

Fruit physico-chemical studies of some local wood apple (*Limonia acidissima* L.) genotypes

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ABSTRACT

Considering the importance of wood apple fruit, physico-chemical properties of twelve selected local genotypes have been studied. Within various fruit physical characters such as its shape, size, fruit weight, pulp weight, rind weight and rind thickness, the Genotype 11 and Genotype 4 had found to have maximum values. Fruits were found of the shape of flattened round, round, and oblong. Fruit length and diameter ranged from 7.9cm to 10.7cm and 7.1cm to 9.8cm, respectively. Fruit weight has been ranged from 97.4g to 225.7g, while pulp weight ranged from 50.7g to 117.5g. Average seed weight varied from 6.5g to 37.9g counting 56 to 531.6 numbers of seeds. Though variation in rind thickness was lesser, however, rind weight exhibited from 53.45g to 78.40g. With respect to quality of the fruits, maximum TSS was recorded in Genotype 4 (22.08°Brix) and minimum in Genotype 10 (11.16°Brix). Highest total sugar was noticed in Genotype 9 (2.83%) and reducing sugar was maximum in Genotype 6 (1.73%). Fruits of different genotypes exhibited acidity ranging from 0.70 to 2.33% while ascorbic acid 7.45 to 24.98 mg/100g. From the above results it can be concluded that Genotype 4, 6, 11 were very promising in terms of better size, where as Genotype 1 and 6 were very encouraging for fruit quality characters.

Key words: Bio-chemical characters, genotypes, wood apple

INTRODUCTION

Wood apple (*Limonia acidissima* L.) is one of the lesser known fruit like Roktogota (*Haematocarpus validus*) in Bangladesh (Rahim *et al.*, 2015) and considered as one of the most important plant of 'Ayurveda'. It is one of the important minor fruit in South East Asia with immense nutritional and therapeutic potential. Various important phyto-constituents like alkaloids, phenolic compounds, triterpenoids, coumarins, tannins, steroids etc. have been isolated from the fruit. Being the rich source of vitamins and minerals it is used as a stomachic, diuretic, cardiogenic and tonic and very recently reported its use in gastrointestinal disorders. This fruit belongs to family Rutaceae having chromosome number $2n = 18$ and is commonly known as curd apple, monkey fruit, elephant apple, kavat, curd fruit and kath bel in India (Mazumder *et al.*, 2006).

There are no such improved types or recognized varieties of wood apple in India. The semi-arid lateritic belt of West Bengal has the rich diversity of wood apple genotypes. But no report of the studies on fruit physico-chemical properties of such

diversified genotypes available in this zone. Although the popularity and the demand of this underutilized fruit crop is very high, the production of this fruit is very meager due to non availability of recognized superior types. In the absence of suitable cultivars, expected growth in production of this crop has not been accomplished till date. Identification of suitable genotypes, therefore, becomes imperative for promoting its production, productivity and quality. Thus the present study has been conducted to assess the diversity of some wood apple genotypes under semi-arid lateritic belt of West Bengal.

MATERIALS AND METHODS

The study was carried out at the laboratory of Department of Horticulture and Postharvest Technology, Institute of Agriculture, Visva-Bharati, Sriniketan, West Bengal. Birbhum. The diversity rich district of wood apple was explored and fruits of 12 different genotypes (denoted as WA) were collected from different villages of various blocks such as Surul, Ruppur, Bahadurpur, Ballavpur, Sahebanga, Makarampur, Raipur etc. 30 fruits of

