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RESEARCH ARTICLE

Diversity in morphological characters of Khirni (*Manilkara hexandra*)

Shashwat P. Mahalle*[1], Dr. G. G. Jadhav[2], Dr. U. A. Raut[1], N. A. Khairkar[1], K. Y. Deshmukh[1], R. N. Deshmukh[1], V. S. Tadas[1]

1Department of Fruit Science,Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola(MS)

2 Central Research Station, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola(MS).

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ABSTRACT

The preponderance of Khirni seedlings are seen growing naturally in scattered/isolated areas of various agro-climatic zones of India, and a chance for the selection of superior genotypes is very high due to the huge genetic diversity in the existing populations. To reveal the genetic variability in khirni, as leaves, fruit sample from diverse areas genotypes were collected and analysed for various morphological attributes. Results of the study revealed a wide range of variability found with respect to tree, leaf, and fruit characteristics among the studied genotypes. This variability can be exploited for the selection of superior genotype for conservation, evaluation, utilization, and a source for future breeding programme in crop improvement.

Keywords: *Khirni, variability, genotypes, morphology, crop improvement.*

INTRODUCTION

Khirni, botanically known as *Manilkara hexandra* (Roxb.) Dubard is an economically multipurpose tree of the family sapotaceae. According to Stewart and Brandis (1992), it originated in India. Tribal people in several Indian states refer to it locally as "Khirni," "Raina," and "Rayan." It is a typical dry-land tree that is found practically everywhere in India, except for the temperate regions. It is an important under-utilized fruit species of tribal populations belonging to tropical deciduous forests in western and central India.

It is a well–known medicinal and commercial important tree species and widely used as herbal drug and as a source of livelihood support by local tribal population (Mishra *et al.,* 2014). It is grown throughout India for fruit as well as ornamental tree for avenue purpose. Ripe fruits are eaten fresh or after dehydration, they are sweet but astringent. Khirni is a rich source of Vitamin A, which proves to be important from a nutritional point of view. Besides different medicinal and social uses of Khirni, it is extensively used as a rootstock since it has been found to be the most promising among various rootstock used for sapota propagation. Present investigations were carried out to record the extent of genetic diversity in available germplasm of Khirni, so that this variation can be further utilized in crop improvement programme.

*Corresponding author's e-mail: shashwatmahalle@gmail.com

MATERIAL AND METHODS

The present findings "**Diversity in morphological characters of Khirni (*Manilkara hexandra*)**" was carried out on thirty seven year old, twenty-six different genotypes of Khirni, maintained at experimental farm, Department of Fruit Science, Dr. PDKV, Akola during 2022-2023. Akola is situated at 307-457 meter altitude from sea level of 20.42^0 N latitude and 72.02^0 E longitude and has marginal tropical climate. For this study, the mature leaves, fruits, flowers and seeds were collected from the selected genotypes and their physical characteristics like leaf area, leaf apex, flower pedicel length, fruit weight, shape, seed colour and seed index were recorded according to sapota plant descriptor prescribed by NBPGR.

RESULTS AND DISCUSSION

Tree height (m): The tree height showed wide variation among twenty-six genotypes which ranged from 5.20 m to 14.50 m with a mean height of 9.82 m. Maximum tree height was observed in genotype MGK-15 (14.50 m) followed by genotype MGK-31 (12.00 m) and minimum tree height was reported in genotype MGK-52 (5.20 m).

Trunk girth (m): The data depicted in Table 1 showed a mean trunk girth of 1.19 m and the maximum was reported in genotype AHDSK-2 (1.44 m) followed by MGK-32 (1.43 m) whereas the minimum trunk girth was reported in genotype CRSK-1 (0.67 m).

Leaf area (cm²): The leaf area range of the studied genotypes was found between 12.70 cm² to 33.75 cm². The significantly highest leaf area (33.75 cm²) was recorded in genotype AHDSK-2. The genotypes MGK-15, MGK-22, MGK-61 and CRSK-6 are at par with the genotype AHDSK-2 with respect to leaf area. Genotype AHDSK-1 has recorded the least leaf area (12.70 cm²). The mean leaf area of twenty-six genotypes was found to be 23.78 cm².

Flower pedicel length: The flower pedicel length of the studied khirni genotypes ranged from 0.73 to 1.63 cm. A significantly maximum flower pedicel length (1.63 cm) was observed in genotype MGK-15 followed by genotypes MGK-63 (1.33 cm) and CRSK-3 (1.28 cm). The genotype MGK-16 had a minimum flower pedicel length of (0.73 cm). The mean flower pedicel length of twenty-six genotypes was 1.05 cm.

