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Journal homepage: <http://www.plantarchives.org>

DOI Url : <https://doi.org/10.51470/PLANTARCHIVES.2024.v24.no.2.331>

## STUDY ON PHYSIOLOGICAL ATTRIBUTES OF BER (*ZIZIPHUS MAURITIANA* LAM.) GENOTYPES UNDER AWADH REGION OF INDIA

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(Date of Receiving-13-05-2024; Date of Acceptance-15-08-2024)

### ABSTRACT

Ber (*Ziziphus mauritiana* Lam.) has been recognized as a useful edible fruit since antiquity in India. Ability to stand drought conditions that's reason knows as 'King of fruit' of arid region the generic name is derived from 'Zizouf', which is the arabic. It is a member of the Rhamanaceae family and has a basic chromosome no  $x=12$ . *Zizyphus mauritiana* is well adapted to arid and semi-arid regions. The plants are vigorous in growth, branches are drooping, evergreen (may partially shed leaves and enter in dormancy during summer) leaves highly pubescent (tomentose) on the under surface, flowers in September to October, fruit ripen in February to April are generally round to oblong with greenish yellow colour. The experiment was carried out at Laboratory of Department of Horticulture, Babasaheb Bhimrao Ambedkar University (U.P.), India, during 2020-2021. Eleven cultivars of ber, Chhuhara, Goma Kirti, Umran, Kaithli, Banarasi Karaka, Mehrun, Gola, Narendra ber selection 3, Narendra ber selection 9, Narendra ber selection 1 were collected from ANDUAT, Kumarganj, Ayodhya and CIAH ber -1, ICAR- CIAH Bikaner. In the month of February, fruits of fully ripe stage were collected from the trees present in the Horticulture Research Farm of the Department of Horticulture, Babasaheb Bhimrao Ambedkar University. Narendra ber selection - 1 is superior in mostly parameters like as fruit length(4.31cm), fruit width (4.46cm), fruit weight (74.65g), specific gravity (1.51ml/g) and pulp weight (59.44mg/100g), which were all statistically almost equivalent.

**Key words :** Genotypes of ber, Physiological attributes.

### Introduction

Ber (*Ziziphus mauritiana* Lamk.) has been recognized as a useful edible fruit since antiquity in India. The generic name is derived from 'Zizouf', which is the arabic name of the fruit of *Z. lotus* Lamk. It is a member of the Rhamanaceae family and has a basic chromosome no  $x=12$ . The species *Z. mauritiana* Lamk. is indigenous to India and is tetraploid ( $2n=48$ ) to *Z. jujube* Mill., is indigenous to China and is diploid ( $2n=24$ ). It is an ancient fruit of the Indo-China region. Being xerophytic, ber is an important fruit crop of arid and semi-arid regions. It is previously recognized as poor man's fruit, also designated as "King of Arid fruits" owing to fact that it can be grown in unproductive, waste, marginal or inferior soil with pH as high as 9.0 in arid and semi-arid regions. Its cultivation

dates back to Vedic times (Sinko, 1971).

Due to its nutritive value, good taste, and affordable price, this fruit is quite popular among people of all social classes. Ber is one of the most nutritious and medicinal fruits available. It ranks second only to aonla and guava in terms of vitamin C content (Bal and Uppal, 1992). Fruits that are left to ripen on the tree have a short shelf life, and the optimal results are obtained when they are picked before the ripening process begins (Al-Niami, Abbas and Asker, 1989).

Requirement of temperatures ranges from 39-42°C and it can tolerate temperatures as high as 49-50°C. However, fruits are adversely affected at temperatures above 35°C. Flowering starts in September and completes in November. The harvesting time of fruit varies

depending upon varieties: it is generally harvested in the month of January and continues till February in different varieties and in different locations (Reddy, 2017). It is eaten mostly fresh but it can be utilized profitably for the preparation of several delicious products. The fruit of the choice grafted varieties is very tasty, the pulp ber drying in the sun is a common.

