

Variability in Physico-chemical Properties of Indian Olive (*Elaeocarpus floribundus* Blume.) Grown under North Bengal Conditions

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ABSTRACT

A study was conducted during the fruiting season of Jalpai or Indian olive a minor fruit of West Bengal, so as to determine the physio-chemical properties of the fruits and evaluate the best accession. The fruits were harvested from distinct locations on North Bengal and were analysed for their bio-chemical properties. The results showed that all the different accessions possessed specific and distinct characters. The plant ACC-11 exhibited a very high value of TSS (7.07°B) followed by ACC-25 with a high TSS value of 6.9°B. ACC-24 showed high fruit weight of 20.83g compared to other accessions. ACC-30 was characterized with a highest value of total sugar (7.50%) along with high reducing sugar content (2.35%). The accession, ACC-20 not only showed high TSS value but was also distinguished with higher amount of total sugar content (6.85%). Similar trend was observed in ACC-29 where a high TSS (18.7°B), high reducing sugar (2.17%) and total sugar content (5.77%) were recorded. It can be established that the ACC-11, ACC-20 and ACC-29 accessions yielded a superior quality of Jalpai whereas ACC-30 produces fruit with high sugar and acid content.

Highlights

- Out of 32 accessions of Jalpai/Indian Olive collected from North Bengal, accessions ACC-11, ACC-20, ACC-29 and ACC-30 yielded superior quality of fruits.

Keywords: Accessions, bio-chemical, jalpai, distinct characters, physio-chemical, Indian Olive

Jalpai or Indian Olive (*Elaeocarpus floribundus* Blume. syn. *E. serratus*), an important minor fruit grown in terai region of West Bengal, India, belongs to the family Elaeocarpaceae. This fruit tree is believed to have originated from Madagascar. *Elaeocarpus* is a genus of 350 plants species with a wide distribution in Madagascar, India, Southeast Asia, Malaysia, southern China and Japan as well as Australia and New Zealand, Fiji and Hawaii in the east (Burkill *et al.* 1966). In India, it is widely distributed in West Bengal, Assam, Tripura and Meghalaya. Indian Olive is a medium to tall evergreen tree, maximum up to 20 meter in height. The leaves are simple, green in colour but there are typical examples of

some leaves which are red or orange in colour. Jalpai is a tropical fruit found extensively in the Indian subcontinent, Indo-China and other South East Asian countries. The tree is found in eastern Himalayas up to 3,000 feet and in the evergreen forests of North Kanara and western coast down to Travancore (Anon. 2003). Trees are grown mainly in northern districts, especially the sub-Himalayan terai region of West Bengal in homestead condition. The total area under fruit crops is 172.70 thousand hectare and production is 2301.70 thousand tones in West Bengal (Anon. 2006). Out of which the northern parts of West Bengal comprises around 33% area and 36% of production. Jalpai (Indian olive) is one



of the important fruit crop of this region, mainly grown as homestead crops in shady or semi-shady condition with little or restricted management practices. No report is available regarding existence of any commercial orchard under jalpai plantation. Flowers are white in colour and appear on the leaf axils. Flowers bloom during April-May and fruits mature for harvest in October-November (Sankarsan *et al.* 2006). The fruits possess high Fe and important medicinal values. Jalpai fruits contain 0.69% protein, carbohydrates 19.5%, mineral matter 0.59%, vitamin C in dry leaves is 257mg/100 gm. The fruits are used in dysentery and diarrhea while the leaves are used in rheumatism and as an antidote for poison (De and Parikh 1985). The medicinal properties of different species of *Elaeocarpus* and the Phenolic contents, antioxidant and cytotoxic activities of *Elaeocarpus floribundus* was reported by the several scientists (Dhadich *et al.* 2013; Utami *et al.* 2013). This plant also known as medangteja (in Malay) and infusion of bark and leaves is used as a mouthwash for inflamed gums (Wiar 2006). Fruits mature for harvesting from October to December in northern districts of West Bengal.

Fruits are greenish in colour, single seeded, the shape resembles to that of the olive fruit. Fruits are single seeded, drupe and the edible portion of the fruit is the mesocarp. Matured jalpai fruits pulp is sub-acid in taste and mainly used for preparation of chutney, pickles and other culinary items. There is a good demand for matured fruit in the market for the preparation of pickles and chutney (Bhowmick 2011). Indian olive is known as 'jalpai' in Bengali and is diversely found in Bengal, especially the northern parts of West Bengal. Indian olive trees are found growing mainly in 'terai' region of West Bengal, specifically in Jalpaiguri, Cooch Behar and Alipurduar districts. Interestingly the name of district Jalpaiguri is believed to be derived from two clubbed words 'jalpai' means plant of jalpai and 'guri' means the trunk of the tree.

