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**ABSTRACT**
Cordyceps is an entomophagous fungus belonging to class ascomycetes and family Clavicipitaceae of the order Hypocreales and are known to parasitize the larvae, pupae or adults of insects. Of the 300 species reported, so far no other species is considered as medicinally important and costly as *Cordyceps sinensis* (Berk.) Sacc.. The fungus *Cordyceps sinensis* (Berk.) Sacc.. is native of high Himalayan mountains in Tibet, Nepal, India and Bhutan, at an altitude ranging from 3,000 to 5,000 m and are commonly known as ‘yartsa-gunbu’ in Tibet and as ‘keera ghas’ or ‘keera jhar’ (insect herb) in Indian mountains. In nature, it is parasitic on the larvae of a small moth, (*Hepialus armoricanus* family Hepialidae, order Lepidoptera). The caterpillar fungus *Cordyceps sinensis* (Berk.) Sacc.. is a well-recognized medicinal mushroom. *Cordyceps sinensis* (Berk.) Sacc., the world’s most efficient and expensive medicinal mushroom and considered as a traditional Chinese medicine having multiple medicinal and pharmacological properties and also used to treat respiratory and immune disorders, pulmonary diseases, renal, liver and cardiovascular diseases, hyposexuality and hyperlipidemia. The pharmacological and medicinal significance of *Cordyceps sinensis* (Berk.) Sacc. mainly due to its bioactive ingredients i.e. Cordycepin, Adenosine, ergosterol etc.

**INTRODUCTION**

*Cordyceps* is an ascomycetous fungus (*Ilлина et al., 2007; Wu et al., 2010*) belongs to the class Pyrenomycetes, order Clavicipitales, family Clavicipitaceae and includes more than 300 species found worldwide (*Saccardo, 1883; Massae, 1895; Mains, 1940; Kobayasi, 1941; Mains, 1947; Rogers, 1954*). *Cordyceps* species are parasitic, mainly on insects and other arthropods (*Petch, 1921; Chen et al., 2002*). Some of these are also parasitic on other fungi like the subterranean, truffle-like *Elaphomyces* (*Mains, 1957*) and also on spiders (*Mains, 1954*). *Cordyceps* species are particularly abundant and diverse in humid temperate and tropical forests, grows parasitically on larvae in high altitude grassland ecosystems. In historical and general usage the term “*Cordyceps*” usually refers specifically to the specific species *C. sinensis*, but there were also many other closely related species that come under the general term of *Cordyceps*. Berkely, the British Mycologist first described this fungus in 1843 as *Sphaeria sinensis* Berk. Later in 1878, Saccardo renamed it as *Cordyceps sinensis*. The accepted scientific name *Cordyceps sinensis* (Berk.) Sacc. is referred to the final form, which is the fruiting body of the fungus arising out of the dead body of a caterpillar (*Devkota, 2006*). *Cordyceps sinensis* (Berk.) Sacc. is an ascomycetous, entomophagous parasitic fungus of the family clavicipitaceae (*Arora and Singh, 2009*). The caterpillar fungus *Cordyceps sinensis* (Berk.) Sacc. is a well-recognized medicinal mushroom (*Arora et al., 2008*). Early records of *Cordyceps* as medicines is as old as the Qing Dynasty in China and this information has been mentioned in Ben-Cao-Cong-Xin (New Compilation of Materia Medica) written by Wu-Yi-lu in around 1757 (*Singh et al., 2008*). Medicinal use of *C. sinensis* by Tibetans has been documented for over 500 years. In Traditional Chinese Medicine, *C. sinensis* is commonly known as ‘dong chong xia cao’ meaning ‘winter-worm summer grass’ which is the literal translation of the Tibetan name (*Jones, 1997*). In interior mountain areas it is also locally known as ‘Yarsha Gamboo’, Keera ghas’ and ‘Keera jhar’. The name ‘Yarsha Gamboo’ means ‘summer-grass winter-worm’. In literatures, ‘Gunba’, or ‘Gonba’, or ‘Gumba’ have also been used instead of ‘Gamboo’ (*Arora, 2008*). This term describes the life stages of *C. sinensis*. Tibetans believe that during winter time it lives as a ‘worm’ and later, as metamorphosis occurs at the start of the spring season, this worm transforms into a kind of ‘grass’ (*Singh et al., 2008*). Two distinct phases have been recognized during the entire transformation process. Firstly, the ‘grass’ starts growing from the head of the larva. A grass-like or blade-like part emerges out from the head of the insect larvae. The worm at this particular stage, appears to be white, is alive and can be seen moving over the ground.
The blade-like part can be seen protruding out from the head of the insect as a tiny horn. This horn like structure continues to grow further. Ultimately, the worm or the insect dies and transforms into a brownish-yellow colored ‘root’ like structure of the grass (Singh et al., 2008); this being the fruiting body of this caterpillar mushroom.

