The Benefits of Seaweed in Companion Animal Foods

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Overview

Seaweed is gaining in popularity as a beneficial supplement in the diets of companion animals. Seaweed supplementation has been found to improve nutritional, antioxidant, and immune status in cats and dogs (Srinivas et al., 2024; Yusof et al., 2024). *Kappaphycus alvarezii*, a red seaweed, has garnered attention for its potential benefits when included in animal feeds. This seaweed is rich in bioactive compounds, including carrageenan, which is known for its prebiotic properties. Recent studies have explored its impact on gut health in various animal models, highlighting its potential to enhance gut microbiota, improve nutrient absorption, and boost overall health. Seadling is a natural ingredient derived from *K. alvarezii* and further enhanced through fermentation to provide a wide array of health benefits, including support of a healthy gut microbiome and immune system, support of skin and coat health, and skeletal and dental dental health support. Seadling is also a natural alternative to improve texture and palatability of pet foods. Along with being nutrient-rich and improving finished product appearance and quality, Seadling is sustainably produced, is organic and non-GMO, and offers clean labeling.

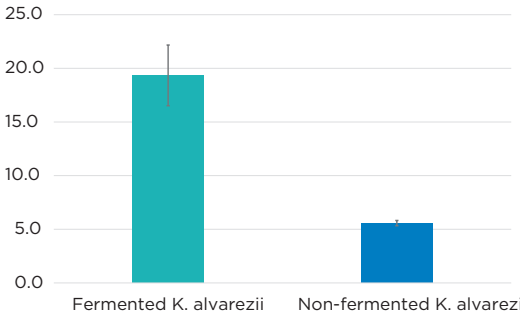
What it is & How it is made?

Kappaphycus alvarezii is extensively cultivated in tropical regions and is the starting point for the production of Seadling. The seaweed is specialty cultivated to ensure nutritional consistency, high quality, and minimal impacts to the environment. Once the seaweed has reached optimal maturity, it is harvested and further fermented using proprietary technology to enhance the bioavailability of nutrients. Following fermentation, the product is dried through a special process to ensure nutritional and processing functionality is maintained. The proprietary fermentation process of *K. alvarezii* improves digestibility and bioavailability of the nutrients present in seaweed but also transforms hard-to-digest fibers into beneficial soluble fibers.

Importance of Fermentation

Fermented *Kappaphycus alvarezii* contains up to three times more soluble oligomeric carbohydrates (or oligosaccharides), which makes it easily bioavailable to beneficial gut bacteria. This can lead to improved digestion, better nutrient absorption, and a healthier gut microbiotia (Lomatire, 2021; Wells, 2017). Fermenting the seaweed material offers several benefits, including reduced crude fiber and increased oligosaccharide, protein, and amino acid content, making it a more cost-effective functional feed additive (Felix et al., 2014; Li et al., 2019; Mandal et al., 2018). It is an alternative way to enhance the raw material while keeping it within the scope of natural and green labeling aspects.

Figure 1: Soluble Oligosaccharide Content of Fermented *Kappaphycus alvarezii* vs Non-Fermented *K. alvarezii*. (Source: Seadling)



Fermented *K. alvarezii* is also nutrient-rich and retains the vitamin and minerals naturally found in seaweed. Fermented *K. alvarezii* is an excellent source of the essential macro-minerals calcium, phosphorus, potassium, and sodium along with trace minerals iron, manganese, zinc, and iodine. The fermentation process of *K. alvarezii* has also been found to enhance the vitamin K2 content. Vitamin K2 is a fat-soluble vitamin that plays a crucial role in various physiological processes.

