

Effects of Supplementation with Tannins and Saponins Blend on Methane Emissions in High-Emitting Dairy Cows



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75th EAAP Annual Meeting

Florence

September 3rd, 2024

Introduction



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Tannins are plant polyphenols used in ruminant farming as growth and health promoters.

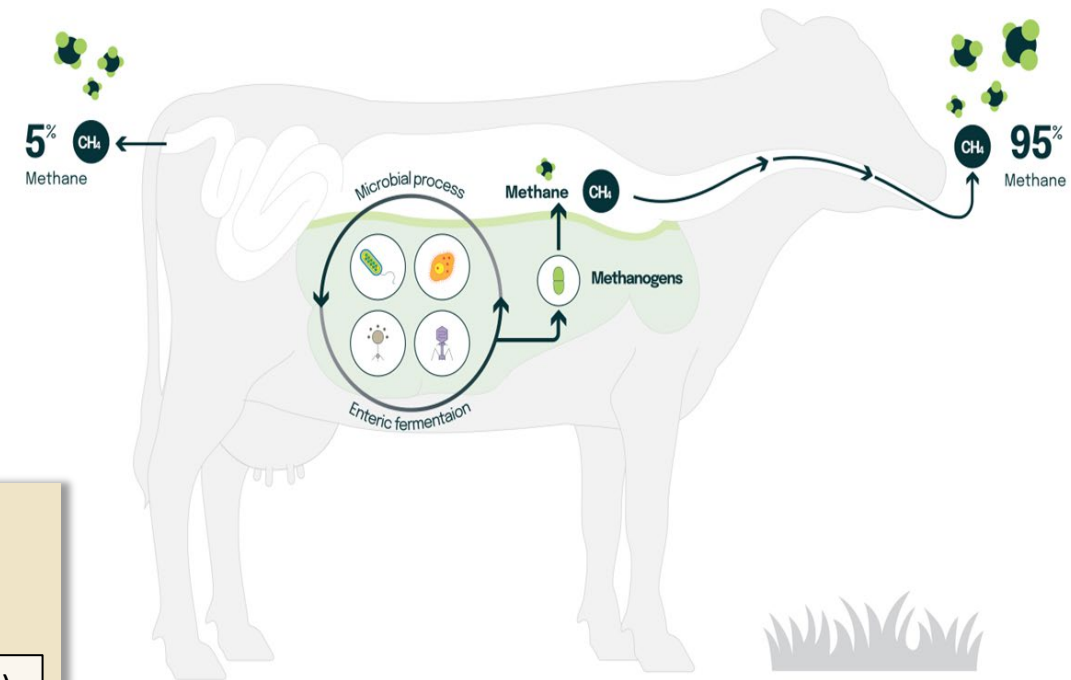
Menci *et al.* (2021)

Tannins have positive effects on by-pass proteins and modulation of ruminal fermentation, with potentially positive consequences methane emissions.

Nawab *et al.* (2020)

Saponins have been considered promising natural substances for mitigating methane emissions from ruminants.

Jayanegara *et al.* (2014)



Aim of the study

Test a blend of hydrolysable and condensed tannins and saponins on high CH₄ emitters cows.



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How?

1 Selecting from a herd high CH₄ emitters cows.

2 Evaluating *Silvafeed*[®] BX (0.08%DMI) effects.

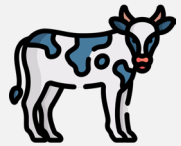


Materials and methods



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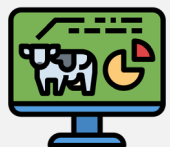
1 Selecting from a herd high CH₄ emitters cows.



40 Italian Holstein cows from experimental-teaching dairy farm of the University of Bologna.



Methane was measured during for 2 days (3 times/day) pointing the laser at the cow's muzzle.

