Dairy and Peas

(Giving Cows a Pulse)

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Production of Starch Materials

Western Canada ('000 tonnes)

		MB	AB	SK	CA
HRSW	Est./Yr	3200	5500	8800	18000
Oats	Est./Yr	950	850	1550	3500
Barley	Est./Yr	1250	5400	4800	12800
Durum	Est./Yr	60	850	3800	4700
Peas	Est./Yr	170	850	2350	3370

Peas

- 2.0 to 3.0 million tonnes Grown yearly in Saskatchewan.
- Surplus and damaged peas not export or food grade available for feed
- Available from Producers, Feed Dealers and pea Processors
- Feed Use backed by Research and history of use
- Established price standards
-Limited use in dairy cattle (considered feed for pigs, **not true**)
- **Protein (amino acid) and carbohydrate profile** increases value and interest in ration modelling programs like CNCPS 6.5.

Antinutritional factors in peas are Low

- **tannins**
- **trypsin inhibitor**
- Not of Concern

Comparison of Protein Sources (90% DM basis)

(90% DM basis)	Field Peas	Canola meal	Soybean meal	DDG	Corn gluten meal
Crude protein %	22.0	34.0	47.0	31.41	62.0
UIP (bypass) %of CP	23.0	31.0	34.0	47.0	55.0
DE (Kcal/kg swine)	3500	3000	3685	3150	4225
TDN %	78.0	68.0	81.5	74.0	81
Amino acid % of protein					
Lysine	7.10	5.9	6.4	2.49	1.84
Methionine + cysteine	2.18	4.85	3.0	2.72	4.06
Threonine	4.27	4.67	3.9	2.78	3.35
Tryptophan	1.09	1.32	1.38	0.63	0.50

Note: Amino Acid and energy fit of Peas and Canola meal

Unique Combination

Balancing diets for soluble protein & bypass protein increases importance.

Processing Peas For Dairy

- **Try to reduce protein solubility (increase UIP) and Maintain slow to degrade Starch.**
- **Methods:**
- **Rolling:** maintains slower starch degradation but does nothing to alter protein
- **Extruding:** Increases UIP but sheer and heating increases rate of starch degradation. (too much heat can also destroy amino acids)
- **Grinding:** Increases rate of starch degradation and no effect on protein
- **Steam Flaking**: Alters protein characteristics with steam heat and rolled product maintains slow to degrade starch???

- **Problem**: Pea seed is hard with hull and needs time to hydrate. Most research on steam flaking failed to look at protein solubility and only at absolute bypass protein. Behnke 2004 found peas steam flaked easily and at 100 C held for 16 minutes obtained 10% starch gelatinization. (Showed a heat effect).

Processing Trial: Steam Flaking Peas

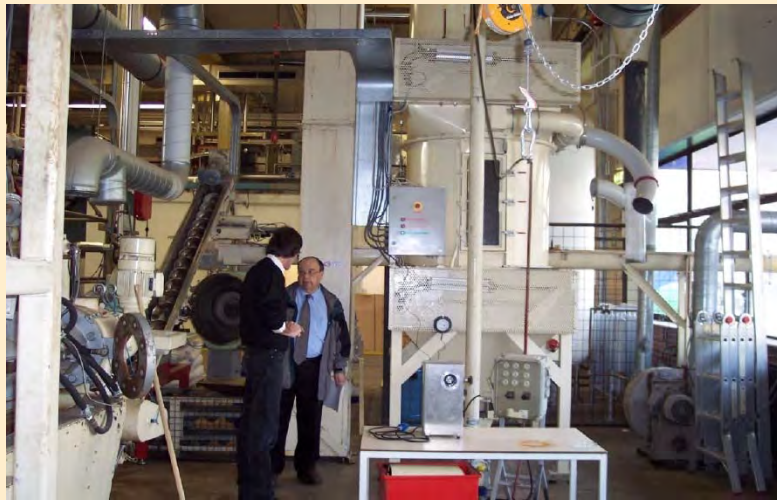
-2 whole pea + 1 pea split and cracks samples were split into two with each half either rolled or steam flaked. (total of 6 research samples).

- Steam flaking: used an A.T. Ferrell flaking mill; temperature of 95 to 102 C. with a residence time of 16 to 18 minutes in steam chamber. (splits were a problem with clumping and need agitation)

- Samples analyzed at CVAS.

