CANADA'S FEED PEA NEWSLETTER

the feed pea Focus

PEA SUPPLY FOR 2007-2008

Statscan's latest prediction for dry pea production in 2007-8 exceeds 3MMT, even though earlier estimates had reduced acreage due to the expanding production of cereals and oilseeds used for biofuels. Some industry reports estimate acreage may go as high as 4M acres, resulting in pea production of up to 3.4MMT. These acreage increases are being driven by high contract prices for new crop edible peas, as well as by the ability of nitrogen-fixing pulse crops to offset skyrocketing N-based fertilizer costs. The feed industry should pay careful attention to peas, as the biofuel industry is not currently competing for this high-quality feedstuff.

ARE YOUR POULTRY RATIONS RECOGNIZING 100% OF THE ENERGY IN PEAS?

European studies indicate that grinding and pelleting are key factors in realizing the full nutrient value of peas for poultry. Carre et al (1991)[2] performed a series of trials examining the effects of grinding and pelleting on energy, starch and protein digestibility in both growing and adult birds (Table 1). Diets were fed in mash (2mm screen) or pelleted/reground form (4x30mm die, 75/76C inlet/outlet temperature; 2.5mm screen). **Pelleting resulted in a 250 kcal/kg increase in the AMEn value (DM basis) of peas** for both young (2763 vs. 3016) and adult (2813 vs. 3069) birds. This may explain the relatively low pea AMEn values determined previously by Canadian researchers using broiler chicks (4-10d, 2500-2600 kcal/kg AMEn, as-fed mash (assumed)). Initial reports from pea/poultry trials currently underway at the U. of S. indicate mash energy values for Canadian peas (2748 kcal/kg AMEn, DM basis, 3.125mm screen size) similar to those documented in European research. Predictions are that ongoing studies will also corroborate the nearly 10% improvement in pea AMEn attributed to pelleting by French[2] researchers (Classen, personal communication).

Table 1. Smooth, spring-seeded pea protein and starch digestibility and AMEn values in young and adult cockerels (means ± SD; n=7)

		Ground	Pelleted and reground
AMEn, MJ/kg DM[a]	young	11.56 ± 0.276	12.62 ± 0.439
	adult	11.77 ± 0.309	12.84 ± 0.155
Starch digestibility, %	young	84.7 ± 1.26	95.0 ± 1.36
	adult	84.6 ± 1.55	96.9 ± 0.89
Apparent protein digestibility, %	young	80.3 ± 3.85	83.9 ± 3.50
	adult	75.3 ± 3.35	81.7 ± 2.92

[a]1 MJ / 0.004184 = 1 kcal

STANDARDIZED AND APPARENT AMINO ACID DIGESTIBILITIES FOR PEAS AND OTHER PULSES

Ingredient amino acid content and poultry requirements can be expressed using different terminologies, including "apparent" and "standardized" ileal digestibility. The apparent ileal digestibility of ingredients is determined by difference between the amino acid content of a feedstuff and of the resulting digesta in the terminal ileum. Standardized ileal amino acid digestibility values differ in that endogenous amino acid losses (ie: enzymes, mucin) are subtracted from the amino acid content of the ileal digesta. This reduced ileal amino acid value is then subtracted from that of the original feedstuff. Therefore, "standardized" amino acid digestibility values appear greater than corresponding "apparent" amino acid digestibility values. Many theoretical arguments exist regarding the benefits and drawbacks of formulating using apparent versus standardized ileal amino acid digestibilities[5,6]. Pulse values calculated or measured for each by collaborating authors are shown for comparison (Table 2).

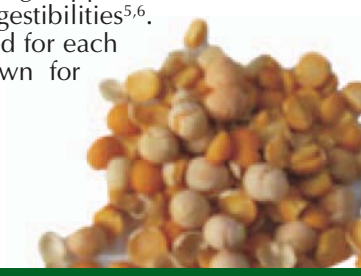

Table 2. Comparison of pea, fababean, lentil, soybean meal (SBM) and canola meal (CM) nutrient contents (pea n=104; lentil n=4; faba bean n=99; SBM n=306; CM n=20)[7], standardized ileal amino acid digestibility (SAAD; pea n=8; faba bean n=1; lentil n=n/a[7]; SBM n=37; CM n=68)[5] and apparent ileal digestibility (AID; pea n=3; faba bean n=2; SBM n=10; CM n=9)[6] values (88% DM basis).