In Traditional Chinese Medicine, valued four times its weight in silver, it is used for lung protection, various reproductive disorders and also balancing ‘Qi’ which is the fundamental energy of life (Jones, 1997). Cordyceps was discovered about 1500 years ago in Tibet by herdsmen who observed that their livestock became energetic after eating it and growing locally. About a thousand years later, the physicians of the Emperor of Ming Dynasty came to know about this wonderful mushroom and used this knowledge with their own wisdom to develop new and powerful medicines.

The first Chinese Emperor used this herbal medicinal mushroom as a tonic for longer life. The legendary Chinese beauty Yang Kue Fei (719-756 A.D.) who is reported to be the regular user of the herb credited this as her fountain of youth. The Chinese athletes consumed this fungus regularly and held many world records (Steinkraus and Whitefield, 1994). In ancient China, Cordyceps was used in the Emperor’s palace and was considered to have ginseng (the tuber of an East Asian and North American plant, supposed to have medicinal properties) like properties. It was used to strengthen the body after exhaustion or long-term illness. Soon it was used for disorders like backache, impotency and other related problems as well as to cure opium addiction (Zhu et al., 1998a, 1998b).

Comprehensive reviews on C. sinensis oriented towards modern medical science elaborate the use of this fungus along with other mushrooms in various treatments (Lei, 1992; Wang and Shiao, 2000; Jason, 2005). The number of studies indicate that C. sinensis (and also its mycelial extract) possess certain anti-cancer, anti-metastatic and immuno-stimulating properties and also have an anti-oxidant activity (Yamaguchi et al., 2000; Li et al., 2001b; Singh et al., 2007). The fruiting bodies and mycelial culture of C. sinensis have been and are still used for strengthening the immune system (Hong and Li, 1990) and for many types of ailments of heart, kidney, liver, circulatory system and for treating TB, asthma, back pain, reproductive disorders, cancer, etc. (Hobs, 1986; Manabe et al., 1996; Manabe et al., 2000), apart from the treatment of Hepatitis B (Zhou, 1990). Cordyceps sinensis, a well known tonic food or invigorant with broad spectrum medicinal properties (Zhen et al., 2011), has been highly valued for the treatment of a wide range of diseases. (Wu et al., 2007; Dong and Yao, 2008).

Till date, there has been no organized result oriented attempts at its cultivation under controlled conditions. Due to these reasons more and more wild mushrooms are being harvested from nature every year in a reckless way. This could possibly lead to extinction of this mushroom from the natural habitats. Cultivated source for C. sinensis mushrooms will be a better sustainable alternative to wild C. sinensis harvested from nature and will lead to more stable pricing of its medicine. Laboratory culture of C. sinensis is typically by growth of the pure culture mycelium in liquid culture. Due to its peculiar characteristics, habitat, morphology and being a store house of medicinal properties, it is a highly prized mushroom.

Occurrence

In vernacular Cordyceps sinensis is named differently in different regions/countries viz. “Vegetable Wasps and Plant Worms” in Western countries, “Yartsa Gunbu” in Tibet (Winkler, 2008) and “Gadavira” in Nepal (Hye, 1999). In Nepal, Dolpa it is known by many names as Yarsagumba, Jara (Root), Kira (Insect), Jeevan buti Chyau (Life tonic mushroom) and Chyau Kira (mushroom insect) (Devkota, 2006). In India, it is known by the name of Ghas Ka Kira or Kira Jhar or Kira ghas (Pithoragarh) or Yartsa Gumba in alpine zones in Darma and Johaar Valleys in Pithoragarh in Kumaun Himalayas (Negi, 2007). Cordyceps is known as “Winter-Worm Summer Grass” or “DongChungHaCao” in Korea, “Totsu kasu” or “Tochukasu” in Japan and “DongChongXiaCao” in China (Holliday and Cleaver, 2004).

