

A STUDY ON ETHNOMEDICINAL USES OF YARTSHAGUMBA, *CORDYCEPS SINENSIS* (BERK.) SACC. (CORDYCIPTACEAE), BY THE TRIBAL COMMUNITIES OF NORTH SIKKIM AND ITS CONSERVATION

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ABSTRACT: *Cordyceps sinensis* (Berk.) Sacc. is commonly known as ‘Caterpillar Fungus’ as it is parasitic on the larvae of different insects of Dipters and Lepidoptera groups. This fungus is of great medicinal value. The whole range of Himalayas, particularly the eastern region is the native place of this taxon. Sikkim, a tiny beautiful state of India also harbours this fungus in some specific high altitude areas (4000-5500 m). The stromatic part develops from the head of the caterpillar having pungent odour even when dried. The ethnic communities of Sikkim, viz. Lapchas, Nepalese, Bhutias, Sherpas etc. use this organism for the remedy of different physical disorders including sexual impotency. It has also some effect on wild animals like Yak. The traditional uses, of this fungus by different tribal communities of North Sikkim including its other medicinal uses and conservation aspects are described.

Key words: *Cordyceps sinensis*, Caterpillar fungus, Medicinal properties, Traditional use, North Sikkim, Conservation.

INTRODUCTION

India is gifted with enormous wealth of biodiversity. There are about 45,000 plant species and 81,000 animal species so far discovered. These huge bio-resources offer great subsistence value to the tribals as well as rural communities. There are about 427 tribal communities all over India, which constitute 9.47% (53 million) of the country’s population. Sikkim, a tiny beautiful state of India is endowed with rich ethnic culture as well as immense biological diversity (Maity 2005, Maity *et al.* 2003a, Maity *et al.* 2003b, Maity

et al. 2004, Tamang *et al.* 2012). North Sikkim is mostly inhabited by different tribal communities viz. Lepchas, Nepalese, Bhutias, Sherpas etc. Many of them still prefer to live in the remote hilly jungles or at their base. They have the choice to exploit a wide range of species in different ways rather than just a limited number of species exploited by the urban citizen. Such knowledge, mostly oral, is passed on to generations. Benefits of such knowledge (ITK) were little commercialized. For the benefit of mankind, this traditional knowledge should be trapped and conserved

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until verified and checked minutely.

Otherwise, there may be a chance of losing some important clues to solve major global problems like control of famine, fight against dreadful diseases, control of environmental degradation etc. Major part of the north district of Sikkim is covered with virgin forests with thousands of medicinal plants (all groups traditionally placed under Plant Kingdom) and numerous botanically interesting species.

The genus *Cordyceps* of the family Cordycipitaceae (subphylum Ascomycotina, class Pyrenomycetes, order Clavicipitales) is with nearly 150 species, most of them parasitic on insects. Others are parasitic on spiders or on the subterranean fruit-bodies of *Elaphomyces*. They produce stout or slender stalks bearing a round or more often elongated, usually pointed, stromatic head in which the numerous perithesia develop (Bassey 1950, Webster 1980). *Cordyceps sinensis* (Berk.) Sacc. a rare species of the genus, native to the alpine regions of Himalaya, is highly valued in the traditional medicinal system of China, Nepal, Bhutan and India. The fungus confined to cold and arid environment of the high Himalayan Mountain ranges in Tibet, Nepal, Bhutan and India at an altitude ranging from 4000 to 5500 meters.

Cordyceps sinensis is commonly known as 'Yartshagumba' (yartsha: winter; gumba: summer). In the Indian states, this is popular as 'keera jhar' (keera:insect; jhar: herb). The Chinese name of the fungus is 'Dong Chong Xia Cao' ('winter worm, summer plant'). This fungus is parasitic on the larvae of moth, Chongcao bat (*Hepialus armoricanus*, family Hepialidae). The mycelium of the fungus grows in the soil and colonizes the buried larvae (caterpillar) of this moth. Eventually, the caterpillar filled with mycelium and mummified

and during summer the mycelium of the fungus forms a fruiting body which, interestingly, always emerges from the head of the larva.

The wonder of *C. sinensis* was discovered by Tibetan herdsmen about 1500 years ago, who observed that their livestock became energetic after eating a certain mushroom during grazing in alpine meadows. Later Emperor's physicians in the Ming Dynasty learned about this Tibetan wonder and used this knowledge with their own wisdom to develop powerful and potent medicine (<http://www.personalhealthfacts.com>). Initial records of *Cordyceps* as medicine is as old as the Qing Dynasty in China and appeared in *Ben-Cao-Cong-Xin* (*New Compilation of Materia Medica*) around 1757 (Zhu *et al.* 1998). Owing to the herb's high efficacy and potency in curing various diseases, it is well known as an important nourishing tonic. Effects of *Cordyceps sinensis* on apoptotic homeostasis was discussed by Buenz *et al.* (2005).

TRADITIONAL USE IN SIKKIM

In Sikkim, local medicine men have been well trained up about the identity of many of the useful plants. They are popular as doctor to the local people and are traditionally using the plant resources for their food, shelter and for health care as medicinal uses.

