PULSES 101

PET FOOD

PULSE CANADA

PULSES 101: PET FOOD

Pulses—including peas, chickpeas, lentils, and faba beans—are gaining attention as valuable ingredients in pet food formulations. Their unique combination of carbohydrates, protein, and fibre offers important nutritional and functional benefits, while their sustainability profile aligns with the growing demand for environmentally responsible ingredients.

This guide explores the role of pulses in pet food, focusing on their impact on nutrition, functionality, and sustainability. It examines how pulses contribute to energy provision, digestive health, glycemic control, and protein formulation, as well as their role in improving processing efficiency. Additionally, it highlights the environmental advantages of incorporating pulses into pet diets.

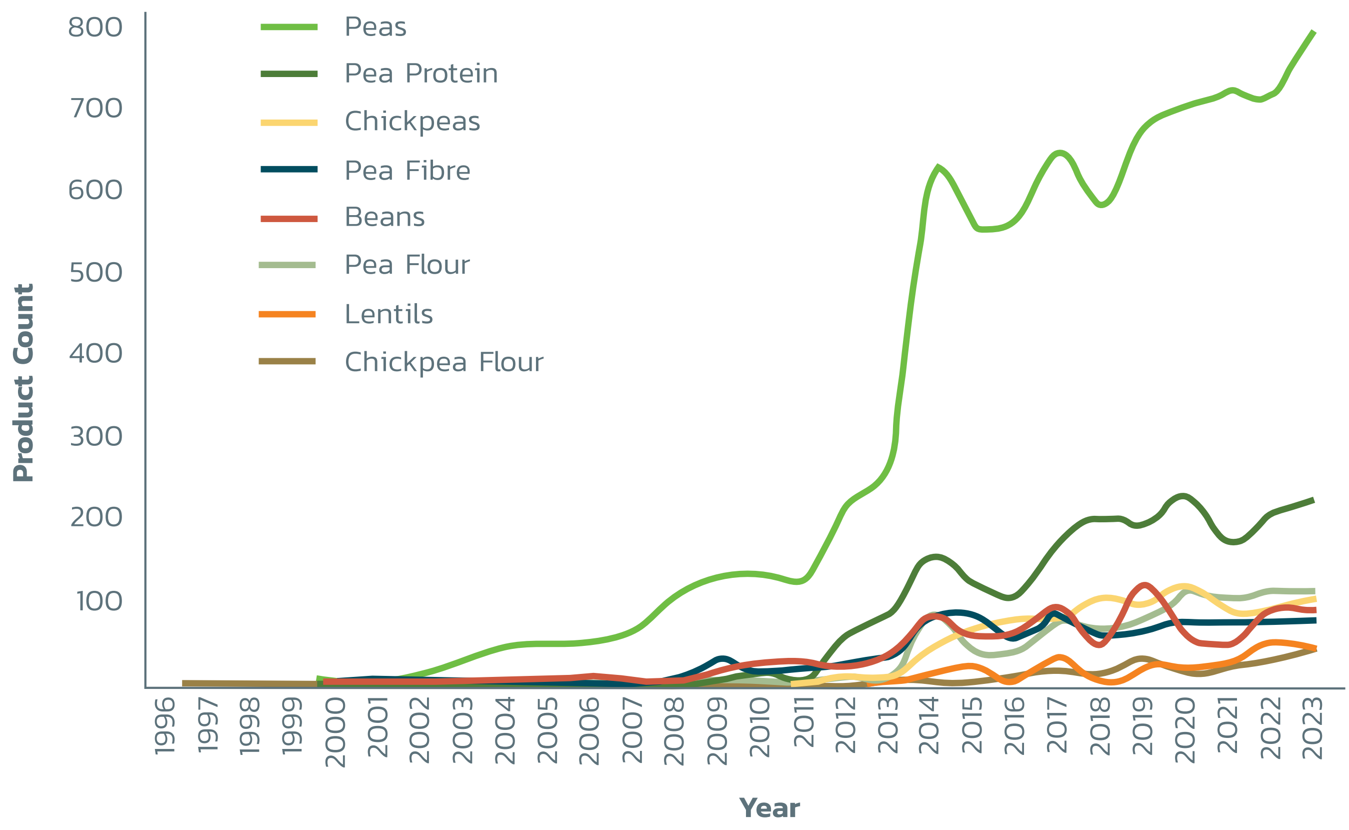
QUICK OVERVIEW

- **Pulses are excellent carbohydrate sources that provide energy for animals. Their starch content also enhances the extrusion process by binding kibble.**
- **Pulses are rich in fibre, which supports digestion, promotes regularity, and serves as a prebiotic for a healthy microbiome. Fibre also aids weight management by enhancing satiety.**
- **With their complex carbohydrates and high protein content, pulses help lower post-prandial glycemic response, benefiting diabetes and insulin resistance management.**
- **Pulse protein fractions offer a viable alternative to animal-based protein concentrates. They contain relatively low ash and calcium levels and may reduce costs.**
- **Beyond their processing and health benefits, pulses contribute to sustainability. Incorporating them into pet food supports both animal health and environmental responsibility.**

