Cordyceps sinensis (Berk.) Sacc., a fungus of the ergot family Clavicipitaceae, is a medicinal mushroom with amazing potential and has been known and used in China for nearly two thousand years. It is commonly known as Winter Worm and Summer Grass. In China it is known as Caterpillar Mushroom and Kira in Pithoragarh, India. In Tibetan Medicine system it is known as ‘Yar-rtsa-dgun-bu’, which means grass in summer and worm in winter. Cordyceps is found in highlands of China (including Tibet), Nepal, and the Himalayan regions of Uttarakhand, above 4000 m. It is a parasite and infects the larvae of Sphinx moth, Hepialus armoricanus and grows on head of the caterpillar. The larva is reported to hibernate underground throughout winter. The stroma (fruit body) appears above the ground in summer as a dark brownish-black blade, approximately 3-6 cm long by about 0.4-0.7 cm thick.

The fungus colonizes the larvae until the inner body is filled with mycelium. The remaining form of the caterpillar is retained, including the dried outermost skin. The stroma, which grows out from the top of the caterpillar larva, is characterized by the Latin name, Cordyceps, because of its swollen head. The fungus kills the infected host and grows in summer; a rod like stroma of the fungus grows out from the mummified shell of the dead host. In the spring, after the caterpillars have died, people wander in the hills and collect the fungus attached to the caterpillar’s head. It is not domesticated or commercially reproduced.

Caterpillar mushroom has been used as tonic to increase stamina, energy levels and endurance and has become one of the top selling sports supplements amongst the world’s best sportsperson. It was one of the highly recommended medicines by ancient medical practitioners as the most effective cure of all illness. In Ayurveda it is believed to suppress ‘vata’ and alleviate ‘pita’. It was also found to help in about 200 different ailments with no toxic effect. Owing to high efficacy and potency in curing various diseases, its demand is increasing while sources and gathering of the herb are decreasing. Chemical analysis of the fungus showed the presence of active...
principles, cordycepin I besides cordycepic acid and some other bioactive triterpenoids. It is also rich in amino acids such as asparagine, threonine, serine, glutamine, glycine and inorganic minerals like Ca, Mg, K and Na. C. sinensis is well known and important ingredient in Chinese medicine both in clinical and household remedy.

The fungus helps to regulate and ensure the normal functioning of various parts of the body; it strengthens the immune system and promotes overall vitality and longevity. Cordyceps is also considered a potent medicine in strengthening lung, kidney, stopping hemorrhage, decreasing phlegm, restoring sexual vitality and eliminating risk of heart attack and as an important nursing tonic. It is very effective in toning arrhythmia with an efficacy up to 94% and is used to treat chronic nephropathy, chronic nephritis, nephralgia, age related illness, neurasthenia, rheumatoid arthritis, cirrhosis, atherosclerosis, coronary heart diseases, flabby waist and knee as well as certain other diseases related to the blood vessels of the brain. Further it helps to strengthen the immune system of tumour patients who have received radiotherapy and chemotherapy. Remarkable effects of this mushroom on establishing the haemogram, increasing the blood protein for producing plasma and for eliminating the ill effects after various therapies have also been reported. Frequent doses can prevent senile disorders. It act as antioxidant, diuretic and lowers lipoproteinemia level.

The aging effect is to a large extent attributed to the rise of active monoamine oxidise enzyme inside the body. C. sinensis can effectively inhibit the rise of such enzyme. Thus, it is an anti-aging medicine, which helps in regeneration of organic functioning of body. Cordycepic acid isolated from the fungus is an isomer of quinic acid found in Cinchona bark from which quinine is obtained.

**Propagation and export prospects**

There are over 250 species in genus Cordyceps, which infect insects of various orders and mummify the insects. In India the occurrence of the fungus was noticed about 10 years ago in Dharchula sub-division of Pithoragarh district, Uttranchal. It is generally found during April-June. Since the natural range of this mushroom consists of only a small area in the high mountains of Tibet and Nepal, its price in world commerce has always been among the very highest of any raw medicinal feedstock. During 2001 it is reportedly sold at the rate of Rs 80,000 per kilogram. In Pithoragarh, it is locally used as potent aphrodisiac and the people sell it at about Rs 15 per fungus and Rs 40-50 thousand per kilogram.

At present there is no scarcity of the fungus in its natural habitat but there are limitations and collection is difficult, which increases its cost. Since wild Cordyceps have possibilities of adulteration during collection, preference is being given to laboratory grown material, which are safe. Modern techniques have been developed for cultivating this mushroom in the laboratory because it is not necessary to grow it on caterpillars in order to gain the medicinal benefits. It is also reported that the cultivated mycelium has consistently more active ingredients than the wild collected variety.

Growing mycelium on a specially formulated substrate, which provides all the required nutrients to the fungus, has been attempted in laboratories in China and UK. The mycelium is grown under tightly controlled conditions of temperature and oxygen content for a long period of time. The mycelium is then dried using special low temperature air dryers. The product obtained so is cheaper than wild variety and is in the reach of common people for its medicinal use.

The attempts are also being made to develop tissue culture technique under laboratory conditions by taking the inoculums from various parts of the fungus. Mycology Research Laboratories Limited, United Kingdom have started its cultivation derived from a master strain of Cordyceps sourced from Nepal. Recent advances in its cultivation in China have resulted in a number of aseptic mycelial products, which are grown in culture from strains of the wild fungus as imperfect forms, asexual forms. The scientists at Aloha Medicinals, a Hawaii based health supplement manufacturer, have also started cultivating Cordyceps. Since the native environment consists of high altitude, cold temperatures and thin air, they started experimenting with growing Cordyceps in specially designed refrigerated containers, and introducing air with very low oxygen content.

Thus the propagation of the fungus in situ or in laboratory possesses remunerative potential for the economy of the Himalayan people at high altitudes and entrepreneurs throughout the country.
References


Propagation of Reishi (Medicinal Mushroom) in India

Mushrooms are rich in proteins, contain less fat, less carbohydrate and salts and are rich in fibre and have high Vitamin B12 and folic acid content uncommon in vegetables. High availability of lysine and tryptophan amino acids usually absent in cereals make them ideal food for patients suffering from hypertension, diabetes and obesity.

Reishi, the fruiting body of the mushroom, Ganoderma lucidum has been known in Japan, China, and other countries as a food and raw material for the development of drugs. Several Pharmaceutical studies done in China revealed that Reishi has wide-ranging uses in the pharmaceutical industry because of its efficacy in treating diseases like cancer, diabetes and hypertension.

The commercial propagation of Reishi is done mainly in Japan, China and Korea who have a world trade of about $4 billion. Recently Scientists of the National Research Centre for Mushroom, Solan, have achieved a major breakthrough by successfully growing Reishi. The success was achieved after work spanning over five years. Most importantly, the famous Red Reishi was grown organically to full maturity (http://www.tribuneindia.com/2002/20021021/agro.htm).