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Effect of Organic Farming on Growth, Yield Attributes and Yield of Sugarcane under South Gujarat Condition

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The experiment was conducted at Organic Farm, Aspee College of Horticulture, Navsari Agricultural University, Navsari (Gujarat) during the *rabi* seasons of the years 2019–20 and 2020–21 The soil of the experimental field was clayey in texture, with electrical conductivity within the safe limit (0.46 dS/m). The soil was medium in organic carbon (0.67%) and slightly alkaline in reaction (pH 7.70), medium in available nitrogen (248.30 kg/ha) and P_2O_5 (43.0 kg/ha), high in available K_2O (416.20 kg/ha), DTPA-extractable Fe (18.90 mg/kg), Mn (16.90 mg/kg), Cu (2.60 mg/kg), and DTPA-extractable Zn (1.48 mg/kg). The treatments, *viz*., (Factor A Spacing, S_1: 90 cm; S_2: 60-120-60 cm

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(paired row with green manuring). (Factor B Manure levels, M_1: NADEP @ 100% RDN; M_2: NADEP @ 75% RDN; M_3: NADEP @ 50% RDN; and M_4: NADEP @ 25% RDN + Sugarcane trash @10 t/ha + jeevamrut @ 2000 l/ha., were applied to the sugarcane crop in the *rabi* season and replicated three times in factorial randomized block design. Number of internodes and cane girth was not affected significantly by any of the treatments. However, total plant height and millable cane height as well as single cane weight were affected significantly by the treatment of compost only. Higher values of these parameters were observed in compost treatment M_1, followed by M_2, M_3 and M_4. Similar trend of treatments was observed in case of millable cane yield/ha. Significantly higher millable cane yield was observed in treatment M_1during the years 2019-20, 2020-21 and in pooled analysis. However, this treatment was remained statistically at par with treatment M_2 treatment.

Keywords: Clayey; sugarcane crop; organic farming; millable cane yield.

1. INTRODUCTION

"India ranks 9th in terms of land under organic cultivation and 1st in terms of total number of organic producers. In India, the total area under organic farming is 4.50 million hectares from which 3.60 million tonnes of certified organic products are produced including all varieties of food products *viz.,* oilseeds, sugarcane, cereals and millets, cotton, pulses, medicinal plants, tea, fruits, vegetables etc (Deshmukh & Babar 2015). The export of organic products also earns handsome revenue to the state. The organic food export realization for 2017-18 was around INR 4255.28 crore" (Anon., 2024a). Among all the states, Madhya Pradesh has the biggest certified area under organic production (33.33%) followed by Maharashtra (26.58%). Gujarat (21.25%), Rajasthan (12.88%) and Odisha (1.86%). These five states represent largest for approximately 95.90% of a land under organic farming in India (Anon., 2024b). Sikkim has called itself an organic state, however, due to its limited geographical size its contribution of a national organic area is only 1.36%. Organic agriculture is gaining popularity in India, in 2003-04. Registered organic farming area in India was 42,000 ha and it has expanded about 26 times in the five years. By March 2010, India has certified more than 4.48 million hectares as organic. In Gujarat, a total of 29566 farmers engaged organic farming on 48,518 acres of land (Yada, 2012).

"Sugarcane (*Saccharum* Hy. sp.) is one of the most important industrial cash crops in both tropical and subtropical region of the world and a major export product of many developing countries. Sugarcane cultivation in India dates back to the Vedic period. The earliest mention of sugarcane cultivation is found in Indian writings of the period 1400 to 1000 B.C. It is a principal raw material for sugar industry as world's 75% sugar comes from sugarcane" (Anon., 2013). It is the main source of sugar, jaggery (gur) and brown sugar (khandsari). Crushed by-products of sugarcane industry like bagasse and molasses also have important uses. Molasses is used in distilleries for the manufacturing of citric acid, ethyl, alcohol *etc.* Press mud is generally used for soil amendment. The upper green part of sugarcane is also used as a fodder for cattle feeding. Owing to its versatile utility and vast capability to meet the demands of human population, it is rightly called as 'Wonder cane'.

