Recent Canola Meal Research with Broilers (2010-11)

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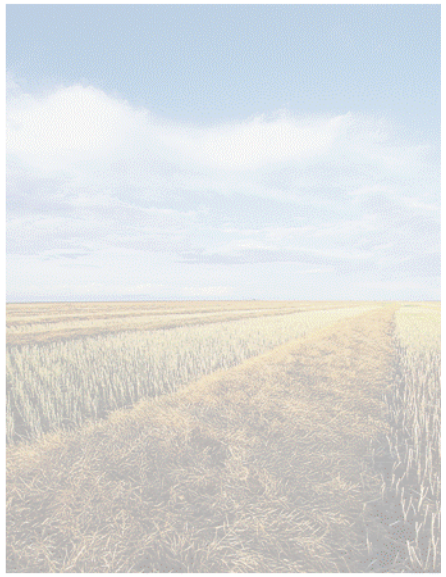
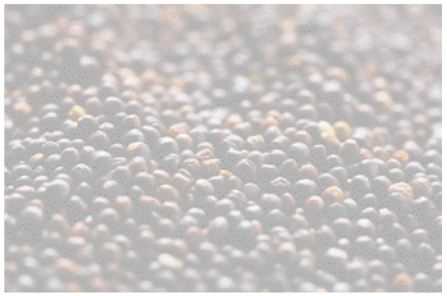
Recent AARD broiler research involving CM

1. **Nutrient digestibility in conventional, expeller-pressed and extruder-pressed CM**
2. **Nutrient digestibility in 2 air-classified CM fractions vs. the parent stock CM**
3. **Nutrient digestibility in *B. napus* vs. *B. juncea* meals**
4. **Performance of broilers fed graded inclusions of *B. napus* and *B. juncea* over d 0 to 35**

