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Traditional and Biocultural Potential of Toko Plant (*Livistona jenkinsiana* Griff) in East Siang District, Arunachal Pradesh

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ABSTRACT

A brief study was conducted in Mirku, Napit, Balek, and Takilung villages of East Siang district, Arunachal Pradesh. The district has diverse forest ecosystems that provide both economic and social benefits for local people. *Livistona jenkinsiana* Griff (locally called Toko by the Adi tribe), is a plant species that provide both economic and social benefits for the local community and it also has traditional and cultural significance within the community. Male and female members engaged in toko plantations were chosen as the respondents of the study. Using personal interviews; questionnaire-based data were collected. Based on the village and forest survey, it was observed that toko in good numbers in varying habitats viz, jhum lands, morang, home gardens, and around paddy fields. The Adi tribe in the area planted toko as an agroforestry component. The overall establishment cost is relatively less compared to other plantations in the region. (Such as orange and pineapple). Women play a significant role in the conservation of this species. The number of bio-culturally important products made out of the leaves and fruits of toko.

INTRODUCTION

Livistona jenkinsiana Griff is a species of palm of the family Arecaceae. It was first described by William Griffith in 1845 from the collection made in 1842 by Major Francis Jenkins from Nowgaon, Assam; the type specimen is still available in the National Botanical Garden of Belgium (Barfod et al., 2010).

It is a palm with large fan-shaped leaves on spiny petioles, thereby commonly known as a fan palm. It is very similar to *L. speciosa* in its leaves and the downward curving spines on the petioles of its leaves, but it is distinguished from this species by its fruit color (laden- blue vs turquoise-iridescent), by its fruit being wider than long vs longer than wide, and by the branching of its infructescence which is to the third- order rather than the fourth. It is a tall, fan- shaped, singly growing palm, height of up to 10 meters but at maturity it may reach more than 10 meter. Leaves palmate, long up to 480 cm, petiole 340 cm tall, blade or lamina size across 250 cm, split after two-

third distance from the base of lamina, segment number 80 to 94, erect at the apices, lamina externally rounded, grayish green abaxially, green adaxially, petiole 30cm thick, 61 cm width, petiole with two types spines along margins, decreasing in density toward distal end, arranged alternately with long 30cm tall, after short, 10 cm tall, recurved, tip pointed, both are brown in color. *L. jenkinsiana* is a plant of tropical regions, though it can be grown in more or less frost- free temperate and subtropical climates. It is found in areas of high rainfall, which can be with or without a distinct dry season. Grow best in a sunny, moist, but well drained position found in the wild mainly on sandy loam (Sourav et al., 2020). Secondary metabolites such as phenols, flavonoids and anthocyanins produced in the plants as a part of self defense from pest and disease attacks, are having various health benefits. These bio-active compounds are receiving considerable importance due to their various

health benefits such as anti-allergic, anti- carcinogenic, anti- inflammatory, anti- proliferative, antiviral, cardioprotective and vasco protective (Bhargav et al., 2018; Ganeshpurkar and Saluja, 2017).

Livistona jenkinsiana Griff is an endangered and threatened species in the Indian continent and globally too. *Livistona* species has a wide distribution; distributed in Africa, South Arabia, South East and Eastern Asia, Malaysia and Australia, China and Thailand (Barfod et al., 2010).

Datta and Rawat (2003) observed foraging of mature fruit by hornbills in northeast India. More recently, Payum (2018) in his study found a number of volatile and non-volatile compounds from the fruit of *Livistona jenkinsiana* Griff with various health benefits. The ethanol extract of *L. jenkinsiana* fruit contain forty three compounds out of which 22 compounds have been reported to be useful and biologically active against number of health problems like anticancer, antioxidant, prevention of uric acid formation etc. Out of the 43 compounds, Trehalose occupied 40% of the TIC (Total ion chromatogram) peak area percentage, trehalose is an energy source and also a protectant against the effects of freezing or dehydration, an attractive ingredient in food, health and beauty and pharmaceutical products (Payum, 2018).

