

INVESTIGATING THE IDENTITY OF CORDYCEPS SINESIS AS MRITHA SANJEEVANI

Raslamol.K¹, Dinesh Pappan.D²

¹Professor, Department of Pharmaceutics, Nirmala college of Health Science, Meloor,
Chalaky, Trissur, Kerala

²Agri-scientist, Rasdin Healthcare Innovations LLP, Thrissur

Abstract—From ancient times, two of the greatest desires of man are to become immortal and never to lose youth. However, such concepts are only restricted to fancy worlds, including books. Mrithasanjeevani was one of the concepts that caused an impact among people at the time of the Ramayana, where Lakshmana was cured of deep wounds with the help of Mrithasanjeevani. Mrithasanjeevani is a Sanskrit word where “Mritha” means “dead” and “Sanjeevani” means “immortal”, “the infinite life” or “that which gives life”. In the current scenario, many researchers are identifying the precious Mrithasanjeevani. Several plants have been proposed to be sanjeevani, including *Selaginella bryopteris*, *Dendrobium plicatile* (synonym *Desmotrichum fimbriatum*), *Cressa cretica*, and others. However, none of them confirm as Sanjeevani. Through our studies, we are trying to confirm Cordyceps as Mrithasanjeevani. Cordyceps is a parasitic fungus, often called “Chinese caterpillar fungus” or “Dongchongxiacao” in Chinese, which are well known for their entamopathogenic nature. There are many species of Cordyceps, among which the Cordyceps *Militaris* and Cordyceps *Sinensis* are the most prominent ones. Cordyceps has many properties quite similar to Mrithasanjeevani including the fluorescence property, its color and Ayurvedic property. This study is a review of Cordyceps *Sinensis* as Mrithasanjeevani, where cordyceps are highly powerful elements to treat certain deadly diseases, including cancer. Furthermore, detailed studies of Cordyceps are provided, showing its future prospects.

Index Terms—Cordyceps *Militaris*, Cordyceps *Sinensis*, *Cressa cretica*, *Dendrobium plicatile*, Entamopathogenic, Mrithasanjeevani, *Selaginella bryopteris*, ,

I. INTRODUCTION

Immortality has been one of the greatest desires of man since time immemorial. Deathlessness and eternal youth are two dreams that humans have always desired. The imaginary objects created based

on such impossible validities are established as fancy elements in literature and legends. Such elements not only create excitement in readers but also make them curious to reach in depths. Mrithasanjeevani is one such element which was popularised through Ramayana.

Mrithasanjeevani is a Sanskrit word where “Mritha” means “dead” and “Sanjeevani” means “immortal”, “the infinite life” or “that which gives life”. According to science there is no such thing which can bring the dead one or which can make you immortal. However, Mrithasanjeevani is considered as one the most powerful element which can heal a person who is battling with deadly disease. The concept of Sanjeevani is also connected to Ayurvedic medicine, where herbs are believed to have medicinal properties.

II. HISTORY

The Ramayana is an epic with various narrations in different parts of the world. Different versions of the Ramayana exist in various countries such as Cambodia, Laos, China, Sri Lanka, Nepal, Thailand, and Indonesia. The oldest and most authentic of these is the Valmiki Ramayan, believed to have been written in the 8th Century BC.

During the battle between Ram and Ravan in the Ramayana, Ravan’s son Meghanath shot an arrow at Lakshmana which caused him to be deeply wounded and almost reach death. Helpless Ram seeks help from Hanuman. Hanuman approached the royal physician of Lanka, the Sushena. Sushena instructs Hanuman to go to the Dronagiri Himalayas in search of Sanjeevani. Sushena also orders to bring Vishalakarani (restorer of life), Sandhanakarani (remover of arrows), and Savarnyakarani (restorer of skin). However, Hanuman was not able to recognize

the herbs specified by Sushena. Thus, he brings the whole Dronagiri Hill to save Lakshmana. Sushena spots the herbs and saves Lakshmana. Also orders Hanuman to place the Dronagiri hill back. While Hanuman was flying, some parts of Dronagiri Hill fell here and there, due to which India still has many hill stations rich in greenery and fresh air.