Digestibility Studies





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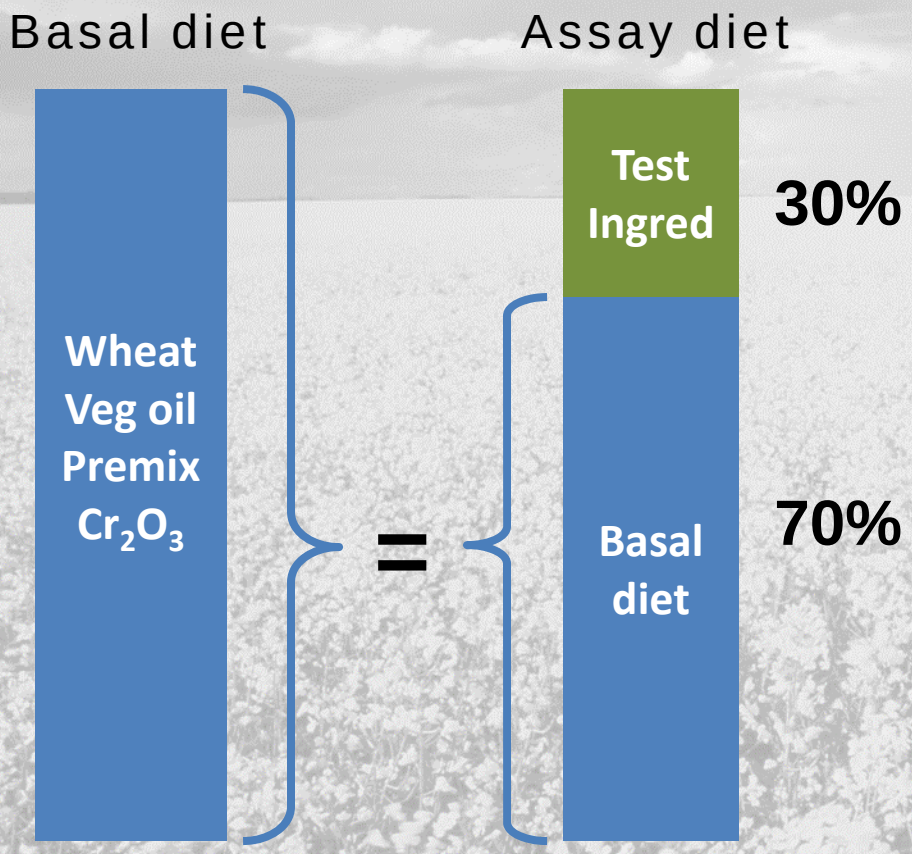
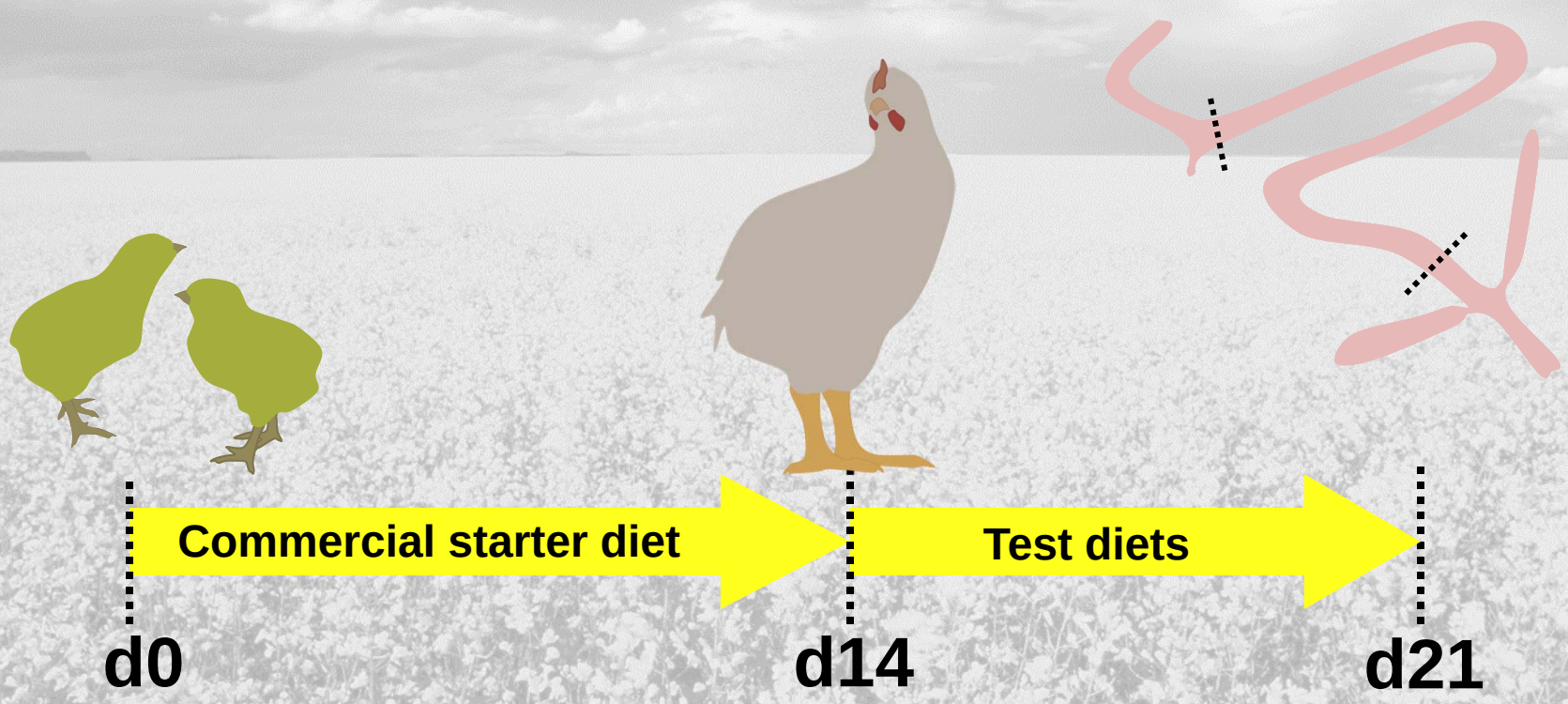
Our approach



$$D_{test} = \frac{\left(D_{assay} - D_{basal} \times RC_{basal}\right)}{RC_{test}}$$

