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## Effect of Flour Blends and Baking Conditions on the Quality of Orange Fleshed Sweet Potato-Pumpkin-Wheat Composite Breads During Storage

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### Abstract

Changes in moisture content and textural properties of bakery products during storage may be detrimental to the products' eating qualities and shelf-life. For example, excessive crumb moisture loss and firming can adversely affect eating quality. This study investigated the effects of flour blends, baking temperature and time on moisture, water activity (aw), textural properties and shelf life of orange fleshed sweet potato (OFSP)-pumpkin-wheat composite breads' crumbs during storage. The constraint design of the Design Expert software was used for the experimental design. OFSP-pumpkin-wheat flour blends were formulated using the flour limits: wheat (40–90 %), OFSP (10–60 %) and pumpkin (10–40 %). The breads were baked at different temperatures (150, 160, 170, 180, 190 and 200 °C) and baking time of 15–25 min. Moisture, aw and textural profile analysis were conducted on the fresh bread crumbs and stored products at 24h interval for 5 days in a climatic chamber at 25 °C and 50 % RH. The rate of staling and mold growth were also assessed during storage. The study showed that flour blends, baking temperature and time significantly ( $p < 0.05$ ) influenced crumb quality properties and shelf-life of OFSP-pumpkin-wheat composite bread during storage. It was observed that, bread crumb moisture content and aw decreased during storage by 5.5–34.7 % and 2.3–31.5 % respectively. Moreover, increased incorporation of OFSP and pumpkin flours slowed the rate of moisture loss from bread crumb and lowered aw during storage. Additionally, breads baked at higher temperatures ( $\geq 180$  °C) for longer time ( $\geq 19$  min) had a faster rate of moisture loss from crumbs. Furthermore, textural profile analysis of bread crumbs showed significant ( $p < 0.05$ ) increased in crumb hardness and chewiness whereas cohesiveness, springiness and resilience reduced during storage. Generally, bread products that contained high levels of wheat flour ( $>70$  %) and products baked at low temperatures for short time ( $\leq 170$  °C and  $\leq 19$  min) had higher rate of staling and mold growth. The study showed that OFSP and pumpkin flours could be included in wheat flour at 33 % and  $\leq 12$  %, respectively as well as baking temperature of 170–180 °C for 17–19 min could be applied to enhance bread crumb quality properties and shelf-life during storage.

**Keywords:** Baking temperature, bread crumb, moisture content, staling, storage, textural profile

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