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Effect of Varying Levels of Nitrogen and Plant Densities on the Root Yield of Two Varieties of Sugarbeet (*Beta Vulgaris* L.)

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An experiment conducted at the Haryana Agricultural University, Hissar during the *Rabi* season of 1974-75 showed that for higher yield of sugarbeet roots, crop should be fertilized with 120 Kg N/ha with a plant population of 1,50,000 plants/ha under Hissar conditions (sandy loam soil with poor status of nitrogen). Any of the varieties, viz; Maribo Magnapoly or Ramonskaya-06 can be profitably cultivated for better returns under agro-climatic conditions of this tract.

Sugarbeet (*Beta vulgaris* L.) has been under trial in the Northern sugar belt comprising of Haryana, Punjab, Rajasthan, Uttar Pradesh, Himachal Pradesh and Jammu and Kashmir. The results of different experiments have revealed that this crop can be successfully grown with higher root yield of good quality and can serve as a good supplement to sugarcane. Manurial irrigational, cultural and other agronomic practices need to be worked out for the information of the growers. The important role of good yielding and better quality varieties, plant densities, under adequate nitrogenous fertilization, etc. has been very well recognised for successful production of any crop. Out of the various plant ingredients, nitrogen plays the most important role. In order to have large leaf area for the rapid establishment of sugarbeet plant, high nitrogen availability to the plants early in the season is of paramount importance. Deficiency of nitrogen during this season is bound to have adverse effect on the growth, vigour, vitality and ultimate out turn of sugarbeet.

Likewise choice of variety is also important to obtain higher tonnage roots. Optimum plant population is also very important for higher sugarbeet production. The main emphasis should be on high tonnage per unit area per unit time. The present investigation was aimed to study the effect of varying levels of nitrogen and plant densities on the root yield of two varieties of sugarbeet.

MATERIALS AND METHODS

The field experiment was conducted at the Agronomy Rasearch Area of the Haryana Agricultural University, Hissar during the *Rabi* season of 1974-75, on deep and light sandy loam soil. Treatments consisted of all the combinations of four levels of nitrogen, viz., 0,40,80 and 120 kg N/ha., two plant densities viz. 1,00,000 plants/ha and

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1,50,000 plants/ha and two varieties viz., Maribo Magnapoly and Ramonskaya-06.

The former variety is a polyploid hybrid from Denmark. Its roots are spindle with crown size as 3.5 and fanginess as 3.6 (0-10). It is a heavy yielder with fairly good sucrose per cent roots. The later variety is diploid open pollinated from U.S.S.R. Its roots are spindle shaped, crown being 3.6 and fanginess 4.4 (0-10). It is a heavy yielder with fairly good sucrose per cent roots. The seed of this variety is being produced in the Kalpa Valley in Himachal Pradesh. It is being cultivated on commercial scale in the Cane Development Zone of the Sri Ganganagar Sugar Factory, Sri Ganganagar, Rajasthan.

The experiment was laid out in split plot design with the combinations of nitrogen levels and plant densities in the main plots and varieties in the subplots. Each treatment was replicated four times thus, total number of plots being 64.

A basal dose of 80 Kg P_2O_5/ha was uniformally applied to all the treatments at the time of sowing. Half of nitrogen as per treatments was applied at sowing and the remaining half dose after thinning.

The available nitrogen status of the soil at the sowing time was 160 kg/ha at 0-80 cm depth.

Main observations were taken for yield and yield attributes.

RESULTS AND DISCUSSION

Effect of nitrogen levels : The effect of nitrogen application was well marked on sucrose contents and all growth and yield attributing characters (Table I). The leaf area, root length

TABLE I. Effect of nitrogen levels, plant densities and varieties on different plant characters of sugarbeet

Plant characters	Plants/ha			Varieties			N Ng/ha				
	1,00,000	1,50,000	C.D. 5%	Ramonskaya-06	Marbio Magnapoly	C.D. 5%	0	40	80	120	C.D. 5%
Leaf area (sq/cm)	3828	3718	62.16	3758	3788	N.S.	3486	3614	3903	4090	87.9
Root length (cm)	37.1	36.0	.34	36.3	36.8	N.S.	35.1	35.8	37.4	38.0	0.49
Root diameter (cm)	11.0	9.2	.58	9.3	11.3	.79	9.2	9.8	10.6	10.9	0.82
Fresh weight of root (g/root)	592.9	581.6	6.16	586.3	588.2	N.S.	525.1	564.4	614.0	645.5	8.71
Dry weight of root (g/root)	95.7	91.0	1.16	93.2	93.6	N.S.	83.6	89.7	97.6	102.7	1.64
Root yield (Tonnes/ha)	46.06	49.28	1.65	47.21	48.13	N.S.	34.50	40.18	55.93	60.06	2.34
Sucrose (%)	16.74	18.26	0.63	17.34	17.66	N.S.	19.40	18.40	16.63	15.55	0.89

