



Rare and Endangered Plant Species with Potential Remedial Outcomes of *Coptis teeta*: An Updated Review

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ABSTRACT

For primary healthcare Ayurveda herbal formulations are in great demand because it is useful in innumerable ailments, cost effective and having higher safety margins. But due to modernization the use of ayurvedic or herbal medicines become lesser these days and results into extinction of several rare or endangered species. *Coptis teeta* (*C. teeta*), an herbaceous plant belongs to family Ranunculaceae, mentioned in the Chinese Red Data Book as a rare species, high demand, profitable harvesting burden on wild inhabitants that were previously deteriorating as a consequence of deforestation and people move at jeopardy of destruction which is cultivates in Mishmi Hills of Arunachal Pradesh northeastern part of India. It also cultivates in China, Bhutan and Sikkim India. In North East India and China, rhizome of *C. teeta* is actually eminent in traditional medicine for prevention and dealing of various human illnesses. After various investigation and studies, we found that *C. teeta* includes number of alkaloids like coptisine, columbamine, berberine and epiberberine. It also contains secondary metabolites like flavonoids, phenolic acids, saccharides and steroids. *C. teeta* due to its versatility and varied of remedial outcomes the agronomy and reproduction of this plant should be accomplished with proper care. In Arunachal Pradesh, local resident of this state started farming of this plant in various places. But due to higher price of *C. teeta* about Rs. 2000/kg, its cultivation and farming is quite difficult.

Keywords: *Coptis teeta*, Chinese Red Data Book, Rare species, Secondary metabolites, Agronomy.

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INTRODUCTION

The spiritual science Ayurveda contributed methodical visions that how live in coordination with mother nature and to nurture in the direction of the awareness of one's true creation. The term Ayurveda denotes love but recognition and prosperity is less. Thus, the healthy, pacify world can develop. Due to modernization the use of ayurvedic medicines become fewer and with the advancement the use of modern medicines become higher that results into loss of natural habitat and extinction of rare or endangered plant species that having varied of therapeutic potentiality [1]. With the rapid urbanization, increased population, deforestation industrialization, global warming etc. results into depletion of plant species and many of them become extinct or endangered. Likely the one of the rare or endangered medicinal plant *Coptis teeta* (*C. teeta*) which is found in the smaller areas of eastern part of Himalayas and it is confined to Arunachala Pradesh, Assam, Sikkim state of India and also found in China, Tibet and Nepal whose habitat is rapidly deteriorated due overexploitation and deforestation, this species has entered into the Chinese Red Data Book, because of its high demand in market, profitable gathering burden on uninhabited populations that were already deteriorating as a result of deforestation and inhabitants extends at jeopardy of extinction, hence is reproductive progress is quite slow [2].

The conservancy of *C. teeta* is very significant as it is one of precious fortune of earth in the field of medicinal plant. *C. teeta* belongs to Ranunculaceae (buttercups) family, diploid chromosome i.e. $2n=18$ [3], Class- Magnoliopsida-dicotyledons, Allied species- *C. teetoides*. World widely, Indian gold thread is its English name, Vernacular names: Assam. - Mishmi tita; Arabic - Mamira-chini; Hindi: Mamira, Haladiya Bachnag, Mishmitita; Sanskrit - Supita, Tiktamula, Mishamitita; Tamil. - Pitarohini, Pitarokini, Peetarogini, Pidarokini, Mamiran; Marathi. - Pitmula haldiya bachnag; Urdu. - Mameeran, Mameesa (mamira, Mamiran), Mamiran-i-chini, Mamira [4].

DESCRIPTION

C. teeta is a small, perennial, stemless herb, rootstocks are bitter, horizontal, thickly fibrous with yellowish brown to golden-yellow externally to internally. Leaves are glabrous, 6-12 inches petiole around, leaflets are glossy and slimy with ovate-lanceolate. Flowers are 1-3 pedicelled, small, regular, whitish in color with shadowed hair follicles. In the transverse section its yellow-orange in color interiorly but the central pith is deeper in color. Rhizomes are 5-15 cm long horizontal to oblique, having fibrous roots, taste is bitter, external skin covered with numerous nodes and rootlets and yellowish brown externally with yellow-orange pith, which is extensively used as a remedy in Ayurveda, Siddha and Unani therapeutic classification. Fruits are multi-seeded i.e. black in colour. Fruits and flowers occurred in different month like (May- July) and (February-April). This plant cultivates at the lower altitude of 1700 m and high-altitude of 2800 m, are showed in **Figure 1 and 2** [5,6,7].



