



TAXONOMY OF *Citrus sinensis* (L.) OSBECK; THE COMMONEST ECONOMIC *Citrus* CROP IN KUMAUN HIMALAYA

Lokesh Dasila* and Adhikari R. S

L. S. M. Govt. P. G. College Pithoragarh, Kumaun University,
Nainital, Uttarakhand, Pin 262 501

ARTICLE INFO	ABSTRACT
Received 20th, January, 2017, Received in revised form 14th, February, 2017, Accepted 17th, March, 2017, Published online 28th, April, 2017	The Himalaya enjoys a remarkable position in the <i>Citrus</i> belt of the world due to its rich wealth of <i>Citrus</i> genetic resources, both wild and cultivated. In addition, the genetic resource spectrum of Indian <i>Citrus</i> includes several primitive cultivars/ land races of some interesting indigenous <i>Citrus</i> fruits such as Kumaun lemons, rough lemons, <i>galgal</i> , <i>madkakri</i> , etc., which sporadically occurs throughout the Kumaun Himalaya. The introduction, cultivation and trade of <i>Citrus</i> fruits in Kumaun have a very remarkable past. <i>Citrus sinensis</i> (L.) Osbeck (The sweet orange) is one of the most important, commercial and widely known cultivated species in Kumaun. The fruit is locally known as <i>maalta</i> , valued for the preparation of juice and represents the commonest economic <i>Citrus</i> crop.
Keywords: <i>Citrus sinensis</i> , Taxonomy, Kumaun Himalaya	

Copyright © 2017 Lokesh Dasila and Adhikari R. S., This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

The genus *Citrus* L. belongs to subfamily Aurantioideae of the family Rutaceae. This genus includes some of the major fruit crops such as (Limes) *Citrus aurantifolia* Swingle, *C. limetta* Risso, (Citrons) *C. medica* L., (Lemons) *C. jambhiri* Lush., *C. limon* (L.) Burm. f., (Oranges) *C. reticulata* Blanco, *C. sinensis* Osbeck., (Pummelos) *C. maxima* (Burm.) Merr. and (Grapefruits) *C. paradisi* Macfad. *Citrus* has great commercial potential. The dietary, nutritional, medicinal, aromatic, antioxidant and other therapeutic values of *Citrus* fruits are well known Nair and Nayar (1997). A great variety of flavonoids and their glycosides, essential oils, coumarins, phenyl propanoids, limonoids, carotenoids and other compounds are extracted from different cultivated species of *Citrus* Nair and Nayar (1997). The essential oils derived from *Citrus* are highly priced in flavouring and perfumery trades. The genus *Citrus* is peculiar in many ways. It includes many cultivated fruits, whose truly wild ancestors can not be fully traced. These plants are too delicate to survive in natural competition from others in the wild jungles of the semi tropics and subtropics.

The diverse agro-climatic and biogeographic zones in Western Himalaya, especially in Kumaun hills, have given rise to different forms of *Citrus* in cultivation and many other forms in semi-wild and wild conditions. The Shiwalik series of Indian Himalaya, from Northwest to Northeast India along the foothills is considered to be abode of *Citrus* genetic resources. Infact, Tanaka (1954) has denotified the region as 'Lemon-

Medica chain'. The genetic resource spectrum of Himalayan *Citrus* has been encountered during last 5 years of study period. It needs to be emphasized here that the *Citrus* genetic resource base in India have not yet been fully utilized due to the reasons not comprehensible, primarily borne out of the fact that *Citrus* taxonomy have not been fully, extensively explored till date. The taxonomy of *Citrus* is controversial. Needless to say, there exists, presently, a great deal of confusion as regards the taxonomy of *Citrus*, which to some extent could be due to high cross-compatibility (inter-specific to inter-generic), and a wide gap in the study pertaining to the firm taxonomy. In order to bridge these lacunae, the present study aims to make a taxonomic account of the *Citrus* wealth of Kumaun Himalaya, with prime objective of collection, documentation, passport data preparation and germplasm collection of each and every accession, and socio-economic relevance of the genus in the Kumaun Himalaya.

