ECONOMIC LIFELINE OR ECOLOGICAL THREAT?

The Dilemma of Caterpillar Fungus

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Over the past few decades, there has been a global increase in the interest in Chinese Caterpillar Fungus (*Ophiocordyceps sinensis*) or "keeda jadi" in Hindi, from the high-altitude Himalayan regions, commonly known as "Yartsa Gunbu" which means *summer grass winter worm* or "Himalayan Viagra". The species is restricted to high-altitude subalpine and alpine meadows or grasslands above the timberline across the Tibetan Plateau and Indian Himalayan ranges. In India, this fungus is found in the alpine areas of Uttarakhand, Sikkim, and Arunachal Pradesh. Due to its proximity and accessibility to markets in Nepal and the Tibetan Autonomous Region of China, Uttarakhand has the largest volume of commerce out of all of these states, with prices per kilogram ranging from $20,000 to $40,000, or between ₹ 15 lakhs and ₹ 30 lakhs at current exchange rates. Since ancient times, the species has been mentioned in Chinese traditional medicine and Bhutanese indigenous medicine as having anti-cancer, anti-inflammatory, antioxidant, and aphrodisiac properties. It has been used to treat a wide range of ailments, such as diarrhoea, headaches, coughs, rheumatism, asthma, cardiovascular disorders, as well as renal and liver diseases. Due to the rapidly expanding global demand for the species and continuously rising prices in international markets, indigenous populations inhabiting higher Himalayan communities have found it to be highly lucrative, substantially improving their socio-economic status. The collection and trading customs that originated in the Kumaon Himalayan district of Pithoragarh in Uttarakhand have travelled to Joshimath, a sacred town in the Garhwal Himalaya and the gateway to the conservation area of Nanda Devi Biosphere Reserve, in the past twenty years.

Caterpillar fungus was designated as a non-timber forest product by the state government of Uttarakhand in 2018, in compliance with the Indian Forest Act, 1927, in an attempt to promote sustainable trade of the fungus and boost fair trade standards. While commercial exploitation of wildlife sanctuaries and national parks is strictly forbidden,

Good quality dried caterpillar fungus ready for sale

collectors are permitted to harvest caterpillar fungus from Reserved Forests through village-level forest councils. Until 2012, collectors had to turn in their stock to the state Forest Department for auction at Rs. 50,000 per kilogram and pay respective Van panchayats a royalty of five percent of the proceeds. The Forest Department and the Van panchayats have only held a few auctions since the regulations came into force, and neither the state exchequer nor the local collectors have profited from them. Currently, collection is allowed through a licensing system. The majority of the harvested fungus is transported out of the region, where local contractors and Nepali middlemen offer prices ranging from two to eight lakh rupees per kilogram (prices depend upon the quality and grade of the collected fungus, which is several times higher than what collectors can anticipate at legal village auctions.

People spend two to three months in the harsh climatic conditions of the meadows in search of the fungus. Fungus trade has supplemented subsistence farming and pastoralism as the primary means of revenue for many families. As a result, household income has increased, allowing for investments in property development, children's education, agriculture, healthcare, and other areas, thereby improving living standards and decreasing reliance on agriculture. Earnings from traditional livelihood systems are frequently surpassed by the profits generated by this seasonal activity, which spans from April to June. However, unsustainable harvesting practices have led to severe environmental degradation. Over-exploitation of the fungus is leading to its population depletion, damage to vegetation and soil structure, deforestation, habitat destruction, and pollution in the meadows. According to reports and field observations the resource is shrinking, and harvesting is becoming more challenging. Interviews with the local villagers indicated that the total quantity of caterpillar fungus acquired this year was 50–60% less than last year due to limited snowfall in Uttarakhand.

Research has shown that the winter temperature is a crucial factor in both its production and distribution. Consequently, significant winter warming may have caused its decline in all of its distributional territories, which include India, Bhutan, and Nepal. This situation demands careful consideration of the long-term health of alpine meadows and of their ecosystem in particular. A multifaceted strategy will be required to address this issue. For communities to become less reliant on caterpillar fungus, it is imperative to develop and promote alternative livelihood opportunities like low-impact community-managed eco-tourism and handicrafts. The implementation of sustainable harvesting protocols, regulations, and resource management initiatives will guarantee the long-term viability of the species and economic benefits. For example, Bhutan's Forest and Nature Conservation Act, Schedule 1 protects the species, and includes technical provisions governing rewards, fines, harvest times, quotas, and other factors to encourage sustainable harvesting. Regular training sessions and workshops are held nationwide to raise awareness.

Natural habitat of caterpillar fungus in Nanda Devi Biosphere Reserve

Un-mature stroma of caterpillar fungus

China has advanced tremendously in fungus-related research in the fields of immunology, biochemistry, ecology, molecular biology, medicine, and product development. China has designated the species as Endangered owing to the rapid decline in its natural population. Furthermore, China has claimed that it has optimised techniques for the artificial cultivation of O. *sinensis* to maintain the survival of the native populations. Given the substantial portion of the Himalayan border, India also possesses comparable scope and opportunities for such nation-building initiatives. Increasing public awareness about the ecological significance of the fungus and the negative consequences of overexploitation is essential. Protection under the Wild Life (Protection) and Biological Diversity laws, along with regular habitat monitoring, community management systems, fair distribution of trade benefits, effective resource governance, and training programs, will contribute significantly to promoting environmental sustainability.

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Local villagers collecting fungus in the meadows of Nanda Devi Biosphere Reserve