TABLE II. Return (Rs.)/kg of nitrogen from sugarbeet

Nitrogen levels (kg/ha)	Root yield (tonnes/ha)	Gross income (Rs./ha)	Income over control (Rs./ha)	Return per kg of nitrogen (Rs.)
0	34.50	5520.00	–	–
40	40.18	6428.00	908.80	12.72
80	55.93	8948.80	3428.80	12.86
120	60.06	9609.60	4089.60	14.08

Note : The rate of beet roots = Rs. 16/qtl.

and the fresh and dry matter accumulation in roots increased significantly with increasing doses of nitrogen. Nitrogen application at 120 Kg/ha which was at par with 80 Kg N/ha was significantly superior over 40 Kg N/ha and control. 80 Kg N/ha proved its superiority over control. However, differences between 80 and 40 kg N/ha, and 40 and control did not turn out to be significant in respect of root diameter. The increase in yield over control in the case of 40 Kg N/ha was 16.4 per cent while in the case of 80 Kg N/ha and 120 Kg N/ha was 62.1 per cent and 74.1 per cent respectively. Similar results were obtained earlier at Pantnagar (Cheema, 1973) and at Delhi (Prashar *et al.*, 1975).

There was significant increase correlation between nitrogen doses and sucrose contents. Higher the doses, less was the sucrose content and vice-versa. Similar observations were also recorded by Brummer and Aura (1974) and Deol and Kanwar (1975).

It was further observed that the return per Kg of N was the highest in the case of dose of 80 kg N/ha, followed by the dose of 120 kg N/ha (Table II). The additional benefit derived from the excess of 40 kg N/ha over 80 kg N/ha (dose of 120 kg N/ha) was not as remunerative as the dose of 80 kg N/ha. The present study supports the previous findings of Sharma *et al.* (1973).

Effect of plant densities : It is a well known fact that the growth, development and size of root crops increase with the increase in space available for the individual plants. However, the total yield depends on the number of roots and the yield of individual root. This relationship is very marked in case of sugarbeet crops.

The results in Table I on growth characters, yield and sucrose contents show that plant population had a significant effect on the development of leaf area and roots; their fresh and dry weights were more under wider spacing. Sowing the crop with 1,50,000 plants/ha increased the root yield significantly by about seven per cent over 1,00,000 plants/ha. This might be attributed to more number of roots under this treatment which would have compensated the less weight of roots/plant. These findings are in confirmity with the reports of Antoniani (1974).

Higher plant density of 1,50,000 plants/ha resulted in significantly higher sucrase per cent over the lower plant density of 1,00,000 plants/ha. This may be attributed to the fact that in smaller roots fibre percentage may be less as compared to bigger roots under lower plant density. The results are in confirmity with the results of Drycott and Webb (1971), and Barocka *et al.*, (1972).

Effect of varieties: Data in Table I revealed that between two varieties under test, Maribo Magnopoly gave the higher yield of roots than Ramonskaya-06, however, the difference was not significant. The higher root yield in case of Maribo Magnapoly might be attributed to the higher leaf area, root length, root diameter, fresh weight of root per plant as compared to Ramonskaya-06. The varieties, however, did not differ statistically in sucrose contents.

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REFERENCES

ANTONIANI, C. 1974. Plant density trials with genetic monogerms sugarbeet in the Bologna plain. *Industria Saccarifera Italiana*. 66 : 7-11. *(Fld. Crop. Abstr.* 27: 424).

BAROCKA, K.H., H. GEIDEL and W. MULLER. 1972. Effect of planting density and N fertilization on sugarbeet performance. II. K, Na and amino-N. Zeitsch. *Zuckerind.* 97 : 556-65.

BRUMMER, V. and E. AURA. 1974. Effect of residual nitrogen and fertizer nitrogen on sugarbeet production in Finland. *J. Scientific Agric. Soc. Finland.* 46 : 143-55.

CHEEMA, J.S. 1973. *Studies on the response of four sugarbeet varieties to nitrogen application.* Unpub. M.Sc., Thesis, Submitted to the G.B. Pant. Univ. Agri. Tech., Pant Nagar.

DEOL, D.S. and R.S. KANWAR. 1975. Effect of different rates of nitrogen on yield and quality of sugarbeet. Sugarbeet Sugar News. 7 : 28-29.

DRYCOTT, A.P. and D.J. WEBB. 1971. Effect of N fertilizer, plant population and irrigation on sugarbeet. *J. agric. Sci.* (Cambridge) 76 : 261-67.

PRASHAR, K. S., N. C. DASTANE and M. PARSHAD. 1975. Effect of soil moisture regimes, plant population and nitrogen levels on yield attributes and their contribution towards the root yield of sugarbeet. *Indian J. Agron.* 20 : 53-56.

SHARMA H.C., S.S. SAINI and M.K. MOOLANI. 1973. Sugarbeet responds remarkably well to better agronomic practices. *Indian Sug.* 23 : 455-57.