

Seaweeds as a rich source of prebiotic dietary fibers and other important nutrients for pet food



By Geert van der Velden, Innovation Manager at IQI Trusted Petfood Ingredients

Seaweeds present opportunities as unique ingredients with a number of health benefits for pets, such as cats and dogs. The most important property of these marine macroalgae is their very high content of soluble prebiotic dietary fibers, which support good gut health. Additionally, seaweeds are excellent sources of amino acids, vitamins and minerals. However, not all seaweeds are equally suitable for use in pet food and need to be carefully selected. Particularly green seaweeds offer a cost-effective ingredient with high palatability, low level of contaminants and an excellent reputation as a healthy source of food for both humans and pets.

Kinds of seaweed

The term seaweeds, or macroalgae, refers to more than 10,000 species of macroscopic, multicellular, marine algae. These plant-like marine organisms can have properties as diverse as those between different kinds of plants found on land and collect nutrients from the abundant resources in circulating seawater. The critical parameters for selecting seaweeds most suitable for use in pet food include iodine and arsenic levels, type and content of fibers, crude ash, and palatability.

Beneficial seaweeds for use in pet food are found in all three color types, including Rhodophyta (red), Phaeophyta (brown) and Chlorophyta (green) macroalgae. These are very broad groups. Brown seaweeds are generally the largest seaweeds, mostly marine and include approximately 1,800 different

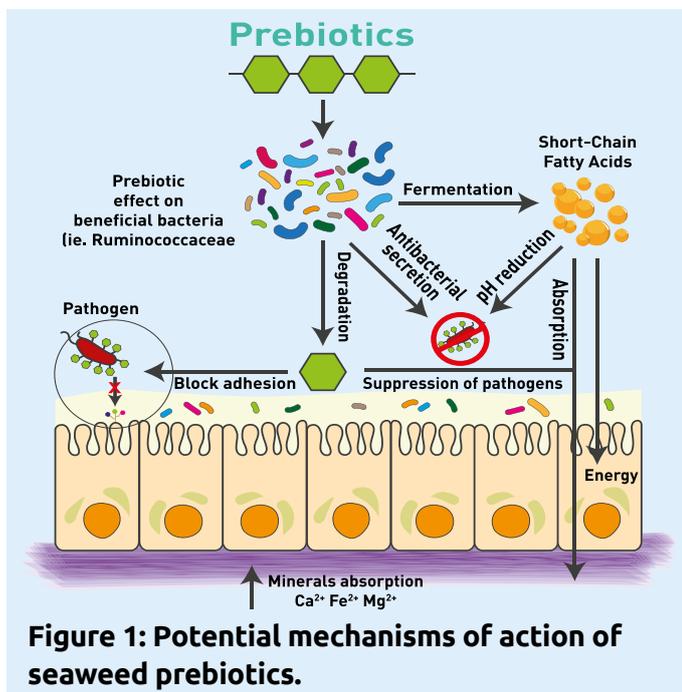
species. Red seaweeds are often found deeper in the ocean than brown seaweeds, are also mostly marine and include approximately 7,000 species. Green seaweeds include over 1,500 species and are found both in marine and fresh waters and overall have superior properties for use in pet food (see table 1).



Excellent source of prebiotics

Seaweeds are an excellent source of both soluble and insoluble, fermentable and non-fermentable dietary fibers, which are the cornerstone of a healthy diet for both humans and pets. Both kinds of fibers are equally important to cats and dogs but have specific functionality contributing to good gut health and a lower risk of different kinds of disease, including obesity, inflammatory bowel disease, cardiovascular disease, diabetes and metabolic syndrome.

Seaweeds in particular are one of the most concentrated sources of soluble fibers, with levels as high as 40%. Soluble fiber dissolves in water and gastrointestinal fluids, and in the large intestine becomes a substrate for the 'good' microflora in the gut. These beneficial microflora ferment the fiber into short-chain fatty acids, resulting in an increase in their population in the gastrointestinal tract. This process is described as a prebiotic effect (see figure 1). The fibers found in red, brown and green seaweeds are therefore prebiotics. Unlike land-based plants, in different seaweeds there are many unique compositions of complex carbohydrate or polysaccharide fibers that are used as the preferred source by the different species of bacteria.



