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Variability of Fruits among Different Improved Landraces and Seedling Origin Tree of *Terminalia chebula* Retz.

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***Abstract*:** The survey was conducted in Hamirpur district of Himachal Pradesh. The 20 random fruits were taken from five improved landraces and seedling origin tree for the fruit variability analysis. Results revealed that Pahlu was found statistically superior among all the landraces with the highest average green weight of fruit (61.3 gm) and pulp weight (57.4 gm). The maximum fresh stone weight was in Kallar strain (4.6 gm). Tamber recorded the highest dry weight of whole fruit (20.3 gm). The maximum dry pulp weight was recorded in Pahlu (15.5 gm). The highest fruit length was recorded in Kallar (7.9 cm). Pahlu (4.7 cm) showed the highest fruit diameter among all the landraces whereas; Seedling origin tree was recessive among all the landraces and showed the lowest value of all the fruit parameters and fruit weight.

***Keywords*:** Fruits, Landraces, Superior, Weight, Recessive

The genus *Terminalia* includes about 250 species of trees and shrubs (Zhang et al 2019). In India, 20 species belonging to four sections namely; *Catappa, Myrobalans, Chuncea and Pentaptera* include *T. alata*, *T.citrina*, *T. coriacea*, *T. crenulata*, *T. arjuna*, *T. bellirica*, *T. berryi*, *T. bialata*, *T. pallida*, *T. paniculata*, *T. parviflora*, *T. catappa*, *T. chebula*, *T. gella*, *T. manii*, *T. moluccana*, *T. myriocarpa*, *T. procera*, *T. tomentosa* and *T. travancorensis* (Raju et al 2012). Harar or Haritaki (*Terminalia chebula* Retz.) fruit of Harar has healing powers. It has astringent, purgative, rejuvenating, antibacterial, antifungal and laxative activity. This activity is due to the presence of substances-tannic acid, chebulinic acid, gallic acid, anthraquinone and sennoside. It is used in India to treat many diseases such as urinary, digestive diseases, diabetes, skin diseases, parasitic infections, heart ailments, fever, flatulence, constipation, ulcers, vomiting, colic pain and hemorrhoids (Bag et al 2013). The edible fruit tissue of Harar also contains nutrients, vitamin C, protein, amino acids and minerals (Mahesh et al 2007, Chander and Chauhan 2014). The present study is an attempt on fruit variability of *T. chebula* with an aim to ascertain the nature and extent of diversity present among improved landraces and seedling variety tree from different geographical regions of Himachal Pradesh.

MATERIAL AND METHODS

The observation on three replicates of samples, each consisting of 20 fruits from five different improved landraces and from the seedling variety planted at Khaggal farm [College of Horticulture and Forestry, Hamirpur H.P.)]. Fruits of harar were randomly selected from each bulked fruit lot of each landrace and seedling variety after discarding the damaged fruits. The parameters viz. fruit length, fruit diameter, stone length, stone diameter was measured using vernier caliper whereas, fresh and dry fruit weight was recorded with the help of weighing balance.

RESULTS AND DISCUSSION

A large variation was observed with respect to size and weight of fruits of different harar landraces (Table 1). The shape of Harar fruits varied from obovate to ovoid, obovoid, elliptical and ovate while fruit colors noted were dark green, light green and pale green. Significant difference was observed with regard to fresh weights of whole fruit, pulp and stone.

The maximum fresh weight of whole fruit was observed in Pahlu strain (61.3 gm), followed by the strains of Kallar and Paluri while the minimum was in seedling of origin tree (22.0 gm). All the improved areas showed that the fresh whole fruit weight was significantly higher over seedling origin tree. Pahlu was statistically superior to all other landraces, exhibiting the highest weight of fruit. The fruit weights of Kallar, Tamber and Paluri strains were, however, statistically alike. The highest fresh pulp weight was registered in Pahlu (57.4 gm) followed by Paluri and Kallar while the lowest was in seedling origin tree (19.2 gm). All the improved landraces recorded significantly higher fresh pulp weight over seedling variety trees. However, as Pahlu showed the highest pulp weight and was statistically higher than all other landraces.

