

Evaluation of the feed value for ruminants of newly developed black and yellow type of canola seeds

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Abstract

Canola is a major oil-seed crop in western Canada and was developed from rapeseed by Canadian plant breeders in 1970's. Canola includes the yellow (CS_Y) and the black-seeded (CS_B) varieties; whereas hulls from yellow-seeded have been noted to be lower in fiber and higher in oil and protein content than those from black-seeded types. The aim of this study was to study the variety effect and evaluate the nutritive value, for ruminants, of the yellow and black-seeded canola (*B. napus*). The items assessed are 1) chemical and nutrient profiles, 2) energy value, 3) rumen CS_Y was lower in NDF and ADF. The crude protein and the feed milk value were not different between the two canola seed varieties. No significant differences for the CT content were observed among the feedstuffs while the total polyphenols were higher for the yellow-seeded. The crude protein degradability of CS_Y was not different from that of the CS_B while the highest NDF degradability found for the CS_Y. The energy values of the yellow-seeded canola were higher compared to the black-seeded canola.

Introduction

Canola is a major oil-seed crop in western Canada and was developed from rapeseed by Canadian plant breeders in 1970's. Unlike with traditional rapeseed, canola contains low levels of "erucic acid" in the oil portion (<2% of total fatty acids in the oil) and low levels of anti-nutritional compounds called "glucosinolates" in the meal portion (<30 μmol of any one or any combination of the four aliphatic glucosinolates in its defatted meal).¹ Canola includes the yellow and the black-seeded varieties; whereas hulls from yellow-seeded have been noted to be lower in fiber and higher in oil and protein content than those from black-seeded types.^{2,3} The hypothesis of this study was that the nutritive value and nutrient degradation characteristics depend on variety and so the two newly developed canola seed varieties (yellow and black) are different. The aim of this study was to study the variety effect and evaluate the nutritive value, for ruminants, of the yellow and black-seeded canola (*B. napus*). The items assessed are 1) chemical and nutrient profiles, 2) energy value, 3) rumen degradation kinetics, 5) *in vitro* intestinal protein digestibility.

Results

Table 1. Chemical profiles: Comparison between the yellow and black canola seed.

Item	CS-Yellow <i>B. Napus</i> (n=2)	CS-Black <i>B. Napus</i> (n=2)	SEM	P value
Basic chemical (% DM)				
Dry matter	94.47	93.96	0.107	0.078
Carbohydrate profile (% DM)				
Carbohydrate	31.42	32.38	1.119	0.607
Neutral Detergent Fiber	12.21	15.45	0.540	0.051
Acid Detergent Fiber	6.07	9.86	0.296	0.012
Protein Profile (% DM)				
Crude Protein	20.79	23.75	0.722	0.102
Soluble Crude Protein	6.95	8.49	0.313	0.074
Non-protein Nitrogen	5.56	6.80	0.188	0.043
Feed milk value	0.96	0.92	0.076	0.769

SEM= Standard error of mean.

Results from this study showed that CS_Y was lower in NDF (12.21 vs. 15.45 % DM, $P<0.05$) and ADF (6.07 vs. 9.86 % DM, $P<0.05$) (Table 1), while no differences observed on the total CHO content. So the notable and significant lower fibre content of the CS_Y compared to the CS_B is in accordance with the lower level of indigestible hull in the yellow seed.

Regarding the protein profile of CS_Y had lower ($P<0.05$) values for NPN (% DM) (Table 1). The crude protein and the feed milk value were not different between the two canola seed varieties.

Table 2. Profile of fatty acids composition and bioactive compounds in yellow and black-type of canola seed (*B. Napus*).

Item	CS-Yellow <i>B. Napus</i> (n=2)	CS-Black <i>B. Napus</i> (n=2)	SEM	P value
Erucic acid (%)	0.020	0.040	0.007	0.184
Fatty acid composition (mg FA/g)				
Total Fatty Acids	902.00	910.70	5.170	0.356
Total Saturates	61.65	67.35	1.877	0.165
Total Omega 3	74.85	84.00	3.558	0.211
Total Omega 6	187.60	185.50	6.453	0.839
Total Omega 9	547.15	540.95	17.955	0.830
Glucosinolates (umoles/g)				
3-butenyl	2.90	0.99	0.083	0.004
4-pentenyl	0.44	0.16	0.050	0.058
Phenylethyl	0.26	0.07	0.019	0.021
Bioactive compounds				
Total Polyphenols (mg/100g)	626.00	718.00	16.125	0.056
Condensed Tannins (g/kg DM)	3.00	3.20	0.224	0.592

SEM= Standard error of mean.

