

the feed pea FOCUS

PEA PRODUCTION STABLE DESPITE SOARING INPUT COSTS

Western Canada appears poised for yet another great year of pea production, and an available dry pea supply of over 3 million metric tonnes. Supply has stabilized at this level in each of the last 5 years, even during periods of low prices (\$135/MT in '04-05 versus \$285-\$315/MT CAD current), because peas have economically important nitrogen-fixation and crop rotation properties for producers. Agriculture and Agri-Food Canada predicts pea prices will drop slightly in '08-09 (\$270-300/MT CAD) due to increased world supply.¹

NUTRITIONAL PROPERTIES OF PEAS

Peas have historically played an important role in human nutrition, providing the protein, energy and fibre necessary for vital metabolic functions. Peas are also an excellent source of nutrition for companion animals. Yellow and green peas have been selected for high levels of digestibility and are the types recommended for use in pet foods. The composition of whole, dried peas is shown in Table 1 (below).

The seeds of peas form in pods that protect them from attack by field fungi and reduce the risk of contamination with mycotoxins prior to harvest (Dr. R. Clear, Canadian Grain Commission, personal communication). The top four grades of Canadian peas are "human consumption" quality (No. 1 Canada, No. 2 Canada, Extra No. 3 Canada, No. 3 Canada) and contain minimal levels of dockage (0.5-1.0%)² - properties which provide important quality control benefits to the pet food industry. Additional information on the quality of each harvest is available from the Canadian Grain Commission website.³

Table 1. Composition of whole, dried yellow and green peas (DM basis)⁴.

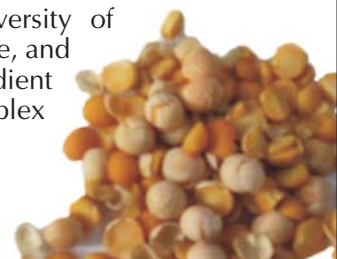
Crude Protein (%)	23	Lysine (%)	1.8
Fat (%)	1.4	Methionine + cystine (%)	0.77
Ash (%)	2.9	Calcium (mg 100g ⁻¹)	78
NDF (%)	10.0	Phosphorus (mg 100g ⁻¹)	490
Starch (%)	45	Potassium (mg 100g ⁻¹)	1153

DOGS PREFER PEAS

Peas are a naturally palatable ingredient for dogs. Studies by Dr. Keith Behnke at Kansas State University revealed dogs preferred diets containing ground peas (15% of diet) versus control diets by a ratio of 3.8:1 (P<0.05)⁶. In other work, first approach, first taste and consumption data for dog foods containing 12.5% peas did not differ significantly from that of a high-end, meat-based commercial dog food⁷. These studies indicate that peas are suited to use at relatively high levels in dog foods, and that minimal reformulation work will be required to incorporate this ingredient.

NUTRITIONAL BENEFITS OF PEAS FOR PETS

The nutritional properties of peas and other legumes are recognized within the "Fruit and Vegetables" section of the US Food Pyramid⁸. Legumes are also good sources of protein, and this is acknowledged by their placement within the "Meat and Meat Alternatives" section of Canada's Food Guide⁹. The diversity of nutrients found within peas is unique, and positions them well as an ingredient capable of contributing to the complex nutritional requirements of pets.



“SLOWLY DEGRADED STARCH” BENEFITS

The structure and digestion of pea starch is unique within the world of natural starch sources, and has properties that may suit it to use in diets designed to control diabetes, weight gain and appetite. Studies indicated that starch granule structure, high amylose:amylopectin ratio¹⁰ and physical inaccessibility¹¹ limited the rate of pea starch digestion and contributed to its “slowly-degraded” properties. In poultry experimental models, the digestion of slowly degraded pea starch was shifted from the jejunum toward the posterior ileum, which resulted in a slower rate of glucose absorption from the gut.¹² This may explain why humans experienced reduced peak blood glucose levels following the consumption of meals containing peas and other legumes.¹³ High glycemic index foods, which produce elevated post-meal (postprandial) blood sugar levels, have been identified as one of the risk factors for developing type II diabetes.¹⁴

In order for the slowly degraded starch to be of benefit, its properties must first survive the extrusion process common to most pet foods. Legume starches subjected to extrusion temperatures typical of most commercial facilities are completely digested in the ileum of dogs (~130°C, Dr. G. Fahey, personal communication). Research showed lower extrusion temperatures increased the slowly degraded starch properties of even cereal starches (79-86°C)¹⁵; therefore, it is possible that manipulation of extrusion temperatures will allow retention and customization of the beneficial “slowly degraded starch” properties of pea-based pet foods.

