Understanding the Effect of Vacuum Level in Structure Development and Oil Absorption in Vacuum-Fried Wheat Starch and Gluten-Based Snacks

Vacuum frying has gained a significant strategic importance for future fried food manufacturing since, due to the low-temperature processing, significant benefits such as the improvement of fried product safety and quality can be obtained. So far, all studies have focused on agricultural products, such as potatoes, which are already structured by nature, but none of them has included fabricated products. This imposes a challenge since minimum conditions must be ensured to form structure during processing. The objective of this work was to understand the role of water boiling point (T bp) and processing temperature (T oil) in structure formation, oil absorption, and most important quality attributes of starch-based products during vacuum frying. Fabricated products were made of a reconstituted blend of gluten (12 % d.b.) and wheat starch (88 % d.b.) in order to accurately control ingredients proportion. Samples were fried varying the T bp from 38 to 71 °C while keeping a thermal driving force of 70 °C (i.e., T oil − T bp = 70 °C). Another set of samples was fried varying the thermal driving force from 37 to 70 °C while maintaining a T bp of 71 °C. Results showed that a higher T bp favored the capacity of the matrix to form structure due to starch gelatinization in the presence of water and temperature, reducing the oil content of the fried products. This was confirmed by scanning electron microphotographs. Results were consistent with textural measurements that showed a higher breaking force as the processing pressure increased (i.e., T bp), which was inversely related to oil absorption ($R^2 = 0.92$). In accordance, this study allows understanding the effect of vacuum level in structure development and oil absorption in vacuum-fried products when different food building blocks (gluten and wheat starch) are combined.

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