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## **Research Status and Discussion on the Processing and Efficacy about One of Large Variety of TCM on *Panax Notoginseng***

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### **Abstract**

*Panax notoginseng* (notoginseng) is one of the typical traditional Chinese medicines(TCM) with great medicinal and health care value. Notoginseng has the effects of hemostasis, dispersing blood stasis and reducing swelling, while cooked notoginseng has a weak effect of hemostasis and removing blood stasis, but it can nourish and nourish. In recent years, the processing of notoginseng and its effect on the medicinal effect of notoginseng have attracted much attention from scholars.In view of the lack of normative and systematic research on the processing of notoginseng, and the lack of research on the processing of raw notoginseng to

promote blood circulation and remove blood stasis and cooked notoginseng to replenish qi and blood, the author put forward the research concept on the prescription of Chinese medicine chemical composition according to the prescription relationship among Monarch, Minister, Assistant and Guide of TCM, and opened up a new way for the processing and pharmacological research of notoginseng.

**Keywords :** Notoginseng; Processing; Chemical prescription of traditional Chinese medicine; Stop bleeding and remove blood stasis; Blood

## INTRODUCTION

*Panax notoginseng* is the dry root of *Panax notoginseng*(Burk.) F.H.Chen, which is mainly produced in Yunnan and Guangxi [1]. "Compendium of Materia Medica Gleanings" make-up first documented notoginseng tonic effect, pointed out that after processing cooked notoginseng blood tonic effect is significant:" three cure wounded seven such as boxing, coming back to life, price and gold ", "notoginseng quite kind of ginseng, ginseng to fill gas first, notoginseng blood first, flavour with work and so on, also someone said is the most precious of drugs, ginseng, panax notoginseng" [2].The processing of panax notoginseng begins to be contained in Ming dynasty "wan shi nvke", to its processing method is "end", after "this grass seeks truth" contained "research with good". Qing dacheng surgery contains "baking".Currently, there are many processing methods, such as steaming, frying, wine making, besides slicing raw products, grinding fine powder, etc. [3].

In recent years, the processing of notoginseng has attracted much attention from scholars. According to research reports, different processing methods had different influences on the chemical constituents of notoginseng, and the quality and efficacy of notoginseng are obviously related to the processing method and processing technology of notoginseng, and different processing methods lead to different efficacy of notoginseng [4,5].This article

processing research of notoginseng on the basis of literature research, put forward the idea of a notoginseng product development research, different processing methods of medium temperature, pressure, time, anything different, have different chemical composition effects of notoginseng, notoginseng saponins between different transformation trends, research clear notoginseng saponin component transformation trend of under different conditions, can be artificially directional transformation of notoginseng saponin constituents, processing can redirect the slices or notoginseng products applied in different areas of notoginseng.

## **RESEARCH STATUS OF PROCESSING METHODS OF NOTOGINSENG**

### **Fresh notoginseng**

Fresh notoginseng retains its original state and has higher chemical content. According to the research of scholars [6], the content of fresh notoginseng saponins was higher than that of dry notoginseng, and the decreasing degree of the three monomer saponins was  $Rg1 > R1 > Rb1$ , which may be caused by heat damage in the drying process. Fresh notoginseng was easier to process, so the product development with fresh notoginseng as raw material should be strengthened based on the advantages of production areas and the high content of fresh notoginseng saponins.

Research and application of modern technology to preserve the original state of fresh notoginseng and preserve the most original characteristics of the chemical constituents of notoginseng was conducive to the development of notoginseng value. Jia-ming Zhou etc. [7] found that blanching technique can be applied to fresh notoginseng tablets extract saponins, determined the optimum extraction technology of fresh notoginseng tablets for blanching extraction technology condition: ethanol concentration of 80%, hot time 20 points, hot temperature 60 °C, number two, by the above optimum blanching extract extract, flocculant and 70% ethanol sink after 12 hours, centrifugal, through D101 macroporous resin, filtering, decoloring with D - 941 resin decolorizing, notoginseng total saponin can be obtained.

However, it is still reported whether the original characteristics of notoginseng saponins were retained.

