Effect of increasing dietary inclusion of solvent-extracted *B. juncea* vs. *B. napus* canola meal:

Broiler growth performance, carcass traits and yield of carcass components

M. Oryschak[1], B. Slominski[2], and E. Beltranena[1,3]

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

[2]University of Manitoba, Winnipeg, MB, Canada;

[3]University of Alberta, Edmonton, AB, Canada

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Acknowledgements

Willis Carrier

Inventor of Air Conditioning

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Background

- **The Canola Science Cluster (AAFC)**
  - Joint initiative that is industry-lead and supported by federal research funding (~3:1 matching of industry funds)
  - Intent: to mobilize scientific/technical resources to support innovation and competitiveness in canola sector
- **9 research themes**
  - Includes meal nutrition

Background

- **Canola meal nutrition theme** (*Team lead – Dr. Bogdan Slominski, U of Manitoba)*
  - ***Objective 1:*** address issues with high dietary inclusion levels (e.g., inefficient nitrogen utilization, effects on carcass composition)
  - ***Objective 2:*** demonstrate that high energy canola meal can effectively be used at very high inclusion levels in poultry feeds

Entry Number	Feed Name Description	International Feed Number[a]	Dry Matter (%)	ME_n (kcal/kg)
	Alfalfa *Medicago sativa*			
01	meal dehydrated, 17% protein	1-00-023	92	1,200
02	meal dehydrated, 20% protein	1-00-024	92	1,630
03	Bakery waste, dehydrated (dried bakery product)	4-00-466	92	3,862
	Barley *Hordeum vulgare*			
04	grain	4-00-549	89	2,640
05	grain, Pacific coast	4-07-939	89	2,620
	Broadbean *Vicia faba*			
06	seeds	5-09-262	87	2,431
	Blood			
07	meal, vat dried	5-00-380	94	2,830
08	meal, spray or ring dried	5-00-381	93	3,420
	Brewer's Grains			
09	dehydrated	5-02-141	92	2,080
	Buckwheat, common *Fagopyrum sagittatum*			
10	grain	4-00-994	88	2,660
	Cane Molasses—see Molasses			
	Canola *Brassica napus-Brassica campestris*			
11	seeds, meal prepressed solvent extracted, low erucic acid, low glucosinolates	5-06-145	93	2,000

B. Napus vs. *B. juncea* canola meals

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Table 1. Analysed nutrient profiles of solvent-extracted *B. napus* and *B. juncea* meal

Nutrient (% as fed)	*B. napus* meal	*B. juncea* meal
Moisture	11.80	10.79
Crude protein	38.63	39.18
Crude fat	1.91	1.72
Crude fiber	8.50	7.36
ADF	18.03	13.45
NDF	26.99	19.87
Starch	-	1.66
Calcium	0.66	0.71
Phosphorus	1.26	1.40
Total amino acids	33.51	34.82
Lysine	2.00	2.01
Reactive Lysine	1.81	1.86
Methionine	0.76	0.74
Met + Cys	1.68	1.57

Table 2. Digestible nutrient profiles of solvent-extracted *B. napus* and *B. juncea* meals (as-fed basis)

	Canola meal type			*P*-value
	B. juncea	*B. napus*	SEM	Type
AME, kcal/kg	2944	2543	139	0.060
Crude protein	29.73	28.37	0.61	0.108
Total AA	26.77	27.23	0.62	0.501
Arginine	2.04[b]	2.24[a]	0.02	0.001
Lysine	1.52	1.56	0.04	0.396
Methionine	0.65	0.64	0.01	0.417
Met + Cys	1.31[a]	1.21[b]	0.02	0.010
Threonine	1.17	1.17	0.04	0.897
Tryptophan	0.37	0.35	0.01	0.053

Source: Oryschak and Beltranena, unpublished data

Objectives

- **Determine effect of increasing dietary inclusion of *B. napus* and *B. juncea* meal (up to 30%) on:**
  - Growth performance;
  - Carcass traits; and,
  - Yield of carcass components

METHODS & MATERIALS

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Methods & Materials

- **Treatment regimens (7):**
  - Test diets containing 0, 10, 20 or 30% *B. napus* or *B. juncea* meal
  - All diets contained 5% wheat DDGS
- **Test system:**
  - Groups of 44 mixed-sex Ross 308 broilers raised to 35-d in bedded floor pens
- **6 replicate pens per treatment in CRD**

