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Spatial Distribution of Buchanania Cochinchinensis in Jharkhand

***ShambhuNath Mishra and Sharad Tiwari**
Institute of Forest Productivity (IFP), Indian Council of Forestry Research & Education
Lal Gutwa Ranchi, Jharkhand

ABSTRACT

The *Buchanania cochinchinensis (Lour.)*M.R. Almeida is a common small size tree of family *Anacardiaceae* generally attaining a height up to 18m and girth up to 1.5m with a straight, cylindrical trunk. The current paper deals about the Geo-referenced primary data along with place, district, number of occurrence, height, and girth for 324 presence points of *Buchanania cochinchinensis* . A total of 324 points of occurrence were recorded by knowledge based random selection methods. *Acacia catechu, Adina cardifolia, Aegle marmelos, Anolgeissuslatifolia, B. ceiba, B. monosperma, B. serrata, B. serrata, C. fistula, Chloroxylonswietenia, D. melanoxylon, Derris indica, Holarrhenaantidysentrica, L. parviflora, Leucaenaleucocephala, S. robusta, Schleicheratrijuga, T. tomentosa, Z. jujuba, Z. mauritiana* and many more species were found as an associates of *Buchanania cochinchinensis* during survey in Jharkhand.

Key words: *Buchanania cochinchinensis,* Jharkhand, Spatial distribution, overexploitation.

***Corresponding author:** shambhu5365@gmail.com

INTRODUCTION

The *Buchanania cochinchinensis (Lour.)*M.R. Almeida, Synonym: *Buchanania lenzan* (Spreng.) (Anonymous, 1996) was first described by Francis Hamilton in 1798, is a small size tree of family *Anacardiaceae* generally attaining a height upto 18m and girth upto 1.5m with a straight, cylindrical trunk. This plant is commonly known as 'Almondette' tree in English and 'Char', 'Achar', 'Chiranujee' and 'Piyar' in Hindi. *Buchanania cochinchinensis* is a non-wood forest species commonly found throughout the Burma, Nepal and India, (Hemavath y*et al.*, 1988) mostly in Northern, Western and Central India in the states of Jharkhand, Chhattisgarh, Madhya Pradesh, Uttar Pradesh, and endemic to the dry deciduous forests, up to an altitude of 1200m (Pandey, 1985). It is endemic to tropical dry deciduous forest of India (Siddiqui *et al.*, 2014). The species was witnessed in poor almost no regeneration phage. The species *Buchanania cochinchinensis* is an during survey in Jharkhand important Non timber forest produce (NTFP) of deciduous forests throughout the greater part of India especially in Jharkhand. The greenish-white flowering of the tree occurs from January to March and yellowish-red drupe, one seeded, fruits ripen in the month of April-June and remain on the tree for quite a long time (Troup, 1986). The bark is rough and dark grey or black. The leaves are dull green, oblong or elliptical, 10 to 25 cm (4 to 10 in) long, smooth on the margins and leathery. The leaves are crowded at the ends of the branches in an alternate arrangement, and are evergreen or semi-evergreen, depending on the length of the dry season, with the branches left bare for around four to six weeks. The tree is leafless or nearly so, for a very short time during the summer season. The Chironji

kernels contain about 52 percent oil (Anonymous, 1952) which is used as a substitute for olive and almond oils (Kirtikarand Basu, 2005), while the whole kernel is used in sweet-meats or as a substitute for almond kernels (Kumar *et al.*, 2012). It is considered as one of the delicious wild fruits. In central India, it is a common associate of sal (*Shorearobusta*), teak (*Tectonagrandis*), dhok/kaldhi (*Anogeissus pendula*), salai (*Boswellia serrata*) and suitable species for afforesting on bare hill slopes (Sharma, 2012). It is a socio-economically important underutilized fruit tree and life supporting species for tribal populations of Jharkhand (Patsnaik*et al.*, 2011; Khatoon *et al.*, 2015). It avoids waterlogged areas and very useful for environmental conservation and in 'agroforestry system' (Sharma, 2012). The species is included as a vulnerable medicinal plant in the Red Data Book of International Union for Conservation of Nature and Natural Resources (IUCN) publication (Annon., 1952; Kirtikar and Basu, 1935; Siddiqui *et al.*, 2014; Khato on *et al.*, 2015). The main reason for extinction of*B. cochinchinensis*a part from the climate change and natural calamity is mostly due to an ever-increasing human population and over-exploitation of the species.