"Sugarcane (*Saccharum* Hy. sp.) belongs to the family *poaceae* (Gramineae) and tropical sugarcane originated from Oceania (New Guinea) while Indian cane (*Saccharum spontaneum* L.) originated from North Eastern India. The word *Saccharum* is derived from the Sanskrit word "sharkara" and it indicates its Indian origin. Brazil led the world in sugarcane production. India is the second largest producer of sugar in the world with over 5 mha of sugarcane growing area. In India, sugarcane is grown in 50.98 lakh hectares with total production 430.50 million tonnes with the productivity of 84.44 tons per hectare and the average sugar recovery of 10.23 % (Anon., 2020). Considering area, Uttar Pradesh, Maharashtra, Karnataka, Tamil Nadu, Bihar, Andhra Pradesh and Gujarat are the major sugarcane growing states. Gujarat produces only 3.72 per cent sugarcane from 4.65 per cent area of India (Anon., 2024). Sugarcane area, production, productivity and sugar recovery, in Gujarat was 2.23 lakh hectare, 17.44 million tones, 78.31 t/ha and 11.09%, respectively" (Anon., 2024c). Surat, Navsari, Valsad, Bharuch, Tapi, Narmada, Bhavnagar, Rajkot, Junagadh and Jamnagar are the important sugarcane producing districts.

2. MATERIALS AND METHODS

2.1 Experimental Site

The present investigation entitles "Effect of organic farming on growth, yield attributes and yield of sugarcane under south Gujarat condition" was conducted at Organic Farm, Navsari Agricultural University, Navsari, Gujarat. The farm was converted in to organic during 2005, since then organic management practices were adopted to raise the crops. This place is situated at 20°57' N latitude, 72°54' E longitude and has an altitude of about 10 m above the mean sea level and is located 12 km away in the east from the great historical place 'Dandi' on the Arabian seashore.

As per NBSS and LUP, this area is located in 19.1 Agro Ecological Sub Region of India and asper NARP zonalization, it is apart of Agro Ecological Situation-III of South Gujarat Agro-climatic Heavy Rainfall Zone-1. The climate of this zone is typically tropical, characterized by humid and warm monsoon with heavy rainfall, moderately cold winter and fairly hot and humid summer. The average annual rainfall of the tractis about 1804 mm (Average of fourteen years from 2011 to 2024) monsoon commences by June and ceases by September end. The winter season starts from November and ends by middle of February. The coldest months are December and January, whereas the hottest months are April and May.

2.2 Physico-Chemical Characteristics of the Soil

The soil of south Gujarat is locally known as "Deep Black Soil". The soil of Navsari campus is classified under the order *"Inceptisols"* comprising member of fine montmorillonitic, isohyperthemic, family of *Vertic ustrochrepts* and soil series Jalalpur by the soil survey officer, Navsari, Department of Agriculture, Gujarat state (Desai and Patel, 1970), having poor drainage capacity and good water holding capacity. The soil cracks heavily on drying and expands on wetting similar soil characteristics was also reported by Keniya et al*.* (2024).

The representative soil samples were drawn from the experimental plot before initiation of experiment from 0-22.50 cm depth. The samples were mixed thoroughly and composite sample was obtained. The sample was analyzed for desired initial physico-chemical properties of the soil and the average values are presented in Table 1.

2.3 Experimental Details

The experiment was carried out in a factorial randomized block design comprising of 8 treatments, combinations with thrice in replication (Table 2). Sugarcane variety used for experiments was CoN 7072 sown with two different spacing treatments like S_1: 90 cm and S_2: 60-120-60 cm paired row (with green manuring) and four different manuring levels

Table 1. Initial physical and chemical parameters of experimental soil. (Soil depth 0-22.5 cm)

Parameters	Value
(A) Mechanical Properties	
Sand (%)	15.30
Silt (%)	25.86
Clay (%)	58.76
Textural class	Clay
(B) Physical Properties	
Bulk Density(g/cc)	1.41
(C) Chemical Properties	
$pH_{1:2.5}$	7.70
$EC_{1:2.5(dS/m)}$	0.38
Organic C (%)	0.67
Available N (kg/ha)	248.3
Available P_2O_5 (kg/ha)	43.1
Available K_2O (kg/ha)	416.2
DTPA extractable Fe (mg/kg)	18.9
DTPA extractable Mn (mg/kg)	16.9
DTPA extractable Zn (mg/kg)	1.5
DTPA extractable Cu (mg/kg)	2.6

Table 2. Nutrient content in NADEP compost

Nutrient	N (%)	P_2O_5 (%)	K_2O (%)	Fe (mg/kg)	Mn (mg/kg)	Zn (mg/kg)	Cu (mg/kg)	C:N ratio
2019-20	0.81	0.58	1.51	918	108	38	31	19.75
2020-21	0.83	0.64	1.47	892	93	54	28	18.07

treatments like M_1: NADEP @ 100% RDN, M_2: NADEP @ 75% RDN, M_3: NADEP @ 50% RDN and M_4: NADEP @ 25% RDN + Sugarcane trash @10 t/ha + jeevamrut @ 2000 l/ha. The experimental design was randomized block design with factorial concepts. The sugarcane seets for sowing collected from Main Sugarcane Research Station, Navsari Agricultural University Navsari. In this experiment, NADEP compost was prepares on farm using farm residues particularly banana, sugarcane and vegetable residues. Nutrient content of compost is given in Table 2. Treatment wise quantity of NADEP compost is worked out on basis of N content and applied two to three days prior to planting.

