46.96	
		S.Em±		CD @ 0.05		S.Em±		CD @ 0.05		S.Em±		CD @ 0.05	
	Cultivars (C)	0.91		3.58		0.34		NS		1.16		4.54	
	RDF levels	0.58		1.90		0.65		NS		1.80		5.85	
	Cultivars at same level of fertilizers	1.49		4.13		0.62		NS		2.38		NS	
	Cultivars at same or different levels of fertilizers	1.23		3.27		0.80		NS		2.61		NS	

C₁ - SNK 635 C₂ - CO 86032 C₃- Konanakatte DAP- Days after Planting RDF: Recommended Dose of Fertilizer (186: 125: 125 NPK Kg ha⁻¹)

NR Value	Grade	Quality
>65	A1	Excellent
60-65	A2	Good
45-60	B	Medium
<45	C	Poor

Table 6: Liquid jaggery yield, recovery and net rendament value (NRV) of ratoon cane jaggery as influenced by fertilizer: levels and cultivars

Vertical strips [Nutrient management practice (NMP)]		Jaggery yield (t ha ⁻¹)				Recovery (%)				NRV			
		Horizontal strips (Cultivars)											
		C ₁	C ₂	C ₃	Mean	C ₁	C ₂	C ₃	Mean	C ₁	C ₂	C ₃	Mean
F ₁	75% of RDF	15.98	13.78	7.88	12.55	13.74	13.50	12.95	13.40	55.41	50.22	49.66	51.77
F ₂	100% of RDF	19.18	15.78	11.15	15.37	13.78	13.53	13.01	13.44	54.64	49.59	49.09	51.11
F ₃	125% of RDF	20.72	17.72	12.47	16.97	13.79	13.53	13.04	13.46	50.13	44.94	44.19	46.42
F ₄	150% of RDF	22.19	19.16	13.45	18.26	13.83	13.61	13.09	13.51	46.09	41.34	40.29	42.57
F ₅	Control	12.00	8.85	6.56	9.14	13.54	13.38	12.91	13.28	55.75	50.31	49.72	51.92
	Mean	18.01	15.06	10.30		13.74	13.51	13.00		52.40	47.28	46.59	
		S.Em±		CD @ 0.05		S.Em±		CD @ 0.05		S.Em±		CD @ 0.05	
	Cultivars (C)	1.07		4.20		0.47		NS		1.29		5.07	
	RDF levels	0.99		3.22		0.33		NS		1.61		5.26	
	Cultivars at same level of fertilizers	1.55		4.73		0.72		NS		3.25		NS	
	Cultivars at same or different levels of fertilizers	1.42		4.29		0.59		NS		3.17		NS	

C₁ - SNK 635 C₂ - CO 86032 C₃- Konanakatte DAP- Days after Planting RDF: Recommended Dose of Fertilizer (186: 125: 125 NPK Kg ha⁻¹)

NR Value	Grade	Quality
>65	A1	Excellent
60-65	A2	Good
45-60	B	Medium
<45	C	Poor

Non-reducing sugars, (cf. Table 7 and 8)

The different cultivars, RDF levels and interaction effect were not influenced significantly for non-reducing sugars in liquid jaggery of plant and ratoon cane. Numerically higher non reducing sugar *per cent* was with SNK-635 (73.93%) and lower content in CO86032 (70.99%) and Konanakatte (70.77%). There was decrease of non-reducing sugar content with increased level of RDF. However, the non-reducing sugar *per cent* ranged from 67.76 to 75.75% in plant cane liquid jaggery and 67.43 to 75.28% in ratoon cane liquid jaggery. Same trend of plant cane liquid jaggery was observed in ratoon also for non-reducing sugar *per cent*.

