



Exploring Polybag Size, Nursery Mixtures and Rootstocks for Optimizing Lasoda (*Cordia myxa* L.) Nursery Techniques

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10.18805/IJARE.A-6211

ABSTRACT

Background: Lasoda (*Cordia myxa* L.) is lesser utilized fruit plant species suitable for growing in large parts of arid and semi-arid regions of India. Besides the economic importance of its fruits in the vegetable and pickle industry, this species is also known for ethnomedicinal properties in different plant parts. In order to utilize it to its fullest potential, standardization of nursery technology for mass multiplication by vegetative propagation method is a necessary step. With the above background in the view, an experiment was conducted to see the effect of polybag size, nursery mixture and rootstock on seed germination, growth of seedlings after germination, budding success and growth of budded plants.

Methods: The study was conducted during June-September, 2020. The treatment comprised of two polybag sizes, six nursery media compositions and two kinds of rootstocks. The observations were recorded on seed germination, seedling growth, days to bud sprout after budding, budding success and shoot length and diameter after 30 days of budding.

Result: The main effects of nursery mixture revealed that plant height, stem diameter, number of leaves, shoot length and shoot diameter after budding were significantly affected by nursery mixture composition. The highest plant height (29.53 cm) recorded in the M4 mixture was significantly higher over M₁, M₂ and M₃ but the differences were non-significant when compared with M₅ and M₆. A similar trend was also recorded in the case of stem diameter and number of leaves which showed significantly higher values in M₄, M₅ and M₆ as compared to M₁, M₂ and M₃. The highest shoot length (8.34 cm) and shoot diameter (3.40 mm) were recorded in M₅ and M₄ which were significantly higher than most of other media levels.

Key words: Budding, Lasoda, Nursery mixture, Nursery techniques, Polybag size, Rootstocks, Vegetative propagation.

INTRODUCTION

There are several underutilized fruit plants native to arid and semi-arid regions of India such as karonda (*Carissa carandas*), ker (*Capparis decidua*), pilu (*Salvadora oleoides*), phalsa (*Grewia subinaequalis*), (*Cordia myxa*), jhar ber (*Ziziphus nummularia*) etc. which are useful to local people since immemorial. Indigenous fruits have been found superior in terms of wider adaptability to environmental conditions besides their known nutritional values. However, due to limited research work on such species for development of packages of practices for better utilization of such species are major limitation for their commercialization. Lesser number of improved varieties and non-availability of quality planting materials are other limitation for their wider adaptability. One such species is lasoda or gonda in local tongue with the botanical name *Cordia myxa* L. belonging to the family Boraginaceae is an important multipurpose species. The genus *Cordia* comprises of hundreds of trees and shrub species growing across tropical and sub-tropical region of America Asia and Oceania. However, two of these species grow in Mediterranean regions in north Africa and in south-western Asia. These are *C. sinensis* Lam. and *C. myxa* (Davis, 1978, Greuter *et al.*, 1984). *C. sinensis* is native to Egypt, in the Israel Palestinian area and in Arabian peninsula. The region of *C. myxa* is less clear and it is believed to be originated from tropical Asia, the Near and Middle East or

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How to cite this article: Meghwal, P.R., Sourabh and Singh, D. (2025). Exploring Polybag Size, Nursery Mixtures and Rootstocks for Optimizing Lasoda (*Cordia myxa* L.) Nursery Techniques. *Indian Journal of Agricultural Research*. **59(8)**: 1267-1273. doi: 10.18805/IJARE.A-6211.