Northeastern region of India is considered one of the biodiversity hot spots and abode of the Indian cultural diversity and repository. The tribal people of Arunachal Pradesh use natural resources in almost all aspects of their life. For instance, the food they eat is collected from the forest and the house they stay in is also constructed by using materials collected from the forests. *Livistona jenkinsiana* Griff; an endangered and threatened species is used in many useful purposes. Such as the use of stalk as firewood, fencing construction and ropes. Use of trunk in floor of local house, as the pillar and also in fencing construction. Fruits consumed raw or cooked (Singh et al. 2020).



Figure 1: *Livistona jenkinsiana* Griff.

Study area

The study was carried out in the East Siang district of Arunachal Pradesh (Figure1), situated at the eastern foothills of the Himalayas at 155 meters above sea level. The district lies in the coordinates approximately between 27°43'' and 29°20'' North latitudes and 94°42'' and 95°35'' East longitude. East Siang district occupies an area of 4,005 square kilometers (1,546sq mi). It is inhabited by the Adi community; the district is a wild mountainous area and presents a remarkable topographical variety. (Source: https://en.m.wikipedia.org/wiki/East_siang_district-year-2022).



Figure 2: Distribution of Species in East Siang district

Climate

The East Siang district has a cold mountainous climate in the north while a tropical climate exists in the south. Where winter temperature drops up to 7°C and summer temperature goes up to 36°C. December and January are the coldest months and July – August are the hottest months. The District receives exceptionally heavy monsoons with an average rainfall of 31.34mm which equals nearly 25mm a day. (Source: [http://cgwb.gov.in/District Profile/Arunachal/East%20Siang.pdf](http://cgwb.gov.in/District_Profile/Arunachal/East%20Siang.pdf)- year - 2022).

Demography

According to the 2011 census East Siang district has a population of 99,214. This gives it a ranking of 615th in India (out of a total of 640). The district has a population density of 27 inhabitants per square kilometer (70/sq mi). Its population growth rate over the decade 2001-2011 was 13.33%. East Siang has a sex ratio of 962 females for every 1000 males and a literacy rate of 73.54%. (Source: <https://eastsiang.nic.in/east-siang-district-at-a-glance/-year-2022>).

Topography

The topography is characteristically rugged due to lofty, haphazardly arranged ranges and deep valleys criss-crossed by a number of rivers and streams spreading along the southern slopes of the eastern Himalayas to the western slope of the Potkoi hills and around the huge valley of mighty river Brahmaputra. (Source: https://en.m.wikipedia.org/wiki/East_siang_district_year-2022).

METHODOLOGY

The study was carried out in four villages of East Siang district, Arunachal Pradesh namely Mirku, Napit, Balek and Takilalung during 2021-2022, based on the surveys and questionnaire method in which information provided by the common local people was collected and further interpreted. The questions were on the establishment, management, harvest, capital investment, labour input, sale and economic returns from the toko plantations.

RESULTS

The study areas were inhabited by the Adi community, the community possess a strong base of traditional knowledge about the forest structure and ecosystem function. The State's local communities have a large role to play where more than 80 percent of forested areas are private lands. *Livistona jenkinsiana* Griff is known by various names with local tribals such as, Toko, OW/ Yoak by Nyishipeople; Taa- ck by Adi tribe; Tokou; Tokouby Assamese; Talai nyom, Purbong by Lepchas of Sikkim. It is commonly known as the Assam Fan palm. In the course of family property sharing, it is taken into account and is inherited as an ancestral property.

Distribution and Status of *L. jenkinsiana* Griff.

The tree endemic to Northeast India grows up to an elevation of 1,100m. It is usually encountered in nature in tropical evergreen forests and sub-tropical broad leaved forests. Though the species is found almost throughout Arunachal Pradesh, the larger concentration is towards the central and eastern parts of the state, particularly in Upper Subansiri, West Siang, Upper Siang and East Siang districts (study area). Apart from its natural occurrence (in morang forest of Adi and other tribes too), it is largely cultivated by the local people in their jhum land / community lands, home Gardens and around paddy fields.