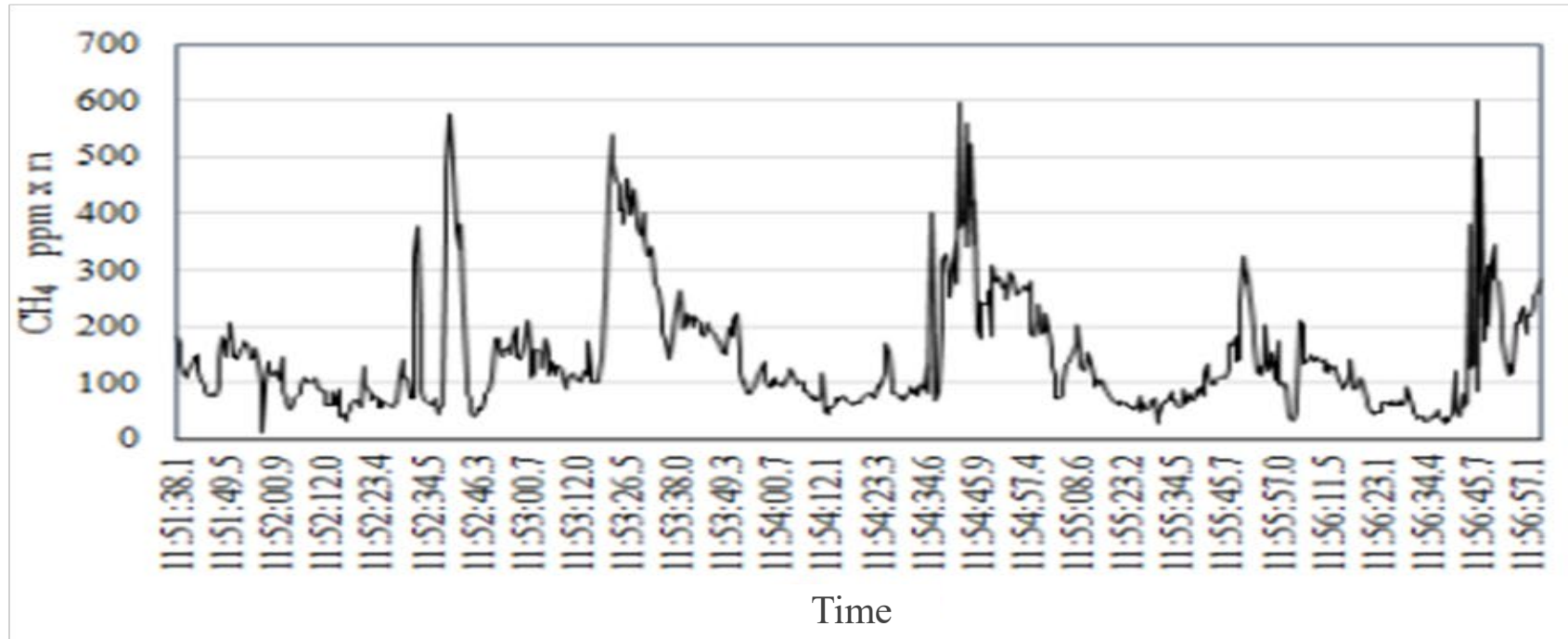


Statistical analysis was performed using cluster analysis to divide high (HM) and low emitters (LM).

Materials and methods



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Data was collected in ppm/m and converted to grams/day:

$$\text{CH}_4 \text{ (g/day)} = 150 + 2.2 \times \text{CH}_4 \text{ peak mean (ppm/m)}$$

Sorg *et al.*, 2018

Groups' characteristics



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	Low Emitters (LM)	High Emitters (HM)	SEM	<i>p</i> -value
Cows, n°	34	6		
Body weight, kg	659.25	635.50	17.15	0.21
Lactation, n°	1.50	1.50	0.15	0.99
CH ₄ , g/d	364.07	512.73	12.55	<0.01
PMR ¹ intake, DM kg/d	22.68	21.04	0.88	0.09
AMS ² concentrate intake, DM kg/d	4.55	4.55	0.38	0.98
Water intake, L/d	182.66	164.08	13.95	0.23
Milk yield, kg/d	39.63	39.98	2.09	0.88

