FEEDING CHONDRUS CRISPUS: EFFECTS ON RUMINAL FERMENTATION, PURINE DERIVATIVE EXCRETION, AND ENTERIC METHANE EMISSIONS IN GRAZING DAIRY COWS

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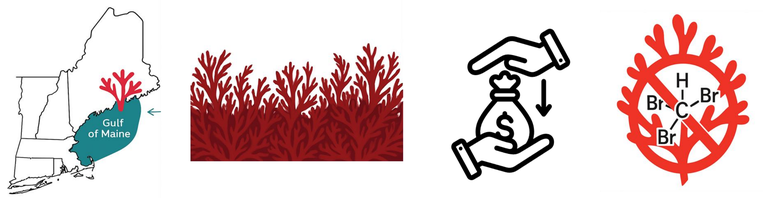
RATIONALE

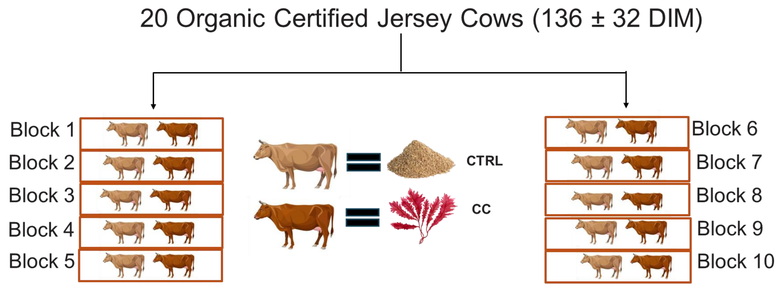


- *Asparagopsis taxiformis* (AT) has been the most effective seaweed in mitigating enteric methane emissions in diary cows due to the halogenated compound bromoform (Angelotti et al., 2025).
- However, limited studies have focused on non-bromoform containing red seaweed (e.g., *Chondrus crispus*; Reyes et al., 2025).
- *Chondrus crispus* (**CC**) is a high-biomass red seaweed native to the Gulf of Maine.
- Therefore, it is important to evaluate the potential of any locally grown red seaweed in production performances and enteric gas emissions in dairy cows.

OBJECTIVE

Our objectives were to evaluate the effects of feeding 3.0% CC to the grazing dairy cows on:

MATERIALS AND METHODS



CTRL = Control (No seaweed) **CC = 3% Red Seaweed (*Chondrus crispus*)**

- Cows had access to a grass-legume pasture mix (herbage allowance = 17.5 kg/cow daily) for 16 h/d and housed for 8 h/d when they received a partial TMR (pTMR) and were milked twice.
- Cows were randomly assigned to 1 of 2 diets: (1) pasture plus pTMR (control = CTRL) or (2) pasture, pTMR, and 3% C. crispus (seaweed = CC).
- Data were analyzed using mixed procedure of SAS

RESULTS

Table 1. Ingredients and nutrient composition of the diets fed to all experimental cows

Item	Diet (% of diet DM)	
	CTRL[1]	CC[2]
Pasture	33.5	33.5
Baleage	24.6	21.7
Mash - 1	41.0	0.00
Mash - 2	0.00	41.0
Habilac Fat	0.76	0.76
Seaweed (*Chondrus crispus*)	0.00	3.0
Ca iodate	0.12	0.00
Nutrient Composition		
DM, % of fresh matter	50.5	49.3
CP, % of DM	15.6	16.1
Ash, % of DM	11.0	10.8
ADF, % of DM	21.4	20.6
aNDFom, % of DM	35.4	34.7

[12]Cows fed no seaweed (CTRL) or 3% inclusion (DM basis) of *Chondrus Crispus* (CC).

Table 2. Ruminal fermentation profile in Jersey cows grazing pasture and a partial TMR (pTMR) plus 0% (control diet = CTRL) or 3% *Chondrus crispus* (Seaweed diet = CC) of diet DM

Item	Treatment (T)			*P-value*[1]		
	CTRL	CC	SEM	T	W[2]	T × W
pH	6.67	6.56	0.04	0.22	0.02	0.20
NH_3-N, mg/dL	3.69	5.94	0.71	0.02	0.02	0.10
Total VFA, m*M*	90.7	89.2	3.90	0.73	0.32	0.26
Individual VFA, mol/100 mol						
Acetate (A)	70.0	68.0	0.30	<0.01	0.02	0.54
Propionate (P)	16.7	17.5	0.22	<0.01	0.05	0.96
Butyrate	11.0	12.3	0.17	<0.01	0.87	0.17
Isobutyrate	0.87	0.82	0.02	0.08	<0.01	0.26
Valerate	0.83	0.96	0.03	<0.01	<0.01	0.54
Isovalerate	0.52	0.49	0.01	0.17	<0.01	0.09
A:P ratio	4.23	3.89	0.08	<0.01	0.02	0.89

