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Statistical Design of Central Point for Evaluate the Combination of PH and Cinnamon Essential Oil on the Antioxidant Activity Using the ABTS Technique

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Abstract : Substances of vegetable origin with antioxidant capacity have a high potential for application on the conservation of some foods, can prevent or reduce for example oxidation of lipids. However a food is a complex system whose wide variety of components wich can reduce or eliminate this antioxidant capacity. The antioxidant activity can be determined with the ABTS technique. The radical ABTS+ is generated from the acid 2, 2´ - Azino-bis (3-ethylbenzothiazoline-6-sulfonic acid) (ABTS). This radical is a composite color bluish-green, stable and with a spectrum of absorption into the UV-visible. The addition of antioxidants causes discoloration, value that can be reported as a percentage of inhibition of the cation radical ABTS+. The objective of this study was evaluated the effect of the combination of the pH and the essential oil of cinnamon (EOC) on inhibition of the radical ABTS+, using statistical design of central point (Design Expert) to obtain mathematical models that describe this phenomenon. Were evaluated 17 treatments with combinations of pH 5, 6 and 7 (citrate-phosphate buffer) and the concentration of essential oil of cinnamon (C): 0 µg/mL, 100 µg/mL and 200 µg/mL. The samples were analyzed using the ABTS technique. The reagent was dissolved in methanol 80% to standardized the absorbance to 0.7 +/- 0.1 at 754 nm. Then samples were mixed with reagent standardized ABTS and after 1 min and 7 min absorbance was read for each treatment at 754 nm. Was used a curve pattern with vitamin C and reported the values as inhibition (%) of radical ABTS+. The statistical analysis shows the experimental results were adjusted to a quadratic model, to the times of 1 min and 7 min. This model describes the influence of the factors investigated independently: pH and cinnamon essential oil (µg/mL) and the effect of the interaction between pH*C, as well as the square of the pH2 and C2. The model obtained was Y = 10.33684 - 3.98118*pH + 1.17031*C + 0.62745*pH2 - 3.26675*10-3*C2 - 0.013112*pH*C, where Y is the response variable. The coefficient of determination was 0.9949 for 1 min. The equation was obtained at 7 min and = - 10.89710 + 1.52341*pH + 1.32892*C + 0.47953*pH2 - 3.56605*10- *C2 - 0.034687*pH*C. The coefficient of determination was 0.9970. This means that only 1% of the total variation is not explained by the developed models. At 100 µg/mL of EOC was obtained an inhibition percentage of 80%, 84% and 97% for the pH values of 5,6 and 7 respectively, while a value of 200 µg/mL the inhibition (%) was very similar for the treatments. In these values of pH was obtained an inhibition close 97%. In conclusion the pH does not have a significant effect on the antioxidant capacity, while the concentration of EOC was decisive for the antioxidant capacity. The authors acknowledge the funding provided by the CONACYT for the project 131998.

Keywords : antioxidant activity, ABTS technique, essential oil of cinnamon, mathematical models
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