Yartshagumba is collected by the rural villagers and is either locally used as a tonic for energy, vigor and youthfulness, body tuner or traded in the national and international market. Even livestock eats it. This product is said to have power in improving sexual vigor and known as nature's 'Viagra'. Few specimens have also been collected and duly kept in Calcutta University Herbarium.

Preparation of medicine:

As the caterpillar is filled with mycelium of the fungus the whole organism (fruiting body of fungus and caterpillar) is used in local medicine. The dried materials crushed directly in a metal bowl to make fine powder. This powder directly packed within capsule covers (sugar coating) purchased from market. Usually a single capsule contains the product obtained from a single larva.

Dose: For an adult person a single capsule is prescribed per day and continue for several days, however, the dose always depend on the age and health factor.

Local medicine-men in Sikkim used this medicine as 'tonic' and prescribe it to cure anemia, body-ache, headache, nerve-complaints, and most importantly, impotency. They believe that this plant improved whole body function anything like magic. *C. sinensis* has been considered the premier agent for restoring energy, supporting healthy lung function, promoting stamina and promoting longevity and improving the quality of life.

Reported use:

Cordyceps is used for increasing both energy level and endurance, enhancing athletic performance through aerobic capacity, and boosting cellular immunity. At least two chemical constituents - cordycepin (deoxyadenosine) and cordycepic acid (mannitol) have been suggested as being the active compounds in improving lung function and increasing energy levels and sex drive.

According to the previous reports, this powerful fungal herb can effectively prevent and treat a wide variety of diseases and health problems like diseases of the respiratory system *viz.* asthma, tuberculosis, and chronic

bronchitis, kidney troubles, heart problems including cardiovascular disease and hypertension, leukopenia and health problems caused by radiotherapy and chemotherapy, insomnia, fatigue, stress, and afflictions of the nervous system, acute and chronic hepatitis, cirrhosis, and tumors of many kinds, soothes the effects of many hard-to-cure diseases by improving immunity and strengthening body resistance to bacteria and viruses (Zhu 1998, Zhu *et al.* 1998).

Chemical composition:

The chemical composition of *C. sinensis* was extensively studied (Cunnigham *et al.* 1951, Chatterjee *et al.* 1957, Sprecher and Sprinson 1963, Xiao *et al.* 1983, Xu 1988, <http://www.naturalproducts.org>). Cordycepin (deoxyadenosine) and Cordycepic acid (mannitol) have been identified as main active compounds, however, many more chemicals, *viz.* amino acids (phenylalanine, proline, histidine, valine, oxyvaline, arginine); polyamines (1,3-diamino propane, cadaverine, spermidine, spermine, omospermidine, and putrescine); cyclic dipeptides; saccharides and sugar derivatives (d-mannitol, oligosaccharides, and polysaccharides); sterols (ergosterol, delta-3 ergosterol, ergosterol peroxide, 3- sistosterol, daucosterol and campasterol); nucleotides and nucleosides (adenine, uracil, uridine, guanine, guanosine, thymidine, and deoxyuridine and cordycepin); 28 saturated and unsaturated fatty acids, their derivatives and other organic acids (oleic, linoleic, palmitic and stearic acids); vitamins (B₁, B₂, B₁₂, E and K); inorganic elements (K, Na, Ca, Mg, Fe, Cu, Mn, Zn, Pb, Se, Al, Si, Ni, Sr, Ti, Cr, Ga, V, and Zr) etc. are also extracted from this plant.

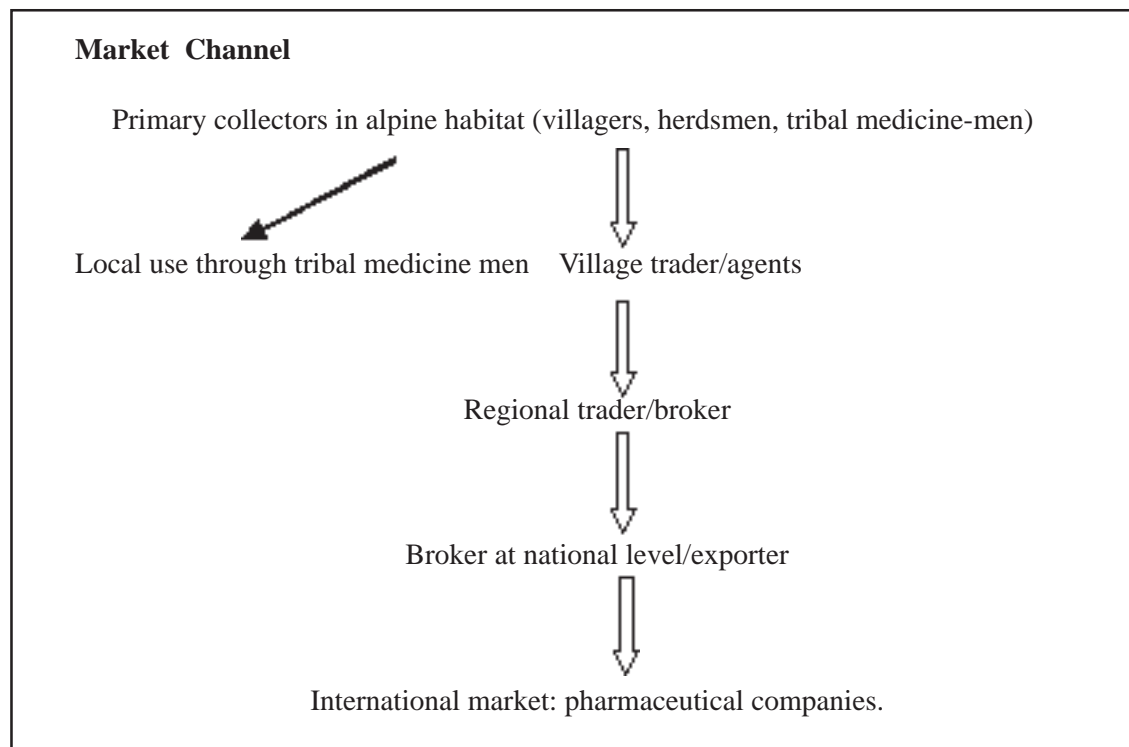
Collection practices:

