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Studies on differences in leaf nutrient composition of some litchi cultivars

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ABSTRACT

An experiment was conducted to find out the varietal differences in leaf nutrient composition of litchi. Leaves were sampled from 16 years old healthy trees of 14 cultivars of Litchi in the month of March (September flush) from third pair of leaflets, on non-fruit bearing branches at mid-height from all directions. Different cultivars of litchi significantly influenced the leaf content of N (1.42-1.86%), P (0.07-0.13%), K (0.56-0.83), S (0.24-0.33%), Ca (0.75-1.00%), Mg (0.46-0.55), Fe (92.57-197.60 ppm), Mn (125.77-155.13 ppm), Zn (20.38-29.75 ppm), Cu (22.13-31.50 ppm), B (18.72-30.50 ppm). In the present study for the 14 cultivars, leaf N content was recorded highest in cv. Kasba (1.86%) while the lowest was recorded in cv. Longia (1.42%). Leaf P content was highest in cv. Shahi (0.13%) and Rosescented (0.13%) and lowest in cv. Kasba (0.07%) and Bedana (0.07%). Leaf K content was highest in cv. Dehrarose (0.83%) and lowest in Kasba (0.56%). Leaf S and Ca content was recoded highest in cv. Bedana (0.33% and 1.00%) while lowest in cv Shahi (0.27%) and cv. Deshi (0.75%) respectively. Cv. Kasba (0.63%) recorded highest leaf Mg content while the lowest was recorded for cv. Late Bedana (0.46%) and Longia (0.46%). Among micronutrients highest leaf Fe, Mn, Zn, Cu and B was recorded for cultivars Kasba (197.60 ppm), Longia (155.13 ppm), Dehradun (29.75 ppm), Green (31.50 ppm) and Kasba (30.50 ppm) respectively while the lowest was recorded in cvs. Late Bedana (92.57 ppm), Purabi (125.77 ppm), Deshi (20.38 ppm), Purabi (22.13 ppm) and Ajhauli (18.72 ppm) respectively.

Key words: Litchi, cultivars, leaf nutrient

INTRODUCTION

Litchi is one of the finest fruits and has a growing demand globally but the productivity continues to be low and gap exists between potential and existing yield. Thus, there is a need to concentrate on nutritional requirement of the crop. Among the number of varieties grown Shahi, China and Bedana are commercially grown cultivars of which China and Shahi accounts for 90 percent of the share. There are many other varieties which are not much popular but have several advantages related to production, size, colour, shelf-life etc. Varietal differences for nutrient uptake at flowering and fruiting are increasingly recognized, also fertilizer use efficiency is determined by cultivars, which lead to selection of cultivars efficient in fertilizer use, resulting in increased input and output ratio. Information on varietal responses to nutrient status is limited. Thus, there is a need to identify cultivars having higher nutrient uptake potential in litchi. As the crop variety also influences the leaf composition (Robson, 8), studies were undertaken to find out the varietal differences in leaf composition in Litchi.

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MATERIALS AND METHODS

To study the differences in leaf nutrient composition, 16 years old, 14 cultivars namely Ajhauli, Bedana, China, Dehradun, Dehra Rose, Deshi, Green, Kasba, Late Bedana, Longia, Purabi, Rose scented, Shahi and Trikolia were selected which are planted at ICAR-RCER Research Centre, Ranchi. Sampling was done in the month of March (September flush), as September flush was the most fruitful of the flushes (Kotur and Singh, 4). Leaves were sampled from third pair of leaflets on non-fruit bearing twigs at mid height (6-7 ft.) of the plant from all directions from six trees in each variety and the samples were made in three sub-samples (replicates) in each variety. The leaflets were decontaminated and then dried at 60± 1^{0}C in hot air oven till constant weight was achieved. Total nitrogen was analysed by Kjeltec-2300 auto analyzer using 40% NaOH, 1% boric acid and 0.1 HCl. Samples were wet digested with diacid mixture of nitric acid and perchloric acid in the ratio of 9:4. Vanado-molybdate colour reaction method was used for estimation of phosphorus using spectrophotometer. Potassium content was estimated using Flame photometer. To determine Sulphur content Turbid metric method was used using spectrophotometer, while Ca,