Reducing sugars per cent (cf. Table 7 and 8)

The reducing sugars differed significantly due to different cultivars in both plant and ratoon cane. The cultivar SNK 635 recorded significantly lower reducing sugars (13.39 and 13.91%, respectively in plant and ratoon cane) than Co-86032 (16.02 and 16.03%, respectively in plant and ratoon cane) and Konanakatte (16.08 and 3.66%, respectively in plant and ratoon cane). Non reducing sugar content of Co-86032 on par with Konanakatte. Higher reducing sugar was recorded in

cultivar Konanakatte 16.08 and 3.66%, respectively in plant and ratoon cane).

Among different nutrient treatments, significantly lower reducing sugar was recorded in 75% RDF treatment (13.71 and 13.87%, respectively in plant and ratoon cane) and on par with 100% RDF (14.78 and 13.86%, respectively in plant and ratoon cane) and control (13.95 and 13.93%, respectively in plant and ratoon cane). There was decreased reducing sugars with decreased levels of fertilizers.

The reducing sugar content in liquid jaggery was differed significantly due to interaction of cultivars and RDF levels also in both plant and ratoon cane. Significantly lower reducing sugar *per cent* was recorded with C₁F₁ (cultivar SNK-635 with 75% RDF) (11.90 and 12.27%, respectively in plant and ratoon cane) and on par with C₁F₂ (13.06 and 12.56%, respectively in plant and ratoon cane), C₁F₃ (13.98 and 15.35% respectively in plant and ratoon cane) and control (12.07 and 12.28% respectively in plant and ratoon cane). Higher reducing sugar *per cent* was recorded in C₃F₄ (18.50 and 19.36%, respectively in plant and ratoon cane), C₂F₄ (18.59 and 18.81%, respectively in plant and ratoon cane and).

Fat content in jaggery (cf. Table 7 and 8)

The treatments effect on fat content was non-significant due to the influence of different cultivars, RDF levels and their interactions in both plant and ratoon cane jaggery. However, it ranged from 0.093 to 0.122 per cent.

Protein content (cf. Table 7 and 8)

Protein content also followed the similar trend of fat content in both plant and ratoon cane. The different cultivars, RDF levels and interaction effect did not influence the protein content of liquid jaggery. However, protein content was ranged from 0.444 to 0.493 per cent.

Table 5: Liquid jaggery yield, recovery and net rendament value (NRV) of plant cane as influenced by fertilizer levels and cultivars

Vertical strips [Nutrient management practice (NMP)]		Jaggery yield (t ha ⁻¹)				Recovery (%)				NRV							
		Horizontal strips (Cultivars)								C ₁		C ₂		C ₃		Mean	
		C ₁	C ₂	C ₃	Mean	C ₁	C ₂	C ₃	Mean								
F ₁	75% of RDF	15.93	13.87	8.10	12.63	13.35	13.20	12.69	13.08	56.57	51.00	50.48	52.68				
F ₂	100% of RDF	19.64	16.27	11.58	15.83	13.81	13.60	13.05	13.49	54.37	48.70	48.54	50.54				
F ₃	125% of RDF	21.68	18.78	13.18	17.88	14.16	14.03	13.37	13.86	50.69	45.26	44.53	46.83				
F ₄	150% of RDF	23.24	20.27	14.30	19.27	14.23	14.11	13.56	13.97	47.48	41.87	41.43	43.59				
F ₅	Control	12.16	9.08	6.58	9.27	13.27	13.11	12.64	13.01	56.34	50.43	49.81	52.19				
	Mean	18.53	15.65	10.75		13.77	13.61	13.06		53.09	47.45	46.96					
		S.Em±		CD @ 0.05		S.Em±		CD @ 0.05		S.Em±		CD @ 0.05					
Cultivars (C)		0.91		3.58		0.34		NS		1.16		4.54					
RDF levels		0.58		1.90		0.65		NS		1.80		5.85					
Cultivars at same level of fertilizers		1.49		4.13		0.62		NS		2.38		NS					
Cultivars at same or different levels of fertilizers		1.23		3.27		0.80		NS		2.61		NS					