Green manure crop dhaincha was sown in a broad space treatment in paired row (treatment S_2) at the time of sugarcane planting and incorporated before flowering.

The NADEP compost is used as an organic manures equivalent to nitrogen requirement of sugarcane as par recommended dose of nitrogen (RDN). Sugarcane trash and jeevamrut (500 lit/ha) at first four irrigation as per treatment. Biometric observations recorded during the period of investigation are as follows. **Total plant height and millable cane height (cm):** The selected five plants from each net plot were measured for their total plant height at harvest from the ground up to the top or tip of the main tiller and millable cane height also measured when removing trash. Average value of five plants for each treatment at harvest stage were computed and recorded. **Cane girth (cm):** At the time of harvest, the girth of five tagged canes was measured from top to bottom. Average cane diameter was recorded by using digital Varnier caliper (Mitutoyo, Japan). Cane girth is calculated using formula, Girth=D x π, D=Diameter. **Numbers of internodes:** The numbers of internodes of five tagged plants from each plot were counted at harvest and the average was worked out. **Single cane weight (kg):** The weight of five randomly selected canes from plot were recorded individually and presented as average weight per cane. **Millable cane yield (t/ha):** The net plot was harvested separately for each treatment. The canes were detoured, and millable canes were prepared by cutting the top portion. The weight of these millable canes for each experimental plot was recorded in kilograms, and then it was converted into tonnes per hectare.

Table 3. Treatments details

Treatments
Factor I: Spacing
S_1: 90 cm
S_2: 60-120-60 cm paired row (with green manuring)
Factor II: Manure levels
M_1: NADEP @ 100% RDN
M_2: NADEP @ 75% RDN
M_3: NADEP @ 50% RDN
M_4: NADEP @ 25% RDN+ Sugarcane trash @10 t/ha + jeevamrut @ 2000 l/ha.

3. RESULTS AND DISCUSSION

3.1 Plant and Millable Cane Height at Harvest

Result furnished in Table 3 is of height of plant and millable cane sugarcane at harvest as influenced by different treatments. Result indicated that spacing treatment did not showed significant impact on plant height and millable cane height of sugarcane at harvest during individual year and pooled analysis. Numerically, higher total plant height (269.4, 279.0 and 274.2 cm) and millable cane height (234.0, 239.2 and 236.6 cm) was found with treatment S_2 (60-120-60 cm paired row with green manuring) while lower total plant height (263.5, 272.8 and 268.2 cm) and millable cane height (224.8, 238.0 and 231.4 cm) was noted with treatment S_1 (90 cm) during the year 2019-20, 2020-21 and in pooled analysis respectively. Result given in Table 3 indicated that the treatments of compost affect the plant height and millable cane height of sugarcane at harvest significantly. Treatment, 100% RDN through NADEP compost (M_1) recorded significantly higher plant height *i.e.* 285.6, 297.4 and 291.5 cm during the years 2019-20, 2020-21 and in pooled analysis, respectively. However, it was remained statistically at par with the treatment M_2

(Application of 75% RDN through NADEP compost) during 2019-20, 2020-21 and pooled analysis respectively. Similarly, millable cane height was also affected significantly by the compost treatments. Here also, treatment M_1 (100% RDN through NADEP compost) recorded significantly higher millable cane height *i.e.* 247.5, 253.8 and 250.7 cm during the years 2019-20, 2020-21 and in pooled analysis, respectively. This treatment was found statistically at par with treatment M_2 (Application of 75% RDN through NADEP) and recorded millable cane height, 235.0, 240.6 and 237.8 cm during the years 2019-20, 2020-21 and in pooled analysis, respectively. Significantly higher plant height was observed by balanced supply of nutrients through organic sources, which enhanced nutrients availability which resulted in increased photosynthetic activity and translocation of photosynthates from source to sink which help to achieve higher plant height. At the same time, effect of organic source (FYM, biocompost, biogas slurry) as a source of plant nutrient improved the soil microbial activity which helped in improving plant height. The increase in plant height is also a function of cell division and cell enlargement, which depends upon availability of nutrients in balanced form especially N and P. These results were supported by Soomro et al. (2013). The similar result was also reported by Patel (2006). Year effect as well as interaction effect of different treatments on plant height and millable cane height of sugarcane at harvest was non-significant during both the individual years as well as in pooled analysis.