Mg, Fe, Mn, Zn and Cu was determined using Atomic Absorption Spectrophotometer. The soil condition of the experimental site at the depth of 0-15 cm was pH of 5.68, EC-0.05 (dsm^{-1}), OC-0.46%, P-1.23 ppm, K-63.45 ppm, S-50.10 ppm, Ca-316.7 ppm, Mg-12.58 ppm, Mn–30.00 ppm, Zn–0.63 ppm, Cu – 2.67 ppm and Fe – 11.66 ppm.

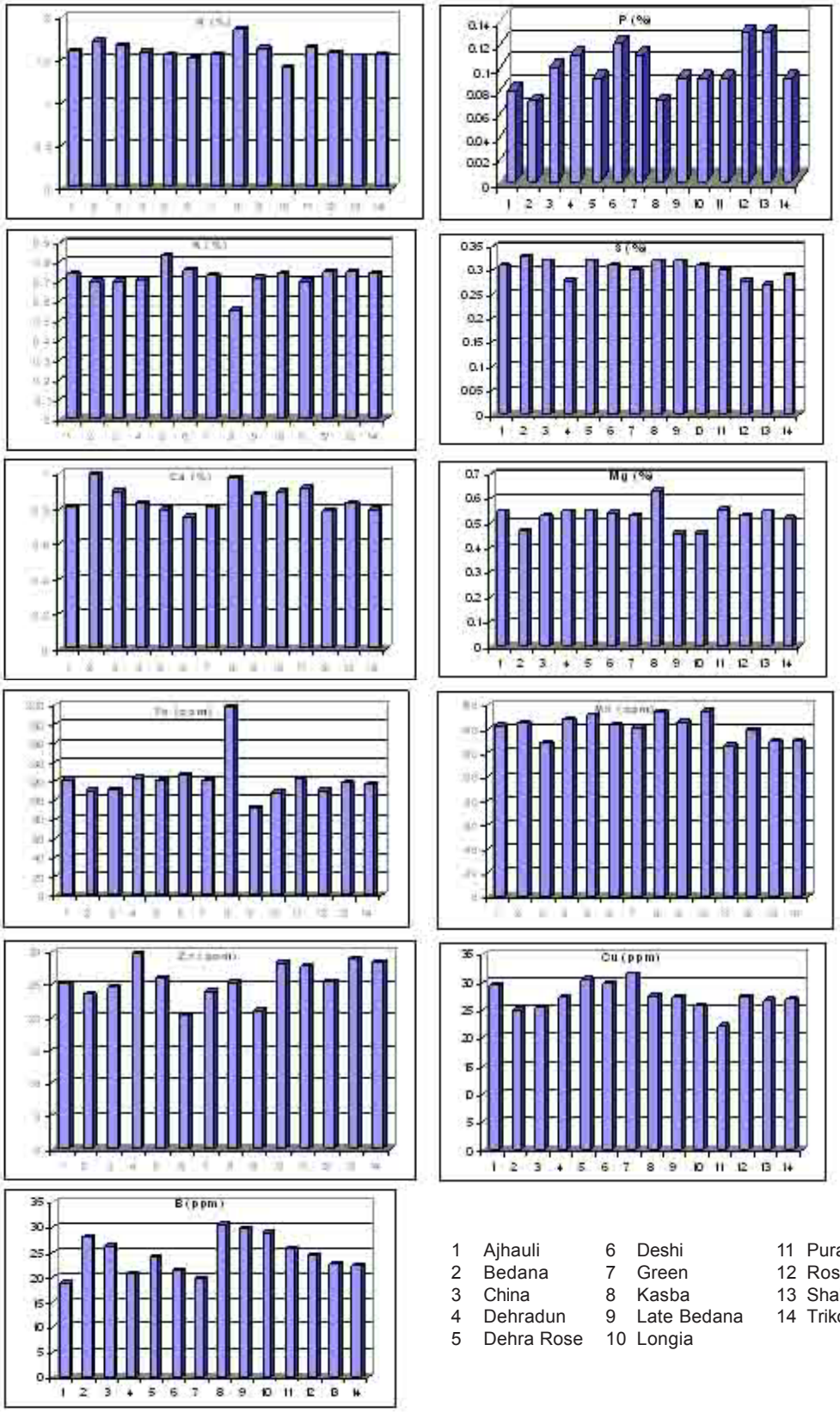
RESULTS AND DISCUSSION

The leaf nutrients content (N, P, K, S, Ca, Mg, Fe, Mn, Zn, Cu and B) of different cultivars were analyzed and results are presented in Table 1 and 2. The nutrient levels in leaf differed significantly among the varieties for all the nutrients. The range of N levels in leaf (1.42-1.86 %) were higher than the range (0.6-1.2 %) reported by Rao *et al*., (7) but compared well with standards (1.3-1.4%) of Menzel and Simpson (1987) and Kotur and Singh (4) (1.28-1.72%). The range of P levels in leaf (0.07-0.13%) were compared well with Cull (1977) and Kotur and Singh (4). The range of K levels in leaf (0.56-0.83%) were almost similar to that recorded by Kotur and Singh (4) but were appreciably lower than those reported by Cull (1977), Anon. (1) and Menzel and Simpson (5). The range of S level in leaf (0.27-0.33%) was higher than the range reported by Kotur and Singh (4). The range of Ca (0.75-1.00%) levels and Fe (92.57-197.6 ppm) levels in leaf were lower than the range reported by Kotur and Singh (4) but compared well with standards of Cull (2), Anon. (1) and Menzel and Simpson (5). The range of Mg (0.46-0.63%), Zn (20.38-29.75 ppm) and B (18.72-30.50 ppm) levels were almost similar to the range reported by Cull (1977), Menzel and Simpson (5) and Kotur and Singh (4). The range of Mn (125.77-155.13 ppm) levels was well compared to Cull (2) and was lower than the one reported by Menzel and Simpson (5) and Kotur and Singh (4). The range of Cu (22.13-31.50 ppm) was higher than the range reported by all the study.

