

Study on the Influence of Superfine Grinding and Additive Compound Technology on the Quality of Asparagus Flavone Hangover Relieving Chewable Tablets

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Abstract

Asparagus chewable tablets with the effect of alleviating alcoholic headache were prepared by using asparagus as the main raw material, ultra-fine crushing, wet granulation, tablet pressing and other processes with the addition of certain auxiliary materials. Based on the color, flavor, product appearance and tissue state of asparagus chewable tablets, the best raw material ratio of asparagus chewable tablets was determined. The asparagus chewable tablets prepared under this condition had the best taste and efficacy. Through the in-depth study on the processing formula and technology of asparagus chewable tablets, it provides a necessary theoretical basis for the functional value of the products.

Keywords

Asparagus; Tablet Pressing; Wet Granulation; Ultrafine Powder.

1. Introduction

Asparagus is a kind of Chinese herbal medicine with high medicinal value, and it is also one of the most representative antidotes traditional Chinese medicines in traditional Chinese medicine. Asparagus is rich in functional components such as asparagus and flavonoid glycosides. According to Compendium of Materia Medica, asparagus has the effect of clearing away heat and fire, and can effectively relieve hangover.

It has been proved in clinical trials by Miao Yanni [1] that asparagus can reduce the intake of ethanol by human body. The results of several acute and chronic toxicity tests show that asparagus is basically a non-toxic compound, and reasonable application will not have toxic effects on human health. Xue Jing stated in his research that natural active ingredients such as saponins [2], flavonoids and alkaloids can accelerate the metabolism of ethanol in human body, enhance the activity of ADH in liver and prevent alcoholic liver injury. Other pharmacological studies [3] have shown that the activities of ADH and ALDH in liver are influenced by isoflavones in asparagus, which can effectively relieve hangover after activation. Studies have proved that [4], isoflavones do have the effects of protecting liver, relieving hangover and resisting oxygen free radicals. Therefore, the isoflavones contained in wild asparagus and pueraria lobata flowers have good health care effect and broad market research and development value.

At present, the asparagus products in the market are mainly asparagus juice and asparagus flour products, and there is little research on the functional products for their anti-hangover effect. The development of chewable tablets is not only convenient to eat, but also has more remarkable curative effect compared with other functional products. Xu Kaixia [5] Based on the study of the hypoglycemic mechanism of asparagus, developed an asparagus chewable tablet, which has the main effects of lowering blood fat, reducing blood sugar and resisting oxidation. Li Jingjiu [6] developed a chewable tablet with *Pueraria lobata* as raw material by wet pressing technology. Zhang Li [5] has developed a *Cynomorium* flavone chewable tablet with health functions such as scavenging free radicals. However, the research and development of hangover-relieving chewable tablets aimed at relieving alcoholic headache in the market is rarely reported in the literature. Based on the extraction, separation and purification process of flavonoids from asparagus *Flos Puerariae Lobatae* and the study on the mechanism of alcoholic headache in the early stage, the formula and technological conditions of asparagus flavonoids chewable tablets were optimized, and a kind of asparagus flavonoids chewable tablets with hangover relieving effects such as alcoholic headache was prepared, which provided a new way for the development and utilization of asparagus.

2. Materials and Conditions

2.1 Experimental Material

Main ingredients: asparagus (Cao County, Shandong Province).

Accessories: borneol; Magnesium stearate (Huzhou Linghu Xinwang Chemical Limited Company); Corn starch (Linyi Economic Development Zone); 95 degrees corn edible alcohol.

(Henan Xin heyang Alcohol Limited Company); Xylitol (Nanjing Gan Juyuan Sugar Limited Company); Wheat bran (Zhangjiakou Kunji Trading Limited Company).

2.2 Instrument

YP5102 Electronic balance (Shanghai Guangzheng Medical Instrument Limited Company); Electric blast drying oven (Shanghai - Heng Scientific Instrument Limited Company); ZPS008 Rotary tablet Press (Shanghai Tian xiang jianhe Pharmaceutical Machinery Limited Company); Dpt-130 Drum aluminum-plastic bubble cover packaging machine (Shandong Jingcheng Medical Equipment Manufacturing Limited Company); Wzj-bj vibrating drug ultrafine mill (Jinan Bally Powder Technology Engineering Limited Company); Xo-sm200 Ultrasonic microwave combined Reaction System (Nanjing Xianou Instrument Manufacturing Limited Company).

