



Increasing inclusions of faba bean in laying hen diets: Effects on productivity, egg quality and carbon intensity

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Summary

The present study demonstrated that faba bean can be included at up to 24% with minimal impact on productivity or egg quality.

The Problem

Pulses, such as faba bean, have several advantages as a feedstuff for Western Canadian poultry producers. The advantages include high digestible nutrient content, local availability and substantially lower carbon footprint compared with other local feedstuffs.

Anecdotal reports indicate that faba bean is already being fed successfully to poultry in Western Canada. There is, however, limited empirical data to support expanded use of faba bean, in particular in relation to potential biological (as opposed to practical) limits to dietary inclusion.

Our Approach

A standard Alberta layer ration was formulated based on the survey data collected by Alberta Agriculture. Test diets were then formulated to contain 8, 16 or 24% faba bean and to meet recommended energy density and digestible AA levels based on the Lohmann LSL-Lite management guide (Table 1).

Table 1. Ingredient composition, target nutrient density, cost and carbon intensity of test diets.

Item	Inclusion level of faba bean, %			
	0%	8%	16%	24%
Wheat	59.88	56.66	53.45	50.23
Faba bean	-	8.00	16.00	24.00
Canola meal	14.90	11.85	8.81	5.76
Soybean meal	6.03	4.29	2.54	0.80
Canola oil	5.38	5.31	5.23	5.16
Limestone	11.17	11.27	11.36	11.46
Dicalcium phosphate	0.93	0.90	0.86	0.83
Choline premix	0.50	0.50	0.50	0.50
Layer premix	0.50	0.50	0.50	0.50
Salt	0.40	0.40	0.40	0.40
L-Lysine	0.09	0.06	0.03	-
D,L-methionine	0.12	0.16	0.20	0.24
L-threonine	0.05	0.06	0.07	0.08
CBS Superzyme plus	0.05	0.05	0.05	0.05
AME, Mcal/kg	2.80	2.80	2.80	2.80
Calcium, %	4.70	4.70	4.70	4.70
Available phosphorus, %	0.43	0.43	0.43	0.43
AID Lysine, %	0.73	0.73	0.73	0.73
Cost, \$CAD/Tonne	303.34	298.25	293.17	288.08
Carbon intensity, kg CO ₂ eq/T	609.19	589.32	569.45	549.58

Ingredient prices used to formulate diets were reflective of those in Central AB at the time of the study. Carbon intensity estimates for ingredients were derived from the ECOALIM database and relevant literature.

Test diets were fed beginning at 40 wks of age to hens (n=128; Lohmann LSL-Lite) housed in conventional battery cages for a 16-week experiment.

Our Observations

Increasing dietary inclusion of faba bean in laying hen diets did not affect feed disappearance, but inclusion above 8% slightly reduced lay percentage, average egg weight and consequently daily egg mass production (Table 2).

Table 2. Effect of increasing dietary inclusion of faba bean in laying hen diets on hen productivity, egg attributes, economic indicators and feed attributable carbon intensity of egg production.

	Inclusion level of faba bean, %				P-values Level
	0%	8%	16%	24%	
Hen productivity					
Feed disappearance, g/hen•day	114.3	115.1	113.3	112.3	0.297
Body weight (55 wks of age), g	1946	1884	1939	1890	0.355
Lay percentage, eggs/100 hen•days	95.20 ^{ab}	96.29 ^a	94.26 ^{bc}	93.37 ^c	< 0.001
Egg mass production, g/hen•day	58.90 ^a	59.27 ^a	56.99 ^b	54.68 ^c	< 0.001
Egg:feed ratio	0.510 ^a	0.512 ^a	0.505 ^{ab}	0.492 ^b	0.054
Egg attributes					
Average egg weight, g	62.10 ^a	61.54 ^b	60.43 ^c	58.56 ^d	< 0.001
Egg shell thickness, mm	0.464	0.473	0.471	0.457	0.075
Specific gravity	1.085 ^b	1.086 ^a	1.087 ^a	1.086 ^{ab}	0.020
Albumen height, mm	7.4	7.7	7.4	7.5	0.560
Haugh units, HU	85.3 ^b	88.1 ^a	88.1 ^a	89.0 ^a	< 0.001
Albumen, % of egg weight	55.54 ^a	55.56 ^a	54.93 ^{ab}	54.70 ^b	0.030
Shell, % of egg weight	14.15 ^b	14.44 ^a	14.47 ^a	14.62 ^a	0.011
Yolk, % of egg weight	30.29	29.97	30.43	30.65	0.181
Economic indicators					
Feed cost, ¢/hen•day	3.47 ^a	3.43 ^a	3.32 ^b	3.23 ^b	< 0.001
Income, ¢/hen•day	16.57 ^b	16.91 ^a	16.45 ^b	16.03 ^c	< 0.001
Income over feed cost, ¢/hen•day	13.20 ^b	13.50 ^a	13.10 ^b	12.80 ^c	< 0.001
Feed-attributable carbon intensity					
g CO ₂ eq/kg egg mass produced	1197 ^a	1150 ^b	1134 ^b	1123 ^b	< 0.001
kg CO ₂ eq/30 doz large eggs	24.99 ^a	24.02 ^b	23.67 ^b	23.45 ^b	< 0.001

^{abcd} Different superscripts within rows denote statistically different (P<0.05) least-squares means based on 8 experimental units (cage of 4 hens) per treatment.

Increasing dietary inclusion of faba bean reduced feed cost, however income over feed costs was optimal at 8% dietary inclusion. Feed attributable carbon intensity of egg production was reduced by approximately 1.5% with each 8% increment increase in dietary inclusion of faba bean.

What This Means

Faba bean is a high quality feedstuff for laying hens with the potential to reduce feed cost and the carbon intensity of egg production.

More information is needed regarding digestible amino acid levels (in particular digestible TSAA) in faba bean in order to maintain optimal egg size at high dietary inclusions.

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