

## ULTRASOUND EFFECT IN KINETICS ANTHOCYANIN THERMAL DEGRADATION OF BORDÔ GRAPE MUST

Micael José de Almeida<sup>1</sup>, Bianca Guimarães<sup>1</sup>, Ellen Silva Lago Vanzela<sup>1</sup>, Javier Telis-Romero<sup>1</sup>

<sup>1</sup>São Paulo State University (UNESP), Institute of Bioscience, Humanities and Exact Sciences (Ibilce), Campus São José do Rio Preto, 15054-400, Brazil

**Abstract:** Bordô grape (*Vitis labrusca*) has commercial and industrial importance due to its versatility of use both for fresh consumption and for processing in the form of juices and wines. It has stood out for its high concentration of anthocyanin, mainly in the bark, which are responsible for the intense purplish color. These pigments are thermolabile and during grape processing for juice production they can be degraded. The aim of this study was to evaluate the effect of ultrasound on the thermal degradation of anthocyanins in Bordô grape must using kinetic parameters: velocity constant ( $k$ ) and half-life ( $t_{1/2}$ ). Thermal degradation kinetics of anthocyanins was studied at temperatures between 274.15 and 363.15 K for 13 °Brix. To obtain the must (mixture of skins, seeds and pulp), first, the grapes were destemmed, sanitized and crushed manually (24°C). Some must samples were submitted to ultrasound (U) and others were not (SU). Thus, the U sample was placed in a non-toxic container immersed in a thermostatic bath at 57°C for 2 hours. In this same sample, the ultrasonic system (titanium probe with 3 nodes and frequency of 20 kHz) was coupled with nominal power of 700W and pulsed system (1s on; 4s off). The SU followed the same procedure as before, without applying ultrasound. The U and SU samples were homogenized with Ultra Turrax for 10 min and placed in a capped test tube immersed in a thermostatic bath at the established temperatures. Aliquots were taken at predetermined time intervals (0, 60, 120, 180, 240, 300, 360, 480, 600, 720, 900, 1080, 1260, 1440, 1620, 1800 and 1980 min). The total anthocyanin content was determined by the differential pH method (Coklar and Akbulut, 2017) and the results were expressed in mg eq of malvidin-3-glucoside/L. Thus, the anthocyanin content over time was fitted to a first order degradation kinetics model ( $R^2 > 0.996$ ), except for a temperature of 20°C ( $R^2 > 0.70$ ). In SU,  $k$  values ranged from  $9.01 \times 10^{-6}$  (20°C) to  $2.13 \times 10^{-3} \text{ min}^{-1}$  (90°C) and  $t_{1/2}$  ranged from 1214.49h (20°C) to 5.42h (90°C). And for U,  $k$  ranged from  $1.04 \times 10^{-5}$  (20°C) to  $2.09 \times 10^{-3}$  (90°C) and  $t_{1/2}$  ranged from 1126.85h (20°C) to 5.53h (90°C). At all temperatures, the  $k$  and  $t_{1/2}$  values of SU and U did not differ significantly ( $\leq 0.05$ ). In general, in U and SU, the values of  $k$  increased and  $t_{1/2}$  decreased from 20 to 90°C. A decrease in the concentration of anthocyanins over time is observed at all temperatures. The process of degradation of anthocyanins was intensified with the increase of temperature and not with the application of ultrasound. Ultrasound did not promote effects on kinetic parameters ( $k$  and  $t_{1/2}$ ) ( $\leq 0.05$ ). The results are useful for the processing and development of grape-derived products with techno-functional potential.

**Keywords:** Bordô grape; Ultrasound; Anthocyanin; Thermal degradation kinetics.