



MOMORDICA CHARANTIA VAR. MURICATA L.: NEED TO CONSERVE AND PROMOTE ITS CULTIVATION IN JAMMU PROVINCE (J&K)

MEHNAZ BANO¹ AND GEETA SHARMA^{2*}

Department of Botany, University of Jammu, Jammu 180006

ABSTRACT

Momordica charantia L., a major cucurbit of economic importance, is represented by two varieties viz. cultivated var. *charantia* and wild var. *muricata*. Both these varieties resemble each other in overall morphology except that the smaller vines of var. *muricata* bear small sized leaves, flowers and fruits which have delicate flavour and taste as well as more nutritious components than those found in var. *charantia*. Besides, the two varieties correspond with each other in having most of the pollen mother cells with 22 chromosomes which associated as 11 bivalents, with a few cells having 20-24 chromosomes. Cytomorphological similarities in the two varieties which are cross-compatible indicate that attempts can be made to transfer desirable traits of var. *muricata* viz. drought tolerance and resistance against fruit fly into variety *charantia* by crossing experiments. Despite its importance, var. *muricata* is grown to limited extent in India and is found at few locations in the wild. In some states as Tamil Nadu, this variety is reported to be threatened. During present surveys, small and fragmented wild populations of var. *muricata* have been spotted at Mansar and Purmandal in district Samba and Palli, Domel and R.S. Pura in district Jammu of Jammu Province. At none of these areas, the variety was cultivated on large scale for commercial purpose. Scarce distribution and limited cultivation of this variety in Jammu Province seems to be due to the competition faced by it from large fruit bearing var. *charantia*, habitat loss and fragmentation and increased dependence of farming communities on locally available vegetables. In view of these limitations, various suggestions for the conservation of this variety and promotion of its cultivation in Jammu Province have been put forth.

KEYWORDS: *Momordica charantia* var. *charantia* L., *Momordica charantia* var. *muricata*, cultivation, endangered, Cucurbitaceae



GEETA SHARMA *

Department of Botany, University of Jammu, Jammu 180006

Received on: 30-08-17

Revised and Accepted on: 20-10-17

DOI: <http://dx.doi.org/10.22376/ijpbs.2017.8.4.b518-521>



[Creative commons version 4.0](https://creativecommons.org/licenses/by-nc-sa/4.0/)

INTRODUCTION

Momordica charantia L. (also called bitter gourd/bitter melon), with its name derived from Latin word "mordeo" (momordi=to bite)¹ indicating jagged seeds, belongs to family Cucurbitaceae.²⁻³ Fruits of this species contain carbohydrates, fats, proteins, vitamins and minerals such as Fe, Zn and Ca and are considered to be quite nutritious.⁴⁻⁵ While decoctions of stem and leaves of bitter gourd are used for treating intestinal ulcer, piles, fever, rheumatism and diarrhoea⁶⁻⁷, root extracts have abortifacient properties.⁸ Besides, fruit extracts of this species are anti-microbial, anti-oxidant, anti-viral, anti-ulcerogenic and anti-diabetic in nature.⁹⁻¹⁰ *Momordica charantia* has been categorized into two varieties viz. cultivated *M. c.* var. *charantia* and wild *M. c.* var. *muricata* on the basis of fruit shape, size and texture.³ Compared to var. *charantia* which is cultivated on large scale in Southeast Asia¹¹, var. *muricata* is grown to a limited extent in Kerala, Karnataka, Tamil Nadu, Andaman and Nicobar Islands, Sikkim and West Bengal¹² and is known to occur at few locations in the wild in Tamil Nadu, Western and Eastern Ghats, Chhattisgarh and Jharkhand.¹³ Previous studies from India have revealed a medium level threat to wild var. *muricata* across its geographical range.¹⁴ For assessing the status of this variety in Jammu Province, explorations were conducted which revealed scarce distribution of this variety. In view of this limitation, different populations were examined for threats operating. Besides, measures for conservation and promotion of this variety were suggested.

