Abstract # 95

Government of Alberta
Agriculture and Rural Development

Effect of Graded Levels of DDGS in Broiler Diets on Performance and Breast Meat Yield

M. Oryschak[1], D. Korver[2], A. Pishnamazi[2] and E. Beltranena[1,2]

[1]Alberta Agriculture and Rural Development, Edmonton, AB, Canada
[2]University of Alberta, Edmonton, AB, Canada

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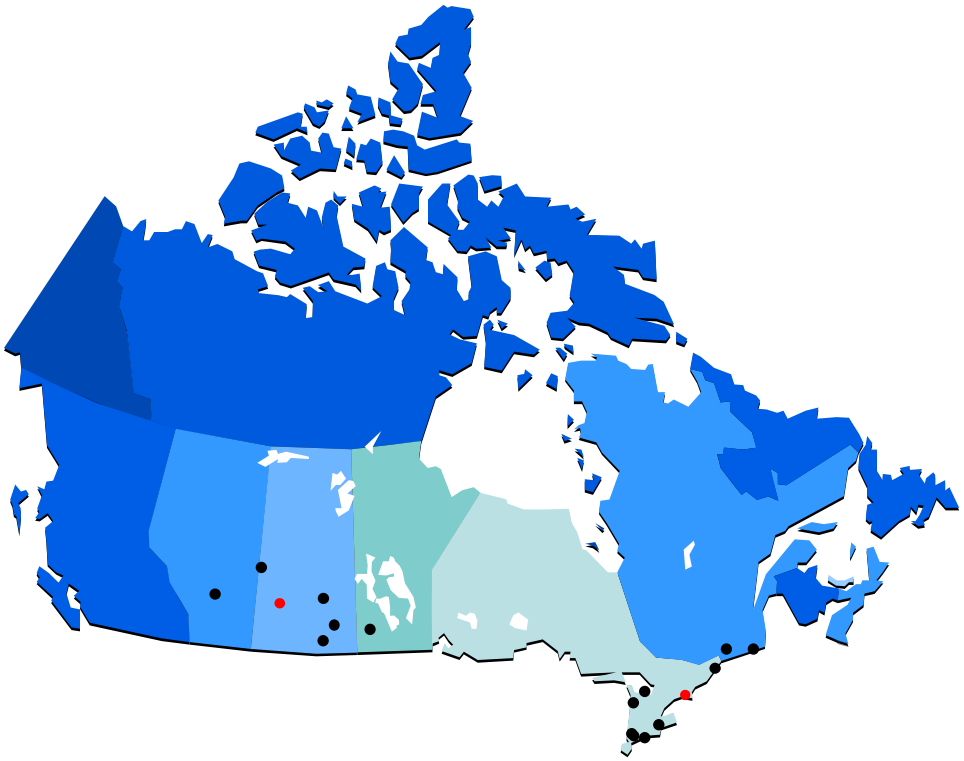
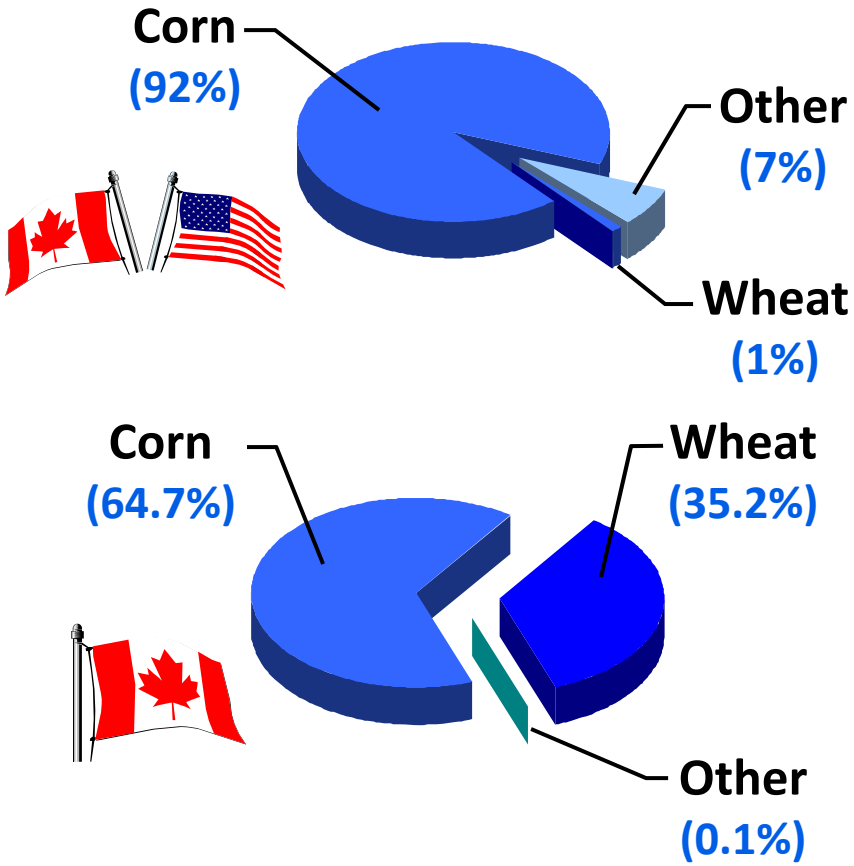
Ethanol Production in Canada





