



DISTRIBUTION, UTILISATION AND FUTURE PROSPECTS OF SOME UNDERUTILISED CUCURBITS OF JAMMU AND HIMACHAL PRADESH (India).

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ABSTRACT

Cucurbitaceous species are cultivated on large scale from tropical to sub-tropical regions of the world. In India, along with major cucurbits such as *Luffa cylindrica*, *Citrullus lanatus*, *Cucurbita pepo*, *Cucumis melo*, *C. sativus*, *Lagenaria siceraria* etc., some minor cucurbits are also cultivated. The minor cucurbits generally found in Jammu and Himachal Pradesh includes *Momordica charantia* var. *muricata*, *M. dioica*, *Trichosanthes cucumerina* var. *cucumerina*, *T. dioica*, *Luffa acutangula* and *Coccinia grandis*. These species provide nutritious vegetables and are source of medicinally important components. While information regarding the distribution and utilization of minor cucurbits in South, central and eastern India is documented, knowledge on these aspects is missing for the minor cucurbits from North-western states, particularly Jammu and Kashmir and Himachal Pradesh. Surveys made presently on these cucurbits from Jammu and Himachal Pradesh indicated that these are cultivated to a limited extent. Except wild *C. grandis* which is found in abundance, wild forms of remaining taxa have been reported at few locations. Present compilation describes nutritional importance and distribution of six minor cucurbits in Jammu and H.P. as well as probable reasons responsible for their underutilization. The information provided will encourage farmers to cultivate these cucurbits on large scale and improve the acceptability of these species among the local populations.

KEYWORDS: Cucurbits, dioecious, perennial, underutilized



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INTRODUCTION

Family Cucurbitaceae comprises of 118 genera and 825 species, which share about 5.6% of the total vegetable production.¹⁻² Different species of this family inhabit tropical and subtropical regions of the world.¹⁻² *Cucumis sativus* (cucumber), *Citrullus lanatus* (water melon), *Cucurbita pepo* (pumpkin) and *Cucumis melo* (melon) are world's most broadly grown taxa of cucurbits. In India, this family is represented by 31 genera and 94 species of which 10 are endemic.³ Presence of more divergent cucurbitaceous lines in India is attributed mainly to the Asian origin of this family in Late Cretaceous (some 60 million years ago) as well as long-distance dispersal mechanisms.¹ Amongst different regions of India, cucurbit diversity is maximum in north-eastern and peninsular regions and minimum in north-western states as Jammu-Kashmir (J&K) and Himachal Pradesh (H.P.).³ In the later two states, *Cucumis sativus* (cucumber), *Lagenaria siceraria* (bottle-gourd), *Momordica charantia* var. *charantia* (bitter-gourd) and *Luffa cylindrica* (sponge-gourd) are the major cucurbits

grown and *Momordica charantia* var. *muricata*, *M. dioica*, *Trichosanthes cucumerina* var. *cucumerina*, *T. dioica*, *Coccinia grandis* and *Luffa acutangula* are the minor ones, cultivated to a very limited extent. The wild forms of these taxa grow in the abandoned lands which are generally inhospitable for the growth of other plants.⁴⁻⁵ Despite being the source of prized vegetables, information regarding the nutritional components and the distribution of these underutilized cucurbits in north-west India is scarce. These aspects have been covered in the present review.

DISTRIBUTION AND UTILIZATION

A total of six minor cucurbits have been studied presently, out of which three are monoecious and annual whereas the remaining three are dioecious and perennial. The flowering period of these taxa overlap, with maximum blooming period of *C. grandis* being 8 months (Table 1).

Table 1
Flowering period of three monoecious and three dioecious cucurbit species.

| Species | Nature | Habit | Flowering period |
|---|------------|-----------|------------------|
| <i>Momordica charantia</i> var. <i>muricata</i> | Monoecious | Annual | April-October |
| <i>Momordica dioica</i> | Dioecious | Perennial | June-September |
| <i>Trichosanthes dioica</i> | Dioecious | Perennial | May-September |
| <i>Trichosanthes cucumerina</i> | Monoecious | Annual | May-September |
| <i>Luffa acutangula</i> | Monoecious | Annual | June-November |
| <i>Coccinia grandis</i> | Dioecious | Perennial | April-November |

