

Mini Review


Chemical compounds and health benefits of Tremella, a valued mushroom as both cuisine and medicine in ancient China and modern era

Mohamad Hesam Shahrajabian¹ , Wenli Sun¹, Hong Shen³, Qi Cheng^{1,2*}

1 Biotechnology Research Institute, Chinese Academy of Agricultural Sciences, Beijing 100081, China

2 College of Life Sciences, Hebei Agricultural University, Baoding, Hebei, 071000, China; Global Alliance of HeBAU-CLS&HeQiS for BioAI-Manufacturing, Baoding, Hebei 071000, China

3 NMPA Key laboratory for Testing and Risk Warning of Pharmaceutical Microbiology, Biological Inspection Department, Zhejiang Institute for Food and Drug Control, Hangzhou 310052, China

Received: 08 June, 2020. Accepted: 18 July, 2020

First published on the web November, 2020

Doi: 10.26545/ajpr.2020.b00077x

Abstract

For many years, traditional Chinese medicine has used mushrooms to treat various ailments. Tremella mushroom is also famous as snow mushroom, silder ear mushroom, snow fungus or white jelly mushroom. This review is focused on pharmacological and pharmaceutical uses of Tremella in modern and traditional sciences. Tremella fuciformis is a species of fungus; it produces white, frond-like, gelatinous basidiocarps. The most important tremella mushroom benefits are anti-aging, anti-inflammatory, lower cholesterol, combat obesity, protect nerves and may fight cancer. The most powerful nutritional constituents of Tremella are amino acids, vitamins, minerals, polysaccharides, Glucurmomannan 1,3-alpha-glucan, Epitope 9beta-D-glucuronosyl), Glucuronic acid, Glucurmic acid, Glucuronoxylomannan, N-acetylglucosamine, Flavonoids, Polyphenols, Alkaloids and Organic acids. Functional foods are making inroads into Chinese diets with their promises to improve health and nutrition. Chinese consumers should choose nutritional and healthy food to maintain general health and reduce the risk of health problems. Nutrition therapy on the basis of traditional Chinese medicine such tremella is quite effective at treating common diseases.

Key-words: Traditional Chinese Medicine, Tremella, Ancient Beauty, Super-Food

Introduction

Traditional Chinese medicine (TCM) has played a positive role in the management of so many diseases (Ogbaji et al., 2019; Shahrajabian et al., 2018; Shahrajabian et al., 2019a,b,c; Sun et al., 2019). TCM is an empirical healthcare system based on human experience dating back several thousand years ago and stands out as the only one with long history among the worlds traditional

medical system (Ogbaji et al., 2013; Soleymani and Shahrajabian, 2018; Shahrajabian et al., 2019e,f,g,h). The most important parameter is providing healthy diets for the decades to come in a world with rapid population growth (Soleymani and Shahrajabian, 2012; Shahrajabian et al., 2019i,j; Shahrajabian et al., 2020a,b,c; Sun et al., 2020a,b,c). Tremella mushroom is also famous

✉ Qi Cheng
E-mail: chengqi@caas.cn

snow mushroom, silver ear mushroom, snow fungus or white jelly mushroom. According to Chinese history, the use of Tremella as a fountain of youth goes back to the Tang Dynasty, and in traditional Chinese medicine (TCM), it is believed to have various benefits for the body. Tremella fuciformis is a species of fungus; it produces white, frond-like, gelatinous basidiocarps. Tremella is commercially cultivated and is one of the most important fungi in the cuisine and medicine of China. The aim of this review is survey on traditional use of Tremella by Chinese and other Asian herbalists and its role in modern pharmaceutical science.

