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Short communication

Performance of litchi cultivars for off-season production under Coorg conditions of Karnataka

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ABSTRACT

Litchi cultivars Dehradun, Early Seedless, Rose Scented, Shahi, Green, Swarna Roopa, Dehra Rose and China were evaluated for growth and physico-chemical attributes for off-season cultivation in humid subtropical regions of Kodagu district of Karnataka. The plant height was highest in cv. Rose Scented (3.56 m) and lowest (2.33 m) in cv. China. The emergence of the panicle and early flowering started in the first fortnight of August in cv. Early Seedless followed by cv. Shahi. The yield was maximum in cv. Dehradun (24.4 kg /tree) followed by cvs Shahi (23.6 kg/tree) and Dehra Rose (23.15 kg/tree). The cv. Swarna Roopa and China failed to produce any fruits during both the years. The average fruit weight was highest in cv. Dehra Rose (17.5 g) followed by Dehradun (15.57g). The higher pulp (%) was recorded in cv. Early Seedless (73.8%) followed by cv. Dehradun. The seed weight and rind weight was higher in cv. Dehra Rose. The total soluble solids were found highest (17.2°Brix) in cv. Dehradun followed by cv. Dehra Rose (16.3°Brix). The per cent titrable acidity was found highest in cvs Early Seedless and Rose Scented (1.04%). Among the cultivars evaluated Dehradun, Shahi and Dehra Rose were found most suitable for humid sub-tropical conditions of Coorg.

Key words: Litchi, off-season cultivation, varietal performance.

Litchi (*Litchi chinensis* sonn.) is an important subtropical fruit crop grown in India. The cultivation of Litchi is mainly concentrated in the foot hills of Himalaya extending from Punjab to Tripura but It's sporadic cultivation can be seen in parts of Maharashtra, Madhya Pradesh and Karnataka and Tamil Nadu (Singh *et al*., 8). In Coorg region, litchi is grown as homestead plant. Contrary to north India, it flowers in the month of August-September and fruits mature in the month of December. Several cultivars have been recommended for the major litchi growing states but no cultivar has been recommended for Coorg region. The area under litchi is increasing in this region as the off-season crop fetches good price in the market. The quality of the fruit in terms of taste is not very good as most of the plantations are of unknown origin. Since, litchi is sensitive to climatic conditions, flowering, fruiting, yield and quality is very much influenced by the climatic conditions of a particular area. Therefore, a study was taken up to evaluate some litchi varieties under Coorg conditions.

The study was taken up at Central Horticultural Experiment Station, Chettalli, Kodagu, Karnataka during 2010-11 and 2011-12. Eight cultivars, namely, Dehradun, Early Seedless, Rose Scented, Shahi, Green, Swarna Roopa, Dehra Rose and China planted in 2000 were taken up for study. The growth and yield data were recorded as per standard procedures. The fruit quality characters were analyzed as per the procedures described by Ranganna (7). The data were analyzed statistically as described by Panse and Sukhatme (6).

The plant height was highest in cv. Rose Scented (3.56 m), which was significantly higher than most of the cultivars. The circumference of stem at 5 cm above soil surface was highest in cv. Rose Scented (59.4 cm). Similarly plant spread (East-West and North-South) were higher (5.05 and 4.98 m) in cv. Rose Scented and were significantly higher than other cultivars. The lowest plant spread was recorded in cv. China after 12 year (Table 1). The results revealed that the growth of the plants were slower in all the cultivars as compared to the growth in northern India (Anubha Rani *et al*., 1; Chauhan *et al*., 2) , while cv. Rose Scented exhibited better vegetative growth than all other cultivars. The low vegetable growth may be contributed to the comparatively lower mean annual temperature and higher rainfall conditions (Fig. 1).

The emergence of the panicle started in the first fortnight of August with slight variation in two years. The cv. Early Seedless was first variety to start flower emergence followed by cv. Shahi. The flower opening was also first noticed in cv. Early Seedless

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Table 1. Growth characteristics of litchi cultivars under Kodagu conditions.

