



Influence of Different Planting Dates on the Survival and Growth Parameters of Different Cultivar of Ber (*Zizyphus mauritiana*)

Shubham ^{a++*}, Devi Singh ^{a#}, C. Jhon Wesley ^{b#}
and Pooja Kakarwal Meena ^{a++}

^a Department of Horticulture, SHUATS, Prayagraj, India.

^b Centre of Geospatial Technologies, SHUATS, Prayagraj, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The present investigation was conducted in Department of Horticulture, Sam Higginbottom University of Agriculture, Technology & Sciences Prayagraj during February 2023 to August 2023. A field experiment was conducted with 3 varieties viz. V₁ (Apple ber), V₂ (Kashmiri ber), V₃ (Miss India) planted at different dates viz. 15th February, 1st March, 15th March. The experiment was laid out in randomized block design with 3 replications and 9 treatments. The result indicated that maximum plant height was recorded in (V₂) Kashmiri (65.73cm) planted on 1st March. The Miss India variety

⁺⁺ M.Sc. (Hort.) Fruit Science;

[#] Associate Professor;

*Corresponding author: E-mail: chaudharyshubham254@gmail.com;

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(V₃) has be planted on 15 february have highest no. of leaves (124.50), highest no. of bud break (27.67), maximum no. of branches (12.83) maximum plant spread East-West (30.08 cm) North-South (32.20cm) and highest survival percentage (88.89%). Apple ber (V₁) planted on 1st march having highest leaf area (18.50cm), highest leaf area index (0.037) and highest chlorophyll content (35.67). From the present study it can be concluded that 15th february are most suitable date for transplanting and miss india (V₃) variety is shown significantly superior performance in relation to growth and survival in prayagraj agro-climatic condition.

Keywords: Ber; varieties; dates; different; planting.

1. INTRODUCTION

Ber (*Ziziphus mauritiana* Lamk) is popularly called the king of arid zone fruits. It is an important fruit crop for arid and semi-arid regions in tropical and sub-tropical regions. Its origin is India. It is known for its ability to withstand adverse conditions. It is truly a desert apple of Thar Desert. Anonymous [1]. The cultivars Umran, Kathapal and Gola are the most promising varieties of ber in North India. The area under cultivation with this fruit is 8.7 lakh ha with an annual production of 8.9 lakh tones in India. Bolada et al. [2].

There are two major domesticated jujubes, *Z. mauritiana* Lam. the Indian jujube or ber, and *Z. jujuba* Mill. the Chinese or common jujube. These two species have been cultivated over vast areas of the Old World and a limited number of others have been, and are, cultivated on a more localised scale. Bhambota and Singh [3]. However all jujubes remain relatively minor crops although demand for production remains steady in many parts where they were originally domesticated. Anonymous [4].

It is deciduous and highly resistant to frost. Its draught hardiness, xerophytic nature, tolerance to salt (40 ESP and 12-15 dSm⁻¹), deep tap root system, spiny nature and ability to shed its leaves during hot summer have helped the plant to adopt well to the arid and semi-arid conditions. It can be successfully cultivated even in the most marginal ecosystems of the subtropics and tropics. It is cultivated widely for its resistance to grow in drought and other diversified soil and climatic conditions. It is a hardy tree that copes with extremes temperature and thrives under dry conditions. Fruit quality is best under hot sunny and dry conditions but there should be a rainy season to support growth and flowering leaving enough soil moisture to carry the fruit to maturity. The ber plant is quick growing, early bearing and spreading tree. It has remarkable adoptability enabling to grow in wide range of agro-climatic situation and soils. Bailey LH.[5].

Establishment of ber orchard is very difficult because of high rate of mortality of young plants at transplanting. This cannot be overcome by budding the seedlings in-situ as it is very tedious process and the trees in the orchard never have a uniform stand. Like other fruit trees, it is desirable to raise budded plants of known varieties, as the seedling trees bear the poor quality fruits of low-commercial value. Bakhshi and Singh [6].

2. MATERIALS AND METHODS

2.1 Description of the Study Area

The present investigation was conducted at Department of Horticulture, Sam Higginbottom University of Agriculture, Technology & Sciences Prayagraj during february 2023 to august 2023. The experimental site was found under sub-tropical belt in the South Eastern Uttar Pradesh, which experience extremely hot summer and fairly cold winter. The maximum temperature of the location reaches up to 45° C to 48° C and seldom falls as low as 4° C to 5°C. The relative humidity ranged between 20-94%. The average rainfall in this area is around 850-1100mm annually.

2.2 Treatments and Experimental Design

The experiment consisted of two factors: planting dates and varieties. A field experiment was conducted with 3 varieties viz. V₁ (Apple ber), V₂ (Kashmiri ber), V₃ (Miss India) with different planting dates viz. 15th february, 1st march, 15th march. The experiment was laid out in randomized block design With 3 replication and 9 treatment.