wood apple were randomly selected from all the direction of marked genotypes and the bulk of sample of all the selected trees from each site collected into bags and tagged by the number and subjected to physico-chemical analysis in the departmental laboratory. The observation on three replicates of samples, each consisting of 10 fruits, the physical characters in terms of fruit shape, size, shell, seed, pulp etc. and qualitative characters in terms of total soluble solids (TSS), total sugar, reducing sugar, titratable acidity and ascorbic acid content analyzed and recorded. The fruit weight was taken on electric weighing balance. The shells were broken and the seeds and pulp were extracted. The total soluble solid content of fruit was determined with the help of hand refractometer (ERMA) of 0 – 32 percent, calibrated at 20 ° C. The readings were corrected as per international temperature correction table and the result was expressed in ° brix. Total acidity was determined by titrating the diluted fruit juice against 0.1 N NaOH solution using phenolphthalin as an indicator and the results were expressed as percentage fresh weight of fruit. The total sugar content was determined by titrating the diluted fruit juice after hydrolysis with hydrochloric acid against Fehling ‘A’ and Fehling ‘B’ solutions in presence of methylene blue as an indicator. The reducing sugar content was determined by titrating the diluted juice against Fehling ‘A’ and Fehling ‘B’ solutions by using methylene blue as an indicator. Ascorbic acid content of the fruit was estimated by using 2, 6-dichlorophenol indophenol dye titration method as described in AOAC (1995). The data were statistically analyzed as per method outlined by Panse and Sukhatme (1967).

RESULTS AND DISCUSSION

Fruit physical characters

The perusal of the data presented in Table 1 shows the wide variation of fruit physical characters of wood apple genotypes studied under the experiment. The fruit weight varied from 97.46g in WA-7 to 225.73g in WA-11. Higher fruit weight is a desirable character in wood apple. The fruit length was found maximum in WA-4 (10.77 cm) while minimum was found in WA-7 (7.97 cm). The fruit diameter was recorded maximum in WA-11 (9.80 cm), while minimum diameter was recorded

Table 1: Fruit physical characters of local wood apple genotypes

Genotypes	Fruit shape	Fruit length (cm)	Fruit diameter (cm)	Fruit weight (g)	Pulp weight (g)	Rind weight (g)	Rind thickness (mm)	Weight of seeds/fruit (g)	Number of seeds/fruit	Pulp: Seed ratio
WA-1	FR	8.97	8.63	146.13	76.50	54.00	3.53	15.63	220.2	4.89
WA-2	R	9.20	9.17	154.00	76.06	63.81	2.96	14.12	213.4	5.37
WA-3	R	8.43	8.07	180.66	110.00	57.10	2.64	13.56	221.6	8.12
WA-4	O	10.77	9.77	206.33	112.26	78.40	2.72	15.66	252.7	7.16
WA-5	O	9.77	8.60	195.13	109.26	66.23	2.66	19.63	321.0	5.57
WA-6	R	8.33	8.13	177.66	106.46	53.45	2.74	17.75	302.1	6.00
WA-7	R	7.97	7.90	97.46	50.73	39.49	2.47	7.24	56.3	7.15
WA-8	O	8.13	7.17	102.60	51.60	44.45	2.40	6.54	73.7	7.89
WA-9	R	9.47	9.43	173.66	108.40	48.21	2.47	17.05	181.4	6.42
WA-10	R	8.77	9.17	161.80	81.50	71.22	3.37	9.07	141.5	8.99
WA-11	R	10.17	9.80	225.73	117.54	70.24	2.59	37.94	531.7	3.09
WA-12	O	8.87	8.53	184.26	110.30	57.49	3.36	16.47	221.3	6.73
S.E.(m) ±		0.12	0.12	4.03	3.65	1.76	0.06	0.79	9.93	0.28
C.D. at 5%		0.35	0.37	11.92	10.78	5.20	0.18	2.35	29.32	0.79

