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Article

Production performance of sugar beet (*Beta Vulgaris*) at in-situ condition of BLRI-RS Baghabari

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Abstract: Field experiments were conducted at the Experimental Farm of Bangladesh Livestock Research Institute, Regional Station, Baghabari, Shahjadpur; Sirajgonj during the economic year 2018-19, this experimental design was split-plot in (CRD) with three replications. The main objective of this study was to evaluate the production performance and proximate contentment of *Beta vulgaris* in loamy soil at the station. Results revealed that, the highest fresh plant weight with leaf was observed in plot 1 and lowest in plot 3 (P>0.05). Insignificantly higher fresh root weight was observed in plot 1 and lowest in plot 3. Fresh leaf weight, number of plant and survivability percentage were high in plot 1 than others plot but they did not significantly (P>0.05) differed.

Keywords: randomized complete design (CRD); *Beta vulgaris*; fresh weight; survivability

1. Introduction

Bangladesh is an agricultural based country. 80% of the people are involved in agriculture. Like other crops such as- paddy, wheat, sugar cane, sugar beet is a cash crop; farmers can earn more profit than sugarcane by cultivating vegetables, fruits and some other crops. Most farmers want to produce more than one crop in a year from one field, therefore, are not interested in producing the perennial crop like sugarcane. Farmers usually do not get proper amount of money in time after supplying the sugarcane in the mill. This is another important reason for reduction of sugarcane cultivation. In Bangladesh, the yield of sugarcane and the recovery rate of sugar from sugarcane is the lowest in the world. The consumption of sugar in Bangladesh is increasing every year. The demand of sugar in 2015-16 has increased by 15 per cent over 2014-15. Sugar beet (*Beta vulgaris*) is one of the most important raw materials for producing sugar. Sugar beet are of various kinds and color. Our crops were white type. Its looks like sweet potato. The pulp, green leaves of sugar beet used as animal feed. It is so much useful and healthier. Round in shape, higher density and contain large amount of sucrose. We may get 15-20% more sugar from beet than sugar cane. It is a temperate crop; however, it can be grown in a wide range of climatic conditions. Sugar beet contains sucrose up to 21% (Memon *et al*., 2004). About 120 countries are recognized for sugar production; among those 40 countries utilize sugar beet for sugar production. Sugar beet root yield varied between 5000-9000 kg/ha (Faddan fad) = 0.42 hectare (ha)) and sugar content varied between 12 and 16% according to growing conditions and climate changes (Turgut, 2012). The sugar beet crop can be also considered an important renewable energy factor (Panella, 2010), that makes an annual contribution of 1.6 million tons of sugar syrup for the bioethanol (also known as ethyl or grain alcohol) production, according to the International Confederation of European Beet Growers. The bioethanol is mainly obtained due to fermentation of agricultural crops, such as corn grain, sugar beet, sugar cane and vegetable residues (Rodríguez *et al*., 2010)

and can be a suitable alternative to replace fossil fuels (Hammerschlag, 2006). The sugar production from sugar beet is under experiment. The growing period from sowing to harvesting is 170–200 days. A mature sugar beet root can grow to 1–2 kg (2.2–4.4 pounds) and can contain 8–22 percent sucrose by weight. Sugar beet harvesting usually starts in late September or early October for summer crops and is performed rapidly so as to finish before the soil freezes.

2. Materials and Methods

2.1. Site of the experiment

The experiment was conducted at Bangladesh Livestock Research Institute (BLRI) regional Station, Baghabari, Shahjadpur, Sirajganj - 6770 from January to June, 2019. The physical and chemical characteristics of experimental soil was tested in the previous year for pH, nitrogen, organic matter, salinity and mineral contents at the Central Laboratory of Soil Resource Development Institute (SRDI), Krishi Khamar Sharak, Farmgate, Dhaka. Constituents of loamy soil are given in Table 1.

2.2. Cultivation procedure of sugar beet

An agronomic trial was conducted at regional station in five plots with *Beeta vulgaris* (Sugar beet) collected from Agricultural Extension office, Shahjadpur, Sirajgonj. The main objectives were to investigate the biomass yield, morphological characteristics, botanical fractions and nutritive value. The selected Sugar beet was grown under identical condition having plot size of 10 x 10 sq.ft. with three replications in each Plot. Therefore, a total of 15 plots were made for this agronomical trial. All the agronomical practices were step by step as per recommended practices developed by AEO. During land preparation fermented cow dung was applied @ of 60 kg/decimal. We also used water, gypsum, potash, urea as fertilizer. The seeds are treated with disinfectants for black root disease, fungal infection. Precautions must also be taken against damage by worms, beetles, and nematodes. Seeds are showed at a depth of 2 to 4 cm (0.75 to 1.5 inches). Fertilizers are applied simultaneously from the beginning of sowing through the entire growth period with the seeds, and after covering, herbicides are applied by spray. The germination of the seeds occurs about 10 days after sowing. Seeds were sowed after 7to 8 times of harvesting. Fertilizers used and their amount for each decimal is given in Table 2.

2.3. Chemical analysis

The chemical analysis of the sample was done by the following methods described by AOAC (1995). Acid detergent fiber (ADF) was estimated by using the methods of Goering and Van Soest. Kjeldhal method was used for determining the nitrogen (N) content of the sample and the crude protein content was estimated as N × 6.25. The ME (MJ kg-1 DM) was estimated according the Ketelaars and Tolkamp (1992) as follows: DOMD (%) = 75.73-(0.269 × ADF%); ME (MJ kg-1 DM) = DOMD (%) x 0.15.

2.4. Design of the experiment

The experiment on production trial of Sugar Beet (*Beeta vulgaris*) was conducted in Completely Randomized Design (CRD).