Z. Guoyan et al. [8] took the amount of ginsenoside Rg1, the active ingredient of notoginseng, as an index to investigate the main factors affecting product quality in the vacuum freeze-drying process of notoginseng. The best process was slice thickness of 1mm, pre-freezing temperature of -25 °C, primary drying time of 3 h, and secondary drying temperature of 50 °C. The retention rate of ginsenoside Rg1 was up to 2.35%, indicating that the freeze-drying technology had a better preservation advantage for the chemical constituents of notoginseng. L. Meifeng et al. [9] adopted vacuum freeze-drying technology to discuss the influence of section thickness, pre-freezing time and freezing duration on freeze-drying quality of notoginseng, comparing with that of the naturally dried, dried and freeze-dried notoginseng. It was found that the color of notoginseng was light yellow, uniform in color and good in luster. The natural dried notoginseng was brown, dark in color and dull in luster, with heavy wrinkles and rough surface. The content of ginsenoside Re was low, and there was little difference in hot air drying. The hot-air dried notoginseng was slightly dark in color, lack of luster, uneven in color, with wrinkles on the surface, and was coarse. The content of saponin Re was low, so there was little difference in natural drying. Therefore, the quality of freeze-dried notoginseng was obviously better than that of sun-dried notoginseng and hot-air dried notoginseng, and the properties of dried notoginseng are also better.

Freeze-drying is a new technology for the preservation of modern goods. It USES the principle of ice crystal sublimation to sublimate the water of frozen food materials directly from ice solid to steam without melting by ice under a high vacuum environment. The freeze-drying technology has great advantages in the application field of fresh notoginseng preservation. The main advantages are : (1) after drying, the freeze-drying equipment can maintain the original chemical composition and physical properties (such as porous structure and colloidal properties); (2) heat consumption is less than other drying methods.

### **Notoginseng in black bean juice**

Black bean juice was mainly used in processing TCM of fleece-flower root, it changed after processing fleece-flower root medicinal properties, can enhance the curative effect of nourishing liver and kidney, reduce drug toxicity or side effects, fleece-flower root processing can effectively improve fleece-flower root contains gallic acid, emodin, emodin methyl ether and other chemical composition level, reduce the styrene glycosides and catechin levels [10-14]. In recent years, some scholars [15] studied the preparation of panax notoginseng with black bean juice and the steaming of black bean juice for 7 hours, taking R1, Rb1 and Rg1 as indicators, and found that the amount of saponins in the processing method of black bean juice steaming decreased relatively little. Whether notoginseng had changed its medicinal property after processing black bean juice, whether its tonic effect has increased again, or it has better kidney-tonifying effect, or the chemical composition has new transformation, etc., are still reported in the literature.

### **Steamed notoginseng**

The steaming method is the main processing method of cooked notoginseng at present. After processing mature notoginseng powder by steaming method, the total saponins and three kinds of content are reduced to different degrees, and the three monomer content is reduced successively to  $Rg1 > R1 > Rb1$ , Rg1 and Rb1 have different degrees of reduction. In the process of preparing notoginseng powder by steaming, the saponins are destroyed to some extent [16]. Wu double etc. [17] HPLC method was used to simultaneously determine three in 10 kinds of notoginseng and steamed ingredients like saponin content, steamed, three ingredients like a lot of saponins in notoginseng saponins R1 and ginseng saponin, Rb1, Rd of Rg1 and Re content decreases, less content of saponins class composition Rh1 ginsenosides, Rk3, Rh4, 20 (S) - Rg3, 20 (R) - Rg3 content increased, the reason is that saponins in seven class composition because of high temperature and high pressure, in the process of steamed glycosides key prone to cracking, their carbohydrate, Into other saponins that contain less sugar.

Q. Jieping et al. [15] used HPLC method to determine the content of ginsenoside Rg1, Rb1 and notoginseng saponins R13 saponins in processed notoginseng products processed with different processing technologies, and conducted comparative analysis on the influence of different processing methods on notoginseng saponins. The results showed that the amount of the three main saponins in notoginseng decreased to different degrees after processing, but the relative mass fraction of ginsenoside Rg1 and Rb1 increased after processing. Among them, the longer the steaming time at high temperature and pressure (1.5h at 105°C and 2 h at 110°C) or normal pressure (8.5h), the more the amount of main saponins decreases.

### **Microwave drying notoginseng**

Microwave drying technology is to use the principle of dielectric loss and ultra-high frequency electric field to heat materials. Compared with the conventional hot air drying mode, microwave heating is internal heating mode. As the whole medium is heated to form the body heat source state, the heating speed is fast and the negative effect of internal and external temperature gradient is small. Microwave radiation changes the single heating effect of the traditional heating method and has a unique biological effect [18].

