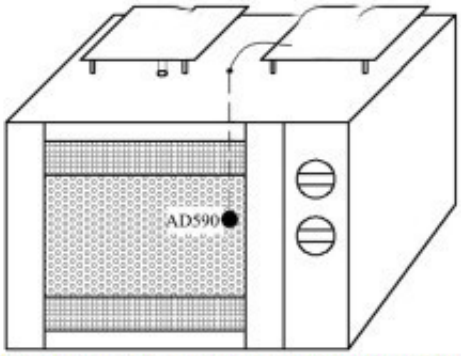
Study on drying technology of citrus peel residue rich in pectin and flavonoids

Absrtact: The drying technology of citrus peel residue rich in pectin and flavonoids was studied for high value utilization of the whole component. Hot air drying and microwave vacuum drying were used to remove moisture from citrus peel residue. The effects of thickness of citrus peel residue, microwave drying equipment and drying time on moisture content, pectin and total flavonoids content of citrus peel residue were investigated.



Schematic diagram of microwave drying temperature control system

The results showed that under this condition, the water content of citrus peel residue decreased to less than 10%, the loss of pectin content was less than 20%, and the loss of total flavone content was less than 15%. The drying process is simple and easy to operate. It can remove moisture from citrus peel residue and retain pectin and flavonoids as much as possible. It provides a useful reference for the high-value utilization of citrus peel residue and provides convenience for the extraction of pectin and flavonoids from citrus peel residue in other places.

Key words: microwave drying of citrus peel residue; drying technology; pectin; total flavonoids

Citrus peel residue is a by-product of citrus juice processing industry and its pulp production enterprises, accounting for 40%-60% of the total weight of citrus fruit. According to statistics from the Ministry of Agriculture, at present, China ranks first in citrus planting area and yield in the world. In 2014 alone, citrus production reached 34.926 million tons, and citrus planting area and yield are increasing every year.

Citrus peel residue is rich in sugar, fat, protein, amino acids, vitamins, dietary fiber and other

nutrients. It also contains pectin, flavonoids and other bioactive substances. The content of pectin is very high, accounting for 20%-30% of the whole peel residue. 70% of the pectin produced by industry in the world is extracted from citrus peel residue.

Pectin is a natural product with excellent gelling and emulsifying effects. It is widely used in dairy processing, medicine, textiles, cosmetics and other industries. In addition, there are many kinds of flavonoids in citrus peel residue. More than 60 kinds of flavonoids have been identified, which can reduce myocardial oxygen consumption, soften blood vessels, reduce blood sugar and blood lipids, and so on. As a natural antioxidant, it has physiological activities such as scavenging superoxide free radicals, anti-aging and increasing immunity. It has broad application prospects and important development value in food, medicine, feed and other fields.

The water content of citrus peel residue is very high (about 80%). It is very perishable and odorous. It is not easy to preserve for a long time. Moreover, most of the water in citrus peel residue is bound water formed with pectin and other substances, which is difficult to remove. Hot air drying is a common method for removing moisture from citrus peel residue in industry. This method not only consumes high energy, but also is easy to roast cinder. Microwave drying is a method of heating the whole product. It has the advantages of fast, high efficiency, energy saving, good uniformity, high retention rate of thermosensitive components and bioactive substances (up to 90%-95%). It has been widely promoted in recent years.

In this study, hot air drying combined with microwave drying was used to remove the moisture of citrus peel residue while retaining the active substances such as pectin and flavonoids as far as possible, so as to realize the high value utilization of the whole components of citrus peel residue, provide convenience for extracting the active substances such as pectin and flavonoids from Citrus peel residue in other places, and provide methods and ideas for solving the problem of peel residue treatment for fruit juice processing enterprises.