



A review of the medicinal value of *Ophiocordyceps sinensis* (Yarshagumba)

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Abstract: Natural products are gaining popularity as a treatment and management option for many chronic diseases. This paper reviews the medicinal value of Yarshagumba (YG) and its effects on the economic status of high-altitude villagers. A total of 45 articles were reviewed to gather the information accessed through online portals such as Google scholar and Research gate. The result showed that, among different natural items, YG holds traditional as well as scientific value in medicine. It is a well-known and high-priced herbal medicine. Strengthening lungs and kidneys, stopping hemorrhage, increasing energy and vitality, decreasing phlegm, etc. are the potential of YG, but not limited to only this. Thus, scientific investigations into its biological, biochemical, and pharmacological features should be conducted to promote it internationally.

Keywords: Thitarodes, Endosclerotium, Mycelium, Expensive, Livelihood.

थुप्रै दीर्घकालीन रोगहरूको उपचार तथा व्यवस्थापन विकल्पको रूपमा प्राकृतिक उत्पादनहरू लोकप्रिय हुन थालेका छन्। यार्शा गुम्बा (वाइ जी) को औषधीय मूल्य र उच्च उचाईका गाउँलेहरूको आर्थिक स्थितिमा यसको असरलाई एकत्रित गर्न यो कागजको पुनरावलोकन गरिएको छ। जानकारी जम्मा गर्न जम्मा ४५ लेखको पुनरावलोकन गरियो: अनलाइन पोर्टलहरू (Google scholar and Research gate) माफत पहुँच प्राप्त गरियो। परिणामले देखाएअनुसार विभिन्न प्राकृतिक उत्पादनहरूमध्ये वाइ जी-ले यसमा परम्परागत तथा वैज्ञानिक महत्व राख्छ। यो सबैलाई थाह हुनुका साथै बहुमूल्य जडीबुटी उपचार हो। फोक्सो र मिर्गौलालाई बलियो बनाउने, रक्तस्राव रोक्ने, ऊर्जा र शक्ति बढाउने, फ्लेगम आदि घट्नु वाइजीको सम्भावना हो तर यतिमा मात्र सीमित छैन। तसर्थ, यसको जैविक, जैविक रासायनिक तथा औषधीसम्बन्धी विशेषताहरूबारे वैज्ञानिक अनुसन्धान गरेर यसलाई अन्तरराष्ट्रिय तवरमा बढवा दिनुपर्छ।



INTRODUCTION

Medicinal plants are the backbone of traditional system of medicine (Samraj et al., 2014). People's belief in natural products to cure a variety of chronic conditions is growing. Aside from plants, numerous ancient medical systems have demonstrated a variety of alternative sources for the treatment of human ailments (Chakraborty et al., 2014). Fungus is an example of a medicinal organism; *Cordyceps sinensis* (yarshagumba) is one of them. It's a fungus-and-dead-insect mixture that's been used in traditional Chinese medicine (TCM) for millennia (Chakraborty et al., 2014). It has the potential to produce novel therapeutic molecules (Chakraborty et al., 2014). The Chinese philosophical notion of Yin and Yang has been credited with its efficiency, and there is number of literature on the subject (Chakraborty et al., 2014).

Cordyceps sinensis (Berk.) Sacc of Clavicipitaceae family is a fungus and is often known as cordyceps mushroom and caterpillar fungus. Cordyceps gets its name from the Latin words 'cord' mean 'club' and 'ceps' mean 'head' that describe the appearance of the fungus (Wasser, 2005). It is known as 'Hiatsao tong tchong' and 'dong chongxiacao' in Chinese. In Tibetan, *O. sinensis* is known as 'Yatshagumba', 'Yarsagumba,' or 'Yartsagunbu,' which means 'winter worm and summer grass'. In the summer, a worm transforms itself to a 'grass.' Therefore, *O. sinensis* is known as Keera ghaas (insect herb) in the Himalayan region of India and Nepal (Wasser, 2005; Singh et al., 2010; Yaqian, 2011; Chakraborty et al., 2014). There are a variety of therapeutic uses for this caterpillar, but the most common reason for its popularity as Himalayan Viagra is its alleged sexual and tonic properties (Winkler, 2009).

The supply of herbs in its native habitat has been declining in recent years, posing a threat to the livelihoods of the poorest mountain inhabitants (Shrestha and Bawa, 2013). In part to climate change, the decline has been attributed (Winkler, 2009; Merow et al., 2013; Shrestha and Bawa, 2013).

