Canola meal as a valuable source of protein for broiler chickens

Anna Rogiewicz, Samuel A. Ariyibi and Bogdan A. Slominski

Department of Animal Science, University of Manitoba, Winnipeg, Canada

IRC | 2019 | Berlin
INTERNATIONAL RAPESEED CONGRESS

Introduction

Pre-press solvent extracted canola meal (CM) is a commonly used source of protein for poultry. Protein with a well-balanced AA composition is the most valuable nutrient of CM. The high nutritive quality CM can be realized by optimized processing conditions and using the appropriate temperatures in the desolventizer-toaster to minimize protein damage and the formation of the lignin-like Maillard reaction products. The dietary inclusion level of CM for broilers has been historically limited to 5-10%. However, it could be used at higher inclusion levels when diets are formulated based on standardised ileal digestible (SID) AA contents.

An experiment was carried out to determine SID of AA values for CM sourced from 13 canola processing facilities across Canada. The second study was conducted to determine the effect of varying inclusion levels of CM on the growth performance of broiler chickens.

Materials and Methods

Samples of CM were collected from 13 Canadian crushing plants were used to determine the SID of AA in broiler chickens. One-day-old chicks were fed a pre-experimental starter diet from 1 to 14 d of age followed by the test diets from 15 to 21d. Test diets were formulated to contain 22% of CP with CM as a sole source of CP. On day 21, birds were euthanized and the ileal digesta samples were collected and freeze-dried. Diets and ileal digesta samples were analyzed for AA and chromic oxide (internal marker) contents which were used for SID of AA calculation.

The growth performance study had four phases; pre-starter, starter, grower 1 and grower 2, each lasting for one week. One-day-old broiler chickens (housed 5 birds/cage) were allotted into the six treatment groups with 10 replicates per treatment. A corn/soybean meal-based diet was used as a control to compare diets with graded levels of CM for all phases of the experiment. Diets were formulated based on the breeder recommendation to meet the nutrient requirement of chickens. They were balanced for SID AA and the metabolizable energy contents. Body weight gain (BWG) and feed intake (FI) were monitored weekly and feed conversion ratio (FCR) was calculated.

Composition of experimental diets,%

	Pre-starter (1-7 days) 23.0% CP, 2950 kcal/kg ME, 1.0% Ca, 0.48% av. P						Starter (7-14 days) 22.0% CP, 3000 kcal/kg ME, 1.0% Ca, 0.45% av. P					
Ingredient (%)	**1**	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
Corn	44.15	43.96	43.40	43.00	42.25	41.31	48.00	47.72	47.00	46.55	46.50	46.00
Soybean meal	35.10	32.92	31.00	28.63	26.50	24.50	33.00	29.72	26.84	23.85	22.55	19.55
Canola meal	**0.00**	**3.00**	**6.00**	**9.00**	**12.00**	**15.00**	**0.00**	**4.00**	**8.00**	**12.00**	**14.00**	**18.00**
Vegetable oil	1.18	2.21	2.75	3.05	3.48	3.97	2.25	2.68	3.26	3.73	4.07	4.62
Other ingredients	19.57	17.91	16.85	16.32	15.77	15.22	16.75	15.88	14.90	13.87	12.93	11.83

	Grower 1 (14-21 days) 21.0% CP, 3100 kcal/kg ME, 0.9% Ca, 0.44% av. P						Grower 2 (21-28 days) 20.0% CP, 3150 kcal/kg ME, 0.85% Ca, 0.40% av. P					
Ingredient (%)	**1**	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
Corn	53.00	52.32	51.00	50.20	49.50	48.80	59.20	57.66	56.10	54.65	53.00	52.00
Soybean meal	28.53	24.45	21.00	17.12	13.00	9.10	26.00	21.30	16.52	12.10	8.00	3.20
Canola meal	**0.00**	**5.00**	**10.00**	**15.00**	**20.00**	**25.00**	**0.00**	**6.00**	**12.00**	**18.00**	**24.00**	**30.00**
Vegetable oil	2.84	3.40	4.16	4.83	5.46	5.96	3.30	3.77	4.53	5.38	6.25	7.01
Other ingredients	15.63	14.83	13.84	12.85	12.04	10.78	11.50	11.27	10.85	9.87	8.75	7.79

