Evaluation of *Camelina sativa* meal as a feedstuff for layers: Effects of increasing dietary inclusion and layer strain on feed intake, egg production and egg characteristics

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INTRODUCTION

Camelina sativa (false flax) is an oilseed belonging to the *Brassica* family and is closely related to mustard, canola and rapeseed. There is growing interest in camelina production in the northern Great Plains as it has shown promise as a feedstock for bio-based aviation fuel production (e.g., Bio-SPK). In contrast to the U.S. where camelina meal is permitted in poultry rations (< 10%), camelina and its co-products from oil extraction do not currently have regulatory approval for use as feedstuffs in Canada.

Like other *Brassica* species, camelina is known to contain antinutritional compounds (e.g., glucosinolates, condensed tannins) that could adversely impact the health and productivity of poultry. In addition to safety/toxicity data, the efficacy of novel ingredients must be demonstrated in order to be listed as an approved feedstuff in Schedule IV of the Canadian *Feeds Act*.

The objective of this study was, therefore, to study the effect of increasing dietary inclusion of expeller-pressed camelina meal (CAM) on feed intake, egg production and egg characteristics. Dietary regimens were fed to white and brown strain hens for a 36-wk production cycle. This poster summarizes the results for the first 24 wk of the study.

METHODS AND MATERIALS

Hens (‘Brown Nick’, n=144; ‘Super Nick’, n=144; H & N International) housed in a 3-tiered, conventional layer battery (4 per cage; > 600 cm^2/bird) were randomly assigned to one of 6 dietary regimens at 23 wk of age. Dietary regimens consisted of complete layer diets containing 0, 5, 10, 15, 20 or 25% CAM for a 36-wk production cycle. Each treatment appeared twice in each block in a randomized complete block design with 6 replicates per treatment.

Test diets within production phase were formulated to contain similar levels of AME, crude protein and crude fat and exceeded requirements for all other nutrients as described in the production guide for these strains (**Table 1**).

For each test cage, egg production was recorded daily; average egg weight and egg mass production calculated weekly; and feed consumption and individual bird weight measured once every 4 wks. Egg characteristics were measured on a single day’s egg production from all cages during around peak egg production (~ wk 19 of study).

Data were analyzed using the MIXED procedure of SAS (v 9.1.3, SAS Institute; Cary, NC). Models included the fixed effects of dietary CAM inclusion (0, 5, 10, 15, 20 or 25%), layer strain (white or brown) and the 2-way interaction. Block (tier of battery) was the random term and linear contrasts were specified for CAM inclusion level.

RESULTS

There was no interaction between strain and dietary CAM inclusion level for any performance or egg characteristic variable measured.

Increasing CAM inclusion resulted in linear decreases in ADFI ($P < 0.05$) in the first 8 wk (Phase 1 & 2) of the study only, but not thereafter (**Figures 1a,b**). Feed efficiency was affected by dietary CAM inclusion linearly in phase 4 and 6 only ($P < 0.05$). Daily egg mass production declined linearly ($P < 0.05$) with increasing dietary CAM inclusion in nearly every wk of the study due to similar decline in average egg weight ($P < 0.05$; **Figures 1c,d**). Laying percentage was not affected by dietary CAM inclusion (**Figure 1e**).