Submitted: 25-01-2024 **Accepted:** 15-07-2024 **Online:** 20-08-2024

Egypt. The *C. myxa* L. appears to be a cultivated plant which become naturalized in the area stretching from southern Iran to northern and tropical Africa including southern Anatolia, Chios, Rhodes, Cyprus, the Near East, the Arabian Peninsula and the coastal areas of Egypt (Davis, 1978, Kislev, 2008). In the past, it was mainly used as drought hardy species for windbreak plantation to create favorable microclimate in the field/orchard and to prevent the negative effects of hot/cold winds. Besides its economic significance, the species has important ecological roles in providing vegetative cover, preventing soil erosion and promoting biodiversity (Singh, 2001). Lasoda plants are easy to maintain as they require regular irrigation only during the establishment phase for an initial 3 years

(Meghwal *et al.*, 2014a, Meghwal *et al.*, 2014b). After establishment, it can be sustained as rainfed for general purposes but for taking regular fruit yield, it needs irrigation and manuring from February to April. In the recent past, it has become commercially important because of its fruits which are used in vegetables and pickles besides the immense value of different plant parts of lasoda in curing various human ailments. It is mostly used as green fresh vegetables and pickles, especially in the lean period when the availability of conventional vegetables is limited (Bhatnagar *et al.*, 2016). With the growing health awareness, people are attracted to the health benefits of indigenous fruits and vegetables and this species is the best example. Ripened fruits are very sweet but they are highly mucilaginous which deters them for use in table purposes. Extraction of mucilage from ripened fruits and its use in edible film coating on fruits and vegetables is another opportunity from this species. Of late scientists have also realized its potential and started working on germplasm collection, evaluation and vegetative propagation techniques (Meghwal *et al.*, 2022). The genetic improvement work undertaken at different research institutions in Rajasthan has resulted in the development of three improved varieties *i.e.* Maru Samridhi, Karan Lasoda and Thar Bold (Meghwal *et al.*, 2021). In spite of these favorable recent developments, the availability of quality planting materials in sufficient number is still a problem because of the lack of suitable nursery technology specifically for lasoda. With the above background in the view, an experiment was conducted to see the effect of polybag size, nursery mixture and rootstock on seed germination, growth of seedlings after germination, budding success and growth of budded plants. The over all objective of the study is to have clonal propagation protocol for mass multiplication of this underutilized fruit plant of immense nutritional and nutraceutical value. The easy availability of vegetatively propagated plants will help popularize and commercialize the species.

MATERIALS AND METHODS

The experiment was conducted in the Horticultural nursery at ICAR-Central Arid Zone Research Institute, Jodhpur from June to September 2020. There were three factors *i.e.* two poly bag sizes (B_1 -10 × 25 cm and B_2 -15 × 25 cm), six nursery mixtures (M_1 -4:1:1, M_2 -5:1:1, M_3 -6:1:1 Sand: ponds clay: Goat manure respectively, M_4 -4:1:1, M_5 -5:1:1, M_6 -6:1:1 sand: Pond clay: Compost respectively) and two rootstocks (RS_1 -Small fruited types lasoda and RS_2 -large fruited lasoda). The small fruited ecotypes have small sized leaves with more drought resistance properties while large fruited lasoda is commercially grown types with relatively bigger leaves and fruit size. The nursery mixture was filled in two sizes of poly bags as per the details given above from M_1 to M_6 and laid vertically in sunken nursery beds. The experiment was laid out in a split-plot design with three replications. The two polybag sizes were taken in the main

plot while nursery mixtures and rootstock combinations were taken in subplot treatments. The seeds of both types of rootstocks were extracted fresh from ripened fruits available during May-June months and sown in poly bags after clearing off the mucilaginous substances at about 2.5 cm depth. The mucilaginous material was removed by rubbing the gummy seeds with sandy soil with hand several times until the stone were completely cleared off. The beds were watered immediately after sowing and covered with jute bag cloth to prevent damage by squirrels and rats and to facilitate quick germination by controlling temperature and humidity. Since, the experiment was conducted in summer season and also looking to low water holding capacity of sandy soils, the beds were irrigated on alternate days. Frequent drenching of beds was done with 0.2% copper oxychloride to take care of fungal infection to the seedlings. There was no incidence of insect pest during experimentation period. There was no provision of temperature control in the nursery except covering the area with 50% agro shed net. The data were recorded on per cent seed germination, seedling height and stem diameter after 60 days of germination and number of leaves in each seedling. About 75-90 days old seedlings were budded with the bud wood taken from mother plants of variety Maru Samridhi. The 'T' budding method was followed uniformly. The data were recorded on days to bud sprouting after budding, per cent bud take and shoot length and shoot diameter after 30 days of budding. The data were analyzed statistically using Opstat online software. In the opstat online software, the data of a particular character was copy pasted one by one and by putting in the required details like number of replications, number of characters and level of each factor and after submitting in software, the detailed analytical results were obtained.