3.2 Lengths and Number of Internodes of Sugarcane at Harvest

The result paraded in Table 4 revealed that spacing treatments did not show significant impact on lengths and number of internodes of sugarcane at harvest during individual experimental period of both the years and pooled data analysis. The higher length of internodes (12.8, 13.3 and 13.0 cm) and number of internodes (17.8, 18.1 and 18.0) was noted in treatment S_2 (120 cm X 60 cm paired row with green manuring) as compared to S_1during the year 2019-20, 2020-21 and in pooled analysis, respectively. In case of compost treatments, it had significant effect on lengths of internodes at harvest (Table 4). Significantly higher lengths of internodes, 13.8 and 14.2 cm was observed in treatment, application of 100% RDN through NADEP compost (M_1) during the year 2019-20, 2020-21, respectively. However, this treatment

Table 4. Effect of different treatments on plant height and millable cane height at harvest

Treatments	Total plant height (cm)			Millable cane height (cm)		
	2019-20	2020-21	Pooled	2019-20	2020-21	Pooled
Factor I: Spacing						
S_1 - (90 cm)	263.5	272.8	268.2	224.8	238.0	231.4
S_2 - (60-120-60 cm with GM)	269.4	279.0	274.2	234.0	239.2	236.6
S Em±	4.8	5.1	4.0	4.0	4.3	3.2
CD at 5%	NS	NS	NS	NS	NS	NS
Factor II: Compost levels						
M_1-Com. @ 100% RDN	285.6	297.4	291.5	247.5	253.8	250.7
M_2-Com. @ 75% RDN	270.5	284.0	277.2	235.0	240.6	237.8
M_3-Com. @ 50% RDN	263.4	265.4	264.4	222.0	234.0	228.0
M_4 -Com. @ 25% RDN + ST @ 10 t/ha + JM @ 2000 l/ha)	246.4	256.9	251.6	213.0	225.9	219.5
S Em±	6.8	7.2	5.7	5.6	6.1	4.5
CD at 5%	20.7	22.0	16.8	17.1	18.6	13.1
CV (%)	6.2	6.4	7.3	6.0	6.3	6.6
S x M						
S Em±	9.6	10.2	8.1	8.0	8.6	6.3
CD at 5%	NS	NS	NS	NS	NS	NS
Pooled	**S Em±**	**CD at 5%**		**S Em±**	**CD at 5%**	
Y	4.0	NS		3.2	NS	
Y x S	5.7	NS		4.5	NS	
Y x M	8.1	NS		6.3	NS	
Y x S x M	11.5	NS		9.0	NS	

GM: Green Manuring, Com.: NADEP Compost, ST: Sugarcane Trash, JM: Jivamrut

was remained at par with treatment M_2 (75% RDN through NADEP compost) during the both years. Similarly in pooled analysis treatment M_1 (100% RDN through NADEP compost) recorded significantly higher length of internodes (14.0 cm). Number of internodes was not affected significantly by compost treatments during both individual years as well as in pooled analysis. The results are in accordance with the earlier findings Singh et al. (2007). However, numerically more and less number of internodes was observed in treatments M_1 and M_4, respectively. Lengths of internodes and number of internodes of sugarcane at harvest were not affected significantly by year as well as any of the interaction of different treatments (S x M, Y x S, Y x M, Y x S x M).

3.3 Cane Girth of Sugarcane at Harvest (cm)

The results regarding cane girth of sugarcane at harvest (cm) presented in Table 5 revealed that the effect of spacing and different levels of NADEP compost did not exert any significant effect on it during both the individual years as well as in pooled analysis. However, in spacing treatments, numerically higher cane girth (8.03, 8.19 and 8.11 cm) of sugarcane at harvest was found with treatment S_2 (60-120-60 cm paired row with green manuring) while lower cane girth (7.84, 8.06 and 7.95 cm) was found in treatment S_1 (90 cm) during the years2019-20, 2020-21 and in pooled analysis, respectively. In manure treatment, numerically higher cane girth was observed in treatment M_1 (NADEP compost @ 100% RDN) and lower cane girth was observed in treatment M_4 (application of NADEP compost @ 25% RDN + Sugarcane trash @ 10 t/ha + jeevamrut @ 2000 l/ha.) during the year 2019-20, 2020-21 and in pooled analysis. Year effect on cane girth of sugarcane was non-significant. Similarly, none of the interactions of different treatment exert significant effect on cane girth of sugarcane at harvest during individual years and in pooled analysis.

