Impact of *Cordyceps sinensis* in the rural economy of interior villages of Dharchula sub-division of Kumaon Himalayas and its implications in the society

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*Cordyceps sinensis* belonging to family Clavicipitaceae is a parasitic fungus on Lepidopteran larvae. It occurs at an altitude over 4,000 m and is known to be found in Chipla, Malpa top, Niyang top, Karschila, Budhi Galja, Chal, Baling, Bon, Dugtu, Panchachuli, Nampa and Api in Dharchula Himalayas. *Cordyceps* is known to be used for many centuries as tonic, medicine, and aphrodisiac and in religious ceremonies in China, Indonesia and upper Himalayas. Since last 4-5 years *Cordyceps* has been traded very extensively in Dharchula area of Pithoragarh District in Uttaranchal. It has had tremendous impact on the rural economy of the villages in Dharchula area. Local people have been getting about Rs. 55,000-65,000 per kg, thereby improving the living conditions of many poor villagers.

**Keywords:** *Cordyceps sinensis*, parasitic fungus, caterpillar fungus, mummified insect, Dharchula Himalayas, Tibetan medicine, Chinese medicine, anti-biotic properties, rural economy.

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*Cordyceps sinensis* (Berk.) Sacc., belonging to family Clavicipitaceae, is a mummified insect found as a result of fungal infection on Lepidopteran larvae. Its occurrence in high mountains at an altitude above 4,000 m was noticed and reported in the year 20001,2. It is commonly known as *Cordyceps*, plantworm or caterpillar fungus. It is valued very highly in Tibetan and Chinese medicine and is known as Yar-RTSA-DGUN-BU (Tibetan), Dong Chong Xia Cao (Chinese).

**Distribution**

It is found in China, Tibet and high Himalayas, in Alpine meadows at an altitude of over 4,000 m. It is found in substantial quantity in Chipla, Malpa top, Njiyang top, Karschila, Budhi Galja, Chal, Baling, Bon, Dugtu, Panchachuli, Nampa and Api in Dharchula Himalayas, Pithoragarh District in Uttaranchal.
Cordyceps is parasitic on Lepidopteran larvae. These Pyrenomycetes belong to Order Sphaeruales. Its stromata are up to 5 cm high, club shaped and solitary. Its spores are colourless. They grow on caterpillars and pupae buried in soil in meadows. It is found during May-June. In Tibetan medical literature it is described as one with slender, short and bamboo-shaped root which has smoke or ochre colour with light yellowish or skin-colour exterior and white fleshy interior. The root has worm-like head, body and legs with numerous thin and fine transverse wrinkles. There are about eight pairs of legs on the body of the root and out of them four middle pairs are more prominent. Its lower part is thin while the upper part is slightly thicker. From the collar of this solitary root grows a dark-brown grassy stalk which is thickened at the middle with slightly pointed tip and slender base (Plate 1). Larvae get infected by the fungus at the end of autumn and, therefore, in winter it is still alive. Gradually it infects the entire body and covers the whole larvae and subsequently kills it. It remains buried under the ground during whole winter. When sun warms the soil after snow begins to melt in May the soil softens and stalk appears above ground. It requires very sharp eye to locate it amongst the

Plate 1: A—Habitat of Cordyceps sinensis (Chipla, altitude 4,700 m); B—Brown stalk of C. sinensis resembling grass; C—Digging of C. sinensis; D—Dried C. sinensis ready for use
grasses. In summer the stalk gives it the appearance of grass and hence the name Yar-rtsa-dgun-bu which literally means grass in summer and worm in winter. It is extracted during May-June before the onset of monsoon. Because of anti-biotic properties associated with Cordyceps the larva does not decay and remains intact.

**Traditional medicinal uses**

In Tibetan Medicine System Cordyceps is valued very highly. It is used to increase vitality and in restoring regenerative fluids – especially the fertility of sperms and kidney heat. It is known to suppress *rlung* (vata) and alleviate *mkhrispa* (pita). Tibetans mix Cordyceps with alcohol or traditional green tea and drink it for vitality and to cure stomach ailments. This is considered to be a very safe drug and can be taken for extended periods of time.