- Samples ground and conducted poultry feeding trial (Dr. Karen Schwan)

- Samples (rolled or steam flaked) were investigated for feed component (dry matter, crude protein and starch) rumen kinetics using in vivo nylon bag methodology. (Dr. Peiqiang Yu).



Analysis of whole and split pea samples pre and post processing (100% DM basis)

Item	Coop Whole Pea	Coop Whole Pea Flaked	DL Whole Pea	DL Whole Pea Flaked	DL Pea Splits	DL Pea Splits Flaked
Moisture %	8.1	13.6	8.4	12.6	9.9	12.1
Crude Protein %	23.3	22.3	20.6	19.6	23.3	23.1
Soluble Protein % and (% of total)	18.2 (78.11)	12.2 (54.72)	16.2 (78.64)	9.3 (47.45)	17.9 (76.82)	10.0 (43.29)
ADICP %	0.29	0.27	0.26	0.25	0.19	0.38
NDICP %	0.32	0.41	0.33	0.26	0.21	0.49
ADF %	7.7	9.2	8.9	7.6	5.0	6.8
NDF %	12.4	10.5	11.4	10.8	9.8	11.8
Lignin %	0.64	0.66	0.60	0.47	0.48	0.84
Starch %	44.4	46.4	46.6	46.5	48.1	47.2
Crude Fat %	1.35	1.66	1.71	2.18	1.58	1.66
Ash %	2.66	2.72	2.97	2.91	3.02	3.13
Available glucose %	5.7	6.2	5.4	6.0	5.7	6.2
Degree of Processing %	10.9	11.8	9.8	11.1	10.0	11.1

Effect of Steam Flaking on Rumen degradation Kinetics of Crude Protein

Items	Processing				Seed Type			
	Control (Raw)	Flaked	SEM	P value	Whole	Split (Screening)	SEM	P value
Rumen degradation kinetics of crude protein								
Kd of CP (%/h)	8.279	10.391	0.6875	0.052	9.288	9.383	0.7074	0.926
T0 of CP (h)	1.65 a	0.08 b	0.302	0.002	0.92	0.80	0.308	0.751
S of CP (%)	18.15	19.44	1.225	0.461	16.90 b	20.69 a	1.260	0.062
D of CP (%)	81.55 a	69.75 b	2.847	0.015	78.47	72.83	2.930	0.207
U of CP (%)	0.31 b	10.81 a	2.328	0.009	4.64	6.49	2.396	0.598
Effectively degradation crude protein								
%EDCP(= %RDP)	65.26	63.27	1.551	0.283	63.71	64.82	1.581	0.561
EDCP (g/kg DM)	153.4	155.4	4.08	0.714	147.0 b	161.9 a	4.19	0.031
Rumen undegraded crude protein								
%RUP	34.74	36.73	1.551	0.283	36.29	35.18	1.581	0.561
RUP (g/kg DM)	81.9	90.2	4.54	0.213	84.2	88.0	4.67	0.579

Rumen degradation kinetics of starch

Items	Processing				Seed Type			
	Control (Raw)	Flaked	SEM	P value	Whole	Split	SEM	P value
Kd of starch (%/h)	7.965 b	10.475 a	0.789	0.046	8.300	10.140	0.812	0.143
T0 of starch (h)	3.20 a	0.69 b	0.587	0.009	1.85	2.05	0.601	0.805
S of starch (%)	3.08	1.88	1.293	0.499	1.62	3.35	1.327	0.368
D of starch (%)	96.17	90.85	2.395	0.140	96.60	90.42	2.464	0.110
U of starch (%)	0.74 b	7.27 a	2.144	0.047	1.78	6.23	2.199	0.170
Effectively degradation starch %EDST (= %RDST)	57.17	58.92	1.743	0.484	56.98	59.10	1.794	0.425

Conclusions

- Steam flaking peas is a relatively easy process
- All steam flaked peas showed a decrease in protein solubility 35 to 45% as compared to their unprocessed pair. This decrease in solubility does not appear to come from harsh overheating.
- The evaluation of rumen nutrient behavior and kinetics of steam flaked peas as compared to unprocessed peas all point to a decrease in protein and dry matter degradability with little or no change in starch degradability.
- Steam flaking of peas produces an optimal feed form for ruminants and represents a cost effective process to decrease protein degradability while maintaining starch integrity.
- Question is: How much do we have to reduce pea protein degradability to be most effective and can we establish parameters to achieve this?
- It is an opportunity to Western Canada

Being Unique

Acknowledgments