

Study on Medicinal Plant Active Substances Extraction and Antibacterial Activity of *Houttuynia Cordata*

Ji Yubin¹, Yang Junjun¹, Yu Miao¹, Cao Yue¹, Guo Shizhen¹, Qiao Anna¹

¹Research Center on Life Science and Environmental Science, Harbin University of Commerce, Harbin 150076, China

E-mail: 245106141@qq.com

Abstract: This study was about the effective component extraction from *Houttuynia cordata* by steam distillation and antibacterial effect on *Escherichia coli*, *Staphylococcus aureus* and *Bacillus subtilis*. The extraction of *Herba Houttuyniae* extract of *Escherichia coli*, *Staphylococcus aureus* and *Bacillus subtilis* were certain inhibitory effect of, which inhibitory effect on *Staphylococcus aureus* the most obvious.

1. Introduction

Houttuynia cordata for the three grass plants with roots of the whole plant, fresh plants broken pungent smell, widely distributed in central China, southeast and southwest provinces, especially in Hubei, Hunan, Jiangsu, Sichuan and other provinces^[1]. *Houttuynia* is rich in protein, vitamins, oils and other nutrients, is one of the commonly used wild vegetables; also has a heat detoxification, eliminate carbuncle pus, diuretic Tonglin and other effects, Chinese medicine used in lung abscess spit, phlegm Cough, heat dysentery, hot shower, carbuncle swollen sore and other diseases of the treatment, so the Ministry of Health has been officially identified as both a drug and food development potential of one of the plant resources.

Houttuynia has antibacterial effect, all kinds of microorganisms have inhibitory effect on *Staphylococcus aureus*, hemolytic *Streptococcus*, *Casecoccus*, pneumococcal influenza bacteria have a significant inhibitory effect. *Houttuynia* has antiviral effect, containing quercetin and isoquercitrin, quercetin and other flavonoids, have significant anti-inflammatory effect^[2]. *Houttuynia* active substances are anti-atherosclerosis, reduce diabetic rats kidney damage and other effects^[3].

1.1 Extraction of active substances from *Houttuynia cordata* Thunb: A certain amount of *Houttuynia* samples were ground, called 100.0g into the steam distillation device. Add water and heat for 4h; collect the distillate, pour the collected mixture into the separatory funnel, add a certain amount of water The amount of petroleum ether is extracted. Repeated water vapor distillation extraction multiple times combined with petroleum ether extract, filtered, vacuum evaporation to remove the solvent, you can get dark yellow extract, the extract is dry. The yield was calculated by weighing the extract with an electronic balance.

1.2 Antibacterial experiments: After the plate was solidified, the 0.1mL of the *E. coli* suspension was added to the plate with a sterile pipette, and the suspension was evenly coated on the plate using an applicator to prepare a plate containing *Escherichia coli*. The filter paper wafer with diameter of 6mm was dry heat sterilized for 2h, immersed in the sample for 30min on the sterile table, and the solvent



was evaporated and the filter paper was attached to the above-mentioned *E. coli*-containing plate. After 1 hour of incubation at room temperature, *E. coli* was placed in a 37°C incubator for 18-24h after incubation. In addition to *Staphylococcus aureus* and *Bacillus subtilis* antibacterial test operation *ibid.* After incubation for 18-24 h, remove the culture dish, open the lid of the culture dish, remove the filter paper with tweezers, and then cover the glass cover. Observe the occurrence of the inhibition zone and diameter, with a vernier caliper to cross the cross method to measure the diameter of the inhibition zone, record, and calculate the average diameter of the inhibition zone.

2.1 Experimental results and discussion

2.1.1 Extraction rate of active substance from *Houttuynia cordata* Thunb: *Houttuynia* after grinding water bath heating, steam distillation extraction 4h. The distillate was collected and the collected mixture was poured into a separatory funnel and added with a quantity of petroleum ether. Repeated water vapor distillation extraction several times, combined with petroleum ether extract, filtered, decompression rotary evaporation to remove the solvent, that is, *Houttuynia* active material extract. The results showed that 0.0392 g of the active substance could be extracted from 100.0 g of *Houttuynia cordata* under the best extraction condition by steam distillation. The extraction yield was 0.039%.

2.1.2 Antibacterial results of *Escherichia coli*: The effect of *Houttuynia cordata* active substance on *Escherichia coli* was studied. The extract of *Houttuynia cordata* was added to *Escherichia coli* by antibacterial experiment. The antibacterial effect was observed and the diameter of the inhibition zone was measured. The results are shown in the following table 1.

Table1. Bacteriostatic diameter of extract of *Houttuynia cordata* Thunb on *E. coli*

	Hc1	Hc2	C1	C2
Diameter1 /mm	9.2	9.3	0	0
Diameter2 /mm	9.5	8.6	0	0
Diameter3 /mm	8.9	9.2	0	0
Diameter4 /mm	8.7	8.3	0	0
Averagediameter/mm	9.0	8.8	0	0

The results showed that the average value of the extract of *Houttuynia cordata* active substance on *E. coli* was 8.9mm, which had certain antibacterial effect on *Escherichia coli*. The average diameter of bacteriostatic diameter of sterile water control group was 0mm, sterile water No inhibitory effect on *E. coli*. It can be seen, *Houttuynia* active substance extract on *E. coli* has antibacterial effect, sterile water no bacteriostatic effect.

