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Comparing methods of identify the appropriate sugar and pulp levels for fruit juice formulation: A consumer-driven approach

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Consumers are better informed about the health benefits of consuming fruit juice and nectars. Recent report on the global beverage sector revealed that the fruit juice production in Europe reached 10.7 billion liters in 2011. Brazilian cherry is a tropical fruit that has an exotic flavor, and high amount of antioxidant compounds. It is quite fragile and seasonal, making difficult its transportation inside the country. Therefore, industrialized products made from Brazilian cherry (*Eugenia uniflora* L.), such as juice, are an appropriate alternative to deliver it all along the year and around the country. However, the production of fruit juice requires the addition of water and sugar to the pulp, whose amount should be determined according to the consumer preference. The objective of this study was to compare two methodologies - ideal scale and response surface - to define the sweetness and dilution of Brazilian cherry nectar, according to consumers' acceptance. Five different concentrations of sugar (6%, 8%, 10%, 12% and 14%) with 35% of Brazilian cherry pulp were used in the first session of the ideal scale methodology. In the following section, five different concentrations of pulp (25%, 30%, 35%, 40% and 45%) were evaluated with 10% sugar concentration, amount determined in the first session. For the response surface methodology study, a 2² full factorial design were applied with three replications of the central point, besides the axial points, totaling 11 runs. For both methodologies 100 fruit juice consumers evaluated overall acceptance using nine-point hedonic scales.

The data from the ideal scale were submitted to linear regression. The ideal sweetness and dilution were estimated at 10g sugar/100mL and 36mL pulp/100mL, respectively. The surface response data were analyzed by ANOVA and showed that the variables sugar ($p < 0.0001$) and pulp ($p = 0.0427$) influenced participants acceptance. The response surface graph was generated and the concentrations of 9.82g sugar/100mL and 33mL pulp/100mL met the optimized region. These findings were considered the study optimal formulation.

After determining the sugar and pulp concentrations using both methods, a third study was carried out a couple of weeks later. In this test the acceptance of the three samples previously defined using the explained procedures were analyzed by 100 fruit juice consumers. Results have shown no significant difference ($p < 0.05$) between them suggesting that the two methods yielded similar results, and can be applied to define concentrations of pulp and sugar for the nectar formulation. Particularities of the two procedures data collection have to be taken into account, and will play a role on the decision of which one will be adopted.

Keywords: Fruit Juice Formulation, Ideal Scale, Response Surface, Brazilian cherry