D_x = digestibility
RC_x = relative contribution

Our approach (*cont'd*)

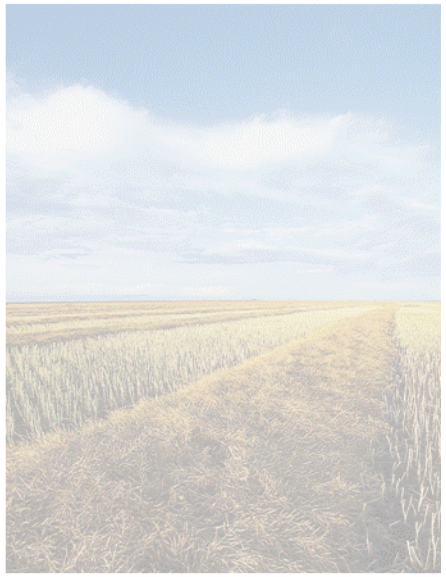


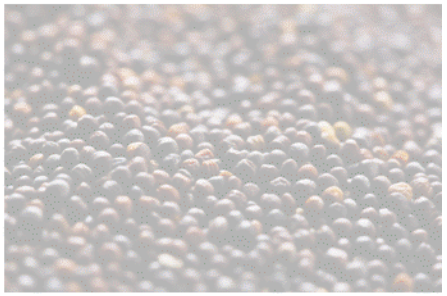
Measurements

- **Feed disappearance measured over the experimental period**
- **Body weight on d 14 and d 21**
- **Lab analysis of diets, ingredients, digesta and excreta**

Nutrient Digestibility in Canola Meal for Broilers:

Effect of oil extraction process





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Alternative extraction processes
(small scale, low capital)

Table 1. Analyzed nutrient content of canola meal types compared in the present study.

Nutrient	EXP CM	EPCM	SECM
Crude Protein	29.54	35.60	37.92
Total Amino Acids	23.93	32.39	34.57
Crude Fat	17.12	12.75	4.76
Crude Fiber	10.04	6.01	7.24
ADF	22.34	16.08	15.49
NDF	27.79	20.17	24.39
Lysine	1.20	2.11	2.15
Methionine	0.54	0.69	0.74
TSAA	1.24	1.55	1.63
Threonine	1.16	1.52	1.58

Table 2. ATTD of GE and AID of CP and AA in samples of conventional, expeller-pressed and extruder-pressed canola meals.

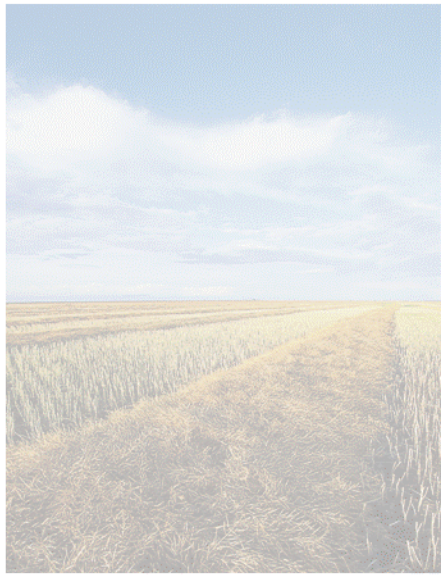
	CM type				*P*-value
	SECM	EPCM	EXCM	SEM	CM type
Gross energy	48.44^{c}	56.73^{b}	67.77^{a}	1.88	<.0001
Crude protein	71.88^{b}	68.73^{b}	79.40^{a}	1.17	0.0002
Total AA	81.66^{a}	75.22^{b}	84.83^{a}	1.16	0.0005
Lysine	81.79^{b}	72.52^{c}	97.33^{a}	1.23	<.0001
Methionine	88.58^{a}	81.43^{b}	91.37^{a}	0.89	<.0001
Total Sulfur AA	82.20^{a}	75.79^{b}	84.92^{a}	1.17	0.0007
Threonine	73.88^{b}	67.44^{c}	85.80^{a}	1.31	<.0001
Tryptophan	78.86^{c}	85.08^{b}	88.86^{a}	0.99	<.0001

