


 #flaxfeed

FLAXSEED: A Nutrient-Packed Ingredient for Pet Food

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- Consumers are increasingly expecting the pet foods they purchase to provide nutritionally complete, balanced formulations using ingredients that offer health benefits for pets while being both safe and tasty.
- Flaxseed is rich in nutrients that support pet health including omega-3 fatty acids, fibre, protein and lignans.
- Flaxseed is a sustainable, local and plant-based ingredient which makes it attractive for inclusion in dog and cat foods.

Pet food contributes approximately \$2 billion dollars annually to the Canadian economy with sales continuing to climb year-over-year.¹ The United States is the largest pet food market in the world.² Product differentiation and “premiumization” are the key factors driving growth and trends closely follow those that influence the human food market.^{1,2} Consumers are increasingly treating their pets as family members, with pet health being among their top priorities.¹ The functionality of foods play an important role in affecting purchasing decisions.¹ The “humanization”

of pets has increased the demand for healthier, more natural foods and ingredients to ensure pets stay healthy and happy.¹

Natural, holistic, human-grade, grain-free, gluten-free, non-GMO, organic, sustainable – these are just a few of the ‘buzz’ words being used in the pet food industry. Pet food manufacturers are faced with the challenge of formulating nutritionally complete, balanced diets using ingredients that offer health benefits for pets and pass the continually increasing scrutiny of pet parents. A number of pet food companies have recognized for decades that flaxseed offers a multitude of nutritional components that will meet their formulation needs.

FLAXSEED: A Locally Grown Source of Omega-3 Fatty Acids

Flax is a blue-flowered plant grown in the cool, northern climate of the western Canadian prairies. Canada is a large producer of flaxseed, providing about 38% of the world’s supply.³ Flaxseed contains a number of health-promoting compounds, such as the omega-3 fatty acid alpha-linolenic acid (ALA), fibre, protein and lignans (which are powerful antioxidants). The nutritional properties of flaxseed make it an excellent addition to dog and cat diets (Table 1).



Table 1. Nutrient content of whole flaxseed and flaxseed oil¹¹

Nutrient	Flaxseed	Flaxseed Oil
Moisture (%)	7.70	-
Protein (%)	19.8	-
Arginine (%)	2.0	-
Histidine (%)	0.5	-
Isoleucine (%)	1.0	-
Leucine (%)	1.3	-
Lysine (%)	0.9	-
Methionine (%)	0.4	-
Cystine (%)	0.4	-
Phenylalanine (%)	1.0	-
Tyrosine (%)	0.5	-
Threonine (%)	0.9	-
Tryptophan (%)	0.4	-
Valine (%)	1.3	-
Fat (%)	41.6	100
Linoleic acid (%)	6.4	15.6
alpha-Linolenic acid (%)	23.1	56.0
Total dietary fibre (%)	27.9	-
Ash (%)	3.7	-
Minerals		
Calcium (%)	0.3	-
Phosphorus (%)	0.6	-
Potassium (%)	0.8	-
Sodium (%)	0.03	-
Magnesium (%)	0.4	-
Iron (mg/kg)	50	-
Copper (mg/kg)	19	-
Manganese (mg/kg)	74	-
Zinc (mg/kg)	43	-
Selenium (mg/kg)	0.3	-
Vitamins		
Vitamin A (IU/kg)	-	-
Vitamin D (IU/kg)	-	-
Vitamin E (IU/kg)	4.8	261
Thiamin (mg/kg)	16.4	-
Riboflavin (mg/kg)	1.6	-
Pantothenic acid (mg/kg)	9.9	-
Niacin (mg/kg)	30.8	-
Pyridoxine (mg/kg)	4.7	-
Folic acid (mg/kg)	0.9	-
Vitamin B12 (mg/kg)	-	-
Choline (mg/kg)	787	-

Flaxseed is available in brown and yellow varieties, which are virtually identical in their nutrient content so purchasing decisions usually depend primarily on price.³ Seed coat colour is determined by the amount of pigment present, a feature that may be modified through traditional plant breeding methods.³

Flaxseed and Flaxseed Oil: Storage and Usage

While whole and milled flaxseed have the same nutritional content, pets receive more benefit from the seed once it is milled (ground). In order to protect its oil from becoming rancid which would reduce its germination potential, flaxseed is naturally covered in a hard, shiny seed coat that is difficult to crack by chewing. Grinding flaxseed breaks this seed coat making its nutrients easier to digest. The very high content of oil comprised primarily of ALA makes flaxseed susceptible to autoxidation, leading to deterioration of quality. However, the seed coat provides a protective layer that preserves flaxseed, which is clean, dry and of good quality, for up to two years. High quality milled flaxseed can be purchased, but attention should be paid to the manufacturer's recommendation as to storage conditions. Overall the storage of milled flaxseed is similar to that of other whole grain flours.⁴

Another option for use in pet food is flaxseed oil, the fat that results from solvent extraction or cold-pressing of flaxseeds. Although flaxseed oil does not contain the beneficial fibre, lignans and protein found in the rest of the seed, on a per weight basis, it provides 55-58% ALA in comparison to 18-23% from flaxseed. Due to the oil's susceptibility to oxidation, it is not typically used as the only fat source in pet food, but is a great complement to other fats and oils to boost the omega 3 content of the diet. Flaxseed oil should be stored in an opaque container in a cool place and may be supplemented with antioxidants to avoid quality deterioration.⁵

Nutritional Benefits of Flaxseed

Flaxseed contains many essential nutrients required by dogs and cats (Table 1). It is the richest plant source of the essential omega-3 fatty acid, ALA. Humans and animals cannot make ALA so it must be obtained from the diet.

