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Valorisation of shea (*Vitellaria paradoxa*) fruit by-products: Processing, characterisation and potential applications in bread development

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Abstract

Shea fruits are primarily processed for their nuts, resulting in the generation of substantial quantities of pulp as a by-product. This pulp is often discarded, despite being rich in health-promoting nutrients. Its nutritional potential makes it a valuable resource for the development of food products. However, fresh shea fruit by-products (SFB) are perishable and require post-harvest treatments to extend their shelf life and enhance utilisation. This study investigated the effect of drying air temperature (55 °C and 65 °C) and milling speed (3500 – 9500 rpm) on the drying characteristics, granulometries and physicochemical, bioactive and antioxidant properties of SFB powder. The effect of particle size (137.6 μm and 170.5 μm) and varying inclusion levels (0 %, 5 %, 10 %, 15 %, 20 %) of SFB powder on the physicochemical, bioactive, antioxidant and sensory properties of bread was also investigated. The results show that increasing the drying air temperature from 55 °C to 65 °C reduced the drying time. Lower milling speeds resulted in more particles being retained in larger sieve. Higher milling speeds were, however, noted to enhance the bioactive properties and antioxidant activity of SFB powder. Incorporating SFB powder into the bread formulation elevated carotenoids, phenolic compounds, flavonoids, dietary fiber, and antioxidant activity in the baked product. Generally, increasing particle size and SFB powder content led to reduced loaf volume, specific volume, and porosity. Bread made with 5 % of 137.6 μm particle size SFB powder exhibited comparable quality to the control bread in terms of loaf volume, specific volume, and porosity. Both the crust and crumb showed an increase in browning index and a decrease in whiteness index with higher SFB powder incorporation in the bread. Moreover, the sensory characteristics of the bread were influenced by both particle size and the level of SFB powder in the recipe. The bread containing 5 % and 10 % of 137.6 μm particle sizes of SFB powder, along with 5 % of 170.5 μm particle size SFP powder, received the highest ratings for overall acceptability. Generally, a 5–10 % substitution of wheat flour with SFB powder in bread can enhance phytochemical and dietary fibre intake without significantly affecting consumer acceptability.

Keywords: Bread development, by-product, drying, milling, shea fruit

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