NUTRITIVE VALUE OF DEHULLED CANOLA MEAL

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ABSTRACT

The chemical composition, energy and amino acid bioavailability and growth performance of broiler chickens and laying hens was determined for dehulled canola meal and compared with conventional commercial canola meal. The comparisons were made for both brown- and yellow-seeded types of canola. Dehulling increased protein and available energy content and decreased total dietary fiber content while having no influence on total available amino acid content. The improved nutrient content of dehulled canola meal (increased total protein and available energy) was reflected in performance data of broiler chicks and to a lesser extent of laying hens fed canola meal diets formulated from the determined available nutrient data.

INTRODUCTION

Canola meal contains a relatively high amount of fiber due to the high content (30%) of hull in the meal (Bell and Shires, 1982). Attempts have been made to improve the nutritional value of the meal by increasing the digestibility of the hull and/or reducing the hull proportion of the meal. Hulls from yellow-seeded rapeseed have been reported to be lower in fiber than those from brown-seeded types (Stringam et al., 1974), and plant selection programs have been directed toward increased yellow seed content to decrease the fiber content. In this regard, studies were conducted to determine the nutritive characteristics and feeding value of dehulled brown- and yellow-seeded canola in comparison with conventional meals.

EXPERIMENTAL

Chemical composition and nutrient availability.

Canola meals prepared from brown- and yellow-seeded commercial (non-dehulled) and dehulled samples were subjected to chemical analyses using standard analytical techniques and available energy (TME_n) and amino acids (TAAA) were determined using the rooster assay technique (Zhang et al., 1994). Results of the chemical analyses and the bioavailability determinations are shown in Table 1.

The samples of brown-seeded canola meal used in this study tended to be higher in protein than the yellow-seeded meal and for both types of meal dehulling significantly increased the total protein content. Similarly, total dietary fiber tended to be higher for the brown-seeded meal and was significantly reduced in the dehulled meals relative to the commercial meals. The total glucosinolate content was elevated in the dehulled yellow-seeded meal relative to the commercial type but this effect was reversed for the

brown-seeded meal which might indicate that the dehulled sample of this latter type was overheated during processing. Dehulling significantly improved the available energy content of the canola meals but all samples showed similar available amino acid values.

Table 1. Chemical composition (dry matter basis) and nutrient bioavailability of brown- and yellow-seeded commercial and dehulled canola meals.[1]

Item	CBM	DBM	CYM	DYM
Protein, %	40.48^{c}	46.13^{a}	39.40^{c}	44.26^{b}
Total dietary fiber[2], %	36.11^{a}	30.40^{bc}	33.21^{ab}	27.97^{c}
Total glucosinolates, μmoles/g	13.1	8.1	16.8	21.3
True metabolizable energy, MJ/kg	9.71^{b}	10.79^{a}	9.57^{b}	10.49^{a}
True available amino acids, %	89.23	89.28	87.03	89.06

[1]CBM = Commercial brown-seeded canola meal, cv. Westar; DBM = Dehulled brown-seeded canola meal, cv. Westar; CYM = Commercial yellow-seeded canola meal, cv. Parkland; DYM = Dehulled yellow-seeded canola meal, cv. Parkland. [2]Includes the sum of non-starch polysaccharides, lignin with associated polyphenols and cell wall protein and minerals.^{abc} Means with different superscript letters within a row are significantly different ($P<0.05$).

Perfromance evaluations with broiler chickens

Six replicates of 60 birds per replicate pen for each sex were fed wheat-based diets containing 10% canola meal for a 42-day experimental period. Diet formulations were adjusted to be isocaloric and isonitrogenous based on the available energy and amino acid data determined for each canola meal. Growth performance data is given in Table 2. No differences were evident for feed intake, weight gain or feed conversion for either males or females and there was no interaction between sex. These data coorborate the nutrient availability data. A similar response was obtained for a 2-week growth trial involving dehulled brown-seeded canola meal as well as the yellow-seeded meal (data not shown).

Table 2. Six-week growth performance of broiler chickens fed a wheat-based diet containing 10% canola meal of various types

Parameter	Diet[1]/Sex					
	CBM		CYM		DYM	
	Male	Female	Male	Female	Male	Female
Feed intake, g	4613	4303	4552	4174	4542	4290
	±107	±110	±75	±78	±191	±55
Weight gain, g	2387	2059	2357	2044	2357	2039
	±62	±26	±12	±30	±40	±19
Feed efficiency	1.93	2.08	1.93	2.04	1.92	2.10
	±.05	±.04	±.04	±.04	±.06	±.02

[1]See Table 1 for description of canola meals.

Performance evaluation with laying hens

The productive performance of laying hens fed canola meal-based diets was followed for an entire production cycle. Canola meal comprised the sole dietary protein supplement in the diets (20-23%) and diet energy levels were adjusted according to the available energy values determined for the canola meals. A high level of egg production was obtained for the canola meal diets (Table 3). Feed intake and egg production tended to be lower for hens fed dehulled canola meal in comparison to those receiving commercial canola meal or control diets. The reason for this response is not clear.

Table 3. Production performance of laying hens fed a control diet or various diets with canola meal as the sole dietary protein supplement.

			Dehulled canola meal	
Parameter	Control	Canola meal	Brown-seeded[1]	Yellow-seeded[2]
Feed intake, g/day	108.9[a]	108.4[a]	105.8[b]	106.0[ab]
Egg production, %	89.9[a]	89.4[a]	86.7[b]	88.4[ab]

[1]*B. napus* canola. [2]*B. campestris* canola
[ab]Means with different superscripts are different ($P < 0.05$).

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