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From Sea to Plate: How Shrimp Powder is Transforming Everyday Vermicelli into a Nutritious Superfood

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Shrimp is a highly nutritious seafood rich in high-quality protein, omega-3 fatty acids, essential minerals, and bioactive compounds. However, its high perishability often limits its utilization. Converting shrimp into powder through modern drying technologies enhances shelf life while preserving its nutritional quality, making it a valuable ingredient for functional foods. Recent research demonstrates that shrimp powder can successfully enrich cereal-based products, particularly noodles and vermicelli, by improving protein content, mineral composition, and overall nutritional value without compromising cooking or sensory characteristics. Incorporating shrimp powder into vermicelli also promotes sustainable utilization of seafood resources by reducing post-harvest losses and creating value-added products. Shrimp powder-enriched vermicelli therefore represents a promising, nutritious, and convenient food that meets the growing consumer demand for healthy, sustainable, and protein-rich convenience foods.

Introduction

In today's fast-paced world, consumers are looking for foods that are not only quick and convenient but also rich in nutrients. Traditional cereal-based products such as noodles and vermicelli are among the most popular convenience foods because they are affordable, easy to prepare, and widely accepted across all age groups. However, these products are primarily rich in carbohydrates and often lack sufficient protein, essential minerals, and health-promoting compounds. This growing concern has encouraged food scientists to explore innovative ways of improving the nutritional quality of everyday foods without compromising their taste and consumer appeal.

One promising solution comes from an unexpected source—the sea. Shrimp is widely recognized as one of the most nutritious seafoods, offering high-quality protein, essential amino acids, omega-3 fatty acids, vitamins, minerals, and natural antioxidants while being low in fat. Despite these remarkable nutritional benefits, fresh shrimp is highly perishable because of its high moisture content, leading to considerable post-harvest losses. Modern food processing technologies such as hot-air drying, foam-mat drying, and oven drying have made it possible to convert shrimp into shelf-stable powders that retain much of their nutritional value and functional properties. These powders can be conveniently incorporated into various food products, creating new opportunities for developing healthy and protein-rich convenience foods.

Over the past decade, researchers have successfully incorporated shrimp meat, fish powder, seafood protein concentrates, and other marine ingredients into pasta, noodles, and similar cereal-based products. These studies consistently demonstrate improvements in protein content, essential fatty acids, mineral composition, texture, and overall nutritional quality. In many cases, carefully optimized formulations have maintained excellent cooking

characteristics and sensory acceptability, proving that healthier products can still satisfy consumer preferences.

Vermicelli, a staple food enjoyed in many Asian countries, provides an ideal platform for nutritional enrichment because of its simple formulation and widespread popularity. However, compared with noodles and pasta, relatively little research has focused on enriching vermicelli with shrimp powder. This presents an exciting opportunity to develop a functional food that combines the nutritional richness of marine resources with the convenience of traditional cereal products. Such innovations not only improve dietary protein intake but also contribute to better utilization of seafood resources and reduction of post-harvest waste.

The development of shrimp powder-enriched vermicelli represents an excellent example of how food science can transform a common household food into a healthier alternative. By combining modern processing technologies with nutrient-rich marine ingredients, researchers are paving the way for sustainable, value-added foods that support better nutrition, promote seafood utilization, and meet the evolving demands of health-conscious consumers.

Shrimp Powder: A Nutritional Treasure

Shrimp is widely recognized as one of the most nutritious seafoods because it is rich in high-quality protein, essential amino acids, omega-3 fatty acids, vitamins, minerals, and natural antioxidants while remaining low in fat. However, fresh shrimp contains a high moisture content, making it highly perishable and prone to spoilage. Converting shrimp into powder through drying technologies not only extends its shelf life but also creates a convenient ingredient that can be incorporated into a variety of foods, including noodles and vermicelli (Hamzeh et al., 2019; Azmi et al., 2024).

Recent advances in food processing have shown that shrimp powder retains most of its nutritional value while offering excellent functional properties such as improved water-binding capacity, solubility, and storage stability. These characteristics make it an ideal ingredient for developing value-added convenience foods.



Figure 1: Shrimp powder

Modern Drying Technologies Preserve Quality

The quality of shrimp powder largely depends on the drying method used. Studies comparing hot-air drying, oven drying, vacuum drying, and foam-mat drying have demonstrated that hot-air drying produces shrimp powder with the lowest moisture content, better microbial safety, and high protein retention. Oven drying also provides good nutritional quality, whereas vacuum drying may retain excessive moisture, reducing storage stability (Azmi et al., 2024).