3.4 Single Cane Weight and Millable Cane Yield of Sugarcane at Harvest

The result of two years of experiment revealed that single cane weight and millable cane yield of sugarcane at harvest was not affected significantly by different spacing treatments but significantly affected by the different levels of NADEP compost. Numerically, higher single

Table 5. Effect of different treatments on length and number of internodes in sugarcane at harvest

Treatments	Length of internodes (cm)			Number of internodes		
	2019-20	2020-21	Pooled	2019-20	2020-21	Pooled
Factor I: Spacing						
S_1 - (90 cm)	12.4	13.1	12.8	16.8	17.8	17.3
S_2 - (60-120-60 cm with GM)	12.8	13.3	13.0	17.8	18.1	18.0
S Em±	0.2	0.2	0.2	0.3	0.4	0.3
CD at 5%	NS	NS	NS	NS	NS	NS
Factor II: Compost levels						
M_1-Com. @ 100% RDN	13.8	14.2	14.0	18.3	18.4	18.4
M_2-Com. @ 75% RDN	12.8	13.5	13.1	17.4	18.2	17.8
M_3-Com. @ 50% RDN	12.1	12.7	12.4	16.8	17.8	17.3
M_4 -Com. @ 25% RDN+ ST @ 10 t/ha + JM @ 2000 l/ha)	11.6	12.3	12.0	16.6	17.4	17.0
S Em±	0.3	0.4	0.3	0.5	0.6	0.4
CD at 5%	1.1	1.2	0.8	NS	NS	NS
CV (%)	7.0	7.6	8.1	7.6	8.4	9.0
S x M						
S Em±	0.5	0.5	0.4	0.7	0.8	0.6
CD at 5%	NS	NS	NS	NS	NS	NS
Pooled	**S Em±**		**CD at 5%**	**S Em±**		**CD at 5%**
Y	0.2		NS	0.3		NS
Y x S	0.3		NS	0.4		NS
Y x M	0.4		NS	0.6		NS
Y x S x M	0.6		NS	0.9		NS

GM: Green Manuring, Com.: NADEP Compost, ST: Sugarcane Trash, JM: Jivamrut

cane weight (1.21, 1.29, 1.25 kg) was found in treatment S_2 (60-120-60 cm paired row with green manuring) while lower single cane weight (1.20, 1.27 and 1.24 kg respectively) was noted with treatment S_1 (90 cm) during the years 2019-20, 2020-21 and in pooled analysis, respectively (Table 6). In case of millable cane yield, numerically higher millable cane yield (94.25, 106.25 and 100.25 t/ha) was found in treatment S_2 (60-120-60 cm paired row with green manuring) while lower millable cane yield (91.75, 101.11 and 96.43 t/ha) was found in treatment S_1(90 cm) during the years 2019-20, 2020-21 and in pooled analysis, respectively. Similarly, application of 100% RDN through NADEP compost (M_1) recorded significantly higher single cane weight (1.29, 1.35 and 1.32kg) at harvest during the years 2019-20, 2020-21 and in pooled analysis, respectively. However, this treatment was remained statistically at par with treatment like M_2 recorded single cane weight 1.22, 1.32 and 1.27 kg and M_3 recorded single cane weight 1.20, 1.25 and 1.22 kg during the years 2019-20, 2020-21 and in pooled analysis, respectively (Table 6). This increase in the single cane weight under the application of organic sources may be ascribed to the fact that application of adequate amount of in the initial stage of growth resulted high supply of photosynthates leading to more cane yield. Moreover, it might also be due to balanced C:N ratio, increased decomposition, mineralization, availability of native and applied nutrients resulted in accelerated carbohydrates synthesis, led to better translocation from sink to source. These findings are in consonance with the report of Patel and Chaudhari (2018) and Banerjee et al. (2018). In case of millable cane yield, significantly higher millable cane yield (101.67, 112.25 and 106.96 t/ha) was recorded under application of 100% RDN through NADEP compost (M_1) during the year 2019-20, 2020-21 and in pooled analysis, respectively. This treatment was remained statistically at par with the treatment $M_2$and recorded yield 95.00 ,110.05 and 102.53 t/ha during the year 2019-20, 2020-21 and in pooled analysis. Here, year effect on single cane weight and millable cane yield was significant and in both the parameters higher yield was observed during the year 2020-21. This might be due to adequate supply of nutrient element at the right time from organic sources which helped optimum dry matter partitioning from the source to sink during reproductive stage of plant and its effect on improved vegetative growth which ultimately lead to increase in photosynthetic activity of plant and root system and thus enabled plant to extract more water and nutrients from the soil depth, resulted into better development of plant growth and ultimately the higher cane yield was also reported by Singh et al.(2007),