M. c. var. *muricata*, commonly called bitter-gourd, bears small, round fruits having excellent culinary traits and resistance against fruit-fly.⁶⁻⁷ Though this variety has lower yield than the cultivated *M. c.* var. *charantia*, it is highly nutritious and 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 those present in var. *charantia* (carbohydrates=4.2 g, proteins=1.6 g, fats=0.2 g, fibers=0.8 g, calcium=20 mg, phosphorus=70 mg, iron=2.2 mg, vitamin A=210 IU and vitamin C=70-85 mg).⁸⁻⁹ In India, China and Central America, whole plant extracts of this species are used for the treatment of diabetes.¹⁰ During 18th century, extensive cultivation of var. *muricata*, even more than var. *charantia*, has been reported.¹¹ However, over the years small fruited var. *muricata* lost attention of the breeders, probably due to more availability of large-fruited and high yielding var. *charantia*.⁷ Reported to inhabit western and eastern Ghats, Chhattisgarh, Jharkhand and South India by previous workers⁹, presently this variety in north-western India has been found at few locations as Purmandal and Mansar of District Samba (J&K), Palli, Domel and R.S. Pura of District Jammu (J&K), Gajrerhah, Banyal-Bal and Rihri-Kathera of District Bilaspur (H.P). *M. dioica*, also known as spine-gourd/kakrol, is a dioecious climber. Its fruits are rich in carbohydrates (7.7 g), proteins (3.1 g), fats (3.1 g), fibers (3.0 g), minerals (1.1 g), iodine, flavonoids, glycosides and vitamins such as Vitamin C, A, thiamin, riboflavin and niacin¹²⁻¹⁴ and are used to cure ulcer, piles, sores, obstruction of liver and spleen, digestive

problems and diabetes. Its seeds are used to relieve chest and urinary tract related problems.¹⁵⁻¹⁶ Reported earlier from north-east (Assam and Garo Hills of Meghalaya) and central India (Gangetic plains),¹⁷⁻¹⁹ presently, this species has been spotted at Miran Sahib and Khandwal (District Jammu) and Patnitop (District Udhampur) areas of Jammu division. *T. dioica*, commonly known as pointed gourd/parwal is another dioecious climber, which bears fruits rich in vitamin A, C, proteins and having appreciable amount of magnesium (9.0 mg), sodium (2.6 mg), potassium (83.0 mg), copper (1.1 mg) and sulphur (17.0 mg) per 100 g edible part.²⁰⁻²¹ In Charak Samhita, its leaves and fruits find mention to cure alcoholism and Jaundice. These are also used as diuretic, laxative and as a remedy for circulatory disorders.²¹ Renner and Pandey in 2013³ reported the occurrence of this species in Assam, Tripura, Bihar, Delhi, Himachal Pradesh, Punjab, Rajasthan and Uttar Pradesh. During present surveys, *T. dioica* vines have been spotted at hedges of fields in Gazansoo and Mangoo of District Jammu.²⁰ Though seed set in *T. dioica* is quite high, it shows poor germination²¹. In this dioecious species, only half of the vines produced via seed are male and the remaining half are female and bear fruits. As the farmers could not distinguish between the two, prior to flowering, male vines growing in their fields serve no purpose except pollination. So, the growers feel reluctant to grow this crop. In few areas where this species is grown, it is multiplied mainly by vegetative means. *T. c.* var. *cucumerina* (commonly called Jangli chichinda), an annual, monoecious vine bearing beautiful small white flowers, is a source of

cucurbitacins and B-trichosanthin. While cucurbitacins have hepatoprotective, anti-cancer, anti-inflammatory and anti-microbial properties, B-trichosanthins inhibit the replication of human-immunodeficiency virus (HIV) in infected lymphocytes and phagocytes.²² Known to be cultivated throughout India,³ in Jammu, this species has been found growing at Billawar (District Kathua), Naghbani, Gharota and Kot Balwal (District Jammu). In Himachal Pradesh, its vines have been located at Kangoo (District Hamirpur), Mubarak-Pur (District Una), Gajrerha and Balsinha (District Bilaspur). Of *L. acutangula* and *L. cylindrica*, the two species found in Jammu, *L. acutangula* (commonly called ridge-gourd) has remained underutilized.²³⁻²⁴ This monoecious vine bears easily digestible vegetable having moderate bitter flavour, slight spongy texture and sweet juiciness. While leaf extracts of this species are used for curing conjunctivitis, extracts from its fruits and seeds provide remedy for venereal diseases, particularly gonorrhoea.²⁵ The mature and dried fruits of ridge gourd are source of non-scratching sponge which is used for scrubbing the body, washing utensils and for filtering and cleaning purpose in industries.²⁶⁻²⁷ Though reported to be cultivated throughout India,³ in Jammu, ridge gourd has been found at Birpur and Purmandal (District Samba). Lesser yield seems to be one of the reasons for limited cultivation of *L. acutangula* in Jammu as compared to *L. cylindrica*.²⁸ *C. grandis*, a perennial, dioecious cucurbit, indigenous to India, provides fruits rich in vitamin A and C.²⁹⁻³⁰ Extracts from its roots, leaves and fruits find use for wound healing, treating jaundice, diabetes, stomach ache, skin diseases, fever, asthma and cough.³¹⁻³² This species is also known to contain some important phytochemical compound that can enhance digestibility.³³ Compared to other underutilised cucurbits, *C. grandis*, occurring throughout India, grows vigorously.³ In rainy season, its vines grow upto 4 inches a day, form dense masses blankets over other plants and shade them from sunlight.³⁴ In Jammu division, this species has been located at Old and New Jammu University Campus, Narwal Chowk, Ambphalla, Bakshi Nagar, Government Technical College, Maulana Azad Stadium, Rajinder Park, Residential complex of Indian Institute of

