IMPACT OF DRIED SEAWEED MEAL ON HEAT-STRESSED LACTATING DAIRY CATTLE

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Summary

Twenty-four lactating Holstein cows were used to determine the production response to the inclusion of brown seaweed in the basal diet during summer heat stress. Cows were blocked by lactation number, days in milk, and energy-corrected milk and then allotted to either a control or control + brown seaweed diet. Cattle on the brown seaweed diet were fed 4 ounces per cow per day for 7 days , and then 2 ounces per cow per day for 14 days, before the start of the experiment. All cattle were housed in a tie-stall barn, fed individually, and milked twice daily. Cows fed brown seaweed produced more ($P<0.01$) milk (77.6 vs 73.8 lb) and milk protein than controls did. But the addition of brown seaweed did not reduce respiration rates, rectal temperature, or rear-udder skin temperature. This indicated a similar heat-stress response for treated and control cows. Other studies have shown a reduction in respiration rates and body temperature when stressed cattle were fed brown seaweed. Further investigation is necessary to determine the factors that resulted in the observed milk and milk-protein responses in this study.

(Key Words: Heat Stress, Nutrition, Milk Production.)

Introduction

Intense summer climates depress animal performance across the United States. High ambient temperature on a dairy farm results in decreased milk production, reproductive performance, and overall animal well being. Previous studies indicated that brown seaweed extract (Tasco-14 seaweed meal) added to the ration of high-producing dairy cows potentially decreases body temperature during heat stress.

The objectives of the study were to quantify the impact of feeding Tasco-14 seaweed meal on feed intake, milk production, milk component concentration, rectal temperature, rear-udder surface temperature, and respiration rate.

Experimental Procedures

Twenty-four Holstein cows were blocked by lactation number, days in milk, and energy-corrected milk and then allotted to either a control diet or control diet containing Tasco-14 seaweed meal. A total mixed ration containing corn silage, whole cottonseed, chopped alfalfa, sweet bran, and grain mix was fed ad libitum twice daily (a.m. and p.m.). Tasco-14 seaweed meal was given as a top-dressing once daily with morning feeding. A total of 12 cows received 4 ounces per cow per day during the first week, and then 2 ounces per cow per day until the end of study. Water was available for ad libitum consumption.

Cows were housed in a tie-stall barn at KSU Dairy Teaching and Research Center for 6 weeks. The first week was an adjustment period, and data were collected during the second through sixth week. Data from weeks 2 and 3 were used to achieve full adjustment to the seaweed, and were not included in the analysis. Rectal temperature, body surface temperature, and respiration rates were measured three times daily for 3 consecutive days per week. Respiration rate was determined by

manual counting of breaths for 15 seconds, rectal temperature was measured with M500 series high-performance digital thermometer (GLA Agricultural Electronics, San Luis Obispo, CA), and body surface temperature was measured at the rear quarter of the udder by using an infrared thermometer (Model 4KM98, Raytek Corporation, Santa Cruz, CA). Milk samples were collected twice weekly and were analyzed for fat, protein, SCC, and milk urea nitrogen by DHIA (Heart of America Lab, Manhattan, KS). Samples of feed components were collected weekly for standard nutritional analysis. During the entire study, all cows were milked twice daily. Milk production and feed intake were recorded daily, as well as the ambient temperature and relative humidity.

Results and Discussion

Similar dry matter intake (Table 1) was observed for cows assigned to the control and seaweed diets. Milk production was greater ($P<0.01$) from cows fed the brown seaweed diet (77.6 lb) than from controls (73.8 lb). Milk fat and protein percentages, as well as the amount of milk fat production, were unaffected by treatment. Amount of milk-protein production was greater ($P<0.01$) from cows fed the brown seaweed than from controls. Treatment did not impact the amounts of energy or fat-corrected milk produced.

Although average respiration rates, rear-udder skin temperatures, and rectal temperatures (Table 2) were less during the morning hours than during the afternoon, no differences were detected between diets.

Milk and milk-protein production were increased when 2 ounces of brown seaweed (per cow per day) was included with a normal diet for lactating dairy cattle. The increase in milk-protein production resulted from greater milk production and a trend for a higher milk-protein percentage when cows were fed brown seaweed. Similar dry matter intakes were observed for control and treatment cattle. Increased milk production in the face of similar intakes resulted in an increase in lactation efficiency, compared with that of the control diet. Improvements in milk and milk protein are not explained by the respiration rate, rear-udder skin temperatures, or rectal temperatures. In this study, the addition of brown seaweed did not reduce the normal heat-stress responses typically observed in dairy cattle. Other studies have shown reduced respiration rates and body temperatures when brown seaweed was fed. Further investigation is required to determine those factors that resulted in the milk and milk-protein production response observed in this study.

Table 1. Production Responses of Heat-stressed Holstein Cows Fed Brown Seaweed Meal

Factor	Diet		SEM	*P* =
	Control	Brown seaweed		
Intake, lb per cow per day	49.9	49.6	1.18	0.800
Milk, lb	73.8	77.6	1.33	0.007
Milk fat, %	3.85	3.61	0.13	0.080
Milk protein, %	3.10	3.21	0.04	0.110
Milk fat, lb	2.79	2.77	0.10	0.840
Milk protein, lb	2.26	2.45	0.05	0.001
ECM[1], lb	76.5	78.9	1.83	0.200
FCM[2], lb	71.3	72.6	1.86	0.520

[1]Energy-corrected milk = 0.327 × lb of milk + 12.95 × lb of milk fat + 7.2 × lb of milk protein.
[2]Fat corrected milk = 0.4 × lb of milk + 15 × lb of milk fat.

Table 2. Impact of Feeding Brown Seaweed Meal on Respiration Rates, Rear-udder Skin Temperature and Rectal Temperature of Heat-stressed Holstein Cows

Item	Diet		SEM	*P* =
	Control	Brown seaweed		
Respiration rate, breaths/min				
Morning	58.1	56.6	2.65	0.90
Early afternoon	69.1	65.0	2.65	0.85
Late afternoon	67.0	66.5	2.65	0.91
Daily average	64.7	62.7	2.09	0.46
Rear-udder skin temperature, °F				
Morning	91.7	91.9	0.39	0.99
Early afternoon	95.1	94.9	0.39	0.99
Late afternoon	96.0	96.1	0.39	0.99
Daily average	94.3	94.3	0.33	0.93
Rectal temperature, °F				
Morning	101.6	101.8	0.13	0.83
Early afternoon	102.0	102.0	0.13	0.99
Late afternoon	102.6	102.6	0.13	0.99
Daily average	102.1	102.1	0.11	0.65