In our study, the erucic acid was not different between the two canola varieties but as it was expected it was quite low for both of them (0.02 and 0.04 %) for the CS_Y and the CS_B, respectively. Although no other significant differences on the fatty acid composition observed between the two canola varieties, numerically, the total fatty acid, the total saturates, the total polyunsaturates and the total omega-3, were detected to be lower for yellow than the black canola

seed. No significant differences for the CT content were observed among the feedstuffs while the total polyphenols were higher for the yellow than the black seed (626 vs. 718 mg/100g).

Comparing CS_Y with CS_B, no significant differences were observed in terms of the effective degradability of dry matter. The crude protein degradability (EDCP) of CS_Y was not different ($P>0.05$) from that of the CS_B while the highest NDF degradability (EDNDF) found for the CS_Y. (Figure 1). The *in vitro* intestinal protein digestibility was higher for the yellow canola seed.

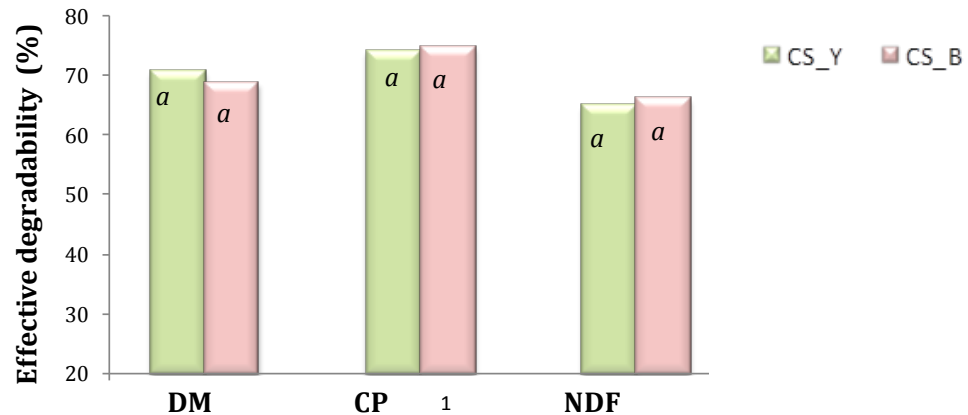


Figure 1. *In situ* rumen degradation kinetics of dry matter (DM), crude protein (CP) and neutral detergent fiber (NDF) of yellow and black canola seed.

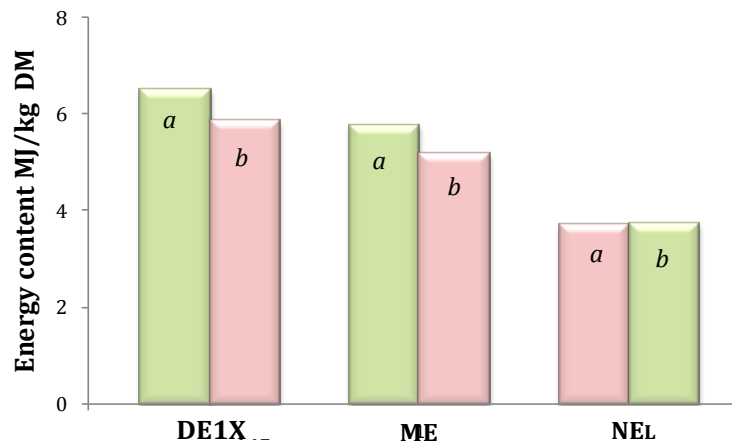


Figure 2. Energy values of yellow and black canola seed.

It was observed that due to the reduced hull and lower fiber content in the yellow-seeded canola, its energy values, digestible (DE_{1X}) metabolisable (ME) and net energy for lactation (NE_L) were higher ($P<0.05$) compared to the black-seeded canola.

Conclusion

The comparison between yellow-seeded and black-seeded canola showed that the first one had lower NDF, ADF and NPN content. Furthermore, the ruminal protein degradation was similar between the two canola varieties, although the higher *in vitro* intestinal digestibility for the CS_Y. The fatty acids compositions, total saturates and total omega-3, were numerically lower for the yellow-seeded canola and the yellow-seeded canola had higher NE_L, DE_{1X} and ME due to its reduced hull and lower fiber.

References

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