A comparison of *B. napus* and *B. juncea* meals and their air-classified fractions: Growth performance, carcass traits and measured AME in growing broilers

Matt Oryschak[1*] and Eduardo Beltranena[1,2]

[1]Alberta Agriculture and Rural Development, Edmonton, AB; [2]Department of Agriculture, Food and Nutritional Science, University of Alberta, Edmonton, AB

INTRODUCTION

While digestibility trials may yield statistically different energy and nutrient digestibility coefficients between test ingredients, these differences may not be of practical or functional significance. True differences in AME content can, however, be elucidated in a performance trial where diets are formulated in such a way to maximize the likelihood of a response. These differences can be further evidenced by looking at the impacts on dressing percentage and yield of carcass components.

We have previously compared nutrient digestibility between *B. juncea* (yellow-seeded with a thinner seed coat) and *B. napus* meals. We have also investigated the possibility of enhancing the digestible nutrient content of canola meal through air classification. Our investigations have suggested substantial differences in AME content among these different ingredients, although previous studies were not designed to look specifically at AME differences.

The objectives of this study were to:

1. Compare energy digestibility (AME) of *B. napus* and *B. juncea* meals and their air classified fractions between 14-d old and 28-d old broilers; and,
2. Detect differences in AME content of *B. napus* and *B. juncea* meals and their air classified fractions manifested as differences in growth performance, dressing percentage and or yield of carcass components of male broilers.

METHODS AND MATERIALS

Day-old male broilers (Ross x Ross 308; n=1056) were housed 22 per cage in a modified pullet battery for the duration of a 35-d growth and digestibility assay. Test cages were randomly assigned to one of 6 dietary regimens in a randomized complete block design, with 6 replicate cages per treatment.

Dietary regimens consisted of starter (d 8-14) and grower (d 15-35) phase diets consisted of 80% of a phase-specific concentrate and 20% of *B. napus* or *B. juncea* meals or their respective heavy or light air-classified fractions (**Table 1**). Test diets were formulated to ensure ratios of AID AA:AME were 115% of recommended, while AME density in diets was 90% of recommended. An AME value of 2.0 Mcal/kg was assumed for all test ingredients. Test diets included 0.1% titanium oxide as an indigestible marker.

Birds were weighed as pen groups on d 7, 14, 21, 28 and 35 to estimate average BW and ADG within each week and phase of the study. Feed consumption was determined for each pen in each phase to estimate ADFI in g/bird/d. On d 14 and 28, excreta were collected to permit calculation of AME in test diets within each phase.

On d 35, 30 birds from each treatment were slaughtered according to standard commercial practice. Chilled carcasses were weighed and then divided into carcass components, which were also weighed. Dressing percentage and proportional wt of carcass components were then calculated.

Normalized data were analyzed using the MIXED procedure of SAS (SAS Institute; Cary, NC). Statistical models included the fixed effects of canola species (*B. napus* vs. *B. juncea*), canola fraction (meal, light AC fraction, heavy AC fraction) and the 2-way interaction. Block was included as the random term.

Table 1. Chemical composition of test ingredients.

Ingredients	*B. napus* canola products			*B. juncea* canola products		
	Parent meal	Light AC fraction	Heavy AC fraction	Parent meal	Light AC fraction	Heavy AC fraction
Moisture	10.55	7.73	8.32	11.07	7.79	8.55
Crude Protein	39.21	41.92	37.33	38.39	40.99	37.2
Crude Fat	2.2	4.1	2.07	1.81	3.18	1.71
Crude Fiber	9.72	0.26	8.73	6.81	0.37	8.35
Indispensable AA's						
Lysine	1.95	2.36	2.05	1.93	2.11	1.81
Methionine	0.70	0.84	0.74	0.71	0.77	0.65
Threonine	1.43	1.72	1.54	1.54	1.68	1.46
Tryptophan	0.51	0.56	0.48	0.42	0.51	0.38

RESULTS

There was no interaction between canola species and fraction type for any growth performance, nutrient digestibility, growth efficiency or carcass trait variable.