Cordyceps is known to have been in use for many centuries as tonic, as medicine in the treatment of nephritis, as aphrodisiac and in religious ceremonies in China and Indonesia. Ancient Chinese, about 2000 years ago, are said to have placed stone effigies of insects with Cordyceps in the mouth of their dead hoping to revive them or to prevent decomposition as in the case of fungal mummified insects. In China it is believed that Cordyceps when boiled with pork cures opium addiction, poisoning, jaundice and even tuberculosis. It is reported to have tonic, astringent, expectorant and anti-asthmatic properties. It is believed to tone up kidney yang and to be useful for weak back and knees, impotence and other kidney yang deficiency symptoms. It is also said to be good for lung yin deficiency when accompanied with kidney yang deficiency, when there are symptoms of chronic cough and cough with blood in the sputum. It is known to be very effective for increasing stamina, making it useful for competitive sports. The Chinese believe that potency of Cordyceps is increased when it is cooked with duck.

Traditionally in Dharchula Himalayas locals consume Cordyceps with alcohol. They immerse Cordyceps in local brew or alcohol for some time before consuming.

Cordycepic acid has been isolated from Cordyceps, which is an isomer of quinic acid found in cinchona bark from which quinine is obtained.

**Economic importance of Cordyceps and its recent social implications**

During the last 7-8 years Cordyceps has been traded very extensively in Dharchula area. Traders have been coming from Nepal or Tibet to buy Cordyceps locally in the villages. There is no organized trade for the product. For each piece of Cordyceps the villagers are offered Rs. 15-20 and approximately 3000-3500 pieces make a kg. The Cordyceps extracted in Chipla, Njyang top and Malpa top is considered to be of better quality and it is relatively bigger than that found in other areas. The current price offered to the primary collectors is, therefore, in the range of Rs. 50,000-65,000 per kg. The price has been appreciating every year by about 15-20%. The estimated volume of trade in Dharchula each year is over 500 kg, of
which half comes from Nepal and half comes from Indian Himalayas.

It has had tremendous impact on the rural economy of Dharchula area. During the months of May and June all the village folks camp in the mountains for collection of Cordyceps, men folks busy in extraction and women and girls busy in feeding them and transportation of ration to the camps. Almost all the young boys spend whole of May and June in the mountains being the summer vacation time in the schools and colleges. On an average a family of five can collect about half a kg in 1-2 months, earning over Rs. 30,000, which is sufficient to sustain them for whole year. For those who had no other source of income earlier, Cordyceps has come as a boon for them. This has helped in improving the living conditions of many poor villagers.

This has also created a lot of tension between the villages. Till about two years ago anybody could go anywhere to collect Cordyceps. There was no restriction from the villages. Even Nepalis were freely coming to Indian mountains and Indians had been going to Nepal Mountains. People had been tracking for days in search of good spots for extraction. Now the people have been objecting to outsiders coming to their mountains for collection of Cordyceps. Many villages have been charging Rs. 50-200 per person from outsiders if they come to their areas for extraction. Since there is no clear boundary demarcation in the high mountains altercation between the villagers are now common occurrences.

Occurrence and tremendous economic impact of Cordyceps were not reported till about 2-3 years ago as it is not known to be used in Indian system of medicine. Moreover it has had no market in India. Of late, some sections of people have been over reacting and demanding ban on extraction of Cordyceps for fear that it might get extinct. This has not been based on scientific knowledge. Since Cordyceps is a fungal infection on the larva, it cannot get extinct because of extraction. Fungal spores are always present in the air and soil and when moisture and temperature are suitable they infect the larva. Only thing that may endanger Cordyceps is the destruction of habitat, which could only happen because of natural causes in high mountains. In fact villagers have noticed that more you collect better the harvest is next year. Collection of Cordyceps does not endanger the environment or the ecology nor is it making any species extinct. It would, therefore, be most prudent if guidelines for extraction and trading in Cordyceps are worked out in consultation with the villagers rather than demanding blanket ban on its extraction, which will only alienate the villagers, as it would mean that people would be denied most potent source of income. In fact, many villages have refused permission to the outsiders to enter their areas for collection of Cordyceps and some villages have been levying a tax of Rs. 50 per person from outsiders who come to their areas for extraction. Some Village Panchayats have earned good income for the village through such taxes. Cordyceps has indeed come as a boon to the high mountain
villages, which made it possible for them to earn sufficient income to see them through and improve the quality of their life.

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