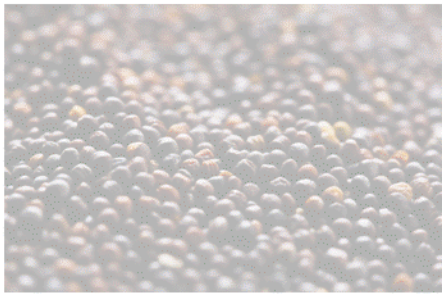
Table 3. AME and ileal digestible CP and AA content in samples of conventional, expeller-pressed and extruder-pressed canola meals (% of ingredient as-fed).

	CM type				*P*-value
	SECM	EPCM	EXCM	SEM	CM type
AME, kcal/kg	1974[c]	2699[b]	3192[a]	87	<.0001
Crude protein	27.26[a]	24.47[b]	23.45[b]	0.42	0.0002
Total AA	28.23[a]	24.36[b]	20.30[c]	0.38	<.0001
Lysine	1.76[a]	1.53[b]	1.17[c]	0.02	<.0001
Methionine	0.66[a]	0.56[b]	0.49[c]	0.01	<.0001
Total Sulfur AA	1.34[a]	1.17[b]	1.05[c]	0.02	<.0001
Threonine	1.17[a]	1.03[b]	1.00[b]	0.02	0.0002
Tryptophan	0.47[a]	0.44[b]	0.35[c]	0.00	<.0001

Nutrient Digestibility in Canola Meal for Broilers:

AC canola meal fractions vs. parent stock canola meal





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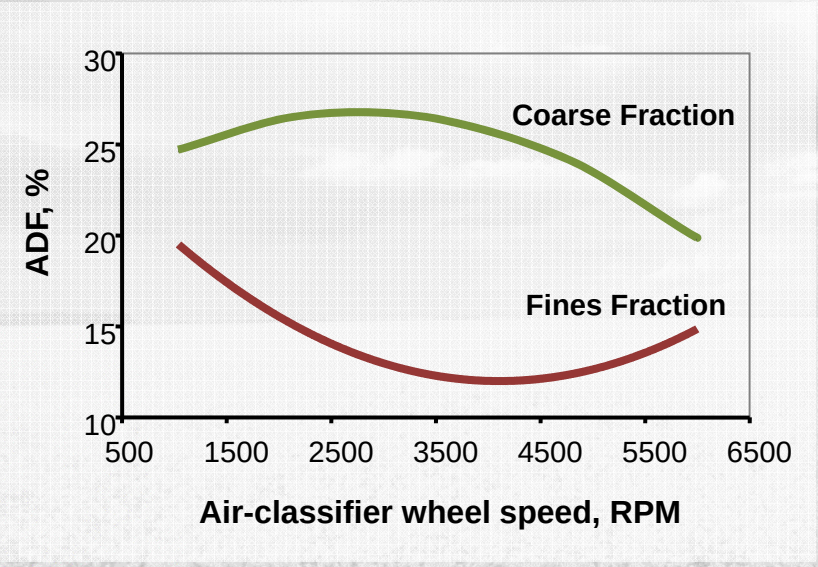
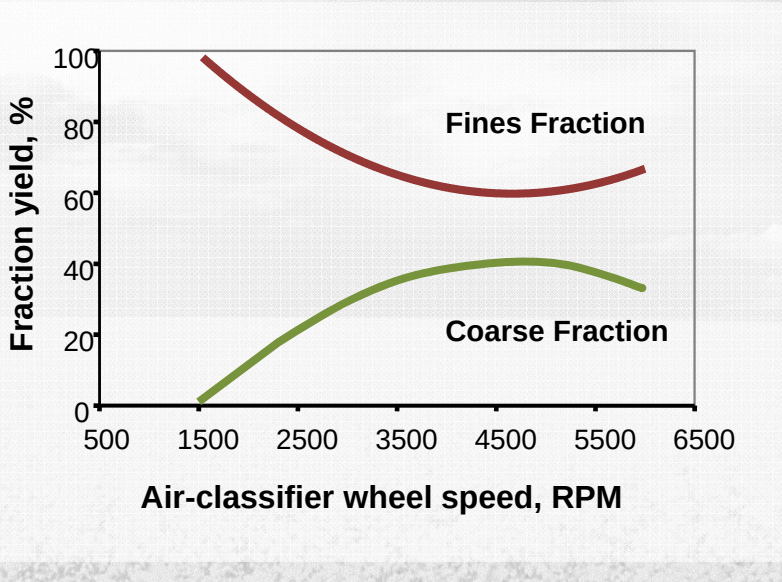
The ‘art’ of fractionation





