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Buchanania lanzan Spreng (Chironji): A vulnerable multipurpose tree species in Vindhyan region

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Abstract

Chironji, Charoli or Char, (*Buchanania lanzan* Spreng.), a member of the family Anacardiaceae, originated in the Indian sub-continent, is an excellent multipurpose tree species. Traditional indigenous knowledge reveals the immense value of almost all parts of the plant i.e. roots, leaves, fruits, seeds and gum for various medicinal uses. At present, it is growing under forest condition as an under exploited fruit and gives monetary reward to tribal community of the country. The tree is natural wild growth in the tropical deciduous forests of Northern, Western and Central India, mostly in the States of Chhattisgarh, Jharkhand, Madhya Pradesh and in Varanasi and Mirzapur districts and Bundelkhand region of Uttar Pradesh. Besides India, the plant is also found in other tropical Asian countries, Australia and Pacific islands. *B. lanzan* also a vulnerable medicinal plant, is included in the Red Data Book published by International Union for Conservation of Nature and Natural Resources. In this background, there is compelling need for developing a suitable technology facilitating easy multiplication, regeneration and conservation of the species, simultaneously imparting and disseminating proper knowledge and education to the tribal population.

Keywords: *Buchanania lanzan*, medicinal plant, chironji, char, multipurpose tree

Introduction

Chironji or Charoli, (*Buchanania lanzan* Spreng.), a member of the family Anacardiaceae, originated in the Indian sub-continent, is an excellent tree of agro forestry. It assumes great significance due to its multifarious uses and capacity to withstand adverse climatic conditions. At present, it is growing under forest condition as an under exploited fruit and gives monetary reward to tribal community of the country. It is a medium size tree, up to 40-50 ft. height with a straight trunk. Trees have the alternate bearing nature as present in the mango. It flowers in the month of January- February and ripen in April-May. Its bark is rough, dark grey or black, fissured into prominent squares, 1.25 to 1.75 cm thick, and is reddish inside. Flowering starts in the month of November and its leaves are coriaceous, broadly oblong with a rounded base. It bears fruits, each containing a single seed known as chironji" and is quite popular as an edible nut. It avoids waterlogged areas, but occurs on yellow sandy loam soils. Tree can be easily identified by its dark grey crocodile bark with red blaze and is a good species for afforestation in bare hill slopes. *Buchanania lanzan*, being a vulnerable medicinal plant, is included in the Red Data Book published by International Union for Conservation of Nature and Natural Resources (IUCN) (Kritikar and Basu, 1935) [1].

Seven species of *Buchanania* have been reported in India of which two *B. lanzan* (Syn. *B. latifolia*) and *B. axillaries* (Syn. *angustifolia*) produce edible fruits. *B. lanceolata* is an endangered species. It is found in the ever green forests of Kerala. *B. platyneura* is found in Andaman only. Other species of the genus are *B. lucida*, *B. glabra*, *B.accuminata*. It is reported that the fruits of *B. platyneura* are also edible. The *B. exillaris* are reported to be dwarf in size and produces excellent quality of kernel. (Chauhan *et al.*, 2012) [3]. Among these species *Buchanania lanzan* Spreng is most important and widely distributed species in India. This species was first described by Mr. Hamilton, a forester in 1798 in Burma and the genus *Buchanania* was named after him. It was originated in the Indian sub continent, and is found in India, Burma, Nepal and few other countries (Chauhan *et al.*, 2012) [2]. *Buchanania lanzan* Spreng commonly known as "Cuddaph almond", "Char", "Chironji" or Pyar is a valuable tree species found in mixed dry deciduous forest throughout the greater part of India excluding eastern Himalayan forests and arid regions of north India. The species is native to India. It is a main species of Southern and northern tropical dry deciduous and Northern dry mixed 4 deciduous forest type widely distributed in the state of Madhya Pradesh, Chhattisgarh,

Jharkhand, South east Uttar Pradesh and part of Gujarat, Rajasthan, Orissa, Andhra Pradesh Karnataka and Maharashtra. It is an important tree species of Vindhyan Zone (Mirzapur and Sonbhadra districts) and Budelkhand region of Uttar Pradesh.