2.3 Experimental Procedures and Agronomic Practices

Land was prepared for ber plants by applying the recommended doses of organic manures (F.Y.M, Vermicompost, Neem cake) and fertilizers. The remaining portions of N.P.K were applied into two

equal parts by using around the root zone at 60 and 90 days after planting. Staking of ber plants with stick for giving extra spot to the plant. Staking is absolutely essential during the first two years to train the tree properly. Irrigation along with other cultural operations including plant protection measures were done as and when required.

Table 1. Details of treatment combination

Treatment Notation	Treatment combination
T ₁	Apple ber+ (15th February)
T ₂	Kashmiri+ (15th February)
T ₃	Miss India+ (15th February)
T ₄	Apple ber+ (1st March)
T ₅	Kashmiri+ (1st March)
T ₆	Miss India+ (1st March)
T ₇	Apple ber+ (15th March)
T ₈	Kashmiri+ (15th March)
T ₉	Miss India+ (15th March)

2.4 Data Collection

The observations were recorded on randomly selected plants based on vegetative characteristics viz., plant height (cm), bud breaks, number leaves per plant, number of branch per plant, plant spread (cm) east-west and north-south, leaf area (cm), leaf area index, chlorophyll content, survival percentage. The growth parameters were recorded at periodical intervals of 30, 60, 90, 120, 180 DAP from the randomly selected plants in each treatment.

2.5 Data Analysis

The data was analyzed by using the completely randomized block design by applying the technique of analysis of variance by Fisher (1958). The data presented in this paper are the mean values of different parameters and the significance level is compared with the critical difference.

3. RESULTS AND DISCUSSION

3.1 Plant Height

At 180 DAP, The maximum plant height 65.73cm was found in V₂ (Kashmiri, 1st march) and the minimum was recorded in V₁ (apple ber, 15th march) with 51.20cm.

The evaluation of various hybrid varieties of ber (*Ziziphus mauritiana*) for plant height reveals significant diversity. Through systematic assessment, certain hybrids demonstrate superior growth characteristics, exhibiting taller stature compared to others. Factors influencing plant height include genetic makeup, environmental conditions, and management

practices. Hybrid selection plays a pivotal role in determining desired plant architecture for optimal yield and resource utilization. Understanding the performance of different hybrids in terms of plant height facilitates informed decision-making for growers, enabling them to choose varieties that align with their cultivation objectives and environmental constraints. These finding were in the conformity of Kaur et al., [7] in Strawberry.

3.2 Bud Break

At 180 DAP, The highest bud break 27.67 was recorded in V₃ (Miss india, 15th february) and the lowest was found in V₁(Apple ber, 15th march) with 19.00.

The effect of various hybrid varieties of ber (*Ziziphus mauritiana*) on the number of buds breaks presents a spectrum of outcomes. Hybrid selection significantly influences bud production, with some hybrids exhibiting higher bud counts compared to others. Genetic diversity plays a crucial role in determining bud formation potential, alongside environmental factors and cultural practices. Evaluating the bud count across different hybrids aids in identifying cultivars with prolific bud production, contributing to enhanced flowering, fruit set, and overall yield potential in ber cultivation systems. This finding were advocated by Sharif et al., [8] in ber.

3.3 Leaves/Plant

At 180 DAP, The maximum leaves 124.50 was found in V₃ (Miss india, 15th february) and the minimum was recorded in V₁ (Apple ber, 15th march) with 92.00.

The impact of different hybrid varieties of ber (*Ziziphus mauritiana*) on leaf numbers varies considerably. Hybrid selection influences leaf proliferation, with certain hybrids displaying greater leaf abundance compared to others. Genetic factors, environmental conditions, and cultural practices collectively influence leaf production. Evaluating leaf numbers across various hybrids enables growers to identify cultivars with desirable leaf characteristics, potentially indicating vigorous growth and photosynthetic capacity. Understanding these effects assists in selecting hybrids that optimize foliage development, contributing to overall plant health and productivity in ber cultivation. This finding is in the conformity of Sharif et al., 2015.

3.4 Branches/Plant

At 180 DAP, The maximum branches 12.83 was found in V₃ (Miss india, 15th february) and the minimum was recorded in V₁ (Apple ber, 15th march) with 8.67.

The evaluation of different hybrids of ber (*Ziziphus mauritiana*) for the number of branches is essential for optimizing orchard management and yield. By studying the branching patterns of various hybrids, growers can identify those with higher branch proliferation, facilitating increased fruit-bearing potential and canopy density. Factors such as branch angle, length, and density play crucial roles in sunlight interception and fruit quality. Selecting hybrids with desirable branch characteristics can lead to improved productivity and more efficient space utilization in ber orchards. Similar finding was reported by Baloda et al., (2014) in ber [9].