RESULTS AND DISCUSSION

The data on the main effects of polybag size, rootstock and nursery mixture on seed germination, growth of rootstock seedlings, bud take and growth of scion after budding are presented in Table 1. The polybag size had a significant effect on seed germination and seedling height of rootstock, shoot length and diameter of scion after budding. The seed germination and plant height were significantly higher in the 10×25 cm polybag while shoot length and diameter after budding were significantly better in big size polybag *i.e.* 15×25 cm. The other parameters such as stem diameter, number of leaves and days to bud sprout and percent bud take remained unaffected due to polybag size since the differences were statistically non-significant.

The main effect of rootstock was significant for percent seed germination, plant height, number of leaves, days to bud sprout, shoot length and shoot diameter. Seed germination, plant height and number of leaves were significantly higher in the case of small fruited gonda seedlings while shoot length and diameter were significantly higher on big fruited gonda seedlings. Similarly, the days to

bud sprout after budding was significantly less on big fruited gonda rootstock as compared to small fruited gonda rootstock.

The main effect of nursery mixture revealed that plant height, stem diameter, number of leaves, shoot length and shoot diameter after budding were significantly affected by nursery mixture composition. The highest plant height (29.53 cm) recorded in the M_4 mixture was significantly higher over M_1 , M_2 and M_3 but the differences were non-significant when compared with M_5 and M_6 . Similar trend was also recorded in the case of stem diameter and number of leaves which showed significantly higher values in M_4 , M_5 and M_6 as compared to M_1 , M_2 and M_3 . The highest shoot length (8.34 cm) and shoot diameter (3.40 mm) were recorded in M_5 and M_4 which were significantly higher than most of the other media levels. The objectives of trying different sizes of polybag were to see its effect mainly on seedling growth after seed germination as faster growth is required for getting buddable stem girth of seedling at the earliest possible time. However, here we got higher seed germination in smaller-sized poly bags but post-germination growth of seedlings in terms of shoot length and stem diameter was better in bigger sized polybags which might be due to a better supply of nutrients due to higher media contained in bigger sized polybags. Higher seed germination in small fruited gunda rootstock may be

attributed to the higher inherent seed germination capacity of the ecotypes as reported earlier by senior author (Meghwal, 2007, Meghwal *et al.*, 2014, 2021). Significant differences in seed germination recorded in two sizes of polybags might be due to variation in selected seeds put for germination since, the seeds are covered with hard seed coat which is difficult to judge from outside appearances. Nursery media composition had a significant influence on seedling height, number of leaves, shoot length and diameter after budding and higher values of these parameters were recorded where goat manures were replaced with compost manures. This might be due to better nutrient and other growth substance supply from well-decomposed compost manures as compared to goat manure. These findings are akin to the results obtained by Meena *et al.* (2017) where they reported higher seedling stem girth and other growth attributes in papaya on vermicompost-based media.

Interaction effects

The interactions among nursery mixer, polybag size and rootstocks were found significant for per cent seed germination, plant height, number of leaves, days to bud sprouting, per cent bud take, scion shoot length and scion shoot diameter.

Table 1: Main effects of bag size, rootstock and nursery mixture on growth and bud take of *Cordia myxa* seedlings in nursery.