As per the survey conducted in the study area the occurrence of toko in different habitats of the following villages was found to be; (i) Mirku, 1300 toko trees in jhumlands, 250 in morang forest, 80 in home gardens and

75 around paddy fields. (ii) Napit, 1700 toko trees in jhumlands, 400 in morang forests, 120 in home gardens and 90 around paddy fields. (iii) Balek, 3000 toko trees in jhumlands, 600 in morang forests, 100 in home gardens and 120 around paddy fields. (iv) Takilalung, 3100 in jhumlands, 670 in morang forests, 200 in home gardens and 110 around paddy fields (Figure3).

Relatively, more number of toko trees were observed in the jhumlands of Takilalung and Balek villages, because of the topography of jhum lands, soil fertility and being rural areas, most of the people were more involved in rural livelihood activities for their subsistence. Also both the village territories were larger than the other two villages viz, Mirku and Napit. The overall status of *L. jenkinsiana* Griff in the study area is abundant.

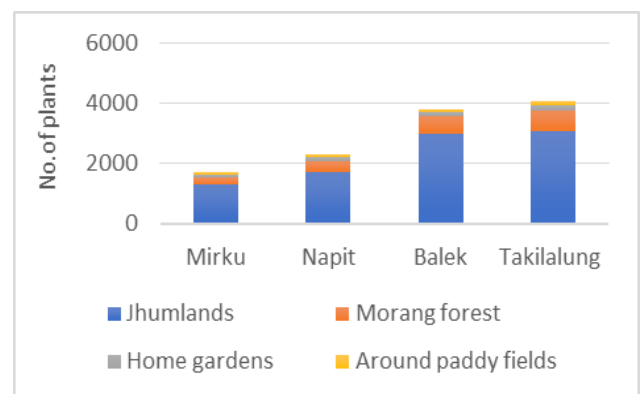


Figure 3: Number of Toko trees in studied villages

Natural Regeneration

Natural regeneration occurs by means of the seeds. Profuse regeneration can be seen in the vicinity of mature fruiting trees along partially open moist slopes. The seeds fallen over the ground or carried over by birds and squirrel-like animals or dropped on the soil during winter months start germinating in good habitats with pre monsoon showers in April – May and establish to form plants. However, the survival percentage is very low due to cattle damage and adverse ecological factors. Despite this, natural regeneration is usually observed in Morang forest as gregarious patches.

Artificial regeneration

Propagation by seeds is the easiest, cheap and most conventional method. Seeds can be gathered from during November - December when they are fully ripe. Freshly harvested seeds are used for sowing. The seeds are extracted from fleshy fruits by depulping, or removing the peel. This can be done manually or fruits can be kept in water or in soak-pits for a couple of days by which time slight rooting of fruit peel takes place and then it becomes easy to remove the peels by gentle mashing and washing.

Seed treatment

Freshly collected seeds are kept in basket wrapped with banana leaves or ekkam-pat (Phyrium pubinerve) for one month in order to loosen the tough impermeable seed coat. It can be otherwise eaten as chutney. Seed coats can be alternatively loosened by burying in soil wrapped with gunny bags.

Generally these seeds are not eaten. The clean seeds are broadcasted in the jhum field in the Month of April by using a digging stick (Dao), with a uniform spacing of about 4m. The seeds can be sown in mother beds or directly in the polythene bags. The seeds should not be sown too deep in the soil and sowing at 2-3 cm depth is found to be ideal. Germination takes place after about 50-60 days of sowing. Sometimes germination may get delayed depending upon the sowing month and winter severity. However, by the month of April germination will take place. Thus, if seeds are sown in December it may germinate only in April next. Seed germination is up to 90-95% germination. Seedlings can be picked up sufficiently early in one leaf stage for transplanting them into polythene bags without causing damage to roots or adjacent seedlings. After picking out, it is good to give profuse watering. The seedlings are initially kept under shade and watering is done as and when required. A single watering per day is sufficient. When seedlings get established in the polybags, after 2-3 months they can be kept in open beds. Usually, this will be the rainy months and can thus avoid watering. Seedlings are comparatively hardy and devoid of disease and pests. They can, however, be monitored for weed infestation and cattle (Mithun, goat and cows) browsing. This initial growth of seedlings is slow and takes about 12-15 months in the nursery to attain plantable size (Table1). Similarly, seedlings can also be obtained and transplanted into polythene bags from the areas of gregarious regeneration, where otherwise the seedlings are destined to die.