Along with this, in verse 32 it is said that -Those plants are illuminated in all ten directions; thus, they could be spotted from anywhere and in any direction. That is, Sanjeevani must be a plant that has the ability to glow in the dark later on in science, which was discovered to be of fluorescence property. Apart from that, In the oral versions of the Ramayana, the Sanjeevani is also referred that plant to have the colour of fire.

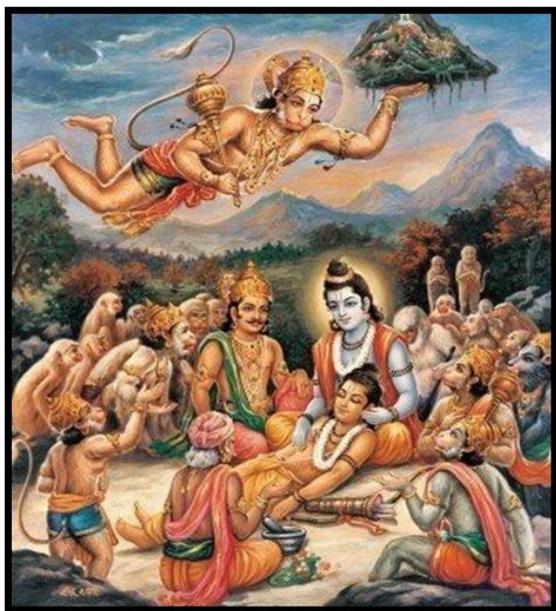


Fig No:1- Hanuman carrying Dronagiri Himalaya containing Sanjeevani

III. CORDYCEPS

Among the plants that can be used as Mrithasanjeevani, the most prominent one is a plant belonging to the mushroom genus *Cordyceps militaris*. Apart from this, there is also a parasitic mushroom called *Cordyceps Sinensis*. They are entamopathogenic in nature thus, feeding on host for

their growth. They parasitize on Himalayan ghost moth's dead larvae.



Fig No:2- Cordyceps Sinensis

Cordyceps is one of the most valuable traditional Chinese medicines which helps to fight against cancer, boost immunity and increases longevity of life.

Cordyceps has different names in different languages however in Nepali and Sanskrit it is still known as Sanjeevani.

IV. PROPERTIES OF CORDYCEPS

- **ANTI-INFLAMMATORY PROPERTIES**
Cordyceps contain a bioactive component called cordycepin which has anti-inflammatory properties thus, can be used in many conditions such as asthma, rheumatoid arthritis, Parkinson's disease, hepatitis and more.
Many Lab studies suggest that cordycepin together with cordyceps polysaccharide can have positive effects on obesity.
- **INCREASE ATHLETIC PERFORMANCE**
Many studies suggest that while exercising the body gets inflamed since Cordyceps has anti-inflammatory properties it can be used in athletics. *C. militaris* helps to increase in ATP production which provides energy to your muscles boosting your capacity and thus improving the athletic activities.
- **ANTI-CANCER PROPERTIES**
Cordyceps contains various bioactive ingredients such as cordycepin. Cordycepin, also known as 3-deoxyadenosine, is a major compound and has been suggested to have anticancer potential.

Cordycepin has property to induce cell death thus retarding the cancerous properties.

- **ANTI-AGING PROPERTIES**
Cordyceps contains polyphenols, which can act as antioxidants or help to boost antioxidant activity. Since we know, Antioxidants are molecules that can fight cell damage by neutralizing free radicals, which can otherwise contribute to disease and aging.
- **IMPROVING HEART RELATED PROBLEMS**
Many studies suggested that cordyceps are beneficial in heart related problems. It containing adenosine, which is a naturally occurring compound that may have heart-protective effects. In addition to that, the effect of Cordyceps on blood fats like triglycerides are indirectly linked to a low risk of heart disease because higher level in the blood ultimately leads to heart related problems.
- **REGULATE BLOOD SUGAR LEVEL**
Certain studies suggest that cordyceps could reduce blood sugar levels, which may be beneficial for individuals with type 2 Diabetes Mellitus. Cordyceps increases insulin resistance improving glucose metabolism.
- **BOOSTING SEXUAL ACTIVITIES**
Cordyceps, are often called as "Himalayan Viagra," has a traditional reputation as a sexual stimulant and may improve sperm quality and testosterone levels. They have potential to increase libido and boosting stamina thus stimulating sexual activities.
- **ANTI-FATIGUE ACTIVITY**
Fatigue is defined as difficulty in initiating or sustaining voluntary activity. cordyceps is used to restore health after various diseases and to hasten recovery from exhaustion because of its adaptogenic.
- **IMPROVING KIDNEY RELATED PROBLEMS**
C. sinensis has been used for the treatment of renal diseases, such as chronic nephritis, chronic pyelonephritis, chronic renal dysfunction or failure, and nephritic syndrome.