Distribution of C. sinensis is widespread and is reported from countries like India, China, Japan, Germany, U.S.A, Mexico, Canada, Denmark, and Italy. In China this mushroom grows naturally in the cold in high mountainous areas 3000-5000m above sea level in Sichuan, Qinghai, Xizang, Yunnan, around the Himalayas (Gwangpo, 2000a). The distribution of this fungus is limited to areas with an average annual precipitation of about 350-400 mm/annum. In general, Cordyceps is not found in areas where precipitation is below 300 mm/annum, such as the Chang-tang and other arid areas of the northwestern Plateau. C. sinensis is a fungus parasitizing the larvae of the insect belonging to the genus Thitarodes (Heipialis), which has its natural habitat in alpine grasslands of the Tibetan plateau. C. sinensis is endemic in the Tibetan Plateau including the adjoining high altitude areas of the Central and Eastern Himalayas (Nepal, Bhutan, and India’s Uttarakhand, Sikkim, Himachal Pradesh and Arunachal Pradesh) (Winkler, 2004).

Native occurrence of the fungus is confined to the high Himalayan mountains in Tibet, Nepal and India, at an altitude ranging from 3000 to 5000m (Singh et al., 2007) and in some provinces of China. The most common occurrence of the fungus is between 3500 m and 4500 m elevation in cold and arid environment (Sharma, 2004). In India it has been collected from upper hilly regions of district Pithoragarh (Uttarakhand) at an altitude of 3200m from the snow meadows of Brahakot, Ulapara, Ghawardhappa, Chipalakot, Najari in Dharchula, Chetri Bugyal and Chipla Kedar (4000 m). It has also been collected from Nagin Dhura, Ralam Bugyal at the base of Panchachuli Hills, Laspa, Tolatop, Darti, Mapa top, Burfu Top, Milam Top in Johar Hills of Kumaun (Negi, 2005).

MORPHOLOGY

Ophiocordyceps sinensis (syn. Cordyceps sinensis) (Weckerle et al., 2010 and Zhong et al., 2010) is a parasite of caterpillars and is endemic to alpine regions on the Tibetan Plateau (Shie et al., 2009). Cordyceps sinensis parasitizes larvae of Thitarodes (Heipialis) moths (Winkler, 2008). The caterpillar-shaped Chinese medicinal mushroom Cordyceps sinensis (Harsahay et al., 2010 and Wei et al., 2011) consists of the fruiting body and the host caterpillar (Yuan et al., 2007). The ascocarp or fruiting body of the C. sinensis mushroom originates at the base on an insect larval host (usually the larva of the Himalayan bat moth (Heipialis armonicanus) although
occasionally other insect hosts besides the bat moth are encountered) and ends at the club-like cap, including the stipe and stroma (Holliday and Cleaver, 2004). The stroma is nearly twice as long as the catenular when fresh (Winkler, 2004). The fruiting bodies of Caterpillar fungi consist of head parts and parts that look like sacks. The head parts come in various shapes: a circle, a club, a cotton swab stick, a coral reef, noodles and a long oval (Hye, 1999). The fruit body is dark brown to black; and the ‘root’ of the organism (the larval body) pervaded by the mushroom’s mycelium. 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 (Garbyal et al., 2004). Fruit bodies of C. sinensis were 4-7 cm long over the catenular cadaver ranging 3-4 cm in size, mostly erect, stalked, slightly swollen at tip; emerged single, double or triple from the head of larvae (Arora et al., 2013). Appears yellowish to brown in colour (Holliday and Cleaver, 2004). The colour varies widely red, yellow, purple, black, green, white, orange and olive (Hye, 1999). The immature larva, which forms the host upon which the Cordyceps grows, usually lives about 6 inches below ground (Holliday and Cleaver, 2004).

Cordyceps sinensis is a peculiar and a very different kind of fungus in the sense that it parasitizes the body of caterpillars, eats the soft tissue and mummifies the insect larvae. In all, it completes its lifecycle at the cost of the life of the insect.