3. Raw Material Preparation

3.1 Processing of Raw Materials and Accessories

The wild asparagus was cut into pieces and pulverized to make asparagus powder. The raw asparagus powder was ultrafine pulverized by ultrafine mill to obtain the ultrafine asparagus powder, which was sifted through 100 mesh and set aside. Using ultrasonic - microwave processing technology, asparagus ultrafine powder flavonoids extraction, extraction rate of asparagus flavonoids 37%.

The rest of the auxiliary materials are ground, 100 mesh sieve reserve.

3.2 Measuring the Selected

3.2.1 Ultrafine Powder of Asparagus

According to literature data [7], the optimal daily dosage of asparagus is 10-20g/ day. Considering the problem of regular use, a smaller value of 10g/ day is selected. The extraction rate of flavonoids in asparagus was 37%, so the content of asparagus in chewable tablets should be 3.7g. The content of asparagus extract powder in chewable tablets accounted for 40%, and the weight of chewable tablets was about 0.9g/ tablet after adding various auxiliary materials. The maximum daily dosage of adult should not exceed 10 tablets.

3.2.2 Stuffing Bulking Agent

The addition of filler can increase the volume and weight of chewable tablets, which is conducive to the production and molding of chewable tablets [8]. When wheat bran is used as filler, it is relatively simple and not suitable for pressing and forming. Therefore, wheat bran and corn starch are selected to be mixed in a certain proportion, and corn starch can play a better bonding role.

Different proportions of wheat bran and corn starch supplemental levels were set respectively, and powder sensation and chewable tablet crispness were taken as evaluation indexes. The results were shown in Table 1.

Table 1. Effects of different wheat bran and corn starch supplemental levels on the mouthfeel of chewable tablets

Index	Amount of wheat bran and corn starch added(%)			
	33 8	30 10	25 15	25 17
The powdery degrees	Obvious sense of powder	Obvious sense of powder	The entrance is fine and smooth	Powder feeling disappear
Brittleness	Severe sense of granules and poor mastication	Poor chewability	Good chewability	Crisp, Good chewability

With the increase of the amount of wheat bran and starch, the powder sensation of chewable tablets gradually weakened. When the amount of wheat bran and starch reached 25% and 17% respectively, the taste of chewable tablets was crisper, the mouth was delicate and smooth, and the preparation should be shaped.

3.2.3 Sweetening Agent

The taste of asparagus extract powder and wheat bran was poor, and the use of sweetener could effectively offset the bitter taste, so xylitol and borneol were selected as bitter taste correction to improve the taste of chewing tablets. The selected dosage of asparagus powder and filler were mixed according to the specified dosage, and the chewable tablets were prepared by wet granulation. The best dosage of sweetener was selected with refreshing and bitter taste as evaluation indexes.

The added levels of xylitol were 8%, 10%, 15% and 17% of the total quality, respectively. Sweet taste was taken as the main tasting index, and the results were shown in Table 2.

Table 2. Effects of different xylitol supplemental levels on the mouthfeel of chewable tablets

Index	Amount of xylitol added(%)			
	8	10	15	17
Sweetness	Bitterer	The bitter taste a bit back	Moderate sweetness	The sweetness of the top is strong

With the increase of the dosage of xylitol, the taste of chewable tablets was improved, but the excessive amount of xylitol would affect the taste. According to the sensory tasting results, the dosage of xylitol should be 15%.

On the basis of adding 15% xylitol, the added amount of borneol was selected as 1%, 2%, 5% and 9% of the total mass, respectively. The refreshing feeling was taken as the main tasting index, and the results were shown in Table 3.

Table 3. Effects of different borneol content on the mouthfeel of chewable tablets

Index	Borneol added amount(%)			
	1	2	5	9
Cool and refreshing degree	Bitter	Refreshing	Strong	Over strong

With the increase of the amount of borneol, the taste of refreshing gradually increased, but excessive amount of borneol will affect the taste, and the cool feeling is too strong. According to the tasting result, the amount of borneol should be 2%.

3.2.4 Lubricant

According to the paper search [6.9-12], most of the mature chewable tablets are prepared by adding 1% magnesium stearate. The test results show that adding 1% magnesium stearate can ensure good filling and even distribution of tablets while increasing the fluidity of particles.