MATERIAL AND METHODS

Field surveys were conducted in the various areas of Jammu Province for locating different populations of wild var. *muricata*. Wild plants collected from various sites were identified by comparing with standard specimens of University Herbarium with the help of Ms. Nidhi Jarangal (Curator, Herbarium of University of Jammu). Voucher specimens of different populations have been deposited in the University Herbarium vide voucher numbers- 15720 to 15724. Five to six climbers of var. *muricata* and that of var. *charantia* from different locations were studied for morphological aspects in blooming period. For studying meiosis in male track, young buds were fixed in 3:1 ethanol and acetic acid in the morning from 8:00 am to 9:00 am for 24 hours, washed in water and preserved in 70% ethanol. Anthers dugged out from these buds were further squashed in 1% propiocarmine for studying chromosome behaviour in the pollen mother cells. Pollen stainability was determined using 1% acetocarmine.

RESULTS AND DISCUSSION

M. charantia var. *muricata* (Fig. 1a), a wild variety of *M. charantia* bears 5.7 cm (3.2-8.2 cm) long and 7.6 cm (4.9-10.9 cm) broad leaves. Flowers (Fig. 1b) of this variety have sepals of size 0.36 cm × 0.25 cm, petals of size 1.46 cm × 0.69 cm and 4.26 cm (3.8-4.5 cm) long pedicels. Individual flowers develop into 3.6 cm (3-4.2 cm) long ovoid fruits (Fig. 1c) with tubercles on their

surface. Compared to wild form, cultivated var. *charantia* has longer vines and bears larger leaves (8.9×9.1 cm) and flowers with large sized sepals (0.7×0.4 cm), petals (2.36×1.26 cm) and pedicels (10.2 cm) as well as elongated fruits (12 cm). Fruits of var. *muricata* having delicate flavor and taste are reported to contain more carbohydrates (9.8 g), proteins (2.9 g), fats (1.0 g), fibers (1.7 g), calcium (50 mg), phosphorus (140 mg), iron (9.4 mg), vitamin A (220 IU) and vitamin C (90-120 mg) than the values reported for the nutritive components of var. *charantia* viz. 4.2 g (carbohydrates), 1.6 g (proteins), 0.2 g (fats), 0.8 g (fibers), 20 mg (calcium), 70 mg (phosphorus), 2.2 mg (iron), 210 IU (vitamin A) and 70-85 mg (vitamin C).¹³ Drought tolerance, resistance against fruit-fly and ability to grow on fertile lands are the other important traits of var. *muricata*.¹² *M. c.* var. *muricata* which does not differ much from var. *charantia* in overall morphology except for small size of leaves, flowers and fruits, also corresponds with the latter in cytological aspects. Both varieties had majority of cells with 22 chromosomes, with a few cells having variant numbers viz. 20-24 chromosomes. In euploid cells, twenty-two chromosomes were present as 11 bivalents except for a few cells that had 1-2 quadrivalents plus bivalents. Mean percentage pollen stainabilities of wild and cultivated varieties valued 84.22 and 87.55 respectively. On account of phenotypic and cytological similarities apparent in var. *charantia* and var. *muricata* and owing to cross compatibility of the two¹⁵⁻¹⁶, attempts can be made to transfer desirable traits of wild bitter gourd into cultivated large bitter gourd forms. Though during 19th century, var. *muricata* was cultivated extensively by Indians for its edible fruits, over the years, it escaped the attention of breeders who became more interested in high yielding and large fruit bearing var. *charantia*.^{13,17} Presently, wild bitter melon is reported to be cultivated to limited extent in Kerala, Karnataka, Tamil Nadu, Andhra Pradesh and Sikkim and is found in the wild at few locations of Eastern and Western Ghats, Chhattisgarh, Jharkhand and Tamil Nadu.¹² In the later state (Tamil Nadu), this variety is reported to be endangered in the wild.¹² During present explorations in Jammu Province, small populations of var. *muricata* have been spotted at Purmandal and Mansar in district Samba and Palli, Domel, R.S. Pura in district Jammu of Jammu Province. Though in Palli region, var. *muricata* is grown by some locals in underutilised lands for personal consumption, in other areas, its vines were found growing in the wild. However, at none of the aforementioned locations of Jammu Province, this variety was seen cultivated on large scale for commercial purpose. Scarce distribution of small bitter gourd in Jammu province seems to be due to the threats posed by intrinsic and extrinsic factors. The intrinsic factors involve formation of small vines which bear smaller fruits and set fewer seeds (10; 8-15) than var. *charantia* which supports larger fruits having more seeds (23; 18-25). Owing to larger fruit size of var. *charantia*, local farmers show more interest in its cultivation. Habitat loss and fragmentation, increasing reliance of agrarian populations on market available vegetables, depletion in the number of conventional farmers, very less agricultural fields available for use, overharvesting of fruits by indigenous people at