Tremella

Origin, Chemical Constituents and Health Benefits

Tremella is a genus of fungi in the family Tremellaceae. Over 100 species of Tremella are currently recognized worldwide (Han et al., 2015). Two species, Tremella fuciformis and Tremella aurantialba, are commercially cultivated for food. It is rich in polysaccharides, triterpenoids, protein, dietary fiber, vitamins and chitin (Zhang et al., 2011). Tremella was one of the original genera created by Linnaeus in his Species Plantarum of 1753. The name comes from the latin tremere meaning to tremble (Liu and Wu, 2019). Linnaeus placed Tremella in the algae, including within it a variety of gelatinous growth, including seaweeds, cyanobacteria and myxomycetes as well as fungi (Ruan et al., 2018). Tremella fuciformis is one of the great superfood mushrooms and longevity tonic herbs in traditional Chinese medicine (TCM). It is use dates back as far as 200 A.D. when it was including in one of the earliest TCM classics- the material by Shen Nong ben Cao Jing, the father of Chinese medicine. In ancient times, like many of the other revered medicinal mushrooms such as Reishi and Cordyceps sinensis, Tremella was only reserved for royalty, ruling family members or for rich people who could afford this highly valued superfood (Wu et al., 2019). Tremella mushroom belongs to the jelly fungus family and has many different names. In Chinese, it is called silver ear mushroom, white wood-ear mushroom and in Japanese, it is called shiro kikurage which

translates to white tree jellyfish. It is also commonly known as snow fungus, and the beauty mushroom. Tremella has been a popular staple of Chinese cuisine for centuries, rich in dietary fibers, protein, minerals, antioxidants, and high in vitamin D. Its used in China in a variety of dishes from anti-aging soups to desserts. Tremella has traditionally been used by Chinese and Japanese herbalists as a potent Jing and Chi (Qi) tonic for thousands of years. It is believed to nourish the lungs, kidneys, heart, brain, stomach, and acts as a powerful tonic for the immune system. Tremella has been clinically used to help clear heat and dryness, replenish fluids in the body (Yin deficiency), to treat chest congestion, asthma, constipation, balance blood sugar levels and cholesterol (reduces LDL), and lower inflammation. Its rehydration and fluid replenishment qualities may be the best reasons to support its claims as one of the best beauty foods for the skin. In ancient China, Yang Guidei was one of the Four Great Beauties, an imperial concubine that is considered one of the most beautiful women in Chinese history. She used it regularly to maintain her glowing complexion and youthful skin. Tremella ,s polysaccharides also stimulates the production of superoxide dismutase (SOD) in the brain and liver. SOD is one of the most important super antioxidant enzymes in the body. SOD helps to protect and regenerate skin and effectively prevent wrinkling and sagging of the skin. Tremella consists of lots of vitamin D, lots of protein, and also contain other vitamins, minerals, immune boosting polysaccharides, trace minerals, carbs, and a little fat (Kuot et al., 2015). Wang et al. (2015) reported that Tremella polysaccharides (TP) are the major component and activity unit of Tremella. Park et al. (2007) concluded that T. fuciformis might potentially be used as a precautionary agent in neurodegenerative disease, such as Alzheimer disease. Shen et al. (2017) indicated that Tremella fuciformis polysaccharide (TFPS) alleviated hydrogen peroxide-induced oxidative stress and apoptosis in skin fibroblasts via upregulation of SIRT1 expression, indicating that TFPS may act as a potential therapeutic agent for oxidative agent for oxidative-stress-associated skin diseases and aging. Results of the GC-MS analysis of the constituent oil from T. fuciformis is shown in Table 1. Composition of Tremella

polysaccharides is presented in Table 2. The most famous beauty and skin enhancing properties of Tremella mushroom is presented in Table 3.

Proven health benefits of Tremells is shown in Table 4.

Table 1. Results of the GC-MS analysis of the constituent oils from *T. fuciformis* (Ohiri, 2017).