TRENDS IN PULSE USE

Pulses have been used globally in pet food formulations for decades. Peas and pea protein are the most common pulse ingredients found in new pet food product launches, however, launches with other pulse ingredients from chickpeas, beans and lentils have increased during the last few years. The grain-free pet food trend contributed to the popularity of pulse use in recent years, as pet food companies were looking for an alternative carbohydrate source to more conventional ingredients such as rice, oats, barley, corn and wheat. However, in addition to being a grain-free alternative, pulses offer many other nutrition, functional and sustainability benefits for pet food formulations.

Number of Global New Pet Food Launches With Pulse Ingredients



Between 2020-2024, there were over 5000 pet food launches globally with pulse ingredients. Pulse use in pet food has been predominantly in dry dog food formulations, however pulse ingredients can also be found in wet formulations and products for cats and other pets.

Common Claims for Pulses in Pet Food

Claim	% of Pulse-based Pet Food Launches in North America
Low/No/Reduced Allergen Ingredient	65%
Grain Free	31%
Functional Pet – Digestion	24%
Premium	19%
High/Added Protein	18%
Functional Pet – Joints, Bones & Muscles	14%
Gluten Free	11%
Ethical – Environmentally Friendly Product	10%
All Natural Product	8%
GMO Free	8%
High/Added Fibre	4%

PULSE NUTRITION

Pulses are often used in pet food products to replace cereals (i.e. oats, barley, rice, corn and wheat). Typical nutritional values for whole pulses in comparison to cereals are presented in the chart on the following page. Just like cereals, pulses are a source of complex carbohydrates (starch) which provide a source of energy for pets. The starch found in pulses is also beneficial to the extrusion process, as it helps to bind the kibble.

Pulses are differentiated from cereals by their higher protein levels as well as their higher fibre content.

Nutritional composition of whole pulses compared to cereals (wet basis).

Nutrients that differ most between cereals and whole pulses are highlighted in this table. While the values in this table are typical averages for the broader category of pulses, nutritional composition can vary based on genetics, growing environment, storage and processing conditions.

Nutrient (%)	Pulses[1]	Brown rice[2]	Oat, grain[2]	Barley, grain[2]	Whole wheat[2]	Corn, grain[2]
Moisture	9.5 – 13.2	12	10	9.8	10.3	11.7
Protein	21.3 – 27.3	7.2	11.9	12.3	13.7	9.1
Fat	1 – 6	2.8	4.6	2.2	1.9	4.4
Starch	32.4 – 52.3	77.5	77.5	58.7	65.1	69
Ash	2.5 - 3.3	1.5	3	2.3	1.6	1.2
Crude fibre[3]	3.2 – 6.2	2.4	10.8	5.3	2.9	2.1
Dietary fibre[4]	12.4 – 16.6	3.5	ND	ND	ND	ND
Soluble fibre	0.8 – 1.6	0.14	4.2	5.6	2.5	0.9
Insoluble fibre	10.7 – 15.7	ND	3.9	8.8	7.4	6.6
Arginine	1.12 – 1.60	0.57	0.81	0.62	0.64	0.47
Histidine	0.47 – 0.64	0.19	0.29	0.28	0.32	0.28
Isoleucine	0.67 – 0.85	0.32	0.45	0.45	0.51	0.33
Leucine	1.39 – 1.81	0.62	0.87	0.85	0.93	1.15
Lysine	1.1 – 1.47	0.29	0.5	0.47	0.38	0.26
Methionine	0.16 – 0.25	0.17	0.2	0.24	0.21	0.2
Cysteine	0.21 – 0.34	0.09	0.33	0.27	0.32	0.17
Phenylalanine	0.97 – 1.23	0.39	0.61	0.7	0.65	0.46
Tyrosine	0.91 – 1.06	0.28	0.53	0.36	0.4	0.37
Threonine	0.63 – 0.84	0.28	0.41	0.42	0.4	0.35
Tryptophan	0.14 – 0.68	0.1	0.14	0.2	0.21	0.07
Valine	0.14 – 0.94	0.44	0.62	0.61	0.62	0.47

The total dietary fibre, soluble and insoluble fibre content of pulses reported in the table was measured using the AOAC method 991.43, which does not account for levels of oligosaccharide components, thus the actual values for non-digestible carbohydrates are likely higher.