Other omega-3 fatty acids, EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid), found in fatty fish, are vital for health, but are not “essential” as they can be produced in the body from ALA. All of these omega-3 fatty acids have been reported to reduce inflammation, which is associated with obesity, diabetes, cancer and arthritis.⁶

In addition, flaxseed is a good source of total dietary fibre, providing 28 g per 100 g of seed, and includes approximately 19 g of insoluble fibre and 9 g soluble fibre. The fibre in flaxseed may provide benefits for pets with digestive disorders as well as reduce energy intake, control body weight and manage diabetes. A small intake of flaxseed, providing 2.5 g of soluble fibre, was found to suppress appetite and energy intake in humans.⁷ The protein content of flaxseed is high compared to cereal grains, providing 20 g per 100 g of seed. Arginine, aspartic acid and glutamic acid are the abundant amino acids in flaxseed, while lysine, methionine and cystine are the limiting amino acids.³ Flaxseed is unique in that it is one of the richest sources of lignans, phytoestrogens that act as potent antioxidants. The primary lignan in flaxseed is secoisolariciresinol (SDG), which has been shown in animal models to protect against cancer.⁸

^aCalculation to determine flaxseed inclusion in dry pet food equivalent to consumption of 40 g/day in humans based on requirements for a 20 kg dog:

Estimated energy requirement: 132 kcal/kg/day * 20 kg^{0.67} = 982 kcal/day

Typical energy density of dry dog food: 3500 kcal/kg

Daily food intake to meet energy requirements: 280 g

Adult male average body weight of 70 kg providing 40 g/day of flaxseed = 0.57 g/kg; equivalent in a 20 kg dog is 11 g/day.

11 g flaxseed in 280 g of food = 3.9% inclusion of flaxseed on dry matter basis

How much flaxseed is recommended for inclusion in complete and balanced dog and cat diets?

While an optimal amount has not been determined for pets, data from humans may be considered. For humans, ground whole flaxseed has received an approved health claim from Health Canada regarding the benefits of flaxseed for lowering blood cholesterol.⁹ The reference

amount of flaxseed for the health claim is 40 g/day. Although cholesterol profiles and atherosclerotic heart disease are not issues in pets, an equivalent inclusion rate for pet food would be 3.9% on a dry matter basis.^a One factor to consider when formulating with whole milled flaxseed or flaxseed oil is the effect on product shelf life. Oxidative stability testing will help to ensure product integrity throughout the guaranteed shelf life and provide the necessary information to prevent over- or under-supplementation with antioxidants.

Flaxseed is Suitable for Grain-Free Diets

Aside from its nutritional attributes, flaxseed offers additional benefits for pet foods. It is not a grain and does not contain gluten, so it is suitable for use in grain- and gluten-free pet foods. Organic flaxseed is available and all flaxseed is non-GMO (genetically modified organism).

Safety

Like many other plant seeds, flaxseed contains moderate amounts of natural defense compounds, called cyanogenic glucosides, which can have negative health effects if consumed in excessive quantities. However, cyanogenic compounds are made harmless by cooking,³ so they are not



Flaxseed is an Ideal Ingredient for Pet Food

From the perspective of both the pet food brand and consumer perception, ALA from flaxseed provides some unique advantages over marine omega-3 fatty acid sources. Limited global availability, high cost, allergenicity, dietary preferences, heavy metals and toxins that have been reported with some seafood products are of minor concern with ALA from flaxseed.¹⁰ In addition, flaxseed is a rich source of dietary fibre, protein and lignan antioxidants. For consumers trying to choose healthier and more sustainable foods for both themselves and their pets, flaxseed and its oil are beneficial dietary additions. In terms of marketing, the overall advantages of flaxseed as a local and plant-based source of oil and protein make it attractive for inclusion in dog and cat food formulations.

References

1. Agriculture and Agri-Food Canada. Consumer Trends: Pet Food in Canada. Ottawa, ON, 2012.
2. Agriculture and Agri-Food Canada. The United States Pet Food Market. Ottawa, ON, 2013.
3. Ganorkar PM, Jain RK. Inter Food Res J. 2013;20(2):519-525.
4. Chen Z-Y, et al. J Am Oil Chem Soc. 1994; 71:629-632.
5. Kajla P, et al. J Food Sci Techn. 2015;52(4):1857-1871.
6. Fleming JA, et al. Adv Nutr. 2014;5:863s-876s.
7. Ibrugger S, et al. Appetite. 2012;58(2):490-495.
8. Adolphe JL, et al. Br. J. Nutr. 2010;103(7):929-938.
9. Health Canada. 2014. http://www.hc-sc.gc.ca/fn-an/alt_formats/pdf/label-etiquet/claims-reclam/assess-evalu/flaxseed-graines-de-lin-eng.pdf.
10. Rodriguez-Leyva D, et al. Can. J. Cardiol. 2010;26(9):489-496.
11. Health Canada. Canadian Nutrient File. 2010; <http://webprod3.hc-sc.gc.ca/cnf-fce/index-eng.jsp>. Accessed September 14, 2015.

