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REVIEW

Next-generation gluten-free noodles: integration of hydrocolloids, fibers, and bioactive compounds

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Abstract

Growing consumer interest in gluten-free food, fueled by celiac disease, gluten intolerance, and health-oriented consumers, has prompted the investigation into gluten-free noodles (G-FN). However, the absence of gluten poses a serious challenge to formulating noodles with desirable texture and nutritional acceptability. This review critically evaluates sustainable and functional solutions for enhancing G-FN formulations, focusing on hydrocolloids, dietary fibers, and bioactive compounds. Recent ingredient blends such as hydrocolloids mimicking gluten network, fibers managing bio-accessibility of starch and hydration, and bioactive compounds improving the nutritional value are highlighted in enhancing product performance and stability. Industrial implications are considered for enhanced dough processing, shelf-life, and nutrition labelling compliance. Sensory quality and consumer acceptance are discussed along with industrially relevant solutions. Future research directions are proposed to guide the nutritionally fortified formulation and universally accepted G-FN by health-oriented consumers, and to offer useful guidance for next-generation G-FN that aligns with consumer and regulatory demands.

Keywords Gluten-free noodles · Nutritional quality · Hydrocolloids · Bioactive compounds · Consumer acceptance

Introduction

In many countries, noodles form a major part of daily nutrition and are produced from rice, corn, wheat, and other grains and starches, including pulses, potatoes, and sweet potatoes (Liao et al., 2021a, b; Obadi et al., 2020; Oladeji et al., 2025). According to reports, 40% of the wheat consumed in Asia is linked to noodles, accounting for about 12% of global wheat (Obadi et al., 2022). However, the rising occurrence of gluten health conditions including wheat allergy and celiac disease has propelled the demand for gluten-free noodles (G-FN). Wheat noodles are restricted for consumers with cardiovascular disease and diabetes due to high glucose in the blood (Liu et al., 2018). The demand for gluten-free foods increased to over USD 7.91 billion in 2024 and is projected to reach USD 14.67 billion by 2032 (Semplicini, 2021). Nevertheless, creating G-FN involves some difficulties, especially regarding texture, flavor, and nutritional quality such as vitamins, fibers, and minerals (Guardianelli et al., 2019). The growing interest in G-FN has propelled extensive research by food scientists on its preparation from pseudo-grains and fortifications with additives (Drub et al., 2021).

In conventional noodles, gluten creates an uninterrupted protein network that offers structural strength, elasticity, and chewiness. The absence of gluten in G-FN produces foods that are brittle, sticky, or prone to disintegrating during cooking (Obadi et al., 2022). However, incorporating modified starches, native starches, and hydrocolloids (HCs) is considered a substitute for gluten or wheat flour in G-FN

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