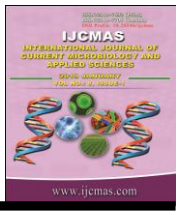
Int.J.Curr.Microbiol.App.Sci (2019) *8*(1): 77-82

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 8 Number 01 (2019)**
Journal homepage: http://www.ijcmas.com



Original Research Article https://doi.org/10.20546/ijcmas.2019.801.010

Effect of Integrated Nutrient Management on Growth, Yield, Quality and Economics of Fodder Sugar Beet (*Beta vulgaris*) Varieties

K.R. Patel* and M.M. Patel

N.M. College of Agriculture, Navsari Agricultural University, Navsari, Gujarat-396450, India

**Corresponding author*

Keywords

Integrated nutrient management, *Azotobacter*, Biofertilizer, Sugar beet, Varieties, Net realization, PSB, Potash solubilizing bacteria

Article Info

Accepted:
04 December 2018
Available Online:
10 January 2019

A B S T R A C T

A field experiment was conducted during *rabi* season of 2016-17 at the College Farm, N. M. College of Agriculture, Navsari Agricultural University, Navsari to study the "Effect of integrated nutrient management on growth, yield, quality and economics of fodder sugar beet (*Beta vulgaris*) varieties". Total ten treatment combinations comprising of two varieties *viz*., V_1: JK kuber and V_2: JK magnolia and five levels of integrated nutrient management *i.e.* F_1 : 100% RDF (RDF: 120 : 60 : 60 NPK kg/ ha), F_2 : 75 % RDF+ 25% N through BC, F_3 : 75 % RDF + 25 % N through BC + bio-fertilizer (*Azotobacter* + PSB + Potash solubilizing bacteria, 10^8 CFU/ml, 1.25 lit/ha each), F_4 : 50 % RDF + 50 % N through BC and F_5 : 50 % RDF + 50 % N through BC + bio-fertilizer (*Azotobacter* + PSB + Potash solubilizing bacteria, 10^8 CFU/ml, 1.25 lit/ha each) were evaluated in factorial randomized block design with four replications. Significantly improved plant height, number of leaves per plant, dry matter accumulation per plant, root length and fresh foliage yield was observed in JK magnolia (V_2), while root weight, fresh root yield and total fresh biomass yield were significantly higher in JK kuber (V_1). All the growth and yield parameters *viz*., plant height, number of leaves per plant, dry matter accumulation per plant, root length, root weight as well as yield such as fresh root yield, fresh foliage yield and total fresh biomass were significantly influenced due to integrated nutrient management. All these parameters beared higher values with application of 50 % RDF + 50 % N through BC + bio-fertilizer (F_5) followed by 75 % RDF + 25 % N through BC + bio-fertilizer (F_3). Maximum net realization (□ 108353 ha^{-1}) and BCR (3.14) were registered under JK kuber (V_1) followed by JK magnolia (V_2) with net realization of □ 98119 ha^{-1} and BCR of 2.94. Whereas looking to the integrated nutrient management, application of 50 % RDF + 50 % N through BC + bio-fertilizer (F_5) accrued the maximum net realization of □ 114897 ha^{-1} and BCR of 3.25 followed by application of 75 % RDF + 25 % N through BC + bio-fertilizer (F_3) with net realization of □ 110147 ha^{-1} and BCR of 3.17.

Introduction

India supports nearly 20 per cent of the world's livestock being the leader in cattle (16%), buffalo (55%), goat (20%) and sheep (5%) population. The livestock sector contributes 32 per cent of the agricultural output which is 22 per cent of the total GDP in India. Deficiency in feed and fodder has been identified as one of the major component in achieving the desired level of livestock production. The shortage in dry fodder is 21.8

per cent compared with requirement of 560 million tones for the current livestock populations (Anonymous, 2009). The low productivity and poor performance of the livestock are mainly due to unavailability of nutritious fodder in sufficient quantity. The availability of nutritious fodder is inadequate in the country. India faces a net deficit of 61 percent green fodder, 21.9 percent dry crop residues and 64 percent feed. The most important constraints in the fodder production and productivity are the non-availability of improved variety of fodder crop.

