

RESEARCH ARTICLE

Ethnobotany of Job's Tears (*Coix lacryma-jobi* L.): A Vanishing Minor Cereal Crop of NEH Region, India

KM Laxmisha¹, GM Puneeth¹, DP Semwal² and KC Bhatt^{2*}

Abstract

Job's tears (*Coix lacryma-jobi* L.), a potential minor cereal crop, has been cultivated primarily under shifting cultivation (*Jhum*) in the northeastern hill region (NEH) of India for a long time. At the same time, a decline in crop cultivation has been observed over the years for various reasons. Keeping this in view, an ethnobotanical study was carried out to document the traditional knowledge associated with Job's tears. For this purpose, 45 respondents from 26 tribes across 5 states were interviewed during the study. Based on the information obtained, the crop is mainly grown to fulfil the basic requirements of food, fodder, medicine, local beverage and various other purposes. In addition to these, a cultural festival, 'Mimkut', with reference to its use, is also celebrated among the Kuki tribe. Besides ethnobotanical information, the rapid decline of its diversity due to changes in consumer preferences, land use patterns and adoption of Christianity by the majority of the tribal communities has also been discussed.

Keywords: Conservation, Ethnobotany, Shifting cultivation, Traditional Knowledge, Tribe

¹ Division of Plant Genetic Resources, The Graduate School, ICAR-Indian Agricultural Research Institute, Pusa Campus, New Delhi-110012, India.

² ICAR - National Bureau of Plant Genetic Resources, New Delhi-110012, India.

***Author for correspondence:**

kailash.bhatt@icar.org.in

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Introduction

Since time immemorial, plant wealth has played an important role in meeting various kinds of daily needs of human beings. The study of plant resources, which are used by "primitive/aboriginal people or tribal communities", is termed 'Ethnobotany' (Mehta *et al.*, 2008; Balick & Cox, 2020). It is a multidisciplinary branch of science, which mainly encompasses botany, anthropology, economics and linguistics. These disciplines study how a society relates to its environment, where indigenous knowledge and its practices play significant roles. One of the fundamental ideas of ethnobotany is that many cultures have formed distinctive knowledge about the crops/plants in their particular environment, which has been transferred from one generation to another by oral tradition (Cotton, 1996). Such studies can be used to compare societies pertaining to their folk knowledge and culture, which may further help in creating theories on origin, migration, diffusion, etc. India is home to over 550 tribal communities having rich traditional knowledge associated with various plants, including minor crops, whose potential has not yet been completely realized as they are produced customarily for a variety of purposes (Bhatt *et al.*, 2009). With changes in climatic conditions, risk of pests and diseases will definitely be increased, and if an increase in demand for food crop

production is experienced due to global climate change, then certainly locally grown little known crops like Job's tears (*Coix lacryma-jobi* L.) will function as a staple crop to ensure food security, healthcare and economic upliftment of rural/ farming /tribal communities.

C. lacryma-jobi ($2n = 4X = 20$) belongs to the family Poaceae, is commonly known as bodhi pearl, millet, pearl rice, medicinal corn, *Coix* pearl, etc. It is also called *Adlay* in Filipino, *Sankru* in Hindi, *Jargadi* in Sanskrit, and *Gurgur* in Bengali (Hore and Rathi, 2007). It is an annual, photosensitive grass that thrives in cool, damp, marshy land and acidic soils with moderate temperatures, and can also withstand high rainfall conditions. Its flowers are monoecious, seeds/ grains are hard, with a shiny coat, and have a hole at the tip from where the flower emerges. The whole plant and its seed pod are commonly known as Job's tears because the seed pod often has a teardrop appearance. Job's tears wild form (hard and stony, fruit case strong, unbreakable, polished/shining, perennial forms), var. *stenocarpa* (plants akin to cultivated forms with coarse leaves, fruit hard and stony, elongate-cylindrical), var. *monilifer* (a variation of *stenocarpa* with more variable fruits); and cultivated form (thin shelled, fruit case soft, breakable, coarse, not shining, bold) and var. *ma-yuen* (tall, annual, all soft-shelled types, fruit case pear shaped to spheroidal) occur in a similar phytogeographical range with various intergrading types. The crop was grown as a minor cereal in the remote part of the northeastern hill region (Arora, 1974), which is also considered the centre of origin/diversity of this crop (Ahmed and Singh, 2007). Besides the NEH region, it is also cultivated in China, the Philippines, Burma, Sri Lanka, and some other Asian countries. It is a multipurpose crop, which is nutritionally superior to most cereals and millets in terms of protein and other vital minerals like calcium,

zinc and iron (Venkateswarlu and Chaganti, 1973). Documenting ethnobotany and comprehending the traditional knowledge associated with the crop may aid in the conservation of its genetic resources by encouraging the sustainable land management techniques that can uphold the rights and autonomy of indigenous/tribal people (Thomas et al., 2011; Pradheep et al., 2014).