Cultivar	Plant height (m)			Plant girth (cm)			Plant girth (cm)			Plant spread (E-S) (m)			Plant spread (N-S) (m)		
	2010	2011	Av.	2010	2011	Av.	2010	2011	Av.	2010	2011	Av.	2010	2011	Av.
Dehradun	3.29	3.32	3.31	54.6	56.0	55.3	53.0	53.2	53.1	4.17	4.3	4.24	4.45	4.65	4.55
Early Seedless	3.16	3.18	3.17	49.1	49.5	49.3	48.8	46.8	47.8	4.14	4.36	4.25	4.30	4.35	4.32
Rose Scented	3.42	3.70	3.56	58.2	60.6	59.4	55.0	55.0	55.0	5.35	4.75	5.05	4.50	4.60	4.55
Shahi	3.35	3.42	3.39	54.6	54.8	54.7	51.8	51.9	51.85	4.70	4.74	4.72	4.74	5.20	4.98
Green	2.75	3.03	2.89	47.6	48.0	47.8	38.7	39.8	39.25	3.13	3.98	3.56	3.38	4.20	3.79
Swarna Roopa	2.48	2.93	2.71	34.9	34.9	34.9	32.4	33.5	32.95	2.88	2.97	2.93	2.80	2.85	2.83
Dehra Rose	2.75	2.87	2.81	41.4	42.6	42.0	38.0	40.1	39.05	4.0	4.37	4.19	4.18	4.55	4.36
China	2.15	2.5	2.33	31.8	32.6	32.2	27.6	28.2	27.9	2.35	2.4	2.38	2.50	2.70	2.60
$CD_{0.05}$	0.27	0.29	0.28	3.2	3.4	3.3	3.1	3.2	3.15	0.53	0.55	0.54	0.57	0.58	0.575

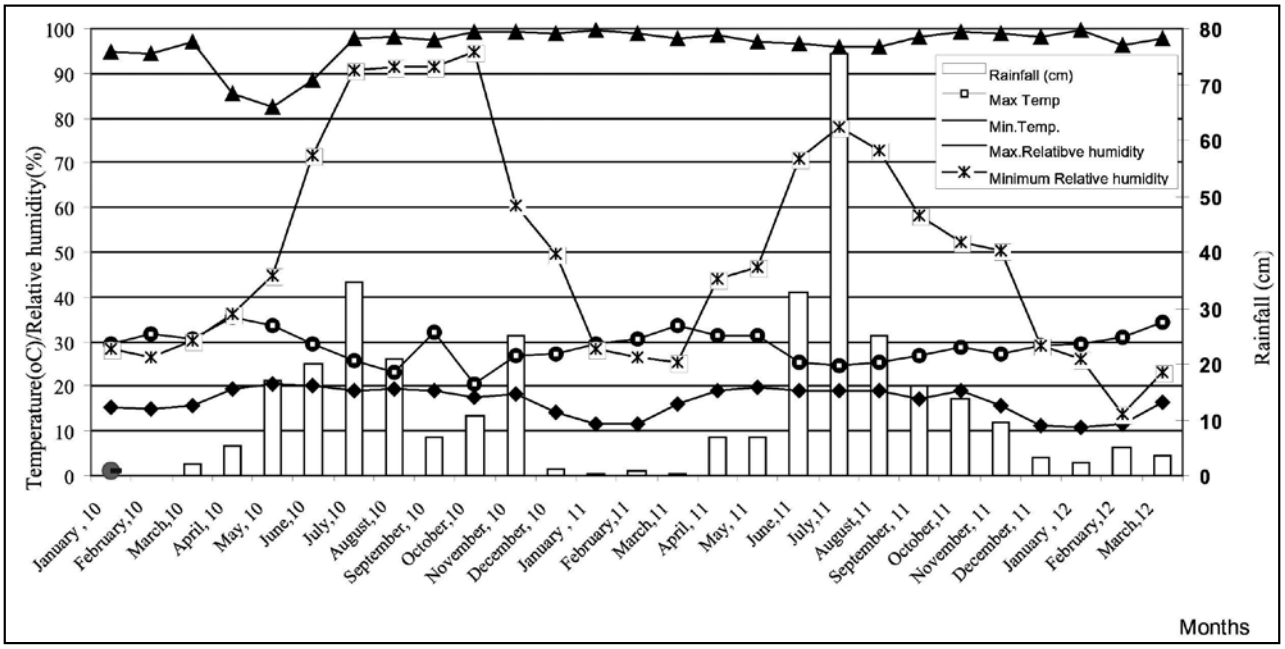

Fig. 1. Climatic conditions of CHES, Chettalli during April 10 - March, 12.