V. LIFE CYCLE OF CORDYCEPS

Cordyceps sinensis, also known as **caterpillar fungus**, is an entomopathogenic fungus from the

family Ophiocordycipitaceae. It is mainly found in the meadows above 3,500 metres on the Tibetan Plateau in Tibet and the Himalayan regions of Bhutan, India, and Nepal. They parasitize ghost moths of the Himalayas, a member of the order Lepidoptera. During the summer and early winter, millions of ascospores are produced from the anthers and dispersed through air. At this time the spores enter into the larvae of ghost moths through their skin, which causes the larva's skin to break down and fungal cells to get mixed with the bloodstream and spread throughout the body.

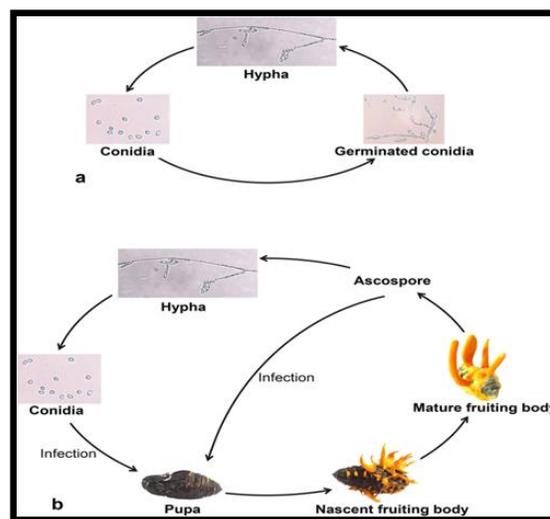


Fig No:3 – Life cycle of Cordyceps Sinensis

At this time, the larvae dig holes in the soil and lay in the vertical position. Cordyceps mushrooms start to grow from their heads. They feed on the internal organs of larvae, leaving behind the exoskeleton. Meanwhile, the ascospores fuse together to form the endoskeleton of the Cordyceps. This form of cordyceps has the capability to survive in any drastic environment. As spring approaches and the external temperature rises, the endoskeleton expands and emerges from the prothorax area of larvae, where it further grows upwards in the soil. The part that grows up from the larvae is known as "stroma." During summer this stroma grows as a mature mushroom that has the capability to produce ascospores that parasitize the ghost moth. Likewise, this cycle goes on, and within one year the life cycle of Cordyceps Sinensis is completed.

VI. CORDYCEPS AS MRITHASANJEEVANI

The first basic question which arise would be why cordyceps should be considered as Mrithasanjeevani? Well, there are many reasons which are listed below:

- COLOUR OF MRITHASANJEEVANI

It is said that Sanjeevani or Mrithasanjeevani in Ramayana has fire like colour which shines. The color of this mushroom ranges from fiery orange to reddish yellow, which projects as colour of fire.

- FLOURESENCE PROPERTY

As described in Ramayana, one of the important features of mrithasanjeevani mentioned is that it glows in the dark i.e illuminating property in all ten directions thus, it could be spotted from anywhere easily. The ability to glow in the dark is a scientific phenomenon called fluorescence. Further, through

the studies of Arinta Agnie Dewantari et al, it was confirmed that Cordyceps has such property due to the presence of cordycepin which one of the prominent contents in Cordyceps.