2.5. Layout of the experiment

There were five (5) plots having homogenous soil characteristics taken and each of the plot size was10ft×10ft. There were five replications for each plot.

2.6. Statistical analysis

Collected data were analyzed statistically by using Compare Means (CM) procedure of one-Way Analysis of variance (ANOVA): Post Hoc Multiple Comparisons of SPSS 20.0 for windows (SPSS Inc. 2002) following the method of Randomized Complete Randomized Design (CRD).

3. Results and Discussion

3.1. Root fresh weight (g/plant)

The highest root fresh weight was 478.0 g/plant was obtained at 150 days with organic fertilizers and cow dung at the first season (Table 3) and Comparatively lower production observed in others plots. These results are slightly lower production explaining with those reported by El-Sayed & Yousif (2003), Ouda (2007) and Hellal *et al*. (2009). Concerning to bio-fertilization treatment gave the heaviest root fresh weight were 1420.3 and 942.5 g/plant in 180 days of production system because bio-fertilization treatment increases the root fresh weight may be due to the role of bio-fertilization in nitrogen fixation via free living bacteria which reduce the

soil pH especially in the rhizo-sphere which led to increase the availability of most essential macro and micro-nutrients, consequently increase growth and root weight. These findings were in harmony with those reported by Suslow *et al.* (1979) and Bassal *et al*. (2001). Though the production parameter observed in plot no 1 was higher but did not significantly differed (P>0.05).

3.2. Root weight (g)

The highest root weight was 393.60 g was obtained at 150 days, respectively, from urea and cow dung treatments in the first season. These results are in line with those reported by Sobhy *et al*. (1999), Kandil *et al*. (2004), Osman (2005) and Saleh (2007). Data in Table 3, clear that root dry weight was insignificantly affected by biofertilization treatment in the different growth stages whole duration of the experiment. The same results were obtained by Mrkovack *et al*. (1997) and Abo EL-Goud (2000).

3.3. Leaf weight (g)

The greatest value of fresh leaf weight was 84.40 and minimum fresh weight was 38.0 g was achieved at 150 days in first season. This result in accordance with that found by Zalat (2002), NemeatAlla (2004), Kandil *et al*. (2004) and Saleh (2007). Concerning the effect of biofertilization treatments on leaf fresh weight (g), The biofertilization treatments had a variable trend with respect to leaf fresh weight, where the highest values were 90.29, 158.09 and 111.46 g at 140, 160 and 180 days from ntrobin, respectively, in the first season. These results are in stand with those confirmed by Stajner *et al*. (1997), Abo EL-Goud (2000) and Saleh (2007).

3.4. Survivability percentage and no of plant (par plot)

The highest survivability percentage and no plant (thousand/ha) were observed in plot 4 and plot 1 respectively than others plot (Table 3).

3.5. Nutrient composition of *Beeta vulgaris* (Sugar beet)

The proximate component of sugar beet may very on the basis of season of the year and stage of harvesting. The average proximate component is given in the Table 4.

Table 1. Physical and chemical analyses of the experimental soil.

Components	Amount(s)
pH	6.21
Organic Matter (%)	1.73
Total Nitrogen (%)	0.085
Potassium (Millitulanko/100g)	0.14
Calcium (Millitulanko/100g)	8.01
Magnesium (Millitulanko/100g)	1.47
Sodium (Millitulanko/100g)	0.14
Phosphorus (µg/g)	11.60
Sulphur (µg/g)	2.49
Boron (µg/g)	0.58
Copper (µg/g)	1.26
Iron (µg/g)	55.60
Manganese (µg/g)	4.20
Zinc (µg/g)	3.33

Source: Effect of different soil types on growth and production of Napier-4 at the Regional Station of BLRI Asian J. Med. Biol. Res. 2017, 3 (2).

Table 2. Amount and types of fertilizer were applied in experimental plots.

Types of fertilizer	Amount(g)/ decimal
Urea	1000
TSP	500
MOP	900
Gypsum	400
Zinc	40
Phosphorus	40
boron	80
Cow dung	60kg

Table 3. Production performance of *Beeta vulgaris* (Sugar beet).

Parameter	Plot(Mean±SE)					P Value	Level of significance
	1	2	3	4	5		
Root fresh weight with leaf(g/plant)	478.0±70.57^{a}	248.40±70.57^{ab}	224.40±70.57^{bc}	266.0±70.57^{b}	229.20±70.57^{c}	0.70	NS
Root fresh weight (g/plant)	393.60±57.72^{a}	210.40±57.72^{ab}	178.80±57.72^{bc}	219.20±57.72^{b}	189.60±57.72^{c}	0.65	NS
Leaf weight (ton/ha)	84.40±19.57^{a}	38.00±19.57^{c}	45.60±19.57^{ab}	46.80±19.57^{b}	39.60±19.57^{bc}	0.14	NS
Existing plant no(thousand/ha)	54.00±0.97^{a}	44.00±0.97^{ab}	42.00±0.97^{bc}	50.00±0.97^{b}	40.00±0.97^{c}	0.12	NS
Survivability%	51.81±4.37^{b}	43.82±4.37^{c}	47.97±4.37^{ab}	54.00±4.37^{a}	44.90±4.37^{bc}	0.15	NS

NS= Non significant(P>0.05)

Table 4. Average proximate component of Sugar beet (*Beta vulgaris*).

DM%	Moisture%	CF		CP%	Ash%	ME (MJkg^{-1} DM)
		ADF%	NDF%			
16.45	84.55	15.02	22.67	6.25	2.14	10.76

4. Conclusions

The observed results revealed that sugar beet may be the potential source for livestock feed ingredients.

Conflict of interest

None to declare.

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