This fruit have immense scope as a minor fruit in India. There are very little references in literature regarding its origin and distribution of jalpai. No recommended packages of practices are available for improved cultivation of jalpai. It is locally propagated by seeds. The fruits are mainly sold at local market in North Bengal districts. A very small quantity is sold at other parts of West Bengal. The

average yield may vary from 40-60 kg fruits per tree per year. Information regarding flowering and fruiting characteristics of Indian Olive is scanty in literature. The present investigation was conducted to evaluate the physico-chemical properties of Indian Olive accessions collected from different locations of North Bengal. By keeping the above things in mind the objectives of our studies were to identify the fruit with the desirable traits like good size, attractive colour, smaller size of seed, more sweet flesh, large sized fruits, etc. Higher amount of total sugar, TSS ($^{\circ}$ B) and acid content (%) is desirable for fresh consumption and in processed form as well.

MATERIALS AND METHODS

Location and site of experiment

The fruits were collected from different locations of North Bengal during fruiting season of 2016. The fruits collected from a location were of same tree. Clean fruits free from biotic and abiotic stress were collected. It was ensured that the fruit samples collected were in perfect maturity, neither unripe nor over ripened. The fruits were at first cleaned in water and then shade dried. The fruit samples were analysed for their physical and chemical properties. The entire experiment was conducted at Department of Pomology and Post-harvest technology, Faculty of Horticulture, Uttar Banga Krishi Viswavidyalaya. The individual plant was termed as ACC-1, ACC-2, ACC-3, ACC-4 to ACC-22 respectively.

Design used in this experiment

The design of the experiment was Randomized Block Design (RBD) with 32 treatments and 3 replications.

Parameters studied

Physical parameters

Fruit skin colour was assayed by colour chart designed by the Royal Horticultural Society, 5th edition (2007). The physical analysis of fruit like length and breadth was done using a standard 30cm scale. The juice (in ml) content in the fruit samples were estimated using standard Borosil glass measuring cylinder. The average weight of



the fruit was determined digitally by electronic weighing balance.

Chemical parameters

The pH of the fruit samples were determined by digital pH meter manufactured by UTech. The weight of fruit, peel and pulp were taken by electronic weighing balance. The total soluble solid (TSS) was estimated by using the hand refractometer. Chemical assessment of the fruits like the titratable acidity (TA) and total sugar (TS) were done by method suggested by Association of Analytical chemists (AOAC, 1995).

RESULTS AND DISCUSSION

Table 1 shows the physical properties of the fruit accessions. Maximum fruit weight was observed in ACC-24 (20.83g) and minimum was observed in ACC-28(12.83g).

Table 1: Physical properties of different jalpai accessions (average of 3 replications)

Accessions	Fruit Weight (g)	Fruit length (cm)	Fruit breadth (cm)	Fruit shape	Fruit Skin Colour
ACC-1	13.37	3.47	1.93	Oval	GGN144B
ACC-2	15.53	4.47	2.6	Oval	GGN144B
ACC-3	13.67	4.13	2.53	Roundish	GGN144B
ACC-4	13.23	3.9	2.6	Oval	GGN144B
ACC-5	15.03	4.57	2.37	Oval	GGN144B
ACC-6	17.1	5.07	2.8	Oblong	GGN144B
ACC-7	17.27	5	2.6	Oval	GG143C
ACC-8	13.1	3.77	2.83	Oblong	GGN144B
ACC-9	19.5	5.27	2.73	Oval	GGN144B
ACC-10	19.23	5.03	2.67	Oval	GGN144B
ACC-11	12.73	3.9	1.97	Oval	GGN144B
ACC-12	13.9	4.5	2.47	Oblong	GG143C
ACC-13	17.37	5.17	2.9	Oval	GGN144B
ACC-14	16.9	4.83	2.47	Roundish	GG143D
ACC-15	13.8	4.2	2.5	Oval	GGN144B
ACC-16	18.63	5.33	2.77	Roundish	GGN144B
ACC-17	16.63	4.53	2.3	Oval	GGN144B
ACC-18	13.87	3.67	2.13	Oval	GGN144B
ACC-19	18.7	4.9	2.73	Oblong	GGN144B
ACC-20	18.23	4.67	2.53	Oval	GGN144B
ACC-21	13.2	4.07	1.97	Oval	GGN144B

ACC-22	14.73	4.53	2.47	Roundish	GG143C
ACC-23	18.33	5.63	2.8	Oblong	GGN144B
ACC-24	20.83	5.9	2.73	Oblong	GGN144B
ACC-25	13.77	3.57	1.97	Oblong	GGN144B
ACC-26	13.97	3.53	2.13	Oblong	GG143C
ACC-27	12.87	3.53	2.23	Oblong	GGN144B
ACC-28	12.83	4.43	2.73	Oval	GGN144B
ACC-29	18.7	5.5	2.97	Roundish	GG143D
ACC-30	17.47	5.33	2.8	Oblong	GGN144B
ACC-31	16.77	5.2	2.77	Oblong	GG143C
ACC-32	16.97	4.87	2.37	Oblong	GG143C
S.Em. (±)	0.42	0.12	0.09	N/A	N/A
C.D. at 5%	1.19	0.34	0.27	N/A	N/A
C.V.	4.59	4.51	6.53	N/A	N/A