Treatment	Germination (%)	Plant height (cm) 60 DAG	Stem diameter (mm) 60 DAG	Number of leaves	Days to bud sprouting	% Bud take	Shoot length (cm) 30 DAB	Shoot diameter (mm) 30 DAB
Polybag size								
B ₁ 10×25 cm	38.89	28.75	4.18	9.41	11.90	70.96	4.82	2.92
B ₂ 15×25 cm	22.78	22.20	4.25	8.11	10.80	80.87	8.03	3.73
SEm±	1.08	0.93	0.13	0.35	0.19	2.22	0.27	0.09
CD at 5%	6.69	5.73	NS	NS	NS	NS	1.68	0.58
Rootstocks								
RS ₁ - Small	37.50	28.24	4.20	10.36	11.91	78.55	5.34	3.12
RS ₂ - Big	24.17	22.70	4.23	7.16	10.80	73.28	7.51	3.54
SEm±	1.23	0.84	0.10	0.24	0.32	1.92	0.41	0.09
CD at 5%	3.52	2.39	NS	0.67	0.92	NS	1.18	0.25
Nursery mixture								
M ₁	32.08	20.30	3.76	7.50	10.83	71.29	4.91	3.81
M ₂	24.58	20.95	3.68	7.76	10.89	67.58	3.69	3.16
M ₃	26.67	23.98	4.15	7.97	11.00	76.27	6.61	3.36
M ₄	31.67	29.53	4.62	9.69	12.01	75.39	8.15	3.40
M ₅	38.33	29.17	4.42	10.14	11.60	81.00	8.34	3.22
M ₆	31.67	28.94	4.65	9.50	11.79	83.98	6.86	3.02
SEm±	2.14	1.46	0.17	0.41	0.56	3.317	0.71	0.15
CD at 5%	NS	4.16	0.50	1.16	NS	NS	2.05	0.43

Notations:

B₁- 10×25 cm, B₂- 15×25 cm, RS₁- Small gonda, RS₂- Big gonda.

Sand: Clay: Goat manure M₁-4:1:1, M₂-5:1:1, M₃-6:1:1

Sand: Clay: Compost M₄-4:1:1, M₅-5:1:1, M₆-6:1:1

Per cent seed germination

The interaction effect of per cent seed germination was found significant among nursery mixture, polybag size and rootstocks (Table 2). Significantly higher seed germination was recorded in M_5 medium and small-fruited gonda rootstock in both sizes of polybags as compared to large-fruited gonda rootstocks. However, the difference in seed germination was non-significant amongst M_3 , M_4 , M_5 and M_6 Media across both polybag sizes and rootstocks

Plant height

Significant interactions were observed amongst media, polybag size and rootstocks (Table 3). The plant height was significantly higher in M_4 , M_5 and M_6 media as compared to M_1 , M_2 and M_3 media across both the rootstock and polybag sizes. However, the differences between M_1 , M_2 and M_3 were non-significant. Similarly, the differences amongst M_4 , M_5 and M_6 were also non-significant across both rootstocks and polybag sizes.

Number of leaves

The number of leaves was significantly affected due to the interaction of polybag size, rootstock and nursery mixture (Table 4). The number of leaves was significantly higher in M_5 medium in 10 × 25 cm polybag size and small-fruited rootstock. The number of leaves was significantly less in the case of big fruited gonda rootstock seedlings in all the media. The differences in the number of leaves were non-significant in both rootstocks and polybag sizes when compared amongst M_4 , M_5 and M_6 media. The interaction between polybag size and rootstock was also found significant with the highest number of leaves (11.52) in small fruited gonda rootstock in 10×25 cm polybag.

Days to bud sprouting after budding

The interactions of days to bud sprouting after budding were found significant amongst nursery mixture and polybag size with minimum number of days recorded to bud sprouting in M_1 media in 15×25 cm polybag size (Table 5). However, the differences were non-significant when compared with most of the other media except M_6 media in small-sized polybags and small-fruited rootstock (13.28 days) and M_4 media in 15×25 size polybags (13.17 days) both treatments took significantly higher days to start bud sprouting.

Per cent bud success

The interaction amongst nursery media, polybag size and rootstock was found significant for per cent bud success (Table 6). The highest bud success (87.44%) was recorded in M_6 media in 10×25 cm polybags on big fruited gonda rootstocks. However, it was at par when compared within the same poly bag size but some differences were significant between two poly bag sizes. The differences due to rootstock were also found to be non-significant between the two rootstocks in all nursery media. The bud success was found significantly less on big fruited gonda

Table 2: Interaction effect of nursery mixture, polybag size and rootstock on % seed germination of *Cordia myxa*.