Table 6. Effect of different treatments on cane girth at harvest

Treatments	Cane girth of sugarcane at harvest (cm)		
	2019-20	2020-21	Pooled
Factor I: Spacing			
S_1 - (90 cm)	7.84	8.06	7.95
S_2 - (60-120-60 cm with GM)	8.03	8.19	8.11
S Em±	0.22	0.21	0.17
CD at 5%	NS	NS	NS
Factor II: Compost levels			
M_1-Com. @ 100% RDN	8.06	8.34	8.20
M_2-Com. @ 75% RDN	7.94	8.17	8.05
M_3-Com. @ 50% RDN	8.03	8.05	8.04
M_4 -Com. @ 25% RDN+ ST @ 10 t/ha +JM @ 2000 l/ha)	7.72	7.95	7.84
S Em±	0.30	0.30	0.23
CD at 5%	NS	NS	NS
CV (%)	9.39	9.07	10.09
SXM			
S Em±	0.43	0.43	0.33
CD at 5%	NS	NS	NS
Pooled	**S Em±**		**CD at 5%**
Y	0.17		NS
Y x S	0.23		NS
Y x M	0.33		NS
Y x S x M	0.47		NS

GM: Green Manuring, Com.: NADEP Compost, ST: Sugarcane Trash, JM: Jivamrut

Table 7. Effect of different treatment on single cane weight and millable cane yield at harvest

Treatments	Single cane weight (kg)			Millable cane yield (t/ha)		
	2019-20	2020-21	Pooled	2019-20	2020-21	Pooled
Factor I: Spacing						
S_1 - (90 cm)	1.20	1.27	1.24	91.75	101.11	96.43
S_2 - (60-120-60 cm with GM)	1.21	1.29	1.25	94.25	106.25	100.25
S Em±	0.02	0.02	0.02	2.58	2.14	1.81
CD at 5%	NS	NS	NS	NS	NS	NS
Factor II: Compost levels						
M_1-Com. @ 100% RDN	1.29	1.35	1.32	101.67	112.25	106.96
M_2-Com. @ 75% RDN	1.22	1.32	1.27	95.00	110.05	102.53
M_3-Com. @ 50% RDN	1.20	1.25	1.22	88.83	97.56	93.20
M_4 -Com. @ 25% RDN + ST @ 10t/ha + JM @ 2000 l/ha)	1.12	1.20	1.16	86.50	94.87	90.68
S Em±	0.03	0.03	0.03	3.64	3.03	2.56
CD at 5%	0.10	0.10	0.08	11.05	9.20	7.48
CV (%)	6.78	6.04	7.47	9.59	7.16	9.02
Year mean	1.20	1.28	1.24	93.0	103.7	98.3
S x M						
S Em±	0.05	0.04	0.04	5.15	4.29	3.62
CD at 5%	NS	NS	NS	NS	NS	NS

Pooled	S Em±	CD at 5%	S Em±	CD at 5%
Y	0.02	0.06	1.81	5.29
Y x S	0.03	NS	2.56	NS
Y x M	0.04	NS	3.62	NS
Y x S x M	0.05	NS	5.12	NS