- NAME OF CORDYCEPS AS SANJEEVANI

Earlier in some parts of India Cordyceps was famous among local people as Sanjeevani. Still in Nepal Cordyceps are known as sanjeevani. Cordyceps mushroom are grown through the dead larvae of Himalayan ghost moths which are found in subterranean region which makes them Entamopathogenic in nature. Thus, cordyceps are aptly named as “Mrithasanjeevani” (which gives life even from the dead) because they came to life through dead larvae.

- GEOLOGICAL EVIDENCE

As described in Ramayana the precious Cordyceps mushrooms are found in the Dronagiri Himalayas. Today, this region is part of the Himalayas in the state of Uttarakhand. Dronagiri mountain are also known by different names including Dunagiri, Gandhamardana mountain, and Mahodaya mountain. The Dronagiri mountain range, which is 7000 meters above the sea level, can experience temperature

as low as **29°C**. The humidity and temperature there are ideal for the growth of Cordyceps.

Scientist at the university of Montana have documented in the Journal of Mountain Science (Volume 14, Issue 2) that members of the Bhotiya tribe are known to collect the insect or cordyceps found in the Himalayas.

- AYURVEDIC PROPERTIES OF CORDYCEPS

Cordyceps boosts energy and stamina: Cordyceps is often used to increase athletic performance and increases energy by improving oxygen utilization and reducing fatigue.

Increase immunity: Cordyceps can modulate the immune system, increase the body’s resistance against infections, and promote overall immune health.

Anti-inflammatory property: Cordyceps contain a bioactive component called cordycepin which has anti-inflammatory properties thus, can be used in many conditions such as asthma, rheumatoid arthritis, Parkinson’s disease, hepatitis and more.

Solving heart related problems: It containing adenosine, which is a naturally occurring compound that may have heart-protective effects.

Anti-aging property: Cordyceps contains polyphenols, which can act as antioxidants or help to boost antioxidant activity.

Controlling blood sugar level: Cordyceps could reduce blood sugar levels, which may be beneficial for individuals with type 2 Diabetes Mellitus. Cordyceps increases insulin resistance improving glucose metabolism.

VII. CORDYCEPS FOR ANTI-CANCER TREATMENT

Nucleosides are molecules containing a five-carbon sugar and a nitrogenous base. *Cordyceps Sinensis* is a major source of nucleoside. Such molecules are highly required for anti-cancer treatment. The most important of these is Cordycepin (3-deoxyadenosine). In addition, adenosine, inosine, adenine, cytosine, cytidine, uridine, guanine, uracil, thymidine, guanosine, and hypoxanthine are also found in *Cordyceps Sinensis*. The cordycepin has many properties including pro apoptosis, anti-proliferation,

and anti-metastasis. Thus, Cordyceps prove to be a promising anti-cancer drug. Through the studies in Human by H Tomadaki, Sorilas, Siapilis and Havardaki it came to know that Cordyceps has ability to reduce the activity of PAP in leukemia. Furthermore, it was also known that Cordyceps exhibits direct cytotoxic activity against a variety of tumour cells, including carcinoma, B16 melanoma, lymphocytic, prostate, breast, hepatocellular and colon cancer.

VIII. CONCLUSION

Through our studies, we conclude that *Cordyceps sinensis* is possibly “Mruthasanjeevani”. As we already know, Sanjeevani was discovered in the 8th century BC; at that time, there was no specific classification for fungi, algae, and more. Thus, there are chances that cordyceps was confused as a plant. Also, among all the other plants, including *Selaginella bryopteris*, *Dendrobium plicatile*, *Cressa cretica* which claimed to be Mruthasanjeevani, does not completely satisfy the properties of Sanjeevani as described in Ramayana. However, *Cordyceps sinensis* has properties that are quite similar to Sanjeevani including its capability to glow in dark and its colour which shines like fire. Also, it could be a promising Component for treating deadly diseases like cancer. Even the life cycle of Cordyceps shows that it has the capability to provide life after death because it parasitizes on dead larvae of Himalayan ghost moths. Apart from that, it also has many ayurvedic properties, including anti-inflammatory and athletic properties, boosting immune system, improving liver-related, heart-related problems, boosting sexual activities. However, detailed studies are needed to find out the dosage forms it could be used in.