[1]Ranges for whole pea, lentils, chickpeas, faba beans (as is basis) using data from Babatunde et al, 2023a and 2023b and Cargo-Froom et al, 2022 and 2023a and 2023b.
[2]Data for grains were adapted from NRC 2006, and USDA database
[3]Crude fibre was measured with the AOAC method Ba 6a-05 (AOAC 2012).
[4]Total dietary fibre, soluble and insoluble fibre were measured based on the AOAC method 991.43.

Protein

Grains have protein levels of 7 to 13%, while pulses have higher values, typically ranging from 21 to 27% (wet basis). The protein content of faba beans is typically higher than that of other pulses.

Grains have relatively low levels of some essential amino acids, such as lysine, methionine and cysteine. Pulses are also lower in methionine and cysteine, however, they are a richer source of lysine than are the conventional grains and also have higher levels of threonine and arginine. Since the requirement for methionine can be hard to reach in pet food formulations from ingredients, it is often added to pet foods, especially cat foods.

Fibre

The fibre in whole pulses is both soluble and insoluble. Insoluble fibre is less digestible than soluble fibre, and works by stimulating the production of feces, decreasing intestinal transit time and increasing intestinal motility. Soluble fibres are those that are fermented by colonic bacteria, producing short chain fatty acids (SCFA). Formulators need to pay close attention to the balance between soluble and insoluble fibre consumption by pets to maximize stool quality and prevent gut discomfort, particularly for grain-free diets (Pezzali, 2019). The total fibre content of the ration must also be monitored, as fibre can decrease the bioavailability and digestibility of other nutrients, in addition to promoting greater excretion of feces (Linder, 2017). The fibre content in pulse flours that are produced from dehulled/decorticated pulse seeds will generally be lower in fibre compared to a whole seed flour, unless the ground seed coat are added back into the final product.

Fat

Compared to pea, lentil, and faba, chickpeas have a higher fat content close to 6%, whereas in other pulses the fat content is closer to 1 or 1.5%.

Anti-Nutritional Factors

As with cereals, pulses must be cooked and ground before being consumed by animals. Anti-nutritional factors normally found in raw grains and pulses may decrease protein, vitamin and mineral digestibility when these products are consumed in the raw state. However, processes that use heat, such as cooking, extrusion and autoclaving will greatly reduce the action of these anti-nutritional factors and make these ingredients more digestible. For example, trypsin inhibitors are inactivated within minutes when the minimum temperature of 100°C is reached (Patterson et al, 2016).

Recent studies have reported the impacts of processing (grinding, pelleting, extrusion) on the nutritional composition of pulses (Babatunde et al, 2023a and 2023b; Cargo-Froom et al, 2023a and 2023b). While these reports cite changes in nutritional composition due to processing that varied by pulse type, the processing method and conditions will influence these changes. For example, the grinding process is responsible for particle size reduction and separation of individual components. Because the individual components found in pulses vary in size, from large polysaccharides (i.e. starch, total dietary fibre) to small protein bodies, the use of sieving during the grinding or milling process can also impact the composition of the resulting powders/flours. Specifically, the size of screens used may restrict or selectively allow certain seed components through thereby influencing its composition. Pelleting and extrusion processing involve the application of heat and/or shear forces, which can cause changes in the physical and chemical structure of pulse components and explain some of the observed differences in composition. For example, resistant starch which is a form of dietary fibre found in raw pulses will gelatinize and become digestible following a cooking process.

PULSE INGREDIENTS

Pulse ingredients produced by a process to fractionate the whole seed into component parts are also of great interest in pet foods. These ingredients include concentrated proteins, starches and fibres that can replace other ingredient sources.

Pulse proteins are made from mechanically dehulled, dry/wet milled pulse seeds that are further separated through **air classification** (dry separation) or **wet separation** (the addition of water, acid, and alkali), or both.

Pulse protein concentrates are produced from air classification or dry separation Pulse protein concentrates are a highly digestible source of protein, with a low ash content, making them an ideal "vegetable protein concentrate". This fraction can be used to replace a portion of the animal protein concentrate (e.g. dried egg product, chicken meal) as a cost-saving measure. Pea and other pulse protein concentrates are especially useful for all life stages diets as an additional protein source, as it allows the formula to have higher protein levels while maintaining a levels of calcium and phosphorus that are below the AAFCO recommended maximum levels for large breed puppies for calcium (1.8%) and phosphorus (1.6%).