Culturing of Cordyceps sinensis (Berk.) Sacc. in Laboratory conditions

C.sinensis are psychrophilic in nature. Attempts were made to culture in laboratory conditions. Multiplication of the fungus in submerged culture under specified conditions (pH – 6 and temperature 15°C) (Arora, 2008 and Arora et al., 2013) had potential advantages. The significant effect of nutritional sources i.e. carbon, nitrogen, vitamins and minerals on the growth of C.sinensis in SDY (sabouraud’s dextrose with yeast extract) broth medium were noticed (Arora and Singh, 2009b). The amount of sugar found in C. sinensis mycelia cultured in SDY broth (63.1%) as compared to that in the fruiting bodies (24.2%). The protein content was higher in fruiting bodies (28.6%) as compared to C.sinensis mycelia (8.2%). The lipid content was (3.15%) in fruiting bodies and 2.95% in the mycelium of C. sinensis (Arora and Singh, 2009a).

Biochemical constituents of natural cordyceps

The chemical composition of Cordyceps was explored in 1951. In 1957, the constituents of C. sinensis were studied and a crystalline substance cordycepic acid was isolated (Chatterjee et al., 1957) The biochemical constituents of the C. sinensis fruit body, as reported by various workers is given as under: Cordycepic acid, glutamic acid, amino acids (phenylalanine, proline, histidine, valine, oxyvaline, arginine); Polyamines (1, 3-diamino propane, cadaverine, spermidine, spermine, homospermidine, and putrescine), Cyclic dipeptides (cyclo-(gly-pro), cyclo-(leu-pro), cyclo-(val-pro), cyclo-(ala-leu), cyclo-(ala-val) and cyclo-(thr-leu); 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, Pi, Se, Al, Si, Ni, Sr, Ti, Cr, Ga, V and Zr) (Xiao et al., 1983; Xu et al., 1988b; Sharma, 2004). Cordycepin is one of the most imp constituent present in the C. sinensis, Cordycepin was first extracted from C. militaris (Cunnigham et al., 1951) and then found to be present in C. sinensis (Huang et al., 2003) and C. Kyushuensis (Ling et al., 2002). Cordycepin and cordycepic acid are regarded as the most important constituents of this fungus and owe high medicinal significance (Cunnigham et al., 1951; Chatterjee et al., 1957; Sprecher and Sprinson, 1963). Nucleosides in C. sinensis include adenosine and cordycepin (3’-deoxyadenosine), which have usually been assumed to be the bioactive ingredients and indices for estimation of the C. sinensis quality (Hsu, 1999).

Medicinal property and chemical constituents

Cordyceps sinensis, the world’s most medicinal mushroom (Holliday and Cleaver, 2008) is a traditional Chinese medicine has various pharmacological effects (Mizuha et al., 2007). The medicinal properties of Cordyceps sinensis are known due to the presence of bio-active components (Arora et al., 2008).

Medicinal Uses

Cordyceps sinensis (Berk.) Sacc., reputed medicinal fungus (Jing et al., 2011) is well known as a Chinese Medicinal ‘herb’ used for its invigorating and immunological effects on the human body (Jiang and Yao, 2002). However, no other species is considered as powerful as C. sinensis, or as costly (Chen et al., 2002a). For medication, the fruiting body (fungus) and the worm (caterpillar) were used together. Worm had chemical composition similar to the fruiting body (Li et al., 2002). The Tables of C. sinensis (1, 2 and 3) regarding constituents of medicinal significance, pharmacological activities and its dietary usages are hereby mentioned: Since ages, C. sinensis has been regarded as panacea of life, imparting youth, vigour and longevity. Other medicinally important functions include:

(a.) Antitumour and anticancerous Property

Cordyceps can be use as a source of new anti-cancer drugs. Cordyceps is currently being recommended and used by a growing number of doctors worldwide as adjunct to chemotherapy, radiation and other conventional and traditional cancer treatments. It has show remarkable progress in not only inhibiting the growth of and in some cases even dissolving certain types of tumours, but also as a means by which the immune system and indeed the body in general may be kept strong and vital as it is being devastated by the effects of chemotherapy and radiation treatment (Nakamura et al., 2003).
1. Constituents for medicinal significance of *Cordyceps sinensis*

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Component</th>
<th>Importance</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Antimonial activity, Regulates homeostatic function</td>
<td>Trigg et al (1971)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Control of Blood flow</td>
<td>Ng and Wang (2005)</td>
</tr>
<tr>
<td>5.</td>
<td>Ergosterol</td>
<td>Anti-tumour and immunomodulatory effect</td>
<td>Huang (1993)</td>
</tr>
<tr>
<td>7.</td>
<td>Ergosta-4,6,8(14)22-tetraen-3-one (Ergone)</td>
<td>Cytotoxic Activity (Cancer Treatment)</td>
<td>Wu et al (2005)</td>
</tr>
</tbody>
</table>