Table 3. Target nutrient levels in test diets for each broiler growth phase, % (unless otherwise indicated)

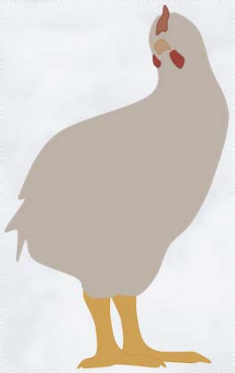
Nutrient	Starter phase	Grower phase	Finisher phase
ME Poultry, Mcal/kg	2.90	2.95	3.00
Crude Protein	23.88	23.06	21.37
Calcium	1.05	0.90	0.85
Digestible Phosphorus	0.50	0.45	0.42
Amino acids			
g dig Lys / Mcal AME	4.38	3.73	3.13
g dig Met:Lys	0.37	0.38	0.39
g dig Met + Cys:Lys	0.74	0.76	0.78
g dig Thr:Lys	0.65	0.66	0.67
g dig Val:Lys	0.75	0.76	0.77
g dig Ile:Lys	0.67	0.68	0.69
g dig Arg:Lys	1.03	1.04	1.05
g dig Trp:Lys	0.16	0.16	0.16

Table 4. Starter phase (d 0 - 11) formulations

		B. napus meal, %			*B. juncea* meal, %		
Ingredient	**Control**	**10**	**20**	**30**	**10**	**20**	**30**
Wheat	59.47	54.62	48.89	41.87	56.75	53.90	48.87
Soybean Meal	28.41	22.90	18.22	14.78	21.62	14.95	10.36
B. napus	-	10.00	20.00	30.00	-	-	-
B. juncea	-	-	-	-	10.00	20.00	30.00
Wheat DDGS	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Dical phosphate	1.82	1.72	1.61	1.50	1.54	1.25	0.96
Canola Oil	1.73	2.30	2.97	3.77	1.47	1.22	1.21
Limestone	1.36	1.27	1.19	1.10	1.36	1.36	1.36
Choline Premix	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Vit/Min Premix	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Salt	0.37	0.38	0.38	0.39	0.38	0.39	0.39
L - Lysine HCL	0.28	0.30	0.30	0.25	0.35	0.41	0.40
D,L - Methionine	0.26	0.22	0.17	0.11	0.23	0.20	0.16
L-Threonine	0.11	0.10	0.08	0.04	0.12	0.12	0.10
Custom Enzyme	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Coccidiostat	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Antibiotic	0.05	0.05	0.05	0.05	0.05	0.05	0.05

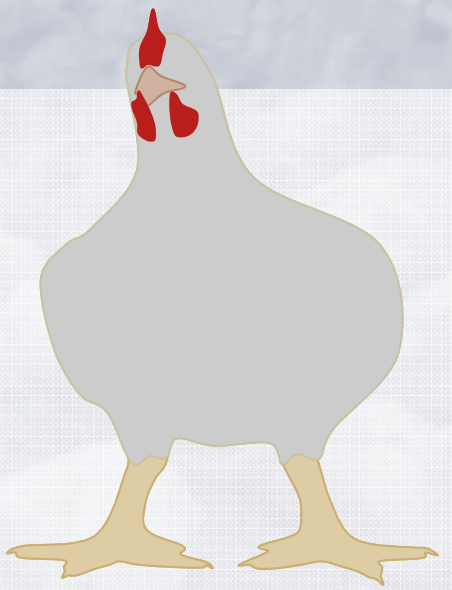
Pens of mixed sex broilers
(44/pen)

d0
Pen weight



d11
Pen weight
Feed disappearance

d22
Pen weight
Feed disappearance



d35
Pen weight
Feed disappearance

Starter phase → **Grower phase** → **Finisher phase**

Starter phase	Grower phase	Finisher phase
ADG	ADG	ADG
ADFI	ADFI	ADFI
G:F	G:F	G:F

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Methods & Materials (cont'd)

- **On d 36, 15 males and 15 females from each treatment were processed under commercial conditions**
  - Antemortem wt, carcass wt
  - Chilled carcasses were cut up into main components (breast muscles, thighs, wings, drums)
  - Component wt used to calculate yield

Methods & Materials (cont'd)

- **Data analyzed using PROC MIXED of SAS (v 9.1)**
- **Factorial models included:**
  - Fixed effects of canola type, inclusion level and the 2-way interaction
  - Initial pen BW as covariate
  - Block as fixed effect