Distribution:

In India, *Buchanania cochinchinensis* is distributed throughout the drier parts of the country, in deciduous forests ascending up to 1,300 m in the sub-Himalayan tract, central India and hills of Peninsula. In the world this species is found in southeast Asia, its natural range extending from the foothills of the western Himalayas, Bangladesh, China, Laos, Myanmar, Thailand, Vietnam, Sri Lanka and Malaysia. Survey and collection of *B.cochinchinens is* revealed that natural wild trees are exist in small populations of 10–15 trees in the forest and occasionally isolated 1–2 trees were seen in the farmers' field near the marginal forest lands. *B.cochinchinens is* along with the trees of *Madhucaindica, Shorearobusta* and *Dalbergia melanoxyl on* form a sizable amount of tree cover of these forests and frequently observed in tandem. Subsequent surveys of these areas revealed that unorganized harvesting and occasional cutting of *B.cochinchinens is* trees to collect fruits from the natural wild trees growing in the forest and marginal lands by the tribal people was also observed. many of the rich populations of Chironji tree existing in the marginal forest lands have been completely wiped off in the recent past due to developmental activities and want of agriculture land by tribal farmers.

Genetic diversity:

Singh *et al.,* (2006) studied the genetic diversity in *B.cochinchinens is* under semi-arid ecosystem of Gujrat. An extensive survey and exploration was carried out during the year 2004 and 2005. Earliest flowering (first week of February) took place in few candidate plus trees. The variation in panicle length (35.11cm to 14.20 cm), percentage of perfect flowers, varied ripening time was observed for indifferent genotypes. The highest fruit yield/plant was found (28.00 kg/plant). The highest protein content was found in (30.70#). Vegetative propagated promising genotypes have been planted in the field for their further evaluation.

Malik *et al.,* (2012) performed a survey and germplasm collection programme undertaken in the Indian states of Rajasthan, Gujarat and Madhya Pradesh and observed that *B.cochinchinens is* is found as natural wild in the forest, marginal land and occasionally in farmers field. A total of 72 diverse accessions of this important tree were collected having wide range of variation in agro-morphological traits among the accessions.

Cultivation Practices:

As per the literature survey, rare improvement work has been carried out on this species in central and eastern India. Vegetative propagation through shoot cuttings has not been tried yet. Research on conservation programme of this species is lacking. Malik *et al.,* (2012) studied survey and germplasm collection programme in Rajasthan, Gujarat and Madhya Pradesh. A total of 72 diverse accessions of this species were collected having wide range of

variation in agro-morphological traits among the accessions. They concluded that genetic resources of *B. cochinchinensis* are facing severe threat of extinction due to direct harvesting of economically important parts of tree from natural habitat, and need immediate conservation efforts. Rai (1982) gave certain information on its population in Uttar Pradesh, its seed production capacity, seed size, characteristics of Chironji bearing soils, proper sowing period, mode of sowing, composition of its seeds and certain properties of its gum, along with the identification of an insect damaging its stem, with a view to interest foresters all over the country to conduct further research work.

An study was conducted (Shukla and Solanki, 2000) at the National Research Centre for Agroforestry, Jhansi, Madhya Pradesh with a view to improve seed germination of *B. cochinchinensis* by artificial means, and ensuring better plant survival and growth under field conditions by manipulating the soil in the root zone. The seed germination studies were conducted in the nursery. For studies on plant survival and growth, one-year-old seedlings of *B.cochinchinensis* were planted in the field in red gravelly soil. Seed germination of 83% within 18 days was 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 60×60×60 cm pits filled with red soil and 10 kg of well-rotted farmyard manure (FYM), coupled with proper mulching around the plants during winter and summer seasons and with or without thatching during the hot summer. Sharma (2012) undertook studies on scientific harvesting for quality seed collection of *B. cochinchinensis* for its conservation and sustainable management. Author observed that fruits become dark red after ripening. The fruit collections take place from April to June. Author also noted that in most parts of Madhya Pradesh, fruits of *B. cochinchinensis* were harvested before ripening. It is also reported that in natural forests, its regeneration is vary scanty due to unscientific and pre-mature harvesting of its seeds and site degradation on account of growing biotic pressure. Author obtained best results in terms of seed size, seed weight, germination percent, oil content etc., in the fruits harvested in the 2nd week of May. Singh *et al.* (2006) assessed genetic diversity in Chironji under semi-arid ecosystem of Gujarat and reported flowering in first week of February in few accessions, while the latest in 4th week of February. Maximum panicle length was found to be 35.11 cm (accessions no-1) while least panicle length recorded was 14.20 cm (accession-18). Highest percentage of perfect flowers (13.10) and fruits/panicle (37.50) was recorded in accession no-12 while, it was found least in accession-18. Ripening time varied from third week of April to second week of May in different genotypes. The highest fruit yield/plant was found 28.00 kg/plant in accession no-7. They concluded that accessions no-1, 2, 5, 6, 7, 8, 12 and 30 were promising based on the all horticultural traits studied.