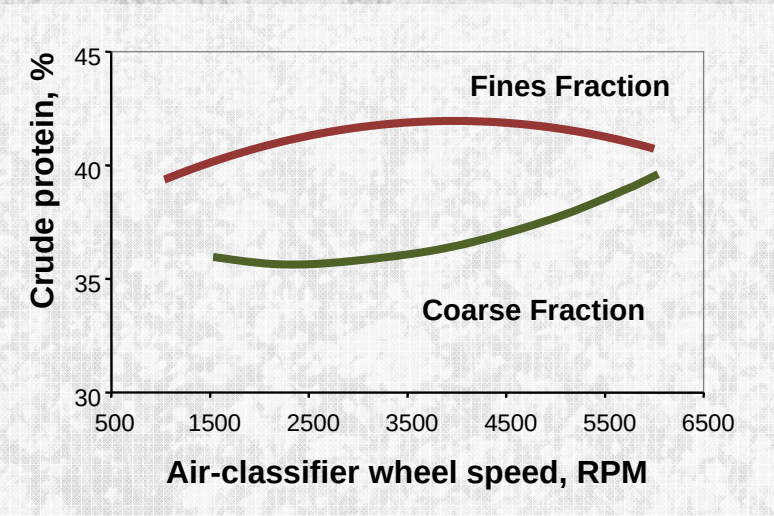


Table 4. Analyzed nutrient content of the parent stock canola meal compared to the AC fractions.

Nutrient	Conventional Canola Meal	ACCM 'Fines' fraction	ACCM 'Coarse' fraction
Crude Protein	37.92	38.77	36.52
Total Amino Acids	34.57	33.71	32.69
Crude Fat	4.76	4.28	3.23
Crude Fiber	7.24	0.40	2.04
Acid Detergent Fibre	15.49	15.85	21.31
Neutral Detergent Fibre	24.39	23.21	36.60
Calcium	1.33	0.83	1.27
Phosphorus	1.13	1.09	1.08
Lysine	2.15	2.08	2.03
TSAA	1.63	1.60	1.51

Table 5. ATTD of GE and AID of CP and AA in a sample of solvent-extracted canola meal and two fractions produced through air classification