The leaf nutrient content of different cultivars and their comparative status is presented in Fig. 1. Highest leaf N content was recorded in cultivar Kasba (1.86%) and the same is reported by Kotur and Singh (4), followed by Bedana, China, Purabi and Late Bedana while the lowest leaf N content was found in cv. Longia (1.42%). Leaf P content varied significantly due to cultivar and was least in cultivar Kasba (0.07%) and Bedana (0.07%) and highest value was recorded in the cultivars Rose Scented (0.13%) and Shahi (0.13%) followed by cultivars Deshi, Dehradun and Green. Leaf K content varied significantly due to cultivars and was least in cultivar Kasba (0.56 %), while the K content was highest in cultivar Dehrarose (0.83%) followed by Deshi, Rose Scented and Shahi. Leaf S content was also significantly influenced by different cultivars. Highest leaf S content was recorded in cultivar Bedana (0.33%) followed by Kasba, similar trend was reported by Kotur and Singh (4). Cultivar China and Dehra Rose also showed higher leaf S content while the lowest was observed in cultivar Shahi (0.27%). Leaf Ca content was highest in cultivar Bedana (1.00%) followed by Kasba and Purabi and the lowest in cultivar Deshi (0.75%), but the reverse trend was reported by Kotur and Singh (1994), wherein the lowest leaf Ca content was observed in cultivar Kasba and Bedana. Highest Mg content was recorded in cultivar Kasba (0.63%) followed by Purabi (0.55%), Ajhauli (well compared to the study reported by Kotur and Singh, 4).

Table 1. Effect of varietal differences on leaf macro-nutrient contents of Litchi (percent dry weight basis).