C₁ - SNK 635 C₂ - CO 86032 C₃- Konanakatte DAP- Days after Planting RDF: Recommended Dose of Fertilizer (186: 125: 125 NPK Kg ha⁻¹)

NR Value	Grade	Quality
>65	A1	Excellent
60-65	A2	Good
45-60	B	Medium
<45	C	Poor

Table 6: Liquid jaggery yield, recovery and net rendament value (NRV) of ratoon cane jaggery as influenced by fertilizer levels and cultivars

Vertical strips [Nutrient management practice (NMP)]		Jaggery yield (t ha ⁻¹)				Recovery (%)				NRV							
		Horizontal strips (Cultivars)								C ₁		C ₂		C ₃		Mean	
		C ₁	C ₂	C ₃	Mean	C ₁	C ₂	C ₃	Mean								
F ₁	75% of RDF	15.98	13.78	7.88	12.55	13.74	13.50	12.95	13.40	55.41	50.22	49.66	51.77				
F ₂	100% of RDF	19.18	15.78	11.15	15.37	13.78	13.53	13.01	13.44	54.64	49.59	49.09	51.11				
F ₃	125% of RDF	20.72	17.72	12.47	16.97	13.79	13.53	13.04	13.46	50.13	44.94	44.19	46.42				
F ₄	150% of RDF	22.19	19.16	13.45	18.26	13.83	13.61	13.09	13.51	46.09	41.34	40.29	42.57				
F ₅	Control	12.00	8.85	6.56	9.14	13.54	13.38	12.91	13.28	55.75	50.31	49.72	51.92				
	Mean	18.01	15.06	10.30		13.74	13.51	13.00		52.40	47.28	46.59					
		S.Em±		CD @ 0.05		S.Em±		CD @ 0.05		S.Em±		CD @ 0.05					
Cultivars (C)		1.07		4.20		0.47		NS		1.29		5.07					
RDF levels		0.99		3.22		0.33		NS		1.61		5.26					
Cultivars at same level of fertilizers		1.55		4.73		0.72		NS		3.25		NS					
Cultivars at same or different levels of fertilizers		1.42		4.29		0.59		NS		3.17		NS					

C₁ - SNK 635 C₂ - CO 86032 C₃- Konanakatte DAP- Days after Planting RDF: Recommended Dose of Fertilizer (186: 125: 125 NPK Kg ha⁻¹)

NR Value	Grade	Quality
>65	A1	Excellent
60-65	A2	Good
45-60	B	Medium
<45	C	Poor

Ash content (%), Moisture per cent and colour (absorbance value) of jaggery (cf. Table 8 and 9)

Ash content in plant and ratoon cane liquid jaggery was not influenced by cultivars, RDF levels and interactions. Numerically lower ash content was recorded in SNK-635 cultivar and highest with Konanakatte in both plant and ratoon cane. However, it was ranged from 2.08 to 2.24 per

cent.

The moisture content and colour plant and ratoon cane liquid jaggery were not influenced by treatments. However, the moisture content ranged from 18.52 to 19.54 per cent and colour (absorbance value) from 0.423 to 0.438 in interactions of RDF levels and cultivars.

Table 9: Quality parameters of jaggery of the plant cane as influenced by inorganic nutrient management practices and cultivars