Policy Drivers for Expanded Ethanol Production in North America

- **Government-mandated 'green' content in fuels:**

5% in gasoline by 2010
2% in diesel/heating oil by 2012

36 B Gallons by 2022
(~15% of gasoline consumption)

The math driving expanded ethanol production

- **Canadians consume approximately 40 Billion L (11 Billion Gal) of gasoline/yr**
  - 5% renewable content = **2 Billion L/yr**
  - 2 Billion L requires approximately 5.5 million metric tonnes of grain

Disposition of Canadian Wheat and Corn (in millions of metric tonnes)

	Corn (for grain)			Wheat (except Durum)		
	2007-08	2008-09	2009-10	2007-08	2008-09	2009-10
Total Supply[1]	16.17	13.95	13.78	22.00	26.83	22.42
Exports	0.91	0.30	0.30	12.68	14.50	12.50
Food & Industrial Use	3.57	3.80	4.30	3.02	3.25	3.20
Feed, Waste & Dockage	10.22	8.73	7.96	1.79	3.67	2.08
Total Domestic Use	13.80	12.55	12.28	5.60	7.73	6.12

[1] Annual domestic production + imports + carry-over stocks

Implication: Further expansion of Canadian starch-based ethanol will likely mean less wheat will be exported

Source: Statistics Canada

Background

- **Increased consumption of Canadian grains by ethanol sector will:**
  - ↑ demand/competition for feed grains
  - ↑ supply of ethanol co-products (i.e., US corn DDGS, Western Canadian wheat DDGS)

Background

- **Wider availability of DDGS could allow producers to reduce feed costs by displacing more costly ingredients**
  - Info on corn DDGS in wheat-based diets (??)
  - Little or no information on upper inclusion levels of wheat or triticale DDGS for broilers

Objectives

- **To compare performance and breast muscle yield of broilers fed 5 or 10% corn, wheat or triticale DDGS compared to a typical Western Canadian diet**
- **Determine the feasibility of including up to 10% wheat or triticale DDGS in wheat-based diets**

Methods and Materials

Test System

- **Ross x Ross 308 male and female broilers housed on litter in floor pens in a single experimental room**
  - Divided into single-gender groups of approx. 55 birds per pen
  - Continuous access to suspended, adjustable bell feeder and nipple drinkers

Experimental Design

- **Randomized Block:**
  - Pens divided into 4 blocks
  - Each treatment fed to at least 1 pen of each gender/block
  - Pen = experimental unit

Test Diets

- **7 test diets:**
  - 2 levels DDGS (15% or 30%), 3 DDGS types (corn, wheat or triticale) and a wheat/SBM control
  - Balanced for ME, CP, dig Lys & Ca:Av P
  - Separate sets of diets formulated for starter, grower and finisher phases

Table 1. Target specifications for starter (d0-14), grower (d14-28) and finisher (d28-42) phase test diets

Nutrient	Starter Phase (d 0-14)	Grower Phase (d 14-28)	Finisher Phase (d 28-42)
AME, kcal/kg	3025	3150	3200
Crude Protein, %	22-25	21-23	19-23
Dig. Lysine, %	1.27	1.10	0.97
Dig. Met, %	0.47	0.42	0.38
Dig. Met + Cys, %	0.94	0.84	0.76
Av. Phosphorus, %	0.5	0.45	0.42
Ca: Av P	2:1	2:1	2:1