Nursery mixture	Polybag size			
	10×25 cm		15×25 cm	
	Rootstocks		Rootstocks	
	Small	Big	small	big
M_1	44.17	20.00	36.67	27.50
M_2	31.67	17.50	34.17	15.00
M_3	33.33	20.00	39.17	14.17
M_4	40.00	23.33	31.67	31.67
M_5	45.00	31.67	46.67	30.00
M_6	39.17	24.17	36.67	26.67
Mean	38.89	22.78	37.50	24.17
Interactions	SEm±		C.D. at 5%	
$M \times BS \times RS$	4.28		12.19	

Table 3: Interaction effect of nursery mixture, bag size and root stocks on plant height (cm, rootstock) of *Cordia myxa*.

Nursery mixture	Polybag size			
	10×25 cm		15×25 cm	
	Rootstocks		Rootstocks	
	Small	Big	Small	Big
M_1	23.94	16.66	24.00	16.61
M_2	20.39	21.51	22.71	19.19
M_3	26.71	21.25	26.94	21.03
M_4	33.33	25.74	33.66	25.41
M_5	33.09	25.24	31.42	26.91
M_6	35.07	22.81	30.76	27.12
Mean	28.75	22.20	28.25	22.70
Interactions	SEm±		C.D. at 5 %	
$M \times BS \times RS$	2.92		8.31	

Table 4: Interaction effects of nursery mixture, poly bag size and rootstock on the number of leaves of *Cordia myxa* (Rootstock).

Nursery mixture	Polybag size			
	10×25 cm		15×25 cm	
	Rootstocks		Rootstocks	
	Small	Big	Small	Big
M_1	8.55	7.22	8.33	5.89
M_2	7.71	7.44	9.78	6.11
M_3	10.11	7.00	8.56	6.22
M_4	13.77	7.33	10.00	7.67
M_5	14.56	7.55	10.33	8.11
M_6	14.44	7.22	8.22	8.11
Mean	11.52	7.29	9.20	7.02
Interactions	SEm±		C.D. at 5%	
Bag size × RS	0.33		0.95	
$M \times BS \times RS$	0.82		2.32	

rootstock (56.26%) and small-sized polybags (64.60%) in M₂ medium.

Shoot length after budding

The interactions for shoot length after budding were found significant between polybag size and rootstock, nursery media and rootstock and also for polybag size and nursery media (Table 7). The interactions between polybag size and rootstock showed maximum shoot length (10.19 cm) with respect to 15 × 25 cm polybags and big fruited gonda rootstock which was significantly higher over other interactions. However, the difference between small and big fruited rootstock in 10×25 cm polybags was non-significant. The interaction between rootstock and media revealed the highest shoot length of 10.81 cm in the case of big fruited gonda rootstock in M₅ medium. I thought it was at par when compared with M₃ and M₄ medium within the same rootstock. Similarly, the interaction of polybag size and nursery media showed the highest shoot length of 10.95 cm in large-sized polybag in M₄ medium, though it was again at par with M₃ and M₅ medium in big-sized polybags. The interaction effects were also significantly higher in M₄, M₅ and M₆ media in small-sized polybags as compared to M₁, M₂ and M₃ media in same-sized polybags.

Scion shoot diameter

All the interactions of scion shoot diameter were found to be significant (Table 8). The interaction was between polybag size and rootstock irrespective of media showed a significantly highest shoot diameter of (4.22 mm) in big-sized polybags and big fruited gonda rootstock. The interaction of rootstock and media showed a significantly highest shoot diameter of (4.55 mm) in M₁ medium on big fruited gonda rootstock. The differences between other media and rootstock were non-significant. The interaction for shoot diameter amongst nursery mixture, polybag size and rootstock was also significant with the highest value (6.27 mm) in M₁ media in big-sized polybags and big fruited gonda rootstock. However, the differences between all other

nursery media, polybag sizes and rootstocks were by and large non-significant.

Various interactions

Both two-way and three-way interactions were found significant, particularly for poly bag size, nursery mixture and rootstocks. Most of the interactions may be attributed

Table 5: Interaction effects of nursery mixture and polybag size on days to bud sprouting of *Cordia myxa*.