MATERIAL AND METHOD

The study was carried out from 2007 to 2011. The collection of *Citrus sinensis* specimens were carried out regularly for three years, covering all important *Citrus* growing areas of the five districts, both in the hills and in the low lying valleys, with particular attention to the sub-montane tracts, where most of the commercial *Citrus* plantations occur. The data undertaken regarding the collection of herbarium material, flower, fruit and seed germplasm in different seasons. Wherever possible the seedlings of the target species were also collected. The work was executed in a very thorough manner and there is hardly any important *Citrus* track in the province situated up to 3000 m.

*✉ Corresponding author: Lokesh Dasila

L. S. M. Govt. P. G. College Pithoragarh, Kumaun University,

which was not visited in quest of the *Citrus*. Characterization of the collected material was systematically recorded and the passport data of each and every accession prepared as per the Descriptor for *Citrus* developed by IPGRI (Anonymous, 1999). The healthy and disease free specimens with at least 3 replicates of the same plant (flowering twigs, wherever possible) were collected for physical herbarium records. The field notebook as an indispensable item was filled on the spot to record the data such as date, place, locality, habitat, elevation, local name, uses and accession number etc. Specimens were dried as rapidly as possible to get the best results and the dried specimens were dipped in a 2% saturated solution of mercuric chloride in ethyl alcohol to prevent the infection of fungi, insects etc. All the pictorial representations (illustrations) have been drawn to the natural scale. The seed germplasm were kept in -4° C. for storage.

RESULTS AND DISCUSSION

Citrus sinensis (L.) Osbeck, Dagb, Ostind. Resa 41.1775; Swingle in *Citrus* Ind. 1:379.1967 *C. aurantium* L. var *sinensis* L., Sp. P1.782.1753.

Vernacular name: (Kumaoni) *maalta*, (Hindi) *mosambi*, (English) The sweet orange.

Taxonomic characterization

Medium-tall trees up to 15 ft. high; branchlets angular when young, spinous; Leaves unifoliolate; petioles ca 2 cm long, narrowly winged; wing oblong spatulate, ca 3 mm broad on either side; leaflet blades ovate to elliptic, cuneate at base, emarginate at apex, obtusely crenate along margin, 7.0-11.5×4.0-5.5 cm, aroma distinctly different from bitter orange. Inflorescence axillary, racemose (4-6 flowered) or of a solitary flower; pedicels 7-12 mm long, glabrescent. Flowers bisexual. Calyx 4- or 5- lobed; sepals suborbicular, acuminate, membranous, ciliolate, glandular. Petals 5, oblong, glandular, pure white. Stamens 20-26; filaments polyadelphous, unequal in length; anthers linear oblong, obtuse, cordate below. Disk annular, ca 2.5 mm broad. Ovary globose; style cylindrical, white; stigma capitate. Fruits medium-sized, subglobose to globose; surfaces smooth, glossy, greenish yellow to orange; pericarp thin, adherent; mesocarp white, mildly sweet; centre usually solid to semi hollow; endocarp segments 10-12; pulp-vesicles yellow to orange coloured, stalked, fusiform, cuneate-obovoid, acute at tip, narrowed at apex with rough marginate plane surface, juice abundant, sweet; seeds usually 10-12 per fruit, ca 13-16 mm long, cuneate to obovate, micropylar end somewhat beaked, cotyledon white.

Origin and name

Bonavia (1890) pointed out that there was no Indian name for the so called sweet orange. It is generally called in India as *maaltas* indicating that it is not indigenous to India. Swingle (1946) stated that the native home of the sweet orange was Southern China, Indo- China, or North Eastern British India which probably includes some parts of the Naga Hills of Assam. According to Tanaka (1937) the sweet orange is suspected to be indigenous to Eastern Burma. He also admits of the existence of a closely allied species, represented by *soh-*

niangling of Assam. But *soh-niangriang* (Khasi) is the only *Citrus*, which actually represents the sweet orange of Assam. The Khasi name *soh-niangriang* has probably been wrongly spelt as *soh-niangling* by Tanaka. In Kumaun Himalaya *C. sinensis* is generally called by the name *maalta* as Bonavia (1890) reported the same in erstwhile India.

