EFFECT OF SARSAPONIN IN THE RATION OF LACTATING DAIRY COWS ON RUMEN FERMENTATION AND PRODUCTION PERFORMANCE

F.R. Valdez[1] and L.J. Bush[2]

Story in Brief

The effect of daily supplementation of sarsaponin to a complete ration was determined using 16 Holstein cows in their first lactation. A switchback design with three 4-wk periods was used. Treatments were: 1) 70 g of sarsaponin/ton of air-dry feed. 2) No sarsaponin (control). Complete rations were formulated daily in a proportion of 55:45 concentrate:silage (dry basis), and equal quantities were fed individually three times a day. No significant differences in milk production (45.8 and 45.3 lb/day), fat test (3.5 and 3.5 %) and milk protein percentage (2.8 and 2.8 %) were observed between groups of cows fed sarsaponin and control rations. Rumen ammonia (4.8 and 4.7 mg/dl) and blood urea (10.4 and 10.5 mg/dl) were similar for the respective treatment groups. Molar percentage of individual ruminal volatile acids also were similar for the two treatment groups.

[Key Words: Sarsaponin, Steroidal glycoside, Digestion, Milk yield, Dairy cows.]

Introduction

Peekstok (1979) observed a stimulating effect of sarsaponin, a steroidal glycoside, on anaerobic fermentation of organic matter in activated sludge waste treatment systems. Enhancement of anaerobic fermentation in ruminant digestion of starch and fibrous feedstuffs could have some beneficial effect in utilization of many livestock feeds.

There is a possibility that changes in fermentation patterns, due to enhancement of ruminal fermentation, may improve the utilization of nutrients by the animal. Grobner et al. (1982) observed a higher total nitrogen output ($P<.05$) in continuous flow fermenter systems treated with 30 ppm sarsaponin. In contrast, Goetsch and Owens (1984) observed increased ruminal and total N digestion due to the addition of 44.1 ppm of sarsaponin to the ration of cannulated dairy cows. Ruminal and total tract digestibilities of organic matter were also increased.

The objective of this experiment was to determine the effect of sarsaponin supplementation on responses of lactating dairy cows under conditions where dietary intake of natural protein was limited in relation to NRC requirements.

Materials and Methods

Sixteen Holstein cows in their first lactation were started on experiment 6 to 10 weeks postpartum. A switchback design with two blocks (eight cows per block) and three 4-wk periods was used. Cows were as-

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[1]Graduate Student, [2]Professor, Animal Science.

signed at random to each block and then to treatment sequences. The treatments were: 1) 70 g of sarsaponin[3] (SARS)/ton of air-dry feed. 2) No sarsaponin (control). Complete rations were formulated daily in a proportion of 55:45 concentrate:silage (dry basis), and approximately equal quantities were fed in individual pens three times a day (1100, 1900 and 0300 hours). The cows had free access to water. Milk weights were recorded daily and samples taken at four consecutive milkings each week were analyzed for fat and protein percentage. Daily feed weighbacks were taken to determine weekly dry matter (DM) and protein intake. Each cow was weighed two times each week to obtain an average body weight for purpose of calculating ration allowances. Intake of natural protein was restricted by including only enough soybean meal in the ration for each cow so that sufficient natural protein was supplied to meet 80% of estimated NRC requirements. Urea was added to provide protein equivalent value equal to 15% of the total protein requirement for each cow.

Blood and rumen fluid samples were taken the last day of each period 3 to 4 hr after the 11:00 AM feeding. Blood was withdrawn from the tail vein with vacutainer tubes and rumen fluid was sampled by stomach tube. The respective samples were analyzed for blood plasma urea, ruminal ammonia concentration and individual ruminal volatile fatty acids.

Results and Discussion

Addition of sarsaponin to the ration resulted in no significant difference ($P>.05$) in milk production, fat percentage or milk composition (Table 1). Intake of natural protein was restricted in relation to the NRC requirements for total protein (Table 1); therefore the possibility existed for the cow to benefit from bypass of more natural protein or increased microbial synthesis of protein in the rumen. Production responses provided no indication of any benefit from the addition of sarsaponin to the ration. This is in agreement with results of a previous feeding trial where natural protein was less restricted (Valdez et al., 1984), and also with the observation of Goetsch and Owens (1984) that ruminal nitrogen digestion tended to be greater for cows fed a diet supplemented with 44.1 ppm of sarsaponin than for cows fed a control diet. Whether or not a positive response to supplementation with sarsaponin would be obtained with older cows in not known. Roffler et al. (1978) reported no increase in milk yield of first lactation cows as protein concentration in the ration increased, whereas a positive response was obtained in multiparous cows.

No significant difference was observed between treatment groups in DM intake and body weight change. The level of SARS supplementation used in this trial had no adverse effect on feed intake. Moreover, it is doubtful that energy intake limited production by the cows since they were allowed as much dry matter as they would consume with natural protein content adjusted weekly to maintain the desired restriction of this component of the ration.

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[3]Source of sarsaponin was Sevarin, a commercial product manufactured by Distributors Processing, Inc., Porterville, CA 93257.

Table 1. Milk yield and feed intake.

ITEM	SARS	CONTROL
Milk yield, lb/day	45.8	45.3
Fat test, %	3.5	3.5
Milk protein, %	2.8	2.8
Total protein intake, lb/day[a]	5.0	5.0
Protein intake/requirements, %	99.7	99.7
Dry matter intake, lb/day	44.0	43.7
Body weight change, lb/period	2.3	-1.0

[a]Including protein equivalent value from urea.

Ruminal ammonia and blood urea concentrations were similar for both treatments (Table 2), suggesting very little or no effect on urease inhibition by sarsaponin, even when urea supplementation was increased to provide 15 % of the total protein required, as compared to 10 % in a previous feeding trial (Valdez et al., 1984). In contrast, Grobner et al. (1982) reported a decrease in ammonia levels in in vitro fermenters when 60 ppm of sarsaponin was added to the substrate.

Molar percentages of acetic, propionic, butyric and valeric acids as well as total VFA concentration were similar for both treatment groups (Table 3). In contrast, Goodall (1980) observed higher propionic acid and lower acetic acid ($P<.05$) in steers when feedlot diets were supplemented with 60, 120, and 240 ppm of sarsaponin.

Table 2. Blood urea and rumen ammonia levels.

ITEM	SARS	CONTROL
	-------(mg/dl)-------	
Rumen ammonia	4.8	4.7
Blood urea	10.4	10.5

Table 3. Rumen volatile fatty acids.

ITEM	SARS	CONTROL
Total VFA concentration, mM/	153.5	144.7
Individual VFA, molar %		
Acetic	63.1	63.4
Propionic	22.6	22.2
Butyric	13.0	13.1
Valeric	1.3	1.3

Supplementation of rations for lactating dairy cows with 70 g of sarsaponin/ton of air-dry feed did not have a beneficial effect on milk production, fat percentage, dry matter intake or body weight change.

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