¹ http://www.agr.gc.ca/pol/mad-dam/index_e.php?s1=pubs&s2=spec

² <http://www.grainscanada.gc.ca/Regulatory/schedules/2007/sch3-2007-e.pdf>

³ <http://www.grainscanada.gc.ca/Quality/pulses/2007/pulses-2007-eng.pdf>

⁴ Wang, N. and Daun, J. Effect of variety and crude protein content on nutrients and certain antinutrients in field peas (*Pisum sativum*). J. Sci. Food Agric. 84:1021-1029.

⁶ <http://www.saskpulse.com/media/pdfs/dog-food-peas.pdf>

⁷ Phelps, C., Kloeck, T., Loomis, T. Analysis of the potential of utilizing field pea and fababeans for export and domestic pet food markets. Alberta Agriculture, Food and Rural Development. Project. 2002C003N. December, 2004.

⁸ <http://www.mypyramid.gov/pyramid/vegetables.html>

⁹ http://www.hc-sc.gc.ca/fn-an/food-guide-aliment/choose-choix/meat-viande/serving-portion_e.html

¹⁰ Themeier, H., Hollmann, J., Neese, U. and Lindhauer, M.G. Structural and morphological factors influencing the quantification of resistant starch II in starches of different botanical origin. Carbo. Polymer 61:72-79.

¹¹ Carre, B., Melcion, J.P., Widiez, J.L., Pierre Biot. 1998. Effects of various processes of fractionation, grinding and storage of peas on the digestibility of pea starch in chickens. Anim. Feed Sci. Technol. 71:19-33.

¹² Weurding, R.E., Veldman, A., Veen, W.A.G., van der Aar, P.J. and Verstegen, M.W.A. 2001. Starch digestion rate in the small intestine of broiler chickens differs among feedstuffs. J. Nutr. 131:2329-2335.

¹³ BDSK Consulting. A Critical Analysis of the Science on Pulses and Glycemic Control. Toronto, Ontario. January 7, 2007.

¹⁴ Salmeron J, Ascherio A, Rimm EB, Colditz GA, Spiegelman D, Jenkins DJ, Stampfer MJ, Wing AL, Willett WC. 1997. Dietary fiber, glycemic load, and risk of NIDDM in men. Diabetes Care. 20:545-550.

¹⁵ Murray, S.M., Flickinger, E.A., Patil, A.R., Merchen, N.R., Brent, J.L., Jr., Fahey, G.C., Jr. 2001. In vitro fermentation characteristics of native and processed cereal grains and potato starch using ileal chyme from dogs. J. Anim. Sci. 79:435-444.

¹⁶ Swanson, K.S., Grieshop, C.M., Clappert, G.M., Shields, J.R., R.G., Belay, T., Merchen, N.R. and Fahey, Jr., G.C. 2001. Fruit and vegetable fiber fermentation by gut microflora from canines. J. Anim. Sci. 79:919-926.

¹⁷ Hussein, S.H., Flickinger, E.A. and Fahey, Jr., G.C. 1999. Petfood applications of inulin and oligofructose. J. Nutr. 129:1454S-1456S.

¹⁸ Queiroz-Monici, K., Costa, G.E.A., da Silva, N., Reis, S.M.P.M. and Oliveira, A.C. 2005. Bifidogenic effect of dietary fiber and resistant starch from leguminous on the intestinal microbiota of rats. Nutrition. 21:602-608.

THE MANY BENEFITS OF PEA FIBRE

Peas contain two sources of fibre: the relatively lignified cell walls in the hull surrounding the cotyledons, and the pectic polysaccharide cell walls within the cotyledons. The total dietary fibre in pea hulls has been measured at 69.7% (66.7 insoluble and 3.0% soluble fibre).¹⁶ The pet food industry already uses pea hull fibre for a variety of purposes, including weight management and dental health in dogs and hair ball control in cats. Soluble fibre sources are also an important component of pet foods. Dietary supplementation with oligosaccharide sources including inulin and oligofructose has been examined as a method of reducing harmful fecal fermentation compounds, and increasing beneficial *Bifidobacteria* concentrations.¹⁷ It is therefore notable that in dietary legume studies involving rats, the dietary fibre and resistant starch in whole peas stimulated the highest *Bifidobacteria* cecal count.¹⁸



For information about The Feed Pea Focus or feeding pulses to livestock, contact Michelle Fleury - Telephone: (306) 873-4132 email:mfleury@xplornet.com

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