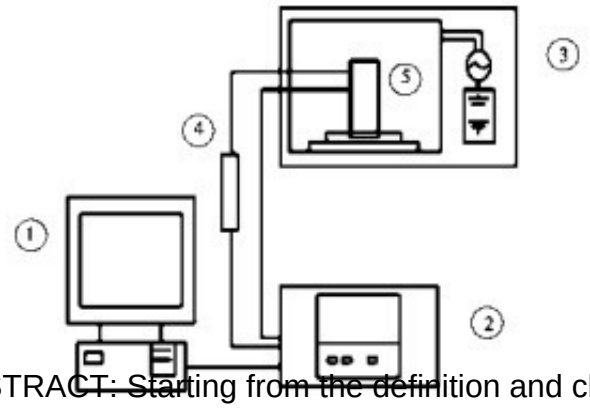
Application of Microwave Technology in Pharmaceutical Field



ABSTRACT: Starting from the definition and characteristics of microwave and its advantages in the production of traditional Chinese medicine extracts, the application of microwave-assisted extraction, microwave drying equipment and microwave sterilization technology in the field of medicine was studied, which promoted the pharmaceutical industry, especially the traditional Chinese medicine industry, to achieve the goals of energy saving, consumption reduction and environmental protection, and played a potential role in improving yield, quality and cost reduction.

Key words: microwave; extraction; drying; sterilization; energy saving; environmental protection; microwave drying of traditional Chinese medicine

Our country has a vast territory, spanning from tropical zone to cold temperate zone, with abundant plant resources. The Chinese culture accumulated over 5000 years and the vast medical books left by our ancestors are the unique conditions for the development of Chinese medicine. The role of traditional Chinese medicine in the prevention and treatment of common diseases, frequently-occurring diseases, chronic diseases, difficult diseases and major infectious diseases has been further highlighted, and has been widely recognized by the international community.

After several years of development, plant (traditional Chinese medicine) extracts have reached a certain industrial scale, with annual output approaching 80,000 tons, and the export proportion

has exceeded that of traditional Chinese medicine, showing an upward trend. In 2015, the output value of traditional Chinese medicine accounted for 30% of the output value of the pharmaceutical industry, of which 2.163 billion US dollars were exported, accounting for 21.71% of the export of medicine, and 57.38% of the export of extracts, increasing at a rate of about 30% annually. Therefore, the development of plant extraction industry will be unstoppable.

Although botanical medicines are developing rapidly in China, there is a significant gap between them and other countries in the world. In 2003, the turnover of botanical drugs in the international market amounted to 16 billion US dollars. Japan accounted for 80%, Korea 10%, India and Singapore 7%, and China only 5%. However, 57% of these 5% are crude and inexpensive Chinese herbal extracts, and few of them are genuine Chinese herbal products.

Other countries use our extracts as crude products for refining, become high-grade drugs, prices skyrocketing back to the domestic market. The main reason why Chinese traditional medicine loses its international market is that its quality is not high and its production technology is backward.

Most of the effective components (therapeutic ingredients or nutrients) in plants belong to heat-sensitive substances, which are easily invalidated or reduced by decomposition at high temperature. Therefore, its production and processing process usually avoid long time high temperature treatment.

Traditionally, a hot reflux method was used to filter out the extract of drugs or nutrient components. The excess solvent was concentrated by steam heating, and the bad impurities mixed with the extract were separated and purified according to the solubility of ethanol at different concentrations. The alcohol solution containing effective components was obtained. The alcohol solution was concentrated, spray dried (or freeze-dried) or after the cream was collected. The dry extract was obtained by drying in a vacuum drying chamber. After a series of high temperature heating, extraction and concentration for 5-7 days, purification by alcohol precipitation with different concentrations and thermal decomposition by vacuum drying for a long time, multiple operations and overflow plate contamination losses, the extracts containing effective components are gradually reduced, resulting in low extraction rate, high production cost and low product quality.