Integrative Medicine, Mahamaya temple and Bahu-Fort (District Jammu), Domel and Nandini (District Udhampur). In District Bilaspur (H.P.), vines of this species have been located at Gajrerhah and Bal-Sinha. This species has remained underutilized because some of its vines bear bitter and other bear edible fruits. As it is not possible to distinguish morphologically the edible and inedible fruit bearing vines, edible fruits borne on wild vines also remain unconsumed. Since the species is mainly vegetatively propagated, only some of the edible forms are cultivated by the growers.

CONCLUSION AND FUTURE PROSPECTS

In North-west India, on account of low yield coupled with the presence of some bitter components and low acceptability, the aforementioned cucurbits have not received the attention they deserve. For making these cucurbits more popular, it is important to morphologically screen populations from different geographical regions of the country. This endeavour can assist in identifying plants with edible and larger fruits, exhibiting wider adaptability, having tolerance to disease and insect-pests which can later be used for the breeding purpose. It is also important to improve the acceptability of these cucurbits by making locals aware of their nutritional qualities.

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CONFLICT OF INTEREST

Conflict of interest declared none.

REFERENCES

- Schaefer H, Renner SS. Phylogenetic relationships in the order Cucurbitales and a new classification of the gourd family (Cucurbitaceae). *Taxon*. 2013;60(1): 122-38.
- Rai M, Pandey S, Kumar S. Cucurbit research in India: a retrospect in Cucurbitaceae. *Proceedings of the IXth EUCARPIA meeting on genetics and breeding of Cucurbitaceae*, INRA, Avignon (France). 2008; May 21-24.
- Renner SS, Pandey AK. The cucurbitaceae of India: Accepted names, synonyms, geographic distribution and information on images and DNA sequences. *PhytoKeys*. 2013;20:53-118.
- Krishi Vigyan Kendra, Una (at Rampur). *Success Stories* [Internet]. Palampur: UNS, DEE, CSKHPKV, Palampur; August 05, 2015, Available from: http://www.hillagric.ac.in/extension/dee_extra/krishiVigyanKendras/kvk_una/success_stories.htm.
- Pandit MK, Acharya S. Potential of minor cucurbits for sustainability and livelihood support in west Bengal. *J. Agrofor. Environ*. 2008;2(2):209-12.
- Chakravarty H.L. Cucurbits of India and their role in the development of vegetable crops. In: Bates DM, Robinson RW, Jeffrey C(eds) *Biology and utilization of Cucurbitaceae*, Cornell University Press, Ithaca, New York. 1990: 325-34.
- Joseph JK, Antony VT. Collection and preliminary evaluation of small bitter gourds (*Momordica charantia* L.) a relicit vegetable of Southern Peninsular India. *Genet. Resour. Crop Evol*. 2009;56:99-104.
- Dey SS, Singh AK, Chandel D, Behera TK. Genetic diversity of bitter gourd (*Momordica charantia* L.) genotypes revealed by RAPD markers and agronomic traits. *Sci Hortic-Amsterdam*. 2006;109:21-8.
- Desai UT, Musmade AM. Pumpkins, squashes and gourds. In: Salunkhe DK, Kadam SS (eds)