[1]Significant difference between diets was declared at $P \leq 0.05$ and trends at $0.05 < P \leq 0.10$.
[2]Wk 4 (July 18 to July 25); Wk 8 (August 15 to August 22)

Table 3. N intake and urinary excretion of nitrogenous metabolites in Jersey cows grazing pasture and a partial TMR (pTMR) plus 0% (control diet = CTRL) or 3% *Chondrus crispus* (Seaweed diet = CC) of diet DM

Item	Treatment (T)			*P-value*[1]		
	CTRL	CC	SEM	T	W[2]	T × W
N intake, g/d	568	626	13.0	<0.01	<0.01	<0.01
Urinary compounds						
Creatinine, m*M*	2.81	3.44	0.17	0.02	0.04	0.01
Urinary N, g/d	162	164	10.3	0.82	0.02	0.46
Urinary N, % of N intake	28.4	26.5	1.47	0.27	0.40	0.98
Urea N, g/d	89.9	86.2	5.13	0.63	<0.01	0.04
Urea N, % of N intake	15.2	13.5	0.91	0.17	<0.01	0.29
Urea N, % of urinary N	55.0	52.3	2.78	0.09	<0.01	0.14
Uric acid, mmol/d	76.5	69.9	2.86	0.12	<0.01	0.96
Allantoin, mmol/d	282	284	13.1	0.89	<0.01	0.87
Total purine derivatives, mmol/d	362	351	16.4	0.62	<0.01	0.86

[1]Significant difference between diets was declared at $P \leq 0.05$ and trends at $0.05 < P \leq 0.10$.
[2]Wk 4 (July 18 to July 25); Wk 8 (August 15 to August 22)

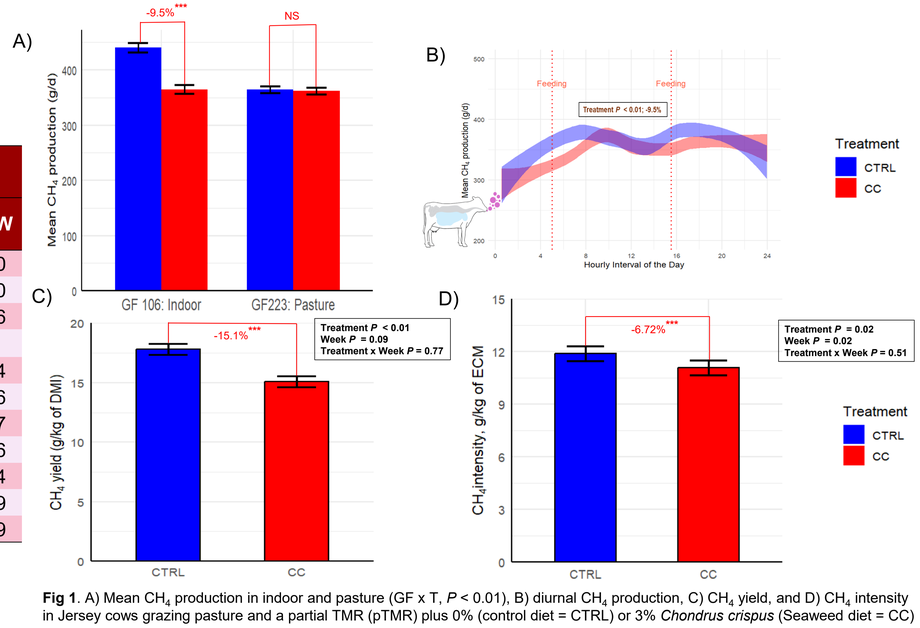


Fig 1. A) Mean CH_4 production in indoor and pasture (GF x T, $P < 0.01$), B) diurnal CH_4 production, C) CH_4 yield, and D) CH_4 intensity in Jersey cows grazing pasture and a partial TMR (pTMR) plus 0% (control diet = CTRL) or 3% *Chondrus crispus* (Seaweed diet = CC)

CONCLUSIONS

- Feeding 3.0 % CC decreased molar proportion of acetate, and A:P ratio while increased propionate, butyrate and valerate.
- Except N intake, and urinary concentration of creatinine which increased in CC diet, no effects were observed for other urinary excretion of nitrogenous metabolites between treatments.
- Enteric CH_4 production, CH_4 yield, and CH_4 intensity decreased 9.5%, 15.1% and 5.72% respectively with feeding CC compared to CTRL.

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ACKNOWLEDGEMENTS

- USDA National Institute of Food and Agriculture OREI award # 2021-51300-35226.
- Partial funding was provided by the New Hampshire Agricultural Experiment Station (Durham, NH)
- This project was further supported by the USDA Hatch Multistate NC-2042 (Project Number NH00616-R; Project Accession Number 1001855).
- Special thanks to the University of New Hampshire Burley-Demeritt Organic Dairy Research Farm staff for animal care and overall research support.