

## Effect of rumen protected choline supplementation on milk production and composition of lactating Friesian cows

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**Introduction:** Rumen-protected choline (RPC) products have been fed to periparturient dairy cows to increase the supply of choline to the small intestine with the goal of increasing milk or component yields or alleviating the development of fatty liver syndrome (Hartwell *et al.*, 2000; Piepenbrink and Overton, 2003; Pinotti *et al.*, 2003; Overton and Waldron, 2004). Increasing the postruminal supply of choline by an infusion of choline into the abomasum has increased milk production and milk fat yield (Erdman and Sharma 1991).

**Materials and methods** Twelve lactating Friesian cows were used in a complete switch-back design (Lucas, 1956). The cows were fed the basal ration consisted on DM basis from 40% concentrate feed mixture + 40% fresh berseem + 20% rice straw without supplement (G<sub>1</sub>) or supplemented with 15 and 30 g choline chloride / head / day for G<sub>2</sub> and G<sub>3</sub>, respectively.

**Results** Results in Table (1) showed that the digestibility coefficients of all nutrients and nutritive values increased significantly ( $P < 0.05$ ) with rumen protected choline supplementation. Rumen protected choline supplementation increased significantly ( $P < 0.05$ ) the intake of TDN and DCP. The pH values and NH<sub>3</sub>-N concentration decreased significantly ( $P < 0.05$ ) and TVFA's concentration increased significantly ( $P < 0.05$ ) in rumen liquor with rumen protected choline supplementation. Rumen protected choline supplementation led to significant decrease ( $P < 0.05$ ) in the concentration of plasma cholesterol and significant increase ( $P < 0.05$ ) in triglycerides. However, the concentrations of glucose, total protein, albumin, globulin and urea-N and the activity of AST and ALT were nearly similar for the different groups. Rumen protected choline supplementation led to significant increase ( $P < 0.05$ ) in actual milk and 4% FCM yield. The contents of fat and total solids (TS) and the yield of all milk constituents except ash increased significantly ( $P < 0.05$ ) with rumen protected choline supplementation. Results in Table (2) revealed that rumen protected choline supplementation improved feed conversion, which led to significant decrease ( $P < 0.05$ ) in the quantities of DM, TDN and DCP per kg 4% FCM. Average daily feed cost were nearly similar for the different groups. While, the feed cost per one kg 4% FCM decreased significantly ( $P < 0.05$ ), the average income of milk yield increased significantly ( $P < 0.05$ ) with rumen protected choline supplementation.

**Table 1** Effect of rumen protected choline supplementation on nutritive values, feed intake, rumen parameters, milk yield and composition.

Item	Nutritive values %		Intake kg/day		Rumen parameters			Milk yield kg/day		Milk composition %				
	TDN	DCP	DM	TDN	DCP	pH	NH <sub>3</sub> -N	TVFA's	Actual	FCM	Fat	Protein	Lactose	TS
control	60.87 <sup>b</sup>	8.57 <sup>b</sup>	16.08	9.79 <sup>b</sup>	1.38 <sup>b</sup>	6.95 <sup>a</sup>	14.81 <sup>b</sup>	18.95 <sup>a</sup>	15.22 <sup>b</sup>	14.22 <sup>b</sup>	3.56 <sup>b</sup>	3.12	4.39	11.78 <sup>b</sup>
15 g RPC	63.98 <sup>a</sup>	8.96 <sup>a</sup>	16.17	10.35 <sup>a</sup>	1.45 <sup>a</sup>	6.72 <sup>b</sup>	17.14 <sup>a</sup>	16.63 <sup>b</sup>	16.54 <sup>a</sup>	15.77 <sup>a</sup>	3.69 <sup>a</sup>	3.15	4.39	11.94 <sup>a</sup>
30 g RPC	64.62 <sup>a</sup>	9.05 <sup>a</sup>	16.20	10.47 <sup>a</sup>	1.47 <sup>a</sup>	6.67 <sup>b</sup>	17.43 <sup>a</sup>	16.25 <sup>b</sup>	17.46 <sup>a</sup>	16.82 <sup>a</sup>	3.75 <sup>a</sup>	3.16	4.43	12.05 <sup>a</sup>

a, b: Values and means in the same row with different superscripts differ significantly at 5% level.

**Table 2** Effect of rumen protected choline supplementation on feed conversion and economic efficiency.

Item	Feed conversion kg / kg FCM			Economic efficiency LE			
	DM	TDN	DCP	Cost	Cost/ kg FCM	Income	Income %
control	1.14 <sup>a</sup>	0.69 <sup>a</sup>	0.098 <sup>a</sup>	19.18	1.36 <sup>a</sup>	28.44 <sup>b</sup>	100.00 <sup>c</sup>
15 g RPC	1.03 <sup>b</sup>	0.66 <sup>ab</sup>	0.093 <sup>ab</sup>	19.37	1.24 <sup>b</sup>	31.55 <sup>a</sup>	110.94 <sup>b</sup>
30 g RPC	0.97 <sup>b</sup>	0.62 <sup>b</sup>	0.088 <sup>b</sup>	19.50	1.17 <sup>b</sup>	33.64 <sup>a</sup>	118.28 <sup>a</sup>

a, b: Values and means in the same row with different superscripts differ significantly at 5% level.

**Conclusions** It could be concluded that rumen protected choline supplementation to lactating Friesian cows improved nutrients digestibility, milk yield and composition, feed conversion and economic efficiency.

### References

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