Singh *et al.* (2016) carried out the study during the years 2011-2013 and evaluated the performance of 30 genotypes of Chironji at experimental farm of Central Horticultural Experiment Station (CIAH), Godhra, Gujarat under rain fed hot semi-arid ecosystem of western India. The results of study revealed that the different genotypes of Chironji exhibited considerable variation for vegetative, floral, yield and physicochemical characters. The vegetative growth in terms of plant height, rootstock girth, plant spread (East-West) and plant spread (North-South) varied between 5.96-1.63m, 23.99-53.38cm, 1.40-5.10m and 1.50-5.38m, respectively. Peak period of ripening in all the genotypes was recorded in May. Fruit yield, fruit weight, pulp per cent, TSS, acidity, total sugar and vitamin C varied from 1.00 kg-11.00 kg/plant, 0.94g-1.34g, 43.52-63.06%, 19.05-23.900brix,1.00-1.34%,13.01-15.51% and 42.24-64.09%, respectively. Stone weight, shell weight, kernel weight and protein content ranged between 0.38-0.68g, 0.27-0.55 g, 0.08-0.15g and

23.53-31.36%, respectively. Based on the findings of the investigation, genotype CHESC-7 was released as variety named as 'Thar' Priya. Shukla and Solanki (2000) conducted studies on seed germination, plant survival and growth of Chironji. They reported that seed germination of 83% 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 60×60×60 cm pits filled with red soil and 10 kg of well-rotted farmyard manure (FYM), coupled with proper mulching around the plants during winter and summer seasons and with or without thatching during the hot summer. Narayan *et al.* (2014) conducted experiments on the seed germination of Chironji and reported seed germination of 75 per cent within 20 days could be achieved with satisfactory seedling growth by mechanically damaging the stony endocarp with hammer before sowing followed by seed treatment with 5 per cent H_2SO_4 that is 61.5 per cent within 25 days and only 39 per cent germination were recorded in seed sown normally.

Singh and Singh (2014) standardized the time of softwood grafting in Chironji and reported, when one-year-old seedlings raised for rootstock commence putting on new growth and the leaves are of light green colour, were ready for soft wood grafting. Shoots of 3-4 months, which have prominent apical bud, should be taken as the scion material. Defoliation of such shoots can be done 8-10 days before detaching from the parent tree for grafting operation. At the time of removal of these shoots, the apical buds should remain intact. The top of the new growth of the stock is cut and the scion is fitted by cleft grafting or splice grafting. The union is tied with 200-gauge polythene strip. They concluded that softwood grafting in July may be adopted for multiplication of Chironji with 66.66 percent success.

Many reports are available on investigation related to phyto-chemistry (Mehta *et al.*, 2010; Sushma*et al.,* 2013, Khatoon *et al.*, 2015, Siddiqui *et al.,* 2016, Vyavaharkar & Mangaonkar 2016) almost all the researchers concluded that Chironji seeds and kernels are rich store house of an important phytochemicals and species possesses anti-inflammatory, antiulcer, wound healing, antivenomous, diuretic effect, memory booster effect. A tissue culture technique for the rapid clonal multiplication of *B.cochinchinens is* was developed by Shende and Rai (2005). The de-coated seeds were cultured on MS medium enriched with various concentrations of auxins and cytokines alone or in combination. Combinations of Benzyl amino purine (BAP) and naphthalene acetic acid (NAA) were found to be superior to BAP and Indole butyric acid (IBA). Murashige-Skoog (MS) medium supplemented with 22.2 µM of BAP and 5.37 µM of NAA promoted formation of the maximum number of shoots. Furthermore, MS medium containing 23.3 µM kinetin induced profuse rooting of the initiated shoots. Sharma *et al.,* (2005) reported a protocol for somatic embryogenes is and plantlet regeneration of *B. cochinchinens is*, which is a tropical fruit tree widely distributed in the dry forests of India. Calluses were initiated from immature zygotic embryos cultured on Murashige and Skoog (MS) medium supplemented with various combinations of 2,4-dichlorophenoxyacetic acid (2,4-D), 6-benzyladenine (BA) and/or 1-naphthaleneacetic acid (NAA). The highest frequency (60%) of somatic embryo induction was obtained in cultures grown on MS medium fortified with 4.53 µ*M* 2,4-D, 5.32 µ*M* NAA and 4.48 µ*M* BA. The medium supplemented with 15 µ*M* abscisic acid (ABA) was most effective for maturation and germination of somatic embryos.