GM: Green Manuring, Com.: NADEP Compost, ST: Sugarcane Trash, JM: Jivamrut

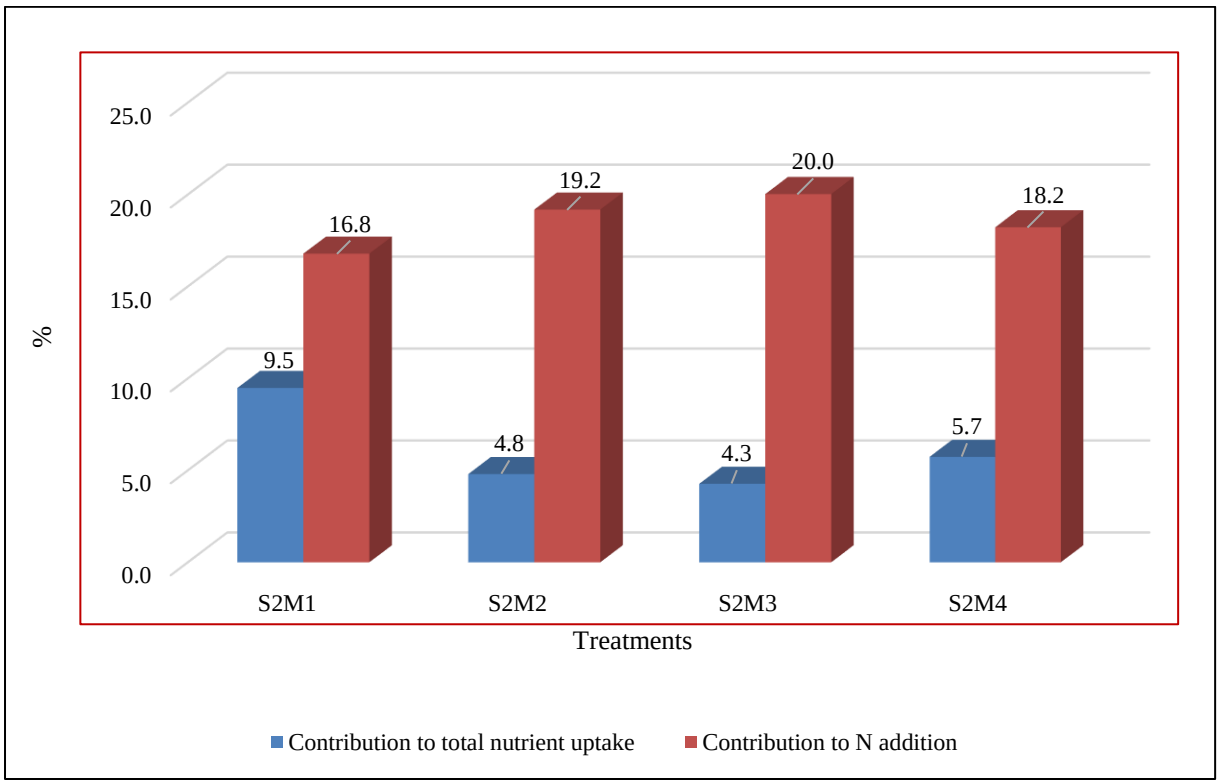

Fig. 1. Contribution of green manuring towards total nutrient uptake and N addition

Soomro et al. (2013), Teshome et al. (2014). and Bairwa et al. (2022). However, single cane weight and millable cane yield at harvest were not affected significantly by any of the interaction of different treatments (S x M, Y x S, Y x M, Y x S x M). Result indicated that none of the spacing treatments and its interaction with compost treatment showed significant effect on growth and yield parameters as well as millable cane yield (Tables 4 to 7). Here, green manuring with dhaincha was done in paired raw spacing treatment. An average 31.9 kg N, 9.7 kg P_2O_5, 22.0 kg K_2O, 633.7 g Fe, 97.2 g Mn, 61.2 g Zn and 18.0 g Cu were added through 1800 kg dry biomass of dhaincha/ha reported earlier in sugarcane crop by Sisodiya et al. (2025). The contribution of green manuring towards total nutrient uptake and addition of N was only 4.3-9.5 and 16.8-20.0 %, respectively (Fig. 1). Further, green manuring crops are known to fix the atmospheric N in soil, however, major portion of their nutritional requirement is fulfilled from the soil and it return with incorporation of green manure crop in soil. It means it's actual contribution in sugarcane nutritional partition much lower than the calculated. This may be reason for non-significant effect of inter spacing green manuring on growth and yield parameters as well as millable cane yield. The aim behind incorporation of this treatment was to reduce the dose of nutrient applied through compost, but it is not served here. Such result was also reported earlier in sugarcane crop by Yadav and Yaduvanshi (2001), Sinha et al. (2014) and Sisodiya et al. (2023).

4. CONCLUSION

It can be concluded that the sugarcane growth, yield and yield attributes as well as economics enumerated with treatment M_1: NADEP @ 100% RDN its, increasing during both the experimental years of experiment. That's might be due to the organic farming positively impacts soil health. The Soil Properties reported enhanced soil fertility with organic treatments and reduced depletion of nutrients. Soil organic carbon improvement might be helpful for nutrient availability as well as biological properties of soil and improvement microbial activity. The sustainable agriculture productivity as well as maintenance of soil fertility available organic resource-based treatment positive impact was noticeable.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declares that no generative AI technologies such as Large Language Models (Chat GPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

Anonymous. (2013). *Indian Sugar Industry: Annual research report – 2013*.

