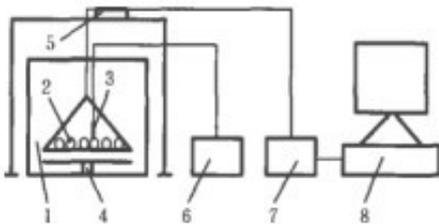


Effect of microwave drying on mechanical properties of Artemisia stem

ABSTRACT: In order to explore the substitutability of Artemisia stem for wood materials, the radial compression and bending resistance of Artemisia stem under natural conditions and microwave irradiation were studied, and the microstructural changes of materials before and after microwave drying were tested and analyzed.

The experimental data show that the [microwave drying equipment](#) is faster. In 700 W drying equipment, the moisture content of 40 g Artemisia stem can be reduced from 55% to less than 10% after 420 seconds, while the natural drying can be completed in 2.5 hours. With the prolongation of microwave drying time, the pore structure of cell wall is destroyed, and the fibrous tissue becomes dense and thinner, which increases the porosity of stem.



After 300 seconds of microwave drying, the radial compressive load of Artemisia stem increased from 550 N to 630 N, the maximum bending load and bending strength were 41 N and 193.44 MPa, respectively. The maximum bending load and bending strength of Artemisia stem could meet the daily use demand of about 10 N. At the same time, compared with natural drying, straightness of stem changed from 1.1/210 (mm/mm) to 0.4/210 (mm/mm), and toughness improved significantly, mainly because microwave drying made Artemisia stem tough. The change of the internal structure of the stem resulted in the release of the growth stress in the stem of Artemisia annua L. The results provide a reference for the industrial processing of disposable chopsticks from Artemisia stem.

Key words: [Microwave drying Artemisia annua](#); Mechanical properties; Artemisia annua stem; Microstructure



Forest resources are one of the main resources needed for human development. However, there are some problems in China's forest resources, such as insufficient total forest amount, low forest quality, and the need to improve the level of forest management. The contradiction

between exploitable resources and social needs is still very acute, and the task of protecting forest resources is arduous.

China's disposable chopsticks industry consumes a lot of wood resources. According to statistics, China produces about 45 billion pairs of disposable chopsticks annually, consumes nearly 5 million m³ of forest resources, and needs to cut 25 million trees that grow for 20 years. It is of great significance to find alternative products for wooden disposable chopsticks.

Artemisia annualis is an annual herb. It is common at the edge of roadside, river, shrub and swamp in humid or semi-humid areas at low and middle altitudes. Its flowering and fruiting period is from August to November. It has the advantages of rapid reproduction, strong regeneration ability and short growth period. It is mainly wild in Heilongjiang, Jilin, Liaoning, Inner Mongolia and Hebei.

The stem of *Artemisia annua* is cylindrical with a height of more than 1.5 m, an average diameter of about 5-9 mm, and a diameter of more than 6 mm. After removing the epidermis, its specifications can meet the requirements of disposable chopsticks and can be used as a potential alternative resource for disposable wooden chopsticks.

Because *Artemisia annua* is widely distributed, low cost and easy to collect, once the raw materials of *Artemisia annua* are transported to factories, the disposable chopsticks can be made by cutting, soaking, drying, straightening, polishing and disinfection. The annual output is about 1 billion pairs, which is obvious.