Sharma (2012) carried out morphological, physiological and biochemical study of *B.cochinchinens is*. Seed harvested at 7 days interval during its various developing stages from April to May. The fruits were collected from the forest of Kundam range of Jabalpur forest division for the study. The best results in terms of seed size, seed

weight, germination percent, oil content etc. were obtained in the fruits harvested in the 2nd week of May. Singh and Singh (2014) conducted experiment for two consequent years at CHES, Vejapur, Gujrat to standardize the time of softwood grafting in Chironji. T wood grafting was carried out at monthly interval commencing July to June. Bud sprout (68%) and graft success (66.66%) were noted highest in July. Length of sprout and number of leaves were recorded highest in March. Irrespective of scion and rootstock, maximum accumulations of nitrogen and carbohydrate contents were recorded in March.

Phytochemical Studies:

Sengupta and Choudhary (1977) reported the fatty acid composition of *Buchanania cochinchinensis* seed oil, determined by urea complex formation and gas liquid chromatography (g.l.c), was found to be: myristic, 0.6; palmitic, 33.4; stearic, 6.3; oleic, 53.7; and linoleic, 6.0%. Triglyceride compositions of the native seed oil and its randomised product were calculated from the fatty acid compositions of the triglycerides and of the corresponding 2-monoglycerides produced by pancreatic lipase hydrolysis. The oil is composed of 3.2, 35.8, 45.5 and 15.5% tri-saturated, monounsaturated di-saturated, di-unsaturated mono-saturated and tri-unsaturated glycerides respectively. The special characteristic of the *B. cochinchinens is* seed oil is its content of 22.7, 31.0 and 11.3% di-palmitoolein, di-oleopalmitin and tri-olein respectively. The percent GS_3 content in the oil increased from 3.2 to 7.5 by the process of randomisation. On directed inter-esterification the oil yielded a product with a slip point of 41.5°C which may be suitable as a coating material for delayed action tablets. The oil also appears to be a promising one as a commercial source of palmitic and oleic acids. Hemavathy and Prabhakar (1988) determined the lipid composition and found that total lipids consisted of 90.4% neutral lipids, 3.4% glycolipids, and 6.2% phospholipids. Neutral lipids consisted mostly of tri-acylglycerols (82.2%), free fatty acids (7.8%), and small amounts of diacylglycerols, mono-acylglycerols, and sterols. At least three glycolipids and six phospholipids were identified. Acylmonogalactosyldiacyl glycerol and acylatedsteryl glucoside were the major glycolipids, while di-galactosyldiacylglycerol was present in small amounts. Warokar (2010) carried out the experiment to evaluate anti-inflammatory and antioxidant activity of methanolic extract of *B.cochinchinens is* kernel (BLK-ME). The in vivo anti-inflammatory activity was evaluated in rats by using carrageenan-induced paw edema, as an acute model and formaldehyde induced arthritis as a chronic model, whereas in vitro antioxidant activity was performed by 1, 1-diphenyl-2-picryl-hydrazyl (DPPH) and reducing power method. Quantitative estimation of total polyphenolic content of the (BLK-ME) was estimated by Folin-Ciocalteu method. BLK-ME (200 mg/kg body wt) significantly decreased paw volume, after oral administration of BLK-ME in carrageenan and formaldehyde injection. BLK-ME also exhibit significant antioxidant activity. Total polyphenolic content was found to be 16.82 %± 23 mg of GAE/100. Presence of phytochemicals like triterpenoids, saponins and tannins in the BLK-ME might contribute to the observed anti-inflammatory and antioxidant activity.

Mishra *et al.,* (2010) investigated the antioxidant activity of different dry fruits (almonds, walnut, cashew nut, raisins, Chironji) through several chemical and biochemical assays: reducing power, lipid peroxidation damage in biomembranes, determination of antioxidant enzymes activity (SOD and CAT). To estimate the total phenolic content, the assay using Folin-Ciocalteu reagent was used. The EC (50) values were calculated for all the methods in order to evaluate the antioxidant efficiency of each dry fruit. The results obtained were quite heterogeneous, revealing significant differences among the dry fruits. The methanolic extract of walnut showed the higher value of antioxidant activity based on lipid peroxidation assay. The higher phenolic content was found in walnuts followed by almonds cashew nut, Chironji and least phenolic

content was found in raisins. Walnut revealed the best antioxidant properties, presenting lower EC (50) values in all assays except in antioxidant enzymatic activity. Jitendrakumar*et. al.* (2014) found that the initial moisture content of Chironji nuts and kernels was vary from 6.60 per cent to 11.07 per cent and from 2.77 per cent to 2.99 per cent (db), respectively. The mean length, width and thickness of Chironji nuts were found to be 10.19, 9.12 and 7.32 mm, respectively while corresponding parameters for Chironji kernels were 6.80, 5.01 and 4.66 mm. The sphericity and roundness of Chironji nuts were found to be 81.85 per cent and 79.45 per cent, respectively while for kernel were 77.08 per cent and 76.41 per cent. The average Chironji nut mass was 0.33 gand kernel 0.07 g.

