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Effect of biogas slurry on juice quality of sugarcane under south Gujarat condition

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Abstract
A field experiment was conducted during *rabi* seasons of 2021–2022, and 2022–23 at College Farm, N. M. College of Agriculture, Navsari Agricultural University, Navsari (Gujarat) to study effect of biogas slurry on growth of sugarcane under south Gujarat condition. The treatments, *viz*., T_1: 100% RDF + 10 t/ha biocompost; T_2: STCR-based fertilizer + 2.5 t/ha LBGS (liquid biogas slurry); T_3: soil test-based fertilizer + 2.5 t/ha LBGS (liquid biogas slurry); T_4: 100% RDF + 2.5 t/ha LBGS (liquid biogas slurry); T_5: 100% RDF + 5 t/ha LBGS (liquid Biogas slurry); T_6: 100% RDF + 7.5 t/ha LBGS (liquid Biogas slurry); and T_7: 100% RDF + 10 t/ha LBGS (liquid Biogas slurry) were applied to the sugarcane crop in the *rabi* season and replicated four times in randomised block design. Brix and sucrose percentage as influenced by different treatments did not exert any significant effect during both the years of experimentation and the pooled study.

Keywords: Sugarcane, biogas slurry, sugarcane juice, brix

Introduction
India is the largest producer of sugar, cultivating sugarcane in an area of 50.98 lakh hectares with a production of 430.50 million tonnes and productivity of 84.44 tonnes per hectare. In Gujarat, total cane production was 17.44 million tonnes from an area of 2.23 lakh hectares, with average productivity of 78.31 tonnes/ha (Anon., 2022) [1]. The sugar industry is the source of livelihood for 50 million farmers and their families. It provides direct employment to over 5 lakh skilled and semi-skilled laborers in sugar mills and allied industries across the nation (Venkatesh and Venkateswarlu, 2017) [3]. Sugarcane is an important cash crop in South Gujarat and as such, most sugarcane growers depend on it for their cash requirements. Hence, adequate net profit is important so that they stick around and continue sugarcane farming. Biogas slurry is a by-product of biogas production generated from cattle dung. Biogas slurry is a by-product of anaerobic digestion that is produced from biogas plants and also produces biogas (combustible methane gas) that is used for cooking, lighting and running engines. The biogas slurry has 93% water and 7% dry matter, of which 4.5% is organic matter and 2.5% is inorganic matter. The digested biogas slurry also contains phosphorus, potassium, zinc, iron, manganese and copper, many of which are depleted from the soil due to intensive agricultural practices (Kumar *et al*., 2015) [2].

Materials and Methods
A field experiment was carried out throughout the seasons of 2021–2022 and 2022–2023 at plots No. B-6 and B-11 of College Farm, Navsari Agricultural University, Navsari. The campus of the Navsari Agricultural University is situated at an altitude of 10 metres above mean sea level, at 20° 57' N latitude and 72° 54' E longitude. The location is 12 kilometres to the east of the famous historical site "Dandi" on the Arabian coast. The soil of the experimental sites is classified under the order "Inceptisols" according to the 7th Approximation, which includes members of the fine, montmorillonitic, isohyperthermic great soil group of Vertic Ustrochrepts and Jalapore series. Locally, these soils are referred to as "deep black soils." Dry soil is a dark brown, clay-like substance. When the earth is dry, it develops extensive cracks and gets quite hard; when it's moist, it gets plastic and sticky. The soil of the experimental field was clayey in texture and had electrical conductivity within the safe limit (0.30 and 0.33 dS/m). The soil was low in organic carbon (0.36% and 0.32%), slightly alkaline in reaction (pH 8.13 and 8.20), medium in available nitrogen (293 kg/ha and 289 kg/ha) and P_2O_5 (56.54 and 50.71 kg/ha), high in available K_2O (490 and 492 kg/ha), DTPA-extractable Fe (40.78 and 41.69 mg/kg), Mn (12.18 and 12.25 mg/kg), Cu (2.80 and