Measurements

- **Pen weight and feed consumption were measured weekly for 6 weeks**
  - **BW**, **ADG**, **ADFI** and **G:F** then calculated on a per bird basis for each pen
- **Breast weight and yield (% of BW) measured on 5 birds/pen on day 37**

Statistical Analysis

- **Performance data analyzed as a repeated measures experiment using mixed models procedure (PROC MIXED) in SAS® v9.1**
  - Dependent variables: **BW, ADG, ADFI, F:G**
  - Model: **y = diet | gender | week**
  - Repeated term: **week**
  - Random term: **block**

Statistical Analysis

- **Breast yield data analyzed using mixed models procedure (PROC MIXED) in SAS® v9.1**
  - Dependent variables: B**reast Wt , Breast Yield**
  - Model: **y = diet + gender + diet*gender**
  - Random term: **block**
  - Covariate: **BW (d37)**

Results - Part I:

Performance

Significance of model terms

Variable	Main Effects			Interactions			
	Treat	Gender	Period	T x G	T x P	G x P	3-way
Liveweight	0.6977	*<.0001*	*<.0001*	0.7982	0.8779	*<.0001*	0.2991
ADFI	0.4576	*<.0001*	*<.0001*	0.0584	*0.0032*	*<.0001*	*0.0187*
ADG	0.7717	*<.0001*	*<.0001*	0.1668	0.6863	*<.0001*	0.1122
G:F	0.1015	*<.0001*	*<.0001*	0.2406	0.2731	*<.0001*	0.9992

Table 2. **Effect of 5 or 10% wheat, corn or triticale DDGS on average daily gain (ADG) and feed efficiency (G:F) of broilers, d0-42**

		Wheat DDGS		Triticale DDGS		Corn DDGS		Pooled
Period	Control	5%	10%	5%	10%	5%	10%	SEM
ADG, g/d	62.29	61.07	60.93	61.42	61.88	61.13	60.63	0.78
G:F	0.74	0.73	0.72	0.74	0.73	0.72	0.72	0.01

Table 3. Effect of 5 or 10% wheat, corn or triticale DDGS on average daily feed intake of broilers (g/d)

		Wheat DDGS		Triticale DDGS		Corn DDGS		Pooled
Week	Control	5%	10%	5%	10%	5%	10%	SEM
1	19.12	18.70	18.21	18.06	18.13	18.19	19.00	3.12
2	43.25	44.70	45.66	44.11	45.88	45.54	46.50	3.12
3	75.75	73.65	78.96	75.68	78.38	79.21	76.38	3.12
4	127.42^{a}	119.00^{ab}	123.33^{ab}	118.26^{b}	120.50^{ab}	120.61^{ab}	116.75^{b}	3.22
5	95.88^{bcd}	92.65^{d}	101.40^{bc}	93.31^{cd}	104.63^{ab}	111.39^{a}	94.88^{cd}	3.16
6	146.63^{bc}	159.68^{a}	146.82^{bc}	148.19^{b}	147.37^{b}	138.34^{c}	149.75^{b}	3.25
1 to 6	84.67	84.73	85.73	82.93	85.81	85.54	83.88	1.34

Interpretation: no clear pattern to differences in intake

Different superscripts in rows denote significant differences ($P < 0.05$)