Nursery mixture	Polybag size	
	10×25 cm	15×25 cm
M ₁	11.83	9.83
M ₂	11.17	10.61
M ₃	11.58	10.42
M ₄	10.86	13.17
M ₅	12.69	10.50
M ₆	13.28	10.31
Mean	11.90	10.81
Interactions	SEm±	C.D. at 5 %
Mx Bag size	0.79	2.26

Table 6: Interaction effect of nursery mixture, poly bag size and rootstock on % bud success of *Cordia myxa*.

Nursery mixture	Polybag size				
	10×25 cm		15×25 cm		Mean
	Rootstock		Rootstock		
	Small	Big	small	Big	
M ₁	70.98	71.61	74.63	67.97	71.30
M ₂	64.60	70.56	78.89	56.26	67.58
M ₃	68.97	83.57	72.46	80.08	76.27
M ₄	64.94	85.83	78.68	72.09	75.39
M ₅	75.77	86.23	81.47	80.54	81.00
M ₆	80.51	87.44	85.20	82.75	83.98
Mean	70.96	80.87	78.55	73.28	75.92
Interactions	SEm±		C.D. at 5%		
BS × RS × M	6.64		18.92		

Table 7: Interaction effect nursery mixture, polybag size and rootstock on shoot length (cm) of the scion of *Cordia myxa*.

Nursery mixture	Polybag size			Polybag size			Rootstock	
	10×25 cm			15×25 cm				
	Rootstock			Rootstock			Small	Big
	Small	Big	Mean	Small	Big	Mean		
M ₁	3.55	2.69	3.12	5.13	8.27	6.7	4.34	5.48
M ₂	3.67	2.68	3.18	4.17	4.23	4.2	3.92	3.45
M ₃	2.72	2.74	2.73	5.48	15.50	10.49	4.10	9.12
M ₄	6.89	3.83	5.36	9.20	12.69	10.95	8.05	8.26
M ₅	5.80	8.33	7.06	5.93	13.29	9.61	5.87	10.81
M ₆	6.24	8.73	7.49	5.30	7.15	6.23	5.77	7.94
Mean	4.81	4.83		5.87	10.19		5.34	7.51
Interactions	SEm±						C.D. at 5 %	
Bag size × RS	0.33						0.95	
RS × M	1.02						2.89	
Bag size × M	1.02						2.89	

Table 8: Interaction effect of nursery mixture, bag size and rootstock on shoot diameter (mm of scion) of *Cordia myxa*.

Nursery Mixture	Poly bag size			Poly bag size			Rootstock		
	10×25 cm		Mean	15×25 cm		Mean			
	Rootstock			Rootstock					
	Small	Big	Mean	Small	Big	Mean	Small	Big	Mean
M ₁	2.64	2.84	2.74	3.50	6.27	4.88	3.07	4.55	3.82
M ₂	3.27	2.96	3.12	3.27	3.14	3.21	3.27	3.05	3.16
M ₃	2.87	2.57	2.72	3.14	4.83	3.99	3.01	3.70	3.36
M ₄	3.03	2.83	2.93	3.77	3.96	3.86	3.40	3.40	3.40
M ₅	2.99	2.97	2.98	3.15	3.77	3.46	3.07	3.37	3.22
M ₆	3.10	3.00	3.05	2.63	3.32	2.98	2.87	3.16	3.02
Mean	2.99	2.86		3.24	4.22		3.11	3.54	
Interactions	SEm±					C.D. at 5 %			
Bag size × RS	0.12					0.35			
RS × M	0.22					0.61			
Bag Size × M	0.22					0.61			
M × BS × RS	0.30					0.87			

to the synergistic effect of media composition, poly bag size and rootstocks. Two eco-types of lasora used as rootstock might have different genetic potentials for growth and that may in turn affect the growth of scion variety budded on particular rootstocks. All the interactions of shoot length and shoot diameter after budding (Table 7 and 8) were found to be significant. The media containing compost manure M₄, M₅ and M₆ had higher values of shoot length and shoot diameter in big-sized polybags and big fruited gonda rootstocks. This may be due to higher growth-promoting nutrients supply from compost-based media together with big-sized polybags and better genetic potential of big fruited gonda rootstocks. No previous studies on this line are available on lasora. However, recently, Kumar *et al.*, 2022 reported enhanced budding success and growth of budlings in coco-peat-based media in plug trays grown seedlings of *Cordia myxa*.

