BERRY PROCESSING BY-PRODUCTS: COMPOSITION, FUNCTIONAL PROPERTIES AND FOOD APPLICATIONS

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Introduction. Fruit-processing by-products represent valuable sources of nutrients and bioactive compounds that can be recovered and incorporated into food products to improve their nutritional and functional properties while supporting waste reduction and circular-economy principles. This work investigates the valorization of berry-processing by-products, particularly pomaces obtained from wild bilberry (Vaccinium myrtillus L.), blackberry (Rubus spp.), and blackcurrant (Ribes nigrum L.), and evaluates their potential as functional food ingredients.

Materials and methods. The dried pomace powders were analyzed for proximate composition, titratable acidity, fatty-acid profile, color characteristics, total phenolic, anthocyanin and flavonoid contents, individual phenolic compounds, and antioxidant activity. The functionality of these by-products was further demonstrated through their incorporation into corn-based extruded snacks and cookies.

Results and discussion. The analyses revealed distinct nutritional and bioactive profiles among the three berry pomaces. Blackberry pomace was particularly rich in dietary fiber, while bilberry showed the highest protein content, total phenolic content, and anthocyanin concentration. Berry pomace oils were dominated by unsaturated fatty acids, with polyunsaturated fatty acids accounting for approximately 72–77% of total fatty acids. Bilberry was especially rich in n-3 fatty acids and exhibited a favorable n-6/n-3 ratio. Bilberry and blackcurrant also demonstrated substantial antioxidant activity and contained important phenolic compounds, supporting their potential use as sources of natural antioxidants and pigments. Addition of bilberry pomace powder to extruded snacks increased fiber, phenolic content, and antioxidant activity while maintaining acceptable technological characteristics. The formulation containing 6% pomace achieved the highest overall sensory acceptability. In cookies, partial replacement of wheat flour with bilberry or blackcurrant pomace powders enhanced fiber, mineral, phenolic, and antioxidant contents and modified dough rheology, texture, color, and sensory characteristics. The 10% replacement level produced the highest overall acceptability for both pomace types.

Conclusions. Overall, berry pomaces are promising multifunctional ingredients for the development of nutritionally improved, antioxidant-rich, sensory-acceptable, and more sustainable food products, demonstrating an effective pathway for transforming fruit-processing residues into value-added functional ingredients.

Keywords: *berry pomaces; bioactive compounds; color; cookies; corn puffs; sensory analysis; texture*

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