Medicinal Use:

It is an important livelihood support species for rural and tribal economy. It is used for environmental conservation and in 'agro forestry system'.The timber of Chironji is somewhat resistant to termite and is utilized for making fine furniture, boxes and crates, desks, match boxes, moulding, packing cases, stools, tables and agricultural implements however, some tribal communities earn money by collecting gum and Kusumi lac from the Chironji trees (Siddiqui *et al.*, 2014; Sharma, 2012). After completion of ripening, seeds are separated by rubbing in the water and dried. After that, kernels are taken out by breaking of the hard seed coat mechanically and packed either in glass jars or polyethylene bags. Kernals are used for preparation of different kinds of sweets. The products like squash and nectar may be prepared from the pulp of the fruit. It is described as a drug of the Ayurveda and the Unani system of medicine. It is known to have tonic, cardio tonic, astringent properties and is also used in the treatment of skin diseases (Chaudhary *et al.,* 2001; Sengupta and Roychoudhury, 1977; Kirtikar and Basu, 1935; Dai *et al.,* 2002).All parts of the plant are used for the treatment of various disorders. The oil from the seeds is used to reduce granular swelling of the neck. Ointment is made from the kernel which is used to relieve itch and prickly heat. The gum from the bark used for treating diarrhea and inter costals pains and leaves are used for promoting wound healing (Kala, 2009; Puri*et al.,* 2000).

Traditional indigenous knowledge revealed immense importance of almost all parts of plant like roots, leaves, fruits, seeds and gum for various medicinal applications like cure for blood disorder, fever, ulcers, burning sensation of body, diarrhoea, dysentery, asthma, snakebite, etc. (Siddiqui *et al.*, 2014). The kernel is pulverized and used into an ointment, for skin diseases specially for itching. It is used to apply on glandular swellings of the neck. It is believed to cure pimples and prickly heat. It is also employed by women to remove spots and blemishes from the face. It is also used as a tonic. The oil extracted from the kernels is used as a substitute for almond oil in native medicinal preparations and confectionery (Kirtikar and Basu., 2005; Warokar*et al.*, 2010). The juice of the leaves is digestive, expectorant, aphrodisiac and purgative, however, the gum after mixing with goat milk is used as an analgesic (Shendeand Rai. 2005).Fruits are laxative and used to relieve thirst, burning of the body and fever. Kernels of fruits are used as ointment in skin diseases Das and Agrawal, (1991). Its bark contains about 13.4% of tannin. Its gum is soluble in water that exudes from the wounds in the stem and it is used in textile business (Tewari, 1995).

Value addition and Economics:

About 75% of the farmers sell their produce at the farm level to the village merchants, retailers, big producers or to the pre harvest contractors They cannot afford to transport their produce to distant markets on account of the non-availability of transport facilities, expensive transport, mal practices in the market. Information regarding demand, supply, price, market outlook, knowledge of the consumer's preference, marketing channels are important for marketing of produce. The annual production of *B. cochinchinens is* in the state of Jharkhand is around 2000MT per year. A study was

conducted during 2009 by Centre for People's Forestry on NTFP-related livelihood dependency in selected locations of Gumla and Simdega districts of Jharkhand. Approximately 12,335 kg Chironji seed was collected during 26 days (on an average) of summer season which is 16 – 26 per cent of annual income of these two districts. Prices for Chironji in the national market vary from Rs.700-1200 per kg (https://www. Non-wood (Non- nationalised) forest produce in Chhattisgarh estimated for marketing.com.). Average annual seed collection is 300 to 1200 quintals in Madhya Pradesh. It is an income generating produce of forest dependent communities. On an average, 40–50 kg fresh fruits are produced per tree, which yields 8–10 kg on drying, resulting in 1–1.5 kg of finished produce per tree (Tewari, 1995). With the increasing demand to promote livelihoods from forest produce for the tribal population, research and evaluation studies for conservation of NTFP species, including *B. cochinchinens is* must be strengthened.