Materials and Methods

For recording ethnobotanical information/ associated traditional knowledge, and factors responsible for its genetic erosion, surveys were conducted in five states of NEH region (Table 1). To record the baseline information, structured and unstructured questionnaires included a set of questions regarding the basic details of the farmer, farming system adopted, part used, vernacular names, local uses, method of usage and recipes prepared, as well as the causes of genetic erosion of the crop were used (Pareek et al., 2000). During the survey, a total of 45 respondents (23 male and 22 female) between age groups of 20-80 years, belonging to 26 tribes, were interviewed. Prior informed consent was taken from the *Gram-bhuda* (*Sarpanch*) before collecting the data from households. The qualitative data obtained were analyzed using Microsoft Excel for descriptive statistics, while the findings were summarized using charts and graphs. The recorded information was compared with the reported information for authentication and new uses. Herbarium specimens of distinct and wild material were identified with taking help of expert taxonomists and deposited in the National Herbarium of Cultivated Plants (NHCP) located at ICAR-National Bureau of Plant Genetic Resources (NBPGR), New Delhi.

Table 1: Details of states and districts surveyed and number of respondents interviewed

State	Districts surveyed	Tribes interviewed	No. of respondents
Arunachal Pradesh	West Siang, East Kameng, Siang, East Siang, Dibang Valley	Galo, Nyishi, Adi (Bori), Idu Mishmi	10
Manipur	Churachandpur, Bishnupur, Imphal West, Kamjong, Senapati	Kuki, Meitei, Poumai-Naga, Tangkhul, Paite	10
Meghalaya	South Garo hills, West Garo hills, East Khasi Hills, West Jaintia hills, Ri-Bhoi	Garo, Khasi, Jaintia, Bhoi	8
Mizoram	Aizawl, Mamit	Mizo, Mizo Lushai	5
Nagaland	Mokokchung, Noklak, Kohima, Peren, Phek, Dimapur, Peren, Zunheboto, Phek	Rengma, Ao, Khamniungan, Chakhesang Angami, Zeliang, Pochury, Kachari, Kuki, Sumi, Chakhesang	12

Results and Discussion

In NEH region, Job's tears is majorly growing under shifting cultivation as informed by the respondents (76%), followed by sedentary farming (15%) and kitchen garden (9%) (Fig. 1). Shifting cultivation (also known as 'jhum') (Fig. 2 a,b) is an important indigenous form of cropping system practiced by the farming communities in the hills of NEH region, which is a traditional method of cultivation being followed since long past (Bhatt *et al.*, 2024). Owing to the mountainous terrain, settled cultivation is mainly limited to plain areas, which constitute a small portion of the cultivable area. However, in the NEH region, the kitchen garden has cultural significance, hence plays a vital role in maintaining crop biodiversity (Tripathi and Barik, 2003), where women are contributing the most in the cultivation of crops to fulfil the various needs and earn money through the sale of their produce in local markets (Shimrah *et al.*, 2018). *C. lacryma-jobi* is known by different vernacular names by tribes of different states *viz.*, in Arunachal Pradesh : *Adi - Tanyet; Adi (Bori) - Tatsing; Ibu Mishmi - Neh*; in Manipur : *Kuki - Mimchang; Paite - Ngabem; Poumai Naga - Duveio; Tangkhul - Atheitha; Thadou - Mimchang*; in Meghalaya : *Khasi-Sohriew; Garo - Megaru; Jaintia - Garada*; in Mizoram :

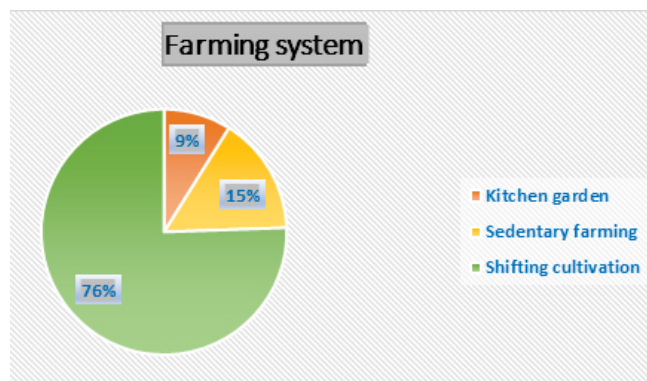


Fig. 1: Farming system followed for Job's tears cultivation.



