

**Canola meal or peas in an extruded
Wheat dried distillers grains with
solubles based dairy concentrate**

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Characteristics of wheat dried distillers grains with solubles (WDDGS)

- Readily available in Western Canada
- Currently being used dairy cow diets
 - High protein
 - Used to replace canola meal
 - High fibre
 - Low starch

Cons of WDDGS

- Low lysine content
 - Has a lysine to methionine ratio of 1:1
 - 3:1 ratio is preferred in dairy cow diets
- Variable rumen degradation
 - Different between ethanol plants
 - Different between batches within one plant
- Small quantity of bypass protein
 - Bypass protein can increase milk production

Enhancing WDDGS protein profile

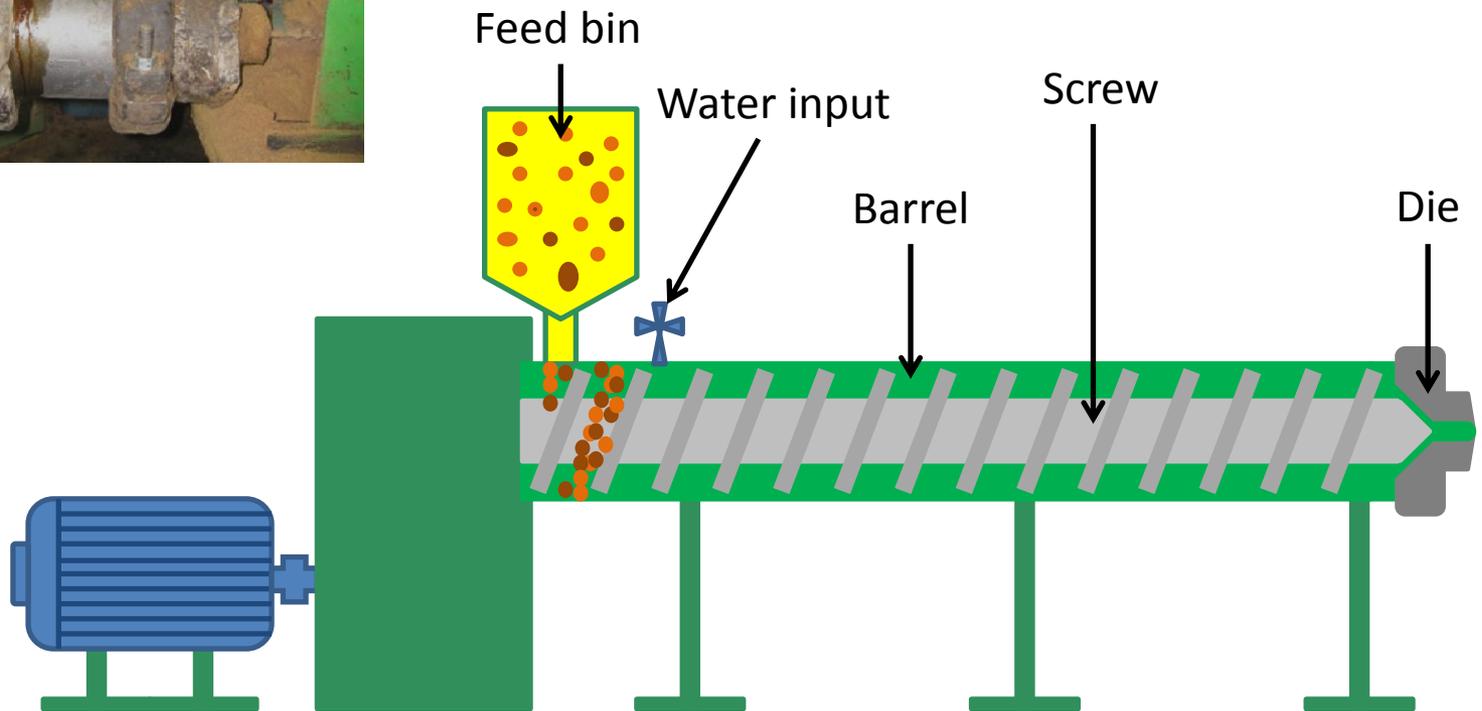
- Improve amino acid profile by combining WDDGS with other protein sources
 - Pea grain and canola meal have higher lysine content
 - Locally available