2.76 mg/kg) and DTPA-extractable Zn (2.17 and 2.20 mg/kg) during both years, respectively. The soil was uniform in depth. Thus, the soil was suitable for growing sugarcane crop. The treatments, *viz*., T_1: 100% RDF + 10 t/ha biocompost; T_2: STCR-based fertilizer + 2.5 t/ha LBGS (liquid biogas slurry); T_3: soil test-based fertilizer + 2.5 t/ha LBGS (liquid biogas slurry); T_4: 100% RDF + 2.5 t/ha LBGS (liquid biogas slurry); T_5: 100% RDF + 5 t/ha LBGS (liquid Biogas slurry); T_6: 100% RDF + 7.5 t/ha LBGS (liquid Biogas slurry); and T_7: 100% RDF + 10 t/ha LBGS (liquid Biogas slurry) were applied to the sugarcane crop in the *rabi* season and replicated four times in randomised block design. The crop was sugarcane (cultivar CoN 05071). The slurry was applied at the time of the sowing. Biocompost was applied treatment-wise to plots 24 hours before the application of chemical fertilizers during planting. Nitrogen, phosphorus, and muriate of potash were applied as per treatments applied at the time of planting. The recommended dose of fertilizer was 250-125-125 N-P_2O_5-K_2O (kg ha^{-1}). STCR equation Fd N = 3.7T – 0.885STV, Fd P_2O_5 = 2.24T-3.97STV, Fd K_2O = 2.67T-0.383STV. Where, Fd = Fertilizer dose (kg/ha); T = Targeted yield of millable cane (150 t/ha); STV = Soil Test Value (kg/ha) (Dalwadi, 1993). STCR based fertilizer 251-149-213 and 253-138-211 during 2021-22 and 2022-23 respectively. Soil test based fertilizer 250-125-94 kg/ha N-P_2O_5-K_2O LBGS was applied at the time of planting. For supplying N, P_2O_5 and K_2O as per the recommended dose and as per treatments, biocompost and liquid biogas slurry were used in both years of the experimental sugarcane plant crop. Biocompost and liquid biogas slurry were brought from the college farm, Navsari Agril. University, Navsari, and private sources, respectively.

Results and Discussion

Brix (%): The brix (%) of sugarcane as influenced by different treatments are tabulated in Table 1. Numerically, higher brix (20.61, 21.20 and 20.90%) was found in treatment T_2 (STCR based fertilizer + 2.5 t/ha LBGS) while an application of treatment T_1 (100% RDF + 10 t/ha Biocompost) was repoted lower brix (19.90, 20.36 and 20.13%) during both years and also in pooled analysis, respectively.

Sucrose (%)

The mean data pertaining to sucrose percent in juice as influenced by different treatments are tabulated in Table 1. Numerically, higher sucrose (19.53, 19.67 and 19.60%) was noted with application of T_7 (100% RDF + 10 t/ha LBGS) but, lower sucrose (19, 19.15 and 19.08%) was recoded in treatment T_3 (Soil test based fertilizer + 2.5 t/ha LBGS) during both years and also in pooled analysis, respectively.

Table 1: Sugarcane juice brix and sucrose percentage at harvest as influenced by different treatments

Treatments		Brix (%)			Sucrose (%)		
		2021-22	2022-23	Pooled	2021-22	2022-23	Pooled
T_1	100% RDF + 10 t/ha Biocompost	19.90	20.36	20.13	19.35	19.46	19.40
T_2	STCR based fertilizer + 2.5 t/ha LBGS	20.61	21.20	20.90	19.19	19.44	19.31
T_3	Soil test based fertilizer + 2.5 t/ha LBGS	20.40	20.65	20.53	19.00	19.15	19.08
T_4	100% RDF + 2.5 t/ha LBGS	20.20	20.57	20.39	19.30	19.36	19.33
T_5	100% RDF + 5 t/ha LBGS	19.98	20.77	20.37	19.45	19.57	19.51
T_6	100% RDF + 7.5 t/ha LBGS	20.54	20.55	20.55	19.23	19.40	19.31
T_7	100% RDF + 10 t/ha LBGS	20.28	20.42	20.35	19.53	19.67	19.60
S.Em ±		0.55	0.28	0.31	0.26	0.51	0.28
CD at 5%		NS	NS	NS	NS	NS	NS
CV%		5.47	2.68	4.28	2.69	5.20	4.15
Year							
S.Em ±		0.17			0.15		
CD at 5%		NS			NS		
Interaction Y × T							
S.Em ±		0.44			0.40		
CD at 5%		NS			NS		

Conclusion

In the present investigation, it has been found that sugarcane juice brix and sucrose percentage not affected significantly due to different treatments under south Gujrat conditions.

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