MATERIALS AND METHODS

Knowledge based random sample survey approach has been adopted in the study area to record occurrences of *Buchnania cochinchinens is*. The study area was divided in 921 grids of 10km x 10km size. In each grid 03 quadrates of sample size 1m x 1m was drawn for recording of training and testing data. There are 324 occurrences of *B.cochinchinens is* was recorded in 108 randomly selected grids wide across entire study area. The geographic coordinates of *B. cochinchinensis* their associates and invasive species occurrence data was recorded at each sampling plots in WGS-84 datum using Garmin Oragon GPS. At least 2km distance was maintained between two quadrates, so that well dispersed data can be obtained. Out of 604 occurrence points witnessed during the field survey, a total of 324 coordinates of occurrence points (field survey data) of the species has been recorded. The ffield data was recorded based on the classified and Use Land Class Map. The coordinates, aspects, phenology, patterns of forest types and plant data of the plantation sites was recorded using GPS and Hypsometer. The survey work was conducted in all seasons throughout the year. Field photographs were also taken.

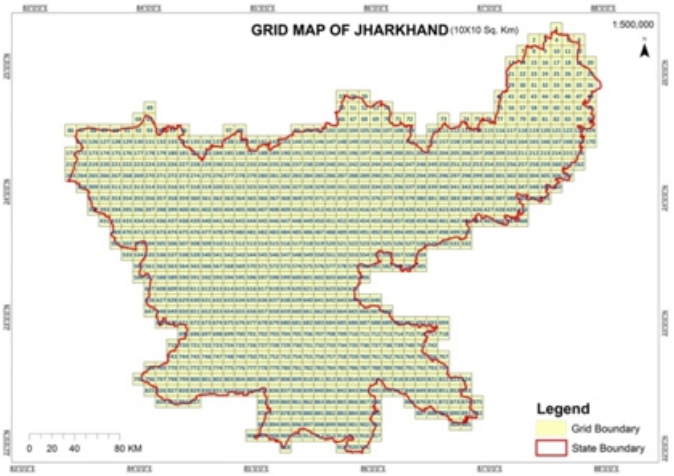

Figure 1: S 921 Grid of size 10 x 10 km

Result and Discussion:

Geo-referenced primary occurrence data alongwith place, district, number of occurrence, height, DBH for 324 presence points of *Buchanania cochinchinens is* has been recorded (Table-1) by knowledge based random selection methods. *Acacia catechu, Adina cardifolia, Aegle marmelos, Anolge is suslatifolia, B. ceiba, B. monosperma, B. serrata, B. serrata, C. fistula, Chloroxylonswietenia, D. melanoxylon, Derris indica, Holarrhenaantidysentrica, L. parviflora, Leucaenaleucocephala, S. robusta, Schleicheratrijuga, T. tomentosa, Z. jujuba, Z. mauritiana* and many more species were found as an associates of *Buchanania cochinchinens is* during survey in Jharkhand.

Table 1: Geo referenced Primary Presence Data of *Buchanania cochinchinens is* in Jharkhand

Sl. No.	Av. Altitude	District	Occurance	Max. Average (In M)	Max. Average (In M)
Zone-IV- Central and North eastern plateau sub zone					
1	145	Dumka	41	10	1.1
2	335	Deoghar	13	14	1.45
3	512	Hazaribag	105	16	1.42
4	327	Giridih	19	9	1.00

5	105	Pakur	15	11	1.00
6	596	Ranchi	108	12	1.00
7	302	Bokaro	8	7	0.57
8	53	Sahibganj	3	10	1.15
9	296	Jamtara	3	9	0.89
Zone-V- Western plateau sub zone					
10	460	Latehar	136	13	1.20
11	644	Lohardaga	12	10	0.82
12	695	Gumla	20	10	0.94
13	534	Simdega	39	10	1.21
14	243	Palamu	16	11	0.90
Zone-VI- South eastern Plateau sub zone					
15	332	West Singhbhum	13	12	0.95
16	190	SarikelaKharsawa	10	12	1
17	440	Khunti	61	12	1
Total Occurrence Data = 604			**Total Presence Point=324**		

The land of forest, Jharkhand were full of *Buchanania cochinchinens is* in the past, now they are facing mass destruction (Narayan *et al.,* 2014). In most parts of central India, fruits of *B. cochinchinens is* are harvested before ripening. As a result because of small seed size and low seed quality, it fetches much lower price in the market. The tree is lopped frequently for the purpose of huge and rapid collection. In forests, its natural regeneration is very scanty due to unscientific and pre-mature harvesting of its seeds and site degradation on account of growing biotic pressure. Inclusions of this species in vulnerable medicinal plant in the Red Data Book indicate that under varying climatic condition the species is shifting its habitat. This study looks at prospective habitats for the *B. cochinchinens is* species within the Jharkhand state. In determining what areas could be suitable for plantation of *B. cochinchinensis*, forest department can plan and develop an appropriate management strategy. GIS