Fresh stone weight was recorded maximum in Kallar (4.6 gm) followed by Tamber and Paluri while the minimum was registered in seedling origin tree (2.7 gm). The fresh stone weight of all improved landraces over seedling trees was significantly higher. Landrace, Kallar showed the highest stone weight was statistically greater than all other landraces. The highest dry weight of whole fruit was in Tamber (20.3 gm) followed by Pahlu and Paluri while the lowest was registered in seedling origin tree (5.8 gm). All the improved landraces significantly exhibited higher dry fruit weight over seedling origin trees. Tamber recorded the highest dry fruit weight was statistically better over all other landraces. Pahlu (15.5 gm) recorded the maximum dry pulp weight followed by Paluri and Kallar whereas, the minimum dry pulp weight was registered in Seedling origin tree (4.7 gm). All the improved landraces significantly recorded higher dry pulp weight than seedling variety. The strain Pahlu, which was statistically superior to all other landraces, had the highest dry pulp weight. The dry stone weight exhibited no significant effect with respect to improved landraces and seedling origin tree. However, dry weight of stone was recorded highest in Tamber (3.3 gm) followed by Kothi and Kallar whereas, the lowest was in Seedling origin tree (1.1 gm).

The significant effect was observed on fresh weight of whole fruit, fresh pulp weight, fresh stone weight, dry weight of whole fruit and dry pulp weight whereas, had non-significant influence on dry stone weight w.r.t. improved landraces and seedling origin tree. Among all the landraces, the maximum values for fresh weight of whole fruit, fresh pulp weight and fresh stone weight were in Pahlu (61.3 gm), Pahlu (57.4 gm) and Kallar (4.6 gm), respectively. The highest values for dry weight of whole fruit and dry pulp weight were in Tamber (20.3 gm) and Pahlu (15.5 gm), respectively. However, the entire minimum values for all the fruit parameters *viz*., fresh whole fruit weight, fresh pulp weight, fresh stone weight, dry whole fruit weight and dry pulp weight were recorded only in seedling variety.

The significant difference was observed on different parameters of fruit and stone viz., fruit length, fruit diameter, stone length and stone diameter (Table 2). The maximum fruit length was in Kallar (7.9 cm) followed by Paluri and Tamber while the minimum was registered in Pahlu (5.1 cm). Pahlu (4.7 cm) showed the highest fruit diameter among all the landraces which was significantly followed by Kallar (4.2 cm) and Tamber (4.1 cm) whereas, the lowest fruit diameter was recorded in seedling origin tree (2.9 cm). Pahlu strain that registered the maximum fruit diameter was statistically better over all other landraces. The maximum stone length was in Kallar (3.5 cm) followed by Paluri and Pahlu while the minimum was shown in Tamber and seedling origin tree (2.6 cm). The highest stone diameter (1.7 cm) was in the landrace, Tamber followed by Kallar and Pahlu while the lowest stone diameter was registered in seedling origin tree (1.2 cm). The two landraces i.e. Kallar and Tamber which had maximum stone length and stone diameter respectively were statistically superior over all other landraces.

Among different improved landraces and seedling variety, the values for highest fruit length, fruit diameter, stone length and stone diameter were in Kallar (7.9 cm), Pahlu (4.7 cm), Kallar (3.5 cm) and Tamber (1.7 cm), respectively. However, the lowest minimum fruit length, fruit diameter, stone length and stone diameter were in Pahlu (5.1 cm), Seedling variety (2.9 cm), Seedling variety; Tamber (2.6 cm) and Seedling variety (1.2 cm), respectively. Thakur et al (2008) showed significant variation in fruit size, weight and seed/pulp ratio. Fruit diameter showed significant and positive correlation with green fruit weight, the most important character from market point of view.

Substantial variation was observed with regard to size and weight of Harar fruits of different landraces due to their inherent potential/genetic make-up. Harar is a highly cross-pollinated species and hence, the variation noticed is as expected in such species. Singh and Singh (2012) also reported large variation in fruit weight, length and pulp

Table 1. Fresh and dry fruit-weight of improved landraces and seedling variety of *Terminalia chebula* Retz

Landraces	Fresh weight (gm)			Dry weight (gm)		
	Whole fruit	Pulp	Stone	Whole fruit	Pulp	Stone
Kallar	51.6	46.6	4.6	15.5	13.1	2.3
Tamber	50.1	45.3	4.4	20.3	17.0	3.3
Kothi	33.2	29.8	3.2	12.5	10.1	2.4
Pahlu	61.3	57.4	3.5	16.9	15.5	1.5
Paluri	51.3	47.6	3.7	16.7	14.8	1.9
Seedling tree	22.0	19.2	2.7	5.8	4.7	1.1
CD (p=0.05)	6.63	6.21	0.91	3.46	3.58	NS