Fig. 2 (a): Job's tears cultivation in 'jhum' field! Fig. 2(b): Seed variability in Job's Tears.

Mizo - Pingpih; Mizo Lushai - Mim; in Nagaland : *Angami - Keshi; Ao - Menchong; Chakhesang - Kiise; Kachari - Lukuthui; Khamniungan - Linyak; Kuki - Mim; Pochury - Asheta; Rengma - Nsha; and Sumi - Akithi*. These names are the manifestations of man's long-standing association with his surrounding green environment (Bareh, 2001). Local names given to plants by indigenous people in their local dialects often reflect a broad spectrum of information on their understanding. Most often, the local names are given based on some salient features, e.g., appearance, shape, size, habit, habitat, smell, taste, colour, utility, and other peculiar characters, etc. of the plants (Bhatt *et al.*, 2022). In earlier days, almost every household of the NEH region used to grow this crop, but presently it is vanishing from the entire jhum areas. A significant amount of genetic diversity from the farmer's field can be lost in future, if efforts are not made for its timely conservation (*ex-situ/in-situ* on-farm) and use in breeding programme (Laxmisha *et al.*, 2022; Soni *et al.*, 2023). Hence, documentation of traditional knowledge associated with the crop is a need of the hour.

Local/ethnobotanical uses of Job's tears

Generally, plants from the surrounding green environment have been used to fulfil various needs by human beings. Similarly, Job's tears is also used in many ways by the tribes of NEH region (Fig. 3). During survey, majority of the respondents (36) informed that its grains are used as food and ornament (15), leaves as fodder (12), medicine (4), feed (4), fertilizer (3) and dried plant as fuel (1). Many tribes are also using its different parts for medicinal purposes (8), and as narrated by the locals, the crop has religious/cultural significance (4) too. Below are some examples of the local uses of the crop as recorded from the experienced local folks of the NEH region.

Food: Thirty-six respondents (Fig. 3) informed about the use of grains in the preparation of various food items and local beverages. The matured grains are cooked with rice; dehulled grains with other cereals are

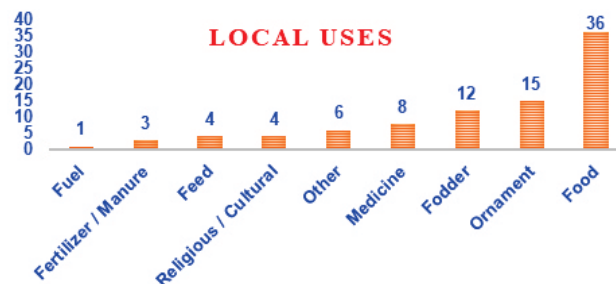


Fig. 3: Local uses of Job's tears as narrated by respondents.

boiled in water and cooked as porridge and *khichree* (Fig. 4a); soaked grains are roasted and popped like popcorn; grains are soaked in water for a whole night, sun dried and pounded to make dough and bread/chapatee, whereas sometimes kneaded flour is used to make dough, which is boiled and eaten; the flour of grains is mixed with water and consumed as a refreshing drink (Hore and Rathi, 2007); whole grains are soaked into water for overnight, dried in sunlight and fried in oil to consume as snacks; grains are boiled in water and added with sugar/ salt to make tea. During scarcity, the Sulung tribe of Arunachal Pradesh used to gather seeds of wild form and cook along with grains of *Echinochloa colonum* (Barnyard millet) and *Panicum milliaceum* (Proso millet) to make pancakes (Singh, 2008).

Beverage: The tribes of the NEH region consume unique food items and also follow their own methods of preparing beer or traditional beverages from food items/grains (Bareh, 2001). Unlike cereals and millets, Job's tears is also used in the preparation of a local beverage. The traditional beverages are meant not only for consumption but also for using as medicine and bestowing it to their deities (Gangwar & Ramakrishnan,

