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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 (≥ 180 °C) for longer time (≥ 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 (≤ 170 °C and ≤ 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 ≤ 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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