CONCLUSION

Based on main effects, two-way and three interactions among nursery mixture, poly bag size and rootstock concerning various seedling growth attributes before and after budding, it can be concluded that for the purpose simple multiplication of either of small-fruited or large fruit gonda species, small size poly bags could be used with M₅ media containing sandy soil, ponds clay and compost manures in the 5:1:1 proportion respectively. However, for the purpose of producing budded plants of lasora either rootstock can be used with almost equal efficiency using M₅ media in big-sized poly bags (15 × 25 cm) since the post-budding growth of scion shoots have been found better in big sized poly bags.

ACKNOWLEDGEMENT

The authors are grateful to the Science and Engineering Research Board, Department of Science and Technology,

government of India for funding. We are also indebted to director, ICAR-Central Arid Zone Research Institute, Jodhpur for providing field and laboratory facilities for undertaking the experiments.

Conflict of interest

The authors certify that there is no conflict of interest regarding the publication of this paper.

REFERENCES

- Bhatnagar, P., Singh, J., Meena, C.B. (2016). Lasoda that blooms on tree trunk -A report. *Hort Flora Res. Spectr.* **5**: 175-176.
- Davis, P.H. (1978). Flora of Turkey and East Aegean Island. Vol. 6 Edinburgh University Press, Edinburgh. pp 128-135.
- Greuter, W., Burdet, M. and Long, G. (1984). Medchecklist critique des plantes vasculaires des pays circummediterranees, Gymnosperme, Dicotyledones. Conet jardinbotaniques de la ville de Geneve, Geneve.
- Kislev, M.E. (2008). Archaeobotanical Evidence of Birdliming at Ashkelon. In: Ashkelon 1. Introduction and overview (1985-2006). [Stager LE, Schloen JD, Master DM (eds)]. Eisenbrauns, WinonaLake, pp 131-137.
- Kumar, K., Sarolia, D.K., Saroj, P.L., Samadia, D.K. and Singh, D. (2022). Standardization of seed, rootstock and plant standards of (*Cordia myxa* L.) for commercial orcharding in India. *Journal of Environmental Biology.* **43(2)**: 267-275. doi: 10.22438/jeb/43/2/MRN-1927.
- Meena, A.K., Garhwal, O.P., Mahawar, A.K. and Sing, S.P. (2017). Effect of different media on seedling growth parameters and economic of papaya (*Carica papaya* L.) cv. Pusa Delicious. *International Journal of Current Microbiology and Applied Sciences.* **6(6)**: 2964-2972.
- Meghwal, P.R. (2007). Propagation studies in lehsua (*Cordia myxa* L.). *Indian Journal of Agricultural Sciences.* **77(11)**: 765-767.
- Meghwal, P.R., Singh, A. and Singh, D. (2021). Research status of lasora (*Cordia myxa* L.) in India - A review. *Current Horticulture.* **9(1)**: 15-19.

- Meghwal, P.R. Singh, A. and Singh, D. (2021). Underutilized fruits and vegetables in hot arid regions of India: Status and Prospects. *Agricultural Reviews*. **43(1)**: 38-45. doi:10.18805/ag R-2087.
- Meghwal, P.R., Singh, A. and Kumar, P. (2014a). Evaluation of selected gonda genotypes (*Cordia myxa* L.) on different rootstocks. *Indian Journal of Horticulture*. **71(3)**: 415-418.
- Meghwal, P.R., Singh, A., Kumar, P. and Morwal, B.R. (2014b). Diversity, distribution and horticultural potential of *Cordia myxa* Roxb.: A promising underutilized fruit species of arid and semi arid regions of India. *Genet. Res. and Crop Evolution*. **61**: 1633-1643. doi: 10.1007/s10722-014-0161-y.
- Singh, I.S. (2001). Minor fruits and their uses. *Indian Journal of Horticulture*. **58(1/2)**: 178-182.