S/N	Compound	Retention time (min)	Percentage of the total	Molecular formula	Molecular weight (g/mol)
1	9,19-Cyclolanost-24-en-3-ol, (3.beta)-	20.766 24.672	32.681	C ₃₂ H ₅₂ O ₂	468.754
2	Lanosterol	21.079 23.034	17.845	C ₃₀ H ₅₀ O	426.710
3	Acetic acid, 7-Isopropenyl-1,4a-dimethyl-3-oxo-2,3,4,4a,5,6,7,8-octahydronaphthalen-2-yl ester	22.42	21.334	C ₁₇ H ₂₆ O ₄	294.390
4	2(1H)Naphthalenone, 3,5,6,7,8,8a-hexahydro4,8a-dimethyl-6-(1-methylethenyl)-	22.560	9.609	C ₁₅ H ₂₂ O	218.335
5	Lupeol	22.825 23.230	18.531	C ₃₀ H ₅₀ O	426.729

Table 2. Composition of *Tremella* polysaccharides (Khondkar, 2009).

Organism	Moisture content (%)	Ash content (%)	Protein content (%) a	Protein content (%) b	Acetyl group content (%)	Carbohydrate content (%)
<i>T. fuciformis</i> (TFU)	11.4 (±0.1)	3.4 (±0.2)	5.7 (±0.2)	0.8 (±0.1)	2.9 (±0.1)	76.6 (±0.0)

Table 3. The most famous beauty and skin enhancing properties of Tremella mushroom.

1- Nourishes Skin
2- Naturally Moisturises
3- Improves Elasticity
4- Slows Skin Aging
5- Brightens Complexion
6- Deeply Hydrates Inside and Out

Table 4. Proven health benefits of Tremella mushrooms.

-
- 1- Creates youthful skin
 - 2- Improved memory and learning capabilities
 - 3- Lowers Cholesterol
 - 4- Neurological Damage Repair
 - 5- Lowers Blood Sugar
 - 6- Anti-inflammatory for the Skin and Whole Body
 - 7- Great for Chronic Coughs
 - 8- Cancer
 - 9- Protects the Liver
 - 10- Prevents Osteoporosis
 - 11- Stomach Health
 - 12- Intestinal Health
 - 13- Weight Loss
 - 14- Protects the Circulatory System
 - 15- Anti-Aging Agent
-

Conclusion and recommendation

Traditional Chinese medicine is an important part of the health care system in most Asian countries, relies on natural products and has been playing a significant role in health protection and disease control for many years. Tremella use dates back as far as 200 A.D. when it was including in one of the earliest TCM classics- the material by Shen Nong ben Cao Jing, the father of Chinese medicine. Tremella has been a popular staple of Chinese cuisine for centuries, rich in dietary fibers, protein, minerals, antioxidants, and high in vitamin D. Its used in China in a variety of dishes from anti-aging soups to desserts. Tremella has traditionally been used by Chinese and Japanese herbalists as a potent Jing and Chi (Qi) tonic for thousands of years. It is believed to nourish the lungs, kidneys, heart, brain, stomach, and acts as a powerful tonic for the immune system. Tremella has been clinically used to help clear heat and dryness, replenish fluids in the body (Yin deficiency), to treat chest congestion, asthma, constipation, balance blood sugar levels and cholesterol (reduces LDL), and lower inflammation. Traditional Chinese Medicine included fruits and herbs are increasingly and extensively used by a substantial part of the population. Jujube has numerous important pharmacological activities and it can be considered as a valuable source of nutraceuticals.

Conflict of interest: The authors declared that there was no conflict of interests regarding the publication of this paper.