Ingredient	Crude Protein	Lysine (% of CP)	Methionine (% of CP)	Lys:Met Ratio
Wheat DDGS	42.3	1.55	1.41	1:1
Peas	25.6	7.17	1.00	7:1
Canola Meal	42.6	5.62	1.87	3:1

Nutrient requirements of dairy cattle, NRC 2001

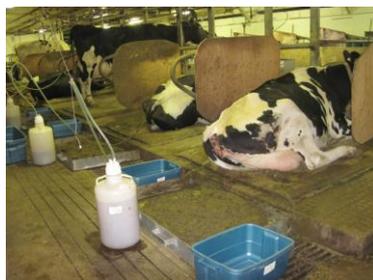
Increasing WDDGS bypass protein content

- Extruding grains and pulses can increase bypass protein
 - Digestion of bypass protein may also increase
- Milk yield, fat content or protein yield increases can occur with extrusion



Experimental objectives

- To determine the effects of extruded WDDGS-peas or WDDGS-canola meal combinations on:
 - Milk production and composition
 - Feed intake and digestibility
 - Rumen fermentation characteristics



Diet ingredients and composition

Table 1 Feed ingredients and chemical composition of the diets.

Ingredient (% of diet DM)	Extruded		Non-extruded	
	WDDGS- Peas	WDDGS- Canola meal	WDDGS- Peas	WDDGS- Canola meal
Barley silage	32.6	31.4	32.6	31.4
Alfalfa hay	19.6	18.8	19.6	18.8
Barley grain	26.2	31.0	26.2	31.0
WDDGS*	8.1	7.8	8.1	7.8
Canola seed*	0.8	0.8	0.8	0.8
Pea grain*	7.3	0	7.3	0
Canola meal*	0	7.1	0	7.1
Corn gluten meal	1.8	0	1.8	0
Vitamin premix	1.8	1.8	1.8	1.8
Golden flake	1.6	1.1	1.6	1.1
Salt	0.2	0.2	0.2	0.2
Chemical composition				
Dry matter (%)	57.7	57.7	57.5	57.3
Crude protein (% of DM)	17.1	17.0	17.3	17.2
Acid detergent fibre (% of DM)	14.7	15.6	14.2	15.2
Neutral detergent fibre (% of DM)	27.4	29.1	26.6	28.5
Crude fat (% of DM)	3.9	4.2	3.9	4.2

*Shaded area indicates treatment combination ingredients

Experimental design and timeline

- Replicated 4 X 4 Latin square design
- Each experimental period lasted 28 days
- Samples and records taken:
 - Feed intake
 - Milk production
 - Milk samples
 - Milk composition
 - Feed and feces samples
 - Nutrient digestibility
 - Rumen samples
 - Rumen pH, VFA & ammonia nitrogen



Milk production results

Table 2 The effects of dietary treatment on feed intake, milk production and composition.