Gut Health Support & Immunity Boost

One of the primary benefits of *Kappaphycus alvarezii* is its ability to modulate gut microbiota. Studies have shown that the inclusion of this seaweed in animal diets can lead to a favorable balance of gut bacteria (Paul et al., 2020; Rupert et al., 2022). Seaweeds, including *K. alvarezii*, also contain an array of bioactive compounds, including polysaccharides and polyphenols. Polysaccharides, such as alginate, carrageenan, and fucoidan have been shown to exhibit antioxidant, anti-inflammatory, and immunomodulary properties. Carrageenan, a large component of *K. alvarezii*, has been found to promote the growth of beneficial gut bacteria, thus enhancing immune function. These compounds can help strengthen the immune response, reducing the risk of infections, and improving overall health (Bajury et al., 2017; Paul et al., 2020; Rupert et al., 2022). This added immune support can be especially beneficial for aging pets or those with compromised immune systems. Additionally, recent research in dogs has shown diet supplementation with *K. alvarezii* increased the population of Bifidobacteria and Lactobacillus, both associated with improved gut health. Along with a shift towards these more beneficial gut bacteria, short chain fatty acid production was also increased in dogs feed supplemental *K. alvarezii* (Srinivas et al., 2024). Short chain fatty acids are essential to help maintain gut integrity and metabolic health (Blaak et al., 2020).

Enhanced Nutrient Absorption

In addition to enhancement of the gut microbiota, *K. alvarezii* has been shown to enhance nutrient absorption. The seaweed's high fiber content aids in the digestion process, allowing for better absorption of essential nutrients. In a study involving cats, the inclusion of fermented *K. alvarezii* (Seadling) in their diet improved nutrient digestibility and overall gut health (Yusof et al., 2024). This improvement in nutrient absorption can lead to better growth rates and overall health in animals.

Antioxidant Capacity & Anti-inflammatory Properties

Along with support of a healthy gut and improved nutrient absorption, *K. alvarezii* contains a range of polyphenols, which are powerful antioxidants that can help protect cells against oxidative stress and reduce overall inflammation. Polyphenols have also been found to improve blood circulation, reducing the risk of heart disease and contributing to overall cardiovascular health (Cardoso et al., 2015). Recent research has also shown *K. alvarezii* can help improve glutathione status in dogs (Srinivas et al., 2024). Glutathione is a powerful antioxidant found in every cell of the body. As an antioxidant, glutathione, helps neutralize free radicals, which are unstable molecules that can damage cells and contribute to aging and disease such as cancer and heart disease. By reducing oxidative stress, glutathione helps protect cells from damage and supports overall cellular health. Along with reducing oxidative stress, glutathione can help detoxify the body by binding harmful substances, like heavy metals and toxins (Labarrere et al., 2022).

Skeletal & Dental Support

The combination of macro (calcium, phosphorus, potassium, and sodium) and trace minerals (iron and manganese) found in fermented *K. alvarezii* helps support healthy bone and teeth formation, support vital components of various enzyme systems in the body, and are responsible for regulation of acid-base balance and osmotic pressure. The vitamin K2 content is enhanced with fermentation and allows *K. alvarezii* to serve as a natural source when needed in diets and treats. Vitamin K is best known for its role in the blood clotting mechanism. Vitamin K is an essential co-factor for the synthesis of clotting factors in the liver and deficiency can lead to excessive bleeding and bruising. In addition to supporting blood clotting factors, vitamin K also plays a significant role in bone health. Osteocalcin, a protein essential for bone formation and maintenance, requires vitamin K for synthesis. Adequate levels of vitamin K contribute to stronger bones and overall skeletal health. Generally, the nutritional requirements for cats and dogs for vitamin K are achieved through synthesis by bacteria in the large intestine, but supplementation may be needed based on health status and/or inclusion of other ingredients (high fish-based inclusion, inclusion of some fibers, etc) in the diet (Case et al., 2011).

Many seaweeds, especially brown seaweeds, are known to have a high iodine content that can sometimes limit inclusion into animal feeds (Lomartire, et al., 2021). The iodine content of *K. alvarezii* is much lower allowing for safe consumption when included in complete feeds and/or treats. Iodine is essential for maintaining thyroid function, supporting growth and development, ensuring reproductive health, and boosting immune function in animals.