Sugar beet (*Beta vulgaris*) belonging to family *Amaranthaceae*, is a biennial crop grown for its fleshy and swollen roots. It is being cultivated in many parts of the world for sugar, fodder and vegetable purpose. It can be successfully grown as a fodder crop and used as valuable source of green fodder. The high crude protein and sugar content makes it more palatable, nutritious and energy feed and having a good scope for livestock industry in India. However, its cultivation in India as fodder crop is not common. The objective of the present study was to evaluate the effect of integrated nutrient management on growth, yield and quality of fodder sugar beet varieties.

Materials and Methods

A field experiment was conducted during *rabi* season of 2016-17 at the College Farm, N. M. College of Agriculture, Navsari Agricultural University, Navsari. Geographically, Navsari is situated at 20º 57' North latitude, 72º 54' East longitudes and has an altitude of 10 meters above the mean sea level. It is located 12 km away in the East from the great historical place "Dandi" on the Arabian seashore. The soil of the experimental plot was clayey in texture and slightly alkaline in reaction (pH: 8.14), low in available nitrogen (231kg/ha), moderately high in available phosphorus (37kg/ha), fairly rich in available potassium (458 kg/ha) and moderately high in organic carbon (0.72 %).

A field experiment was laid out in factorial randomized block design with four replications, comprising of two varieties *viz.*, V_1: JK kuber and V_2: JK magnolia and five levels of integrated nutrient management *i.e.*, F_1 : 100 % RDF (RDF: 120 : 60 : 60 NPK kg/ ha), F_2 : 75 % RDF+ 25% N through BC, F_3 : 75 % RDF + 25 % N through BC + bio-fertilizer (*Azotobacter* + PSB + Potash solubilizing bacteria, 10^8 CFU/ml, 1.25 lit/ha each), F_4 : 50 % RDF + 50 % N through BC and F_5 : 50 % RDF + 50 % N through BC + bio-fertilizer (*Azotobacter* + PSB + Potash solubilizing bacteria, 10^8 CFU/ml, 1.25 lit/ha each).

Sowing of fodder sugar beet was done manually at 45 x 20 cm spacing on raised beds (60 cm breadth x 20 cm depth). The recommended fertilizer dose (100 % RDF) of N, P and K was 120, 60 and 60 kg/ha respectively, of which half dose of N and full dose of P and K were applied as basal while remaining half dose of N was applied in two equal splits at 45 and 90 DAS as per treatments.

Nitrogen, phosphorus and potash were supplied through urea, single super phosphate and muriate of potash, respectively. Bio compost was applied on the basis of N content as per treatment at 20 days before sowing. Biofertilizer (*Azotobacter*, PSB and Potash solubilizing bacteria) were applied as seed inoculation at 24 hrs before sowing as per the treatments. All other recommended practices were followed. The data recorded for different parameters were statistically analysed with the help of analysis of variance (ANOVA) technique for a factorial randomised block design.

Results and Discussion

Growth and yield attributes

Growth and yield parameters *viz.*, plant height, number of leaves per plant, dry matter accumulation per plant, root length and root weight were significantly influenced by different varieties (Table 1). JK magnolia (V_2) recorded significantly higher value for plant height, number of leaves per plant, dry matter accumulation per plant and root length as compared to JK kuber (V_1).While root weight was significantly higher in JK kuber (V_1). The difference in growth and yield attributes might be due to genetic make-up of plant itself. These findings are in close agreement with those reported by Sanghera *et al.*, (2016).

Significant difference was observed among integrated nutrient management for growth and yield attributes (Table 1). Application of 50 % RDF + 50 % N through BC + bio-fertilizer (F_5) produced significantly higher plant height, which was statistically at par with 75 % RDF + 25 % N through BC + bio-fertilizer (F_3) and 50 % RDF + 50 % N through BC (F_4). Number of leaves per plant, dry matter accumulation per plant, root length and root weight were recorded significantly higher under 50 % RDF + 50 % N through BC + bio-fertilizer (F_5)but it remained statistically at par with 75 % RDF + 25 % N through BC + bio-fertilizer (F_3).