Due to negligence, poor attention and heavy biotic pressure, several tree species in different parts of India are depleting very fast and leading towards extinction. *Buchanania lanzan* (Chironji) is one of them, which is depleting with a very fast rate and presently categorized under the threatened species. In the absence of conservation measures, it may extinct in the near future. Therefore, conservation and sustainable use of this type of species is an important necessity for ecologically sustainable development, food security and development of socio-economically poor communities of the nation. In this regards, every citizen has the responsibility to conserve, protect, restore and sustainably utilize plants with in its locality. A comprehensive action plan is required to conserve, domesticate, and sustainably utilize all the depleting tree species including *Buchanania lanzan* (Chironji).

Economic importance

Fresh fruit are eaten raw having pleasant, sweetish, sub-acid flavor and consumed by local people and also sold in the village market. Chironji is mainly regarded for its costly, high-priced kernels. These kernels has almond like flavor, eaten raw or roasted form, used as cooking spice and dry fruit in sweets, kheer, meaty korma in India. Chironji seeds are rich in nutrients and medicinal properties. Chironji is an active source of phenolics, natural antioxidants, fatty acids and minerals. Its seed oil is used to treat skin diseases, remove spots and blemishes from the face. Chironji is a source of income for tribal people of Chhattisgarh and other states It is backbone of their economy. A considerable reduction in the population of Chironji in the forest and non-forest areas has been recorded (Singh *et al.*, 2002) ^[11] and facing a severe threat of extinction. Due to this, Chironji is categorized under the 195 red listed medicinal plant species of Indian origin, that requires conservation measures as reported by Foundation of Revitalization of Local Health Tradition (FRLHT), Environmental Information System (ENVIS)-Centre on Medicinal Plants, Bangalore, Govt. of India.

Present status in India

Information regarding the area and production of this fruit in India is not available because it is not grown on plantation scale and limitation in forest areas. *Chironjee* is not cultivated as regular plantation. It is found growing as stray plantation in natural habitat. However, its regular plantation is seen under some botanical garden. Exact statistics as regard to area is not available. However, density of population across various forest range, gives an idea as regard to plant stand and the production. In Lalitpur (U.P.) forest ranges the density of *Chironjee* plants recorded was 4.5 to 23.66 tree/ha. (Tewari *et al.*, 2001) ^[6] reported relatively higher plant population of *Chironjee* near water sources. Similarly, reported a density of 4 to 23.66 tree/ha in teak dominant forest of Seony (M.P.) and concluded that the density of plants was greatly influenced by its vicinity to habitation. Reported that in Madhya Pradesh and Chhattisgarh alone, *Chironjee* seeds to the tune of 1108 tonne/year were Collected (Chauhan *et al.*, 2012) ^[3]. The production in India is mainly concentrated in the drier states and the produce is collected by the villagers and sold in the local market. It cultivation may spread to semi-arid areas, resource poor areas and wastelands. The collection and sell of

nationalized forest produce is done by CG MFP Federation only. This agency has network for the collection of superior quality Non-Nationalized Non-Wood Forest Produce (NWFP). *Buchanania lanzan* (Chironji) is non-nationalized Non-Wood Forest Produce in Chhattisgarh. Estimated annual trade of Chironji is 5000-10000 MT per year at national level. Its price varies and depends on its size. Average price of Chironji ranges from Rs. 500 to 750 per kg. Demand of Bastar Chironji is high in national market and now it becomes a rare commodity and fetches higher prices more than Rs. 1000 per kg. According to CGMFPF, Chhattisgarh have 51,200 quintal per year production potential of Chironji valued for Rs. 44.29 cores contributing more than 50 per cent of national production. Chironji kernels also exported to many Asian and European countries (www.zauba.com/export-Chironji).

Conservation methods adapted for Chironji

As far as conservation of genetic diversity of Chironji is concerned, both *in-situ* and *ex-situ* approaches should be used. In the present scenario, most appropriate strategy for Chironji germplasm conservation is to adopt immediate *ex-situ* conservation (i.e. field genebank and cryobanking) complemented with *in-situ* conservation (*In-situ* on-farm conservation and in protected areas such as National Parks) for this species. *Ex-situ* field genebanks are presently being established at horticulture research institutes of Indian Council of Agricultural Research at Godhra, Gujarat and Lucknow, Uttar Pradesh for conservation and developing advance propagation methods. Collected germplasm has been cryostored as base collection representing sizable diversity in the form of 127 accessions in the National Cryogene bank at NBPGR, New Delhi for posterity and future utilization (Malik *et al.*, 2012) ^[7].