Gao mingju et al. [19] studied the influence of different microwave powers on the content of notoginseng active ingredients, and compared the content with traditional processing methods to explore the adaptability of microwave drying to notoginseng processing. Microwave radiation of different intensity caused the content of notoginseng saponins to reduce the active components, and the content was all lower than the 2005 Chinese pharmacopoeia regulation  $Rg1 + Rb1 + R1 \geq 5\%$ . According to the current research results, using notoginseng saponin Rg1 as the evaluation index, the quality of microwave low-fire drying in processed products was the best [20]. The effect of microwave drying on the chemical constituents of notoginseng had been seldom reported, and the control indexes were few.

### **Fermentation notoginseng**

Fermentation refers to the process of preparing microbial bodies themselves, or direct metabolites or secondary metabolites by the life activities of microorganisms under aerobic or

anaerobic conditions. Fermentation is sometimes also referred to as fermentation, with different definitions depending on the application. Usually said that the fermentation, is refers to the organism to some kind of decomposition process. Fermentation is a kind of biochemical reaction which was contacted earlier by human beings, and now it is widely used in food industry, biological industry and chemical industry. It is also the basic process of biological engineering, namely fermentation engineering. The research on its mechanism and process control is still continuing [21]. The organic combination of modern biotechnology and TCM fermentation and pharmaceutical technology provided a broad space for the rapid development of TCM fermentation technology. Modern Chinese medicine hot - multi-strain fermentation of mixed fermentation and new media such as the medicinal properties of biphasic fermentation substrates such as the rise of new type fermentation technology, the basic theory of modern biological technology and fermentation technology guidance proposed requirements, how to make use of modern biological as well as the related basic theory of modern traditional Chinese medicine instruction, it remains to be further research to explore [22].

In recent years, traditional Chinese medicine fermentation technology has been applied in the research field of panax notoginseng. Zhao peng et al. [23] used 108 strains of microorganisms to ferment panax notoginseng and investigated the ferment with the bacteriostatic model. After preliminary screening and rescreening, 2 active strains with good inhibitory effect on indicator bacteria were obtained. Two cyclic peptide compounds, zp-d2-3 and zp-e, were isolated by gel column chromatography, silica gel column chromatography and HPLC preparation. The MIC for compound zp-d2-3 for staphylococcus aureus CMCC(B)26003 was 32ug/ml, for micrococcus garcinia CMCC(B)28001 was 8ug/ml, and for bacillus cereus CMCC(B)63303 was 32ug/ml. Compound zp-e has no inhibitory effect on indicator bacteria. The structures of the two compounds were preliminarily analyzed by means of mass spectrometry and nuclear magnetic resonance, and the compound zp-e was cyclosporine A, but there were no reports on the isolation of cyclosporine A from the fermentation of notoginseng or strain YMF1.00149.

CHeng Shu et al. [24] studied the fermentation process of notoginseng to produce total saponins, and the results showed that the optimal medium formula for the fermentation of notoginseng was soluble starch 3 g/100mL, peptone 0.2 g/100mL, potassium dihydrogen phosphate 0.3 g/100mL, magnesium sulfate 0.1 g/100mL. The optimal fermentation conditions were 10% inoculation, 5 g/100mL addition of traditional Chinese medicine, 25°C, initial pH7, and fermentation for 8 d. The yield of total saponins in the optimized process was 7.233%. Through this study, the optimized process of notoginseng fermentation by poring was obtained, which ensured the content of total saponins in the fermentation liquid. However, the monomer composition changes and new pharmacological activities of total saponins in notoginseng after fermentation still needed to be further studied. Yang Jingjuan [25] the Box - such as Benhnken experimental design for process optimization, microbial fermentation notoginseng and extracted from the transformation between the total saponin content, composition and extracts antioxidant, antibacterial, antitumor activity Angle compared with the conventional extraction method. Experimental results show that the bran 31% in cultivation matrix, and water ratio 1:1. 2, pH 7.6 under the condition of solid state fermentation notoginseng, extract the notoginseng total saponin content than conventional extraction content increased by 35.36%, including ginseng glycol type ginsenoside Rb1, Rd obviously increase the dissolution and part three glycol type saponins specificity into rare saponin component Rh1, F1. Meanwhile, the changes in the content of total saponins and their components brought changes in the activity. Compared with the conventional extraction, the activity test showed that the IC<sub>50</sub> cleared by DPPH decreased from 1.226 to 0.377mg/mL, which increased the reducing power of Fe<sup>3+</sup>. The inhibitory activity of staphylococcus aureus and penicillium aureus was enhanced. Anti-gastric cancer activity also increased to some extent. The results showed that the application of fermentation assisted extraction of total saponins from panax notoginseng could increase the dissolution of active ingredients, and at the same time realize the biological transformation between components, and further improve their biological activity.