Table 1: Procedure for seed treatment & raising seedlings

Seed sown	2-3 cm deep
Germination	After 50-60 days
Germination percentage	90-95%
Transfer of seeds to polythene bags	After 2-3 months
Growth of seedling to plantable size	12-15 months

Plantation technique

Planting is done when seedlings are about 18 months old at a spacing of 4m x 4m during May-June with the beginning of the rainy season. Adi people use closer spacing up to (2.5 x 2.5m) in hill Slopes when they grow toko as mono plantation (Table2). This helps in saving manpower for watering and also for assuring a better survival rate. Seedlings can be transplanted in any other month provided the soil has enough moisture for its establishment. The pits of 45x45x45 cm in size are made, weathered and filled with a rich mixture of soil, sand and farm yard manure at the time of planting (Figure3). After, planting, it is better to prune some of the basal leaves which encourages leaf production and reduces transpiration loss.

Obnoxious weeds like Mikania, Eupatorium, and Ageratum etc. tend to over topple the seedlings and hinder the establishment. Weeding ensure better survival and growth of plants. It has been observed that trunk formation starts after 4 years of planting and leaf production is at a rate of 1-2 leaves per month with an average of 10-12 leaves a year (Table3). The local practice of pruning the leaves and splitting the fiber cover helps in better growth and leaf production.

Table 2: Plant spacing of toko depending on the nature of the plantation

Site	Plant spacing	Planting season
Jhumlands (as mono plantation)	2.5m x 2.5m	May – June
Jhumlands (as agroforestry component)	4m x 4m	May- June

Table 3: Average leaf production from single toko plant

Leaf production per month (single tree)	Average leaves a year
1-2	10 - 12

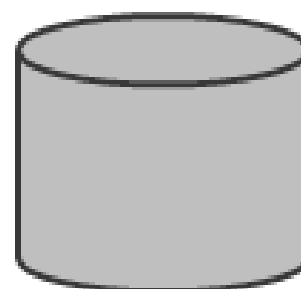


Figure 4: 45 x 45 x 45cm size pith

Traditional agroforestry

Toko can also be planted as an agroforestry or shade/nursery tree species with other crops. It does not produce much shade as the stem is branchless and leaves occur at the top only, therefore, seasonal crops and vegetables can easily be grown below toko trees.

The Adi tribe in study areas was observed to follow the following agroforestry combination with the toko Tree: toko + ginger, toko + tea, toko+ orange (toko is taken as living fence crop), toko + tuber crops engin and singe-engin (sweet potato and tapioca) and t oko + maize (for initial 4-5 years) Table4.

At the time of establishing jhum lands, after the slash and burn of the forest, the first plantations of toko around the boundary of the field and in between as intercrop is also made. Following these traditional models of agroforestry, farmers are able to utilize the available spaces in between the two trees of toko. These models are adopted according to the slope of topography, nature of crops (shade loving) and the basic needs of the farmers. Usually in first 6 years of new jhum land establishment, crops intercropping are followed more.

Table 4: Traditional Agro-forestry components with Toko.

Toko +	Ginger
	Tea
	Orange
	Tuber crops; engine & Singe- engine (sweet potato and Tapioca).
	Maize
	Leafy vegetables.

Manure and fertilizers

Application of organic manure like oil cake dust, bone meal and fish meal are useful for hastening seedling growth. It decomposes slowly in the soil releasing the essential nutrients to growing plants for longer periods. Well rotten cow dung is also good manure but too much use of this manure is harmful and it invites termites and other pests. The manure should be applied before the growing season, i.e., at the end of colder months or just before the monsoon.

Plantation Cost

The overall establishment cost is relatively less as compared to other plantation establishments in the region (such as orange and pineapple). Seedlings may be collected from the natural stands or can be obtained from the fruits sold in the local markets at the rate of Rs. 50, 5

portions of such fruits gives sufficient seeds for establishing plantation of 1 acre. For planting an acre of plantation 3 laborers employed for Rs.600/day. The plantation requires weed management 3-4 times a year for which 4 laborers employed at the rate of 400 (Table5).