FIGURE 1. COPTIS TEETA WALL: MAMIRA (8)

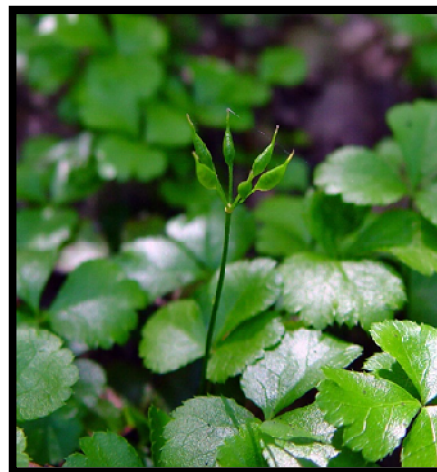


FIGURE 2: GENUS-COPTIS (GOLDTHREAD) FLOWER AND FRUIT WITH LEAVES (8)

Coptis teeta is believed as a archetypal of the worldwide inhabitants because about 90 % population of *Coptis teeta* is found in India. In 1825, this plant was firstly documented by R. Wilcox and Captain Bedford from Mishmi Hills of Indian flora surveyed by Griffith in 1836. Mishmi and other community people of Arunachal Pradesh utilized *C. teeta* to cure several diseases like stomach pain, malaria and dysentery. *C. teeta* reproductive rate is slow due to various reasons but benefits are more hence it is quite costly and currently marketed at about Rs.2000/kg. *C. teeta* adulterated species are also found i.e. *Geranium wallichianum*, root of *Thalictrum filiosum* DC, Swertia genus resembles the rhizome of *C. teeta* [9].

CULTIVATION PRACTICES AND ITS MANAGEMENT

C. teeta is nurtured in a minor scale with the goal to preserve it in its ecological environment. In small pockets of Dibang Valley and Lohit districts, the cultivation of this plant has taken up by Arunachal Pradesh Forest department. In certain places the local resident of Arunachal Pradesh has also taken up

cultivation of *C. teeta* but on pilot scale the cultivation reported in some areas of adjoining districts of Nagaland, outside the Arunachal Pradesh. This plant is not cultivated in all types of climate and soil. The temperate areas covered with snow during winter is suitable to grow this plant. *C. teeta* well grown in drained muddy, filthy soil and propagated by rhizomes and seeds. Seeds cultivate in 30 - 35 days and can be scattered over nursery bed from May to September. It is a slow growing herb [6].

RAMETS COLLECTIONS

The utmost flourishing and prevailing month for ramets are at the end of May or starting of June when the rainy season begins. The bulky and powerful plants are preferred that have grown-up as high as about 25 cm, at that time pluck their lively ramets. The plants select or chosen that are as aloof away from each other which are from the same population

UPROOTING RAMETS

The ramets are collected, on the same day or, within 1–2 days ramets related with their mother plants will be transplanted to the new place. An average altitude of over 2200 m above sea level, the soil, with abundant humus, is actually productive and humid as this land is placed in the evergreen broad-leaved forest. About 15 3 6 cm and about 2–3 cm deep, the ramets are easily rested into a small depression and then are shielded with the mixture of soil and humus., the field will be irrigated to some extent after transplantation. Around one hectare of land approx. 1500 ramets can be planted.

HANDLING OF C. TEETA

The Tibeto-Burman ethnic group who inhabit mountainous regions also called Lisu farmers within one to two years manage the young *C. teeta* by weeding, fertilizing with residue from burned shrubs and grasses, and in dry season pouring water. Three years later, few branches of trees in the field need to be trimmed so that more light can reach the lower surface under the tree covering, and through this method they can receive greater yields of the rhizomes. After the field survey we observed that the Tibeto-Burman farmers used very minute pesticide and chemical fertilizer in *C. teeta*-based agroforestry system.