Fruit weight (g): Significant variation was found with respect to fruit weight among different genotypes (Table 1), where the mean fruit weight reported among khirni genotypes was 2.00 g. The maximum fruit weight was observed in genotype MGK-63 (3.33 g), which was at par with genotypes MGK-59 (3.24 g) and AHDSK-2 (3.23 g). Whereas genotype CSRK-1 reported a minimum fruit weight of 1.25 g.

Seed weight (g): Significant variation was found with respect to seed weight among all the genotypes with the mean seed weight of 0.19 g. The genotype MGK-63 reported highest seed weight of 0.35 g.

Seed index (g): The seed index ranged from 11.00 to 32.50 g. The genotype MGK-63 has recorded a significantly higher seed index (32.50 g) followed by the genotypes MGK-59 (28.50 g) and MGK-60 (24.80 g). The genotype CRSK-1 has recorded a minimum seed index of 11.00 g. The mean of seed index was found to be 17.60 g.

Tree characteristics: Various rating were assigned to different tree growth habit, branching habit, leaf shape, leaf apex, fruit shape and seed colour based on sapota plant descriptor prescribed by NBPGR.

Tree growth habit: The tree growth habit was rated as upright, spreading and drooping. Among twenty-six genotypes, three showed upright growth habit and thirteen showed spreading growth habit and remaining showed drooping growth habit.followed by genotypes MGK-59 (0.29 g) and MGK-60 (0.27 g), whereas genotypes CRSK-1 and CRSK-8 reported lowest seed weight of 0.12 g,

Table 1: Plant characteristics in respect of plant height, trunk girth, leaf area, flowers pedicel length (cm), seed weight and seed index

Genotype	Tree Height (m)	Trunk girth (m)	Leaf area (cm²)	Flowers pedicel length (cm)	Fruit Weight	Seed weight (g)	Seed index
MGK-14	11.00	1.26	27.90	1.18	2.48	0.17	15.00
MGK-15	**14.50**	1.32	32.20	**1.63**	2.29	0.24	22.50
MGK-16	11.00	1.09	15.63	0.73	1.61	0.16	14.00
MGK-22	11.00	1.01	29.53	0.83	2.06	0.22	20.00
MGK-26	9.00	1.00	26.80	1.18	2.20	0.14	12.50
MGK-31	12.00	1.39	27.98	1.08	2.33	0.16	14.50
MGK-32	11.00	1.43	27.83	0.88	2.03	0.18	15.50
MGK-52	5.20	1.26	26.70	0.93	2.82	0.24	21.80
MGK-58	9.00	1.33	26.50	1.13	2.46	0.24	21.90
MGK-59	10.00	1.25	12.75	1.08	3.24	0.29	28.50
MGK-60	9.00	1.32	20.90	1.10	3.00	0.27	24.50
MGK-61	8.00	1.40	30.60	0.88	2.36	0.20	18.67
MGK-63	10.00	1.36	20.03	1.33	**3.33**	**0.35**	**32.50**
CRSK-1	8.00	0.67	18.55	1.13	2.00	0.12	11.00
CRSK-2	7.50	0.83	28.13	1.15	2.23	0.13	12.50
CRSK-3	11.00	1.24	23.95	1.28	2.38	0.14	13.20
CRSK-4	9.50	0.94	23.60	1.08	2.10	0.13	11.50
CRSK-6	11.50	1.04	33.35	1.10	2.35	0.14	13.40
CRSK-7	11.00	1.04	24.60	0.98	2.13	0.14	12.80
CRSK-8	10.00	1.42	22.03	0.93	2.19	0.12	11.50
AHDSK-1	8.50	1.04	12.70	0.88	1.90	0.17	14.00
AHDSK-2	11.50	**1.44**	**33.75**	0.93	3.23	0.24	18.50
AHDSK-3	10.00	1.36	21.48	0.83	3.03	0.25	23.50
AHDSK-4	8.00	1.02	16.33	1.18	2.21	0.22	20.50
AHDSK-5	10.00	1.30	20.03	1.18	1.94	0.17	17.80
AHDSK-6	8.00	1.23	14.38	0.93	2.37	0.16	15.50
Range	5.20-14.50	0.67-1.44	12.70-33.75	0.73-1.63	1.61-3.33	0.12-0.35	11.00-32.50
Mean	9.82	1.19	23.78	1.01	2.00	0.19	17.60
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Leaf shape and Leaf apex: Leaf shapes were categorised as elliptic, elliptic-obovate, obovate and ovate-oblong. Elliptic leaf shape was recorded in seven genotypes, elliptic-obovate leaf shape was recorded in ten genotypes, obovate leaf shape was recorded in seven genotypes and ovate-oblong leaf shape was recorded in two genotypes. There were two types of leaf apex observed, *i.e.,* obtuse and emarginate. Eight genotypes showed a obtuse leaf apex while eighteen genotypes showed a emarginate leaf apex.