The dried fruit is kept for use during the off season. Umran is highly suitable for sun-drying and dehydration. Fully mature unripe fruits of ber can be used for the preparation of murabba, candy, pickle chutney. The juicy varieties can be converted into pulp to serve as base material for squash, nectar and ready to serve beverages. The fully mature fruits of ber can be canned in sugar syrups. Ber candy is an excellent product and the fruits of Umran variety gives an excellent product when candied. A nice jelly, prepared from the ripe fruit, retain a good amount of vitamin as ber is now being cultivated as a commercial crop. During exploration of some germplasm of ber fruits variability in various morphological characters *viz.* fruit shape (oval, oblong oval, ovate, sub spherical, apple shape), length, surface colour at maturity (brownish, radish brown, yellowish red, yellowish green yellowish surface with red-ting, half green, half-red), flesh colour (yellow, creamy-yellow, white, yellowish white) and texture was observed. Wider variability in stone shape (round, spherical, painted at both ends) and size was also observed (Rai and Gupta, 1994).

### Materials and Methods

The experiment was carried out at Laboratory of Department of Horticulture, Babasaheb Bhimrao Ambedkar University (U.P.), India, during 2020-2021. It is situated within the sub-tropical tract of central U.P. at 26° 56 North latitude and 80° 52 East longitude at an elevation of 111 meter above mean sea level. The climate of this zone is subtropical with maximum temperature ranging from 29.3°C to 45°C in summer and minimum temperature ranging from 3.5 to 12 °C in winter. The relative humidity of 49 to 77% in different parts of the year. Lucknow is characterized by subtropical climate with hot dry summers and cold winters. The annual rainfall is 650-750 mm most of which is received from June to September with some scattered showers in winter from the Northeast monsoon. Eleven cultivars of ber, Chuhara, Goma Kirti, Umran, Kaithli, Banarasi Karaka, Mehrun, Gola, Narendra ber selection 3, Narendra ber selection 9, Narendra ber selection 1, were collected from ANDUAT Kumarganj Ayodhya and CIAH ber-1, ICAR-CIAH Bikaner. In the month of February, fruits of fully ripe stage were collected from the trees present in the

Horticulture Research Farm of the Department of Horticulture, Babasaheb Bhimrao Ambedkar University, Lucknow. Observations were recorded for fruit shape, fruit length, fruit width, fruit weight, specific gravity, pulp weight and stone weight. Data obtained were analysed statistically.

**Table 1 :** List of genotypes.

S. no.	Genotypes	Collect from
1.	Chuhara	ANDUAT Kumarganj, Ayodhya
2.	Goma Kirti	ANDUAT Kumarganj, Ayodhya
3.	Umran	ANDUAT Kumarganj, Ayodhya
4.	Kaithli	ANDUAT Kumarganj, Ayodhya
5.	Banarasi Karaka	ANDUAT Kumarganj, Ayodhya
6.	Mehrun	ANDUAT Kumarganj, Ayodhya
7.	Gola	ANDUAT Kumarganj, Ayodhya
8.	Narendra ber selection 3	ANDUAT Kumarganj, Ayodhya
9.	Narendra ber selection 9	ANDUAT Kumarganj, Ayodhya
10.	Narendra ber selection 1	ANDUAT Kumarganj, Ayodhya
11.	CIAHber-1	ICAR- CIAH Bikaner

**ANDUAT-** (Acharya Narendra Deva University of Agriculture & Technology, Kumarganj, Ayodhya)

**ICAR- CIAH Bikaner-** (Central Institute for Arid Horticulture Bikaner)

### Observations Recorded

#### Shape of fruits

The shape of fully uniform mature ripe fruits for each treatment was calculated on the basis of diameter and length ratio in randomly selected 11 fruits.

#### Length of fruits (cm)

Length was measured from the base of the pericarp till the base of fruit with the help of vernier calipers and average value was calculated in randomly selected 3 fruits.

#### Width of fruits (cm)

Width was measured at the point of maximum bulge of fruit with the help of Vernier Caliper and average value was calculated.

