CLASSIFICATION OF ROSELLE POWDERS WITH NON-HOMOGENEOUS COLORS BY IMAGE ANALYSIS APPLICATION: SIZE PARTICLE EFFECT

Camelo-Méndez, Gustavo Adolfo[1*], Vanegas-Espinoza, Pablo Emilio[1], Jiménez-Aparicio, Antonio Ruperto[1], Heredia, Francisco José[2], Del Villar-Martínez, Alma Angélica[1], 1 CeProBi-IPN, Carretera Yautepec-Jojutla Km. 6, Calle CEPROBI 8, Col. San Isidro, 6273 Morelos, México.
2 Food Colour and Quality Lab., Dept. Nutrition and Food Science, Universidad de Sevilla, Facultad de Farmacia, 41012 Sevilla, Spain
*email: tavo.camelo@gmail.com

Key words: roselle powders, non-homogeneous colors, image analysis application.

Introduction. The color stimulus is composed of three different sensations, giving to color three-dimensional nature as lightness, chroma and hue (1). Color measurements usually use the "average" color of food material's surface exposed to the measuring window of the instrument (2). Averaging values are acceptable for uniformly colored surfaces; when colors change with location or they are non-homogeneous, averaging may result in inaccurate color determination (2). By image analysis application these drawbacks could be overcomed for identification of heterogeneous samples or with different colors.

The aim of this study was to classify the effect of the sieve on color attributes of heterogeneous roselle *(Hibiscus sabdariffa* L.) powders of four varieties evaluated by image analysis.

Methods. In this study three pigmented (Negra, Sudan and Rosa) and a non-pigmented (Blanca) roselle varieties were used. Samples were lyophilized and pulverized, powder was consecutively sieved through bolters of 710, 550, 355 and 250 µm mesh sizes, and five different fractions were collected. Color was measured by tristimulus colorimetry. Mean Colour Difference from the Mean (MCDM) and geometrical ellipsoid values as: area, width and long were captured. The ellipses plotted contained the 95% of the measurements as the "cloud of points" (1).

Results. The non-homogeneous samples data were represented in a* b* diagram (Fig. 1). The color ellipses contained 95% of the measured values of the pixels of images, clearly is expressed chromatic changes by sieving effect. It was found that the geometric parameters could describe chromatic changes by ellipse analysis (R> 0.9). Using a multiple regression analysis was found that width was the parameter that most heavily influences chromatic changes. Proposed parameters had acceptable correlation coefficients (R>0.9) with the decrease of chromatic attributes (standard deviation of chroma) of samples of their sieving process. This method eliminated the "average value" of non-homogeneus samples allowing a better classification between varieties and grain size of the powders, and it could be used to define colorimetric changes in powder foods, since proposed parameters eliminated the "average value" of non-uniform samples overcoming limitation encountered with some equipment and sensory evaluation.
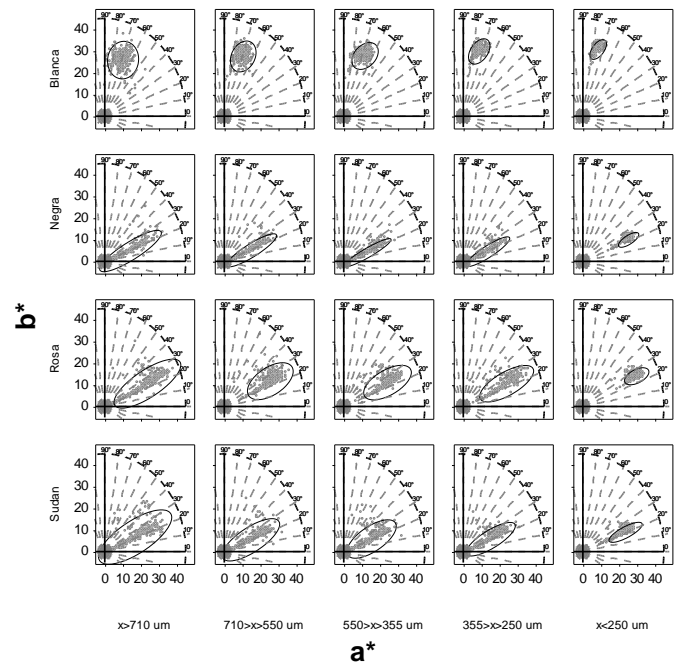

Fig.1 Ellipses formed by the "cloud of points" by the effect of the sieving of roselle powders

Conclusions. Results suggest that the image analysis is potentially applied to colorimetric evaluation in food industry. This tool could be used in industry as an attractive alternative due to its simplicity, versatility, low cost besides being a nondestructive technique.

References.
1. Rodríguez-Pulido FJ, Gómez-Robledo L, Melgosa M, Gordillo B, González-Miret ML, Heredia FJ. (2012). *Computers and Electronics in Agriculture* 82, 128-133
2. Balaban, M.O. (2008). *Journal of Food Science*, 73: S431–S437