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Studies on Adaptability of Aonla (*Emblica officinalis* Gaertn.) Cultivars under High Rainfall Zone of Coorg

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Aonla (*Emblica officinalis* Gaertn.) is one of the important minor fruit and a crop of commercial significance, quite hardy, prolific bearer and highly remunerative even without much care. In Coorg, existing cropping system of coffee based Coorg mandarin cultivation is not remunerable due to prevalence of greening diseases and various other factors. Therefore, there is need to diversify the existing crops that can be suited well for the region. With this background, the present study was taken up with seven different aonla cultivars namely, Kanchan, NA-6, NA-7, NA-10, Krishna, Chakaiya and BSR-1 at Central Horticultural Experiment Station, Chettalli, Kodagu District, Karnataka to their adaptability under Coorg region. The observations on growth parameters (collar diameter and diameter at breast height) after three years of planting showed significant differences, which ranged from 4.36 and 1.99cm in Kanchan to 8.00 and 5.69cm in BSR- 1, respectively. The yield (average of 5th and 6th year) ranged from 9.00 kg/plant in NA-7 to 25.93 kg/plant in BSR-1. Observations on physico-chemical characters of fruits indicated significant variations for both quantitative and qualitative characters. The fruit weight ranged from 21.42 g in 'BSR-1' to 38.66 gm in the cv 'Kanchan'. Total soluble solids contents ranged from 8.02º B in cv 'Kanchan' to 13.07º B in 'BSR-1'. The other parameters such as fruit volume, pulp weight, stone weight, pulp-stone ratio and juice content were found more in Kanchan whereas total sugar solids, vitamin C, total sugar, reducing sugar, acidity were recorded maximum in BSR- 1. As for as adaptability is concern BSR- 1 is best suited cultivar in terms of yield and quality parameters followed by Kanchan.

Key words: Adaptability, Physicochemical properties, Quality, Aonla cultivars, Coorg

Aonla (*Emblica officinalis* Gaertn.) is one of the important underutilized fruit of Indian origin and grown mostly in arid and semi arid region of the country. The commercial significance of crop is due to quite hardy nature, prolific bearer and highly remunerative even without much care. It is a rich source of vitamin 'C' and pectins, therefore regarded as very important in medicinal value under Ayurvedic system of traditional medicine in India. Chettalli is located in the district Coorg that is situated in the Western Ghats of Peninsular India with an elevation of about 3500' above MSL. The mean annual rainfall is about 1450 mm and it rains heavily in the months of July-September. The area is classified as hilly humid tropic region and the major cropping system is based on coffee along with pepper, Coorg orange, areca nut, cardamom etc. In last few years, it has been experienced that the climatic conditions of the regions are changing/shifting gradually and also price of the coffee and pepper commodities fluctuated heavily. In such circumstances the existing cropping system of coffee based Coorg mandarin cultivation is also not remunerable due to prevalence of greening diseases and various other factors and hence affecting the living standard of the people in one or other way, therefore, the need of the hour/ future is to diversify the existing crops that can be suited well for the region and could fetch more income without much care. Hence, an attempt has been made to see the adaptability of different aonla cultivars for this region as one of the diversified crop on the basis of their growth, yield and physicochemical characteristics.

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Materials and Methods

Seven different Aonla cultivars namely Kanchan, NA-6, NA- , NA-10, Krishna, Chakaiya and BSR-1 were planted in Randomized Block Design, replicated thrice at Central Horticultural Experiment Station, Chettalli, Kodagu District, Karnataka to study their adaptability. During the experimental period, the orchard was maintained in good health by following all the recommended cultural practices. Observations were recorded on growth parameters such as plant height and collar diameter once in three months and there after the plants were headed back approximately at the height of 150 cm to give them proper shape and therefore, observations were recorded only on collar diameter (cd) and diameter at breast height (dbh). Yield parameters and physicochemical characteristics were also recorded. Matured fruits were taken randomly from each cultivar, washed properly and then analyzed

for their physicochemical characteristics i.e. fruit number and average yield (kg/plant), fruit weight (gm), fruit size (cm), fruit volume (cc), pulp weight (gm), stone weight (gm), pulp to stone ratio, juice content (weight and volume), total soluble solids (TSS ^{0}B), percent acidity, ascorbic acid (mg/100ml of juice), percent reducing sugars and total sugars. Fruit size was measured with Vernier Calliper. Total soluble solids were determined with the help of hand refractometer. The titrable acidity, ascorbic acid contents, reducing sugars and total sugars were determined by standard procedures described in AOAC (1980). Then the data were subject to statistical analysis by RBD with three replications.

Results and Discussion

Growth parameters

Results with regard to growth parameters are presented in Table 1 and it is clear from the Table that the plant height was maximum in cv. Krishna followed by BSR-1 and Chakaiya whereas it was minimum in cv. NA-10. The collar diameter and diameter at breast height was recorded maximum in cv. BSR-1 followed by cv. Krishna whereas it was minimum in cv. Kanchan. It has also been observed that cv. BSR-1 has the character to grow fast among all the cultivars under study.