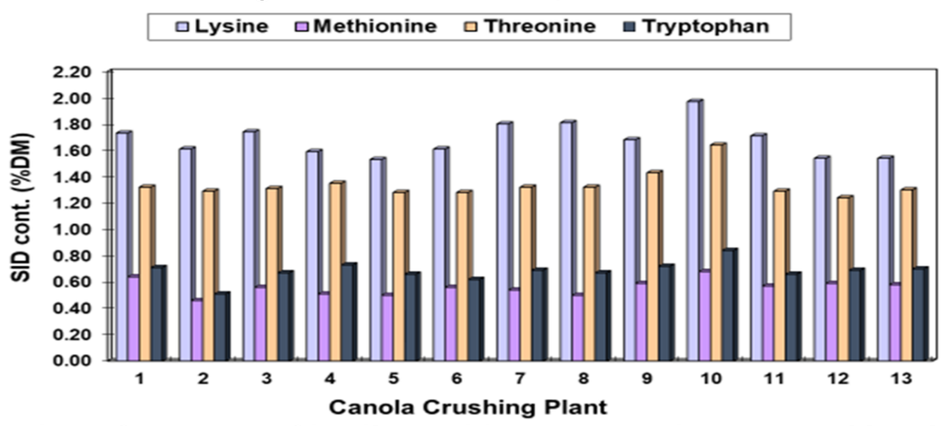
Results

Standardized Ileal Digestibility of selected AA from 13 crushing plants, %

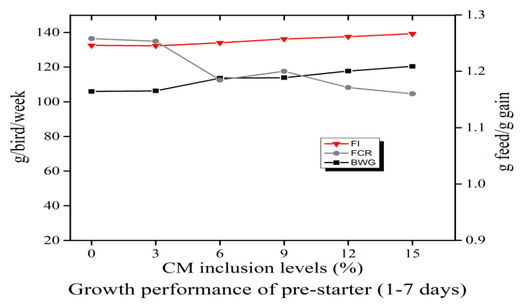
Plant	LYS	MET	THR	ARG	CYS	TRP
1	81.5^{abc}	90.7	77.3^{bcd}	87.2^{bcde}	79.1	86.4^{bc}
2	77.0^{cde}	88.7	74.2^{bcd}	85.7^{cde}	78.0	85.0^{bc}
3	81.4^{abc}	87.4	77.5^{bcd}	87.6^{bcd}	77.2	85.0^{bc}
4	76.6^{cde}	88.0	77.3^{bcd}	86.2^{bcde}	76.6	85.5^{bc}
5	76.0^{de}	88.7	76.0^{bcd}	83.78^{e}	74.9	83.5^{cd}
6	80.3^{bcd}	90.1	78.7^{bcd}	88.3^{bcd}	80.0	84.7^{bc}
7	83.9^{ab}	91.8	79.8^{abcd}	89.5^{ab}	80.0	86.5^{bc}
8	83.0^{ab}	90.6	80.3^{abc}	89.1^{abc}	78.3	86.8^{bc}
9	81.8^{abc}	90.3	81.7^{ab}	89.0^{abc}	76.8	89.2^{ab}
10	86.3^{a}	90.5	87.3^{a}	92.0^{a}	80.0	94.5^{a}
11	77.8^{cde}	88.1	71.6^{d}	86.0^{cde}	75.9	76.7^{e}
12	75.6^{de}	88.9	72.0^{d}	85.5^{de}	75.9	79.0^{de}
13	74.2^{e}	87.4	73.4^{cd}	84.1^{e}	74.1	82.2^{cd}

There were variations in SID of AA values of CM from different processing plants except Met and Cys. Lys being the first limiting AA was the most variable followed by Trp and Thr. The variations could be due to differences in temperature applied during the meal desolventizing/toasting.