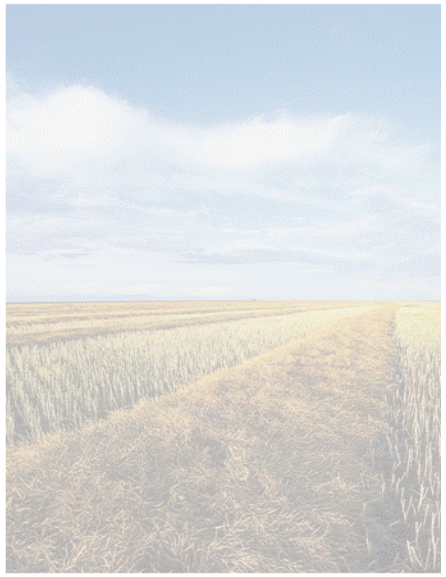
	Ingredient				*P*-value
	FPS CM	'Fines'	'Coarse'	SEM	Ingredient
Gross energy	76.87[a]	49.36[b]	48.84[b]	3.73	0.0004
Crude protein	101.42[a]	91.61[b]	96.33[ab]	2.18	0.0303
Total AA	92.56[a]	86.22[b]	89.66[ab]	1.47	0.0368
Lysine	88.66	85.89	87.35	1.47	0.4152
Methionine	98.34	92.53	95.48	1.58	0.0655
Total Sulfur AA	93.59[a]	85.33[b]	87.53[ab]	2.20	0.0487
Threonine	82.74[a]	74.41[b]	79.11[ab]	2.57	0.0813
Tryptophan	85.07	81.40	82.43	1.41	0.1899

Table 6. AME and ileal digestible CP and AA content in a sample of solvent-extracted canola meal and two fractions produced through air classification

	Ingredient				*P*-value
	FPS CM	'Fines'	'Coarse'	SEM	Ingredient
AME, kcal/kg	3133[a]	2046[b]	1999[b]	153	0.0004
Crude protein	38.46[a]	35.52[b]	35.18[b]	0.82	0.0345
Total AA	32.00[a]	29.07[b]	29.31[b]	0.49	0.0031
Lysine	1.91[a]	1.79[b]	1.78[b]	0.03	0.0172
Methionine	0.73[a]	0.68[b]	0.66[b]	0.01	0.0029
Total Sulfur AA	1.53[a]	1.37[b]	1.32[b]	0.04	0.0038
Threonine	1.31[a]	1.15[b]	1.17[b]	0.04	0.0174
Tryptophan	0.50[a]	0.45[b]	0.40[c]	0.01	<.0001

Nutrient Digestibility in Canola Meal for Broilers:

B. Napus vs. *B. juncea*



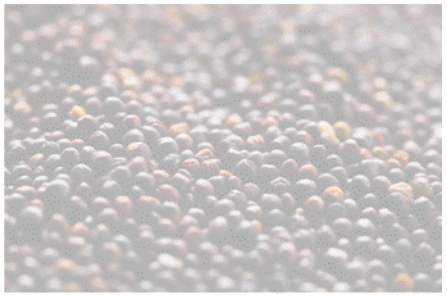


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Table 7. ATTD of GE and AID of CP and AA in *B. juncea* meal compared to *B. napus* meal for broilers.

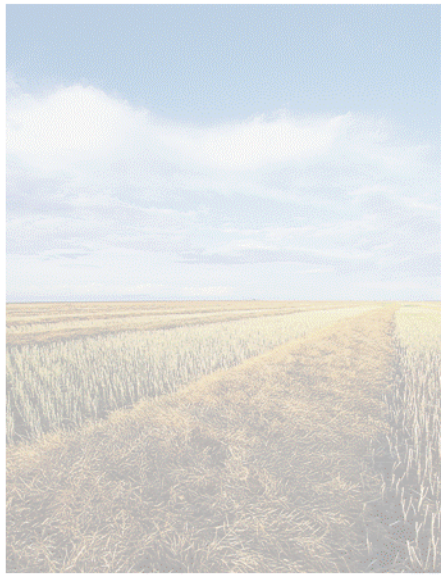
	Canola meal type			*P*-value
	B. juncea	*B. napus*	SEM	CM type
Gross energy	64.75	55.84	3.05	0.0586
Crude protein	76.95	72.40	1.58	0.0558
Total AA	79.89	78.19	1.83	0.4037
Lysine	75.90	77.46	1.79	0.4605
Methionine	85.94	86.51	1.61	0.7374
Total Sulfur AA	78.24	76.80	1.51	0.3670
Threonine	72.44	72.67	2.37	0.9028
Tryptophan	86.16	84.67	1.78	0.4366