Vertical strips [Nutrient management practice (NMP)]		Content											
		Ash (%)				Moisture (%)				Colour (absorbance value)			
		Horizontal strips (Cultivars)											
		C ₁	C ₂	C ₃	Mean	C ₁	C ₂	C ₃	Mean	C ₁	C ₂	C ₃	Mean
F ₁	75% of RDF	2.080	2.143	2.181	2.135	18.52	18.55	18.62	18.56	0.431	0.426	0.426	0.428
F ₂	100% of RDF	2.110	2.151	2.217	2.159	19.07	19.11	19.21	19.13	0.438	0.434	0.431	0.434
F ₃	125% of RDF	2.177	2.149	2.241	2.189	19.30	19.37	19.47	19.38	0.431	0.427	0.429	0.429
F ₄	150% of RDF	2.191	2.183	2.240	2.205	19.37	19.47	19.54	19.46	0.429	0.425	0.427	0.427
F ₅	Control	2.078	2.129	2.160	2.123	19.41	19.51	19.61	19.51	0.424	0.424	0.423	0.424
	Mean	2.127	2.151	2.208		19.13	19.20	19.29		0.431	0.427	0.427	
		S.Em±			CD @ 0.05	S.Em±			CD @ 0.05	S.Em±			CD @ 0.05
Cultivars (C)		0.101			NS	0.88			NS	0.019			NS
RDF levels		0.073			NS	2.07			NS	0.019			NS
Cultivars at same level of fertilizers		0.161			NS	1.71			NS	0.031			NS
Cultivars at same or different levels of fertilizers		0.136			NS	2.46			NS	0.030			NS

C₁ - SNK 635 C₂ - CO 86032 C₃- Konanakatte DAP- Days after Planting RDF: Recommended Dose of Fertilizer (186: 125: 125 NPK Kg ha⁻¹)

Table 10: Quality parameters of jaggery of the ratoon cane as influenced by inorganic nutrient management practices and cultivars

Vertical strips [Nutrient management practice (NMP)]		Content											
		Ash (%)				Moisture (%)				Colour (absorbance value)			
		Horizontal strips (Cultivars)											
		C ₁	C ₂	C ₃	Mean	C ₁	C ₂	C ₃	Mean	C ₁	C ₂	C ₃	Mean
F ₁	75% of RDF	2.07	2.12	2.15	2.11	18.51	18.54	18.61	18.55	0.430	0.425	0.425	0.427
F ₂	100% of RDF	2.08	2.12	2.19	2.13	19.07	19.07	19.17	19.10	0.435	0.433	0.431	0.433
F ₃	125% of RDF	2.14	2.13	2.22	2.16	19.23	19.37	19.40	19.33	0.431	0.427	0.428	0.429
F ₄	150% of RDF	2.16	2.16	2.22	2.18	19.36	19.40	19.44	19.40	0.428	0.424	0.427	0.426
F ₅	Control	2.07	2.10	2.13	2.10	19.41	19.50	19.48	19.46	0.424	0.423	0.422	0.423
	Mean	2.10	2.13	2.18		19.12	19.18	19.22		0.430	0.427	0.427	
		S.Em±			CD @ 0.05	S.Em±			CD @ 0.05	S.Em±			CD @ 0.05
Cultivars (C)		0.08			NS	0.83			NS	0.023			NS
RDF levels		0.08			NS	2.07			NS	0.025			NS
Cultivars at same level of fertilizers		0.13			NS	1.74			NS	0.046			NS
Cultivars at same or different levels of fertilizers		0.12			NS	2.49			NS	0.044			NS

C₁ - SNK 635 C₂ - CO 86032 C₃- Konanakatte DAP- Days after Planting RDF: Recommended Dose of Fertilizer (186: 125: 125 NPK Kg ha⁻¹)

Liquid jaggery pH and Electrical conductivity (EC) (dS m⁻¹) (cf. Table 11)

In both plant and ratoon cane liquid jaggery, pH value was not significantly influenced by cultivars, RDF levels and interactions. However, it was ranged from 6.11 to 6.33 per cent in plant cane and 6.05 to 6.35 in ratoon cane liquid jaggery. N application at higher doses and later stages of crop also increases the organic non-sugars, colloids, gums, and pectin and non-protein nitrogen and decreases the phosphorus content of juice, leading to dark coloured poor quality jaggery. There is increase of total organic acid content thereby decreasing the pH. Higher levels of glucose in juice will interact with soluble nitrogen compounds and alkali salts producing dark coloured jaggery.