Plant propagation

Seed propagation and Raising of seedlings

Chironji plants are generally propagated by seed giving a long gestation period (15-20 years) and large variability. Percent germination in freshly extracted seeds is poor because of hard seed coat on the kernels. Seed germination of 83.00% within 18 days could be achieved with satisfactory seedling growth by mechanically damaging the stony endocarp before sowing in the month of June, plant survival of 93-96% with satisfactory plant growth was obtained when one year old seedlings were planted in 60x60x60 cm pit filled with red soil and 10 kg of well rotten farmyard manure coupled with proper mulching around the plants during winter and summer season and with or without thatching (Shukla and Solanki, 2000) ^[8]. Seed treatment with sulphuric acid (5-7%) was also found very suitable for promotion of seed germination in chironji. Seeds can be sown on raised beds or in polythene bags about 30 cm deep during June-July and it germinates within 25-35 days. The seedlings become ready for grafting after one year from the date of sowing.

Vegetative propagation: Vegetative propagation methods like chip budding and softwood grafting (Singh and Singh, 2014) ^[10] are also standardized and reported in Chironji. But these are less effective due to loss availability of rootstocks and dependency on seasonal conditions. Moreover, propagation through root cutting is a very slow process (Singh *et al.*, 2002) ^[11].

Ethnomedicinal Importance

The tribal people often consume and sale the highly nutritious seeds to sustain and also to earn their livelihood. The seeds are used as expectorant and tonic. The oil extracted from kernels is applied on skin diseases and also used to remove spots and blemishes from the face. The root is used as expectorant, in biliousness and also for curing blood diseases. The juice of the leaves is digestive, expectorant, aphrodisiac, and purgative. The gum after mixing with goat milk is used as an analgesic (Pandey, 1985) ^[12]. Seed collection should be done from 2nd to 3rd week of May for quality seed collection with respect to fruit weight, kernel weight, germination percent, and chemical content i.e. oil, protein and sugar contents. Destructive harvesting could be checked by educating forest tribal population about collection of ripe fruits at proper time i.e. from 2nd to 3rd week of May without damaging the trees by organized collection (Choubey, 1997) ^[14]

Traditional uses

Traditional indigenous knowledge reveals the immense value of almost all parts of the plant like roots, leaves, fruits, seeds and gum for various medicinal uses.

The roots: Are acrid, astringent, cooling, depurative and constipating and are useful in treatment of diarrhea. Extract of the root is also used as an expectorant and for curing biliousness and blood diseases.

The leaf juice: Is used as expectorant, aphrodisiac, purgative, blood purifier, thirst-quencher and cures digestive disorders. It contains 2.64% tannins (0.35% gallo-tannins), triterpenoids, saponins, flavonoids and reducing sugars. Powdered or crushed leaves are applied to wounds.

The chironji seeds/kernels: Are nutritional, palatable and used as a substitute for almonds in confectionery. The seeds possess 3.0% moisture and are rich in lipid/fat (59.0%), protein (19.0– 21.6%), starch/carbohydrate (12.1%), fibre (3.8%), minerals like calcium (279.0 mg), phosphorus (528.0 mg), iron (8.5 mg) and vitamins like thiamine (0.69 mg), ascorbic acid/vitamin C (5.0mg), riboflavin (0.53 mg), niacin (1.50 mg) and also contain 34-47% fatty oil which is used as a substitute for olive and almond oils.

The calorific value of kernel: Is 650 k-cal/100g. Kernel lipids comprised mainly of neutral lipids (90.4%), consist mostly of triacylglycerol (82.2%), free fatty acids (7.8%) and small amount of diacylglycerols, monoacylglycerols and sterols. Ointment made from its kernels is used to relieve itch and prickly heat.

The oil: Extracted from kernels is known as „char“ and used for curing skin diseases and removing spots/blemishes from the face. The oil is also applied externally on glandular swellings of the neck singly, as also in combination with other herbal oils.

