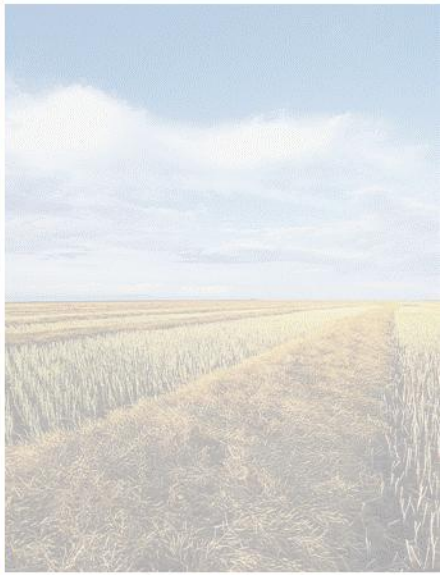
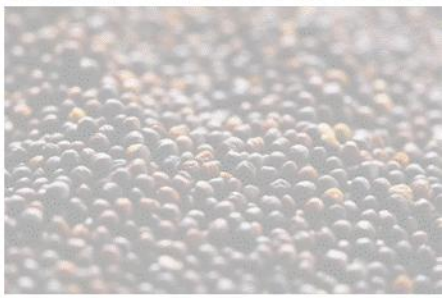
Canola meal inclusion and broiler performance:

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





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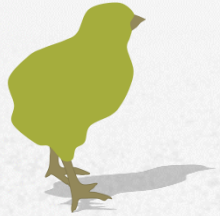
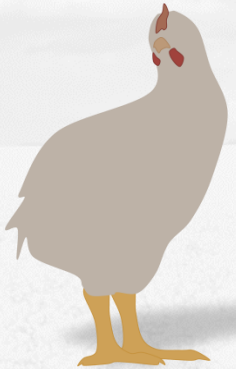
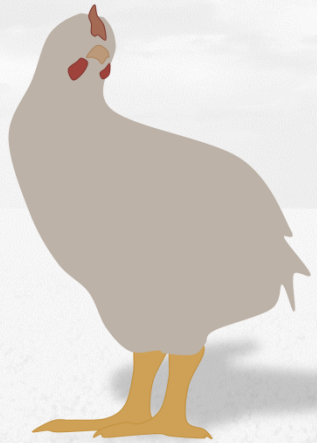
Agriculture and Rural Development

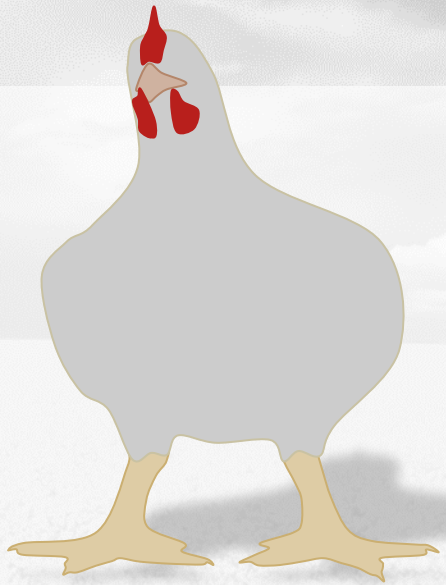
Our approach

Pens of mixed sex broilers
(44/pen)









d0	d11	d22	d35
Pen weight	Pen weight Feed disappearance	Pen weight Feed disappearance	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 1. 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 2. 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, %							*P*-value
		B. napus			*B. juncea*			
	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 3. 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 4. 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

Table 5. Whole body composition (% as-is) of 35-d-old mixed-sex broilers fed diets containing 10, 20 or 30% of solvent extracted *B. napus* or *B. juncea* meal compared to controls (0% canola meal)

		B. juncea			*B. napus*				*P* - values		
	Control	10%	20%	30%	10%	20%	30%	SEM	Treat	Sex	T x S
Moisture	71.81	72.58	73.47	73.95	73.30	72.76	74.02	0.69	0.248	0.172	0.591
Protein	16.46^{a}	14.55^{b}	14.36^{b}	14.91^{b}	15.31^{ab}	15.03^{b}	16.58^{a}	0.46	**0.003**	0.852	0.296
Nitrogen	2.63^{a}	2.33^{b}	2.30^{b}	2.39^{b}	2.45^{ab}	2.40^{b}	2.65^{a}	0.07	**0.003**	0.861	0.296
Ash	1.84	1.81	1.81	1.79	1.75	1.87	1.85	0.06	0.787	**0.004**	0.906
Phosp.	0.31	0.30	0.30	0.29	0.28	0.31	0.30	0.01	0.280	**0.010**	0.909
Fat	10.94^{a}	10.80^{a}	10.13^{ab}	9.74^{b}	10.65^{a}	10.44^{ab}	8.79^{c}	0.32	**0.001**	**0.001**	0.396

Table 6. Litter composition (as sampled) from mixed-sex broilers fed diets containing 10, 20 or 30% solvent extracted *B. napus* or *B. juncea* meal compared to controls (0% canola meal)