REAPING RHIZOMES

C. teeta single plant is about 10 years of life cycle and *C. teeta* is categorized by nonsexual propagation. The rhizomes yield for ever when the forests are not destroyed and they are regularly harvested. After, four to seven years may pass before the first harvest the ramets are transplanted, when the diameter of rhizomes reaches about 1.5 cm. In late November, when the dry season begins and the rainy season ends, the oldest leaves become yellow and withered, of *C. teeta* and the vegetative growth of the plants halt. At this moment, the size of the rhizome is checked by using their hands in the loose soil and then very cautiously cut the appropriate rhizome with a small knife from mother plants instead of hurting other unsuitable rhizomes or ramets. Hence in the same way, the Lisu farmers can produce rhizomes every year.

The economical part of this plant was rhizome and from six month onwards of transplanting its production start. In Ayurveda, Siddha and Unani medicine rhizome of this plant is enormously used. It is grown by rhizomes and seeds.

PHYTOCONSTITUENTS

Through a study about 56 compounds have been identified with wide range of pharmacological activities, but few of them are represented in **Table 1**.

TABLE 1: VARIOUS PHYTOCONSTITUENTS AND THEIR PHARMACOLOGICAL ACTIVITY

Phytoconstituents	Pharmacological activities
2-methoxy-4-venylphenol	anti-tumor, antimicrobial anti-inflammatory [10]
Berberine	analgesic, Anesthetic, antibacterial, anti-tumor [11]
Pentadecanoic Acid	Antioxidant [12]
9,12-Octadecadienoic acid (Z, Z)-, Methyl Ester	Hepatoprotective, hypocholesterolemia, antieczemic
Indenol[1,2-b] quinoxaline- 11-one,2-methylspiroindenquinoxaline	Anti-cell proliferation of tumor cell [13]
Methyl Strete	Anti-diarrheal [14]
Stigmast-5-EN-3-OL,(3.BETA.)-	Potent anti-diabetic agent in regulating glucose transport [15]

REMEDIAL OUTCOMES

C. teeta widely used by Mishmi and other tribes of Arunachal Pradesh during variety of health issues like malaria, dysentery, Cold and Cough, Diarrhea, blood Dysentery, Typhoid, Hypertension, Hepatitis,

Febrifuge, stomach pain and also to relieve pain of eyes conjunctives [16]. Roots containing berberine and it acts as a bitter tonic. Due to several alkaloids rhizomes is bitter in taste (Berberine, Coptisine and Palmatine etc.) which are useful in preventing various microbes and also in treatment for many disorders [17,18]. Berberine has the property to treat type 2 diabetes, to reduces and maintains the blood sugar level [19,20]. lowers cholesterol level through a mechanism different than the statin drugs [21].

POTENTIAL LIMITATIONS TO CULTIVATION

The following reasons of *C. teeta* to become endangered in north Eastern Himalaya [1].

- The tremendous pressure on their natural habitat because of increasing demand of raw plant used in medicine as well as cosmetic also as herbal products.
- Because of increasing population pressure and other evolving activities in hills the natural habitat of this rare plant declined.
- From natural sources, over exploitation and haphazard seen.
- The farmer has uncertainties to acclimatize the highly demanded *C. teeta* plants, it in field condition because lack of agro-technology.
- For commercial scale agronomy no serious efforts were taken.
- To clear the land, forest fire used by local hill people that showed very distressing role in the devastation of this plants.
- Trading of high value banned medicinal plants illegally.
- Lack of awareness towards this treasured inheritance.
- Because of high altitude grown plant the change in the weather and climate pattern.
- Excessive using of this plant by domestic as well as wild animals.
- For fulfilling the basic necessities, like use of fuel, timber, etc., and cutting of leaves for silage and cattle bedding.

CONCLUSION

After detailed study about the herbaceous plant *C. teeta* concluded that this plant is scattered in the north eastern part of Himalayas and it noticeable as mostly vulnerable and threatened medicinal plant. Apart from various remedial benefits and presence of variety of treasured compounds like alkaloids and secondary metabolites confined in this herb which are active biologically in contrast to array of ailments like antidiabetics, antitumor etc. To protect the highly demandable, most effective and pharmacological benefits of this plant by drawing attention towards its propagation and additional studies for the prosperity of ecology and mankind.

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CONFLICT OF INTEREST

Authors have no conflict of interest.

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