



# *Camelina sativa* meal as a feedstuff for laying hens: II. Effects on egg quality and egg fatty acid profiles

Matt Oryschak<sup>1</sup> and Eduardo Beltranena<sup>1,2</sup>

<sup>1</sup>Alberta Agriculture and Rural Development; <sup>2</sup>Department of Agricultural, Food and Nutritional Science - University of Alberta

## Background

*Camelina sativa* (a.k.a. false flax) is an oilseed (~37% oil) belonging to the *Brassica* family and is closely related to mustard, canola and rapeseed. There is recent interest as a food source of omega-3 (n-3) fatty acids, as well as for bio-diesel production.

The major obstacle to expansion of camelina production and use is that the meal and oil resulting from crushing are not registered in Schedule IV of the Canadian *Feeds Act* as a feedstuff for livestock or poultry. To obtain registration as a feedstuff, the SAFETY and EFFICACY of the product must first be demonstrated. Camelina is known to contain anti-nutritional compounds which could adversely impact the health and/or productivity of poultry. These include glucosinolates, erucic acid, sinapine and condensed tannins.

The objective of the present study therefore was to determine the effect of increasing dietary inclusion of expeller-pressed *Camelina sativa* meal on performance, egg quality, egg fatty acid profiles and signs of toxicity.

This poster reports the results relating to egg quality, egg fatty acid profiles and component weights from this study.

## Our approach

In a 36-week experiment, 288 laying hens housed 4 to a test cage (668 cm<sup>2</sup>/hen) in a commercial battery were assigned to one of 6 dietary regimens. Dietary regimens consisted of complete diets containing 0, 5, 10, 15, 20 or 25% expeller-pressed camelina meal. Diets within each layer phase were formulated to contain the same level of dietary energy (AME) and similar levels of digestible amino acids, crude protein and crude fat across all treatments.

Eggs were collected during week 17 of the study and pooled by test cage to produce a single specimen of homogenized whole egg fatty acid profiling for each test cage. Objective measures of egg quality (specific gravity, albumen height, etc.) were based on a minimum of 3 eggs per test cage laid on a single day during week 13 of the study. Weight of egg components (shell, albumen, yolk) were determined on a minimum of 3 eggs per test cage collected during week 25 of the study.

## What we observed

There was no difference among treatments for specific gravity, albumen height, albumen pH or yolk pH (data not shown).

In contrast, there were linear shifts in the fatty acid profile of eggs as dietary camelina meal inclusion increased (Table 1). Specifically, there were linear reductions in the proportions of both saturated and monounsaturated fatty acids, which was accompanied by a linear increase in the proportion of polyunsaturated fatty acids. There were also linear increases in the proportion of both total and long-chain

omega-3 fatty acids with increasing dietary camelina meal inclusion.

Although there was a linear reduction in yolk weight, (the proportionate weight of egg components did not differ among treatments).

**Table 1.** Effect of dietary expeller-pressed camelina meal inclusion level on fatty acid profiles of whole egg and weight of egg components.

