



Effects of *Ascophyllum nodosum* meal and monensin on performance and iodine metabolism in lactating dairy cows

Simone F. Reis¹, André F. Brito^{1*}, Caren P. Ghedini¹, Daiane C. Moura² and Andre S. Oliveira²

¹University of New Hampshire, ²Universidade Federal de Mato Grosso, Sinop, Brazil



INTRODUCTION AND OBJECTIVES

❖ *Ascophyllum nodosum* (ANOD) meal is largely used as feed additive in ruminant diets.

❖ Previous research suggested that bioactive compounds of ANOD meal (e.g. phlorotannins) and microminerals (Cu, Zn, and Fe) may enhance animal health and performance.

❖ However, high iodine concentration in ANOD meal can limit its use in dairy rations.

❖ The objective of this study was to evaluate the impact of incremental amounts of ANOD meal (TASCO meal; Acadian Seaplants; Nova Scotia, Canada) on performance, markers of animal health, ruminal fermentation profile, and iodine metabolism in lactating dairy cows.

❖ We also aimed to compare the effects of ANOD against the ionophore monensin (MON) on the same variables reported above.

MATERIALS AND METHODS

❖ The study was conducted at the University of New Hampshire Fairchild Dairy Teaching and Research Center.

❖ Five ruminally-cannulated lactating Jerseys cows (102 ± 15 DIM and 27.7 ± 2.8 kg/d of milk yield) were randomly assigned to 1 of 5 dietary treatments: 0 g (negative control), 57 g, 113 g, or 170 g of ANOD meal or 300 mg of MON (positive control) in a 5×5 Latin square design.





Effects of *Ascophyllum nodosum* meal and Monensin on performance and iodine metabolism in lactating dairy cows

Simone F. Reis¹, André F. Brito^{1*}, Caren P. Ghedini¹, Daiane C. Moura² and Andre S. Oliveira³

¹University of New Hampshire, ²Universidade Federal de Mato Grosso, Brazil



MATERIAL AND METHODS

- ❖ Treatments were administered daily placed directly in the rumen after the morning feeding.
- ❖ Each experimental period lasted 28 d with 21 d for diet adaptation and 7 d for data and sample collection.
- ❖ Milk yield was recorded daily and milk samples collected monthly for 4 consecutives milkings, pooled by cow per period, and analyzed for components using mid-infrared reflectance spectroscopy.
- ❖ Spot urinary and fecal grab samples were collected with markers used to estimate urinary volume (creatinine) and fecal output of DM (indigestible ADF).
- ❖ Blood sample was collected approximately 4h after the morning feeding.
- ❖ Milk, feces, urine, and serum were analyzed for iodine using inductively coupled plasma mass spectrometry.
- ❖ Degrees of freedom for treatment were partitioned into 4 single-degree-of-freedom non-orthogonal contrasts: linear, quadratic, ANOD diets vs. MON diet, and 170 g ANOD diet vs. MON diet.

Table 1. Ingredient and chemical composition of the experimental diet.

Item	TMR, % DM
Ingredients, % of DM	
Corn silage	25.5
Haylage	40.8
Corn meal	20.9
Soybean meal	7.50
Roasted soybean	3.52
Minerals & vitamin premix	1.83
Chemical composition, % DM	
DM, % of fresh matter	50.7
CP, %	15.8
aNDFom, %	37.3
ADF, %	24.8
iADF, % ADF	7.44
NFC, %	34.6
Starch, %	22.9
TDN, %	70.4



Effects of *Ascophyllum nodosum* meal and Monensin on performance and iodine metabolism in lactating dairy cows

Simone F. Reis¹, André F. Brito^{1*}, Caren P. Ghedini¹, Daiane C. Moura² and Andre S. Oliveira³

¹University of New Hampshire, ²Universidade Federal de Mato Grosso, Brazil



RESULTS

Table 2. Effect of *Ascophyllum nodosum* (ANOD) meal or monensin on performance, milk composition, and urinary excretion of purine derivatives in lactating dairy cows.

