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Effect of the Incorporation of Modified Starch on the Physicochemical Properties and Consumer Acceptance of Puff Pastry

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Abstract : The intricate relationship between health and nutrition has driven the food industry to seek healthier and more sustainable alternatives. A key strategy currently employed is the reduction of saturated fats and the incorporation of ingredients that align with new consumer trends. Modified starch, a polysaccharide widely used in baking, also serves as a functional ingredient to boost dietary fiber content. However, its use in puff pastry remains challenging due to the technological difficulties in achieving a buttery pastry with the necessary strength to create thin, flaky layers. This study explored the potential of incorporating modified starch into puff pastry formulations. To evaluate the physicochemical properties of wheat flour mixed with modified starch, five different flour samples were prepared: T1, T2, T3, and T4, containing 10g, 20g, 30g, and 40g of modified starch per 100 g mixture, respectively, alongside a control sample (C) with no added starch. The analysis focused on various physicochemical indices, including the Water Absorption Index (WAI), Water Solubility Index (WSI), Swelling Power (SP), and Water Retention Capacity (WRC). The puff pastry was further characterized by color measurement and sensory analysis. For the preparation of the puff pastry dough, the flour, modified starch, and salt were mixed, followed by the addition of water until a homogenous dough was achieved. The margarine was later incorporated into the dough, which was folded and rolled multiple times to create the characteristic layers of puff pastry. The dough was then cut into equal pieces, baked at 170°C, and allowed to cool. The results indicated that the addition of modified starch did not significantly alter the specific volume or texture of the puff pastries, as reflected by the stable WAI and SP values across the samples. However, the WRC increased with higher starch content, highlighting the hydrophilic nature of the modified starch, which necessitated additional water during dough preparation. Color analysis revealed significant variations in the L* (lightness) and a* (red-green) parameters, with no consistent relationship between the modified starch treatments and the control. However, the b* (yellow-blue) parameter showed a strong correlation across most samples, except for treatment T3. Thus, modified starch affected the a* component of the CIELAB color spectrum, influencing the reddish hue of the puff pastries. Variations in baking time due to increased water content in the dough likely contributed to differences in lightness among the samples. Sensory analysis revealed that consumers preferred the sample with a 20% starch substitution (T2), which was rated similarly to the control in terms of texture. However, treatment T3 exhibited unusual behavior in texture analysis, and the color analysis showed that treatment T1 most closely resembled the control, indicating that starch addition is most noticeable to consumers in the visual aspect of the product. In conclusion, while the modified starch successfully maintained the desired texture and internal structure of puff pastry, its impact on water retention and color requires careful consideration in product formulation. This study underscores the importance of balancing product quality with consumer expectations when incorporating modified starches in baked goods.

Keywords : consumer preferences, modified starch, physicochemical properties, puff pastry
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