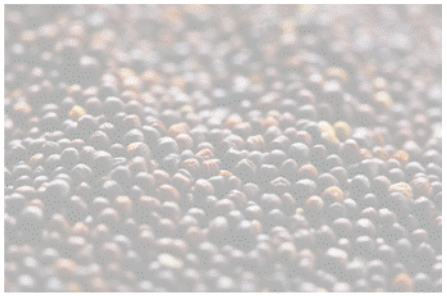
Table 8. AME and ileal digestible CP and AA content in *B. juncea* meal compared to *B. napus* meal for broilers (% of ingredient as-fed).

	Canola meal type			*P*-value
	B. juncea	*B. napus*	SEM	CM type
Gross energy	2944	2543	139	0.0603
Crude protein	29.73	28.37	0.61	0.1079
Total AA	26.77	27.23	0.62	0.5008
Lysine	1.52	1.56	0.04	0.3962
Methionine	0.65	0.64	0.01	0.4169
Total Sulfur AA	1.31[a]	1.21[b]	0.02	0.0102
Threonine	1.17	1.17	0.04	0.8966
Tryptophan	0.37	0.35	0.01	0.0527

Canola meal inclusion and broiler performance:

Effect of graded inclusion of B. Napus vs. *B. juncea meals*





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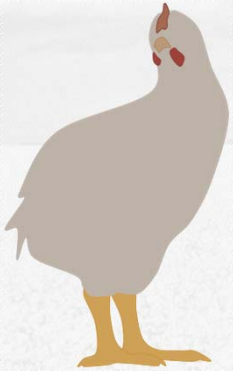
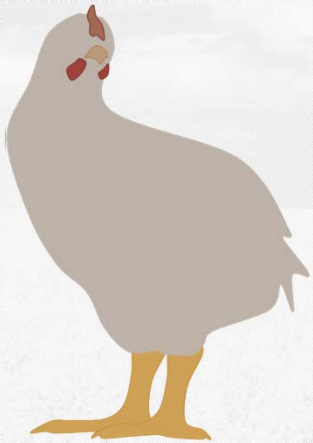
Our approach

Pens of mixed sex broilers
(44/pen)

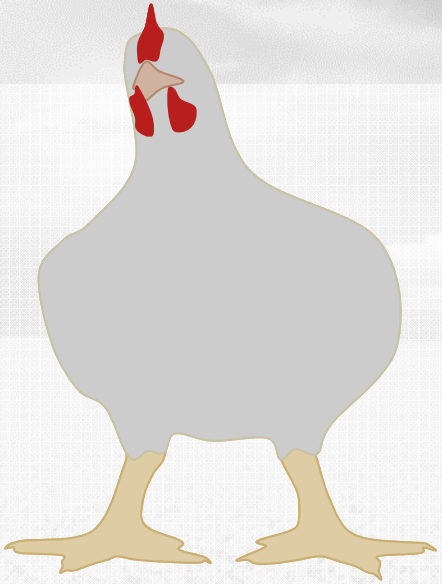
d0
Pen weight



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

Our approach (cont'd)

- **Dietary regimens consisted of phase-specific diets containing 0%, 10%, 20% or 30% of either B. napus or B. juncea**
  - **All diets were formulated to have similar levels of AME and digestible AA within phase**
  - **Target energy levels lower than recommended**

Table 9. Overall growth performance of mixed-sex broilers fed diets containing graded inclusion levels of *B. napus* or *B. juncea* meal (d0 - 35)