Item	Treatments					SEM	Contrast (<i>P</i> -value)			
	ANOD meal				Monensin		ANOD meal		Monensin vs ANOD	Monensin vs 170 g ANOD
	0 g	57 g	113 g	170 g			Linear	Quadratic		
DMI, kg/d	20.1	19.8	19.7	19.8	19.2	0.60	0.48	0.61	0.10	0.17
Milk yield, kg/d	20.8	20.1	19.9	20.8	20.2	0.58	0.76	<u>0.005</u>	0.65	0.10
4% FCM, kg/d	22.7	22.1	22.2	22.6	23.1	0.64	0.84	0.14	<u>0.05</u>	0.32
ECM, kg/d	24.4	23.8	23.7	24.2	24.5	0.68	0.72	0.12	0.14	0.56
Milk fat, %	4.66	4.66	4.80	4.61	5.01	0.06	0.85	<u>0.001</u>	<u><0.001</u>	<u><0.001</u>
Milk fat, kg/d	0.96	0.94	0.95	0.95	1.00	0.02	0.89	<u>0.04</u>	<u>0.002</u>	<u>0.02</u>
Milk protein, %	3.59	3.62	3.62	3.55	3.64	0.11	0.07	<u>0.004</u>	<u>0.01</u>	<u><0.001</u>
Milk protein, kg/d	0.74	0.73	0.71	0.73	0.72	0.02	0.33	<u>0.05</u>	0.50	0.22
Lactose, %	4.71	4.68	4.70	4.69	4.71	0.05	0.72	0.35	0.19	0.35
Lactose, kg/d	0.98	0.94	0.94	0.97	0.95	0.02	0.69	<u>0.01</u>	0.93	0.23
Milk TS, %	13.9	13.9	14.0	13.8	14.2	0.18	0.96	<u>0.002</u>	<u><0.001</u>	<u><0.001</u>
Milk TS, kg/d	2.80	2.76	2.78	2.75	2.72	0.10	0.46	0.99	0.41	0.70
Milk SCC, x 1,000 cells/mL	18.1	21.5	25.5	17.4	23.4	2.86	0.53	<u><0.001</u>	<u>0.01</u>	<u><0.001</u>
MUN, mg/dL	10.3	9.7	10.4	10.5	11.1	0.66	0.06	<u>0.04</u>	<u><0.001</u>	<u>0.01</u>
Urinary purine derivatives, mmol/d	123	126	125	127	128	10.8	0.79	0.92	0.81	0.89



Effects of *Ascophyllum nodosum* meal and Monensin on performance and iodine metabolism in lactating dairy cows

Simone F. Reis¹, André F. Brito^{1*}, Caren P. Ghedini¹, Daiane C. Moura² and Andre S. Oliveira³

¹University of New Hampshire, ²Universidade Federal de Mato Grosso, Brazil



RESULTS

Table 3. Effect of *Ascophyllum nodosum* (ANOD) meal or monensin on iodine output and serum concentrations of iodine and T₃ and T₄ in lactating dairy cows.

Item	Treatments					SEM	Contrast (<i>P</i> -value)			
	ANOD meal				Monensin		ANOD meal		Monensin vs ANOD	Monensin vs ANOD 170 g
	0g	57g	113g	170g			Linear	Quadratic		
Total iodine intake, mg/d	8.60	28.7	48.6	68.9	10.4	2.34	<0.001	0.95	<0.001	<0.001
Iodine intake ANOD, mg/d	0.00	20.3	40.3	60.6	0.00	2.32	<0.001	1.00	<0.001	<0.001
Milk iodine, mg/d	7.30	14.4	19.5	24.6	6.1	1.77	<0.001	0.54	<0.001	<0.001
Fecal iodine, mg/d	20.5	48.1	60.6	86.6	21.1	7.76	<0.001	0.91	0.0002	<0.001
Urinary iodine, mg/d	4.30	13.0	15.3	22.3	6.3	1.92	<0.001	0.66	0.0002	<0.001
Serum iodine, ng/mL	106	208	304	363	109	20.2	<0.001	0.09	<0.001	<0.001
Serum T ₃ , ng/mL	1.08	1.03	1.01	0.97	1.02	0.07	0.27	0.97	0.79	0.57
Serum T ₄ , ng/mL	40.6	40.5	43.4	39.1	43.0	3.30	0.88	0.41	0.49	0.27



Effects of *Ascophyllum nodosum* meal and Monensin on performance and iodine metabolism in lactating dairy cows

Simone F. Reis¹, André F. Brito^{1*}, Caren P. Ghedini¹, Daiane C. Moura² and Andre S. Oliveira³

