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Optimizing the agronomic requirements of taro (*Colocasia esculenta*) for Punjab

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ABSTRACT

An experiment was carried out during 1999–2002 at Ludhiana, to work out the agronomic requirements of taro [*Colocasia esculenta* (L.) Schott]. The results revealed that crop should be sown in the first fortnight of February at 45 cm × 20 cm or 60 cm × 15 cm. The crop should be applied 50 kg N/ha. The crop did not respond to phosphorus application.

Key words : Taro, Sowing date, Spacing, Nitrogen, Phosphorus, Growth, Yield, Net returns.

Taro is an ancient tuber crop grown throughout the tropics and sub-tropics. It is well adapted to high rainfall areas particularly swampy and artificial flooded conditions but can also be cultivated under wide range of moisture conditions. It is an important staple food for millions of people. It is mainly cultivated for its edible cormels but the leaves and petioles are also used as vegetables. The soil and climatic conditions of Punjab are quite suitable for taro cultivation but no scientific information is available for its cultivation. Keeping this in view, present study was initiated to develop the production technology of taro for Punjab conditions.

MATERIALS AND METHODS

The study was carried out at Student's Farm, Department of Agronomy and Agrometeorology, Punjab Agricultural University, Ludhiana, from 1999 to 2002. The soil was sandy loam, normal in respect of pH and EC, low in organic carbon and available nitrogen but medium in available phosphorus and potassium. The study was carried out in 3 separate trials.

In Trial I, the treatments consisted of 8 different sowing dates, viz. 16 January, 1 February, 16 February, 2 March, 17 March, 31 March, 15 April and 30 April. The experiment was laid out in randomized block design with 3 replications. The crop was sown in ridges 60 cm apart with plant-to-plant spacing of 30 cm. Whole of the phosphorus (30 kg P_2O_5/ha) was applied at sowing. Nitrogen @ 50 kg/ha was applied in 2 equal splits, i.e. half 1 week after emergence and second half 1 month after first application. In Trial II, the effect of different row and plant spacing combination was evaluated in randomized block design with 3 replications. Different spacing combinations were: 45 cm × 20 cm, 45 cm × 30 cm, 45 cm × 40 cm, 60 cm × 15 cm, 60 cm × 22.5 cm, 60 cm ×30 cm, 75 cm × 18 cm and 75 cm × 24 cm. The crop was sown on ridges in the first week of February. Phosphorus @ 30 kg/ha was drilled at sowing and nitrogen (50 kg/ha) was applied in 2 equal splits, i.e. half 1 week after emergence and second half 1 month after first application. In Trial III, the effect of different nitrogen and phosphorus levels was evaluated in split-plot design. Phosphorus levels (0, 50 and 100 kg P_2O_5/ha) were kept as main plot treatment and nitrogen levels (0, 50, 100 and 150 kg/ha) were kept as sub-plot treatment. The crop was sown on ridges 60 cm apart with plant-to-plant spacing of 30 cm in the first week of February. Whole amount of of phosphorus was applied at sowing and nitrogen was applied in 2 equal splits, i.e. half 1 week after emergence and second half 1 month after the first application.

After sowing, irrigation was applied. Pendimethalin 1.0 kg/ha was applied within 3–4 days after sowing. Two hand-weedings were also given, one 15 days after emergence and second about 1 month after first hoeing and each hand-weeding was followed by earthing up. Irrigations were ensured throughout the growing season. Crop was harvested in September.

RESULTS AND DISCUSSION

Sowing dates

The early sowing dates of 1 February and 16 February gave higher corm yield of taro (Table 1). The corm yield decreased with each delay in sowing. Pooled analysis indicated that maximum yield of 351.7 q/ha was obtained in 1 February sowing date and it was statistically at par with 16 February (345.6 q/ha) and 16 January (305.0 q/ha) sowing date but was significantly better than all the later sowing dates. Sowing on 1 February resulted 15.3, 1.7, 20.4, 30.8, 66.0, 87.4 and 164.0% more fresh corm yield than 1 January, 16 February, 2 March, 17 March, 31 March, 15 April and 30 April sowing dates respectively. The taller plants with more number of tillers and corms/plant and more corm weight (Table 1) had resulted in more corm yield of early sowing dates. Mishra (1995) reported that *Colocasia* is invariably planted during February-March and June–July. The net returns and benefit : cost ratio were higher in 1 February and 16 February sowing dates than other sowing dates.