Qu Mo et al. [26] selected the best fermentation conditions by taking the time of bud formation as the index. Results the optimal fermentation process of ganoderma lucidum fermentation notoginseng dreg was as follows: notoginseng dreg powder (10 mesh sieve), 1.5% growth factor  $\text{CaCO}_3$  was added, water was added (the water content was up to 60%), inoculation amount (V/V) = 1:1 ~ 1.5:1,  $(28 \pm 1)^\circ\text{C}$ , dark culture. This study provides a new idea and method for the fine and high quality utilization of notoginseng residue.

### **Fried notoginseng**

The method of deep-frying notoginseng was first published in "Dacheng Surgery": "baking". Now, take the net notoginseng, beat into pieces, separate the size, fry with oil until the surface brown-yellow color, take out, fine powder. The ratio of crude drugs to oil was 20 : 40, the frying time was 7 min, and the frying degree was  $120 \sim 130^\circ\text{C}$ . The mass fractions of extracts, notoginseng R1, ginsenoside Rg1 and ginsenoside Rb1 were 28.6%, 0.88%, 0.76% and 0.02% respectively. Notoginseng processed products appearance color for brown and yellow, the quality of products is stable. The determination of the process of frying notoginseng not only fills the gap in the long-term process parameters of notoginseng without frying, but also improves the processing process of notoginseng, providing technological guarantee for further research on the chemical composition and pharmacological effect changes of notoginseng [27]. Wan xiaoqing et al. [28] found that the average content of notoginseng saponin R1 in steamed notoginseng was 0.806%, Rg1 was 3.18%, Re was 1.00%, and Rb1 was 0.998%, which were higher than those in raw notoginseng and fried notoginseng. Among them, the content of the above components in notoginseng was 0.747%, 3.24%, 0.961%, 0.977%, and 0.765%, 2.84%, 0.860%, 0.847%, respectively. There were few reports on the processing of notoginseng, and the changes of chemical composition and composition content need to be further studied.

## **RESEARCH STATUS OF PHARMACOLOGICAL EFFECTS OF DIFFERENT PROCESSING ON NOTOGINSENG**

### **Pharmacological research status of raw notoginseng for promoting blood circulation and removing blood stasis**

Notoginseng has the effect of "sheng da shu bu", among which "da" refers to the effect of notoginseng to stop bleeding and activate blood circulation, strengthen the heart and calm pain, reduce swelling and disperse blood stasis, while "bu" refers to the effect of notoginseng to enrich blood, qi and health. According to reports in the literature, after processing, the content of substances contained in notoginseng will change, leading to different effects of sanqi and cooked notoginseng. The results of various literature studies show that the total saponins of notoginseng (PNS) are the components of activating blood circulation. At present, there are more than 70 known saponins in notoginseng, among which ginsenoside Rg1 and Rb1 have the highest content. PNS can protect myocardium, resist arrhythmia, improve brain circulation, promote the growth of blood cells, improve vascular endothelial function, and resist thrombosis, providing theoretical basis for the treatment of angina pectoris, thrombosis and other diseases [29~32]. Xiu C K et al. [33] established replicative aging vascular smooth muscle cells to be used as a model of aging research, and the morphology and protein expression of cytoskeletal proteins f-actin and g-actin changed significantly during the process of cell aging. In addition, it was found that notoginseng extract could significantly interfere with f-actin and g-actin, which may be indirectly related to the delay of vascular senescence.

Notoginseng roots is a famous traditional Chinese medicine (TCM), is used to stop bleeding, reduce inflammation and heart disease, including saponins are the main active ingredient [34], which mainly notoginseng activity significantly, notoginseng, can significantly affect the rat blood coagulation system of blood coagulation factor ( $P < 0.05$ ) and platelet aggregation ( $P < 0.01$ ), fibrinolytic system influence significantly ( $P < 0.01$ ). It can induce platelets to release adenosine diphosphate (ADP), calcium ions and other active hemostatic substances, so as to exert hemostatic effect. It can significantly shorten the time of coagulation, thrombin and

prothrombin, improve the platelet aggregation rate, and achieve good hemostatic effect [30,34]. Wang D et al. [35] found that R1 can promote the proliferation and angiogenesis of HUVECs by human umbilicus vein endothelial cells and chemically induced vessel loss in zebrafish. SU5416 can effectively inhibit the proliferation of HUVECs by these saponins. Yang br et al. [36] found that R1, similar to Rg1 and Re, may activate the vegf-kdr/flk-1 and pi3k-ak-enos signaling pathways, showing a pro-angiogenic effect. This discovery reveals the interesting effect of R1 in promoting angiogenesis in drug-induced zebrafish vessel loss model in the absence of angiogenesis, providing a scientific basis for the application of notoginseng in the treatment of cardiovascular disease, traumatic injury and wound healing.