Monsoon (from June to August) is the best season for collection of *Cordyceps*. To collect one has to look at grass level; the fungus has a small dark brown fructification with yellowish-white stalk. Collection is done by manual picking without using any tools regardless of age of Yartshagumba.

Though it is believed that once the Yartshagumba is harvested, the following year a greater number of Yartshagumba are found growing around the pit of last year's harvest. However, in recent years the collection is so extensive that a regulation from the authority becomes urgent. Sometimes the fungus is collected very rudely in successive years without giving the chance of regeneration. Excessive high market value promoted local

inhabitants to collect the fungus. Traditionally, the fungus is traded in China for its weight in silver or gold (<http://www.road-to-health.com>).

The market price, trade and channels of *Cordyceps* collection are not enough transparent in the Indian subcontinent. In India, the cost varies and is above (Indian Rupees) one lakh (more than US \$2000) per kg. It is believed that in the international market the fungus may fetch a price between one and two million rupees per kg (US \$20,000–40,000). Such high price leads to develop some illogical channels in different remote pockets and a portion of the trade is secretive. In nature, *Cordyceps* grows in very difficult terrain and is rare. Traditional knowledge to explore this fungus at high elevations of Sikkim is to watch wild yaks; usually the mushroom is found where the yak



grazes. During the time of grazing practice the fungus is collected by the herdsmen, mostly villagers and they are the primary collector of this plant. Primary gatherers stay in the alpine regions for months to look after their pet animals (Yak) and side by side collect the fungus along with other medicinal plants also. Local medicine men also visited these areas to collect this rare plant. They have vast knowledge regarding habitats of the fungus. They even stored the dried material for future use. Then through the agents the materials reach to the regional trader/broker and then to the broker at national level. There may be some users at national level also. However, finally the material reaches to the international market for different pharmaceutical companies for different pharmaceutical products. Now, in high mountain valleys collection and selling of *Cordyceps* has emerged as a new source of income.

CONSERVATION

The fungus is endemic to the Himalaya and the mass collection throughout its distributional ranges (India, Nepal, Bhutan and Tibet) puts it in the category of threatened plants. In India no regulations and legislation control the collection, trade and export of *C. sinensis* has been seen and the fungus is not in the Negative List of Export. However, the neighboring countries, like Nepal and Bhutan have forced some rules and regulations at Govt. level regarding the collection of this organism (<http://www.mope.gov.np>; Maity 2010). Fortunately, the alpine habitat of the fungus have been brought under different protected areas under Protected Area Network (PAN) programme of India, viz. Nanda Devi Biosphere Reserve in Uttaranchal, Kanchenjunga Biosphere Reserve



Fig. 1: Cordyceps sinenses

in Sikkim, and Dehan-Debang Biosphere Reserve in Arunachal Pradesh, Gangotri National Park and Govind National Park in Uttaranchal, Great Himalayan National Park and Pin Valley National Park in Himachal Pradesh, Askot Wild Life Sanctuary and Kedarnath Wild Life Sanctuary in Uttaranchal, etc. (Singh and Singh 2002).

However, the fungus contributed a significant role to the economy of the villagers. Therefore, a scientific management practice is essential. Due to lack of awareness about the sustainable use of the bio resources, the management practice does not reach to its optimum level.

As the population in North Sikkim is very less the cyclic regulation method of collection in different habitats of the fungus will provide better result. This practice will give enough time

and opportunity to regenerate the fungus in its own habitat. This approach may be adopted in protected areas under the supervision of authorities.

Moreover, a scientific exploration is very much needed to explore the occurrence and status of the wild population throughout its distributional ranges in the Himalaya and to design a strategy for conservation as well as sustainable harvesting practice of the fungus for a better future. Development of mechanism for commercial production may also be considered basing on the detail study of gathered information.

Cultivation practice as alternative supply of this fungus is not reported in India till date. An attempt in this regard should be taken at government level involving various research organizations to meet the market demand which will reduce the pressure on natural population and will save of the fungus from extinction from its natural habitat.

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