¹University of New Hampshire, ²Universidade Federal de Mato Grosso, Brazil



RESULTS

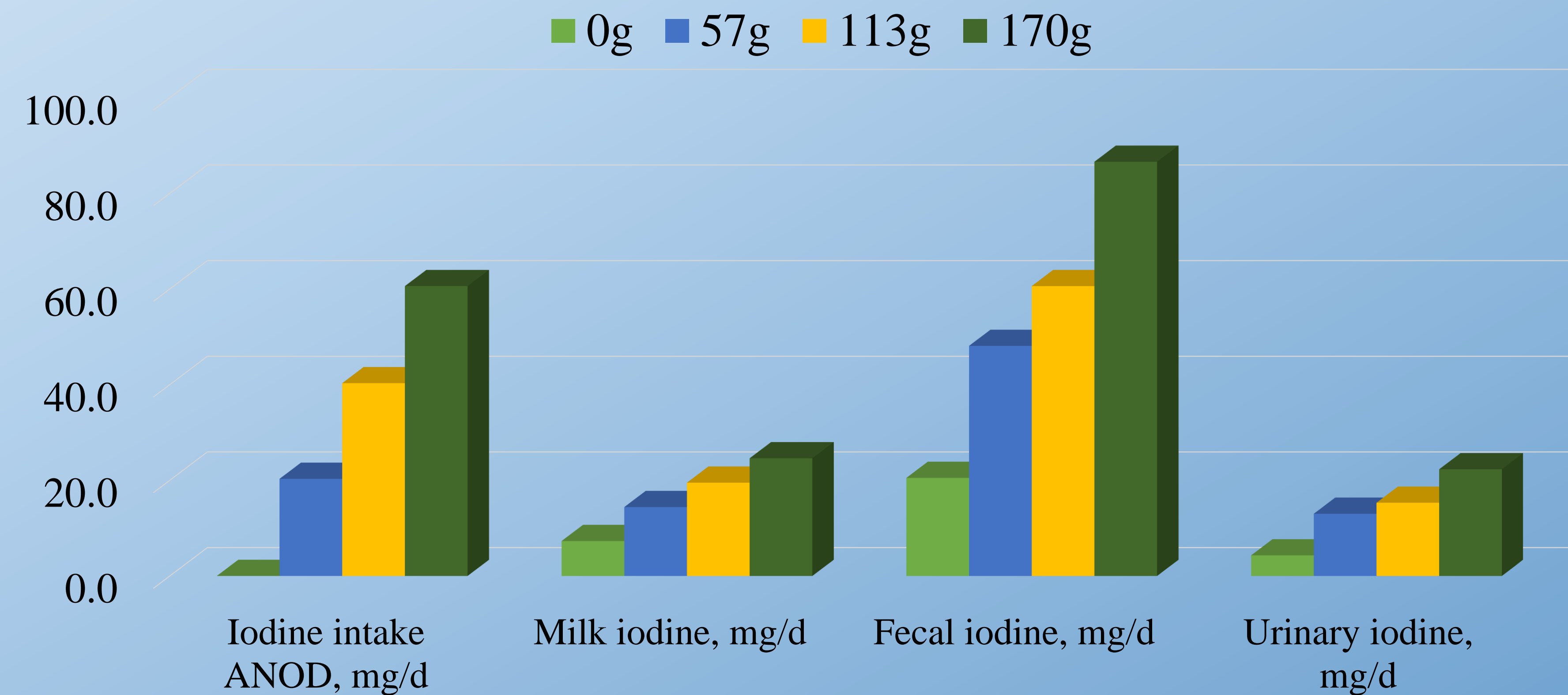


Figure 1. Iodine excretion in lactating dairy cows fed incremental amounts of *Ascophyllum nodosum* meal.

CONCLUSION

- ❖ ANOD supplementation linearly increased the concentration of iodine in serum, and the output of iodine in milk, feces, and urine.
- ❖ Feeding MON improved concentration and yields of milk components compared with ANOD.

ACKNOWLEDGEMENTS

Partial funding was provided by the New Hampshire Agricultural Experiment Station (Durham, NH). The authors also would like to thank the Northeast SARE and Acadian Seaplants (Nova Scotia, Canada) for funding this research.