WA= Wood apple genotypes, FR= Flattened round, R=Round and O= Oblong

Table 2: Fruit bio-chemical characters of local wood apple genotypes

Genotypes	TSS (°Brix)	Acidity (%)	Ascorbic acid (mg/100g)	Total Sugar (%)	Reducing Sugar (%)	TSS : Acidity
WA - 1	22.00	1.13	24.98	2.10	1.54	19.46
WA - 2	21.90	1.00	21.40	1.52	0.82	21.9
WA - 3	18.50	2.06	11.72	1.28	0.89	8.98
WA - 4	22.08	1.51	7.45	1.54	0.85	14.62
WA - 5	18.50	1.31	10.53	1.81	1.38	14.12
WA - 6	17.83	0.70	15.31	2.28	1.73	25.47
WA - 7	19.83	1.86	12.71	2.04	1.43	10.66
WA - 8	17.16	1.25	12.36	1.55	0.97	13.72
WA - 9	18.33	2.34	15.01	2.83	0.90	7.83
WA - 10	11.16	1.60	16.02	2.40	0.83	6.97
WA - 11	18.50	1.80	13.17	1.83	1.02	10.27
WA - 12	18.50	1.79	14.24	1.77	0.93	10.33
S.E.(m)±	0.70	0.10	1.06	0.08	0.05	0.20
C.D. at 5%	2.08	0.31	3.13	0.23	0.14	0.57

WA= Wood apple genotypes.

in WA-8 (7.17 cm). Pulp weight ranged from 50.73 g (WA-7) to 117.54 g (WA-11). Rind weight was found maximum in WA-4 (78.40 g), while minimum was found in WA-7 (39.49 g). Rind thickness ranged from 2.40 mm (WA-8) to 3.53 mm (WA-1) which was measured with help of vernier caliper. Number of fruits varied from 213.5 (WA-3) to 360(WA-12). The different shapes of the fruits like flattened round, round, and oblong was observed. Regarding the total weight of seeds per fruit the maximum was found in WA-11(37.94g) while the minimum was found in WA-8 (6.54g). Total number of seeds per fruit ranged from 56.3 (WA-7) to 531.7 (WA-11). Regarding ratio of pulp weight to seed weight maximum was found in WA-10 (8.99) and minimum was found in WA-11 (3.09). Different fruit shape and size of wood apple were also found by Ghosh *et al.* (2011) and Singh *et al.* (2016).

Bio-chemical characters

Table 2 shows significant variations among the wood apple genotypes with respect to different biochemical parameters. The TSS content varied from 11.16°Brix (WA-10) to 22.08°Brix (WA-4). The titratable acidity was found minimum in WA-6 (0.70 %) and maximum in WA-9 (2.34%). The ascorbic acid content was found highest in WA-1 (24.98 mg/100g) and lowest in WA-4 (7.45mg/

100g). The total sugar and reducing sugar was found maximum in WA-9 (2.83%) and WA-6 (1.73%), respectively. The minimum total sugar and reducing sugar was found in WA-3(1.28%) and WA-2(0.82%), respectively. TSS: acidity ratio was found maximum in WA-6(25.47) and minimum in WA-10(6.97). Total soluble solids content of the fruit pulp found in the present experiment has the conformity of findings of Singh *et al.* (2016) where they reported TSS range of 11.07-19.36°Brix. Titratable acidity was found in similar with that found by Sharma *et al.* (2014) where they found ripe fruits were less acidic (1.74%) than both un-ripe (2.92%) and half-ripe (2.40%) respectively. Ascorbic acid content of the fruits was also found similar with the findings of Singh *et al.* (2016) where they observed it in the range from 7.08 - 19.60mg/100 g. Sharma *et al.* (2014) reported the average total sugar content of wood apple fruit pulp around 2.12% and reducing sugar was around 1.23%. Thus the total sugar and reducing sugar content of different wood apple genotypes in the present experiment was in line with the findings of Sharma *et al.* (2014).

CONCLUSION

From the findings of the experiment it can be concluded that there was a wide variability in morphological and physico-chemical characters of

12 wood apple genotypes which were explored. Findings with respect to better fruit size and edible matter show that WA-4, WA-6, and WA-11 were very promising. Related to fruit quality such as TSS, acidity, ascorbic content, total sugar, and reducing sugar the genotypes WA-1 and WA-6 were very encouraging. The information about the nature and magnitude of genetic variability as well as associations among key traits would be helpful in formulating an effective breeding programme for its genetic improvement or genetic upgradation of this valuable crop.

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