As opposed to land-based prebiotic fibers, seaweeds have negligible lignin, meaning that fibers found in seaweeds ferment far more readily, thereby enhancing the prebiotic effect in the gut. Prebiotics in general contribute to a diverse and balanced gut microbiota which reinforce the natural defensive response to pathogenic and toxigenic bacteria. Thus prebiotics offer an effective reinforcement against

digestive disorders, such as diarrhoea and inflammatory bowel disease. They help the animal to digest food more efficiently, reduce faecal odours and promote more solid stools, making them easier to collect and dispose of.

Essential omega-3s

Seaweeds are important sources of omega-3 or n-3s, which are fatty acids that perform an essential role in the physiological processes of humans and other mammals, such as cats and dogs. N-3s have many additional benefits, such as increasing the absorption of vitamins and minerals, stimulating hormone production, ensuring healthy growth and development, and helping in the prevention and treatment of diseases.

Seaweeds are one of the few plant groups that contain the two most important omega-3 fatty acids eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). These must be obtained through food because cats and dogs do not produce them naturally. EPA and DHA offer a number of specific health benefits. EPA can be converted in vivo into anti-inflammatory components, thereby managing inflammatory problems related to joints, muscles, skin/coat and heart and bladder diseases. DHA has a more structural role and is found in high concentrations in nerve tissue, such as the brain and eyes, and enhances vision and cognitive function.

Additional benefits

As seaweeds collect nutrients from the abundant resources found in circulating seawater, they are an excellent source of vitamins and minerals. Minerals can make up around 1/3 of the dry weight of the seaweed. The crude ash is a measure of the minerals absorbed from the ocean and available for the animal, which can benefit the skin and coat of the animal, as well as overall conditioning. Seaweeds are also rich in amino acids, which are important in several metabolic processes that are essential for the proper functioning of the body and help to strengthen the immune system.

Iodine and arsenic levels

The inclusion levels for seaweeds in pet food can be limited by the regulatory levels of iodine and arsenic, both of which are naturally present in seaweeds in varying concentrations. While iodine is an essential nutritional element for thyroid and metabolic health, it is only required in very small amounts by cats and

dogs. The EU suggests an iodine limit for dogs of 4 mg/kg, so lower iodine levels will allow for greater inclusion rates or help to keep a safe margin for error. Brown seaweeds have the highest iodine levels, often limiting their inclusion rates beneath the level needed for gut health efficacy. Green seaweeds have much lower levels of iodine, and can therefore be used at the highest rates.

Brown seaweeds also have the highest total arsenic levels, in some cases exceeding the EU's feed limit of 40 mg/kg on a batch basis. As with iodine, green seaweeds tend to have much lower total arsenic levels, and are orders of magnitude lower than the browns. Iodine and arsenic levels of red seaweeds are typically in between the green and the brown seaweeds. An important limiting factor is the amount of inorganic arsenic, which is regulated in the EU to be less than 2 mg/kg. Seaweeds used in pet food should never run close to this limit.

Selection criteria

Iodine and arsenic levels in pet food can be kept within safe ranges by using green seaweeds or using seaweed blends. As different seaweeds from all three color types can have different properties, blends may be used to achieve broader efficacy, targeting specific performance and bioactivity. For use in pet food applications, seaweeds should be selected based on efficacy, palatability, nutritional limits, and adherence to regulations.

The most common kind of seaweed used in pet food,

particularly in certain dog foods, is a brown seaweed called *Ascophyllum Nodosum* (Kelp). This is predominantly based on its availability in Europe and North America. However, according to a recent study conducted at the University of Perugia, it is also considered to have a negative impact on palatability when used at efficacious levels for good gut health. This is consistent with most people's preferences, who greatly enjoy greens like *Ulva* (sea lettuce) and reds like *Nori* (sushi wrappers) but don't like the taste of brown seaweeds.

Furthermore, in many harvesting regions Kelp frequently breaches the allowable inclusion level for total arsenic of 40 ppm, or runs very close to it. Certain other brown seaweeds, in particular *Sargassum* and *Hizikia Fusiforme*, should be avoided in pet food applications all together because of their dangerously high levels of inorganic arsenic.