The growth and yield attributes, viz. plant height, corms/plant and corm weight, were significantly influenced by different sowing dates. The plant height, tillers and corms/plant and weight of corms were significantly higher in early sowing dates of 1 and 16 February and these growth characters decreased significantly with delay in sowing (Table 1).

The crop sown on 16 January took the maximum days for emergence (Table 1). With each delay in sowing, the number of days for emergence decreased. In early sowing dates of 16 January, 1 February and 16 February, the crop emerged in the second fortnight of March irrespective of sowing dates and this might have resulted in the statistically same corm yield of these sowing dates. The longer growth period along with favourable climatic conditions of early sowing dates resulted in better growth of the plants and ultimately the higher corm yield.

Spacing

Pooled analysis revealed that corm yield of 349.8 q/ha and 334.0 q/ha was obtained in closer spacing of 45 cm × 20 cm and 60 cm × 15 cm, respectively, and these 2 treatments were statistically same but both were significantly better than all other wider spacing (Table 2). The effect of different row and plant spacing combination on growth and yield-attributing characters, viz. plant height, tillers and corms/plant, was not significant. The higher plant population per unit area resulted in more corm yield of *Colocasia* under closer spacing of 45 cm × 20 cm and 60 cm × 15 cm. The net returns and benefit : cost ratio were also higher in these 2 treatments compared to all other wider spacing combinations (Table 2). Siddique *et al.* (1988) also reported that an increase in plant spacing from 60 × 20 cm to 60 cm × 30 cm significantly increased the

Table 1. Growth, yield and economics of taro as affected by different sowing dates (mean data of 3 years)

Sowing date	Fresh corm yield (q/ha)	Plant height (cm)	Leaves/ plant	Tillers/ plant	Corms/ plant	Corm weight (g)	Days to emergence	Net returns (Rs/ha)	Benefit : cost
16 January	305.0	77.4	8.0	5.3	33.3	22.7	57.5	76,760	3.56
1 February	351.7	85.5	10.3	7.2	34.2	25.7	46.0	93,157	4.11
16 February	345.6	82.5	10.2	6.5	31.6	29.0	37.7	91,075	4.04
2 March	292.1	78.4	9.9	6.2	31.4	22.6	27.7	72,455	3.43
17 March	268.8	67.9	10.5	6.4	27.2	22.3	22.0	64,405	3.17
31 March	211.9	65.6	11.8	6.2	24.0	22.1	15.0	44,595	2.51
15 April	187.6	52.9	11.7	5.6	20.0	19.4	14.3	36,245	2.23
30 April	133.2	45.9	9.2	4.6	17.0	19.5	12.6	17,310	1.5
CD (P=0.05)	46.9	11.3	1.9	1.1	4.5	3.8			

Sale price of taro Rs 350/q

Table 2. Effect of different spacing on growth, yield and economics in taro (mean data of 3 years)

Spacing cm × cm	Fresh corm yield (q/ha)	Plant height (cm)	Leaves/ plant	Tillers/ plant	Corms/ plant	Corm weight (g)	Net returns (Rs/ha)	Benefit: cost ratio
45 × 20	349.8	58.0	6.3	4.6	22.2	22.7	92,380	4.07
45 × 30	266.5	55.0	6.4	4.9	22.9	25.8	63,225	3.10
45 × 30	217.9	54.1	8.1	5.8	26.7	29.0	46,215	2.53
60 × 15	334.0	56.5	6.9	5.7	26.1	22.6	86,850	3.89
60 × 22.5	254.9	510.5	5.6	4.8	23.4	22.3	59,165	2.97
60 × 30	225.6	52.5	6.0	5.0	24.0	22.1	48,910	2.63
75 × 18	242.9	53.0	6.3	5.1	26.4	19.4	54,965	2.83
75 × 24	197.6	59.8	7.1	5.3	26.1	19.5	39,110	2.30
CD (P=0.05)	98.3	NS	1.3	NS	NS	3.8		