1990). Consumption of fermented beverages and alcoholic drinks has a deep-rooted history among different cultures. These drinks are widespread because of their nutritive value as well as the pleasure they impart, which makes them the most acceptable products for consumption during various religious or recreational rituals (Gogoi, 2021). The method of traditional alcohol brewing is different among the tribes as they follow their own unique protocol using distinct starter cultures, even though the majority of them use a similar base for fermentation (Tamang et al., 2016). The *Zeliang* tribe (Nagaland) use grinded grains for preparing local beer '*Hechi*' (Fig. 4b). For the purpose, local rice grains mixture is kept inside the dried seedless fruit of bottle gourd (locally known as *Kela*) for a period of four days or up to one month (Fig. 5a) along with starter culture (locally known as 'medicine'). This beer can be kept for consumption till one week. The *Ao* tribe (Nagaland) prepares two grades (superior and inferior) of alcoholic drink. In superior grade, grains are boiled and 'medicine' (starter-which is a mixture of rice and fungal culture) (Fig. 5b) is added and kept for three days to initiate the fermentation process, while consumed when the froth comes out. Whereas in the inferior grade, the leftover mixture of grains from the superior one is crushed into a paste and water is added to make a drink before consumption. In the *Angami* tribe



Fig. 4(a): Job's tears dehusked grains.



Fig. 4(b): Job's Tears beer '*Hechi*' of *Zeliang* tribe.



Fig. 5(a): Bottle guard in preparation of Job's Tears beer.



Fig. 5(b): Local recipes of Job's Tears.

(Nagaland), a wine '*Kesikhe*' is prepared, for which the mixture of grains is added with starter culture and kept for two months for fermentation. This wine is special and shared only among loved ones, but at present its preparation is declined, hence many people have not tasted it to date. The Sumi tribe of Nagaland brews a wine '*Akithiji*' using its three month's old fermented seeds. Similarly, wine '*Shethaka*' prepared by the Pochury tribe of Nagaland, beer '*Nshazu*' by the Rengma tribe of Nagaland and wine '*Noyin*' by the Adi Bori tribe of Arunachal Pradesh are prepared by fermenting dehulled grains of Job's tears. It was observed that adoption of Christianity by most of the tribal communities in Nagaland during the late 20th century, the consumption of locally brewed alcohol was forbidden because the consumption of alcohol was considered equal to sin. Hence, many tribal communities (Pochury, Zeliang and Sumi) of Nagaland have abandoned the cultivation of this alcoholic beverage brewing crop (Dhanaraju, 2019).

Medicine: Besides food and beverages, it is also used in the local medicine system (Fig. 3). Still majority of tribes rely on the community-based traditional healing system for their basic healthcare needs in the NEH region (Ghosh, 1992). The Poumai-Naga tribe of Manipur use its root paste with honey and milk in the treatment of fever and as a vermifuge. The root infusion is used by the Meetei community of Manipur as a blood purifier (Singh & Pilgrim, 2010). The leaf juice is used to treat diarrhoea and dysentery by the Garo tribe of Meghalaya, while the paste of fermented seeds is applied externally to treat skin diseases and chickenpox. The decoction made from both leaves and roots is used in the treatment of urinary tract infection by rural communities of Mizoram (Laxmisha et al., 2022). The seeds/grains are boiled with milk or water and are given by the Angami tribe of Nagaland in the treatment of kidney problems and asthma. The boiled grains are also given to people who are suffering from throat cancer. Freshly plucked leaves are boiled in water and drunk as green tea, which is supposed to be good for indigestion. The Pochury and Kachari tribes of Nagaland use cooked grains as rice and give it to the people with high blood pressure, while the decoction of leaves is orally taken for treating kidney problems. The Chakhesang tribe of Nagaland consume its grain to reduce joint pain; decoction of fresh leaves is also taken as a blood purifier; and leaves are dipped into hot water and later taken in a cloth and put on pain areas in joint pain. In the Garo tribe of Bangladesh, *Coix gigantea* root paste is used for the treatment of leprosy (Ningombam et al., 2014).

Ethnic ornaments: *Coix* gives the most perfect beads for various ornamental purposes. The seeds obtained from wild types have been used by rural folks to make different kinds of ornamentals like earrings, rosaries, garlands, rings, bracelets, belts, photo frames, etc. Its seeds are an excellent source of natural jewellery as it has a hole in the centre through which wire or thread can easily pass. The traditional headgear of the Mizo women, called '*Vakiria*', is decorated with *Coix* seeds during celebrations (Laxmisha et al., 2022). Fifteen respondents from different tribes like Nyishi of Arunachal Pradesh; Paite tribe of Manipur; Jaintia of Meghalaya and *Mizo* of Mizoram have informed that chains, necklaces and bracelets are made from wild type of hard seeded *Coix* using strings; whereas in many places, its seeds are also used to decorate the belts (Fig. 6 a,b). The seeds can also be used in making musical instruments such as Shaker's gourd by covering hollow gourds with a loose net strung with beads of *Coix* (Anisuzzaman et al., 2007).



Fig. 6(a): Ornaments from the wild type of Job's tears.

Fig. 6(b): Balls from grains used as feed of pigs.