		B. juncea			*B. napus*				*P* - value
Litter parameter, %	Control	10%	20%	30%	10%	20%	30%	SEM	Diet
Moisture	36.75	37.96	39.65	39.79	37.59	38.80	39.75	1.50	0.705
Total N	2.20	2.28	2.39	2.44	2.16	2.28	2.49	0.08	0.125
Total P	0.95^{ab}	1.01^{a}	0.89^{b}	0.88^{b}	0.92^{b}	0.91^{b}	0.95^{ab}	0.02	**0.011**
NH_3-N, % of total N	5.15	5.84	4.48	4.42	4.26	4.70	4.14	0.73	0.670
NH_3-N, ppm	1046	1336	1095	1140	891	1037	1057	169	0.704

Table 7. Main effect of canola inclusion on litter composition (as sampled)

	Canola meal inclusion level, %					*P* –values[1]	
Litter parameter, %	0%	10%	20%	30%	SEM	Level	Linear
Moisture	36.85	37.59	39.20	39.71	1.29	0.258	0.057
Total N	2.21^{b}	2.24^{b}	2.35^{ab}	2.48^{a}	0.06	**0.022**	**0.002**
NH_3-N, % of total N	5.19	4.98	4.49	4.17	0.56	0.647	0.207
NH_3-N, ppm	1049	1098	1063	1101	133	0.990	0.878

Table 8. Phosphorus mass balance for pens of mixed-sex broilers fed diets containing 10, 20 or 30% of solvent extracted *B. napus* or *B. juncea* meal compared to controls (0% canola meal) for 35-d

		B. juncea			*B. napus*				
	Control	10%	20%	30%	10%	20%	30%	SEM	Treat
P intake, kg/eu[1]	1.221^{d}	1.284^{cd}	1.288^{c}	1.327^{bc}	1.301^{c}	1.381^{ab}	1.405^{a}	0.023	**0.001**
P in litter, kg/eu	0.810^{c}	0.959^{ab}	0.868^{bc}	0.918^{abc}	0.884^{bc}	0.899^{abc}	1.014^{a}	0.043	**0.034**
P retained in birds, kg/eu	0.286	0.283	0.282	0.257	0.259	0.288	0.278	0.010	0.081
P recovery, % of intake	89.88	96.71	89.31	88.45	88.00	86.02	91.75	3.07	0.190
P retention, % of intake	23.46^{a}	22.09^{ab}	21.87^{ab}	19.42^{c}	19.88^{c}	20.89^{bc}	19.66^{c}	0.63	**0.001**

Table 9. Nitrogen mass balance for pens of mixed-sex broilers fed diets containing 10, 20 or 30% of solvent extracted *B. napus* or *B. juncea* meal compared to controls (0% canola meal) for 35-d

		B. juncea			*B. napus*				
	Control	10%	20%	30%	10%	20%	30%	SEM	Treat
N intake, kg/eu	5.282^{c}	5.595^{b}	5.642^{b}	5.823^{b}	5.541^{b}	5.720^{b}	6.131^{a}	0.098	< **0.001**
N in litter, kg/eu	1.911^{d}	2.226^{bcd}	2.298^{bc}	2.492^{ab}	2.116^{cd}	2.245^{bc}	2.632^{a}	0.119	**0.014**
N retained in birds, kg/eu	2.442^{a}	2.177^{b}	2.106^{b}	2.098^{b}	2.279^{ab}	2.214^{b}	2.419^{a}	0.069	**0.003**
N recovery, % of intake	82.20	78.93	78.17	78.94	79.13	77.78	82.55	1.71	0.308
N retention, % of intake	46.04^{a}	39.07^{bc}	37.47^{cd}	36.03^{d}	40.94^{b}	38.63^{bcd}	39.67^{bc}	0.99	< **0.001**

Table 10. Estimated N emissions from pens of mixed-sex broilers fed diets containing 10, 20 or 30% of solvent extracted *B. napus* or *B. juncea* meal compared to controls (0% canola meal) for 35-d

		B. juncea			*B. napus*				
	Control	10%	20%	30%	10%	20%	30%	SEM	Treat
N emitted, kg	0.940	1.179	1.229	1.222	1.158	1.273	1.061	0.095	0.214
N emitted, kg NH_3	1.143	1.434	1.494	1.486	1.408	1.548	1.291	0.115	0.213
NH_3 emitted, g/kg live	11.9	14.7	15.6	16.1	14.7	16.1	13.7	1.3	0.225
NH_3 emitted, g/kg carcass	17.1	21.2	22.6	23.5	21.2	23.2	19.8	1.8	0.198
Adj. N emitted, kg	1.058	1.201	1.379	1.386	1.367	1.520	1.164	0.135	0.239
Adj. N emitted, kg NH_3	1.286	1.460	1.677	1.686	1.662	1.849	1.416	0.164	0.238
Adj. NH_3 emitted, g/kg live	13.4	15.0	17.5	18.3	17.4	19.3	15.0	1.8	0.240
Adj. NH_3 emitted, g/kg carcass	19.3	21.6	25.4	26.6	25.0	27.7	21.7	2.5	0.219
N volatilized, % N excreted	32.80	34.48	34.90	33.01	35.20	36.34	28.97	2.77	0.608

So what have we learned…

1. *B. napus* and *B. juncea* can both be included at up to 30% of broiler diets without adverse impact on performance
2. There was likely an AA response on breast yield and total saleable meat due to increasing dietary canola meal inclusions

So what have we learned…

3. However, feeding canola meal generally lowered whole body N, protein content, and N retention
4. As expected, nitrogen litter content increased with dietary canola inclusion level
5. Phosphorus retention as % of intake was highest in controls, but not different from broilers fed *B. juncea* at 10 and 20%

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