Nomenclature

Linnaeus (1753) considered the so called sweet orange or tight skinned orange as a variety of the sour orange and called it *C. aurantium* var. *sinensis*. Loureiro (1790) designated the sweet orange as *C. aurantium*, while Osbeck (1775) earlier segregated it from the sour orange as distinct species and named it as *C. sinensis* L., which has now been accepted as the correct botanical name for the sweet oranges. The distinctive characters that led to raise the sweet orange to a specific rank have been discussed by Swingle (1946).

Probably, owing of the rising temperature in hills, the area of *Citrus* orchard cover is increasing year by year. The traditional farmers of Kali-Kumaun region are showing their interest towards the farming and marketing of this crop. As per the District Horticulture Officer, Champawat the orchard area and production in the year 2009 was 510 ha and 450 metric tons respectively, while in the year 2012 the values of the same was recorded as 605 ha and 628 m. tons respectively.

Table the year by year increasing orchard area and production of *Citrus* crop in Kali-Kumaun region. *Source* D.H.O., *Champawat*. (Here the *Citrus* comprises three principle species of commerce as *Citrus aurantifolia* (Christm & Panz.) Swingle, *C. sinensis* (L.) Osbeck and *C. reticulata* Blanco. Again *C. sinensis* contributed more than half of the total.)

Year	<i>Citrus</i> orchard cover (in ha)	Production (in m. tons)
2009	510	450
2010	522	530
2011	535	595
2012	605	628

CONCLUSION

Till date no attempt has been conducted to ascertain the *Citrus* taxonomy, as well as the other aspects related with the same, in the region. The present study, will pave towards the greater understanding of the commercial *Citrus* species, and will thereby greatly facilitate in the proper/scientific profile of the species. The present study indicates that the role of *Citrus* crop in socio-economy of the Kumauni farmers is very limited. Here the farmers planted different species of *Citrus* crops of which oranges are the main *Citrus* grown in commercial scale while lime and lemon are confined in very limited production and sale. Other *Citrus* are grown just for home consumption.

References

- Anonymous, 1999. *Descriptor for Citrus*, International Plant Genetic Resources Institute, Rome, Italy. pp. 27.

- Bonavia, E. 1890. *The Cultivated Oranges and Lemons etc. of India and Ceylon*: Bishan Singh Mahendra Pal Singh, Dehradun.
- Linnaeus, C. 1753. *Species Plantarum*: Bishan Singh Mahendra Pal Singh, Dehradun. Loureiro, J. de. 1790. *Flora of Cochinchina*, Typ. Academiae, Ulyssipone, Lisbon, 2 vol.
- Nair, K. N., Nayar, M. P. 1997. Rutaceae. In Hajara P K, Nair V J, Daniel P (Eds.), *Flora of India: Botanical Survey of India*, Calcutta (4): 259-408.
- Osbeck, P. 1775. *Dagb. Ostind. Resa* 41. http://books.google.co.in/books/about/Citrus_Classification.html?id=cUovtr3sMtsC
- Swingle, W.T. 1946. The botany of *Citrus* and its relatives of the orange subfamily. In Webber, H. J. and Batchelor, L. D. (Eds.), *The Citrus industry*, Vol. 1, University of California Press, Berkeley and Los Angeles, pp. 129-474.
- Tanaka, T. 1937. Further revision of Rutaceae-Aurantiaceae of India and Ceylon, (Revisio aurantiacearum VIII.), *Jour. Indian Bot. Soc.*, 16: 227-240.
- Tanaka, T. 1954. *Species Problem in Citrus (Revisio aurantiacearum, ix)*: *Jap. Soc. Promt. Sci.*, Veno, Tokyo.
