Research Progress on Chemical Constituents and Pharmacological Effects of Atractylodes Chinensis

Qianxin Xue[1], Zhijie Zhou[1], Xin YIN[1], Ang LI[2], Haocheng Chang[3], Guangwei Mang[1], Xiaohe Duan[1]

[1]Chengde Academy of Agricultural and Forestry Sciences, Chengde City, Hebei 067000, China

[2]Agricultural Technology Center of China Association for Science and Technology, Beijing 100000, China

[3]byd Company Limited, Chengde City, Hebei 067000, China

Keywords: Atractylodes chinensis, Chemical constituents, Pharmacological effects

Abstract: Atractylodes chinensis is a kind of crude drug in traditional Chinese medicine, mainly distributed in Heilongjiang, Liaoning, Jilin, Inner Mongolia, Hebei and other places, with a variety of chemical components and pharmacological effects. This paper reviews the research progress of chemical constituents and pharmacological effects of Atractylodes chinensis, providing a theoretical basis for the follow-up research and clinical rational drug use of Atractylodes chinensis.

1. Introduction

The chemical composition of Chinese herbal medicine is relatively complex, but it is these complex chemical components that directly affect the clinical efficacy. Therefore, the systematic analysis and research on the chemical composition and pharmacological effects of Chinese herbal medicine is of great significance for the better use of Chinese herbal medicine in clinical practice.

Atractylodes was included as dry rhizome of Atractylodes lancea (Thunb.) DC. or Atractylodes chinensis (DC.) Koidz. in Pharmacopoeia of the People's Republic of China (2020 Edition), mainly used to dry dampness and invigorate spleen, dispel wind and disperse cold, and clear eyes. It is also used to treat dampness obstructing the center burner, abdominal distension, diarrhea, edema, flaccidity of feet, rheumatism, cold, night blindness, and blurred eyes [1]. Atractylodes chinensis is mainly distributed in Heilongjiang, Liaoning, Jilin, Inner Mongolia, Hebei and other places, and the content of atractylodin in Atractylodes chinensis produced in Chengde is better than that in Inner Mongolia and Liaoning [2].

2. Chemical Constituents of Atractylodes Chinensis

The main chemical constituents of Atractylodes chinensis are terpenoids, polyene alkynes, steroids and acyl sugarcane. In addition, it also contains phenylpropanopyrans, benzoquinones, coumarins, phenolic acids, furaldehyde, alcohol glycosides, nucleosides and other derivatives.

2.1 Terpenoids

According to modern research reports, the chemical constituents of Atractylodes chinensis are mainly terpenoids, including eucalyptus sesquiterpenes, guaiacane sesquiterpenes, vetiverspirane sesquiterpenes, menthol type sesquiterpenes, oleanol pentacyclic triterpenes, ursolic pentacyclic triterpenes, betulinan pentacyclic triterpenes, and irimophene type sesquiterpenes [3].

2.2 Polyene Alkynes

It has been reported that many polyene alkynes in Atractylodes chinensis are 4,6-diynes, which can be divided into C10 enyne, C13 enyne, C14 enyne, furan ring polyene and thiophene ring polyene.

  DOI: 10.25236/medsbe.2020.016

2.3 Steroids

The reported steroids in Atractylodes chinensis are relatively few. Ding and some others isolated two steroids from the acetone extract of Atractylodes chinensis [4].

2.4 Acyl Sucrose

Tanaka and some others analyzed and studied the water extract of Atractylodes chinensis by liquid chromatography-mass spectrometry, and obtained 6 chromatographic peaks of acyl sugarcane derivatives. After separation and purification by column chromatography, three new chemical components of acyl sucrose were identified and resolved [5].

2.5 Other Constituents

In addition, in Atractylodes chinensis, the chemical constituents reported also include lignans, coumarins, alkaloids, glycosides, nucleosides and other derivatives.

3. Pharmacological Effects of Atractylodes Chinensis

3.1 Effects on Digestive System

Zhang Mingfa and some others found that the main pharmacological effects of Atractylodes chinensis on digestive system include anti gastric ulcer, promoting gastric emptying, regulating gastrointestinal propulsion movement, anti-diarrhea, cholagogic and liver protection, and improving digestion and absorption function [6].

Zhao Chunying and some others found that the alcohol extract of Atractylodes chinensis could inhibit the formation of ulcer in mice by gavage in mice with 5 g / kg and 15 g / kg of Atractylodes chinensis [7].

3.2 Effects on Liver Protection

Atractylodes chinensis in clinical application of traditional Chinese medicine generally does not need raw products. It is used for clinical application after stir frying with bran. Modern pharmacological studies have found that volatile oil of both Atractylodes chinensis and stir fried Atractylodes with bran had pharmacological effects on liver protection, and after bran frying, the liver protective effect of volatile oil is enhanced [8]. Tasis and some others found that both water extract and volatile oil of Atractylodes chinensis showed positive effect on liver protection, and the effect of volatile oil is stronger than that of water extract [9].