Foam-mat drying has also gained attention because it produces shrimp powder with improved functional properties and faster drying rates. Higher drying temperatures reduce moisture and water activity while enhancing powder solubility, making the product more suitable for incorporation into cereal-based foods (Hamzeh et al., 2019).

Processing methods also influence the nutritional quality of shrimp. Grilling has been reported to preserve protein and antioxidant activity more effectively than frying or boiling. Likewise, pre-treating shrimp with about 3% salt before drying improves protein retention, sensory quality, and microbial safety without adversely affecting flavour (Zawawi et al., 2023).

Shrimp Powder Improves Everyday Foods

Shrimp powder is increasingly being used as a functional ingredient to enrich commonly consumed foods. Researchers have successfully developed powdered shrimp products and seafood seasonings that retain the natural flavour and nutritional quality of shrimp while offering greater convenience and longer shelf life (Phanumong et al., 2023). The greatest potential, however, lies in fortifying cereal-based foods. Since noodles and vermicelli are consumed worldwide, enriching them with shrimp powder provides an effective way to increase dietary protein and essential nutrients without changing eating habits.

Seafood-Fortified Noodles: Healthier Convenience Foods

Numerous studies have demonstrated that incorporating shrimp meat or fish powder into noodles significantly improves their nutritional quality. Addition of freeze-dried shrimp meat increases protein, essential amino acids, and omega-3 fatty acids while maintaining acceptable cooking and sensory characteristics when used at optimum levels (Ramya et al., 2015).

Similarly, fish powders from species such as red cod, salmon, anchovy, and Bombay duck have been successfully incorporated into pasta and noodles, leading to higher protein, mineral, and antioxidant contents. Although seafood proteins may slightly increase cooking loss at higher inclusion levels, optimized formulations maintain good texture, cooking quality, and consumer acceptability (Desai et al., 2019).

Research has also shown that shrimp proteins strengthen the internal structure of noodles by interacting with starch and gluten, producing firmer products with improved cooking stability. Shrimp-enriched noodles containing moderate levels of shrimp generally receive the highest sensory scores, demonstrating that nutritional improvement does not necessarily compromise taste or texture (Yerlikaya et al., 2021).

Why Shrimp-Enriched Vermicelli Deserves Attention

Vermicelli is a popular convenience food across many Asian countries, but it is mainly prepared from refined wheat flour and therefore contains limited protein and micronutrients. Previous studies have successfully enhanced vermicelli using millets, pulses, herbs, and other functional ingredients, resulting in higher protein, dietary fibre, calcium, iron, and antioxidant contents while maintaining desirable cooking and sensory qualities (Sinha & Sharma, 2020).

Despite these advances, very few studies have explored the use of shrimp powder as a fortifying ingredient in vermicelli. Considering its excellent nutritional composition and functional properties, shrimp powder offers significant potential for developing high-protein vermicelli with improved health benefits and consumer appeal.

Towards Sustainable and Nutritious Foods

Using shrimp powder in vermicelli offers benefits beyond improved nutrition. Processing fresh shrimp into shelf-stable powder helps reduce post-harvest losses, increases the value of seafood resources, and supports sustainable utilization of marine products. At the same time, fortifying widely consumed foods allows consumers to increase their intake of protein and essential nutrients without changing their dietary habits. As demand for healthier convenience foods continues to grow, shrimp powder-enriched vermicelli represents a promising innovation that combines nutrition, sustainability, and consumer convenience. With continued research and product development, this simple yet effective approach has the potential to transform an everyday staple into a functional food that contributes to improved public health and better utilization of valuable seafood resources.

Conclusion

Shrimp powder-enriched vermicelli represents an innovative approach to developing healthier convenience foods by combining the nutritional benefits of seafood with a widely consumed cereal product. Advances in shrimp processing and drying technologies have made it possible to produce high-quality shrimp powder that retains valuable protein, minerals, and bioactive compounds while ensuring longer shelf life. Incorporating this nutrient-rich

ingredient into vermicelli can significantly enhance its nutritional profile without compromising cooking quality or consumer acceptability. Besides promoting better nutrition, such value-added products also support sustainable utilization of seafood resources and help reduce post-harvest losses. Continued research and product development will further strengthen the potential of shrimp powder-fortified vermicelli as a functional food for health-conscious consumers.

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