

Productivity of Tropical Sugarbeet Varieties in Respect of Growth, Yield and Quality

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ABSTRACT

An experiment on agronomic performance of sugarbeet (*Beta vulgaris* L.) was conducted during 2003-2004, 2004-2005 and 2005-2006 cropping seasons at Bangladesh Sugarcane Research Institute (BSRI) farm, Ishurdi, Pabna. Sugarbeet varieties developed by HILLSHOG Research Institute of France for tropics and sub-tropics viz. Subhra, Cauvery, Dorotea, Posada, Synchro and HI 0064 were undertaken as test materials in the study. The results of the experiment showed that beet yields were varied with growing seasons and varieties. Highest yield (82.0 t ha⁻¹) was obtained by variety Dorotea which was planted in February in 2003-2004 and the lowest (22.5 t ha⁻¹) was recorded in variety Cauvery which was planted in November, 2004 in 2004-2005 cropping season. Growth parameters like beet height, girth and weight were found variable in different varieties. Pol % of different varieties was varied with seasons. Beet yield and pol % were found higher in February planted compared to that of November. It is revealed that sugarbeet cultivation in Bangladesh is possible successfully.

Key words : Sugarbeet, tropical variety, productivity

INTRODUCTION

Sugarbeet (*Beta vulgaris* L.) is the second most important crop for sugar production in the world and recently it is used as an important material for ethanol production as bio-fuel. According to FAO France, Germany, USA, Russia and Ukrain are the major sugarbeet producing country of the world. They produced 29.0, 25.0, 25.0, 22.0 and 16.0 million metric tons of sugarbeet respectively in 2005 (Anon., 2006). Sugarbeet is a temperate crop, generally grown in Europe, North America and temperate zones of Asia (Anon., 2005). Recent achievements of research on tropicalizing sugarbeet and developing varieties suitable for sub-tropical and tropical agro-climatic conditions indicated that the crop also can be grown in Bangladesh. With the assistance of Syngenta Bangladesh Ltd., Agronomy and Farming Systems Division of Bangladesh Sugarcane Research Institute (BSRI) had undertaken several studies at institute's farm on field performance of sugarbeet varieties developed by HILLSHOG Research Institute. These varieties were developed specially for cultivation in sub-tropical and tropical regions. Sugarbeet roots contain 15-16 per cent sucrose and in the process of sugar extraction 10-12 per cent recovery is obtained. The crop remains in the field only for six months. Optimum pH range for beet production is 6.5 to 8.0 but also grows well in soil with pH 9.5 or those affected with severe salinity, where other crops fail to grow (Motiwale *et. al.*, 1991). Moisture level plays a vital role in root development and crop growth in sugarbeet. It is reported that depending on the soil types and rainfall, sugarbeet requires 8-10 irrigation (Ustimenko-Barumovsky, 1983). Sugarbeet is not only the source of sugar but also provides several useful by-products. One hectare of sugarbeet yields 20-22 tonnes of beet tops which can fed to the cattle by mixing it with other feeds. Sugarbeet pulp, a factory product, is also used as a cattle feed and molasses is used by only as a supplementary crop to augment sugar production (Singh *et al.*, 1985).