#### Weight of fruits (g)

Average 3 fruits from each cultivar were weighed on an electronic balance and average weight of the fruits was recorded and expressed in gram.

$$\text{Specific gravity (g/ml)} = \frac{\text{Weight of fruit (gm)}}{\text{Volume of water displaced by the fruit (ml)}}$$

The specific gravity was calculated by dividing the fruit weight with the volume as per the method given by Rangana (1991) according to the following formula.

### Weight of pulp

The weight of 3 randomly selected fruits from each treatment was measure Specific gravity (g/ ml) red on an electronic balance. The fruit and stone weight were measured separately on an electronic balance and weight of fruit from which weight of stone has been subtracted given the weight of pulp and average value was calculated.

### Stone weight (g)

Stone from 3 fruits in each cultivar were weighed on an electronic balance and the average weight of the fruit was calculated.

## Results and Discussion

### Effect of different genotypes physiological attributes of ber

The fruit shape showed that the cultivars, Goma Kirti, Umran, Kaithli, Banarsi karaka, Narender ber -3, CIAH Ber-1 are oblate in shape. The cultivar Chhuhara, Gola, Narender ber – 1, Narender ber - 9 and were round in shape and Mehrun cultivar in oval shape. Maximum cultivars are oblate in shape viz. Goma Kirti, Umran, Kaithli, Banarsi karaka, Narender ber -3, CISH ber -1 which were significantly different from the other cultivars.

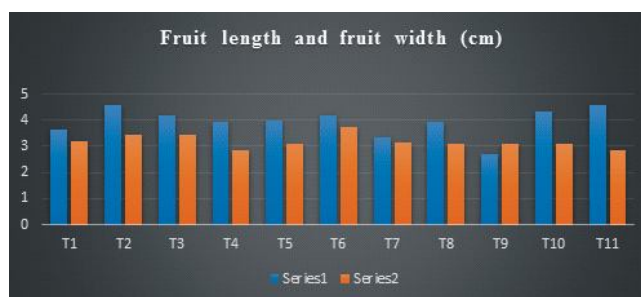


Fig. 1 : Effect of physiological parameters of ber (*Ziziphus mauritiana* Lamk.) genotypes.



Fig. 2 : Effect of physiological parameters of ber (*Ziziphus mauritiana* Lamk.) genotypes.

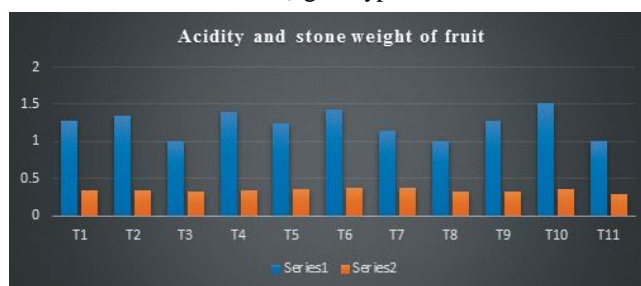


Fig. 3 : Effect of physiological parameters of ber (*Ziziphus mauritiana* Lamk.) genotypes.

Table 2 : Effect of physiological parameters of ber (*Ziziphus mauritiana* Lamk.) genotypes.

Treatment details	Fruit shape	Fruit length (cm)	Width of fruit (cm)	Fruit weight (mg)	Specific gravity (ml/g)	Pulp weight (mg/100g)	Stone weight (mg/100g)
T <sub>1</sub> Chhuhara	Round	3.62	3.21	63.60	1.28	56.40	0.340
T <sub>2</sub> Goma Kirti	Oblate	4.6	3.44	54.33	1.35	49.33	0.336
T <sub>3</sub> Umran	Oblate	4.16	3.43	61.34	0.998	47.34	0.324
T <sub>4</sub> Kaithali	Oblate	3.93	2.86	55.20	1.39	51.74	0.337
T <sub>5</sub> Banarasi Karaka	Oblate	3.99	3.11	55.80	1.25	58.33	0.356
T <sub>6</sub> Mehrun	Oval	2.48	2.34	49.22	1.31	53.66	0.372
T <sub>7</sub> Gola	Round	3.32	3.16	57.30	1.14	43.66	0.371
T <sub>8</sub> Narendra ber selection 3	Oblate	3.95	3.11	56.40	1.00	51.88	0.319
T <sub>9</sub> Narendra ber selection 9	Round	2.68	3.11	36.66	1.276	35.14	0.323
T <sub>10</sub> Narendra ber selection 1	Round	4.31	4.46	74.65	1.51	59.44	0.356
T <sub>11</sub> CIAHber-1	Oblate	4.56	2.85	54.60	1.00	46.60	0.289
SE(m) ±		0.173	0.142	2.643	0.055	2.446	0.015
CD at 5%		0.513	0.421	7.851	0.164	7.265	0.045