	Dietary inclusion level of CM, %							*P*-value
		B. napus			*B. juncea*			
	0%	10%	20%	30%	10%	20%	30%	Diet
Wt, d 35	2284	2236	2282	2269	2300	2312	2261	0.4865
ADG	61.9	60.7	62.0	61.7	62.5	62.9	61.4	0.7677
ADFI	106.8	107.1	106.7	107.3	107.5	107.9	108.4	0.9028
GF	0.614	0.607	0.625	0.616	0.621	0.614	0.606	0.7364

Table 10. Carcass wt and dressing % of mixed-sex broilers fed diets containing graded inclusion levels of *B. napus* or *B. juncea* meal

	Dietary inclusion level of CM, %							
		B. napus			*B. juncea*			*P*-value
	0%	10%	20%	30%	10%	20%	30%	Diet
AM Wt, g	2176	2209	2222	2155	2203	2123	2160	0.4903
Carcass Wt, g	1518	1511	1514	1502	1512	1504	1499	0.2617
Dressing, %	0.697	0.694	0.695	0.690	0.694	0.689	0.687	0.2259

Table 10. Yield of saleable carcass components from mixed-sex broilers fed diets containing graded inclusion levels of *B. napus* or *B. juncea* meal

	Dietary inclusion level of CM, %							*P*-value
		B. napus			*B. juncea*			
	0%	10%	20%	30%	10%	20%	30%	Diet
P. major	0.240^{b}	0.253^{a}	0.253^{a}	0.251^{a}	0.247^{ab}	0.254^{a}	0.254^{a}	0.0119
P. minor	0.050^{c}	0.053^{ab}	0.053^{ab}	0.054^{ab}	0.053^{ab}	0.052^{bc}	0.055^{a}	0.0066
Thighs	0.177	0.174	0.175	0.177	0.180	0.175	0.178	0.8588
Drumsticks	0.140	0.137	0.139	0.139	0.139	0.139	0.136	0.5934
Wings	0.110	0.110	0.110	0.115	0.110	0.112	0.113	0.8396
Total saleable	0.716^{b}	0.726^{ab}	0.729^{a}	0.736^{a}	0.730^{a}	0.733^{a}	0.737^{a}	0.0454

Table 11. Income over feed costs for mixed-sex broilers fed diets containing graded inclusion levels of *B. napus* or *B. juncea* meal

	Dietary inclusion level of CM, %							*P*-value
		B. napus			*B. juncea*			
	0%	10%	20%	30%	10%	20%	30%	Diet
$/bird placed	2.64^{abc}	2.58^{c}	2.63^{bc}	2.59^{c}	2.72^{ab}	2.74^{a}	2.59^{c}	0.0037
$/bird placed (quota-adjusted)	1.92^{bc}	1.86^{c}	1.90^{c}	1.87^{c}	1.98^{ab}	2.01^{a}	1.89^{c}	0.0009
$/ bird marketed	2.73^{bc}	2.66^{d}	2.74^{bc}	2.70^{cd}	2.80^{ab}	2.86^{a}	2.74^{bcd}	0.0001
$/ bird marketed (quota-adjusted)	1.98^{c}	1.92^{d}	1.98^{c}	1.96^{cd}	2.04^{ab}	2.09^{a}	2.00^{bc}	0.0001

So what have we learned...

1. **Oil extraction process has a large impact on digestible nutrient content of resulting meal**
   - **Importance of knowing origin of the CM**
   - **Could extruding meal improve digestibility???**
2. **Despite successfully separating CM into two fractions differing in crude fiber, no detectable improvement in digestible nutrient content**

So what have we learned...

3. **Does not appear to much difference in nutrient digestibility b/t *B. napus* and *B. juncea***
   - **GE / AME exception?**
4. ***B. napus* and *B. juncea* can both be included at up to 30% of broiler diets without adverse impact on performance**
   - **Opportunity for real cost savings, especially with *B. juncea***

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