Table 5: Estimates of Total Establishment Cost of toko plantation (in Rs/Acre)

Nature of Costs	Estimated cost (in Rupees)
Seedling Cost	300
Plantation weed management	6400
Planting cost	1800
Total establishment Cost	8,500

Cow dung is preferred for manure if required; cow dung worth Rs. 100 is enough for 1 acre of plantation. At the time of harvest 3 laborers employed at the rate of Rs.600/day. Transportation cost of leaves to the market @ Rs.1200, the average cost of operation and maintenance incurred per acre is shown in Table 6.

Table 6: Average cost of operational and maintenance incurred per Acre

S.No	Nature of Cost	Amount (in Rupees)
1.	Total Labour cost	3,400
1a.	Harvest & collection	1800
1b.	Plantation weed management	1600
2.	Manures & fertilizers	100
3.	Transport Costs	1200
	Total costs	4,700

Pests and diseases

Generally, no serious pests or diseases have been observed in the toko plant. However, some Insects attack the green leaves and fruits of the plants sporadically in some localities.

Sometimes, borer attack is seen in older stems which can be controlled by spraying insecticides. The major problem faced in establishing the plantation is cattle grazing/ browsing particularly by Mithun.

Harvesting

The fan-shaped leaves are harvested from a mature tree. Generally, while harvesting, only 2-3 leaves are left in the palm excluding the tender leaves. It is harvested after the

full moon to avoid termite and pest attack. There is a popular belief among Adis that the pre full moon days are not good for harvesting as those harvested will be vulnerable to pest attack and cause damage to the trees. The leaves are harvested on every alternate year. Generally, harvesting of toko at large scale is done by the indigenous institution called Mila. Male harvests the leaves, while female after making the bundles skillfully carry it. In this institution, male members of close relatives assembled together and help to toko plants owner for harvesting leaves and carrying it.

Drying and curing of leaves

After harvesting, the petioles of leaves are cut off leaving a small portion intact with the leaf blade then both the right and left flanks are folded to the same side of the leaf, arranged systematically, and stacked to dry. Over each stack some weight is given at the top to cure it and prevent it from crumpling during drying.

It is kept as long as the leaves turn completely brown only then it is used for roofing.

Economics of Toko leaves

The leaves are bundled and traded. Generally, each bundle has 40-45 leaves and sold or bartered with other tribes. In the villages, 50 leaves of toko are sold at Rs 70-90, while same numbers after trading in nearby local market (like Pasighat), the toko owners sale it in Rs 150-200 (Table 7). A single leaf may vary from Rs 2-6 depending upon conditions of market and season of leaves availability.

Table 7: Price of toko leaves bundle in village & local market

Leaves per bundle	Price in villages	Price in local market
40-50	Rs.70-90	Rs. 150-200

Good yield can be obtained for up to 35-40 years. The older palms bear small-sized leaves and it becomes difficult and risky to climb the older trees for the collection of leaves. Therefore, older trees are removed by felling.

The Adi community have experienced that the productivity of toko leaves is found always better in the Jhum land than in home gardens and around the paddy field. In the ideal situation, from 625 tree plants/ha, 10 leaves and a total 6,250 can be harvested. After deducting the labor and transportation charges, the net benefit is obtained every alternate year which may continue for over 30 years (Table 8). Additional income can be obtained by the sale of seeds and seedlings.

Table 8: Leaves harvested per hectare in the ideal situation

Toko plant/ha.	No. of leaves harvested per tree	Total harvested leaves per hectare	Years of production
625	10	6250	30 years.

Biocultural uses

A number of products are made out of toko leaves and fruits, which had great cultural, food and Livelihoods values for Adi tribe. Using tender leaves of Toko, Botok (rain cover) is made. Botok is used to cover the back during the rainy season in fields, fishing etc. Botari (cap) is worn during ploughing of fields. The basket like item is also made from the leaves of toko.

The leaves are an integral part of using them to pack the meat and wild games during the special occasions like Solung, Etor and Aran festivals of Adi. The petioles are used in making mat.

Using leaves of toko, Hut (chang ghar) and Poyup (small hut in jhum land) are made. Leaves are used after proper drying as a roofing material for local houses. The leaves of kitchen room are said to last for 10 years or so, while leaves of other rooms for 4-5 years.

