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**File: ■ Lupin (*Lupinus* spp., Fabaceae) Kernel Fiber**
**■ Nutritional Composition**
**■ Consumer Appeal**

**HC 082221-708**

**Date: March 15, 2023**

**RE: Lupin Kernel Fiber, Functional Ingredient with Opportunity for Use in Foods**

Malekipoor R, Johnson SK, Bhattarai RR. Lupin kernel fibre: nutritional composition, processing methods, physiochemical properties, consumer acceptability and health effects of its enriched products. *Nutrients*. July 11, 2022;14(14):2845. doi: 10.3390/nu14142845.

The kernels (dehulled seeds) of a few species of Lupins (*Lupinus* spp., Fabaceae) have recently gained interest as a rich source of dietary fiber. Lupins are also gluten-free, non-genetically modified, and low in phytoestrogens, potentially increasing consumer appeal. This review summarizes the nutritional composition, manufacturing methods, physiochemical properties, health effects, and drivers and barriers of consumer acceptability of lupin kernel fiber (LKF).

Lupin seeds contain both insoluble and soluble fibers, offering different physiochemical properties and health effects. The seed coat (hull) of lupins accounts for about 25% of the seed's weight and is composed of 96.5% insoluble and 3.5% soluble fiber. The lupin seed hull has been used in the production of high-fiber bread, meat products, and as a bulking agent; however, most lupin hull provides little value as a food additive and is disposed of as waste. The remainder of this review will focus on LKF.

In contrast to the lupin hull, the kernel contains more soluble fiber along with a wider range of polysaccharides without lignin, which has anti-nutrient effects. Owing to these properties, lupins have great potential in the manufacturing of plant-based food ingredients and products. Potential methods to manufacture LKF include wet (chemical) and dry (physical processing), both of which separate the protein and lipid from the dietary fiber using starting material. However, there are inherent advantages and disadvantages to both.

Wet processing produces large volumes of high-moisture, paste-like residue that is uneconomical to dry to a shelf-stable powder. There are also drawbacks to manufacturing lupin fractions using wet processing methods due to the large quantities of water, energy, and chemicals required. Extrusion cooking is a novel approach to overcome the drying issues of LKF residue and may favorably change the fiber composition to include a higher proportion of soluble fiber. Alternatively, dry processing involves a relatively simple construction of processing plants, no wastewater production,

and minimal changes in the structure and functional properties of LKF components. These advantages can translate to low capital and labor costs, a less costly effluent disposal system, and minimal sanitation to extract the protein and fiber fractions from lupins.

A wide range of physiochemical properties influences the effects of adding dietary fiber ingredients into food products. The pale color and low odor and flavor of LKF make it suitable to enrich various products such as dairy, baked goods, and meat products with fiber. A preheat treatment of the lupin seed to reduce the lipoxygenase activity prior to manufacturing LKF can prevent the non-enzymatic oxidation that can occur during storage. LKF also has a high water- and oil-binding potential, especially compared with other primary sources of insoluble fiber, making it an ideal additive for preparations like burgers and as a replacement for fat in processed meat products. And although there are only a few published studies on the sensory acceptability of foods containing LKF, it has demonstrated acceptable palatability when incorporated in a variety of foods, including white bread and pasta. However, muffins, orange juice, and breakfast bars incorporated with LKF have demonstrated lower palatability compared with controls, indicating that the importance of understanding the phytochemical properties of fibers and their interactions in the food matrices and processing-induced changes.

The nutrient composition of LKF may have beneficial health effects owing primarily to its fiber content. Specifically, LKF has demonstrated appetite-suppressing effects that lead to weight loss and improvements in blood lipids as well as bowel function. LKF may also support glycemic control and reduce the risk of type 2 diabetes or help manage glycemic control in those with the condition. Beyond these health effects, the prebiotic fiber of LKF positively affects the gut microbiota, which plays an essential role in immune health and lowering the systemic low-grade inflammation associated with various diseases, including heart disease.

The authors conclude that LKF is a functional health ingredient with great opportunity for more widespread use in foods, but there are currently few, if any, commercially available LKF food ingredients. Because the high water-binding properties of LKF are a commercial barrier to drying it as a stable powder food ingredient, future investigation into alternative drying methods such as extrusion cooking are necessary. Future study is also necessary to confirm the health benefits of LKF on weight management and for improving blood lipids and bowel health. The authors report no conflicts of interest.

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Referenced article can be accessed at https://www.mdpi.com/2072-6643/14/14/2845.