

Evaluation of nutritional values of caraway-seed pulp fed to Holstein dairy cattle

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Introduction Caraway seed pulp (CSP) is an agro-industrial by-product extracted during herb processing and manufacture (Raina, 1990, Syed *et al*, 1986). Annually 6000 ton caraway is produced in I.R. of Iran and after extracting its juice, 93% of it is CSP. Due to shortage of feedstuff, CSP can be used as a feed source for ruminant nutrition. The CSP are high in protein and fat with reported ether extract (EE) of 6%, CP of 15.2%, ADF of 51% and NDF of 55%. Because of the nutrient content, CSP appear to be a desirable feed ingredient in animal nutrition. Unfortunately, there is no data available on the nutritional value of CSP, especially in dairy cattle. The main objective of present experiment was to evaluate the effects substitution of CSP with wheat bran on dairy cattle performance, milk composition and some blood metabolites.

Material and methods Eight lactating Holstein cows (50±10 d. postpartum 600±20 kg) were randomly allocated to the 4 treatments based on calving date, lactating number and daily milk production (based on 10 days before the start of the experiment) in a 4×4 Latin square design. All cattle were housed in a tie-stall barn, fed individually, and were milked three times a day. Four dietary treatments offered to animals were different levels of CSP which were substituted with wheat bran (WB) in concentrate. The TMR ration was 15% WB and CSP substituted with WB in the following order: 1- WB (100% WB, 0% CSP as a control group), 2- 33.3% CSP + 66.6% WB, 3- 66.6% CSP+33.3% WB and 4- 100% CSP+0%WB. Diets were formulated based on NRC 2001. Nutrient requirement of dairy cattle and TMR diet were offered to animals as ad-libitum. Each experimental period was 21 days including a 14 day adaptation period and 7 days for collection of samples. Milk samples were analysed for protein, lactose and fat. Blood samples were drawn from the jugular vein into evacuated tubes on the last day of each experimental period at about 3-4 post feeding. The collected serum was frozen at the -20°C after centrifuging for the future analysis for glucose and cholesterol concentrations, Data were analysed by using the GLM procedure of SAS (9.1).

Results The dry matter intake (DMI), milk yield and its composition are presented in the Table 1. Differences between treatments for DMI and milk yield and composition were not statistically significant ($p>0.05$). The substitution of wheat bran by the CSP tended to increase milk fat concentration compared to the control, However, the difference between them was not statistically significant ($p>0.05$). Cholesterol increased with increasing dietary CSP and was greatest for cows offered the 100% CSP diets.

Table 1 Dry matter intake, milk production, and composition and blood metabolites of experimental dairy cow¹

Item	Treatment (caraway seed pulp level % substituted with WB)				SEM
	0	33	66	100	
DMI(kg day ⁻¹)	22.22	22.93	22.33	23.53	0.17
Milk yield(kg day ⁻¹)	36.28	37.24	36.30	37.00	0.35
Milk composition (%)					
Protein	2.67	2.63	2.59	2.61	0.02
Lactose	4.54	4.54	4.44	4.52	0.02
Fat	2.84	2.94	3.06	3.15	0.06
Blood metabolites (mg/dl)					
Glucose	56.88 ^a	44.76 ^{ab}	42.86 ^b	46.81 ^{ab}	1.45
Cholesterol	143.23 ^b	166.66 ^{ab}	170.39 ^a	186.68 ^a	2.82

¹ Different superscripts in each row designate significant differences ($P<0.05$)

Conclusion Results indicated that substitution of wheat bran by CSP tended to increase milk fat content although the differences between treatments were not statistically significant. However, results indicated that substitution of CSP at 100 % level with wheat bran (dry mater basis) may improve farm income by decreasing the cost of milk production without any adverse effect on animal health and performance. This Agro-Industrial by-product can be regarded as a source of effective fibre for the ruminant animal. However more experiments are needed for confirmation of these finding and suggestions.

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