REFERENCES

- [1]. Balasubramanian D (2016). In search of the Sanjeevani plant of Ramayana. The Hindu. Retrieved on 29 July 2016. Online available at [www.thehindu.com/scitech/science/In-search-of-the-Sanjeevani-plant of Ramayana/article16880681.ece](http://www.thehindu.com/scitech/science/In-search-of-the-Sanjeevani-plant-of-Ramayana/article16880681.ece)
- [2]. Antony R, Thomas R. 2011. A mini review on medicinal properties of the resurrecting plant *Selaginella bryopteris* (Sanjeevani). *Int J Pharm Life Sci.* 2(7):933-939.
- [3]. K. N. Ganeshaiah, R. Vasudeva and R. Uma Shaanker published in *Current Science* Vol. 97, No. 4 (25 August 2009), pp. 484-489 (6 pages)
- [4]. Peter Xin Chen , Sunan Wang. Properties of *Cordyceps Sinensis*: A review. 2013 Mar 21;5(2):550–569
- [5]. Akaki J., Matsui Y., Kojima H., Nakajima S., Kamei K., Tamesada M. Structural analysis of monocyte activation constituents in cultured mycelia of *Cordyceps sinensis*. *Fitoterapia.* 2009;80:182–187. doi: 10.1016/j.fitote.2009.01.007.
- [6]. Armbruster D.A., Terry P. Limit of blank, limit of detection and limit of quantitation. *Clinical Biochemical Review.* 2008;29:S49–S52.
- [7]. Balon, T. W., Jasman, A. P., and Zhu, J.-S. (2002). A fermentation product of *Cordyceps sinensis* increases whole-body insulin sensitivity in rats. *J. Alternative Compl. Med.* 8, 315–323. doi:10.1089/107628002761574581
- [8]. Youngjie Zhang, Erwei Li. *Ophiocordyceps sinensis*, the flagship fungus of China: terminology, life strategy and ecology. 02 Feb 2012. doi.org/10.1080/21501203.2011.654354.
- [9]. An , ZQ , Wang , CS , Liu , XZ and Bennett , JW. 2010 . China's fungal genomics initiative: a whitepaper . *Mycology* , 1 (1) : 1 – 8 .
- [10]. Buenz , EJ , Bauer , BA , Osmundson , TW and Motley , TJ. 2005 .The traditional Chinese medicine *Cordyceps sinensis* and its effects on apoptotic homeostasis. *J Ethnopharmacology.* , 96 (1-2) : 19 – 29.
- [11]. An , ZQ , Wang , CS , Liu , XZ and Bennett , JW. 2010 . China's fungal genomics initiative: a whitepaper . *Mycology* , 1 (1) : 1 – 8 .
- [12]. Zhong S, Pan H, Fan L, Lv G, Wu Y, Parmeswaran B, et al. Advances in research of polysaccharides in *Cordyceps* species. *Food Technol Biotechnol.* 2009;47:304–12.
- [13]. Shrestha B, Zhang W, Zhang Y, Liu X. What is the Chinese caterpillar fungus *Ophiocordyceps sinensis* (Ophiocordycipitaceae)? *Mycology.* 2010;1:228–36.
- [14]. Anyu, Anawinla Ta; Zhang, Wen-Hui; Xu, Qi-He cultivated *Cordyceps* : A Tale of two Treasured Mushrooms 4(4):p 221-227, Oct–Dec 2021.
- [15]. Anyu, Anawinla Ta; Zhang, Wen-Hui; Xu, Qi-He cultivated *Cordyceps* : A Tale of two

- Treasured Mushrooms 4(4):p 221-227, Oct–Dec 2021.
- [16]. Olatunji OJ, Tang J, Tola A, Auberon F, Oluwaniyi O, Ouyang Z The genus *Cordyceps*: An extensive review of its traditional uses, phytochemistry and pharmacology *Fitoterapia* 2018 129 293 316
- [17]. National Pharmacopeial Commission. Pharmacopeia of the People's Republic of China. Vol. 1 Beijing China Health Press 2020 119 Chinese
- [18]. Xu J, Huang Y, Chen XX, Zheng SC, Chen P, Mo MH The mechanisms of pharmacological activities of *Ophiocordyceps sinensis* fungi *Phytother Res* 2016 30 1572 83