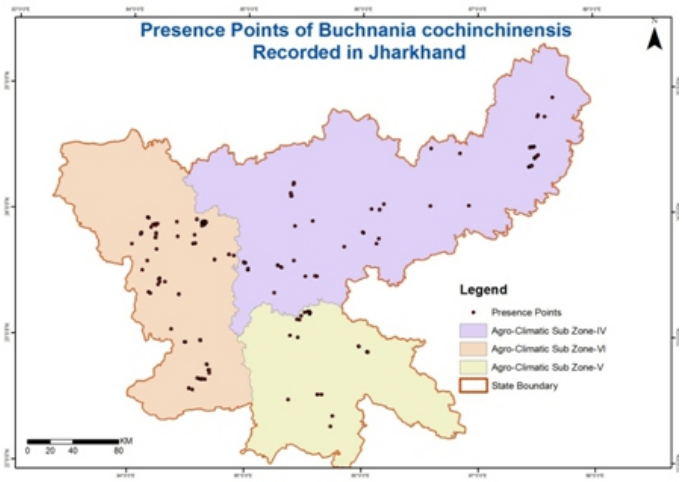

Figure 2: Distribution of *Buchnania cochinchinensis* in Jharkhand

can be used to refine predictions of the potential areas for plantation of the species.

REFERENCES

Anonymous.1952. Wealth of India, A dictionary of Indian raw materials and Indian products, B revised ed., Vol. 2: Publication and Information Directorate CSIR: New Delhi

Anonymous.1996. The international plant names index Buchanania cochinchinens is (Lour.) M.R. Almeida. Fl. Maharashtra 1: 287. http://www.theplantlist.org/ tpl1.1/ record/ kew-2684767 retrieved on 6th April, 2016.

Chaudhary, U. S., Rathod, V. and Vankhede, G. N. 2001. Effect of water extract of the bark of Buchanania cochinchinens is linn. On behaviour and chromatophores of a fresh water fish, Labeorohita.*J Environ Biol*. 22(3): 229- 231.

Dai, Y., Ye, W.C., Wang, Z.T., Matsuda, H., Kubo, M. and But, P.P.H. 2002. Antipruritic and antinociceptive effects of Chenopodium album L. in mice.*J. Ethnopharmacol*. 81(2): 245-250.

Das, D. and Agrawal, V. S. 1991.Fruits drug plants of India", Kalyani Publishers, New Delhi, pp. 250.

Hemavathy, J. and Prabhakar, J.V. 1988.Lipid Composition of Chironji (*Buchanania cochinchinensis*) Kernal.*J Food Composition*

and analysis, 1: 366-370

Jitendrakumar, Prabhakar, P.K., Srivastav, P.P. and Bhowmick, P. K. 2014. Physical characterization of Chironji (*Buchanania cochinchinensis*) nut and kernels. *Food science research journal*.5(2): 148-153.

Kala, C. P. 2009. Aboriginal uses and management of ethnobotanical species in deciduous forests of Chhattisgarh state in India. *J Ethnobiol Ethnomed*.4(5):20.

Khatoon, N., Gupta, R.K. and Tyagi, Y.K. 2015.Nutraceutical potential and phytochemical screening of *Buchanania cochinchinens is*, an underutilized exotic Indian nut and its use as a source of functional food.*Journal of Pharmacognosy and Phytochemistry,* 4(1):87-94.

Kirtikar, K.R. and Basu, B.D. 1935. Indian MedicinalPlants: Lalit Mohan Basu, Allahabad, Vol III,2nd Edn: pp 1964-1965.

Kirtikar, K.R. and Basu, B.D. 2005. Indian Medicinal Plants. 2 Ed. Vol IV: International Book Distributors Dehradun; 660-61.

Kumar, J., Vengaiah, P.C., Srivastav, P.P. and Bhowmick, P.K. 2012.Chironji nut (Buchanania cochinchinens is) processing, present practices and scope. *Indian Journal of Traditional Knowledge*. 11(1):202-204

Malik, S.K., Chaudhury, R., Panwar, N.S., Dhariwal, O.P., Choudhary, R., Kumar, R. and Kumar, S. 2012. Genetic resources of Chironji (*Buchanania cochinchinens is Spreng*): a socio-economically important tree species of central Indian tribal population. *Genet.Resour. Crop.Evol.*, 59(4):615-623.

Mehta, S., Pradeep, K., Samriti, F., Jyotiram, S. and Kalia, A.N. 2010.In-Vitro Antioxidant Activity of Cassia occidentalis Seeds. *Pharmacology online* 3: 217-224.