2. Important pharmacological activities of *Cordyceps sinensis*

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Pharmacological Activity</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Anti-asthmatic effect and anti-cancer agent</td>
<td>Huang (1993)</td>
</tr>
<tr>
<td>3.</td>
<td>Enhance hepatic energy</td>
<td>Pan et al (2010)</td>
</tr>
<tr>
<td>5.</td>
<td>Regulating blood pressure (high or low blood pressure), Anti-aging, lowering raised blood lipid levels, Strengthening the body’s immunity</td>
<td>Huang (1993)</td>
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<td>17.</td>
<td>Immunomodulator Property</td>
<td>Yamnell and Atascula (2008)</td>
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</tbody>
</table>

3. Dietary uses of *Cordyceps sinensis* in Medicinal Dishes

<table>
<thead>
<tr>
<th>S.No</th>
<th>Mode of Consumption</th>
<th>Medicinal value</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><em>Cordyceps</em> boiled with pork</td>
<td>Cures opium addiction, poisoning, Jaundice and tuberculosis</td>
<td>Gist (1918)</td>
</tr>
<tr>
<td>2.</td>
<td><em>Cordyceps</em> cooked with duck</td>
<td>Potency of <em>Cordyceps</em> increased</td>
<td>Tiera (1998)</td>
</tr>
<tr>
<td>4.</td>
<td>Combination of <em>C. sinensis</em> with rhizome of <em>Dactylorhiza hatagirea</em> (D. Don), honey and cow’s milk</td>
<td>Used for a tonic and aphrodisiac</td>
<td>Lama et al (2001)</td>
</tr>
<tr>
<td>6.</td>
<td>Combination with daily dosage one dried <em>C. sinensis</em> with half litre of milk and two teaspoons of ghee for a week</td>
<td>Used as a tonic and used for the sexual stimulant</td>
<td>Devkota (2006)</td>
</tr>
</tbody>
</table>
Its secondary effects on immune function help the body to more efficiently manage its immune resources while undergoing the stresses of the attack by cancer (Shin et al., 2003) allowing it to recognize, eradicate and prevent abnormalities and disease, both at the local and the systemic level (Koh et al., 2002). Cordyceps sinensis is found to have anti-leukemia activities (Lui et al., 2007) and ameliorate suppressive effects of chemotherapy on bone marrow function as a model for cancer treatment (Liu et al., 2008).

(b.) Immunomodulating Property

Cordyceps sinensis can both suppress and enhance various aspects of the immune system, known as immunomodulators (Yarnell and Abascal, 2008; Xiao et al., 2010). When Cordyceps is given to a patient in an immune-deficient state, such as cancer, hepatitis or HIV infection, the number and activity of the white blood cells increase. Conversely, if the same Cordyceps is given to someone in a hyper-immune state such as is found in Lupus, Lymphoma or Rheumatoid arthritis, the number and activity of the white blood cells drop, while the red blood cells often increase in number. The mechanism appears to be in the differentiation phase of blood cell production. Cordyceps effects leukemia cells maturing (Chen et al., 1997). This immunomodulation-at-the-differentiation level is like nature's smart bomb against disease (Holliday and Cleaver, 2004).

(c.) Hypoglycemic effect

Cordyceps has been shown to help both diabetics and alcoholics. The caterpillar fungus is found to lower the blood sugar levels by the conservation of hepatic glycogen and improving glucose metabolism (Zhao et al., 2002). Cordyceps has been tested in a number of animal and human trials for the potential as a blood sugar regulation agent, and it has performed very well in this roll indeed. It is efficient in lowering blood sugar levels in genetically diabetic animals and in those with chemically induced diabetes. It increases insulin sensitivity (Balon et al., 2002) and also the liver’s output of the glucose regulating enzymes, glucokinase and hexokinase. In short, it appears that, Cordyceps can be useful in the control of the diabetic patient, either as a single agent or in conjunction with other drugs (Holliday and Cleaver, 2004).