3.5 Plant Spread (cm) (E-W)

At 180 DAP, The maximum plant spread (E-W) 30.08cm found in V₃ (Miss india, 15th february) and the minimum was recorded in V₁ (Apple ber, 15th march) with 24.57cm (E-W).

Evaluation of different hybrids of ber (*Ziziphus mauritiana*) for plant spread is crucial for optimizing yield and space utilization. Hybrid selection directly impacts canopy architecture, branching pattern, and overall plant spread, influencing sunlight interception, pollination efficiency, and ease of management. Through systematic trials, hybrids exhibiting desirable traits such as compact growth, uniform branching, and moderate lateral spread can be identified. Considerations must also be given to environmental adaptability, disease resistance, and fruit quality. By assessing various hybrids for their plant spread characteristics, growers can make informed decisions to maximize productivity while minimizing resource inputs. This evaluation process contributes to sustainable ber cultivation practices and ensures efficient land utilization in orchards. This finding is in conformity with Dwivedi et al., [10] in capegooseberry.

3.6 Plant Spread (cm) (N-S)

At 180 DAP, The maximum plant spread (N-S) 32.20cm found in V₃ (Miss india, 15th February) and the minimum was recorded in V₁ (Apple ber, 15th march) with 25.27cm (N-S).

3.7 Leaf Area (cm)

The highest leaf area 18.50cm was found in V₁ (Apple ber, 1st march) and the lowest was recorded in V₃ (Miss india, 15th march) with 8.58cm.

Assessing various hybrids of ber (*Ziziphus mauritiana*) for leaf area is vital for understanding their photosynthetic capacity and overall growth potential. Hybrids with larger leaf areas generally exhibit enhanced photosynthetic efficiency, resulting in improved nutrient assimilation and higher biomass production. Evaluating leaf area also provides insights into the plant's water use efficiency and tolerance to environmental stresses. Additionally, larger leaf areas contribute to better canopy development, which can influence microclimate regulation and fruit quality. By selecting hybrids with optimal leaf area, growers can enhance productivity, resource utilization, and resilience in ber cultivation, ultimately leading to more sustainable and profitable orchard management practices. Similar finding were reported by Menzel and Smith, (2012) in strawberry [11].

3.8 Leaf Area Index (cm)

The maximum leaf area index 0.037 was found in V₁ (Apple ber, 1st march) and the minimum was recorded in V₃ (Miss india, 15th march) with 0.015.

Assessing various hybrids of ber (*Ziziphus mauritiana*) for leaf area index is vital for understanding their photosynthetic capacity and overall growth potential. A leaf area index expresses the leaf area per unit ground or trunk surface area of a plant and is commonly used as an indicator of the growth rate of a plant. Leaf area index is a complex variable that relates not only to the size of the canopy, but also to its density, and the angle at which leaves are oriented in relation to one another and to light sources. By selecting hybrids with optimal leaf area, growers can enhance productivity, resource utilization, and resilience in ber cultivation, ultimately leading to more sustainable and profitable orchard management practices. Similar finding by Dwivedi et al., [10] in gooseberry.

3.9 Chlorophyll Content

At 180 DAP, The highest chlorophyll content 35.67 was found in V₁ (Apple ber, 1st march) and minimum was recorded in V₃ (Miss india, 15th march) with 26.83.

Assessing various hybrids of ber (*Ziziphus mauritiana*) for Chlorophyll Content is vital for understanding their photosynthetic capacity and overall growth potential. Hybrids with larger Chlorophyll Contents generally exhibit enhanced photosynthetic efficiency, resulting in improved nutrient assimilation and higher biomass production. Evaluating Chlorophyll Content also provides insights into the plant's water use efficiency and tolerance to environmental stresses. Additionally, larger Chlorophyll Contents contribute to better canopy development, which can influence microclimate regulation and fruit quality [12-14]. By selecting hybrids with optimal Chlorophyll Content, growers can enhance productivity, resource utilization, and resilience in ber cultivation, ultimately leading to more sustainable and profitable orchard management practices. Similar finding were reported by Jami et al. [15] in strawberry.

3.10 Survival (%)

At 180 DAP, The maximum survival (%) 88.89 was found in V₃ (Miss india, 15th February),

and the minimum survival (%) was recorded in V₁ (Apple ber, 1st march) with 33.33 [16-18].

The evaluation of different hybrids of ber (*Ziziphus mauritiana*) for survivability percentage is critical to ascertain their adaptability and resilience to various environmental conditions. By subjecting hybrids to rigorous field trials and stress tests, growers can determine their ability to withstand factors such as drought, pests, diseases, and extreme temperatures. Hybrids exhibiting higher survivability percentages indicate greater vigor, robustness, and potential for long-term orchard establishment. Understanding survivability percentages also aids in selecting hybrids suitable for specific agro-climatic zones, optimizing resource allocation, and mitigating risks associated with crop failure. Ultimately, prioritizing hybrids with superior survivability enhances the sustainability and success of ber cultivation endeavors. Jamro et al., [19].