Flowering time: There was huge variation observed with respect to flowering time among the genotypes under study. The flowering time varied from the third week of September to the second week of December. The genotypes MGK-22, CRSK-1 and CRSK-8 produced flowers early during the third week of September and genotype MGK-52 produced flowers late during the second week of December.

Fruit shape: The different types of fruit shapes found among the population were round, oval and oblong. Twenty genotypes had an oval fruit shape followed by a round fruit shape in four genotypes and an oblong fruit shape in two genotypes (Table 2).

Seed colour: Two seed colour were observed among the genotypes *viz.,* light brown and dark brown (Table 2). Dark brown seed colour was recorded in sixteen genotypes. However, ten genotypes have a light brown seed colour. Similar kind of observations are close conformity with the reported by some earlier finder

The present findings are in conformity with *Singh et al.* (2021) and Sonawane *et al.* (2022) in khirni.

Table 2: Plant characteristics in respect of tree growth habit, leaf shape, leaf apex, flowering time, fruit shape, seed colour.

Genotype	Tree growth habit	Leaf shape	Leaf apex	Flowering time	Fruit shape	Seed colour
MGK-14	Spreading	Elliptic	Emarginate	1st week of November	Oval	Light brown
MGK-15	Upright	Elliptic-obovate	Emarginate	4th week of October	Round	Dark brown
MGK-16	Upright	Obovate	Emarginate	4th week of October	Oval	Dark brown
MGK-22	Drooping	Elliptic-obovate	Obtuse	3rd week of September	Oval	Dark brown
MGK-26	Upright	Obovate	Emarginate	4th week of October	Oval	Light brown
MGK-31	Spreading	Elliptic	Emarginate	4th week of October	Oval	Light brown
MGK-32	Spreading	Obovate	Emarginate	4th week of October	Oblong	Dark brown
MGK-52	Spreading	Elliptic-obovate	Emarginate	2nd week of December	Round	Dark brown
MGK-58	Spreading	Elliptic-obovate	Emarginate	1st week of October	Oval	Dark brown
MGK-59	Spreading	Elliptic-obovate	Emarginate	1st week of November	Oval	Light brown
MGK-60	Spreading	Elliptic	Emarginate	1st week of November	Round	Dark brown
MGK-61	Spreading	Elliptic-obovate	Emarginate	4th week of October	Oval	Dark brown
MGK-63	Spreading	Elliptic-obovate	Emarginate	1st week of October	Round	Dark brown
CRSK-1	Spreading	Elliptic	Emarginate	3rd week of September	Oval	Light brown
CRSK-2	Spreading	Obovate-oblong	Obtuse	1st week of November	Oval	Dark brown
CRSK-3	Drooping	Elliptic-obovate	Obtuse	4th week of September	Oval	Dark brown
CRSK-4	Drooping	Obovate-oblong	Obtuse	1st week of November	Oval	Dark brown
CRSK-6	Drooping	Elliptic-obovate	Obtuse	1st week of November	Oval	Dark brown
CRSK-7	Drooping	Obovate	Obtuse	1st week of November	Oval	Light brown
CRSK-8	Spreading	Elliptic	Emarginate	3rd week of September	Oval	Light brown
AHDSK-1	Spreading	Elliptic	Emarginate	4th week of October	Oval	Dark brown
AHDSK-2	Drooping	Elliptic-obovate	Emarginate	4th week of October	Oval	Light brown
AHDSK-3	Drooping	Obovate	Emarginate	3rd week of October	Oval	Light brown
AHDSK-4	Drooping	Elliptic	Emarginate	3rd week of October	Oval	Dark brown
AHDSK-5	Drooping	Obovate	Obtuse	3rd week of October	Oval	Dark brown
AHDSK-6	Drooping	Obovate	Obtuse	3rd week of October	Oval	Light brown

CONCLUSION

Based on various observations, it may be inferred from the study that khirni genotypes exhibited enormous genetic diversity in the existing population with respect to morphological and quality traits. The genotype MGK-63 showed maximum fruit weight, seed weight and seed index. Therefore these findings may be useful for the selection of elite genotypes and also be a source for crop improvement in future breeding program.

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