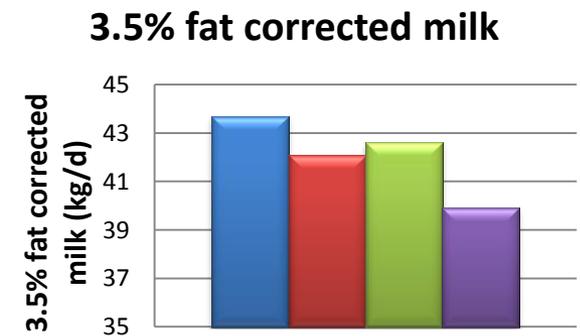
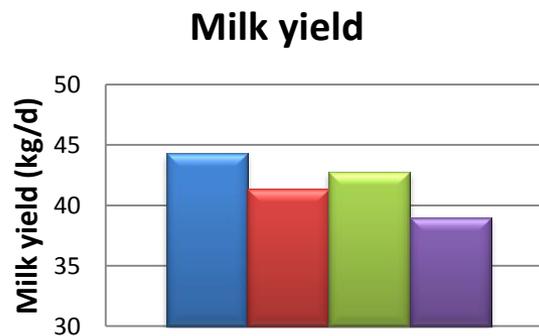
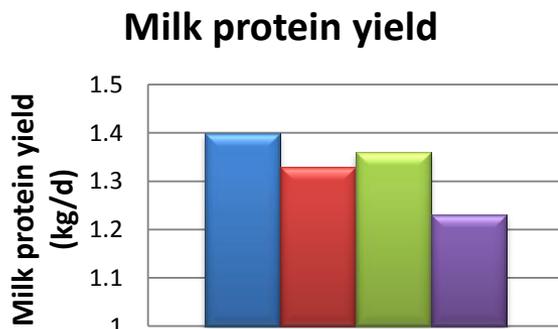
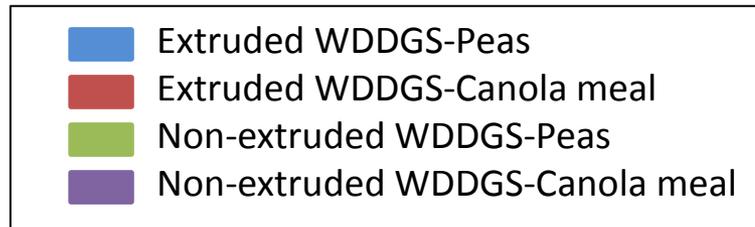
Item	Extruded		Non-extruded	
	WDDGS- Peas	WDDGS- Canola meal	WDDGS- Peas	WDDGS- Canola meal
Dry matter intake (kg/d)	28.4	29.1	28.2	27.6
Milk yield (kg/d)	44.3	41.4	42.8	39.0
Milk fat (%)	3.46	3.59	3.57	3.61
Milk protein (%)	3.21	3.22	3.20	3.21
Milk urea nitrogen (mg/dL)	14.9	15.5	15.5	15.4
Fat yield (kg/d)	1.51	1.48	1.51	1.39
Protein yield (kg/d)	1.40	1.33	1.36	1.23
3.5% fat corrected milk (kg/d)	43.7	42.1	42.6	39.9

Item rows that are bolded have significantly different values ($P < 0.05$).



Milk production results continued

- Pea diet protein and milk yield increases may be attributed to the better amino acid balance
- Essentially no effect of extrusion

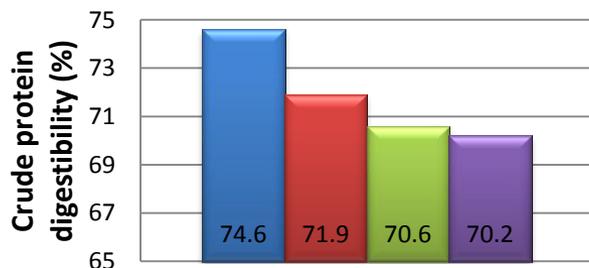


Nutrient digestibility and rumen fermentation results

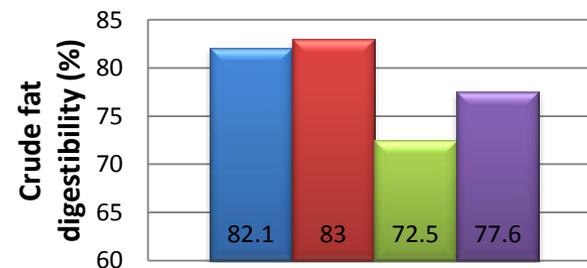


Total tract nutrient digestibility (Table 3)

Crude protein digestibility



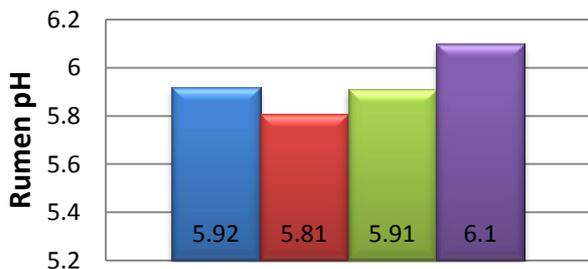
Crude fat digestibility



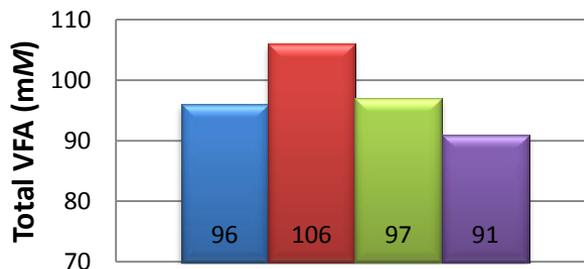
- Extruded WDDGS-Peas
- Extruded WDDGS-Canola meal
- Non-extruded WDDGS-Peas
- Non-extruded WDDGS-Canola meal