Chironji seeds: Are tolerant to desiccation and chilling and show 95-100% survival upto 90 days at all storage temperatures with gradual loss in germination after 280 days of storing (Singh *et al.*, 2011) ^[13] & (Shukla & Solanki, 2000) ^[8] The seeds are used for preparing a traditional sweet dish known as „chirongi ki burfi“ halwa and kheer. Average annual seed collection is 300 to 1200 quintals in Madhya

Pradesh alone. It is an income generating produce for the forest dependent communities. On an average, 40–50 kg fresh fruits are produced per tree, which come down to 8–10 kg on drying, yielding 1.0–1.5 kg of finished produce per tree (Sharma, 2012) ^[15]

The fruits: Are laxative and are used to relieve thirst, body-burning, fever, cough and asthma.

Bark yields: Tannin (upto 13%) which is used in the tannin industries. The tribes of Southern Bihar blend the powder of the stem bark and *Syzygium cumini* (Myrtaceae) together and the same is given to treat infantile diarrhea.

The gum: Oozed from the cut-bark is soluble in water and used internally for treatment of intercostals pain and diarrhea. The gum is mixed with goat's milk for effective and curative results in intercostals pains, being analgesic.

Some tribal communities of Andhra Pradesh consume a blend of the gum dissolved in cow's milk for treating rheumatic pains. It is believed that the production and collection of about 175 metric tons of char gum is from Mandla, Dindori, Umaria, Shahdol, Katni and Chhindwara districts of Madhya Pradesh (India). The gum is generally used for adulteration of guggul (*Commiphora wightii*) by adding some perfume/scent. In the tobacco industry it is used for the refinement. The superior quality gum is used in soft drinks and edibles for coloring.

The timber of chironji: Is slightly resistant to termite and is utilized for making furniture, boxes and crates, desks, fine furniture, match boxes, moulding, packing cases, stools, tables and agricultural implements. The tribal communities of Sonbhadra District, one of the most backward districts of Uttar Pradesh and a part of the Vindhyan zone, earn money by collecting gum and lac by rearing kusumi strain of lac on the chironji trees.

Thus, *Buchanania lanzan* is a socioeconomically important underutilized life-support and tropical medicinal species for the tribal populace of North, West and Central India. But unfortunately due to over-exploitation and indiscriminate harvesting (lopping and cutting) considerable reduction in the population of *Buchanania lanzan* has been recorded in the recent past, leading to severe threat of its extinction, which needs urgent conservation efforts (Kumar *et al.*, 2012) ^[16] & (Chauhan *et al.*, 2012) ^[3] The production of this economically important forest tree species is threatened by insect pests also. Of them, stem borer *Plocaederus obesus* is the most harmful insect pest in Central India (Malik *et al.*, 2012) ^[7] & (Meshram and Soni, 2011) ^[17]

Traditional method of processing

Kumar *et al.* (2012) ^[16] has standardized the traditional method for processing *chironje* fruits and kernels. There are following three steps for its processing

De-skinning of chironji nuts: The skin of the harvested green nuts turns black on storage which has to be removed before shelling. The nuts are usually soaked overnight in water and rubbed with palms for small scale processing and with the jute sack for large scale processing. The water containing fine skin is decanted. The nuts are washed with fresh water to obtain clean nuts. The cleaned nuts are dried in sun for 2 to 3 days and stored for further processing i.e., shelling.

Shelling: It is the process of separating kernel from hull. For small scale processing, the dried nuts are rubbed using stone slab on a rough stone surface. The kernels are then manually separated. However, for large scale shelling horizontal stone under runner or burr mill is used. The impact and abrasive forces separate coat from kernel and split the kernel.

Grader: This is done to separate kernels from hulls and also to separate kernels of different sizes. The shelled or splitted kernels are passed through a grader. The graders are fitted with three oscillating screens of various sizes. The grader separates the produce as per its opening size.

Conclusion

Buchanania lanzan has a high socio-economic value for providing livelihood to the tribal population of the area besides possessing enormous potentials as commercial horticulture species. Unfortunately due to over-exploitation and indiscriminate harvesting (lopping and cutting), considerable reduction in the population of *Buchanania lanzan* has been recorded in the recent past, leading to very severe threat to its extinction, which calls for urgent conservation efforts at all levels. The production of this economically important forest tree species is further threatened by insect pests also. In this background, there is compelling need for developing a suitable technology facilitating easy multiplication, regeneration and conservation of the species, simultaneously imparting and disseminating proper knowledge and education to the tribal population for stopping the practice of destructive harvesting and spreading sufficient awareness regarding collection of ripe fruits at appropriate timings.

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