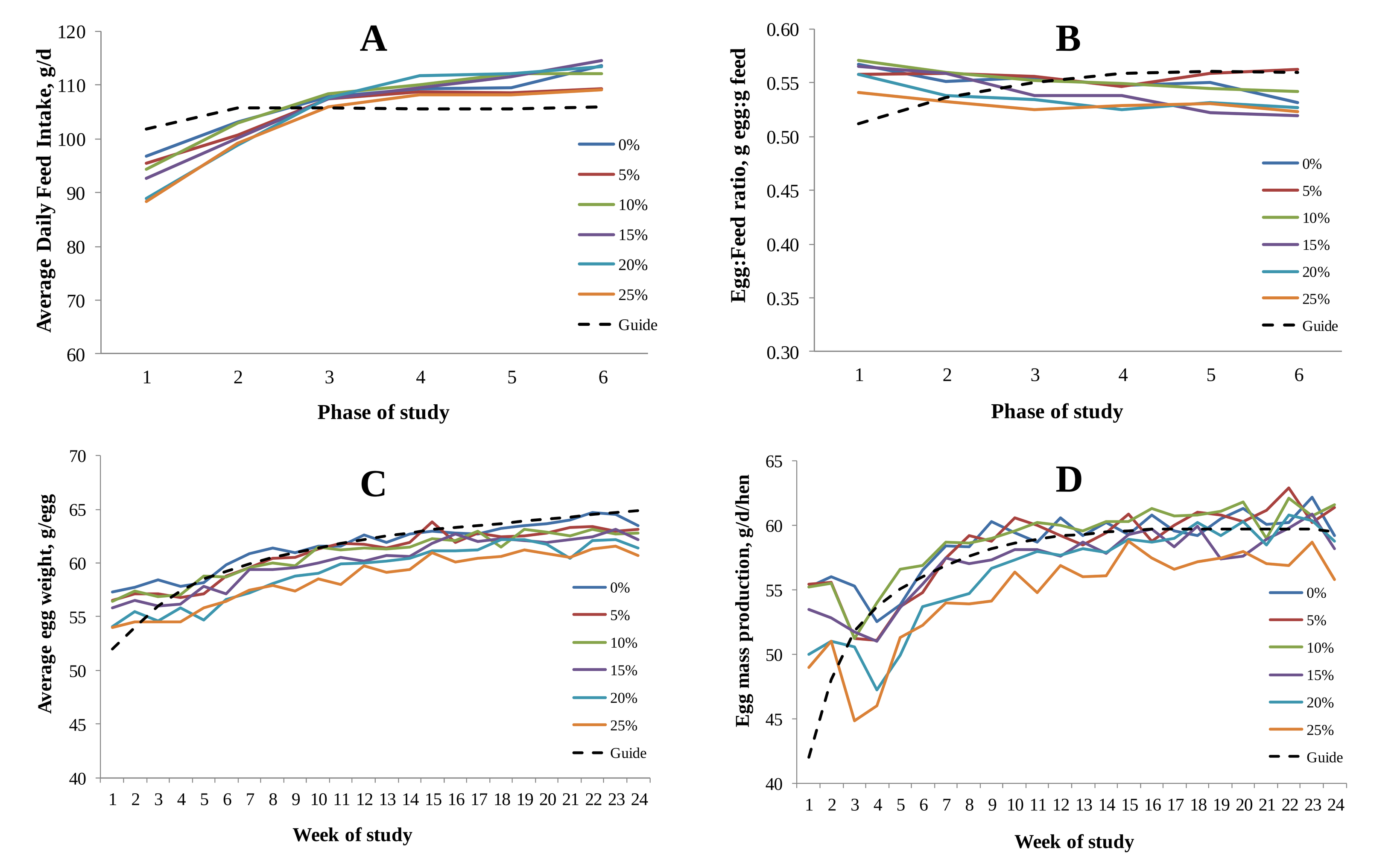
Specific gravity, albumen height and pH of yolk and albumen were not affected by increasing dietary CAM inclusion. Dietary CAM inclusion did not affect proportional wt (% of intact egg) of egg components (data not shown).

There was no difference between strains for ADFI and lay percentage. Average egg wt, feed efficiency (Egg:Feed) and egg mass production were all higher for brown compared to white hens ($P < 0.05$; data not shown), which was expected based on performance speficications for these strains.

Albumen height and pH were both higher in eggs from brown compared with white strain hens ($P < 0.01$, data not shown). Eggs from white hens had higher proportional wt of shell ($P < 0.01$) and yolk ($P < 0.01$), but a lower proportion of albumen ($P < 0.01$) versus eggs from brown layers (data not shown).