¹PMR: Partial Mixed Ration; ²AMS: Automatic Milking System

Materials and methods



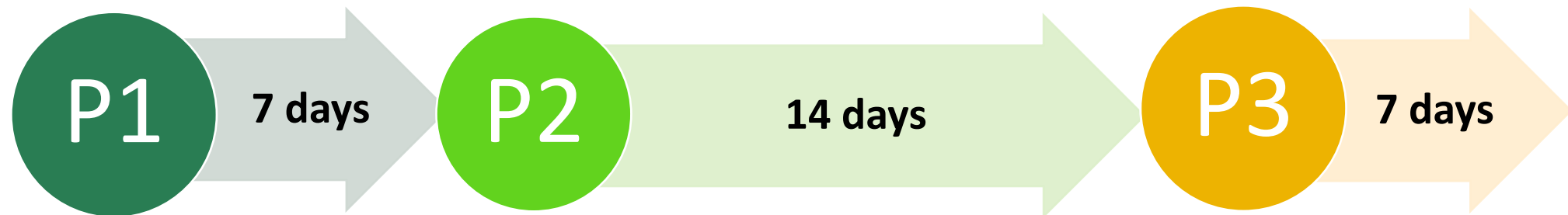
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2

Evaluating *Silvafeed*® BX (0.08%DMI) effects.

Longitudinal design study:

- **Period 1 (P1):** baseline without blend
 - **Period 2 (P2):** blend adaptation
 - **Period 3 (P3):** collection period



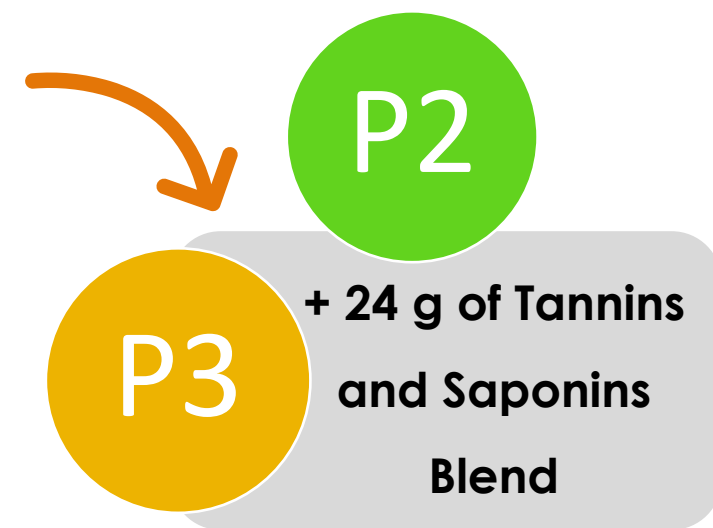
Materials and methods

Characteristics of the diet



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Ingredients, kg/head/day	Parmigiano Reggiano ration
Alfalfa hay	7.0
Wheat hay	7.0
Beetpulp	2.0
Corn-sorghum flaked	10.0
Liquid feed	0.3
Extruded soybean meal	2.4
Soybean whole flaked	1.0
Minerals and vitamins mix	0.45
Rumen protected Methionine	0.02
Rumen protected Lysine	0.08
Composition, %DM	
Crude protein	14.67
Ether extract	3.61
Starch	23.30
aNDFom	37.60
uNDF	13.56



Materials and methods

Samplings

At **P1** and **P3** :



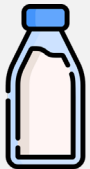
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Individual feed, water intake
and **reticular pH** were continuously recorded.



Cows were automatically **weighed after each milking** and
rumination time monitored by **accelerometer collar tag**.



Milk and rumen fluid were collected
and **analyzed for composition**.



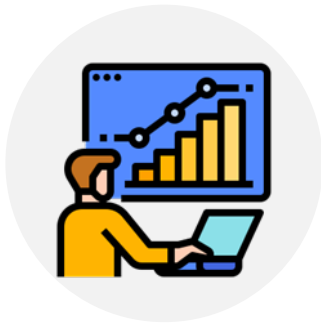
Methane emissions were measured
using a **laser methane detector**.