Canola species generally had no effect on most variables measured in the present study. Diets containing *B. juncea* products resulted in greater G:F ($P < 0.02$) and a tendency toward higher ADG ($P < 0.07$) in the overall study (d 8 - 35), compared with diets containing *B. napus* (**Table 2**).

Table 2. Effect of canola species on overall performance variables and calculated ingredient AME at d 14 and 28.

	Canola species			
	B. juncea	*B. napus*	SEM	*P* - value
Growth performance (d 8 – 35)				
ADFI, g/bird/d	76.0	75.1	0.8	0.256
ADG, g/bird/d	95.6	98.9	1.2	0.070
Gain:Feed	0.798^{a}	0.760^{b}	0.01	0.015
Ingredient AME, kcal/kg as-fed				
Day 14	2675^{a}	2585^{b}	20	0.004
Day 28	2323^{a}	2208^{b}	32	0.018

Several differences were observed among fraction types and the parent meal (**Table 3**). While ADG did not differ among product type, ADFI and G:F were highest for the light fraction, followed by the heavy fraction and the parent stock meal ($P < 0.03$). Ingredient and test diet AME, measured in both phases of the study, confirmed previous measurements that AME content is highest in the light fraction, followed by the parent stock meal and the heavy fraction ($P < 0.01$).

The ranking of the respective fractions for ante-mortem wt on d 35 followed the same as that observed for AME content ($P < 0.01$). Numerically lower carcass weight ($P < 0.10$) and dressing percentage ($P < 0.12$) for birds fed meal and the light AC fraction, together with differences in breast muscle yield ($P < 0.03$), indicate that diets containing light AC fractions may have been limiting in digestible AA.

Table 3. Effect of canola fraction type on performance, AME and carcass traits of broilers raised to 35 d.

	Parent meal	AC fraction		SEM	*P* - value
		Heavy	Light		
Growth performance (d 8 – 35)					
ADFI, g/bird/d	73.4^{b}	75.9^{a}	77.3^{a}	0.9	0.002
ADG, g/bird/d	97.1	98.2	96.4	1.5	0.698
Gain:Feed	0.757^{b}	0.774^{ab}	0.807^{a}	0.013	0.029
Ingredient AME, kcal/kg as-fed					
Day 14	2588^{b}	2498^{c}	2805^{a}	24	0.001
Day 28	2202^{b}	2100^{b}	2495^{a}	39	0.001
Test diet AME, kcal/kg as-fed					
Starter phase (d 8 – 14)	3282^{b}	3197^{c}	3315^{a}	9	0.001
Grower phase (d 15 – 35)	3425^{b}	3355^{c}	3491^{a}	13	0.001
Carcass traits (d 35)					
Ante-mortem wt, g	2047.2^{b}	2114.7^{a}	2148.1^{a}	22.2	0.003
Carcass wt, g	1446.5	1455.1	1441.2	4.6	0.095
Dressing percentage, %	68.72	69.16	68.51	0.2	0.111
Total breast muscle, % of carcass	31.36^{a}	31.16^{a}	30.53^{b}	0.22	0.023

IMPLICATIONS

These data confirm that at moderately high dietary inclusion levels (20%), different formulation matrix AME values should be used for canola meal vs. air-classified heavy and light canola meal fractions.

Our data further suggest that the AME value for modern canola meal is a minimum of 10% higher than the NRC (1994) value of 2000 kcal/kg.

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UNIVERSITY OF ALBERTA
DEPARTMENT OF AGRICULTURAL, FOOD & NUTRITIONAL SCIENCE

Matt Oryschak
Research Associate - Monogastric Feeds
Alberta Agriculture and Rural Development

Tel: (780) 415-2220
e-mail: matt.oryschak@gov.ab.ca
Fax: (780) 427-1057

Alberta Agriculture and Rural Development