

Effect of Nitrogen Levels on Yield and Yield Attributes of Sugarcane (*Saccharum officinarum* L.) Ratoon

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Abstract

This experiment was conducted during 2008-09 and 2009-10 to assess the optimum doses of nitrogen level for maximizing the yields and yield attributes of sugarcane ratoon. Application of 210 kg N/ha resulted in increased number of millable canes, cane length, number of internodes/ cane, weight of millable canes and cane yields followed by lower doses of nitrogen. The highest yields (168.44 and 109.06 t/ha) were recorded in the first and second ratoon crops. At 180 kg N/ha increase in yield over 150 kg N/ha was found 19.04 and 30.45% more yields but with the enhanced application of further 30 kg N/ha over 180 kg N/ha produced only 4.68 and 6.4% more yields in first and second ratoon crops.

Key words : Sugarcane ratoon, Yield, Yield attributes.

On global basis the contribution of sugarcane to the total sugar production recorded a quantum jump from 64 to 76% in the last one decade. The productivity of sugarcane in india is 63.3 t/ha which is for less than that of efficient sugarcane growing countries like Brazil, Peru, (112.9 t/ha) and Ethiopia (108.0 t/ha). In India, Uttar Pradesh ranks first both in area and production. However, its productivity (56.3 t/ha) is much below the national average (1). In India more than 50 to 55% of sugarcane acreage is occupied by ratoons, which are often poor yielder than the plant cane due to several reasons but small improvement in ratoon productivity would add considerably to overall sugarcane production in the country and benefit both cane growers and mill owners. In general, nitrogen plays a vital role in all living plant tissues (2). It ranks fourth after carbon, hydrogen and oxygen in the per cent of total dry matter of plants and 0.5 to 5.0% of dry weight of plant is constituted by nitrogen and altogether constitutes more than 90% of dry matter (3). Nitrogen is a constituent of protein, vitamins, enzymes, hormones, alkaloids and chlorophyll. Plant growth is adversely affected in its absence (4). Nitrogen have both metabolic and osmotic effects on plant growth (5). Nitrogen is one of the major plant nutrients required in large amounts by the sugarcane and its ratoon. On account of favorable effect of nitrogen on vegetative growth and yield attributes, sugarcane responds well to nitrogen (6—8). Therefore, ra-

toon sugarcane was experimented with different levels of nitrogen to get maximum yields from first and second ratoon crops.

Methods

The field experiment was carried out during spring season of 2008-09 and 2009-10 at BHU Research Farm, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi (UP). Experimental soil was sandy clay loam with pH 7.94, with organic carbon 0.33%, total available nitrogen 184 kg/ha, low available phosphorus and medium available potassium 228 kg/ha. The experiment was conducted under split plot design with three levels of nitrogen (150 kg N/ha, 180 kg N/ha and 210 kg N/ha) and replicated thrice. After the harvest of the cane plant, ratoon was taken as plant material for experimental plot. The cane crop was already planted at a row spacing of 90 cm and plant to plant spacing was not accurate. Some are at 30 cm and others are at a gaps of more than 30 cm apart. After four rows, fifth rows of stubbles were uprooted from the soil to make irrigation channel and boundary wall for the plots. Uprooted stubbles of canes were shifted to vacant places (gap filling) so as to get desired plant population to maximize the yields of sugarcane ratoon and same fields was considered for second ratoon crops in the next year also. Full dose of single super phosphate (SSP)

Table 1. Effect of nitrogen levels on number of millable canes/ha, cane length, number of internodes/cane, weight of millable cane, and cane yield.

Treatments Nitrogen levels (kg N/ha)	Number of millable cane ('000/ha)		Cane length (cm)		Number of internodes/cane		Weight of millable cane (g)		Cane yield (t/ha)	
	2008-09	2009-10	2008-09	2009-10	2008-09	2009-10	2008-09	2009-10	2008-09	2009-10
150	105.28	100.56	371.62	235.96	30.47	28.42	1258.64	645.11	128.17	68.89
180	111.39	108.44	412.22	257.01	37.21	34.44	1455.77	786.77	158.33	99.06
210	112.61	109.67	416.58	262.15	40.80	36.04	1558.58	813.19	168.44	109.06
SE ±	1.01	1.38	4.08	5.06	0.20	0.93	6.74	6.99	1.03	0.48
CD ($P=0.05$)	2.94	4.03	11.92	14.76	0.58	2.73	19.67	20.39	3.00	1.41

and muriate of potash (MOP) and one third of urea was applied at the time of ratooning as a basal dose when stubbles were left for raising ratoon after first irrigation. Rest 2/3 of nitrogen in the form urea was top dressed in two equal split before earthing up in April and May as per-treatments in first as well as in second ratoon crops.

Results and Discussion

Number of Millable Canes/ha

Nitrogen levels exerted significant variations in number of millable canes in both first and second ratoon crops (Table 1). As such the maximum number of canes (112.61 thousand/ha in the first ratoon and 109.67 thousand/ha in second ratoon) were recorded due to application of 210 kg N/ha which remained at par with 180 kg N/ha. However, both were significantly superior as compared to 150 kg N/ha in both first and second ratoon crops of study which might be due to higher doses of nitrogen helped in increasing chlorophyll content of leaves resulted in maximum growth of crop leads to enhanced number of millable cane. These results are confirmed with the findings of Ali et al. (9).

Cane Length (cm)

Higher doses of nitrogen significantly influenced the cane length. The highest cane length were observed due to application of 210 kg N/ha (416.58 m in first ratoon and 262.15 cm in second ratoon) which remained at par with 180 kg N/ha (412.22 and 257.01). However, both were significantly superior than 150 kg N/ha in respect to cane length in both first and second ratoon (Table 1). Higher cane length was due

to more photosynthesis under higher availability of nitrogen (10, 11).

Number of Internodes/Cane

Application of nitrogen significantly augmented the number of internodes upto 210 kg N/ha (40.80 and 36.04) than 150 kg N/ha in both the ratoon and to that of 180 kg N/ha during the first ratoon. Similarly 180 kg N/ha resulted in significant increase in internode number over 150 kg N/ha in both the years of study.

Weight of Millable Cane (g)

That nitrogen fertilization also increased the cane weight significantly upto 210 kg N/ha and recorded highest millable cane weight of 1,558.58 and 813.19 g during 2008-09 and 2009-10 respectively, which were significantly superior over 180 and 150 kg N/ha (Table 1). Similarly 180 kg N/ha resulted in significant improvement in weight of millable cane than 150 kg N/ha in both the years of ratoon crops. The higher doses of nitrogen accumulates more food material within the plants by increased photosynthetically active leaves (6).

Cane Yield (t/ha)

Table 1 further revealed that maximum cane yields of 168.44 t/ha in first ratoon and 109.06 t/ha in second ratoon were recorded due to application of 210 kg N/ha which were significantly higher than 180 and 150 kg N/ha. More number of millable canes/ha, cane length, girth and weight of millable cane resulted in increased cane yield (12). The lowest cane yields of (128.17 and 68.89 t/ha) were recorded with 150 kg N/

ha in both first and second ratoon crops. Application of 210 kg N/ha increased cane yield to a tune of 19.04 and 30.45% over 150 and 180 kg N/ha respectively during first ratoon crop and 23.90 and 36.83% during second ratoon. The percentage of increase in yield of 180 kg N/ha over 150 kg N/ha were found more effective than 210 kg N/ha over 180 kg N/ha (4.86 and 6.4% only).

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