followed by cvs Rose Scented and Shahi. The cvs Dehradun and Dehra Rose started flowering later than other cultivars. The percentage of female flower was highest in cvs Shahi and Green, while lowest female and hermaphrodite flowers were recorded in cv. Rose Scented (Table 2). The lower percentage of female hermaphrodite flowers was also reported by Chauhan *et al*. (2) in litchi cultivars in Haryana conditions. The flowering time of all the cultivars was quite different for north India and all flowered in August-September, while there was no flowering in February-March. The off-season flowering in Coorg may be attributed to the climatic conditions because the temperature in the month of November-December seasons seldom decrease below 10°C, hence plants did not get the proper lower temperature exposure to produce flower. Further, the long monsoon prevailing in this region receiving both south-west and north-west monsoon do not allow drought like stress to the plants during November-December. Thus, plants fail to flower during February-March. In contrast dry season of March-April provided water stress conditions to the plants and after the onset of monsoon in June-July, the plants started flowering. The higher male flowers and lower female flower may be due to the lower temperature in August (Menzel and Waite, 5).

Table 2. Panicle and flowering characteristics of litchi cultivars under Kodagu conditions.

Cultivar	Date of panicle emergence			Date of flowering opening			% Female flower			% Fruit set		
	2010	2011	Av.	2010	2011	Av.	2010	2011	Av.	2010	2011	Av.
Dehradun	12/8	8/8	10/8	02/9	24/8	28/8	6.99	10.01	8.5	33.5	36.5	35.25
Early Seedless	10/8	6/8	8/8	26/8	18/8	22/8	8.61	7.36	7.98	27.3	32.5	29.9
Rose Scented	12/8	8/8	10/8	30/8	22/8	26/8	5.52	5.62	5.57	11.5	5.5	8.5
Shahi	12/8	7/8	9/8	30/8	22/8	26/8	13.56	26.95	20.25	33.6	35.6	34.6
Green	12/8	8/8	10/8	1/9	24/8	27/8	20.2	25.66	22.93	33.2	34.6	33.9
Swarna Roopa	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	-	-	-	-
Dehra Rose	12/8	8/8	10/8	2/9	24/8	28/8	9.89	16.64	13.26	26.5	29.6	28.1
China	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	N.F.	-	-	-	-
$CD_{0.05}$	-	-	-	-	-	-	3.25	3.96	3.55	5.61	6.32	5.95

The yield was highest in cv. Dehradun (24.4 kg /tree) followed by cvs. Shahi (23.6 kg/tree) and Dehra Rose (23.15 kg/tree). Alternate bearing was noticed in cv. Rose Scented, while cvs Swarna Roopa and China failed to produce any fruit during both the years. The average fruit weight was highest in cv. Dehra Rose (17.5 g) followed by cv. Dehradun (15.57 g). Small size fruits were recorded in cv. Green (12.80 g). The fruit volume, equatorial diameter, polar diameter of fruit was higher in cv. Dehra Rose (Table 3). The higher pulp (%) was recorded in cv. Early Seedless (73.8%) followed by cv. Dehradun. The lower pulp content was recorded in cv. Dehra Rose (69.31%). The seed weight and rind weight was higher in cv. Dehra Rose. The total soluble solids were found highest (17.2°Brix) in cv. Dehradun followed by Dehra Rose (16.3°Brix). The per cent titrable acidity was found highest in cvs. Early Seedless and Rose Scented (1.04%), while it was lowest (0.67%) in cv. Green. The higher sugar was found in cv. Dehradun. The ascorbic acid counted was higher (39.9 mg/ 100 g) in cv. Green but it was statistically at par with all other cultivars (Table 4). The results revealed that the fruit size in some cultivars was lower than the average size in northern Indian conditions. This may be correlated with the lower temperature and low solar intensity because of cloudiness and rain. Further the lower sugars and higher acidity may be correlated with lower temperature during the latter part of fruit development which probably leads to formation of higher acid. Among the cultivars evaluated cvs Dehradun, Dehra Rose and Shahi were found producing higher yield and better quality fruits than other cultivars under Coorg conditions.