4. Preparation Technology

The process of making asparagus chewable slices is as follows:

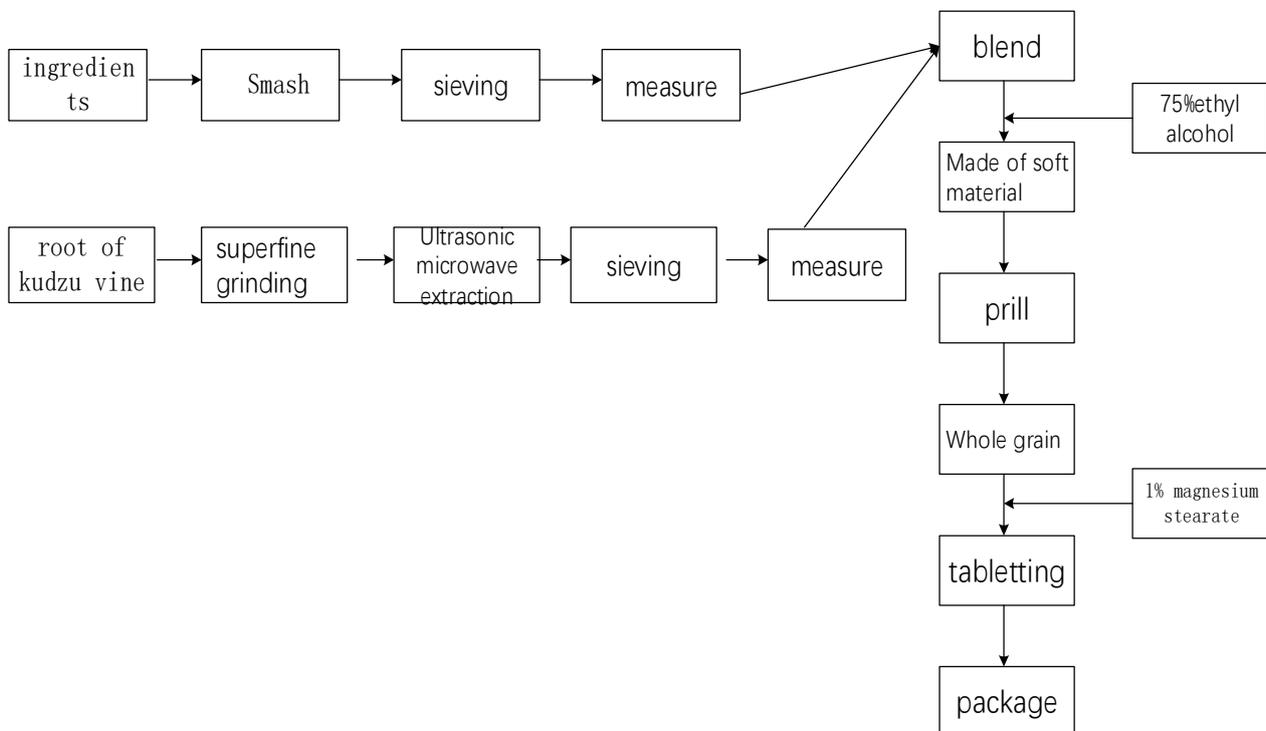


Figure 1. Production process

4.1 Key Points of Process Operation

4.1.1 Mixed Particle

Mix all ingredients except magnesium stearate at set ratio. Slowly spray 75% edible alcohol on the top of the mixed powder to condense the powder into a soft material that is soft and easy to disperse by hand. Soft material after 14 mesh sieves, evenly flat, set aside.

4.1.2 Desiccation

Put the soft material into the vacuum drying oven to dry, turn over every 30min, repeat six times, after drying the particle water content is kept at about 3% is appropriate.

4.1.3 Whole Grain

The dried particles were taken out through a 16-mesh sieve to obtain evenly dispersed particles.

4.1.4 Tableting

Before tablet pressing, in order to increase the fluidity of particles and ensure good filling performance of tablets, 1% magnesium stearate was added to the particles as lubricant, and the particles were added to the rotary tablet press for tablet pressing after evenly mixing.

4.1.5 Sterilization Packaging

Use the packaging machine to pack the chewable slices and control the humidity to keep below 50% to get asparagus chewable slices.