References

- Han CK, Chiang HS, Lin CY, Tang CH, Lee H, Huang DD, Zeng YR, Chuang TN, Huang YL. 2015. Comparison of immunomodulatory and anticancer activities in different strains of Tremella fuciformis Berk. *Am J Chin Med* 43(8):1637-1655
- Khondkar P. 2009. Composition and partial structure characterization of Tremella Polysaccharides. *Mycobiol* 37(4):286-294
- Kuot CC, Chen HH, Chiang W. 2015. Adlay (yi yi; soft-shelled job ,s tears; The seeds of Coix lachrymal-jobi L. Var. Ma-yuen stapf) is a potential cancer chemopreventive agent toward multistage carcinogenesis processes. *J Tradit Complement Med* 2:267-275
- Liu FJ, Wu XZ. 2019. Advances in research on anti-tumor of Coix seed. *Precis Med Res*; 1(2):37-43
- Ogbaji PO, Shahrajabian MH, Xue X. 2013. Changes in germination and primarily growth of three cultivars of tomato under diatomite and soil materials in auto-irrigation system. *Int J Biol* 5(3):80-84
- Ogbaji PO, Li J, Xue X, Shahrajabian MH, Egrinya EA. 2018. Impact of bio-fertilizer or nutrient

- solution on spinach (*Spinacea Oleracea*) growth and yield in some province soils of P.R. Chin. *Cecetari Agronomice in Moldova* 2(174):43-52
- Ohiri RC. 2017. GC/MS analysis of tremella fuciformis (white jelly mushrooms) oil. *Ukr Biochem J* 89(N3)
- Park KJ, Lee SY, Kim HS, Yamazaki M, Chiba K, Ha HC. 2007. The neuroprotective and neurotrophic effects of Tremella fuciformis in PC12h cells. *Mycobiol* 23(1):11-15
- Ruan Y, Li H, Pu L, Shen T, Jin Z. 2018. Tremella fuciformis polysaccharides attenuate oxidative stress and inflammation in macrophages through miR-155. *Anal Cell Patho Article ID 5762371*, 10 pages
- Shahrajabian MH, Sun W, Cheng Q. 2018. A review of goji berry (*Lycium barbarum*) in traditional Chinese medicine as a promising organic superfood and superfruit in modern industry. *Academia Journal of Medicinal Plants* 6(12):437-445
- Shahrajabian MH, Sun W, Cheng Q. 2019a. The power of natural Chinese medicine, ginger and ginseng root in an organic life. *Middle-East Journal of Scientific Research* 27(1):64-71
- Shahrajabian MH, Sun W, Cheng Q. 2019b. Clinical aspects and health benefits of ginger (*Zingiber officinale*) in both traditional Chinese medicine and modern industry. *Acta Agriculturae Scandinavica, Section B- Soil & Plant Science*
- Shahrajabian MH, Sun W, Cheng Q. 2019c. A review of ginseng species in different regions as a multipurpose herb in traditional Chinese medicine, modern herbology and pharmacological science *J Med Plant Res*; 13(10):213-226
- Shahrajabian MH, Sun W, Cheng Q. 2019d. Modern pharmacological actions of Longan fruits and their usages in traditional herbal remedies. *J Med Plants Stud* 7(4):179-185
- Shahrajabian MH, Sun W, Cheng Q. 2019e. The influence of traditional Iranian and Chinese medicine on western and Islamic countries. *Asian J Med Biol Res* 5(2):94-99
- Shahrajabian MH, Sun W, Cheng Q. 2019f. DNA methylation as the most important content of epigenetics in traditional Chinese herbal medicine. *J Med Plant Res* 13(16):357-369
- Shahrajabian MH, Sun W, Cheng Q. 2019g. Tremendous health benefits and clinical aspects of Smilax China. *Afr J Pharm Pharmaco* 13(16):253-258
- Shahrajabian MH, Sun W, Zandi P, Cheng Q. 2019h. A review of Chrysanthemum, the eastern queen in traditional Chinese medicine with healing power in modern pharmaceutical sciences *Appl Ecol Env Res* 17(6):13355-13369
- Shahrajabian MH, Sun W, Cheng Q. 2019i. A review of Astragalus species as foodstuffs, dietary supplements, a traditional Chinese medicine and a part of modern pharmaceutical science *Appl Ecol Env Res* 17(6):13371-13382
- Shahrajabian MH, Sun W, Cheng Q. 2019j. Chinese star anise, magic herbs in traditional Chinese medicine and modern pharmaceutical science *Asian J Med Biol Res* 5(3):162-179.
- Shahrajabian MH, Khoshkham M, Zandi P, Sun W, Cheng Q. 2020a. The influence of temperatures on germination and seedling growth of Pyrethrum (*Tanacetum Cinerariifolium*) under drought stress *Int J Adv Biol Biomed Res*; 8(1): 29-39
- Shahrajabian, M. H., Sun, W., and Cheng, Q. 2020b. Chinese star anise (*Illicium verum*) and pyrethrum (*Chrysanthemum cinerariifolium*) as natural alternatives for organic farming and health care- A review. *Australian Journal of Crop Science* 14(03): 517-523
- Shahrajabian, M. H., Sun, W., Shen, H., and Cheng, H. 2020c. Chinese herbal medicine for SARS and SARS-CoV-2 treatment and prevention, encouraging using herbal medicine for COVID-19 outbreak. *Acta Agriculturae Scandinavica, section B- Soil & Plant Science*. DOI: 10.1080/09064710.2020.1763448
- Shen T, Duan C, Chen B, Li M, Ruan Y, Xu D, Shi D, Yu D, Li J, Wang C. 2017. Tremella fuciformis polysaccharide suppresses hydrogen peroxide-triggered injury of human skin fibroblasts via upregulation of SIRT1. *Mol Med Rep* 16:1340-1346
- Soleymani A, Shahrajabian MH. 2018. Changes in germination and seedling growth of different cultivars of cumin to drought stress. *Cercetari Agronomice in Moldova* 51(1):91-100
- Soleymani A, Shahrajabian MH. 2012. Response of different cultivars of fennel (*Foeniculum*

