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Short communication

Effect of phosphorus on growth, yield and nutrient use efficiency of litchi grown on Alfisol

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The *litchi* (*Litchi chinensis* Sonn.) is an evergreen subtropical fruit commercially grown in parts of North Bihar, Jharkhand, eastern Uttar Pradesh and Dehra Dun Valley of Uttarakhand (Dey *et al*., 3). It has been identified as one of the potential fruits for export. Hence, production of quality fruit of international standard is of utmost importance. Fertilizer is one of the most important inputs for improving production and productivity of litchi orchards. Inadequate nutrition often attributed to low yields in litchi (Menzel and Simpson, 6) and poor quality of litchi fruit. To ensure high economic productivity and to sustain the available nutrient status in the soil at the desired level, correct doses of manures and fertilizers must be applied by use of reliable diagnostic tools designated to avoid nutrient imbalance (Bhargava and Chadha, 1). The amount, quality and type of fertilizers to be used in a litchi grove are largely influenced by cultivar, soil type and age of tree. The Chotanagpur Plateau region is emerging as a potential region for litchi cultivation. Due to high P fixing capacity, acid soils of Chotanagpur Plateau are in general deficient of phosphorus. However, scanty information is available on nutrient management in general and phosphorus management in particular. Keeping this in view, an attempt has was made to standardize the phosphorus requirement of junior adult bearing litchi plants of cv. China under Chotanagpur Plateau region. Attempt was also made to derive possible relationship between the leaf phosphorus content and yield of litchi fruits.

A field experiment was carried out on litchi cv. China during six consecutive years using graded levels of phosphorus (200, 300, 400, 500, 600, 700, 800 and 900 g P_2O_5/tree/year) apart from control. Soils of the experimental site was Alfisol having sandy loam texture with pH 5.9, organic carbon 5 g/kg, available N 42 kg/ha, available (Bray I) P 3.2 kg/ha, available K 110 kg/ha. After attaining the economical growth stage of litchi, the data on vegetative, fruit physico-chemical characteristics and yield were recorded. The leaf samples were analyzed for P_2O_5 as per the methods described by Chapman and Pratt (2). Pooled analysis for six years data were done for growth parameters, yield and physico-chemical characteristics of litchi fruits.

Data pertaining to effect of phosphorus on vegetative growth parameters (Table 1) revealed that application of 500 g P_2O_5/tree/year resulted in the maximum tree girth and height. The maximum E-W and N-S spread of canopy and tree volume was also obtained with 500 g P_2O_5/tree/year. Significant increase in the yield of litchi was observed with the application of phosphorus (Table 1). An application of 500 g P_2O_5/tree/year recorded maximum yield. It was, however, on *par* with the yield obtained with the application of 200 and 800 g P_2O_5/tree/year. Several other authors recorded the response of P fertilizer in litchi (Ghosh and Mitra, 4; Koen *et al*., 5; Sharma *et al*., 7). Among the physico-chemical characteristics of litchi fruit (Table 2), maximum pulp weight of litchi fruit was recorded with the application of 400 g P_2O_5/tree/year. Maximum acidity of litchi juice was recorded with the application of 400 g P_2O_5/tree/year while minimum was with 900 g P_2O_5/tree/year. Leaf phosphorous content of litchi cv. China varies from 0.18 to 0.29 per cent due to application of different doses of phosphorus. Highest P use efficiency (10.55 kg/kg P_2O_5 used) was recorded with the application of 200g P_2O_5 under sub-humid plateau region of Eastern India.

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Table 1. Effect of phosphorus on growth and yield of litchi in Alfisol.

Treatment (g/tree/year)	Girth (m)	Height (m)	Spread (m)		Tree volume (m^3)	Yield (kg/tree)
			E-W	N-S		
0	52.3	3.1	5.6	5.7	58.3	25.9
88	56.8	3.7	5.3	5.6	59.0	28.0
132	58.0	3.7	5.5	5.5	60.7	24.3
176	53.7	3.6	5.3	5.3	57.0	23.4
220	60.3	3.9	5.8	5.9	70.5	31.0
264	54.5	3.7	5.3	5.4	55.8	23.9
308	55.4	3.6	5.4	5.4	57.2	22.4
352	58.7	3.8	5.7	5.8	68.6	27.4
747	55.4	3.7	5.3	5.6	59.4	24.7
Mean	56.1	3.6	5.5	5. 6	60.7	25.7
CD at 5%	2.8	0.1	0.3	0.3	7.01	4.3

Table 2. Effect of phosphorus on quality of litchi fruits in Alfisol.

Treatment (g/tree/year)	Fruit length (cm)	Fruit volume (cm^3)	Fruit weight (g)	Skin weight (g)	Seed weight (g)	Pulp weight (g)	TSS (ºB)	Acidity (%)	Ascorbic acid (mg/100 g)
0	3.3	15.5	17.7	2.03	3.14	12.36	19.80	0.24	49.7
88	3.5	14.9	17.5	1.94	3.08	12.95	20.03	0.22	48.2
132	3.4	15.6	17.7	1.98	3.26	12.80	19.85	0.25	51.0
176	3.3	15.8	18.0	2.03	3.19	13.23	20.02	0.26	51.9
220	3.3	15.2	17.6	1.97	3.15	13.13	20.68	0.24	50.4
264	3.4	15.2	17.6	1.98	3.40	12.63	21.13	0.25	48.8
308	3.4	15.7	17.9	1.94	3.41	13.04	21.05	0.22	49.7
352	3.4	15.7	18.0	1.97	3.33	12.09	21.67	0.22	49.7
747	3.5	15.7	18.0	2.03	3.39	12.69	21.84	0.20	50.4
Mean	3.4	15.5	17.8	1.99	3.26	12.87	20.67	0.23	50.0
CD at 5%	NS	NS	NS	NS	0.18	0.53	0.72	0.03	NS

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