MATERIALS AND METHODS

Field experiments were carried out at Bangladesh Sugarcane Research Institute (BSRI) farm, Ishurdi, Pabna during 2003-2004, 2004-2005 and 2005-2006 cropping seasons under irrigated condition. The soils of the experimental plots were sandy loam with medium high land having pH 7.6 to 7.8. The climate of this location is sub-tropical. Six sugarbeet varieties viz. Subhra, Cauvery, Dorotea, Posada, Synchro and HI 0064 were studied in the experiment and each variety considered as individual treatment. The experiment was laid out in randomized complete block design (RCBD) with three replications. Individual plot size was 8 m x 5 m. The land was ploughed by power tiller and then light ridges were made for seed sowing. Polished sugarbeet seeds sown on ridge at 3-4 cm depth. The distance between two ridges was 50 cm and seed to seed 20 cm. Two seeds per pit were sown to ensure desired population. Farm yard manure (FYM), Urea, TSP, MP, Gypsum, Zinc sulphate and Boric acid were applied as the rate of 15.0 t ha⁻¹, 260 Kg ha⁻¹, 100 Kg ha⁻¹, 225 Kg ha⁻¹, 100 Kg ha⁻¹, 10 Kg ha⁻¹ and 7 Kg ha⁻¹ respectively. All FYM, TSP, MP, Gypsum, Zinc sulphate and Boric acid were applied at the time of final land preparation. Urea was applied in two installments at 30 and 60 days after sowing. Among the tested varieties Posada and Dorotea were multi-germ and each sugarbeet seed gave rise 2-3 plants. So, singling operation was done to maintain one plant per pit after 2-3 weeks. After singling, thinning was done at 3-4 weeks after sowing to keep plant to plant distance of 20 cm. Sugarbeet plot was kept free from weed upto harvesting. Six irrigations were applied during vegetative period of the crop. Dithane M 45 solution (0.45%) at an interval of 10 days for three times was sprayed for controlling *Cercospora* leaf spot and *Sclerotium* root rot. For control insect pest relclothrin 10 EC (cypermethrin) was sprayed three times @ 1.0 ml per litre water.



Figure 1. Sugarbeet seed sowing



Figure 2. Sugarbeet crop



RESULTS AND DISCUSSION

Beet yields were found variable with growing seasons and variety (Table 1, 2 & 3). Comparatively higher beet yield (mean yield 63.7 t ha⁻¹) was found in 2003-2004 and it was lower (mean yield 25.1 t ha⁻¹) in 2004-2005 cropping year when beet was grown in November, 2004 to April, 2005 period. Highest beet yield of 82.0 t ha⁻¹ was produced by variety Dorotea in 2003-2004 cropping season but the same variety gave only 38.0 t ha⁻¹ beet yield in 2005-2006 season. During 2003-2004 cropping season, the highest beet yield of 82.0 t ha⁻¹ was produced in variety Dorotea where as variety HI 0064 produced only 50.0 t ha⁻¹. In 2004-2005 cropping year two varieties Subhra and Cauvery were cultivated in two growing seasons which produced almost identical yields in the same season and the highest average yield of 40.5 t ha⁻¹ was obtained in February-July, 2005 growing season. Yield of commercially cultivated sugarbeet in different countries ranges 15.0 to 115.0 tons per hectare (Britannica Concise, 2007). The average beet and sugar yields in major growing countries were found 42.0 and 7.7 tha⁻¹ respectively (Encyclopaedia of Agril. Sc. V. 4, 1994). But increases in yield performance and enhanced

technical quality have been achieved through continuous progress in breeding and improvement in crop management systems. Even different varieties developed for cultivation in sub-tropics and tropics performed better compare to temperate areas where the crop was originated.

Sugarbeet variety Posada was infested by *Cercospora* sp. Nematode infection was not present in matured sugarbeet but it was found in the fibrous root system and also in the soil concluding more their presence is not harmful for sugarbeet cultivation in our condition.

In the studies, beet leaves were infested by some lepidopterous insect, which were caterpillar of cutworm. No varietal difference in infestation was observed. White grubs were also found in the soil around the sugarbeet causing feeding marks on root.

Table 1. Yield performance of sugarbeet varieties. (growing season: February-July, 2004).

Sl. No.	Variety	Beet yield (t ha ⁻¹)
1	Dorotea	82.0
2	HI 0064	50.8
3	Posada	59.0
Mean		63.7

Table 2. Growth, yield and sugar content of different sugarbeet varieties. BSRI, 2004-2005.