Table 1. Performance of Aonla cultivars under high rainfall zone of Coorg

Cultivars	Plant Height (cm)	Collar diameter (cm)	Diameter at breast height (cm)
Kanchan	**74.84**	**4.36**	**1.99**
NA-6	76.70	4.67	2.17
NA-7	91.40	4.66	2.61
NA-10	72.23	4.58	2.51
Krishna	104.57	5.12	3.40
Chakaiya	102.80	4.89	2.79
BSR-1	104.07	8.00	5.69
CD at 5%	10.93	0.84	0.78

Yield and other physical parameters

Data pertaining to proximate yield, fruit size, volume and pulp-stone ratio are presented in Table 2 and it is evident from the Table that the numbers of fruits were more (1210.33) in cv. BSR-1 with the proximate yield of 25.93 kg/plant. Cultivar NA-6 recorded the least number of fruits (248) with 9.49 kg fruits/plant; however the lowest yield was recorded in cv. NA-7 (9.00 kg/plant). Bhavani Sanker *et al* (1999) had also reported cv. BSR-1 as a high yielding aonla variety for different agro- climatic regions of Tamil Nadu. Fruit weight was found to be maximum in cv. Kanchan (38.66 gm) that was statistically at par with cv. NA-6 (38.27 gm), NA-10 (33.82 gm) and Krishna (35.39 gm). The minimum fruit weight was recorded in BSR-1 (21.42 gm). The same trend was also found in case of fruit size, fruit volume and pulp weight. The increase in fruit weight, size and pulp weight in case of cv. Kanchan may be due to more activeness of mesocarp cells, which enlarge during fruit development (Balasubramanyan and Bangarusamy, 1998). Pulp to stone ratio was found maximum (22.21:1) in cv. Kanchan as a result of small sized stones inside the fruits. However, the minimum pulp to stone ratio was found in BSR-1 (15.19:1). This result is in conformity with the result of Bhavani Sanker *et al.* (1999), who have reported the minimum pulp to stone ratio in BSR-1.

Table 2. Proximate yield, fruit size, volume and pulp-stone ratio of aonla cultivars in Coorg region (data average of two years)

Cultivars	Av., fruit nos./ pl	Av., fruit wt (gm)	Yield kg/pl	Fruit size (cm)		Volume (cc)	Pulp wt (gm)	Stone wt (gm)	Pulp : Stone ratio
				L	B				
Kanchan	**453.33**	**38.66**	**17.52**	**3.60**	**4.15**	**36.20**	**37.00**	**1.67**	**22.21**
NA- 6	248.00	38.27	9.49	3.48	4.24	37.25	36.52	1.76	20.83
NA- 7	329.33	27.37	9.00	3.30	3.75	25.53	25.76	1.61	16.08
NA- 10	470.33	33.82	15.96	3.43	3.96	30.70	32.24	1.58	20.50
Krishna	326.67	35.39	11.58	3.52	4.10	33.50	33.54	1.85	18.27
Chakaiya	628.33	32.04	20.13	3.37	4.00	31.00	30.19	1.86	16.27
BSR- 1	1210.33	21.42	25.93	3.02	3.43	20.17	20.09	1.32	15.19
CD at 5%	140.79	3.73	6.18	0.21	0.19	4.27	3.76	0.36	4.72

Juice content and chemical characteristics

Data related to juice content and chemical characteristics of different aonla cultivars are presented in Table 3 which clearly shows that juice content in terms of weight and volume is maximum in cv. Kanchan followed by NA-6. Minimum juice content was recorded in cv. BSR-1 (6.52 and 6.53, respectively). The total soluble solids were recorded at maximum in cv. BSR-1 (13.07^{0}B) and minimum in cv. Kanchan (8.02^{0}B). Maximum total soluble solids in BSR-1 may be due to conversion of starch to sugar as reported by Prasad *et al* (1983) who have reported that as the maturity advances, the total soluble solids increases. The total sugars, reducing sugars, ascorbic acid and acidity were also found to be more in cv. BSR-1. This might be due to the inherent character and/or low moisture content in the pulp at the time of harvesting. Balamohan *et al.* (2002) while studying the performance of aonla under sodic soils reported similar type of findings.

Table 3. Juice content and chemical characteristics of different aonla cultivars in Coorg region (data average of two years)

Cultivars	Juice content		TSS (^{0}B)	Acidity (%)	Ascorbic acid (mg/100ml of juice)	Sugar (%)	
						Reducing	Total
Kanchan	31.96	31.30	8.02	1.93	278.22	2.69	7.63
NA- 6	24.99	25.00	8.07	1.79	335.18	2.11	6.95
NA- 7	14.82	15.00	8.40	2.04	292.37	2.37	6.29
NA- 10	22.49	22.22	9.00	1.51	348.48	2.77	8.60
Krishna	19.20	19.16	8.28	1.21	246.11	2.69	8.74
Chakaiya	19.80	19.73	9.27	1.54	323.80	2.82	9.08
BSR- 1	6.52	6.53	13.07	2.31	451.30	3.5	9.41
CD at 5%	4.83	4.61	0.49	0.15	16.67	0.48	0.86

From the findings, it can be concluded that aonla could very well be grown in high rainfall areas of Kodagu and the cultivar BSR-1 is best suited in terms of yield and quality parameters followed by Kanchan, among all the cultivars whose performance was evaluated. The impact of the study was after seeing the performance of aonla at the center by the State Department of Horticulture, Madikeri, Government of Karnataka funded a project to CHES, Chettalli for its popularization in Coorg region under the scheme of “Aonla campaign”.

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