	Peas	Faba Beans	Lentils	Soybean Meal	Canola Meal
Crude Protein	21.7	26.5	22.4	46.9	37.3
Lysine	1.52	1.62	1.35	2.88	2.02
Lysine SAAD	85	85	90	90	80
Lysine AID	83	76	n/a	85	81
Methionine	0.19	0.19	0.19	0.64	0.72
Methionine SAAD	73	73	89	91	84
Methionine AID	70	63	n/a	83	86
Meth + Cyst	0.50	0.50	0.41	1.33	1.60
Meth + Cyst SAAD	68	68	92	86	80
Threonine	0.80	0.92	0.79	1.85	1.58
Threonine SAAD	78	78	91	85	73
Threonine AID	69	68	n/a	76	69
Tryptophan	0.19	0.23	0.17	0.64	0.51
Tryptophan SAAD	66	66	n/a	89	80
Tryptophan AID[8]	69	63	n/a	84	78

AMINO ACID DIGESTIBILITY VALUES MAY BE UNDERESTIMATED FOR PULSES

Pelleted vs. ground amino acid digestibility values

Processing significantly affects the protein digestibility of peas by poultry. Studies showed that pelleting ground peas increased crude protein digestibility from 80.3 to 83.9%, versus grinding alone (2 mm screen, $P<0.05$, Table 1)[2]. This information should be considered when interpreting data in Table 2, for which available references indicated only coarse-grinding (5 mm screen) of cereals. Protein and starch is poorly digested from large particles in the digesta of peas[2]; therefore, if the results in Table 2 are from unpelleted material, they may underestimate the amino acid digestibilities of peas, lentils and faba beans relative to processed competitors such as soybean meal and canola meal when used in commercially pelleted diets for poultry.

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Slowly-degraded starch effects spare gluconeogenic lysine

Peas contain slowly degraded starch (SDS), an energy form which has been associated with enhanced performance in poultry. Glucose absorption from pea starch extends to the posterior ileum, in contrast to cereal starch which is digested primarily in the jejunum. Broilers consuming nutritionally equivalent rations showed improved performance when the diet contained a high level of SDS (peas as starch source) versus a low SDS content (tapioca starch) (Table 3)[9].

Table 3. Weight gain, feed intake and feed conversion ratio of female broiler chickens receiving either high (peas) or low (tapioca) amounts of slowly digestible starch (SDS) (n=6).[9]

Period	Parameter	High SDS (peas)	Low SDS (tapioca)	Starch effect (P-value)
0-38 days	Body weight (g)	1823	1729	<0.01
	Feed intake (g)	3093	3002	0.070
	FCR	1.734	1.777	0.010

Researchers hypothesized that glucose absorbed from the slowly degraded starch supplied the energy requirements of the ileum, and that this may have spared gluconeogenic amino acids, such as lysine, for use in muscle growth. This concept was supported by results from a subsequent, larger scale trial (6800 mixed Cobb broilers) which examined performance versus lysine level in high SDS (pea/corn/SBM) versus low SDS (tapioca/corn/SBM) diets. Weight gain and feed conversion were improved on the pea-based "high SDS" diet ($P<0.01$). Even more interestingly, the lower levels of lysine in high SDS diets supported performance equivalent to that seen with higher levels of lysine in the low SDS treatments (Table 4).[10]

Table 4. Effect of slowly degraded starch (SDS) level and digestible lysine content on performance of broiler chickens (9-30 days)[10].

		Digestible lysine content (g/kg)			
	SDS	8.50	9.75	11.00	P-value
Weight gain, g	High (pea)	1417	1425	1444	P<0.01
	Low	1376	1400	1418	
FCR	High (pea)	1.586	1.542	1.524	P<0.01
	Low	1.629	1.573	1.543	

[1] http://www.agr.gc.ca/mad-dam/index_e.php?s1=pubs&s2=spec&s3=php&page=spec_2007-04-27

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