Sale price of taro : Rs 350/q

Table 3. Effect of different nitrogen and phosphorus levels on growth, yield and monetary returns of taro (mean data of 3 years)

Treatment	Fresh corm yield (q/ha)	Plant height (cm)	Leaves/ plant	Tillers/ plant	Corms/ plant	Corm weight (g)	Net returns (Rs/ha)	Benefit : cost ratio
Phosphorus (kg/ha)								
0	278.1	55.6	7.6	3.8	19.2	23.9	74,845	4.33
50	267.9	53.0	7.8	3.8	17.5	23.4	70,412	4.01
100	286.1	61.6	9.2	4.2	19.9	23.1	75,920	4.13
CD (P=0.05)	NS	5.4	NS	NS	NS	NS		
Nitrogen (kg/ha)								
0	222.2	49.5	7.8	3.8	15.0	21.1	54,417	3.33
50	282.7	58.7	8.5	4.1	18.9	25.3	75,137	4.15
100	293.6	61.2	8.5	3.9	20.0	23.6	78,497	4.21
150	306.9	57.5	8.1	4.0	21.5	23.8	82,697	4.34
CD (P=0.05)	32.3	5.5	NS	NS	1.8	1.8		
N× P	NS	NS	NS	NS	NS	NS		

Sale price of taro: Rs 350/q

cormel yield/hill but reduced cormel yield/plot.

Phosphorus

The effect of different phosphorus levels on yield and yield-attributing characters (leaves, tillers and corms/plant and weight of corm) was not significant (Table 3) and this might be due to the medium status of phosphorus of experimental field. The results confirm the findings of Mohan Kumar and Sadanadan (1989), who reported that graded levels of P did not show any significant effect on tuber yield and dry-matter production.

Nitrogen

The effect of differential levels of nitrogen on fresh corm yield of *Colocasia* was significant (Table 3). The fresh corm yield with 50 kg N/ha was significantly more than no nitrogen or control, but the differences in corm yield due to 50, 100 and 150 kg N/ha were not significant. Fresh corm yield of 222.2, 282.7, 293.6 and 309.6 q/ha was recorded with 0, 50, 100 and 150 kg N/ha respectively. The net returns and benefit : cost ratio increased with each increase in N application. Mathew *et al.* (1993) reported that levels of N significantly influenced the taro yield and summer taro required 40 kg N/ha. The plant height, tillers/plant, corms/plant and weight of corms improved significantly with N application (Table 3). The favourable effect of nitrogen application on these growth and yield-attributing characters resulted in increased corm yield of taro. Mohan Kumar *et al.* (1990) reported that corm number and corm weight increased significantly with N application.

REFERENCES

Mathew Reena, Santhakumary G. and Chandrasekharan, P. 1993. Influence of irrigation and nitrogen levels on growth, yield and water use in Taro. *Journal of Root Crops* **19** (2) : 113–117.

Mishra, R.S. 1995. Effect of date of planting on phytophthora blight severity and tuber yield in *Colocasia. Journal of Root Crops* **21**(2) : 111–112.

Mohan Kumar, C.R. and Sadanandan, N. 1989. Growth and dry matter accumulation in taro (*Colocasia esculenta* L. Schott) as influenced by NPK nutrition. *Journal of Root Crops* **15**(2) : 103–108.

Mohan Kumar, C.R. and Sadanandan, N. and Saraswathy, P. 1990. Effect of NPK and time of application of N and K on yield of taro (*Colocasia esculenta* L. Schott). *Journal of Root Crops* **16**(1) : 33–38.

Siddique, M.A., Dhar, M. and Rabbani, M.G. 1988. Effect of seed cormel size and planting spacing on the yield of Mukhi Kachu (*Colocasia esculenta* L.). *Bangladesh Journal of Agricultural Research* **14** (1) : 31–56.