|  | Expeller-pressed camelina meal inclusion, % |                     |                     |                    |                     |                     |
|--|---|---------------------|---------------------|--------------------|---------------------|---------------------|
|  | 0%  | 5%                  | 10%                 | 15%                | 20%                 | 25%                 |
| <b>Fatty acid profiles, % of total</b> |   |                     |                     |                    |                     |                     |
| Saturated                              | 25.72 <sup>a</sup>                          | 25.49 <sup>a</sup>  | 25.00 <sup>ab</sup> | 23.99 <sup>c</sup> | 24.11 <sup>bc</sup> | 24.55 <sup>bc</sup> |
| Monounsaturated                        | 44.75 <sup>a</sup>                          | 43.47 <sup>ab</sup> | 42.93 <sup>bc</sup> | 41.66 <sup>c</sup> | 41.66 <sup>c</sup>  | 42.13 <sup>bc</sup> |
| Polyunsaturated                        | 15.33 <sup>c</sup>                          | 15.47 <sup>c</sup>  | 15.75 <sup>c</sup>  | 15.70 <sup>c</sup> | 16.54 <sup>b</sup>  | 17.47 <sup>a</sup>  |
| C18:3 (n-3)                            | 1.17 <sup>f</sup>                           | 1.40 <sup>e</sup>   | 1.60 <sup>d</sup>   | 1.75 <sup>c</sup>  | 2.10 <sup>b</sup>   | 2.43 <sup>a</sup>   |
| C20:5 (n-3)                            | 0.01 <sup>c</sup>                           | 0.03 <sup>bc</sup>  | 0.03 <sup>ab</sup>  | 0.03 <sup>ab</sup> | 0.04 <sup>a</sup>   | 0.04 <sup>a</sup>   |
| C22:5 (n-3)                            | 0.14 <sup>c</sup>                           | 0.16 <sup>bc</sup>  | 0.18 <sup>a</sup>   | 0.18 <sup>a</sup>  | 0.17 <sup>ab</sup>  | 0.18 <sup>a</sup>   |
| C22:6 (n-3)                            | 1.44  | 1.45                | 1.50                | 1.50               | 1.51                | 1.53                |
| Total n-3                              | 2.82 <sup>e</sup>                           | 3.10 <sup>d</sup>   | 3.38 <sup>c</sup>   | 3.54 <sup>c</sup>  | 3.93 <sup>b</sup>   | 4.33 <sup>a</sup>   |
| Total LC n-3                           | 1.65 <sup>c</sup>                           | 1.70 <sup>bc</sup>  | 1.78 <sup>ab</sup>  | 1.79 <sup>ab</sup> | 1.80 <sup>ab</sup>  | 1.84 <sup>a</sup>   |
| n-6:n-3                                | 3.91 <sup>a</sup>                           | 3.45 <sup>b</sup>   | 3.12 <sup>c</sup>   | 2.86 <sup>d</sup>  | 2.70 <sup>e</sup>   | 2.61 <sup>e</sup>   |
| <b>Egg component weights</b>           |   |                     |                     |                    |                     |                     |
| Weight, g                              |   |                     |                     |                    |                     |                     |
| Intact egg                             | 64.8 <sup>a</sup>                           | 63.0 <sup>ab</sup>  | 63.1 <sup>ab</sup>  | 62.0 <sup>bc</sup> | 62.0 <sup>bc</sup>  | 61.0 <sup>c</sup>   |
| Albumen                                | 38.4  | 37.5                | 37.5                | 36.9               | 36.9                | 36.7                |
| Shell                                  | 8.8   | 8.6                 | 8.8                 | 8.7                | 8.5                 | 8.4                 |
| Yolk                                   | 17.5 <sup>a</sup>                           | 17.0 <sup>ab</sup>  | 16.8 <sup>b</sup>   | 16.4 <sup>bc</sup> | 16.6 <sup>bc</sup>  | 15.9 <sup>c</sup>   |
| Weight, % of egg                       |   |                     |                     |                    |                     |                     |
| Shell                                  | 13.66                                       | 13.65               | 13.99               | 14.01              | 13.80               | 13.84               |
| Albumen                                | 59.28                                       | 59.37               | 59.32               | 59.48              | 60.03               | 60.04               |
| Yolk                                   | 26.98                                       | 26.99               | 26.63               | 26.47              | 26.18               | 26.17               |

Different superscripts denote statistically significant differences between (P < 0.05) means.

## Implications

These data suggest that high dietary inclusion (25%) of expeller-pressed camelina meal does not adversely affect egg quality and can actually enhance fatty acid profiles in eggs.

Linear reductions in egg weight with increasing dietary inclusions of camelina meal suggest that further refinements to digestible nutrient estimates in this ingredient are needed to optimize use in layer diets.

## Contact information

For more information about this project, please contact:

**Dr. Eduardo Beltranena**

Alberta Agriculture and Rural Development

e-mail: [eduardo.beltranena@gov.ab.ca](mailto:eduardo.beltranena@gov.ab.ca)

Tel: (780) 427-4567