The EC value of liquid jaggery were significantly influenced by cultivars, RDF levels and interaction treatments. Significantly lower EC value for plant cane liquid jaggery was recorded in SNK- 635 ((1.31 dSm⁻¹) than Co-86032 (5.27 dSm⁻¹) and Konanakatte (9.47) dSm⁻¹. Whereas, Konanakatte cultivar recorded significantly higher EC value (9.77 dSm⁻¹).

Similar trend as that of plant cane was observed in ratoon for EC value. Lower EC in SNK-635 due to lesser mineral salts content in liquid jaggery. This differential EC in liquid jaggery of different cultivar was due to differential salt exclusive mechanism in cultivars. SNK-635 might expressed salt exclusive mechanism and hence absorbed lesser mineral salt that leads to lesser EC than other two cultivars. Among RDF levels, 75% RDF level recorded significantly lower EC (5.15 dSm⁻¹) than 150% RDF level (6.07 dSm⁻¹) but on par with 100% RDF (5.29 dSm⁻¹), 125% RDF (5.51 dSm⁻¹) and Control (5.26 dSm⁻¹). Significantly higher EC value was registered in 150% RDF and on par with 125% RDF level. Same trend was observed in ratoon liquid jaggery. In interaction effect of combination of RDF levels and cultivar, significantly lower EC was recorded in C₁F₁ (SNK 635 with 75% RDF) and on par with SNK 635 of all treatments. Konanakatte of all treatments recorded significantly higher EC values. Similar interaction effect noticed in ratoon cane liquid jaggery for EC values.

Table 11: Liquid jaggery pH, and EC in plant and ratoon cane as influenced by fertilizer levels and cultivars

Vertical strips [Nutrient management practice (NMP)]		Plant cane								Ratoon cane							
		pH				EC (dSm ⁻¹)				pH				EC (dSm ⁻¹)			
		Horizontal strips (Cultivars)															
		C ₁	C ₂	C ₃	Mean	C ₁	C ₂	C ₃	Mean	C ₁	C ₂	C ₃	Mean	C ₁	C ₂	C ₃	Mean
F ₁	75% of RDF	6.17	6.18	6.13	6.16	1.13	5.08	9.23	5.15	6.18	6.12	6.18	6.16	1.15	5.42	9.79	5.45
F ₂	100% of RDF	6.23	6.20	6.14	6.19	1.15	5.09	9.62	5.29	6.22	6.22	6.24	6.23	1.20	5.65	10.28	5.71
F ₃	125% of RDF	6.28	6.25	6.21	6.25	1.37	5.30	9.86	5.51	6.32	6.28	6.31	6.30	1.52	6.09	10.95	6.18
F ₄	150% of RDF	6.33	6.31	6.24	6.29	1.78	5.82	10.60	6.07	6.34	6.35	6.35	6.35	1.94	6.30	11.81	6.68

F ₅	Control	6.16	6.16	6.11	6.14	1.13	5.07	9.56	5.26	6.10	6.12	6.05	6.09	1.14	5.22	9.86	5.41
	Mean	6.24	6.22	6.17		1.31	5.27	9.77		6.23	6.22	6.23		1.39	5.73	10.54	
		S.Em±	CD @ 0.05	S.Em±	CD @ 0.05	S.Em±	CD @ 0.05	S.Em±	CD @ 0.05	S.Em±	CD @ 0.05	S.Em±	CD @ 0.05	S.Em±	CD @ 0.05	S.Em±	CD @ 0.05
	Cultivars (C)	0.30	NS	0.14	0.54	0.34	NS	0.21	0.81								
	RDF levels	0.32	NS	0.20	0.64	0.33	NS	0.18	0.60								
	Cultivars at same level of fertilizers	0.54	NS	0.37	0.78	0.41	NS	0.31	0.85								
	Cultivars at same or different levels of fertilizers	0.52	NS	0.37	0.89	0.39	NS	0.28	0.81								

Conclusion

Application of 75% RDF levels (186:125:125 NPK kg ha⁻¹) was optimum for better sugarcane juice and liquid jaggery quality and on found on par with 100% RDF (186:125:125 NPK kg ha⁻¹)

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