3.3 Effects on Antibacterial and Anti-Inflammatory

Through research, Zhang Mingfa and some others found that the 75% alcohol extract of Atractylodes chinensis can inhibit the ear swelling caused by xylene and the toe swelling caused by carrageenan [10].

3.3 Effects on Cardiovascular and Cerebrovascular System

Chen Hongyuan and some others reported that the water extract of Atractylodes chinensis after extraction with petroleum ether, ethyl hexanoate and acetone showed obvious inhibitory effect on angiotensin inhibitory enzyme [11]. Xu Yongjun and others found that the ethyl acetate extract of Atractylodes chinensis can promote the recovery of EEG amplitude after ischemia, reduce the content of MDA and intracellular Ca2 + concentration in brain cells, improve the activity of serum SOD, and reduce the pathological changes of brain tissue, showing that the extract has protective effect on cerebral ischemia-reperfusion injury, and the mechanism may be related to anti oxygen

free radicals and inhibition of calcium overload [12].

3.4 Other Pharmacological Effects

In addition to the above pharmacological effects, Atractylodes chinensis also shows other pharmacological activities, such as antitumor, analgesic, immunomodulatory, diuretic and so on.

4. Conclusion

To sum up, modern pharmacological studies show that Atractylodes chinensis has positive pharmacological activities in gastric peristalsis promotion, anti-gastric ulcer, liver protection, anti-inflammatory, anti-cardiovascular and cerebrovascular diseases, hypoglycemic and other aspects. At present, the research on chemical constituents and pharmacological activities of Atractylodes chinensis is not enough, and the research on the mechanism of effective components needs to be further strengthened. Therefore, it is of great significance for clinical rational drug use and scientific development of traditional Chinese medicine resources to further combine and study the effective ingredients and pharmacological mechanism of Atractylodes chinensis.

5. Acknowledgment

The authors acknowledge the Special Fund for the Science and Technology Research and Development Program of Chengde city, Hebei Province (201902B001).

References

[1] Chinese Pharmacopoeia Commission. Pharmacopoeia of the People's Republic of China [S]. Volume I. Beijing: China Medical Science Press, pp.168-169.2020.

[2] Li Wanjuan, Guo Yanling, Shang Chunli, et al. Analysis of Chemical Constituents of Atractylodes chinensis Rhizome by GC-MS [J]. Chinese Journal of Experimental Traditional Medical Formulae, vol.6, no.22, pp.66-70, 2016.

[3] Resch M, Steigel A, Chen ZL, et al. 5-Lipoxygenase and cyclooxygenase-l inhibitory active compounds from Atracylodes lancea [J]. J. Nat. Prod., vol.61, no.3, pp.347-350, 1998.

[4] Ding HY, Wu YC, Lin HC. Phytochemical and pharmacological studies on Chinese Changzhu [J]. J. Chin. Chem. Soc-Taip, no.47, pp.561-566, 2000.

[5] Tanaka K, Ina A. Structure elucidation of acylsucrose derivatives from Atractylodes lancea rhizome and Atractylodes rhizome[J]. Nat. Prod. Commun., vol.4, no.8, pp.1095-1098, 2009.

[6] Zhang Mingfa, Shen Yaqin. Research progress on pharmacologic action of Atractylodis Rhizoma and its effective constituent in in digestive system [J]. Drug Evaluation Research, no.3, pp.411-419, 2017.

[7] Zhao Chunying, Mao Xiaoxia. Research progress on chemical constituents and pharmacological effects of Atractylodes lancea [J]. Journal of Chengde Medical College, no.3, pp.309-311, 2010.

[8] Sha Duoyi, Hang Yongfu, Song Fei, et al. Study on the Protecting-liver Effect of Volatile Oil of pre and post Processing Cangzhu [J]. Research and Practice on Chinese Medicines, vol.24, no.4, pp.41-43, 2010.

[9] Tasis, Zhang Jie, Hang Yongfu, et al. Hepatoprotective Activity of Atractylodes chinensis (DC.) Koidz Water Extract and Polysaccharides against CCl4-Induced Acute Liver Injury in Mice [J]. Research and Practice on Chinese Medicines, vol.25, no.3, pp.45-47, 2011.

[10] Zhang Mingfa, Shen Yaqin. Advances in studies on anti-inflammation, antitumor, and

immunoregulation of Atractylodis Rhizoma [J] Drug Evaluation Research, vol.39, no.05, pp.885-886, 2016.

[11] Chen Hongyuan, Ming Zhiqiang, Li Xuegang, et al. Inhibitory activity of Atractylodes lancea extract on angiotensin converting enzyme [J]. Journal of Chongqing Technology and Business University (NATURAL SCIENCE EDITION), vol.25, no.4, pp.419-422, 2008.

[12] Xu Yongjun, Zhang Hongying. Protective effect of extract from Atractylodes Japonica on brain ischemia-reperfusion injury in rats [J]. China Journal of Modern Medicine, vol.19, no.22, pp.3398-3402, 2009.