Variety	Growing season November 2004-April 2005				Growing season February-July 2005			
	Beet hight. (cm)	Beet girth (cm)	Beet wt. (gm)	Yield (t ha ⁻¹)	Beet hight. (cm)	Beet girth (cm)	Beet wt. (gm)	Yield (t ha ⁻¹)
Subhra	23.0	25.4	370.0	27.6	27.7	30.8	548.0	43.8
Cauvery	19.5	21.0	320.0	22.5	24.0	25.8	464.0	37.1
Mean	21.3	23.2	345.0	25.1	25.9	28.3	506.0	40.5

Table 3. Growth, yield and sugar content of different sugarbeet varieties (growing season: November 2005-April 2006).

Variety	Height (cm)	Girth (cm)	Beet yield (t ha ⁻¹)	Pol %
Posada	26.8	26.10	60.0	14.8
Synchro	25.4	21.30	28.0	14.5
Dorotea	29.6	24.77	38.0	14.5
Subhra	32.9	27.04	27.0	15.8
Cauvery	30.4	23.60	22.0	16.5
Mean	29.02	24.56	35.0	15.2

Variation on beet height, girth and weight were found in different varieties which were significantly influenced by growing seasons. All parameters including beet yield and sugar content were also found higher in February planted sugarbeet than that of November planting (Fig. 3). It is revealed that sugarbeet cultivation in summer was more suitable compared to winter using the varieties supplied by Syngenta Bangladesh Ltd. Again, varieties Dorotea, Posada and Subhra may be recommended for commercial cultivation.

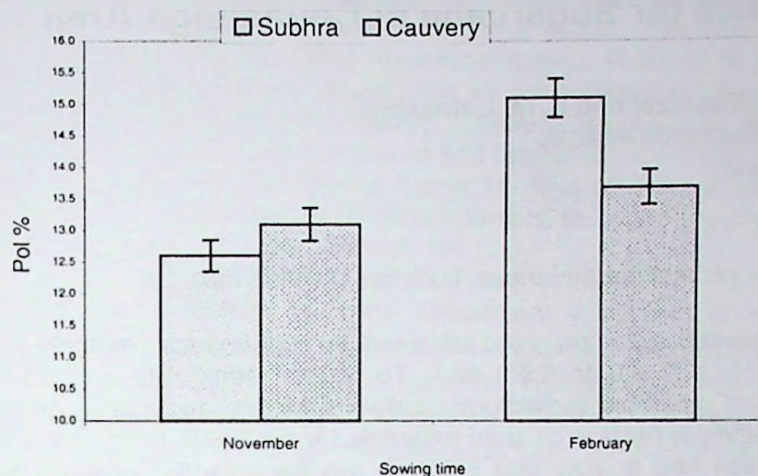


Fig. 3. Pol % of sugarbeet variety Subhra and Cauvery as affected by different sowing time (November, 2004 and February, 2005).

CONCLUSION

Sugarbeet is a new crop in Bangladesh. Selection of suitable genotypes and development of agronomic management practices are very important for its commercial cultivation as an economic crop. The limited study undertaken by the Agronomy and Farming Systems Division, BSRI is a pioneer steps to expand the crop in the country. Results of the study revealed that the tested varieties of sugarbeet might be cultivated successfully in Bangladesh. But some important decisions should be made by the policy-making authority of the country for its sustainable production and marketing.

REFERENCES

- Anonymous. 1994. Encyclopedia of Agricultural Science, Vol. 4, 1994.
- Anonymous. 2005. Tropical sugarbeet cultivation your pathway to profitability, Syngenta Bangladesh Ltd.
- Anonymous. 2006. Sugarbeet-Wikipedia, The free encyclopedia, Internet Version.
- Anonymous. 2007. Concise. britannica.com/ebc/article-9070180/sugarbeet.
- Motiwale, M.P.; Chauhan, R.S. and Agnihotri, V.P. 1991. Sugarbeet cultivation, Indian institute of sugarcane research, Lucknow-226002.
- Singh, Gurudev; Gupta, Tirath and Guleria, Amar 1985. Economic and management aspect of sugarbeet cultivation and processing in India, Centre for management in agriculture. Indian institute of management, Ahmedabad.
- Ustimenko-Barumovsky G.V. 1983. Plant growing in the tropics and subtropics, Mir Publishers, Moscow.