(d) Improvement in Kidney Functioning

Cordyceps sinensis extract might be one novel therapeutic drug for chronic kidney diseases (Song et al., 2010). Traditional views of the Cordyceps mushroom held that its consumption strengthened the Kidneys. C. sinensis has been found to accelerate the regeneration of tubular cells, protect the sodium pump activity of tubular cells and also reduces the content of calcium in certain tissues (Li et al., 1996; Wang et al., 1998). It also improves disease conditions in various animal and human clinical trials with renal failure (Zhen, 1992), renal insufficiency (Cheng, 1992; Guan et al., 1992), mesangial nephropathy (Lin, 1999) and nephrotoxicity (Zhao, 1993).

(e.) Treatment of Respiratory Disorders

The traditional Chinese medicine Cordyceps sinensis (Marchbank et al., 2011) improves pulmonary function and is used to treat respiratory disease (Yue et al., 2008). C. sinensis has proved to be highly useful in alleviating other symptoms of several respiratory illnesses such as chronic bronchitis, etc. (Kuo et al., 2001). Much of its reputation for protecting the lungs is believed to come from its ability to promote enhanced oxygen utilization efficacy. Such efficacy alludes to the use of Cordyceps as an effective treatment for Bronchitis, Asthma, and Chronic Obstructive Pulmonary Disease (COPD). Extracts of C. sinensis have been shown to inhibit tracheal contractions, especially important for asthma patients. In addition, its anti-inflammatory properties bring further relief to asthma patient (Halpern, 1999).

(f.) Improvement in Heart Functioning

The Cordyceps have the ability to stabilize the heart beats and correct heart arrhythmias. Cordyceps has been used traditionally for heart disease and stroke patients.

(g.) In Liver Disorders

Cordyceps is commonly used as an adjunct in the treatment of chronic hepatitis B and C. In one study, Cordyceps extract was used in combination with several other medicinal mushroom extracts as an adjunct to lamivudine for the treatment of hepatitis B. In this study, the group receiving the Cordyceps and other medicinal mushroom extracts had a much better outcome in a shorter period of time than the control group who received only the lamivudine (Wang et al., 2002).

(h.) Hypercholesterolemia

Hypercholesterolemia is not a disease in true sense but is a clear indicator of dysfunction of the metabolic system and indicates high risk of cardiovascular attack. Studies have demonstrated that C. sinensis helps in lowering the total cholesterol level and also the level of triglycerides (Geng, 1985 and Shao, 1985). It also helps to increase the ratio of HDL-cholesterol (good cholesterol) to LDL cholesterol (bad cholesterol). The exact mechanism of lowering of cholesterol levels has yet to be deciphered. It might be probably by enhancing liver function or through blood sugar stabilization (Singh et al., 2007).

(i.) Reduction of Fatigue

Cordyceps is a remedy for weakness and fatigue and is often used as an overall rejuvenator for increased energy while recovering from serious illness (Holliday and Cleaver, 2004). It also improves shortness of breath and reduces fatigue in patients suffering from chronic heart failure. It was thus, used by competitive athletes in the treatment of fatigue and weakness, and to improve endurance and increase energy levels (Liu et al., 1997). The story related to Cordyceps that Goats and Yaks grazing on some sort of a small, brown grass-like mushroom, growing from the head of a caterpillar in the high mountains of Tibet and Nepal, would become frisky and start chasing the other goats and yaks around with lustful intent.

(j.) Uses against Male/Female Sexual Dysfunction

Cordyceps has been used for centuries in Traditional Chinese Medicine to treat male and female sexual dysfunction (Chen and Huang, 2010), such as hypolibidinism and impotence. Preclinical data on the effects of C. sinensis on mice showed...
sex-steroid-like effects. Human clinical trials have demonstrated similarly the effectiveness of Cordyceps in combating decreased sex-drive. Cordyceps was clearly indicated as a therapeutic agent in treating hypolibidenism and other sexual malfunction in both men and women (Holliday and cleaver, 2004).

(k.) Protection against Free Radical Damage

C. sinensis has powerful antioxidant properties and thus, can protect against the damages caused by free radicals (Yamaguchi et al., 2000; Li et al., 2001b) and hence acts as an anti-ageing agent (Chen and Zhang, 1987).

(l.) Made Human Organ Transplants Possible

Cyclosporin is an antifungal drug developed from Tolypocladium inflatum, which is the asexual stage of Cordyceps. It was quickly realized that when this drug was used, the patients did not have as much of a tendency to reject their new organs. This appears to be a realized that when this drug was used, the patients did not have as much of a tendency to reject their new organs. This appears to be a

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REFERENCES


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