- vulgare*) to irrigation and planting dates in Isfahan Iran. *Res Crops* 13(2):656-660
- Sun W, Shahrajabian MH, Cheng Q. 2019. Anise (*Pimpinella anisum* L.), a dominant spice and traditional medicinal herb for both food and medicinal purposes. *Cogent Biol* 5:1-25
- Sun W, Shahrajabian MH, Huang Q. 2020a. Soybean seeds treated with single walled carbon nanotubes (SwCNTs) showed enhanced drought tolerance during germination. *Int J Adv Biol Biomed Res* 8(1):9-16
- Sun, W., Shahrajabian, M. H., Khoshkaram, M., Shen, H., and Cheng, Q. 2020b. Cultivation of cotton in China and Iran with considering biological activities and its health benefits. *Cercetari Agronomice in Moldova* 1(181): 105-120
- Sun, W., Shahrajabian, M. H., Khoshkaram, M., and Cheng, Q. 2020c. Adaptation of acupuncture and traditional Chinese herbal medicines models because of climate change. *Journal of Stress Physiology and Biochemistry* 16(1): 85-90
- Zhang Y, Pei L, Gao L, Huang Q, Qi J. 2011. A neurotogenic compound from *Tremella fuciformis*. *Zhongguo Zhong Yao Za Zhi* 36:2358-2369
- Wu YJ, Wei ZX, Zhang FM, Linhardt RJ, Sun PL, Zhang AQ. 2019. Structure, bioactivities and applications of the polysaccharides from *Tremella fuciformis* mushroom: a review. *Int J Biol Macromole* 121:1005-1010
- Wang R, Cao H, Zhang J. 2015. Scientific explorations of the snow fungus (*Tremella fuciformis* Berk.) in republican China: A brief review. *Indian J Hist Sci* 50(2):340-344

Cite this article as:

Mohamad Hesam Shahrajabian, Wenli Sun, Hong Shen, Qi Cheng. 2020. Chemical compounds and health benefits of *Tremella*, a valued mushroom as both cuisine and medicine in ancient China and modern era. **Amaz. Jour. of Plant Resear.** 4(3): 692-697.

Submit your manuscript at
[https:// www.ajpr.online](https://www.ajpr.online)