T<sub>1</sub> Chhuhara, T<sub>2</sub> Goma Kirti, T<sub>3</sub> Umran, T<sub>4</sub> Kaithali, T<sub>5</sub> Banarasi karaka, T<sub>6</sub> Mehrun, T<sub>7</sub> Gola, T<sub>8</sub> Narendra Ber selection–3, T<sub>9</sub> Narendra Ber selection – 9, T<sub>10</sub> Narendra Ber selection – 1, T<sub>11</sub> CIAH Ber – 1.

Whereas cultivar Chhuhara, Gola, Narender ber - 1 Narender ber - 9 round and Mehrun in oval shape which is significantly different from the rest of the cultivars. The shape of fully uniform mature ripe fruit of ber from each treatment was calculated on the basis of diameter and length ratio or per the method of Bobone. In the current study, it was found that maximum fruit length (4.60cm) was observed in Goma Kirti and following that CIAH ber-1 (4.56cm), the highest width of fruit was observed in Narendar ber selection -1(4.46cm) and second near fruit width in cv. Goma Kirti (3.44cm) and also similar in maximum fruit weight (74.65 g) and highest specific gravity (1.51) as well as superior pulp weight (59.44 mg/100g) also found Narendar ber selection – 1 ( $T_{10}$ ) and the highest stone weight (0.372 mg/100g) was observed in Mehrun treatment ( $T_6$ ). An increase in fruit length might be due to accumulation of foods and water into fruits and more cell division and cell elongation that was harvesting time of the fruits. The observations are in close proximity to the findings of Pandey *et al.* (1990) investigated the pattern of changes in physical character of developing ber in cv. Narendra ber selection-1 at 7 days interval from fruit set to ripening and observed that fruit length increased from days of fruit setting (0.49cm) to 4.51cm at 168 days after fruit setting. Sahu *et al.* (2019) studied on physical changes during fruit growth and development of different genotypes of ber viz., Gola, Banarasi, Karaka, Umran, Jawahar ber-1, Jawahar ber -2, Jawahar ber-3 and found that width increased with advancement of growth and development period. The variation among cultivars as regard to average fruit weight might be due to genotypic variation of the cultivar, inherent characters and climatic adaptability in a particular region (Mahajan and Dhillon, 2000 and Kumar *et al.*, 2014). Variation in some of the genotypes is due to the difference in agro climatic conditions and the genotypes under study. Variations in fruit length and breadth have also been reported by Aulakh *et al.* (2005); Navjot *et al.* (2007) and Dhanumjaya and Subramanayam (2010). The results are in conformity to those reported by Teotia *et al.* (1974) in fruits of ber cv. Banarasi Karaka.

### Conclusion

On the basis of present investigation, it can be concluded that the fruit shape, where as cultivar Chhuhara, Gola Narenderber 3, Narender ber - 1 Narender ber - 9 round, which is significantly different from the rest of the cultivars. Narendar ber selection - 1 is superior in mostly parameters like as fruit width, fruit weight, specific gravity and pulp weight. Thus, we can be recommended to growers for commercial cultivation of Ber (*Ziziphus mauritiana* Lamk.) that they are cultivation of cultivar Narendar ber selection – 1.