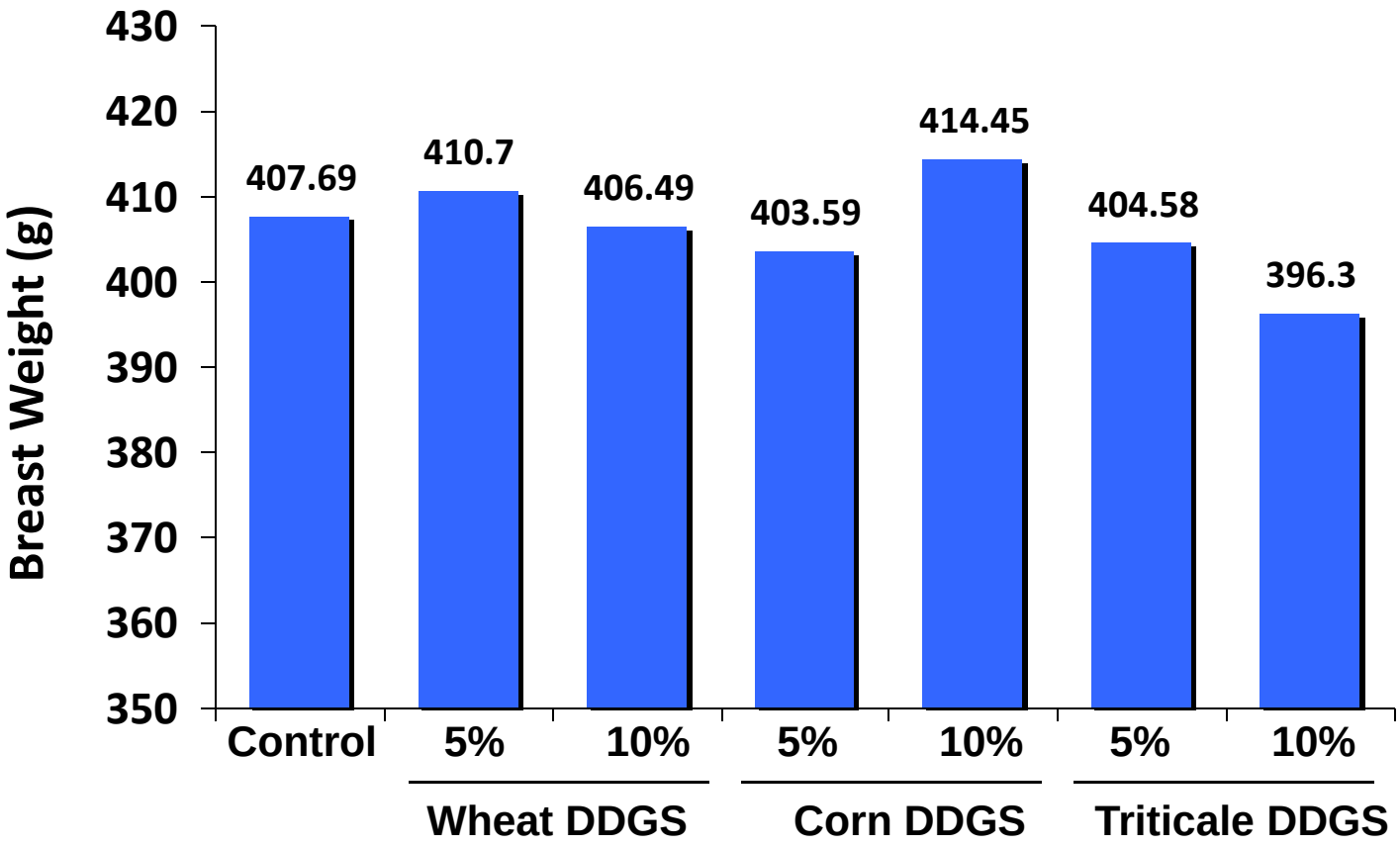
Results - Part II:

Breast Weight/Yield

Significance of model terms

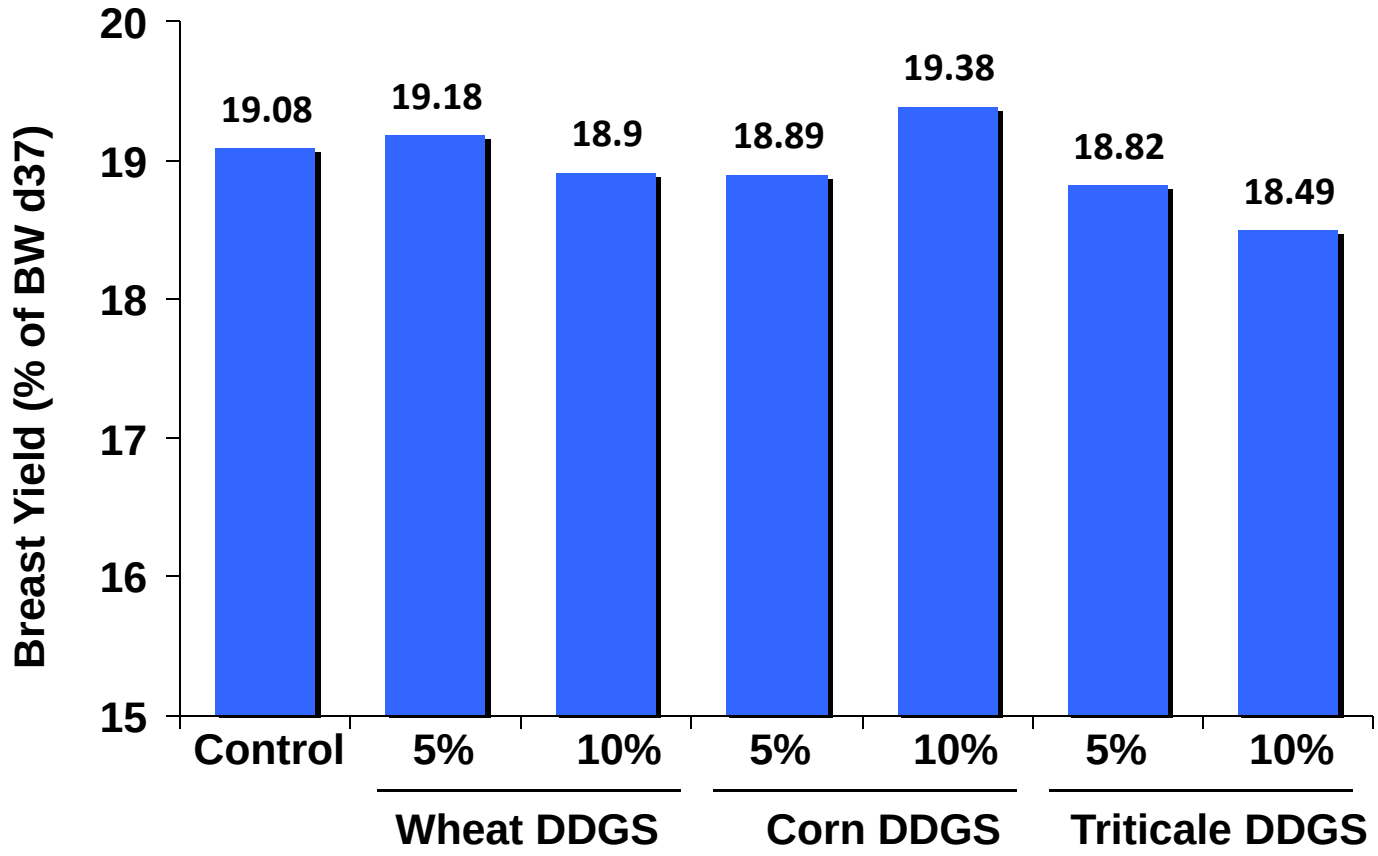
Variable	Treat	Gender	Treat x Gender	d37 BW
Breast Weight	**0.1123**	***<.0001***	**0.9101**	***<.0001***
Breast Yield	**0.0855**	***<.0001***	**0.7485**	***<.0001***

Figure 2. Effect of 5 or 10% Wheat, Corn or Triticale DDGS on Breast Weight of Broilers (d 37)



Effect of treatment P = 0.1123

Figure 3. Effect of 5 or 10% Wheat, Corn or Triticale DDGS on Breast Yield of Broilers (d 37)



Effect of treatment P = 0.0855

Table 4. Effect of gender on performance (d0-42) and breast weight variables (d37)

Variable	Males	Females	SEM	P-value
ADFI (g/d)	87.54[a]	81.98[b]	0.87	<.0001
ADG (g/d)	65.52[a]	57.15[b]	0.43	<.0001
Gain:Feed	0.74[a]	0.71[b]	0.01	<.0001
Breast Wt (g)	394.07[b]	418.45[a]	2.38	<.0001
Breast Yield (%)	18.36[b]	19.57[a]	0.12	<.0001

Summary

- **Increased demand for ethanol will increase availability of DDGS for livestock & poultry feeding**
  - US: corn DDGS
  - Canada: wheat DDGS (and possibly DDGS from other currently underutilized crops)

Summary

- **Canadian wheat and triticale DDGS appear to be suitable at levels up to 10%**
  - No detectable effect on performance or breast meat yield

Implications (…the 'so what')

- **Based on current/recent commodity prices, inclusion of 10% DDGS would save producers at least $5 per metric tonne**
  - At observed conversion rates this would save the average AB broiler producer approximately **$2500** per year

Acknowledgements

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