Mishra, N., Dubey, A., Mishra, R. and Barik, N. 2010. Study on antioxidant activity of common dry fruits. *Food ChemToxicol*.48(12):3316-3320.

Narayan, K., Patra, H.K. and Dhruw, S.K. 2014. Standardization of propagation methods of Chironji (*Buchnania cochinchinens is Spreng*). *The Asian Journal of Horticulture,* 9(1):283-284.

Pandey, G.P. 1985. Effects of gaseous hydrogen fluoride on the leaves of Terminalia tomentosa and Buchanania cochinchinens is trees. J. Environmental Pollution (Series A), 37:323-334.

Patsnaik, A.K., Kodati, D., Pareta, S.K., Patra, K.C. and Harwansh, R.K. 2011.Analgesic and anti-inflammatory activities of *Buchanania cochinchinens is Spreg*.Roots. Research *Journal of Pharmaceutical, Biological and Chemical Sciences*. 2(1):419

Puri, A., Sahai, R., Singh, K.L., Saxena, R.P., Tandon, J.S. andSaxena, K.C. 2000.Immunostimulant activity of dry fruitsand plant materials used in Indian traditional medicalsystem for mothers after child birth and invalids.*J Ethnopharmacol.*71(1-2): 89-92.

Rai, Y.C. 1982. *Buchananialazan*, Spreng. – studies on methods of propagation and estimation of fruit yield. *Indian Forester*.108: 501 -511.

Sengupta, A. and Roychoudhury, S.K. 1977. Triglyceridecomposition of Buchanania cochinchinens is seed oil.*J Sci Food Agric*. 28(5): 463-8.

Sharma, A. 2012.Scientific Harvesting for Quality Seed Collection of *Buchanania cochinchinens is Spreng* for its conservation and sustainable management – case study of Chhindwara, Madhya Pradesh, India. *International Journal of Bio-Science and Bio-Technology*, 4(1):65-74.

Sharma, P., Koche, V., Quraishi, A. and Mishra, S.K. 2005. In Vitro Cell. *Dev. Biol.-Plant* 41: 645.

Shende, S. and Rai, M. 2005. Multiple shoot formation and plant regeneration of a commercially-useful tropical plant,

Buchanania cochinchinens is (Spreng). *Plant Biotechnology.* 22(1): 59–61.

Shukla, S.K. and Solanki, K.R. 2000.Studies on seed germination, plant survival and growth of chironji (*Buchanania lanzan* Spreng.). *Journal of Tropical Forestry.* 16(1): 44-49

Siddiqui, M.Z., Roy Chowdhury, A., Prasad, N. and Thomas, M. 2014. *Buchanania cochinchinens is*: a species of enormous potentials. *World J Pharm Sci*.

Singh, S. and Singh, A.K. 2014**.**Standardization of softwood grafting in Chironji (Buchanania lanzan Spreng.) under semi-arid environment of western India. *Indian Journal of Horticulture.* 71(1):120-122

Singh, S., and Singh, A.K., Apparao, V.V. and Bhargava, R. 2016.Genetic divergence in chironji (Buchanania lanzan) under semi-arid ecosystem of western India. *Indian Journal of Agricultural Sciences*.86 (4): 550–555.

Singh, S., Singh A.K. and Apparao, V.V. 2006.Genetic diversity in Chiraunji (Buchanania lanzan Spreng.) under semi arid ecosystem of Gujrat. *Indian Journal of Agricutural Sciences*. 76:695-698

Sushma, G.S., Devi, B.A., Madhulatha, C.H., Kumar, K.U., Harathi, P., Subramanian, N.S. and Ramadevi, M. 2013. Preliminary phytochemical screening and HPTLC fingerprinting of leaf extracts of Ficus nervosa Heyne ex Roth. *Journal of Chemical and Pharmaceutical Research*. 5(3):98-104

Tewari, D.N. 1995. Bulletin on *Buchanania lanzan* (Chironji). Indian Council of Forest Research and Education, pp. 1–6.

Troup, R.S. 1986. The Silviculture of Indian Trees, IBP Publishers, Dehra Dun (Reprinted). 1: 240–243

Vyavaharkar, R.Y. and Mangaonkar, S.S. 2016. Extraction of flavonoids from Buchanania lanzan Spreng. seeds by supercritical fluid extraction and determination of their antioxidant activity. *International Journal of Pharmacy and Pharmaceutical Sciences*. 8(1): 353-358.

Warokar, A.S., Ghante, M.H., Duragkar, N.J. and Bhusari, K. P. 2010. Anti-inflammatory and Antioxidant Activities of Methanolic extract of Buchanania Cochinchinens is Kernel. *Indian J.Pharm. Educ. Res*. 44(4).