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Table 3. Yield and fruit characteristics of litchi cultivars under Kodagu conditions.

Cultivar	Yield/tree (kg)			Fruit wt. (g)			Fruit Vol.(ml)			ED (cm)			PD(cm)		
	2010	2011	Av.	2010	2011	Av.	2010	2011	Av.	2010	2011	Av.	2010	2011	Av.
Dehradun	20.5	28.3	24.4	12.7	18.43	15.57	10.4	18.5	14.45	3.2	3.04	3.12	3.2	3.59	3.40
Early Seedless	19.6	21.0	20.3	15.2	13.33	14.27	14.0	13.25	13.62	3.3	2.8	3.05	3.1	3.27	3.19
Rose Scented	13.2	-	13.2	13.3	-	13.3	13.5	-	13.5	3.1	-	3.1	3.0	-	3.0
Shahi	21.2	26	23.6	10.0	19.2	14.60	8.9	18.2	13.55	3.0	3.0	3	2.4	3.2	2.80
Green	21	20	20.5	10.4	15.2	12.80	8.8	15.3	12.05	3.2	2.9	3.05	2.6	3.41	3.01
Swarna Roopa	0	0	0	-	-		-	-	-	-	-	-	-	-	-
Dehra Rose	22.3	24	23.15	17.5	17.51	17.51	17.5	17.5	17.5	3.1	3.0	3.05	3.5	3.52	3.51
China	0	0	0	-	-		-	-	-	-	-	-	-	-	-
$CD_{0.05}$	2.31	2.63	2.46	1.75	1.73	1.74	1.70	1.70	1.70	0.11	0.12	0.12	0.13	0.12	0.13

Table 4. Physico-chemical characteristics of litchi cultivars under Kodagu conditions.

Cultivar	Seed weight (%)			Pulp weight (%)			Rind weight (%)			TSS (°Brix)			Acidity (%)			Ascorbic acid (mg/100 g pulp)		
	2010	2011	Av.	2010	2011	Av.	2010	2011	Av.	2010	2011	Av.	2010	2011	Av.	2010	2011	Av.
Dehradun	13.10	11.88	12.49	71.70	72.91	72.31	15.20	15.19	15.20	17.3	17.1	17.2	0.94	0.98	0.96	33.3	41.30	37.3
Early Seedless	11.90	9.81	10.86	73.80	73.89	73.85	14.20	16.30	15.25	13.4	16.3	14.9	1.06	1.02	1.04	29.5	36.9	33.2
Rose Scented	13.50	-	13.50	69.50	-	69.50	18.30	-	18.30	13.5	-	13.5	1.07	-	1.07	26.2	-	26.2
Shahi	14.20	14.91	14.56	71.20	71.30	71.25	14.28	13.65	13.97	16.3	16.2	16.2	1.03	1.04	1.04	38.5	37.8	38.2
Green	9.82	10.39	10.11	69.65	71.23	70.44	19.10	18.11	18.61	11.4	15.8	13.6	0.68	0.66	0.67	39.5	40.4	39.9
Dehra Rose	14.50	14.62	14.56	70.20	70.42	70.31	14.90	14.96	14.93	16.4	16.2	16.3	0.95	0.96	0.96	36.2	35.2	35.7
$CD_{0.05}$	1.42	1.33	1.36	2.32	2.35	2.34	1.51	1.53	1.52	1.26	1.11	1.18	0.08	0.07	0.08	NS	NS	NS

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