Seaweed solution from IQI Trusted Petfood Ingredients

IQI Trusted Petfood Ingredients is a supplier of high-quality, pure whole seaweeds and seaweed blends to the pet food industry. Roughly 30% of our seaweeds come from cold European waters, and 70% from warm Asian locations. Blends are formulated based on the bioactive properties the seaweed contains. IQI has also developed a particular kind of green seaweed, called *Ulva Lactuca*, that contains low levels of arsenic and, has high levels of soluble fiber, and excellent palatability. IQI and its partners have

Production of seaweeds

Seaweeds in general can be sourced all around the world, although different kinds of brown, red and green seaweeds are found in different locations.

Ascophyllum Nodosum (Kelp), a kind of brown seaweed most commonly used in pet food, is sourced from the cold waters of the North Atlantic in countries such as Scotland, Ireland, Iceland and Canada. Red seaweeds are found globally and harvested in many geographies. Green seaweeds are available globally, but are most commonly harvested in warmer Asian waters in Vietnam, Philippines and Indonesia.

Seaweeds are either harvested from naturally found or cultivated batches. Cultivation of seaweeds is done either on flat reefs in coastal areas, where they are harvested at low tide, or using long-line cultivation methods in deeper waters. Since the harvesting of seaweeds is labor-

intensive, it is an excellent method to financially support local fishermen and as a means to reduce the pressure on overexploited fishing ground.

In terms of quality, all of the seaweeds can be available in GMP+ certification or organic forms. All seaweeds can be used to make a 'soluble fiber' or a 'seaweed' label claim, but to reach true efficacy the inclusion rates need to be in the 0.25-1% range. Blends offer the highest efficacy while maintaining safe iodine and arsenic levels. Economically, however, whole seaweeds tend to be more cost-effective than blends as they deliver sufficient efficacy for many pet food applications without the additional costs of logistics, maintaining multiple supply chains and processing needed to create homogeneous mixtures. Proprietary production makes it possible to create unique product forms including crumbles, pellets and finely milled powders.

created a supply chain for Ulva Lactuca by training local fishermen in South East Asia to gather seaweeds according to IQI standards as a supplementary source of income that supports the local community. Standards are kept at the highest European and US requirements: GMP+ and where

appropriate, our Organic certifications require both strict traceability, as well as exacting quality control and production standards.

For more information on seaweeds and the finest ingredients for the pet food industry, please visit our [website](#) or contact us directly.

	Ascophyllum nodosum	IQI Green seaweed	IQI Seaweed blend
Seaweed type	Brown	Green	Red, brown and green
Iodine levels (mg/kg)	532-862	12-39	145
Total arsenic (mg/kg)	37-44	4.5	8.1
Inorganic arsenic (mg/kg)	0.47	0.46	0.46
Total ash (%)	23.3	28.1	29.9
Crude ash (%)	15.8	18.2	20.0
Gut health function	Base	Base	Base+
Palatability	Low	High	Medium

Table 1: Seaweed alternatives compared

Want to know more?

<https://link.springer.com/article/10.1007/s10811-019-01799-5>

<https://ivcjournal.com/seaweeds-animal-health/>

About IQI Trusted Petfood Ingredients

IQI Trusted Petfood Ingredients is a global distributor of premium-claim ingredients to the top brands in the pet food industry. Founded in 1994 as a trading company in raw pet food materials, today IQI offers an extensive variety of services to aid and assist our customers and suppliers worldwide. IQI Trusted Petfood Ingredients employs highly skilled personnel, owns and operates a global network of logistical hubs, and relies on a global supply network to obtain the purest natural resources available.

For IQI, quality is key. IQI Trusted Petfood Ingredients goes to great lengths to ensure the quality of its products and develop innovative new products. IQI also invests a great deal in maximizing the quality of its partnerships. Since this business is all about trust, IQI needs to bond with its partners to succeed. By working closely with both its customers and suppliers, IQI creates full transparency in the supply

chain. IQI oversees and controls every step in the process from source to shelf and supplies products that are pure and traceable to their source.

About Geert van der Velden

Geert van der Velden is IQI Trusted Petfood Ingredients' Innovation Manager responsible for Business Development, generating new products and concepts that meet the needs of existing and new customers. Geert has more than 25 years' experience in the international pet food industry and has gained knowledge and experience in many sections of IQI's business.

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