Pulse protein isolates are produced by wet separation and generally have a higher protein content than concentrates. Pulse protein isolates are also used in pet food products but to a lesser extent than pulse protein concentrates due to higher costs and limited availability. For example, some vegetarian pet foods rely on pea protein isolates to provide dietary protein, along with other pulse ingredients and eggs.

Pulse starches are the fractions remaining after removal of protein and fibre from pulse seeds. Pulse starches are obtained from mechanically dehulled, dry milled pulse seeds that are further separated through air classification (dry separation) or through the addition of water (wet separation), or both. Pulse starches produced by dry separation generally have a lower starch concentration compared to those produced by wet separation. In addition to being a source of energy, pulse starches are also beneficial for binding the kibble during the extrusion process.

Pulse fibres are made from mechanically crushed pea hulls and contains both soluble and insoluble fibre. This fibre source improves the quality of stools, reduce the calorie content of the recipe, and supports a feeling of satiety. Pulse fibres can be used in addition to or substitute for other fibre sources like tomato pomace, alfalfa, miscanthus grass, powdered cellulose or beet pulp.

Opportunities for higher inclusion of pulse fibres reside in functional recipes like indoor cat formulas, and weight control for cats and dogs. Indoor cat formulas often include fibre levels that are higher than other cat formulas. Adding pulse fibre to these formulas is an excellent way to boost fibre and encourage movement through the digestive tract while maintaining a healthy weight for indoor cats.

Pea and other pulse fibres can be used as a carrier in vitamin or trace mineral premixes, herbal premixes, dried fruit and veggie premixes. The benefit is that it qualifies as "grain-free" when included in formulations. Commonly, it can constitute 25-75% of a premix while serving as a substitute for other carriers like rice hulls, sodium bentonite, cellulose or calcium carbonate.

PULSE HEALTH BENEFITS

Nutritional Composition

The nutritional composition of pulses, particularly their combination of protein and fibre as well as presence of complex carbohydrates is relevant to physiological effects such as blood sugar management, gut health, and satiety/weight management. Research on the health benefits of pulses in pet food formulations has been growing. Multiple studies have shown that pulses fed both alone and in complete diets to healthy dogs resulted in lower post-prandial glycemic responses than non-pulses or grains (Briens et al, 2021; Carciofi et al; 2008; Kaelle et al, 2023; Quilliam et al, 2021). A similar yet less pronounced effect has been reported in cats (Briens et al, 2021; de-Oliveira et al, 2008; Verbrugghe and Hesta, 2017).

Microbiome

Available research on the effects of pulse consumption on the microbiome of dogs is limited but a recent study suggests that pulse ingredients may improve indicators of gut functionality and health via promoting a favourable microbiome and short chain fatty acid production compared to grains (corn, sorghum, and brown rice) and potatoes when included in complete diets providing the same starch content (300 g/kg; Kaelle et al, 2023). Due to the positive impact of pulse fibre and starch contents on glycemic response and gut microbiome, pulses may also be a valuable addition to weight management diets for pets. An older study found when dogs and humans were fed a meal containing lentils, versus bread, there was slower gastric emptying after being fed a second lentil-free meal, suggesting pulses may increase satiety (Lin et al, 1992). There is a need for more research on how pulses may impact weight loss in obese pets.

Cardiac Health

A few years ago, pulses were studied for their possible effect in contributing to dilated cardiomyopathy (DCM). The most comprehensive study looked at many different nutrients and blood markers to determine if pulses had an effect on increasing DCM. The study found that including pulses at up to 45% of the diet did not produce any detrimental effects on cardiac health and confirmed that pulses are excellent ingredients for the pet food industry and can be incorporated into complete and balanced diets without causing cardiac issues to dogs (Singh et al, 2023).

LOWERING THE CARBON FOOTPRINT WITH PLANT-BASED PROTEIN

Sustainability is becoming a major trend among pet food owners and translates into increasing demand to replace or reduce meat protein content with alternative proteins like those that are plant-based. Pulses require fewer resources to be produced compared to beef, lamb and poultry, and they also contribute to reducing the use of nitrogen fertilizers by fixing atmospheric nitrogen when used in crop rotations. In particular, pulses have an inherently low carbon footprint due to their capacity to fix atmospheric nitrogen and present an opportunity to lower supply chain greenhouse gas emissions for pet food when they are used to replace higher carbon footprint ingredients.

QUESTIONS?

Book a meeting with one of our experts.

Julianne Curran,
Market Innovation

CLICK OR SCAN

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