Table 2. Effect of different planting dates on plant height, no. of bud break and no. of leaves of different cv. of ber

Treatment symbol	Treatment combination	Plant height(cm)	Bud breaks	No. of leaves
T ₁	Apple ber+ (15th february)	59.88	19.83	97.67
T ₂	Kashmiri+ (15th february)	60.30	25.33	108.00
T ₃	Miss india+ (15th february)	62.36	27.67	124.50
T ₄	Apple ber+ (1st march)	61.20	21.33	94.33
T ₅	Kashmiri+ (1st march)	65.73	24.33	113.67
T ₆	Miss india+ (1st march)	60.97	27.17	114.83
T ₇	Apple ber+ (15th march)	51.20	19.00	92.00
T ₈	Kashmiri+ (15th march)	57.33	21.83	104.83
T ₉	Miss india+ (15th march)	55.93	26.67	111.83
F.test		S	S	S
S.E (d) (±)		2.82	1.98	5.92
CD(5%)		5.98	4.21	12.29

Table 3. Effect of different planting dates on no. of branches and plant spread of different cv. of ber

Treatment symbol	Treatment combination	No. of branches	Plant spread(cm)	
			East-West	North- South
T ₁	Apple ber+ (15th february)	9.00	28.30	26.77
T ₂	Kashmiri+ (15th february)	10.17	29.50	30.03
T ₃	Miss india+ (15th february)	12.83	30.08	32.20
T ₄	Apple ber+ (1st march)	9.30	27.13	28.37
T ₅	Kashmiri+ (1st march)	10.83	27.30	28.17
T ₆	Miss india+ (1st march)	10.17	28.03	27.40
T ₇	Apple ber+ (15th march)	8.67	24.57	25.27
T ₈	Kashmiri+ (15th march)	9.83	26.33	25.40
T ₉	Miss india+ (15th march)	10.50	27.50	26.77
F.test		S	S	S
S.E (d) (±)		0.81	1.07	1.11
CD(5%)		1.73	2.28	2.37

Table 4. Effect of different planting dates on leaf area and leaf area index of different cv. of ber

Treatment symbol	Treatment combination	Leaf area(cm)	Leaf area index
T ₁	Apple ber+ (15th february)	17.83	0.035
T ₂	Kashmiri+ (15th february)	12.33	0.028
T ₃	Miss india+ (15th february)	9.47	0.016
T ₄	Apple ber+ (1st march)	18.50	0.037
T ₅	Kashmiri+ (1st march)	12.83	0.027
T ₆	Miss india+ (1st march)	8.50	0.015
T ₇	Apple ber+ (15th march)	17.67	0.034
T ₈	Kashmiri+ (15th march)	11.50	0.025
T ₉	Miss india+ (15th march)	8.97	0.017
F.test		S	S
S.E (d) (±)		0.75	0.0028
CD(5%)		1.59	0.0058

Table 5. Effect of different planting dates on chlorophyll content and survival percentage of different cv. of ber

Treatment symbol	Treatment combination	Chlorophyll content	Survival(%)
T ₁	Apple ber+ (15th february)	34.90	66.67
T ₂	Kashmiri+ (15th february)	30.93	77.78
T ₃	Miss india+ (15th february)	27.17	88.89
T ₄	Apple ber+ (1st march)	35.67	55.57
T ₅	Kashmiri+ (1st march)	30.80	66.67
T ₆	Miss india+ (1st march)	27.23	77.78
T ₇	Apple ber+ (15th march)	34.33	33.33
T ₈	Kashmiri+ (15th march)	29.80	55.57
T ₉	Miss india+ (15th march)	26.83	66.67
F.test		S	S
S.E (d) (±)		2.16	11.47
CD(5%)		4.60	24.20

4. CONCLUSION

On the basis of results obtained in the present investigation entitled, "Influence of different planting dates on the survival and growth parameters of different cv. of Ber (*Zizyphus mauritiana*)" it concluded that Miss india variety (V₃) was found superior in growth parameters *i.e.* number of bud breaks per plant, number of leaves per plant, number of branches per plant, canopy spread (East-West and North-South direction) and survival percentage whereas Miss india (V₃) variety of ber had exhibited superior in growth parameters.

However, the 15th February has been found the best planting date for increment in vegetative growth of ber varieties (Apple ber, Kashmiri, Miss India).

In this experiment the ber varieties (Apple ber, Kashmiri, Miss india). with different planting dates (15th february, 1st march, 15th march) concluded that 15th february are most suitable date for transplanting and Miss india (V₃) variety

is shown significantly superior performance in relation to growth and survival in prayagraj Agro-climatic condition.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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