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Moisture sorption and diffusion determination of Chinese Herbal Granules: moisture-resistant effects of fluidized bed granulation with dextrin

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ABSTRACT

Objective To investigate the effects of fluidized bed granulation with dextrin on moisture sorption and diffusion of Zexie Decoction granules. **Methods** The particle characterization was studied by the particle size, scanning electron microscopy (SEM), differential scanning calorimetry (DSC), and Fourier transform infrared (FTIR). The moisture sorption isotherm, equilibrium moisture content (EMC), and moisture diffusion coefficients were determined by using the saturated salt solution method. **Results** The particle size increased from 6.04 μm (powder) to 1201.47 μm (granule). The glass transition temperature of dextrin, Zexie Decoction powder, and granule was 107.13 °C, 94.82 °C, and 126.25 °C. As the increase of temperature, the initial rate of moisture sorption become higher. Furthermore, the initial rate of moisture sorption of Zexie Decoction granules was lower than those of powders and dextrin. The EMC and moisture diffusion coefficients were reduced significantly after granulation ($p < 0.01$). Critical relative humidity and diffusion activation energy of granules were higher than powders. **Conclusion** Results suggested that fluidized bed granulation with dextrin could reduce the hygroscopicity of the Zexie Decoction extract powders and inhibit moisture diffusion, which is mainly related to the microstructure reorganization by fluidized bed granulation and anti-plasticizing effects of dextrin.

Key words

Zexie Decoction granules; fluidized bed; moisture-resistant effects; diffusion coefficient

1. Introduction

Chinese herbal formula extract powder is an important raw material for Chinese material medica (CMM) preparation, its physical properties affects the formulation optimization and stability (Newman et al, 2008). Zexie Decoction is one of frequently used, very effective and classic formula of TCM, which derives from *Synopsis of the*

Golden Chamber (Jingui Yaolue in Chinese) and consists of *Alisma orientale* (Sam.) Juzep. and *Atractylodes macrocephala* Koidz. (Tan and Chen, 2007). The formula has the effects of hydragogue to alleviate water retention, dropping lipid, expanding blood vessel, and lowering blood pressure. Triperpenoids, sesquiterpenoids, diterpenoids, polysaccharides, and other compounds have

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