Rumen fermentation characteristics (Table 3)

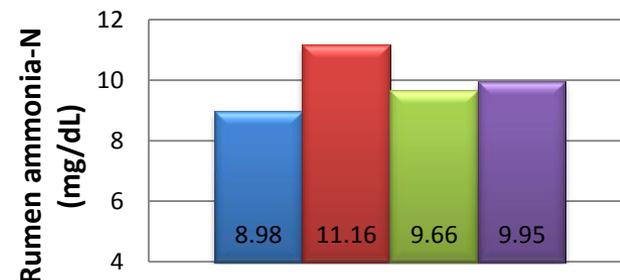
Rumen pH



Total VFA



Rumen ammonia nitrogen

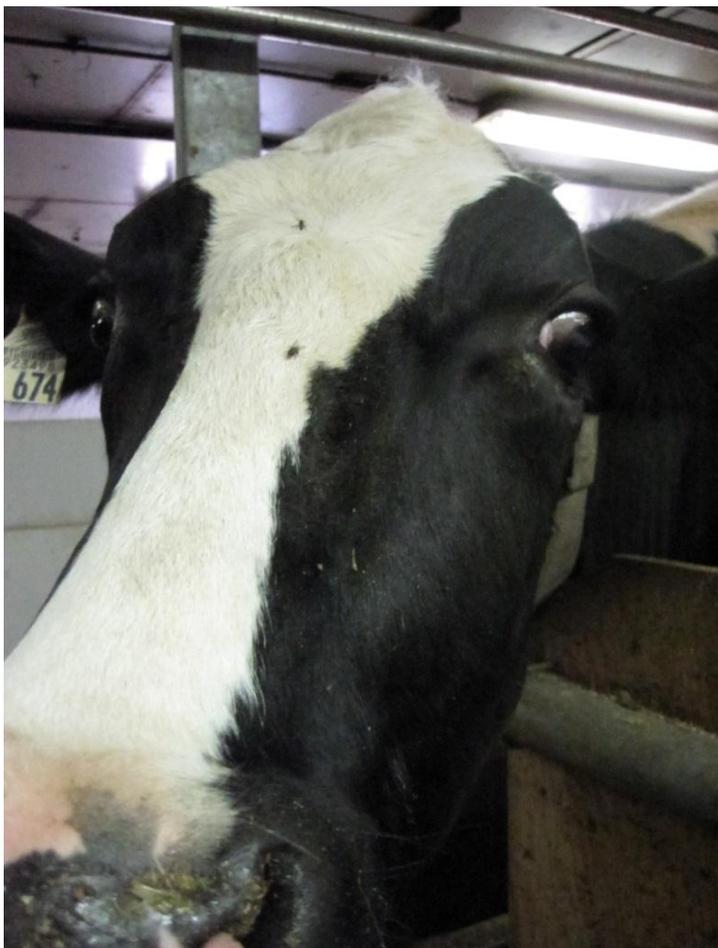


Summary and conclusions

- Extrusion increased crude protein and crude fat digestibility
 - Extrusion had no effect on milk production
 - Extrusion had a greater impact on rumen fermentation of canola meal diets
- WDDGS pea diet combinations resulted in higher milk yield, 3.5% fat corrected milk and milk protein yield
 - WDDGS pea combinations may be a better combination



Thank you



Greenbrae Dairy
Research Facility

Dairy Farmers of
Saskatchewan and
Saskmilk

FOBI Network
Feed Opportunities from Biofuels Industries
(An initiative of the Feeds Innovation Institute)

Wheat **DDGS**
Wheat Dried Distiller Grains with Solubles



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