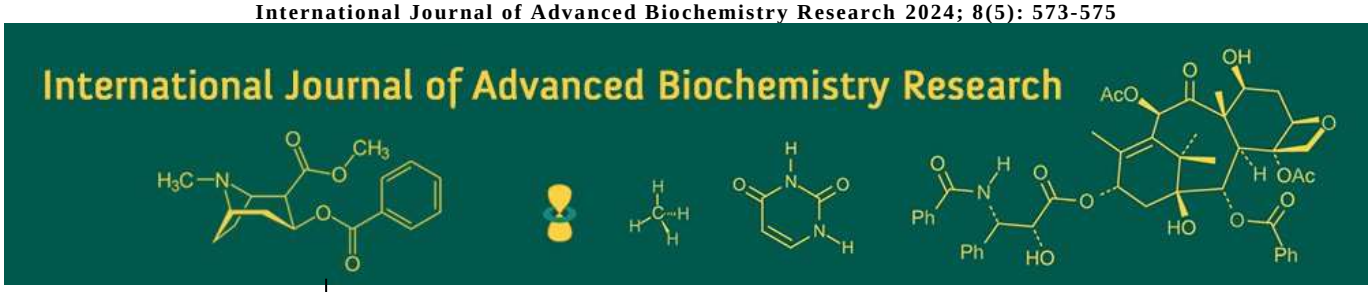

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Studies on growth, development and establishment of different varieties of ber (*Ziziphus mauritiana*) under Prayagraj agro climatic condition

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Abstract
The present was conducted in the Horticulture Research Farm, Department of Horticulture, Naini Agricultural Institute Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj during the year 2022-23. The experiment was carried out in randomized block design with 7 variety which were replicated thrice. The variety were V_1 (Thai apple ber), V_2 (Miss india), V_3 (Kashmiri apple ber), V_4 (Baal sinduri), V_5 (Khata mitha), V_6 (Gola), V_7 (Banarasi karka). On the basis of our experimental findings it is concluded that the V_1 Thai apple ber variety was found to be best in the terms of growth *viz* plant height, plant spread, number of buds, days to bud break, number of branches, chlorophyll content, Survivability % It is also concluded that the best variety for prayagraj agro-climatic conditions was found to be V_1 Thai apple ber for establishment.

Keywords: Ber, variety, survival %, growth and establishment

Introduction
Ber (*Ziziphus mauritiana* Lamk) holds significant importance as a fruit crop in the arid and semi-arid regions of northern India. Unlike many other fruits, Ber thrives even in marginal soils, making it a valuable choice for cultivation in challenging environments. Although its cultivation in tropical parts of India is relatively recent, it demands increased attention to plant protection measures under such conditions. Ber belongs to the Rhamnaceae family, which encompasses approximately 50 genera and over 600 species. Within the genus *Ziziphus*, there are around 40 species distributed across tropical and subtropical regions in both hemispheres. The Ber plant exhibits summer dormancy, a strategy that helps it withstand stressful conditions. Following fruit harvest in March-April, the trees shed their leaves and remain dormant until June, effectively adapting to resist drought and desiccating conditions during summer months.

Establishing a Ber orchard poses significant challenges due to the high mortality rate of young plants during transplanting. Addressing this issue is difficult through in situ budding of seedlings, as it is a laborious process and results in orchards with uneven stands. Similar to other fruit trees, it is preferable to cultivate budded plants of known varieties, as seedling trees produce fruits of inferior quality and low commercial value.

Establishing different varieties of Ber (*Ziziphus mauritiana* Lamk) in Prayagraj's agro-climatic conditions offers numerous benefits, contributing to agricultural diversity, resilience, and economic prosperity in the region.

Materials and Methods
The present study was conducted in the Horticulture Research Farm, Department of Horticulture, Naini Agricultural Institute Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj during the year 2022-23. The experiment was carried out in randomized block design with 7 variety which were replicated thrice. The variety were V_1 (Thai apple ber), V_2 (Miss india), V_3 (Kashmiri apple ber), V_4 (Baal sinduri), V_5 (Khata mitha), V_6 (Gola), V_7 (Banarasi karka)This study was Undrtaken to.the objective of the experiment was to study the growth and establishment of ber orchard in Prayagraj climatic conditions.

Results and Discussion

The maximum plant height was observed in V1 (Thai apple ber) with (137.08) cm followed by V2 (Miss India) with (129.94) and minimum was recorded in V7 (Banarasi Karaka) with (105.08) cm. 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. These finding were in the conformity of Singh *et al.,* 2019 in mango.

The maximum Number of Bud was observed in V1 (Thai apple ber) with (10.84) followed by V2 (Miss India) with (10.65) and minimum number of bud was recorded in V7 (Banarasi Karaka) with (8.41). The effect of various hybrid varieties of ber (*Ziziphus mauritiana*) on the number of buds presents a spectrum of outcomes. 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 Yadav *et al.,* 2020 [18] in ber.