Yield

Significant differences in fresh root yield, fresh foliage yield and total fresh biomass yield were recorded due to varieties and integrated nutrient management (Table 2). Among the two varieties, JK kuber (V_1) produced significantly higher fresh root yield (38.33 t/ha) and total fresh biomass yield (52.99 t/ha) as compared to the JK magnolia (V_2). Increased value of fresh root yield and total fresh biomass yield was attributed to higher value of root weight. In case of fresh foliage yield, JK magnolia (V_2) produced significantly higher (16.67 t/ha) as compared to JK kuber (V_1).This results might be due to overall improvement in vegetative growth as evidenced by higher plant height and number of leaves due to its genetic character of faster canopy development. These results are in line with those reported by Singh and Grag (2013).

Among the integrated nutrient management, application of 50 % RDF + 50 % N through BC + bio-fertilizer (F_5) being statistically at par with 75 % RDF + 25 % N through BC + bio-fertilizer (F_3) and 50 % RDF + 50 % N through BC (F_4),produced significantly higher fresh root yield (38.28 t/ha), fresh foliage yield (17.06 t/ha)and total biomass yield (55.34 t/ha). This might be due to adequate supply of nutrient from inorganic fertilizers with use of organic manure and bio-fertilizers. Bio-compost contains more essential plant nutrients, vitamin, hormones, enzymes and other beneficial microbes *etc*. had better effect on yield attributes due to improvement in the soil fertility. It also releases the nutrients slowly for the benefits of crop during entire crop growth period. These findings are in agreement with Bhullar *et al.*, (2010).

Quality

Varieties did not exert significant influence on crude protein content in root and foliage of fodder sugar beet (Table 1). Maximum crude protein content in root (4 %) and foliage (13 %) was observed under JK magnolia (V_2) and JK kuber (V_1), respectively. This might be due to better availability of nitrogen to different plant parts. While, integrated nutrient management has exert significant improvement on crude protein content in root and foliage of fodder sugarbeet (Table 1). Application of 50 % RDF + 50 % N through BC + bio-fertilizer (F_5) recorded significantly higher crude protein in root and foliage (4.18 and 13.59 per cent, respectively)

Table.1 Effect of integrated nutrient management on growth, yield attributes and quality of fodder sugar beet varieties

Treatments	Plant height (cm)	No. of leaves	Dry matter accumulation per plant (g)	Root length (cm)	Root weight (g)	Crude protein content (%)	
						Root	**Foliage**
Varieties (V)							
JK kuber	43.95	18	125	19.82	488	3.98	13.00
JK magnolia	46.88	22	156	22.12	410	4.00	12.70
SEm±	0.95	0.4	2.45	0.31	9	0.06	0.16
CD (P=0.05)	2.75	1.2	7.11	0.89	26	NS	NS
Integrated nutrient management (F)							
100% RDF (RDF: 120 : 60 : 60 NPK kg/ ha)	40.67	18	119	18.69	391	3.78	12.04
75 % RDF+ 25% N through BC	44.17	19	131	20.22	435	3.91	12.50
75 % RDF + 25 % N through BC + Bio-fertilizer (*Azotobacter* + PSB + Potash solubilizing bacteria)	47.12	21	149	22.25	471	4.08	13.23
50 % RDF + 50 % N through BC	46.10	20	145	20.62	446	3.98	12.87
50 % RDF + 50 % N through BC + Bio-fertilizer (*Azotobacter* + PSB + Potash solubilizing bacteria)	49.00	22	158	23.09	500	4.18	13.59
SEm±	1.50	0.6	3.88	0.49	14	0.09	0.26
CD (P=0.05)	4.35	1.9	11.25	1.41	41	0.25	0.76

RDF, Recommended dose of fertilizer; BC, Biocompost; PSB, Phosphorus Solubilizing Bacteria

Table.2 Effect of integrated nutrient management on yield and economics of fodder sugar beet varieties