- Handbook of Vegetable Science and Technology: Production, Composition, Storage and Processing. New York, USA. 1998; 273-98.
10. Grover JK, Yadav S, Vats V. Medicinal plants of India with antidiabetic potential. J. Ethnopharmacol. 2002;81: 81-100.
 11. Roxburgh W. Flora Indica or descriptions of Indian plants. Today and Tomorrow Publishers (rep.edn.), New Delhi, 1832.
 12. Ali M and Srivastava V. Characterisation of phytoconstituents of fruits of *Momordica dioica*. Indian J. Pharma. Sci. 1998;60:278-79.
 13. Singh D, Bahadur V, Singh DB, Ghose G. Spine gourd (*Momordica dioica*): an underutilised vegetable with high nutritional and medicinal values. Acta Hort. 2009;809:241-48.
 14. Behera TK, Staub JE, Behera S, Simon PW. Bitter gourd and human health. Medicinal and Aromatic Plant Science and Biotechnology, 2008;1:224-6.
 15. Arora RK. Genetic resources of vegetable crops in India: their diversity and conservation. In Genetic Resources of Vegetable Crops (eds.), NBPGR, New Delhi, India. 1995: 29-39.
 16. Bawara B, Dixit M, Chauhan NS, Dixit VK, Saraf DK. Phyto-pharmacology of *Momordica dioica* Roxb. Ex. Willid: A review. Int. J. Phytomedicine. 2010.
 17. Ram D, Kumar S, Banerjee MK, Kalloo G. Occurrence, identification and preliminary characterisation of gynoeicm in bitter gourd. Ind. J. Agric. Sci. 2002;72(6):348-49.
 18. Sharma BM, Kachroo P. Flora of Jammu and plants of neighbourhood. Bishen Singh Mahendra Pal Singh, Dehradun. 1981.
 19. Kumar K. Studies on plant diversity of Patnitop and adjoining areas and impact of biotic activities. Ph. D. Theseis submitted to University of Jammu, Jammu. 1997.
 20. Sarker DD, Datta KB, Sen R. Cytomorphology of some wild and cultivated members of *Trichosanthes* L. Cytologia, 1987;52:405-17.
 21. Kumar N, Singh S, Manvi, Gupta R. *Trichosanthes dioica*: an overview. Pharmacognasy Review, 2012;6(11): 61-7.
 22. McGrath MS, Hwang KM, Caldwell SEI, Gaston KC, Luk P, Wu VL, Ng S, Crowe, Daniels J, Marsh J, Deinhart T, Lekas PV, Vennari J, Yeung HW, Lifson JD. GLQ223: an inhibitor of human immunodeficiency virus replication in acutely and chronically infected cells of lymphocyte and mononuclear phagocyte lineage. Proc. Natl. Acad. Sci. (USA), 1989;86:2844-8.
 23. Gopalan C, Ramasastrri BV, Balasubramanian SC. Nutritive value of Indian foods. 2nd edn. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad. 1993.
 24. Chandra U. Distribution, domestication and genetic diversity of *Luffa* gourd in Indian subcontinent. Indian J Plant Genet Resour. 1995;8:189-96.
 25. Martin FW. Vegetables for the hot humid tropics. Part 4. Sponge and bottle gourds, *Luffa* and *Lagenaria*. Science and Education Administration United States Department of Agriculture, New Orleans, United States. 1979:19.
 26. Oboh IO, Aluyor EO. *Luffa cylindrica*- an emerging cash crop. Afr. J. Agric. Res. 2009;4(8): 684-8.
 27. Okusanya OT, Ola-Adams BA, Bamidele JF. Variations in size, leaf morphology, and fruit characters among 25 populations of *Luffa aegyptiaca*. Can. J. Bot. 1981;59:2618-27.
 28. Jamwal M, Sharma N. Reproductive efficiency of two *Luffa* species - Factors affecting low reproductive rate in meiotically stable *Luffa acutangula* (L.) Roxb. Nucleus, 2015;58(1):59-65.
 29. Nath P. Cucurbitaceous vegetable in north India, University of Udaipur, College of Agriculture Jobner, Ext. bull. 1966;7:64.
 30. Shaina TJ, Beevy SS. Chromosomal variations in *Coccinia grandis* (L.) Voigt, an actively evolving dioecious cucurbit exhibiting floral polymorphism. Nucleus, 2014;57(2):121-7.
 31. Linney G. *Coccinia grandis* (L.) Voigt: A new cucurbitaceous weed in Hawai'i. Hawaii. Bot. Soc. Newslett. 1986;25(1):3-5.
 32. Shibib BA, Khan LA, Rahman R. Hypoglycemic activity of *Coccinia indica* and *Momordica charantia* in diabetic rats: depression of the hepatic gluconeogenic enzymes glucose-6-phosphatase and fructose-1,6-bisphosphatase and elevation of both liver and red-cell shunt enzyme glucose-6-phosphate dehydrogenase. Biochem J. 1993;292:267-70.
 33. Hemalatha J, Kaleena PK, Valivittan K. Impact of plant extract, *Coccinia grandis* on digestive tract microflora. Int. J. Pharm. Bio. Sci. 2015;6(1):1184-9.
 34. Tamilselven N, Thirumalai T, Elumalai EK, Balaji R, David E. Pharmacognosy of *Coccinia grandis*: a review. Asia Pac. J. Trop. Biomedicine. 2011; S299-S302.

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