### References

- Al-Niami, J.H., Abbas M.F. and Asker M.A. (1989). The effect of temperature on some chemical constituents and storage behaviour of jujube fruit cv. Zayoui. *Basrah J. Agricult. Sci.*, **2**, 31-36.
- Aulakh, P.S., Vij V.K. and Kumar A. (2005). Comparative performance of some promising ber varieties grown under arid-irrigated conditions of Punjab. *Indian J. Horticult.*, **62(2)**, 127-128.
- Bal, J.S. and Uppal D.K. (1992). *Ber Varieties*. Assoc. Publishing Co. New Delhi, p 90.
- Bal, J.S. and Chohan G.S. (1981). Fixation of maturity standards for ber cv. Umran. *Punjab Horticult. J.*, **3**, 70-73.
- Dhillon, W.S. and Mahajan B.V.C. (2011). Ethylene and ethephon induced fruit ripening in pear. *J. Stored Products and Postharvest Res.*, **2(3)**, 45-51.
- Kumar, S., Yadav P., Jain V. and Malhotra S.P. (2014). Isozymes of antioxidative enzymes during ripening and storage of ber (*Ziziphus mauritiana* Lamk.). *J. Food Sci. Technol.*, **51**, 329-334.
- Navjot, N., Brar K.S., Mittal V.P., Thakur A. and Dalal R.P. (2009). Genetic parameters, character association and path analysis for fruit yield and its components in ber (*Ziziphus mauritiana*). *The Indian J. Agricult. Sci.*, **79(12)**.
- Pandey, S., Deen B., Singh V. and Singh R. (2019). Studies on the pattern of changes in physical characters of developing ber (*Ziziphus mauritiana* Lamk.) fruits. *J. Pharmacog. Phytochem.* **8(4)**, 644-648.
- Patel, P.R. and Rao T.R. (2014). Growth and ripening in black plum [*Syzygium cumini* (L.) Skeels]. *Int. J. Fruit Sci.*, **14(2)**, 147-156.
- Rai, M. and Gupta P.N. (1994). *Genetic diversity in fruits of ber*. Indian Horticulture, I.C.A.R. New Delhi, (April-June 10-51p).
- Rao, K.D. and Subramanyam K. (2010). Growth and yield performance of pomegranate varieties under scarce rainfall zone. *Agricult. Sci. Digest*, **30(1)**, 71-72.
- Reddy, A.G.K., Kumar J.S., Maruthi V., Venkata Subbaiah K. and Rao C.S. (2017). Fruit production under climate changing scenario in India: A review. *Environ. Ecol.*, **35(2B)**, 1010-1017.
- Sahu, K., Pandey C.S., Pandey S.K. and Verma R. (2019). Studies on physical changes during fruit growth and development of different genotypes of ber (*Ziziphus mauritiana* Lamk.). *Int. J. Curr. Microbiol. Appl. Sci.*, **8(2)**, 3325-3332.
- Shattir, A.E. and Abu-Goukh A.B.A. (2010). Physico-chemical changes during growth and development of papaya fruit. *Agricult. Biol. J. North Amer.*, **1(5)**, 866- 870.
- Singh, B.P., Singh S.P. and Chauhan K.S. (1981). Certain chemical changes and rate of respiration in different cultivars of ber during ripening. *Haryana Agricult. Univ. J. Res.*, **11(1)**, 60-64.
- Sinko, L. (1971). *Ziziphus jujuba* one of the most valuable subtropical fruit crops in the Soviet Union south. *Trudy- Gosudarstvenny-Nikitski- botanicheskoi- sad*, **52**, 52.
- Soares, F.D., Pereira T., Marques M.O.M. and Monteiro A.R. (2007). Volatile and non-volatile chemical composition of the white guava fruit (*Psidium guajava*) at different stages of maturity. *Food Chem.*, **100 (1)**, 15–21.
- Teotia, S.S., Dubey P.S., Awasthi R.K. and Upadhyay N.P. (1974). Studies on physico-chemical characteristics of some important ber varieties (*Ziziphus mauritiana* Lamk.). *Progressive Horticulture*, **5(4)**, 81-88.
- Yadav, S.S. (2009). Studies on physicochemical changes during growth and development of Ber (*Ziziphus mauritiana* Lamk.) fruit cv. Pevendi. *Quart. Res. J. Plant Anim. Sci.*, **24**, 77.