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Performance Evaluation of Improved Lasora (*Cordia myxa* L.) Varieties for Growth and Yield under Limited Irrigation in India's Hot Arid Region

P.R. Meghwal*, Dheeraj Singh and Sourabh

ICAR-Central Arid Zone Research Institute, Jodhpur 342 003

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Abstract: Lasora (*Cordia myxa* L.) is an underutilized fruit-cum-vegetable crop that has gained commercial importance in arid regions due to its adaptability under limited irrigation and diverse soil and climatic conditions. This study was aimed to evaluate the vegetative growth, fruit yield, and physical parameters of three improved lasora varieties—Maru Samridhi, Karan Lasoda, and Thar Bold under limited irrigation in the hot arid region of India. The experiment was conducted at ICAR-Central Arid Zone Research Institute, Jodhpur, using budded plants of the three varieties in a randomized complete block design with seven replications. Data were recorded from the third year onwards and analyzed statistically. Results showed that Maru Samridhi exhibited superior vegetative growth, with the tallest plants (pooled height: 2.84 m) and the highest fruit yield (9.74 kg plant^{-1}). Karan Lasoda demonstrated the largest canopy area (8.78 m^2) and the longest fruits (24.34 mm), while Thar Bold showed balanced performance across most parameters. Maru Samridhi also had the highest pulp-to-stone ratio (9.26), indicating better fruit quality. These findings highlight the potential of Maru Samridhi for high productivity and Karan Lasoda for maximizing ground coverage and fruit size in arid regions. The study provides valuable insights for selecting suitable lasora varieties based on specific cultivation goals and environmental conditions.

Key words: Lasora, varietal evaluation, fruit yield, fruit physical parameters, arid region.

***Correspondence**
P.R. Meghwal
prm20964@gmail.com

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Among the underutilized fruits in arid regions, lasora (*Cordia myxa* L.) has gained prominence as an important fruit and vegetable crop that is now commercially cultivated. This is primarily due to the standardization of its vegetative propagation technique through budding (Meghwal, 2007; Meghwal *et al*., 2014). The mature but unripe fruits of lasora are rich in essential minerals such as calcium, phosphorus, manganese, molybdenum, copper, chromium, and polyphenols (Meghwal *et al*., 2022). Previously, this species was predominantly grown along farm boundaries for use as windbreaks and shelter belts. However, with the development of improved varieties such as Maru Samridhi, Karan Lasora, and Thar Bold, along with advanced agrotechniques like clonal

propagation methods, it is now cultivated as a standalone orchard crop. Lasora (*Cordia myxa* L.) demonstrates a remarkable ability to thrive under limited irrigation and diverse soil and climatic conditions, making it highly suitable for arid regions where water is scarce. Its drought resilience is attributed to its deep root system, leathery leaves, and deciduous nature. The plant achieves maximum canopy development and vegetative growth during July to October, benefiting from abundant soil moisture from the monsoon season and favorable weather conditions. The nutritious fruits of lasora become available in March-April, coinciding with the availability of raw mangoes, which are essential for preparing lasora-based vegetables or pickles. The sourness of raw mango is crucial for balancing the mucilaginous texture of lasora fruits. Advanced agrotechniques, including defoliation, manuring, and judicious irrigation, have been developed to ensure early and uniform fruiting (Meghwal *et al*., 2021). Genetic improvement efforts at research institutions in Rajasthan have led to the development of three improved varieties: Maru Samridhi, Karan Lasoda, and Thar Bold (Meghwal *et al*., 2021). While varietal development was conducted independently at Jodhpur, Bikaner, and Jobner, a simultaneous evaluation of these varieties under consistent environmental conditions has not been attempted previously. To address this, an experiment was conducted at the Central Arid Zone Research Institute, Jodhpur, to assess the vegetative growth, fruit yield, and fruit physical parameters of these varieties under limited supplementary irrigation over three years for establishment, followed by irrigation during February to April in subsequent years.

Materials and Methods

The experiment was conducted at CR farm ICAR- Central Arid Zone Research Institute, Jodhpur (26.249°N,72.99°E, 235m MSL). The budded plants of three varieties i.e., Maru Samridhi, Karan Lasoda and Thar Bold were obtained from CAZRI, Jodhpur, SKNAU, Jobner and ICAR-CIAH, Bikaner respectively during the month of August, 2020.The experiment was laid out in Randomized Complete Block Design with seven replications in square system of planting at 5 x 5 m spacing. The data on vegetative growth, fruit yield and fruit physical parameters were recorded in third year onwards. The plant height and canopy spread (East-West, and North-South) were measured with meter scale/measuring tape while collar diameter and fruit size with the help of vernier caliper. Mean fruit weight and mean cluster weight were recorded with electronic top pan balance while fruit size was measured with vernier caliper. The mean canopy diameter was calculated by averaging canopy diameter from East-West and North-South directions. The canopy area(A) was calculated by the formula:

$$A = \pi r^2$$

where, r=mean radius derived by adding the mean canopy diameter of E-W and N-S direction and then dividing it by 2.

The data were analyzed statistically using opstat online software.