Table 2. Fruit parameters of improved landraces and seedling variety of harar

Landraces	Fruit length (cm)	Fruit diameter (cm)	Stone length (cm)	Stone diameter (cm)
Kallar	7.9	4.2	3.5	1.6
Tamber	5.8	4.1	2.6	1.7
Kothi	5.6	3.5	2.9	1.4
Pahlu	5.1	4.7	3.0	1.5
Paluri	7.4	4.0	3.1	1.3
Seedling tree	5.7	2.9	2.6	1.2
CD (p=0.05)	0.66	0.27	0.38	0.18

content of jamun (*Syzygium cumini*). Malshe et al (2016) reported maximum fruit weight in Krishna variety of aonla which was at par with Kanchan variety while the minimum fruit weight was in NA-7 variety followed by NA-10 variety. Increased fruit weight might be attributed to the character of genotype. The weight and fruit size might be also related to the bearing habit and yield of that variety. Singh and Singh (2016) observed large variation with respect to fruit weight , fruit length fruit diameter, fruit girth and stone weight. The genotype T_{12} and T_{14}, were found superior in terms of their physico-chemical attributes than rest of the genotypes. Morphological variation in fruit characters of aonla was ascribed due to differences in their genetic make-up and environmental conditions. Bora et al (2017) studied the characterization of mango (*Mangifera indica* L.) genotypes based on physico-chemical quality attributes and found that “Mallika” and “Neelgoa” varieties were superior in terms of fruit weight, size , pulp weight and pulp stone ratio Chiranjeevi et al (2018) reported significant variability among the varieties of aonla for different fruit and seed traits. The variety Krishna registered maximum fruit length , fruit diameter, fruit weight and pulp weight . The maximum pulp content and pulp to stone ratio were recorded in NA-10 and Krishna cultivars, respectively. The maximum stone weight, seeds per fruit and seed length were highest in Kanchan variety. The variations in the fruit size depend upon the varietal and genetic characters of an individual variety and are highly influenced by environmental factors.

CONCLUSION

Pahlu was found statistically superior among all the landraces with the highest average green weight of fruit and pulp weight. The maximum fresh stone weight was recorded in Kallar strain. Tamber had the highest dry weight of whole fruit and was statistically better over all other landraces. The maximum dry pulp weight was in Pahlu. The maximum fruit length was in Kallar while the minimum was registered in Pahlu . Landrace, Pahlu showed the highest fruit diameter among all the landraces. Seedling origin tree showed the lowest value of all the fruit parameters and fruit weight.

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REFERENCES

Bag A, Bhattacharyya SK and Chattopadhyay RR 2013. The development of *Terminalia chebula* Retz. (Combretaceae) in clinical research. *Asian Pacific Journal of Tropical Biomedicine* **3**: 244-252.

Bora L, Singh AK and Singh CP 2017. Characterization of mango (*Mangifera indica* L.) genotypes based on physio-chemical quality attributes. *Journal of Applied and Natural Science* **9**: 2199-2204.

Chakrabarty T, Krishna G and Rasingam L 2019. Taxonomic notes on Indian *Terminalia* (Combretaceae). *Plant Science Today* **6**: 281-286.

Chander J and Chauhan SK 2014. Current Status of Management of Harar (Terminalia chebula Retz.) in Shiwalik Hills. *Journal of Krishi Vigyan* **3**(1): 13-17.

Chiranjeevi MR, Muralidhara BM, Hongal S and Sneha MK 2018. Physico-chemical characterization of aonla fruits grown under Bengaluru conditions. *International Journal of Current Microbiology and Applied Sciences* **7**: 3611-3615.

Mahesh R, Ramesh T, Nagulendran KR, Velavan S and Hazeena BV 2007. Effect of *Terminalia chebula* on monoamine oxidase and antioxidant enzyme activities in aged rat brain. *Pharmacognosy Magazine* **3**:12-16.

Malshe KV, Salvi BR and Gawankar MS 2016. Evaluation of different varieties of aonla (*Emblica officinalis* Gaertn) under hard lateritic rocky conditions of South konkan coastal zone of Maharashtra. *New Agriculturist* **27**: 135-138.

Raju AJS, Lakshmi PV and Ramana KV 2012. Reproductive ecology of *Terminalia pallida* Brandis (Combretaceae), an endemic and medicinal tree species of India. *Current Science* **102**: 909-917.

Singh S and Singh AK 2012. Studies on variability in jamun (*Syzygium cuminii* Skeels) from Gujarat. *Asian Journal of Horticulture* **7**: 186-189.

Singh PP and Singh AK 2016. Variability studies in aonla wild genotypes for fruit character from the North-Eastern Region of India. *International Journal of Basic and Applied Biology* **3**: 170-172.

Thakur S, Sharma K and Gupta A 2008. Assessing natural variation in fruits and seeds of Harar (*Terminalia chebula* Retz.). *Indian Journal of Agroforestry* **10**: 66-70.

Zhang XR, Kaunda JS, Zhu HT, Wang D, Yang CR and Zhang YJ 2019. The Genus *Terminalia* (Combretaceae): An ethnopharmacological, phytochemical and pharmacological review. *Natural Products and Bioprospecting* **9**: 357-392.