Treatments	Yield (t/ha)			Gross realization (□ /ha)	Net realization (□ /ha)	B:C ratio
	Fresh root	**Fresh foliage**	**Total fresh Biomass**			
Varieties (V)						
JK kuber	38.33	14.66	52.99	158983	108353	3.14
JK magnolia	32.92	16.67	49.58	148749	98119	2.94
SEm±	8.98	3.50	9.54	--	--	--
CD (P=0.05)	26.07	10.16	27.70	--	--	--
Integrated nutrient management (F)						
100% RDF (RDF: 120 : 60 : 60 NPK kg/ ha)	32.03	14.00	46.03	138085	87998	2.76
75 % RDF+ 25% N through BC	34.05	15.50	49.54	148632	98217	2.95
75 % RDF + 25 % N through BC + Bio-fertilizer (*Azotobacter* + PSB + Potash solubilizing bacteria)	37.57	16.08	53.65	160936	110147	3.17
50 % RDF + 50 % N through BC	36.20	15.69	51.89	155663	104920	3.07
50 % RDF + 50 % N through BC + Bio-fertilizer (*Azotobacter* + PSB + Potash solubilizing bacteria)	38.28	17.06	55.34	166015	114897	3.25
SEm±	14.20	5.53	15.09	--	--	--
CD (P=0.05)	41.23	16.06	43.79	--	--	--

RDF, Recommended dose of fertilizer; BC, Biocompost; PSB, Phosphorus Solubilizing Bacteria

It was statistically at par with 75 % RDF + 25 % N through BC + bio-fertilizer (F_3) and 50 % RDF + 50 % N through BC (F_4). The improvement in crude protein content in root and foliage due to combined effect of inorganic fertilizer, organic manure and biofertilizer which may increase by nitrogen content in root and foliage. These results are in conformity with the finding of Yadav *et al.*, (2007) and shekara *et al.*, (2009) in fodder sorghum

Economics

The economic parameters for fodder sugar beet were calculated and presented in Table 2. Among two varieties, JK kuber (V_1) secured maximum net realization of 108353 ha^{-1} and BCR value of 3.14 followed by JK magnolia (V_2) with net realization of 98119 ha^{-1} and BCR value of 2.94. In case of integrated nutrient management, maximum net return of 114897 ha^{-1} and BCR value of 3.25 were achieved with application of 50 % RDF + 50 % N through BC + bio-fertilizer (F_5) followed by application of 75 % RDF + 25 % N through BC + bio-fertilizer (F_3) with net return of 110147 ha^{-1} and BCR with 3.17.

On the basis of results obtained in present investigation, it can be concluded that for achieving higher yield, profitability and quality of fodder sugar beet with lowest cost of cultivation, variety JK kuber should be grown with application of 50 % RDF (RDF: 120 : 60 : 60 N, P_2O_5, K_2O kg ha^{-1}) + 50 % N through bio-compost.

References

Anonymous 2009. Hand Book of Agriculture (Indian Council of Agricultural Research), New Delhi-110 012.

Bhullar, M. S., Uppal, S. K. and Kapur, M. L. 2009. Effect of agronomic practices and varieties on productivity of sugarbeet (*Beta vulgaris* L.) in semi-arid region of Punjab. *J. Res. Punjab agric. Univ.* 46: 6-8.

Sanghera, G. S., Singh, R. P., Kashyap, L., Tyagi, V. and Sharma, B. 2016.Evaluation of sugar beet genotypes (*Beta vulgaris* L.) for root yield and quality traits under subtropical conditions. *J. Krishi Vigyan*, 5(1): 67-73.

Shekara, B. J., Lohithaswa, H. C. and Pavan, R. 2009. Effect of different sources of nutrients on green forage yield and quality of multicut fodder sorghum (*Sorghum bicolor* L. *Moench*). *Forage Res.*, 35(3): 137-142.

Singh, D. and Garg, A. K. 2013. Fodder beet-A promising fodder crop for dairy animals. *Indian Farming* 61(10): 10-13.

Yadav, P. C., Sadhu, A. C. and Swarnkar, P. K. 2007. Yield and quality of forage sorghum (*Sorghum sudanense*) as influenced by the integrated N management. *Indian J. Agron.*, 52: 330- 334.

How to cite this article:

Patel, K.R. and Patel, M.M. 2019. Effect of Integrated Nutrient Management on Growth, Yield, Quality and Economics of Fodder Sugar Beet (*Beta vulgaris*) Varieties. *Int.J.Curr.Microbiol.App.Sci.* 8(01): 77-82. doi: https://doi.org/10.20546/ijcmas.2019.801.010