2.1.3 *Staphylococcus aureus* test results: *Houttuynia cordata* active substance on *Staphylococcus aureus*, the *Houttuynia cordata* extract was added to *Staphylococcus aureus* by antibacterial experiment operation. The antibacterial effect was observed and the diameter of the inhibition zone was measured. The results are shown in the following table2.

Table2. Bacteriostatic diameter of extract of *Houttuynia cordata* Thunb on *Staphylococcus aureus*

	Hc1	Hc2	C1	C2
Diameter1 /mm	15.2	13.9	0	0
Diameter2 /mm	13.8	13.6	0	0
Diameter3 /mm	14.2	14.2	0	0
Diameter4 /mm	13.2	14.4	0	0
Averagediameter/mm	14.1	14.0	0	0

The results showed that the extract of *Houttuynia cordata* had some bacteriostatic effect on *Staphylococcus aureus* representing Gram-negative bacteria, and the antibacterial effect was obvious, and the antibacterial diameter was 14.1mm. The average bacteriostatic diameter of the sterile water control group was 0mm, which had no inhibitory effect on *Staphylococcus aureus*. It can be seen, *Houttuynia* active substances on *Staphylococcus aureus* have a better antibacterial effect, sterile water on *Staphylococcus aureus* no bacteriostatic effect.

2.1.4 Antibacterial results of *Bacillus subtilis*: The effect of extract of *Houttuynia cordata* on *Bacillus subtilis* was studied. The extract of *Houttuynia cordata* was added to *Bacillus subtilis* by antibacterial experiment. The bacteriostatic effect was observed and the diameter of the inhibition zone was measured. The results are shown in the following table3.

Table3. Bacteriostatic diameter of extract of *Houttuynia cordata* Thunb on *Bacillus subtilis*

	Hc1	Hc2	C1	C2
Diameter1 /mm	9.8	8.9	0	0
Diameter2 /mm	9.3	9.6	0	0
Diameter3 /mm	8.9	9.2	0	0
Diameter4 /mm	9.4	8.4	0	0
Averagediameter/mm	9.35	9.0	0	0

The results showed that the active substance of *Houttuynia cordata* had some bacteriostatic effect on *Bacillus subtilis* of Gram-positive bacteria, and the average diameter of antibacterial diameter was 9.1mm. The average diameter of antibacterial diameter of sterile water control group was 0mm, and it had no bacteriostatic effect on *Bacillus subtilis*. Thus, *Houttuynia* effective substances on *Bacillus subtilis* have antibacterial effect, sterile distilled water on *Bacillus subtilis* no bacteriostatic effect.

Houttuynia cordata extract on *E. coli*, *Staphylococcus aureus*, *Bacillus subtilis* have a certain antibacterial effect, antibacterial diameter of a certain difference, which *Staphylococcus aureus* antibacterial diameter of the largest, the most obvious antibacterial effect.

3. Conclusion

With the long-term use of organic chemical pesticides, many drawbacks are also increasingly prominent, such as bacterial resistance, environmental pollution, the harm to health, etc., has become a concern in society. Therefore, it is very important to develop new bioactive antimicrobial substances from medicinal plants and functional health substances, which is of great significance to the development of ecological agriculture, the maintenance of natural balance and the protection of human health^[4-5].

In this study, the extract of *Houttuynia cordata* Thunb was significantly inhibited by the extract of *Houttuynia cordata* Thunb. On the pathogen of three kinds of pathogens. It can provide theoretical basis and research for the preparation of products with *Houttuynia* as the main component in the future, but further research is needed for drug screening of specific pathogens.

References

- [1] Xu Xiaoyu. Pharmacology of Traditional Chinese Medicine [M]. Beijing: China Traditional Chinese Medicine Publishing House, 2010. 58-60.
- [2] Liu G, Xiang H, Zhng K, *et al.* Transcriptional and Functional Analysis Shows Sodium Houttuynifonate-Mediated Inhibition of Autolysis in *Staphylococcus aureus* [J]. *Molecules*, 2011, 16(10): 8848-8865.
- [3] Shin S, Joo SS, Jeon JH, *et al.* Anti-inflammtory effects of a Houttuynifonate cordate supercritical extract [J]. *J Vet Sci*, 2010, 11(3): 273-275.
- [4] ZHENG Yong-er. Study on the bactericidal condition of five kinds of traditional Chinese medicine

- extract [J] .Chinese Journal of Traditional Chinese Medicine, 2010, 2 (1): 49-51.
- [5] National Pharmacopoeia Commission. Chinese Pharmacopoeia (a) [S]. Beijing: China Medical Science and Technology Press, 2010: 331-332.