immature stage which hinders bird mediated seed dispersal and gradually narrows down genetic variability of variety, are the extrinsic factors responsible for its limited distribution. In view of the limited germplasm of this variety, there is an urgent need to conserve this variety, both in-situ and ex-situ. Though presently only few landraces are being conserved at National Bureau of Plant Genetic Resources (NBPGR) and Indian Agricultural Research Institute (IARI), New Delhi, more initiatives at larger scale are required. For this, the ecological habitat of this variety needs to be protected by regulating anthropogenic activities in the areas of its occurrence and monitoring wild populations regularly.

Secondly, var. *muricata* can be promoted as an alternative crop for its excellent culinary traits which can improve livelihood of poor farming communities. Besides, government should also promote this delicious fruit bearing variety by giving incentives to the farmers for its cultivation. In fewer areas of West-Bengal, Sikkim, Kolkata, Andaman and Nicobar Islands and Tamil Nadu, cultivation of var. *muricata* is being promoted by locals with the assistance of some private seed companies.¹² Similar trend needs to be extended by non-government organizations of our state for enriching the germplasm of wild bitter melon.



Figure 1
Morphology of *Momordica charantia* var. *muricata*
a. A vine growing on wasteland, b. A full opened male flower, c. A fruit

CONCLUSION

M. c. var. *muricata*, providing highly nutritious vegetable and exhibiting resistance against fruit fly, is distributed to limited extent in Jammu Province. Scarce distribution of this variety is due to the formation of smaller fruits with fewer seeds, habitat destruction, increasing dependence of locals on market available vegetables and competition faced by it with var. *charantia*. Going by the limited germplasm of var. *muricata* in Jammu Province, it is required to conserve it in-situ and ex-situ. Besides, cultivation of this variety should be promoted which in turn can improve livelihood of poor farmers.

FUNDING ACKNOWLEDGEMENTS

This communication is a part of research work carried out under the project "Assessment ...*Coccinia*indica." vide SERB vide Sanction order SB/YS/LS-175/2013 dated 13 May, 2014. Authors are also thankful to the Head, Department of Botany, University of Jammu for providing necessary facilities.

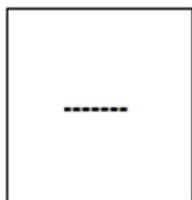
CONFLICT OF INTEREST

Conflict of interest declared none.