The maximum Number of leaves was observed in V1 (Thai apple ber) with (158.13) followed by V2 (Miss India) with (156.45) and minimum was recorded in V7 (Banarasi Karaka) with (150.91). 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 Malik *et al.*, (2020) [19].

The maximum Plant spread was observed in V1 (Thai apple ber) with (47.06) followed by V2 (Miss India) with (45.33) and minimum was recorded in V7 (Banarasi Karaka) with (41.58). 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 Yadav *et al.,* 2021 [20] in mango crop.

The maximum Number of Branches was observed in V1 (Thai apple ber) with (14.92) followed by V2 (Miss India) with (14.50) and minimum was recorded in V7 (Banarasi Karaka) with (13.06). Selecting hybrids with desirable branch characteristics can lead to improved productivity and more efficient space utilization in ber orchards. Similar finding was reported by Ahmad *et al.,* in Phalsa in 2022 [21].

The minimum Days to bud break was observed in V1 (Thai apple ber) with (23.67) days followed by V2 (Miss India) with (24.91) days and maximum number of days required to bud break was recorded in V7 (Banarasi Karaka) with (31.89) days.

The maximum Leaf area was observed in V1 (Thai apple ber) with (31.89) cm^2 followed by V2 (Miss India) with (30.48) cm^2 and minimum was recorded in V7 (Banarasi Karaka) with (23.67) cm^2. 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 Yadav *et al.* 2020 [18] in ber.

The maximum Chlorophyll Content was observed in V1 (Thai apple ber) with (35.31) followed by V2 (Miss India) with (30.25) and minimum was recorded in V7 (Banarasi Karaka) with (27.48). 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 Yadav *et al.* 2020 [18] in ber.

The maximum Survivability % was observed in V1 (Thai apple ber) with (89.43) followed by V2 (Miss India) with (88.47) and minimum was recorded in V7 (Banarasi Karaka) with (81.32). 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.

The minimum Mortality % was observed in V1 (Thai apple ber) with (10.57) followed by V2 (Miss India) with (11.53) and maximum was recorded in V7 (Banarasi Karaka) with (18.68).

The maximum Establishment % was observed in V1 (Thai apple ber) with (84.54) % followed by V2 (Miss India) with (83.58) % and minimum was recorded in V7 (Banarasi Karaka) with (73.64) %. Evaluating different hybrids of ber (*Ziziphus mauritiana*) for establishment percentage in orchards is crucial for successful commercial cultivation.

Table 1: Performance of different hybrid of ber for Plant height, Number of bud, Number of leaves, Plant spread

Variety	Plant Height (cm)	Number of bud	Number of Leaves	Plant Spread (cm)
	180 DAT	180 DAT	180 DAT	180 DAT
V1	137.08	10.84	158.13	47.06
V2	129.94	10.65	156.45	45.33
V3	124.59	10.19	152.72	44.37
V4	123.03	9.98	155.13	43.97
V5	121.8	9.73	153.78	44.9
V6	121.07	8.86	151.45	42.4
V7	105.08	8.41	150.91	41.58
F test	S	S	S	S
S.Ed.	0.478	0.076	1.694	1.904
$C.D._{5\%}$	0.956	0.152	3.22	3.769
C.V.	1.86	0.304	6.776	7.616

Table 2: Performance of different hybrid of ber for Number of branches, Days to bud break, Leaf area, chlorophyll content, Survivability %, mortality % and establishment %.

Variety	Number of Branches		Days to bud break	Leaf area (cm^2)	Chlorophyll content	Survivability %	Mortality %	Establishment %
	90 DAT	120 DAT						
V1	6.43	14.92	23.67	31.89	35.31	89.43	10.57	84.54
V2	6.01	14.5	24.91	30.48	30.25	88.47	11.53	83.58
V3	5.95	14.44	28.81	28.81	28.87	86.28	13.72	81.39
V4	5.83	14.32	26.62	26.62	29.21	85.48	14.52	80.59
V5	5.31	13.8	25.87	25.87	28.47	83.67	16.33	75.99
V6	4.87	13.36	30.48	24.91	29.84	82.45	17.55	74.77
V7	4.57	13.06	31.89	23.67	27.48	81.32	18.68	73.64
F test	S	S	S	S	S	S	S	S
S.Ed.	0.876	1.21	0.785	0.087	1.087	1.437	0.895	1.372
$C.D._{5\%}$	1.752	2.42	1.473	0.165	2.164	2.86	1.753	2.65
C.V.	5.748	3.58	2.876	31.89	35.31	5.684	4.432	5.643

Conclusion

On the basis of our experimental findings it is concluded that the V_1 Thai apple ber variety was found to be best in the terms of growth *viz* plant height, plant spread, number of buds, days to bud break, number of branches, chlorophyll content, Survivability % It is also concluded that the best variety for Prayagraj agro-climatic conditions was found to be V_1 Thai apple ber for establishment.

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