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POTENTIAL USE OF PUMPKIN SEED OIL PROCESSING BY-PRODUCT TO IMPROVE QUALITY OF GLUTEN-FREE CRACKERS

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As a consequence of the growing population of health-conscious individuals, there is a trend toward the fortification of conventional bakery products with nutrient-rich ingredients to produce nutritionally improved or health-enhancing goods, such as high-protein, high-fibre, and low-glycaemic-index products. This trend is particularly prevalent in the development of gluten-free products. The use of unconventional gluten-free flours that are not rich in starch components can significantly improve the nutritional quality of this type of product. In that sense, pumpkin seed press cake, a by-product of oil production and a source of nutritionally valuable compounds such as dietary fibre, proteins, essential fatty acids, antioxidant compounds, and minerals, represents a chance to reduce the nutritional deficiencies of gluten-free products. Therefore, the objective of the present work was to evaluate the effect of pumpkin seed press-cake flour addition on gluten-free cracker formulation, considering nutritional and sensory characteristics as well as the glycaemic index, polyphenolic content, and antioxidant activity of the final product. Three different crackers were formulated: a control cracker prepared with 100% chickpea flour and crackers containing 20% and 35% of the cold-pressed pumpkin seed cake flour instead of chickpea flour. The proximate composition of the crackers obtained is a function of the gradual substitution of chickpea flour with pumpkin seed cake flour, with the presence of pumpkin seed cake flour influencing the higher content of proteins, fats, and ash in crackers while decreasing the total carbohydrate content. Due to the high dietary fibre and protein content of the used raw materials, the investigated crackers may have the claims "high in fibre" and "source of protein". The incorporation of pumpkin seed press cake flours resulted in higher values of total phenolic content and antioxidant activity. All tested crackers had a moderate glycaemic index, but substituting pumpkin seed press cake flour for chickpea flour at both levels (20 and 35%) significantly reduced cracker glycaemic index. Sensory evaluation of crackers showed that all examined samples exhibited acceptable sensory properties, implying that the presence of pumpkin seed press-cake flour did not diminish but rather improve some sensory attributes, such as taste and flavour. The present study revealed that this by-product could be exploited in gluten-free cracker production, ensuring multiple benefits such as increasing the nutritional quality of the final product, enhancing total phenolic content and antioxidant activity, and reducing the glycaemic index of bakery foods, thus concomitantly supporting the concept of industrial symbiosis and revaluing by-products of the food industry.
Key words: *gluten-free crackers, pumpkin seed oil processing by-products, glycaemic index*

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POTENCIJAL BRAŠNA OD POGAČE SEMENA ULJANE TIKVE GOLICE KAO SIROVINE U PROIZVODNJI NUTRITIVNO OBOGAĆENIH BEZGLUTENSKIH KREKERA

Jelena TOMIĆ[1], Dubravka ŠKROBOT[1], Nikola MARAVIĆ[1], Miroslav HADNAĐEV[1], Tamara DAPČEVIĆ-HADNAĐEV[1], Ljiljana POPOVIĆ[2], Jelena ČAKAREVIĆ[2]
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Povećana svest savremenog društva o odnosu hrane i zdravlja nametnula je pojavu trenda ka obogaćivanju konvencionalnih pekarskih proizvoda bogatim hranljivim sastojcima u cilju proizvodnje nutritivno unapređenih proizvoda, kao što su proizvodi bogati proteinima, vlaknima i proizvodi niskog glikemijskog indeksa. Ovaj trend je posebno zastupljen u razvoju bezglutenskih proizvoda. Upotreba nekonvencionalnih bezglutenskih brašna, koje karakterišu manji sadržaj skroba, može značajno poboljšati nutritivni kvalitet ove vrste proizvoda. U tom smislu, pogača semena uljane tikve golice, kao nusproizvod proizvodnje ulja i izvor nutritivno vrednih jedinjenja kao što su dijetalna vlakna, proteini, esencijalne masne kiseline, antioksidativna jedinjenja i minerali, predstavlja adekvatnu sirovinu za proizvodnju bezglutenskih proizvoda odgovarajućeg nutritivnog profila. Stoga je cilj ovog rada bio da se proceni uticaj dodatka brašna od pogače semena uljane tikve golice na kvalitet bezglutenskih krekera, uzimajući u obzir nutritivne i senzorske karakteristike, kao i glikemijski indeks, sadržaj polifenola i antioksidativnu aktivnost finalnog proizvoda. Formulisana su tri različita krekera: kontrolni kreker pripremljen sa 100% brašna od leblebije i krekeri koji sadrže brašno od pogače semena uljane tikve golice u dva nivoa supstitucije (20% i 35%). Hemijski sastav dobijenih krekera je u značajnoj meri zavisio od sirovina korišćenih u formulaciji pri čemu je prisustvo brašna od pogače semena uljane tikve golice uticao na povećanje sadržaja proteina, masti i pepela u krekerima uz smanjenje ukupnog sadržaja ugljenih hidrata. Zbog visokog sadržaja dijetetskih vlakana i proteina u korišćenim sirovinama, novokreirani bezglutenski krekeri mogu biti nosioci nutritivnih izjava kao što su "bogati vlaknima" i "izvor proteina". Supstitucija brašna leblebije sa brašnom od pogače semena uljane tikve golice povećala je sadržaj ukupnih fenola te poboljšala antioksidativnu aktivnost krekera. Svi ispitivani krekeri su imali umeren glikemijski indeks, dok je prisustvo brašna od pogače semena uljane tikve golice značajno uticala na smanjenje glikemijskog indeksa. Senzorska analiza krekera pokazala je da su svi ispitivani uzorci pokazali prihvatljiva senzorska svojstva, pri čemu je prisustvo brašna od pogače semena uljane tikve golice uticao na poboljšanje pojedinih senzorskih svojstava kao što su ukus i aroma. Na osnovu rezultata ovog istraživanja može se zaključiti da se nusproizvod proizvodnje ulja iz semena tikve golice može iskoristiti u proizvodnji bezglutenskih krekera, obezbeđujući višestruke prednosti kao što su povećanje nutritivnog kvaliteta finalnog proizvoda, povećanje ukupnog sadržaja fenola i antioksidativne aktivnosti i smanjenje glikemijskog indeksa, istovremeno podržavajući koncept industrijske simbioze i revalorizacije nusproizvoda prehrambene industrije.
Ključne reči: *bezglutenski krekeri, pogača semena uljane tikve golice, glikemijski indeks*

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