REFERENCES

1. Sethi P. *Momordica charantia* L-an ethnobotanical drug. Int. J. Pharm. Bio. Sci. 2012;3(2):1-5.
2. Bharathi LK, Munshi AD, Vinod, Chandrashekar S, Behera TK, Das AB, John JK, Vishalnath. Cytotaxonomical analysis of *Momordica* L. (Cucurbitaceae) species of Indian occurrence. J. Genet. 2011;90(1):21-30.
3. Chakravarty HL. Cucurbits of India and their role in the development of vegetable crops. In: Bates DM, Robinson RW, Jeffrey C, editors. Biology and Utilization of Cucurbitaceae. Cornell University Press, Ithaca, New York; 1990.p. 325-34.
4. Behera TK, Dey SS, Sirohi PS. Variation in ascorbic acid and carotenoid content in bitter gourd (*Momordica charantia* L.) genotypes. In: International Conference on Biotechnology Approaches for Alleviating Malnutrition and Human Health. Bangalore, India; 2006.p. 62.
5. Miniraj N, Prasanna KP, Peter KV. Bitter gourd *Momordica* spp. In: Kalloo G, Bergh BO, editors. Genetic improvement of vegetable plants. Pergamon Press, Oxford; 1993.p. 239-246.
6. Gurbuz I, Akyuz C, Yesilada E, Bilge S. Anti-ulcerogenic effect of *Momordica charantia* L. fruits on various ulcer models in rats. J. Ethnopharmacol. 2000;71:77-82.
7. Subratty AH, Gurib-Fakim A, Mahomoodally F. Bitter melon: an exotic vegetable with medicinal values. Food Sci. Nutr. 2005;35:143-47.
8. Gurib-Fakim A. Plantes medicinales de L'île Maurice. Ed. Ocean Indien, (1994–1996).
9. Weilhinda J, Karunanayake EH, Sheriff MH, Jayasinghe KS. Effect of *Momordica charantia* on glucose tolerance in maturity onset diabetes. J. Ethnopharmacol. 1986;17:277-82.
10. Raman A, Lau C. Antidiabetic properties and phytochemistry of *Momordica charantia* L. (Cucurbitaceae). Phytomedicine, 1996;2:349-62.
11. Behera TK, Bharathi LK, John KJ, Karuppaiyan R. *Momordica*. In: C. Kole, editor. Wild Crop Relatives: Genomics and Breeding Resources, Vegetables. Springer-Verlag, Berlin, Heidelberg;2011.p. 217-46.
12. Joseph JK, Antony VT. Collection and preliminary evaluation of small bitter gourds (*Momordica charantia* L.) a relic vegetable of Southern Peninsular India. Genet. Resour. Crop Evol. 2009;56:99-104.
13. Desai UT, Musmade AM. Pumpkins, Squashes and Gourds. In: Salunkhe DK, Kadam SS, editors. Handbook of Vegetable Science and Technology: Production, Composition, Storage and Processing. New York, USA; 1998.p. 273-98.
14. Joseph JK. Studies on ecogeography and genetic diversity of the genus *Momordica* in India. Ph.D. Thesis, Mahatma Gandhi University, Kottayam, Kerala, India. 2005.
15. Beevy SS, Bai NH. Karyotypic analysis of parents and F1 hybrids of intra-specific crosses in *Momordica charantia* L. Nucleus, 2013;56(2):99–105.
16. Beevy SS, Bai NH. Characterization of intraspecific F1 hybrids of *Momordica charantia* L. based on morphology, cytology and palynology. Cytologia, 2012;77(3):301-10.
17. Roxburgh W. Flora Indica or descriptions of Indian plants. Today and Tomorrow Publishers (rep.edn.), New Delhi, 1832.

Reviewers of this article



Reema Goni Ph.D

Lecturer, Dept of Botany,
University of Jammu,
Jammu - 180006
India.



Prof. Dr. K. Suriaprabha

Asst. Editor , International Journal
of Pharma and Bio sciences.



**Asst. Prof. Dr. Deepansh Sharma, M.Sc,
M.Phil, Ph.D.**

Assistant Professor, Amity Institute of
Microbial Technology, Amity University,
Rajasthan, Jaipur, India



Prof. P. Muthuprasanna

Managing Editor , International
Journal of Pharma and Bio sciences.

We sincerely thank the above reviewers for peer reviewing the manuscript