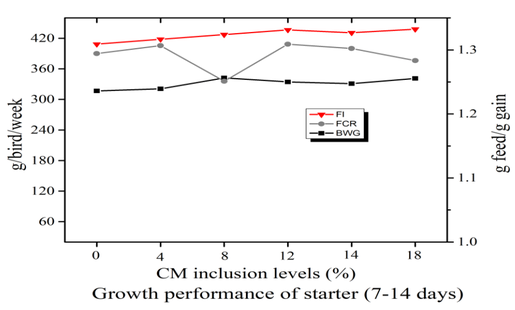
Standardized Ileal digestible AA content, % DM



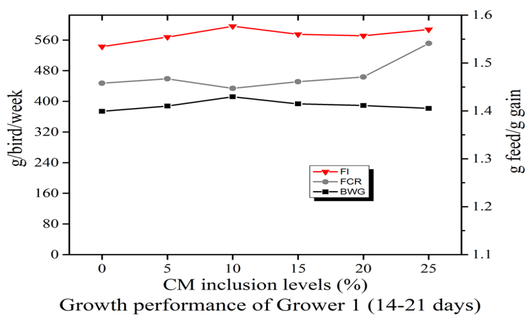
Growth performance of broilers with respect to incremental levels of CM inclusion



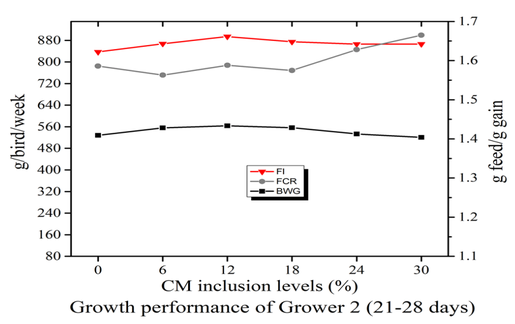
Growth performance of pre-starter (1-7 days)



Growth performance of starter (7-14 days)



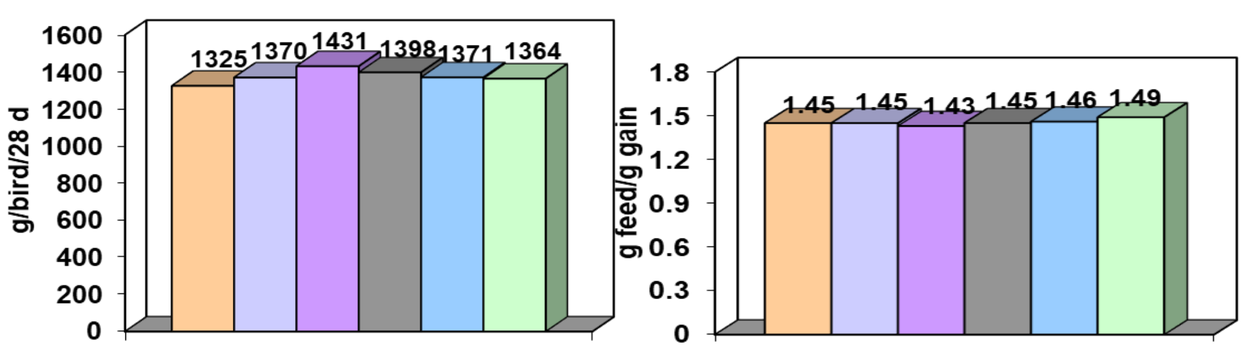
Growth performance of Grower 1 (14-21 days)



Growth performance of Grower 2 (21-28 days)

Increasing levels of CM substantially increased NDF content of diet but no significant effect (P>0.05) was seen on growth performance when compared to the control diet.

Effect of incremental levels of CM in broiler diets on growth performance parameters (1-28 days)



Irrespective of the phase and CM inclusion levels, FI, BWG, and FCR averaged 2,019 g/bird/28 d, 1,387 g/bird/28 d, and 1.46 g feed/g gain, respectively, which were similar to that of the control treatment.

Conclusion

It could be concluded that CM can effectively replace SBM when used up to 30% in broiler chicken diets, and that CM fiber has minimal effect on nutrient utilization.

Acknowledgements

Agriculture and Agri-Food Canada

canolacouncil OF CANADA