Leaves are used for covering tops of doolies (palanquins) and boats and making hand fans. Mid rib of the leaves is used to make coarse broom. Plants are largely used in nursery as overhead shade. The leaves are also used as the item to cover the burial places, and the store bin of community grain banks. These palms are also planted as an ornamental and avenue plants. Fibrous sheaths are used for making ropes; for making winter resistant shields for shoulder bags (tali). New soft shoots are sometimes eaten as vegetables. Pericarp of ripe fruits, which are blue in colour are eaten raw or as salad. Fruits are also used after the fermentation as chutney.

Dried peel of fruit contain good amount of oil and thus powder is now being used as mixing items with the leaves of ongerc (*Zanthoxylum rhetsa*), ongin (*Clerodendrum colebrookianum*), and bangko (*Solanum spirale*) to use as chutney. Nut is edible and used as masticator; as a substitute for areca nut. The cut stems are used as temporary log bridges to cross over village streams and as posts of temporary structures.

Gender, conservation and knowledge variability

From seed collection to the plantation of toko, women play a pivotal role and contribute 80-95%. Only in those practices, where hard physical labor is required male folk contribute from 60%. As per the survey conducted in the study area, the contribution of men and women was

observed as, Seed collection (female-83%, male- 17%), seed soaking (female- 90%, male- 10%),nursery preparation (female-80%, male-20%),seed sowing (female- 95%, male- 5%), nursery care (female-82%, male- 18%), transplanting (female- 83%, male-17%), plantation (female-79%, male-21%), training & pruning (female-23%, male-77%), harvesting (female-20%, male-80%), curing of leaves (female-35%, male-65%), trading & marketing (female-85%, male-15%) (Figure5). This shows that women of Adi community have a significant role in the Conservation of toko tree populations. Males harvest the leaves from the toko tree, while females carry the load of bundles of Toko leaves. It could be learned that except for the practices of training and pruning of trees, harvesting skills of leaves and curing the leaves for use, women were significantly higher in all the toko related practices. Further, there was a difference in the knowledge of young, middle and old aged Adi community members on the conservation practices relating to the toko tree. It indicates that elders of the Adi community have more knowledge about toko tree which is helpful in conservation of this tree species.

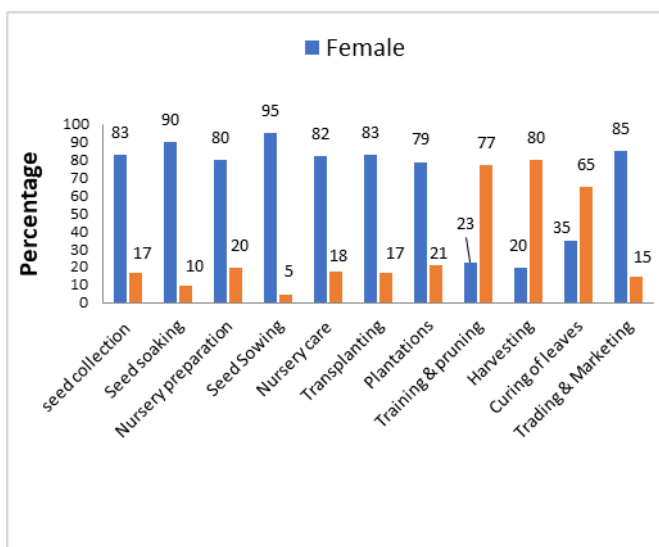


Figure 5: Gender role in conservation of toko tree

DISCUSSION

Arunachal Pradesh, being the largest state of Northeast India, harbours great number of plant species that are endemic to the region. The diversity and endemism of the state have kept in the category of biodiversity hot-spot. Though in the recent past in the Red Data Book of Indian plants (1987) a number of plant species are being listed as rare, endangered and threatened species because of increasing threats from anthropogenic and other natural factors. In the list of threatened species, *L. jenkinsiana* Griff has also been mentioned. However, as per the survey conducted in the study area, it was observed that

there is no dearth of toko plants population. It can be endangered and threatened in other regions like Assam, but not in Arunachal Pradesh according to the study.