Fertilizer/manure and fuel: Different tribes like Adi of Arunachal Pradesh, Khasi of Meghalaya and Kuki of Nagaland use decomposed leaves and stems as manure. The quality of manure is improved when grains are trampled in piggeries and mixed with mud (Biswas & Das, 2022). Dried leaves and stems are burnt as fuel by the Kuki tribe (Nagaland) and also stored for off-time.

Animal feed and fodder: Dehulled/polished grains are used to feed pigs and hens by the Thangkul tribe of Manipur and the Chakesang tribe of Nagaland. Presently, the soft-shelled types of Job's tears are gaining popularity as feed for poultry and rabbits (Arora, 1977). The Bhoi tribe of Meghalaya, the Galo of Arunachal Pradesh and the Mizo Lushai of Mizoram use green leaves and stems of the plant as fodder for cattle and pigs. The green leaves can be used to make silage (Gupta et al., 1995).

Religious/cultural value: Apart from food, medicinal and other ethnobotanical uses, the crop holds cultural

and religious significance among many tribes of NEH. Its tear-shaped seeds are primarily used as beads for making prayer beads, rosaries, and garlands. The seeds of wild species are called *Vaijayanti*, which are considered sacred because a garland made from their seeds is worn by the gods Vishnu and Krishna. In Manipur, garlands made from seeds of wild (*Coix stenocarpa*) are used for religious purposes by the Meitei tribe. Similarly, the Muslim community of Manipur use a wild form of Job's tears locally known as '*Tasbih Pambi*' for counting the number of prayers daily by righteous men (*Tasbih Chatpa*) (Jain & Banerjee, 1974). During the 'Hega festival' of the *Zelaiing* tribe of Nagaland, its beer is commonly served among the people. Among the Kuki tribe of Nagaland, the main festival '*Mimkut*' ('*Mim*' referred to as Job's tears, while '*kut*' as the post-harvest) is celebrated immediately after the harvest of Job's tears. In NEH, the rich cultural history associated with it is still preserved in the memory of tribal communities and expressed through folktales, folksongs, regional paintings, and other artefacts (Ahmed & Singh, 2007). 'A story of two brothers', associated with Job's tears, is exemplified by the people in each generation among the Kuki tribe of Nagaland. As per the story, Mr Lendou and his younger brother, Mr Teucha, who were abandoned by their mother, share a piece of *Mim* to fulfil their feeling of hunger that expressing brotherhood and love with each other in scarcity of food as well as in a state of distress. The Pochury tribe of Nagaland gather around the jhum field and sings harvesting songs as the crop is harvested.

Other uses: Grains are used to trap the rats when they attack the crop, while the stems are used for thatching the huts by the *Khasi* tribe of Meghalaya. The children of the *Kachari* tribe of Nagaland use grains of wild form known as '*Kawrimoni*' for counting when playing a game. Grains are also used as bait in '*Riam Kallong*', a traditional method of fishing among the *War Khasi* community of Meghalaya (Bhalerao et al., 2016).

Though majority of information is available in the literature but some of the ethnobotanical information recorded first time from the tribal communities of NEH region are popping grains for consumption; method of preparation of local beverages from its grains like *Hechi*, *Keshike*, *Noyin*, *Shethaka*, *Akithiji*, etc.; use of fermented seed pastes in treating chickenpox, usage of leaf paste in joint pain; use of grains in local festivals Hega festival, *Mimkut* festival; using grains of wild form locally known as *Kawrimoni* for counting; folktale regarding two brothers and harvesting song of Job's tears are.

Conclusion

Ethnobotanical study of Job's tears indicated that the crop has significant importance in the culture and day-to-day life of the people of the NEH region. Job's tears seeds are a rich source of nutrients and justify the food status. Hence, it has been used by the tribes as food, fodder, medicine and ethnic ornaments, etc. Discontinuation of crop cultivation is a serious concern; hence, both *ex situ* and *in situ* on-farm conservation efforts need to be expedited to enhance the sustainable management of such valuable /potential crop. As the crop is highly nutritious, the development of value-added products will certainly help in doubling the farmer's income. Therefore, fine-grid surveys need to be undertaken in remote parts of the NEH region for the collection of its untapped germplasm before it is lost forever. Validation of the ethno-medicinal use of Job's tears for the development of new medicines is the need of the hour. Further studies need to be undertaken to evaluate and determine the use of this crop in aspects of medicinal, nutraceutical and pharmacological values. Hence, efforts for conservation (*ex-situ*, *in-situ*, on farm) and use for developing superior genotypes are essential.

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