Results and Discussion

The data on vegetative growth and fruit physical parameters including fruit yield are depicted in Table 1 and 2, respectively. The pooled data for vegetative growth parameters exhibited significant differences with respect to collar diameter, while it showed non-significant difference among the three varieties in case of plant height and canopy area. Maru Samridhi exhibited the tallest plants with a pooled height of 2.84 m, followed by Karan Lasoda (2.46 m) and Thar Bold (2.40 m). This indicates that Maru Samridhi has superior vertical growth potential compared to the other varieties, though the differences were statistically at par. In case of collar diameter also Maru Samridhi showed significantly the highest pooled collar diameter (12.50 mm), outperforming Karan Lasoda (10.56 mm) and Thar Bold (10.71 mm). This suggests better stem robustness in Maru Samridhi as compared to other varieties which were at par with each other. Similarly nonsignificant differences were also observed in respect of canopy area. The data on fruit physical parameters and fruit yield indicated that the varieties differed significantly in respect to mean fruit weight, pulp stone ratio and fruit yield only, while the other parameters such as bunch weight, number of fruits per bunch and fruit size were least affected by varieties as the differences were insignificant. The fruit yield is the most important economic character in lasora as it decides the net return. Maru Samridhi recorded the highest pooled fruit yield per plant (9.74

Table 1. Evaluation of gonda varieties for vegetative growth 2023-24

Varieties	Plant height(m)			Collar diameter(mm)			Canopy area(m^2)		
	2023	2024	pooled	2023	2024	pooled	2023	2024	pooled
Maru Samridhi	2.77	2.89	2.84	11.043	13.97	12.50	9.98	6.76	8.37
Karan Lasoda	2.41	2.51	2.46	9.486	11.65	10.56	10.53	7.03	8.78
Thar Bold	2.41	2.39	2.40	9.829	11.59	10.71	10.21	7.6	8.90
LSD (0.05)	NS	NS		1.074	2.64		NS	NS	

Table 2. Evaluation of gonda varieties for fruit physical parameters and fruit yield 2024-2025

Varieties	Years	Bunch weight (g)	No.of fruits/ bunch	Mean fruit weight(g)	Fruit length (mm)	Fruit girth (mm)	Pulp:stone ratio	Fruit yield kg/plant
Maru Samridhi	2024	54.30	11.30	8.60	23.70	21.90	9.00	7.30
	2025	44.33	14.15	7.31	24.51	22.71	9.53	12.18
	pooled	49.31	12.72	7.96	20.11	22.30	9.26	9.74
Karan Lasoda	2024	49.60	11.20	8.00	24.10	22.00	9.00	6.02
	2025	36.40	12.75	8.09	24.58	21.81	9.78	7.07
	pooled	43.00	11.97	8.05	24.34	21.90	9.39	6.55
Thar Bold	2024	48.00	9.20	7.04	22.9	20.40	7.99	6.43
	2025	37.38	13.40	7.88	24.71	22.83	9.39	5.70
	pooled	42.69	11.30	7.46	23.80	21.62	8.69	6.06
CD (0.05)		NS	NS	0.82	NS	NS	0.93	0.89

kg), followed by Karan Lasoda (6.55 kg) and Thar Bold (6.06 kg). This highlights Maru Samridhi's superiority over other varieties under limited irrigation conditions.

A comparative evaluation of three improved *Cordia myxa* (lasora) varieties under limited irrigation in India's hot arid region revealed distinct performance patterns associated with drought adaptation. Among these, Maru Samridhi exhibited superior vegetative growth, achieving the tallest plant height (2.84 m), widest collar diameter (12.50 mm), and highest fruit yield (9.74 kg $plant^{-1}$). These traits are consistent with the physiological adaptations of *C. myxa* documented by Meghwal (2007); Meghwal *et al*., 2021), including deep root systems and leathery leaves that reduce transpiration and enhance water-use efficiency.

Maru Samridhi's robust structural traits likely contribute to its drought tolerance, supporting sustained productivity. This aligns with findings by Chaves *et al*. (2009) that stem stability in woody perennials enhances resilience under water-limited conditions. In addition, Maru Samridhi's high pulp-to-stone ratio (9.26) significantly improves its commercial value, as pulp content directly affects edible yield and processing efficiency (Meghwal *et al*., 2022). In contrast, Karan Lasoda demonstrated the largest canopy area (8.78 m^2), potentially aiding microclimate regulation by reducing soil evaporation—a trait consistent with the traditional use of lasora in shelterbelts (Meghwal *et al*., 2021). However, the observed non-significant differences in canopy development among varieties suggest that management practices may have a greater influence than genetic factors in determining canopy traits. The variety Thar Bold displayed balanced vegetative growth but produced a lower yield (6.06 kg $plant^{-1}$), indicating a possible trade-off between vegetative development and reproductive output under drought stress (Turner, 2018).

The overall performance of variety Maru Samridhi underlines its potential as a climate-resilient, high-yielding cultivar suitable for arid regions. These findings reinforce the relevance of clonal propagation methods developed for drought-prone environments (Meghwal *et al*., 2014). Looking forward, integrating genomics-assisted breeding (Varshney *et al*., 2014) with root architecture optimization (Lynch, 2013) could further enhance drought resilience and sustainability in *C. myxa* cultivation, aligning with adaptation strategies highlighted by the

IPCC (2021) in response to intensifying climate challenges.

Conclusion

The study demonstrates that Maru Samridhi is the most promising lasora variety for arid regions under limited irrigation, offering high fruit yield and superior fruit quality. Karan Lasoda, with its expansive canopy, may be suited for systems prioritizing ground coverage. These findings provide a scientific basis for farmers and policymakers to select varieties aligned with local cultivation goals and environmental constraints.

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