Anonymous. (2020). *First advance estimates of production of food grains for 2019–20*. Ministry of Agriculture and Farmers Welfare, Department of Agriculture, Cooperation and Farmers Welfare. http://agricoop.gov.in/sites/default/filesTim

Anonymous. (2024). *Commodity profile for sugar – March 2023*. http://agricoop.gov.in/sites/default/files/SugarNew29.pdf

Anonymous. (2024a). *APEDA: Organic products*. http://apeda.gov.in/apedawebsite/organic/Organic_Products.htm (Accessed: 07/01/2024)

Anonymous. (2024b). *Advance estimates of area and production of organic farming for 2023–24*. Ministry of Agriculture and Farmers Welfare, Department of Agriculture, Cooperation and Farmers Welfare. http://agricoop.gov.in/sites/default/filesTim

Anonymous. (2024c). *Commodity profile for sugar – March 2024*. http://agricoop.gov.in/sites/default/files/SugarNew29.pdf

Bairwa, R., Jha, C. K., Thakur, S. K., & Kumar, V. (2022). Soil health, cane productivity and juice quality improvement through sugarcane trash management in plant-ratoon system grown in calcareous soil. *Biological Forum – An International Journal, 14*(2), 1091–1094.

Banerjee, K., Puste, A. M., Gunri, S. K., Jana, K., & Barman, M. (2018). Effect of integrated nutrient management on growth, yield, quality and soil health of spring planted sugarcane (Saccharum officinarum) in West Bengal. *Indian Journal of Agronomy, 63*(4), 41–47.

Desai, R. K., & Patel, M. D. (1970). Report on soil survey of Navsari Taluka. In *Technical Bulletin No. 41* (p. 7). Department of Agriculture, Gujarat State.

Deshmukh, M. S., & Babar, N. (2015). Present status and prospects of organic farming in India. *European Academic Research, 3*(4), 4271–4287.

Keniya, B. J., Zinzala, V. J., & Sisodiya, R. R. (2024). Assessment of soil physico-chemical properties in sugarcane cultivation areas of Navsari District, Gujarat, India. *Asian Journal of Soil Science and Plant Nutrition, 10*, 13–20. https://doi.org/10.9734/ajsspn/2024/v10i4377

Patel, D., & Chaudhari, M. (2018). Integrated application of organic, inorganic and biological fertilizers for enhancing sugarcane productivity and improving soil health in plant ratoon cycle. *Journal of Pharmacy and Pharmacology, 7*(3), 1586–1589.

Patel, G. G. (2006). *Sustenance of soil health and productivity of sugarcane through integrated nutrient management in Inceptisols of South Gujarat* (Doctoral dissertation, Navsari Agricultural University).

Singh, K. P., Archna, S., Singh, P. N., & Menhi, L. (2007). Yield and soil nutrient balance of a sugarcane plant–ratoon system with conventional and organic nutrient management in sub-tropical India. *Nutrient Cycling in Agroecosystems, 79*, 209–219.

Sinha, S. K., Jha, C. K., Kumar, V., Kumari, G., & Alam, M. (2014). Integrated effect of bio-methanated distillery effluent and bio-compost on soil properties, juice quality and yield of sugarcane in Entisol. *Sugar Tech, 16*(1), 75–79.

Sisodiya, R. R., Patel, K. G., Dubey, P. K., Zinzala, V. J., Kaswala, A. R., Singh, N., & Vasave, J. B. (2025). Impact of resource-based organic farming on soil fertility in sugarcane fields under South Gujarat climatic conditions. *International Journal of Plant & Soil Science, 37*(3), 285–292. https://doi.org/10.9734/ijpss/2025/v37i35366

Sisodiya, R. R., Vasave, J. B., & Naik, J. R. (2023). Crop residues management: A viable tool for sustainable agriculture. *International Journal of Plant & Soil Science, 35*(19), 1750–1754. https://doi.org/10.9734/ijpss/2023/v35i193724

Soomro, A. F., Shamasuddin, T. F., Chand, O., & Inaitullah, R. (2013). Integrated effect of inorganic and organic fertilizers on the yield and quality of sugarcane (Saccharum officinarum L.). *Pakistan Journal of Botany, 45*(4), 1339–1348.

Teshome, Z., Zeleke, G., & Hagos, F. (2014). Effect of nitrogen and compost on sugarcane (Saccharum officinarum L.) at Metahara Sugarcane Plantation. *Advances in Crop Science and Technology, 2*, 153.

Yada, A. K. (2012). *Organic agriculture: Concept, scenario, principles and practices*. National Centre of Organic Farming, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India.

Yadav, D. V., & Yaduvanshi, N. P. S. (2001). Integration of green manure intercropping and fertilizer-N for yield and juice quality and better soil conditions in sugarcane grown after mustard and wheat in different plant arrangements. *Journal of Agricultural Science, 136*, 199–205.

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