RESULTS

Table 5. Effect of increasing dietary inclusion of *B. napus* and *B. juncea* on growth performance of mixed-sex broilers, d 0 - 35

	Dietary inclusion level of CM, %							
		B. napus			B. juncea			P-value[1]
	0%	10%	20%	30%	10%	20%	30%	Diet
Final Wt, g/bird	2284	2236	2282	2269	2300	2312	2261	0.487
ADG, g/d	61.9	60.7	62.0	61.7	62.5	62.9	61.4	0.768
ADFI, g/d	106.8	107.1	106.7	107.3	107.5	107.9	108.4	0.903
GF, gain:feed	0.61	0.61	0.63	0.62	0.62	0.61	0.61	0.736

Table 6. Effect of canola meal inclusion level on carcass weight and dressing percentage of 36-d-old broilers

	Dietary inclusion level, %					P-value[1]		
	0%	10%	20%	30%	SEM	Type	Level	Linear
AM wt, g	2175	2206	2173	2158	27	0.311	0.613	-
Carcass wt, g	1517[a]	1510[ab]	1508[ab]	1499[b]	4.4	0.451	0.044	0.007
Dressing %	0.697	0.694	0.692	0.688	0.002	0.366	0.056	0.008

Table 7. Effect of canola meal inclusion level on yield of carcass components from 36-d-old broilers

	Dietary inclusion level, %					P-value[1]		
	0%	10%	20%	30%	SEM	Type	Level	Linear
P. major	0.240^{b}	0.250^{a}	0.253^{a}	0.252^{a}	0.003	0.923	0.001	0.001
P. minor	0.050^{c}	0.053^{ab}	0.053^{b}	0.055^{a}	0.001	0.944	0.001	0.001
Thighs	0.177	0.177	0.175	0.178	0.003	0.431	0.776	-
Drumsticks	0.140	0.138	0.139	0.138	0.001	0.896	0.299	-
Wings	0.110	0.110	0.111	0.114	0.002	0.995	0.450	-
Total saleable	0.716^{b}	0.728^{a}	0.730^{a}	0.737^{a}	0.003	0.511	0.001	0.001

Conclusions

- **Feeding diets formulated on a digestible nutrient basis to contain up to 30% *B. napus* or *B. juncea* meal does not affect growth performance**
  - Validity of max inclusions when formulating diets on digestible nutrient basis??

Conclusions (cont'd)

- **Carcass wt declined linearly with increasing canola meal inclusion**
  - Similar trend with dressing % ($P < 0.06$)
  - ↑gut weight with↑ fibre content??
- **Increasing canola meal inclusion increased yield of breast muscles and total saleable yield**
  - Underestimate of AME or dig AA in meals??

Table 8. Economic analysis of the treatments compared in the present study

		B. napus			B. juncea		
	0%	10%	20%	30%	10%	20%	30%
Total feed cost, $ CAN/bird marketed	1.202^{a}	1.203^{a}	1.201^{a}	1.208^{a}	1.158^{b}	1.132^{c}	1.107^{d}
Total feed cost, $ CAN/kg marketed	0.526^{b}	0.537^{a}	0.526^{b}	0.532^{ab}	0.505^{c}	0.489^{d}	0.497^{cd}
Cost of gain, $ CAN/kg gain	0.377^{a}	0.376^{a}	0.367^{ab}	0.378^{a}	0.359^{bc}	0.354^{c}	0.346^{c}
Income over feed costs[1], $ CAN/bird marketed	2.734^{bc}	2.663^{d}	2.735^{bc}	2.704^{cd}	2.800^{ab}	2.858^{a}	2.740^{bcd}

[1] Based on revenue of CAN$1.7225 per kg marketed

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Table 9. Formula costs for each treatment regimen, by phase.

		B. napus			*B. juncea*		
	0%	**10%**	**20%**	**30%**	**10%**	**20%**	**30%**
Formula costs[1], $CAN/Tonne							
d 0 – 11	338.83	335.57	333.79	334.25	325.79	312.97	303.88
d 11 – 22	314.56	311.30	310.09	311.47	301.53	289.84	281.10
d 22 – 35	298.65	295.39	295.33	298.11	285.61	275.09	267.43

[1] Based on central Alberta ingredient pricing in early September; *B. juncea* meal was assigned a value of CAN$5 per tonne higher than *B. napus* meal in recognition of lower fibre and therefore higher presumed dietary energy content.