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New Studies Show Canola Meal Helps to Reduce Enteric Methane and Nitrous Oxide Production in Dairy Cows

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In addition to supplying escape protein and essential amino acids, research just released by Agriculture and Agri-Food Canada Researcher, Dr. Chaouki Benchaar shows that canola meal can be instrumental in reducing enteric methane and nitrous oxide in dairy cows.

The accumulation of greenhouse gases, primarily carbon dioxide, methane and nitrous oxide are blamed for causing atmospheric changes, including global warming. The warming potential of methane is approximately 20 times greater than carbon dioxide, and nitrous oxide is about 300 times greater than carbon dioxide. The current convention for measurement is to convert greenhouse gas emissions to a carbon dioxide equivalent basis. Therefore, the removal of one pound of methane is equal to eliminating 20 pounds of carbon dioxide, and likewise one pound of nitrous oxide is as good as removing 300 pounds of carbon dioxide from the atmosphere.

Exact figures for emission by livestock vary with source. However, values obtained from the Food and Agriculture Organization (FAO) (http://www.fao.org/3/a-i3437e.pdf) suggest that 14.5% of the greenhouse gases produced by human activity arise from livestock production. Rumen fermentation accounts for about 75% of the total. Thus, reducing greenhouse gas production by dairy and beef cattle can be a practical way of reducing a portion of these emissions, particularly if it can be accomplished at a low cost to dairy and beef producers.

One way of reducing costs to producers is to capture the energy from methane that would otherwise be lost to the atmosphere and allow that energy to be used by the cow. Some of Dr. Benchaar's previous research showed that fat supplementation, particularly fats rich in unsaturated fatty acids, are useful for the reduction of rumen methane. Indeed, the fatty acid profile of canola meal has been shown to be particularly beneficial to reducing methane output (See Dairy Business, February 14, 2020 "Does Dietary Protein Source Impact Energy Lost as Methane?).

Dr. Benchaar' presented two posters of his most recent research at the virtual American Dairy Science Association Annual Meeting.

The first presentation "Replacing Soybean Meal with Canola Meal Reduced Enteric Methane Production and Improved Milk production in Dairy Cows" showed that the percentage of the total dietary energy lost as methane was reduced with canola meal, and methane emission/kg of energy corrected milk declined as the feeding rate of canola meal was increased.

The diets used in the study provided 0, 4, 8 and 12% canola meal. The diets contained 52% forage and 48% concentrate, and all diets provided 16% crude protein. Results are provided in Table 1. Dry matter intake and milk yield increased with each incremental increase in canola meal in the diet. Methane production decreased both overall and when expressed/unit of milk. The energy lost as methane was also reduced by the substitution of canola for soybean meal. This energy then became available for the cows to put to productive purposes.

Table 1. How replacing soybean meal with canola meal changed intake, milk production and methane output

	Canola meal, % of total Dry Matter			
	0	4	8	12
Dry matter intake, lb	58.7	61.2	61.6	62.9
Energy corrected milk, lb	92.6	95.0	95.9	98.6
Total methane output, g/day	489	475	463	461
Methane/lb of energy corrected milk, g	5.3	5.0	4.8	4.7
Energy lost as methane, % of total	5.65	5.28	5.05	4.90

The second of Dr. Benchaar's presentations "Canola Meal in Dairy Diets: Effects on Nitrogen Utilization" shows that canola meal results in less urinary nitrogen output when compared to soybean meal (Table 2). Urine nitrogen is volatile and is known to contribute to atmospheric ammonia and nitrous oxide.

Table 2. How replacing soybean meal with canola meal reduced urine nitrogen output

	Canola meal, % of total Dry Matter			
	0	4	8	12
Nitrogen intake, g/day	679	700	707	718
Milk nitrogen, g/day	210	213	218	222
Urine nitrogen, g/day	35.1	33.4	31.7	31.4
Urine nitrogen, % of total intake	5.1	4.8	4.5	4.3

There are many feed additive products available on the market to help reduce greenhouse gas emissions. This research shows that the inclusion of canola meal in the diet may also be an effective and economical tool for reducing these waste products as well as improving milk production. This research is part of the Canola AgriScience Cluster, with funding provided through Agriculture and Agri-Food Canada's Canadian Agricultural Partnership, the Canola Council of Canada, Alberta Canola, SaskCanola and the Manitoba Canola Growers. For more information, please visit CanolAmazing.com.

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