Legend: GG- green group

However, the accessions ACC-9 and ACC-11 were at par with ACC-24. Fruit length (cm) was observed maximum in ACC-24 (5.9cm) and minimum in ACC-1 (3.47cm). Fruit breadth (cm) was recorded maximum in ACC-29 (2.97cm) and minimum in ACC-1 (1.93cm). Fruit shape varied from oval in accessions ACC-1, ACC-2, ACC-4, ACC-5, ACC-7, ACC-9, ACC-10, ACC-11, ACC-13, ACC-15, ACC-17, ACC-18, ACC-20, ACC-21 and ACC-28 to roundish oval in ACC-3, ACC-14, ACC-16, ACC-22 and ACC-29. Oblong shaped fruits were observed in accessions ACC-6, ACC-8, ACC-12, ACC-19, ACC-23, ACC-24, ACC-25, ACC-26, and ACC-27. Fruit skin colour varied from GGN144B in most of the accessions and GG143C was observed in ACC-7, ACC-12, ACC-22, ACC-26, ACC-31, and ACC-32. GG143D skin colour was observed in ACC-14 and ACC-29.

Table 2 shows the chemical properties of the fruit accessions. Maximum TSS ($^{\circ}$ B) was observed in ACC-11(7.07 $^{\circ}$ B) and minimum in ACC-4 (4.8 $^{\circ}$ B). However, ACC-20 and ACC-25 was at par with ACC-11. Titratable acidity was recorded maximum in ACC-3 (17.93) and minimum in ACC-9 (12.73). In this case, ACC-3 was found at par with ACC-25. Total sugar was recorded maximum in ACC-30 (7.5%) and minimum in ACC-2 (5.62%). However, ACC-3, ACC-4, ACC-12, 19, ACC-20 and ACC-31 were found at par with ACC-30. Maximum



reducing sugar was observed in ACC-13 (2.42%) and minimum in ACC-2 (2.03%).

Table 2: Chemical properties of different jalpai accessions from North Bengal (average of 3 replications)

Accessions	TSS (°B)	Titratable acidity (%)	Total sugar (%)	Reducing sugar (%)
ACC-1	6.3	16.83	6.15	2.22
ACC-2	5.33	13.5	5.62	2.03
ACC-3	5.83	17.93	7.02	2.20
ACC-4	4.8	15.2	5.67	2.09
ACC-5	5.03	14.87	6.43	2.03
ACC-6	6.7	13.97	6.87	2.4
ACC-7	6.47	14.53	5.67	2.2
ACC-8	5.73	13.57	6.68	2.07
ACC-9	6.4	12.73	6.98	2.19
ACC-10	6.6	14.4	5.96	2.34
ACC-11	7.07	14.53	6.34	2.14
ACC-12	6.33	16.37	6.93	2.33
ACC-13	6.6	15.77	5.83	2.42
ACC-14	5.77	14.43	5.81	2.04
ACC-15	5.47	14.5	5.68	2.13
ACC-16	6.03	15.77	6.18	2.24
ACC-17	6.53	13.27	5.8	2.38
ACC-18	6.63	15.8	6.76	2.33
ACC-19	6.6	15.2	7.35	2.32
ACC-20	6.83	14.67	6.85	2.22
ACC-21	6.17	15.53	6.67	2.18
ACC-22	5.67	15.6	5.83	2.26
ACC-23	6.77	14.9	6.98	2.35
ACC-24	6.83	14.77	6.50	2.31
ACC-25	6.9	13.43	7.4	2.33
ACC-26	6.27	14.6	6.47	2.2
ACC-27	5.37	16.87	7.35	2.1
ACC-28	5.7	17.83	6.54	2.35
ACC-29	6.4	17.43	5.77	2.17
ACC-30	6.43	14.33	7.50	2.35
ACC-31	6.43	14.3	6.85	2.17
ACC-32	5.83	13.77	6.51	2.35
S.Em.(±)	0.1	0.18	0.13	0.04
C.D. at 5%	0.28	0.5	0.67	0.11
C.V.	2.75	2.01	3.47	3.13

CONCLUSION

By considering all the above results, it was found that the accession, ACC-11 was characterized with a very highest value of TSS (7.07°B) followed by ACC (6.9°B). ACC-24 had high fruit weight of 20.83g which was high as compared to other accessions. ACC-30 showed a highest value of total sugar (7.50%) and high reducing sugar content (2.35%). ACC-20 not only had a high TSS value but also higher amount of total sugar content (6.85%). Similar trend was observed in ACC-29 where a high TSS (18.7°B), high reducing sugar (2.17%) and total sugar content (5.77%) were recorded. It can be established that the accessions ACC-11, ACC-20 and ACC-29 are plants that yielded superior quality of Jalpai, whereas the accession ACC-30 exhibited fruit with high sugar and acid content.

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