### **The present situation of pharmacological research on cooked notoginseng invigorating and activating blood circulation**

Zhou xinhui et al. [37] found that both notoginseng and steamed cooked notoginseng had significant blood tonic effect on hemorrhagic anemia mice, and the effect of cooked notoginseng was slightly better than that of cooked notoginseng, but there was no significant difference between them. The effects of cooked notoginseng on mice with blood deficiency caused by cyclophosphamide were significant in the high-dose group, but not significant in the high-dose and low-dose groups, indicating that cooked notoginseng had better effects on improving immunity and invigorating qi than shengqi. In terms of hemostatic effect, raw sanqi was better than cooked notoginseng. In the improvement of microcirculation, the raw notoginseng was better than the cooked notoginseng. In improving blood viscosity, cooked notoginseng is better than raw notoginseng. PNS has a similar effect to hematopoietic growth factor, promoting the proliferation of human progenitor cells and thereby up-regulating hematopoietic function, which may be related to the increase of glucocorticoid receptor nuclear transcription factors and the enhancement of DNA binding activity [31]. According to the results of clinical application research, cooked notoginseng can significantly improve the hemoglobin and red blood cell levels of patients with cancerous anemia, promote the healing of femoral fracture, improve postoperative anemia, correct anemia indicators, and improve the symptoms of qi and blood deficiency [39]. It can effectively improve the hemorrhagic anemia

of patients after internal fixation with proximal femur intramedullary nail, improve the hemocyte specific volume, hemoglobin and red blood cell level, and effectively prevent deep vein thrombosis [40]. I period healing of incision in patients with gynecologic surgery and peripheral blood changes like has obvious improvement effect, can effectively improve anemia in patients with [41].

Now ripe notoginseng tonifying qi huoxue mainly concentrated in the clinical application of case study reports, cooked notoginseng blood tonifying qi efficacy material base and its specific mechanism is not fully clear at present, some scholars think that may be due to the nature of TCM composition content changes, processing for cooked or raw notoginseng produced in the process of new blood components. Some scholars believed that this was the result caused by the changes in the content of blood tonic ingredients and the production of new blood tonic ingredients [30], which needs further research and verification.

## **PHARMACOLOGY AND PROCESSING OF PANAX NOTOGINSENG "SHENG DA SHU BU"**

TCM prescription is composed of Monarch, Minister, Assistant and Guide. Every single medicine plays a different role. After the traditional Chinese medicine is processed by different methods, the drug properties or efficacy change, mainly because the chemical composition type or chemical composition content changes after the processing. The chemical composition of traditional Chinese medicine is complex. The effect of medicine changes due to the decrease or increase of some chemical composition or the production of new composition. This relationship is similar to that of traditional Chinese medicine prescription. Therefore, this paper puts forward the concept of chemical prescription of TCM, which regards every herb of TCM as a small prescription, and each class or chemical component in it as a role of Monarch, Minister, Assistant and Guide. When the TCM processed by different methods, because of the change in the drug or the effect of the effect, the relationship between Monarch, Minister, Assistant and Guide also changed. This concept should be built around the figure out the chemical and physical properties of chemical

composition in traditional Chinese medicine, efficacy and mechanism of action: (1) the chemical and physical properties can be according to the chemical composition, choose the corresponding processing method, adjust the temperature, pressure, PH, time factors, such as directional or purposeful transforms the internal chemical composition between traditional Chinese medicine (TCM) or generate new ingredients; (2) on the basis of the study on the efficacy and mechanism of each component, the content of chemical components acting on each mechanism or target can be adjusted purposefully to find the optimal proportion of chemical components for the treatment of different diseases.

Notoginseng saponins is one of the main active components of notoginseng, has significant pharmacological effects in various aspects, but the composition of notoginseng saponins type known there are more than 70 elements, with Rg1 ginsenosides, Rb1 content highest, chemical properties of different composition, pharmacological action, mechanism of targets, and each are not identical, the different processing method after processing, such as temperature, pressure, PH, time factors, the influence of transformation or new components in the active ingredient, notoginseng efficacy differences lead to different processing methods, this article concept for chemical composition of prescription of traditional Chinese medicines, notoginseng, Scholars believe that it can solve the research problem of "fresh, cooked and supplemented" of notoginseng, promote the processing standard of notoginseng, and have great significance to the development and research of various kinds of notoginseng decoction slices or products.

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