Table 1. Ingredient composition and calculated nutrients in phase 1 (wk 1 - 24) test diets (%).

	Expeller pressed camelina meal inclusion level, %					
Ingredient	**0%**	**5%**	**10%**	**15%**	**20%**	**25%**
Corn	0.00	5.00	10.00	15.00	20.00	25.00
Wheat	0.00	0.84	1.68	2.52	3.36	4.20
Barley	58.64	51.37	44.11	36.84	29.58	22.31
Soybean meal	12.99	11.07	9.15	7.24	5.32	3.40
Wheat DDGS	10.00	8.87	7.74	6.61	5.48	4.35
Camelina meal	**0.00**	**5.00**	**10.00**	**15.00**	**20.00**	**25.00**
Canola oil	6.70	6.24	5.79	5.33	4.88	4.42
Salt	0.05	0.07	0.09	0.10	0.12	0.14
Sodium bicarbonate	0.37	0.36	0.35	0.35	0.34	0.33
Limestone	9.28	9.25	9.23	9.20	9.17	9.14
Dicalcium phosphate	0.49	0.47	0.45	0.43	0.41	0.39
Lysine HCl	0.15	0.15	0.16	0.16	0.17	0.17
D,L - Methionine	0.18	0.16	0.15	0.13	0.12	0.10
Threonine	0.10	0.08	0.06	0.04	0.02	0.00
Vitamin premix	1.00	1.00	1.00	1.00	1.00	1.00
Enzyme	0.05	0.05	0.05	0.05	0.05	0.05
Nutrient						
AME, Mcal/kg	2.80	2.80	2.80	2.80	2.80	2.80
Crude protein	17.25	17.25	17.25	17.25	17.25	17.25
Crude fat	8.40	8.49	8.57	8.66	8.74	8.83



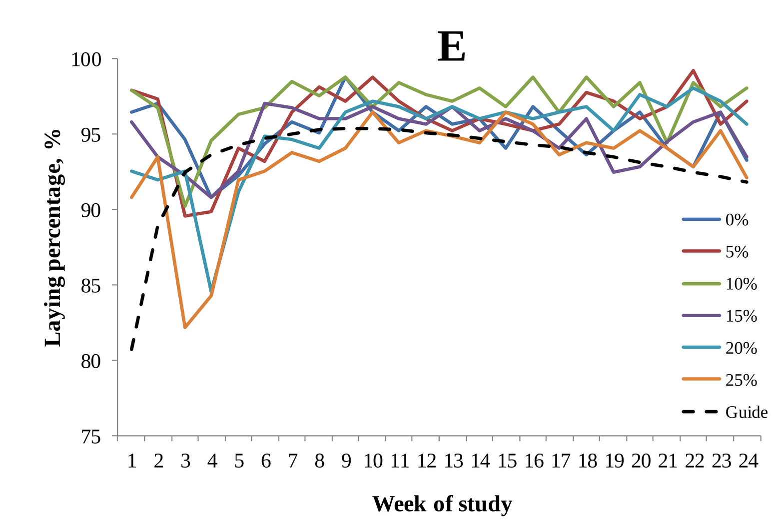


Figure 1. Effect of dietary inclusion of expeller-pressed camelina meal on **a)** average daily feed intake; **b)** feed efficiency (i.e., Egg:Feed); **c)** average egg weight; **d)** egg mass production; and **e)** laying percentage of laying hens. The dashed line in each figure represents expected performance based on the production guides for these strains (H & N International, 2011).

IMPLICATIONS

Dietary inclusion of up to 25% CAM did not adversely impact egg characteristics or egg production in laying hens. Feed consumption exceeded production guide targets for all treatments, suggesting that palatability and anti-nutritional factors in CAM are a minor concern.

Egg wt and egg mass production data from the present study indicate that further study of digestible nutrient content in CAM is required in order to optimize its use as a feedstuff for layers.

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