Sl.No.	Cultivars	N	P	K	S	Ca	Mg
1.	Ajhauli	1.61	0.08	0.74	0.31	0.81	0.55
2.	Bedana	1.72	0.07	0.70	0.33	1.00	0.47
3.	China	1.67	0.10	0.70	0.32	0.90	0.53
4.	Dehradun	1.60	0.11	0.71	0.28	0.83	0.55
5.	Dehra Rose	1.56	0.09	0.83	0.32	0.80	0.55
6.	Deshi	1.51	0.12	0.76	0.31	0.75	0.54
7.	Green	1.56	0.11	0.73	0.30	0.81	0.53
8.	Kasba	1.86	0.07	0.56	0.32	0.98	0.63
9.	Late Bedana	1.64	0.09	0.72	0.32	0.88	0.46
10.	Longia	1.42	0.09	0.74	0.31	0.90	0.46
11.	Purabi	1.65	0.09	0.70	0.30	0.92	0.56
12.	Rosescented	1.59	0.13	0.75	0.28	0.79	0.53
13.	Shahi	1.55	0.13	0.75	0.27	0.83	0.55
14.	Trikolia	1.57	0.09	0.74	0.29	0.80	0.52
	CD (P=0.05)	0.07	0.01	0.07	0.03	0.06	0.04



1	Ajhauli	6	Deshi	11	Purabi
2	Bedana	7	Green	12	Rosescented
3	China	8	Kasba	13	Shahi
4	Dehradun	9	Late Bedana	14	Trikolia
5	Dehra Rose	10	Longia		

Fig. 1. Varietal differences in leaf nutrient composition of litchi

Table 2. Effect of varietal differences on leaf micro-nutrient contents of Litchi (ppm dry weight basis)

Sl. No.	Cultivars	Fe	Mn	Zn	Cu	B
1.	Ajhauli	121.15	142.63	25.28	29.45	18.72
2.	Bedana	110.83	144.77	23.55	25.00	27.80
3.	China	111.55	128.08	24.65	25.48	26.12
4.	Dehradun	122.57	147.48	29.75	27.32	20.78
5.	Dehra Rose	120.37	151.70	26.07	30.53	24.03
6.	Deshi	125.98	143.13	20.38	29.82	21.33
7.	Green	119.78	141.17	23.90	31.50	19.73
8.	Kasba	197.60	154.18	25.45	27.57	30.50
9.	Late Bedana	92.57	145.40	20.98	27.35	29.77
10.	Longia	108.43	155.13	28.37	25.78	28.97
11.	Purabi	121.42	125.77	27.83	22.13	25.73
12.	Rosescented	110.80	139.28	25.48	27.50	24.33
13.	Shahi	117.87	128.92	29.00	26.80	22.55
14.	Trikolia	116.43	129.60	28.48	26.93	22.35
	CD (P=0.05)	17.79	18.43	2.40	2.96	0.43

The Mg content in the leaves of cultivars Dehradun (0.55%) and Shahi was also higher. While the lowest Mg leaf content was in cultivar Late Bedana (0.46%) and Longia (0.46%). This investigation did not tally with the observations of Kotur and Singh (1994). Highest leaf Fe content was recorded in cultivar Kasba (197.60 ppm) followed by Deshi and the lowest was recorded in cultivar Late Bedana (92.57 ppm), but Kotur and Singh (4) reported higher level of leaf Fe content in Late Bedana. Highest leaf Mn content was recorded in cultivar Longia (155.13 ppm) followed by Kasba and Dehra Rose while the lowest in cultivar Purabi (125.77 ppm). Highest leaf Zn content was recorded in cultivar Dehradun (29.75 ppm) followed by cultivars Trikolia and Longia and lowest in Deshi (20.38 ppm). Leaf Cu contents was highest in cultivar Green (31.50 ppm) followed by Dehra Rose and Deshi and the lowest in cultivar Purabi (22.13 ppm). Leaf B contents was recorded highest in cultivar Kasba (30.50 ppm) followed by cultivars Late Bedana and Longia while the lowest in cultivar Ajhauli (18.72 ppm).

The findings indicated that the varieties differed significantly in respect of nutrient composition of leaf which necessitate due consideration while formulating leaf nutrient standards of litchi cultivars for diagnostic and advisory purpose. Cultivars Kasba, Late Bedana and Bedana were significantly richer in nutrient composition of leaf. The leaf nutrient content especially nitrogen is related more closely with bearing habit of cultivar and can be used for genetic evaluation.

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