Skin & Coat Support

Many components of fermented *K. alvarezii*, including prebiotic activity, antioxidant capacity, anti-inflammatory properties, and zinc help support skin and coat health. Preliminary data has shown the supplementation of fermented *K. alvarezii* in cat diets had positive impacts on skin and coat. Fermented *K. alvarezii* supplies multiple bioactive compounds and nutrients with activities at the gastrointestinal level that contribute to overall health which further supports hair recovery, hydration, keratinization, and hair growth to help maintain normal skin and coat quality. Overall, skin and coat appearance are a reflection of an animal's overall health status (Yusof et al., 2024).

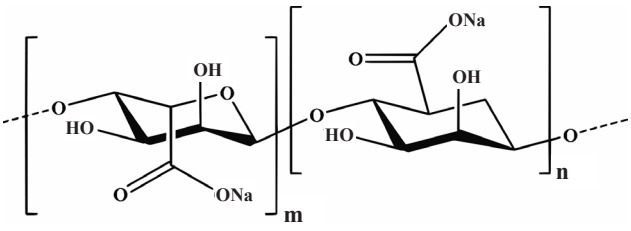
Applications in Pet Food Production

Seaweeds serve as effective natural binding agents in pet food and animal feeds due to their rich content of compounds like alginates, agar, and carrageenan. These substances help improve texture, moisture retention, and stability in pet food products, particularly in wet or semi-moist formulations. As natural and safe alternatives to synthetic binders, seaweed-based agents align with the growing demand for clean label pet food, enhancing both the quality and appeal of the final product.

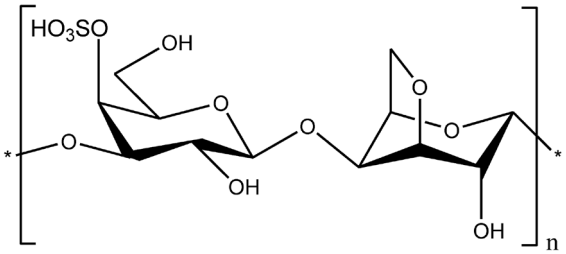
Figure 2. Structures of a) alginates and b) carrageenan naturally found in brown and red seaweed (Source: Faroughi & Warren, 2018; Solov'eva et al., 2013).

Natural gelling and binding from the use of fermented seaweed helps enhance the texture of wet foods by creating a smoother and more cohesive product. This allows manufacturers to maintain a high degree of product consistency. Enhanced texture contributes to overall palatability of a product, especially for cats. Fermented *K. alvarezii* has been found to be a suitable replacement for other binding ingredients including various gums (guar, xanthan, locust bean, etc.), carrageenan, etc. Inclusion of fermented *K. alvarezii* for binding and texture purposes can vary depending on the overall formulation, but typically ranges in the 0.5 to 1.0% range.

Although natural hydrocolloid binders can be obtained from plants and seaweed, chemical modifications of these compounds are often performed to meet the industrial needs. Altering the structure of seaweed-derived polysaccharides to enhance their properties as binders and are done through chemical crosslinking, sulfation, carboxylation, acetylation, alkylation and oxidation. While this can improve solubility, viscosity, mechanical strength, and biodegradability, the natural and clean label essence of the hydrocolloid binder is lost. Fermentation of *K. alvarezii* allows for the desirable gelling and binding properties to be maintained and also keeps the natural and clean label claims.



(a)



(b)

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Sustainability

In addition to being a nutrient and processing powerhouse, the use of seaweed, including Seadling, has many positive environmental and economic impacts. Seaweed farming is considered environmentally sustainable because it does not require freshwater, fertilizers, or pesticides thus reducing the overall environmental footprint compared to traditional agriculture (NOAA Fisheries, 2023). Along with being sustainable, cultivation of seaweed helps with carbon sequestration, enhancement of marine biodiversity, and help improve water quality by absorbing excess nutrients to help reduce the occurrence of harmful algal blooms (UNEP, 2023; Spillias et al., 2023, WEforum.org). Positive economical impacts include job creation, diversification of local economies, and meets growing market demands for additives with functional health and processing benefits along with being non-GMO and clean label (Spillias et al., 2023).

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