Materials and methods

Statistical analysis



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Linear Mixed Model



➤ Fixed effect:

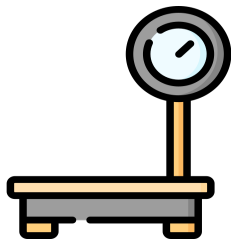
- Tannins vs No Tannins

➤ Random effect:

- Cow

Results and discussion

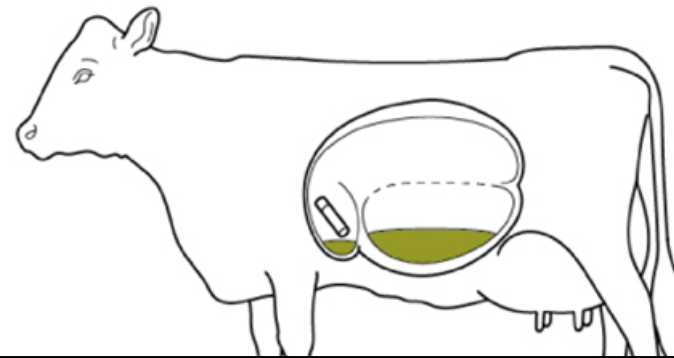
Zootecnical parameters



	TAN-	TAN+	SEM	P-value
Dry Matter Intake, kg/d	25.95	26.44	1.28	0.31
Water Intake, L/d	150	155	11.22	0.25
Rumination Time, min/d	500	492	41.93	0.66
Body Condition Score	2.25	2.26	0.06	0.88
Body Weight, kg	620	624	35.47	0.93

Results and discussion

Inside the rumen

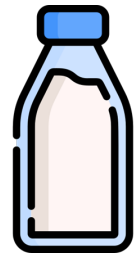


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	TAN-	TAN+	SEM	P-value
Reticular pH	6.22	6.28	0.07	0.01
Reticular pH < 5.8, min/d	75.08	5.69	5.98	0.01
Reticular pH daily spread	0.755	0.652	0.04	0.01
VFA, mmol/L	96.96	100.02	3.37	0.28
Rumen ammonia, mg/dL	5.59	5.59	0.60	0.98

Results and discussion

Milk yield and composition



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	TAN-	TAN+	SEM	P-value
Milk Yield, kg/d	40.72	43.58	3.07	<.01
Fat yield, g/d	1427	1413	102.95	0.54
Protein yield, g/d	1260	1423	84.77	<.01
Energy-Corrected Milk, kg/d	37.58	39.40	2.62	<.01

Results and discussion

Efficiency and sustainability



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	TAN-	TAN+	SEM	P-value
CH ₄ , g/day	502	457	14.85	<.01
MY/DMI, kg	1.58	1.64	0.06	0.15
ECM/DMI, kg	1.46	1.48	0.04	0.46
CH ₄ /DMI, g/kg	19.35	17.28	0.66	<.01
CH ₄ /MY, g/kg	12.33	10.49	0.58	<.01
CH ₄ /ECM, g/kg	13.36	12.00	0.60	<.01
Dietary Nitrogen Retention	32.35	36.45	1.10	<.01

Conclusion



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Addition of ***Silvafeed*® BX** in the dairy cow diet after 14 days of adaptation produces:

	TAN+
DMI & RT	=
Rumen NH ₃ & VFA	=
Rumen pH Stability	↑
Milk Yield	↑
Milk Protein Yield	↑
Energy-corrected Milk	↑
Nitrogen Utilization	↑
Feed Efficiency	=
Methane Emissions	↓



A close-up photograph of a cow's head in a barn. The cow has white fur with black patches and is looking out of a large open doorway. Outside, a vibrant sunset or sunrise is visible, with a mix of orange, red, and blue in the sky. A net hangs from the ceiling of the barn.

Thank you for your attention

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