Singh et al. (2010) observed that toko is good in numbers in jhum lands, Morang, home gardens and around paddy fields, conserved by the adi community in East Siang District, Arunachal Pradesh by adopting closer plant spacing (2.5x 2.5m) in hill slopes when they grow toko as mono plantation. However, based on our village and forest survey in the study area it was found that some plantations had wider plant spacing varying up to 4 meters. The present survey of the study area found active participation and contribution of women in toko plantation in number of practices such as seed collection, seed sowing, planting, curing of leaves, trading and marketing shows that our observations are in line with the earlier observations made by Singh et al., 2010. In the year 2009-2010, *L. jenkinsiana* Griff was one of the major food items for the Asiatic black bear cubs (Dasgupta et al., 2015).

In the present study, it was observed that toko being a multipurpose tree has a variety of use and plays an integral role in the tribal Adi community, from the use of leaves as

thatching material , fruits, fibers, ropes, fire woods, different products such as; hand fans, mats, Botari, Botok, tali and cultural significance too. It provides income generation to the toko planters by selling the leaves in nearby local markets, like Pasighat. After harvesting, the leaves are arranged systematically and stacked to dry. Once the leaves have dried properly they are bundled and traded, each bundle has 40-45 leaves and is sold for Rs.150-20, which is at par with regarding the toko plant being an integral part of the Adi tribe earlier observed by Singh et al., 2010.

As per a survey conducted in the study area, it was observed that the survival percentage of naturally regenerating seeds was very low due to cattle damage and adverse ecological factors. However, natural regeneration was observed in morang forest as gregarious patches. Also, toko is planted as an agroforestry tree species with other crops, less manure is required and generally, no serious pests and diseases were observed this concedes with the earlier observations made by Singh et al. (2010).

CONCLUSION

Toko is a multipurpose tree; a number of products are made out of its leaves and fruits, which have great cultural, food and livelihood values for the Adi tribe. It finds its habitat in jhum lands, Morang forest (broad leaved forest) and to some extent in the home gardens

under subtropical climate. The seeds of toko are dispersed and carried over by the squirrels and birds. Due to the damage caused by animals in the seeds, the natural germination percentage is relatively low. However, germination is maintained by the Adi tribe through its traditional treatment after pruning in ekkam leaves. Apart from monoculture, the conservation of toko is encouraged by adopting the traditional agroforestry models by the Adi tribe. The higher plant population was observed in jhum land, because of its good productivity and people's preference according to the topography as well as toko has been observed to be a cross-culturally important species and an integral part of Adi tribe. Though inputs required for conservation promotion of toko are learned to be very less, however, the net income is of considerable percentage but not competitive in comparison to other cash crops. Because of labour-intensive jobs required for generating incomes from toko, younger people do not prefer to plant the toko. Therefore, more people are interested in planting high-cash crops such as oranges, pineapple, and others to have more economic gain. This discourages the conservation intensity of the toko tree. The conservation of Toko on an individual level and decreasing percentage of collective management seem to be caused by the disintegration of joint family to nuclear family and aggravated by the privatization of natural resources among the Adi tribe. However, the conservation of toko in Morang forest provides a permanent reservoir for the use of its genetic resource to multiply later on in emergency conditions. The conservation of toko is primarily done by the women folk and variability in the knowledge required for it was noticed across the ages. Many studies indicate that indigenous institutions (kebang), traditional knowledge (TK), and TK nurturing institutions play a significant role in the conservation of indigenous biodiversity. Toko is a bio-culturally important tree species and is being conserved across habitats and cultures. There is no dearth of the plant population of Toko in the study areas. It can be endangered and threatened in other regions like Assam, but not in Arunachal Pradesh. The community with their TK and indigenous institutions (kebang) conserves this tree species at a large scale since it is an integral part of their life support system. Special attention is required to integrate the younger generation of the community with their better incentives so that the conservation intensity of Toko could be improvised at a larger scale. Further, the community needs training and research support on toko to enhance the plant population, but it is only possible when toko is well integrated with its rational use through value addition in its products (handicrafts, house construction material,

food products from fruits etc.), proper market channels and controlled harvesting. There might be few biological threats against this species that need to be studied further to understand the complete status and issues around toko tree species in Arunachal Pradesh.

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