METHODOLOGY

The article's complete data and findings were based on secondary data. A total of 45 published articles were extracted from online portals such as Google Scholar and Research Gate and reviewed. The keywords used to search for articles were Yarshagumba, *Ophiocordyceps sinensis*, *Cordyceps sinensis*, medicinal plants, ghost moths, and traditional medicines. The morphology, distribution, lifecycle, medicinal relevance, and economic importance of the species have all been studied in this research.



RESULTS AND DISCUSSION

Table: 1: Taxonomy of *Cordyceps sinensis* (Berk.) Sacc.

Botanical Classification	
Kingdom	Fungi
Phylum	Ascomycota
Class	Ascomycetes
Order	Hypocreales
Family	Clavicipitaceae
Genus	<i>Cordyceps</i>
Species	<i>C. sinensis</i> (Berk.) Sacc.(1878)

Distribution of Cordyceps sinensis: Yartagumba, Yatsagumba, Yarshagumba, Yarchagumba, or "Himalayan Viagra," is a Himalayan endemic species: Bhutan, India, China, and Nepal are the four countries that make up the Himalayan area. In the open grassland of Nepal at the elevation of 3500-5000 masl., this Caterpillar fungus occurs (Devkota, 2010; Shrestha and Bawa, 2013). It is the highly-priced medicinal herb of Nepal and also one of the most expensive medicinal herbs in the world (Stone, 2008; Shrestha, 2012). In Nepal every year this herb is collected during July and directly sold to the business people to sustain the livelihood in rural areas (Amatya, 2008; Chhetri and Lodhiyal, 2008).



Yarshagumba (caterpillar fungus)

Morphology: Endosclerotium and the top fungal portion are both present in fungi (stroma). The caterpillar is normally yellowish, with a dark brown or black stroma that is 4-10 cm long and a caterpillar that is 3.5–4 cm long.



Lifecycle: It exhibits a very fascinating lifecycle where it parasitizes various root boring *Thitarodes* caterpillars (Wang and Yao, 2011). During winter, as the caterpillar hibernates underground, the fungal spores invade and proliferate after adhering to the insect surface (Hajek and St. Leger, 1994). The caterpillars that are not infected by fungus produce bat moths or swift moth also known as Ghost moths. The adult moth only lives for a few days for mating while caterpillar fungus has a 2 to 6-year life cycle, depending on the species and climatic conditions (Chen et al., 2002; Gunbu, 2008; Baral et al., 2015). The fungus drives the infected host 2-5cm beneath the soil surface. Uninfected larvae are found to hibernate in deeper soil than infected larvae. Infected larvae generally die in 15 to 25 days, and their internal organs, as well as other body components, transform into a sclerotium encased by an exoskeleton, which helps them to survive the winter (Wang and Yao, 2011). In early spring, fruiting begins by rupturing the host body and then directly develops from the prothorax's dorsal surface which is the larva's fontanel portion (Gunbu, 2008). It now creates stroma, a sexual structure that arises from a dead host (Paterson, 2008; Wang and Yao, 2011). After maturation, the fungal fruiting body releases spores into the environment to infect neighboring caterpillars and serve as hosts for the next generation (Gunbu, 2008). Furthermore, the close habitation of highly valued plants are supposed to enhance the medicinal properties of this fungus

Artificial cultivation: Despite the fact that the *O. sinensis* fungus can be grown on artificial substrates, the large-scale cultivation was only recently achieved in China after decades of effort (Li et al., 2019; Liu et al., 2019). Cao et al. (2015) demonstrated the artificial cultivation of fungus in fruiting bodies on the rice media and host caterpillar *Thitarodes* species (Cao and Han, 2014; Tao et al., 2016). Fermentation technology has also been used to produce mycelial products of the fungus *O. sinensis* (Yan et al., 2014).

Chemical composition: *O. sinensis* began its journey in Tibet and China as a Traditional Chinese medicine and as time passed, it moved to other regions of the globe, including Nepal (Chakraborty et al., 2014). *O. sinensis* has undergone extensive investigation to isolate bioactive chemical components (Chakraborty et al., 2014). It is beneficial to the immunological, hematogenic, pulmonary, cardiovascular, circulatory, and glandular systems, according to modern pharmacological investigations (Zhou et al., 2009; Yue et al., 2013). More than 7.99 percent free mannitol is found in natural caterpillar fungus, whereas cultured *O. sinensis* has less than 5.83 percent mannitol (Guan et al., 2010). *O. sinensis* has many components that differ depending on the origin and type of mycelium culture strain used (Shrestha et al., 2012).

