SPRAY DRYING OF BIOLOGICAL MATERIALS: CHARACTERIZATION BY MICROSCOPY AND DIGITAL IMAGE ANALYSIS

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Introduction. Spray drying is widely apply in biotechnology process, due to it is possible to dry biological thermosensible materials. The products obtained are powders whose particles have specific characteristics: morphology, particle size, internal structure, surface properties, which are determined by the physical and chemical properties of the fed material and the operating conditions of the dryer [1,2]. Characterization of dried materials through non-invasive techniques, as scanning electron microscopy and digital image analysis allows obtaining quantitative information on the quality of the drying process [3]. The objective of this work was to characterize materials obtained by spray drying, through microscopy and digital image analysis.

Methods. Biological materials were spray dried under two conditions of inlet/outlet temperatures of drying air (200/80ºC (A) and 200/90ºC (B)). The obtained powders were characterized by determining particle size; surface roughness and texture by fractal dimension of contour (FD_c) and of texture (FD_T). These last two features were determined by analyzing micrographs obtained by Scanning Electron Microscopy (SEM), processing and analyzing trough Image J 1.43® program [4,5].

Results. According to the results, particle size increases with increasing temperature of the outlet air, maybe this expansion of the particles is result of intense partial pressure of steam provoked within the particle [6,7]. At lower drying air outlet temperatures, the values of fractal dimension of contour and texture of the particles are greater with respect to those obtained at high temperatures, which is associated to the low diffusion of water into the particle that causes the deformation of the structure and collapse of these during the drying process (Table 1). In the micrograph of Figure 1, it is possible to appreciate the characteristic morphology of powders obtained. Particles have slits and tendency to sphericity, both associated to shrinkage, slow structuring process, all coincident to results shown in Table 1.

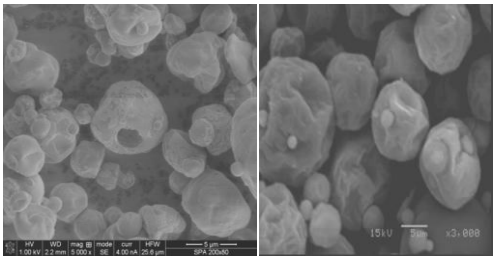

Fig.1 Powders obtained by spray drying: a) 200/80ºC and b) 200/90ºC

Table 1. Size particle, fractal dimension of contour and fractal dimension of texture

Sample	*Particle size (μm)*	*FD_c*	*FD_t*
A	**2.7 ±0.60**	**1.70 ±0.09**	**2.03 ± 0.04**
B	**6.4±0.10**	**1.69 ± 0.15**	**1.90 ± 0.04**

Conclusions. By means of microscopy and digital image analysis, it was possible to characterize biological materials obtained by spray drying, and identify the effect induced by drying air temperatures.

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