4.2 Sensory Evaluation

Sensory evaluation criteria of asparagus chewable tablets are shown in Table 4.

Table 4. Sensory evaluation scale of asparagus chewable tablets

Score/points	Color and luster(20%)	taste(30%)	relish(30%)	texture(20%)
poor(45-60)	Dark brown, uneven color	Heavier granular feeling, poor chewability	It has no sweetness and tastes bitter	The surface is rough and the section is powdery
good(61-80)	Light yellow, uneven color distribution	Slightly astringency, poor chewing	Medium sweetness on the palate with a bitter asparagus aftertaste	The surface is rough, the shape is complete, and the cross-section structure is smooth and compact
excellent(81-100)	Light yellow, uniform color distribution	The entrance is smooth and smooth without obvious powder feeling	Moderate sweetness and a clear and cool taste	Smooth surface, complete shape, close section without powder feeling

Taking color, taste, flavor and texture of chewable tablets as tasting indexes, a sensory evaluation group of 10 people was randomly selected to score the products, among which appearance color accounted for 20 points, taste accounted for 30 points, flavor accounted for 30 points, texture and texture accounted for 20 points. Perform comprehensive evaluation and score according to the scoring criteria in Table 4, remove abnormal data and take the average value.

5. Conclusion

This experiment focused on the research and development of chewing tablet technology of asparagus, a homologous material of medicine and food, and finally determined the optimal process ratio: asparagus 40%; Xylitol 15%; Starch is 17%; Corn starch 25%; Borneol 2%; Magnesium stearate 1%.

The asparagus chewable slices produced under this ratio are delicate and smooth in taste, sweet and refreshing.

Acknowledgments

This project was approved by the key research and development plan (Science and Technology Demonstration Project) of Shandong Province in 2021, with the project number of 2021SFGC1202; As well as the Vegetable storage and processing positions in Shandong modern agricultural technology system, project number: SDAIT-05-14.

References

- [1] Miao Yanni, Zhong Gansheng. Study on the preventive effect of Pueraria lobata on alcoholic liver injury in rats [J]. Science and Technology Herald, 2008(15):60-65.
- [2] Xue Jing. Study on extraction, efficacy and product development of anti-hangover and liver protection components of asparagus [D]. Tianjin University of Science and Technology, 2014.
- [3] Ouyang Changhan, Lin Xi, Wu Dan. Effect of total flavonoids from Pueraria lobata on vascular activity of rat thoracic aorta and its structure-activity relationship [J]. Shizhen Traditional Chinese Medicine, 2013,24(11):2655-2657.
- [4] Zhang Pengjie, Zhang Feixue, Liu Xiufen, Yang Xiaosong. Determination of total flavonoids in Flos Puerariae Lobatae and optimization of extraction process [J]. Journal of Hubei University of Science and Technology (Medical Edition), 2019,33(01):7-10+13.
- [5] Li Zhang, Dong Pei, Jianteng Wei, Qingping Hu, Ningli Wang, Yongzhi Yang, Duolong Di, Lanxia Wang. Study on preparation technology of cynomorrhoea flavone chewable tablets [J]. Shizhen traditional Chinese medicine and traditional Chinese medicine,2016,27(07):1631-1633.
- [6] Li Jingjiu, ZHAO Xin. Technology and properties of gehua buccal tablets [J]. Food industry, 2020, 41(06): 44-47.
- [7] Fu Yanling et al. Journal of traditional Chinese medicine,2014,55(20):1773-1776. (in Chinese).
- [8] Wu Zhenfeng, He Wei. Research situation of Chinese traditional medicine dispersive tablet [J]. Food & Drug,2008(05):69-72. (in Chinese).
- [9] WEI F H. Preliminary study on preparation of asparagus chewable tablets and its hypoglycemic and lipid lowering effects [D]. Shanxi University of Traditional Chinese Medicine,2016.
- [10] Zhou Yang, LONG Cheng et al. Preparation and antioxidant activity of dendrobium ophiopoga chewable tablets [J]. Science and technology of food industry,2020,41(08):163-169.
- [11] Shi Xinlei, Huang Shengwu. Research progress of chewing tablets [J]. China Pharmaceutical Industry, 2008(14):17-19. (in Chinese).
- [12] Tang Baosha, Lai Pufu et al. Food science,2017,38(24):171-176. (in Chinese with English abstract).