Economic importance: A single 5 cm long caterpillar fungus a of fraction of a gram has been said to be sold in China for as much as USD 50, more than the international gold price (Chapagain et al., 2021). Each year in May and June, many people from distant places trek to Nepal's high mountains to collect YG. Commercial collection of *O. sinensis* is a critical source of income for people in Dolpa (53.3 percent of total family income; Shrestha and Bawa, 2015), Darchula, and other districts in Nepal, especially in the northern high Himalayan region (Amatya, 2008; Chhetri and



Lodhiyal, 2008). In Nepal, market prices, trade, and collecting routes for *O. sinensis* are still unknown, as commercial trading takes place illegally due to the threat of rising taxes (Banjade and Paudel, 2008). Cordyceps intensity has been considerably reduced each year, according to the majority of collectors (95.1 percent) (Shrestha and Bawa, 2015), necessitating its immediate conservation. Due to its high demand and tight host-specificity deterioration, the IUCN has classified it as vulnerable until 2020. It has been out of reach for the common person due to its expensive cost. Cordyceps spp., despite its high cost and scarcity, has become a highly prized mainstay of Traditional Chinese Medicine due to its unrivaled therapeutic potential (Holliday and Cleaver, 2008).



Yarshagumba (the miracle mushroom)

Traditional medicinal values: It was formerly thought to be a mystical creature that changed from a plant to an insect in the summer and vice versa. It has been used for hundreds of years as a tonic in Traditional Chinese Medicine (TCM) to cure a number of ailments including cancer or tumor disorders, respiratory ailments, liver or renal difficulties, and hyperglycemia (Das et al., 2021). It has been used as a sexual stimulant for both sexes for centuries. It is known as "Himalayan herbal Viagra" as a result of this. Headache, irregular menstruation, sexual impotency, asthma, cough, headache, rheumatism, allergic rhinitis, diarrhea and liver problems are all treated with it. Varied people have different perspectives on how to use this in different types of ailments (Devkota, 2006; Sharma et al., 2009; Rajbhandari, 2019). *C. sinensis* is powdered and mixed with *Dactylorhiza hatagirea*'s rhizome for eating in some parts of Nepal (Adhikari, 2000). Yak and sheep are also given it as a tonic. For tonic and aphrodisiac purposes, *D. hatagirea* (D. Don) is combined with honey and cow's milk (Lama et al., 2001). In the Thak regions of Mustang, it is popularly utilized as a tonic and aphrodisiac. It is consumed whole, along with honey and cow's milk, orally (Devkota, 2006).

Medicinal values: Aside from Ayurved, different Chinese literature has cited therapeutic properties of Yarsagumba for over two thousand years, and it has been formally included in Chinese pharmacopeia (Shrestha, 2021). It was first mentioned in 620 during Tang dynasty (618-907) (Halpern, 1999). Officially, the Chinese



government recognized it as a medicinal herb in a document written by Wu-Yiluo in 1757, New Compilation of Materia Medica. It has been acknowledged in Nepal for thousands of years. It was first referenced as Bhu-Sanjibani in the Atreya Samhita around three thousand years ago, and it was used to treat difficult kidney and syphilis problems (Shrestha, 2021). Health benefits of *O. sinensis* have been observed and tested around the world in asthma, chemical-induced renal injury, chronic bronchitis, coughing, allergic rhinitis, poor renal function, poor respiratory tract resistance, regulating blood pressure, irregular menstruation, anti-aging, strengthening the body's immunity, weakness, lowering raised blood lipid levels, poor lungs and kidney function and decline of sex drive (Zhu et al., 1998; Francia et al., 1999; Halpern, 1999; Mizuno, 1999).

CONCLUSION

Yarshagumba is a medicinal fungus used to treat a different range of ailments. Trade of yarshagumba is increasing in the last few decades. People usually eat them plain or powdered, mixed with milk or water. Traditional Chinese medicine (TCM) claims that boiling the fungus and adding it to tea or soup can serve as an aphrodisiac, heal cancer, and fight weariness. It is also popular for medication purposes. Hence, therapeutic potential and bioactive substances found in the Cordyceps genus will require additional research in the future. To improve product quality, scientific laboratories with skilled personnel are essential.

DECLARATION OF CONFLICT OF INTEREST

No conflict of interest to declare.

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