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Ensiling and thermic treatment effects on ruminal carbohydrate fermentation and post-ruminal crude protein concentration in partial-crop peas and faba beans

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Table S1. Crude nutrient and detergent fibre concentrations of field pea and faba bean treatments.

Substrate	DM	CA	CP	AEE	CF	aNDFom	ADFom	ADL	NFE[1]	Starch	GE	ME[2]
Field peas												
Native	375	48	147	11	187	338	244	29	607	268	16.7	11.2
Ensiled	415	42	163	13	173	281	197	21	609	350	18.1	11.9
Toasted	905	45	162	11	185	377	242	32	597	294	17.8	11.3
Ensiled plus toasted	941	45	162	14	194	337	223	26	585	272	18.6	11.3
Faba beans												
Native	375	80	166	13	202	320	275	38	539	187	17.5	10.8
Ensiled	369	76	177	12	220	312	262	27	515	172	17.5	11.0
Toasted	967	80	166	12	200	498	257	44	542	209	17.7	11.0
Ensiled plus toasted	825	74	187	12	176	305	258	31	551	233	17.3	11.1

ADFom = acid detergent fibre expressed exclusive of residual ash, ADL = acid detergent lignin, AEE = acid ether extract, aNDFom = neutral detergent fibre treated with amylase and expressed exclusive of residual ash, CA = crude ash, CF = crude fibre, CP = crude protein, DM = dry matter, GE = gross energy, ME = metabolizable energy, NFE = nitrogen-free extract.

DM is given as g/kg, GE and ME are given as MJ/kg DM, all other nutrient concentrations are given as g/kg DM. Treatments are specified in the text.

[1] Calculated as 1,000 – CA – CP – AEE – CF.

[2] Calculated according to the Society of Nutrition Physiology (GfE, 2017).

Table S2. Crude protein fractions of field pea and faba bean treatments.

Substrate	CP	TP[1]	SP[2]	A	B1	B2	B3	C
Field peas								
Native	147	800	625	200	425	320	24	31
Ensiled	163	450	729	551	178	231	16	25
Toasted	162	796	306	203	103	454	181	58
Ensiled plus toasted	162	399	626	600	25	248	88	38
Faba beans								
Native	166	767	392	233	159	493	68	47
Ensiled	177	552	531	449	82	411	18	41
Toasted	166	803	243	196	47	244	419	93
Ensiled plus toasted	187	602	428	398	30	471	59	42

CP = crude protein, SP = soluble protein, TP = true protein. Protein fractions of the Cornell Net Carbohydrate and Protein System: A = non-protein nitrogen, B1 = buffer-soluble TP, B2 = buffer-insoluble TP minus TP insoluble in neutral detergent, B3 = TP insoluble in neutral detergent, but soluble in acid detergent, C = TP insoluble in acid detergent.

CP is given as g/kg DM and all other analytes are given as g/kg CP. Treatments are specified in the text.

[1] Calculated as B1 + B2 + B3 + C.

[2] Calculated as A + B1.

Table S3. Amino acid concentrations of field pea and faba bean treatments.

Substrate	Arg	Ile	Leu	Lys	Met	Cys	Phe	Thr	Trp	Val	Ala	Asp	Glu	Gly	Pro	Ser
Field peas																
Native	11.4	6.6	10.8	10.0	1.6	2.0	7.2	6.0	1.6	7.1	7.0	17.0	23.1	6.6	6.0	7.3
	(7.6)	(4.5)	(7.4)	(6.8)	(1.1)	(1.4)	(4.9)	(4.1)	(1.1)	(4.8)	(4.8)	(11.6)	(15.7)	(4.5)	(4.1)	(5.0)
Ensiled	8.5	7.5	11.9	10.6	1.6	1.9	7.8	6.4	1.5	7.9	8.1	18.8	24.6	7.1	6.6	7.4
	(5.2)	(4.6)	(7.3)	(6.5)	(1.0)	(1.2)	(4.8)	(3.9)	(0.9)	(4.9)	(5.0)	(11.5)	(15.1)	(4.4)	(4.1)	(4.5)
Toasted	11.8	7.4	11.7	9.9	1.7	2.0	7.9	6.2	1.7	7.7	7.5	18.5	25.6	7.2	6.2	7.6
	(7.3)	(4.6)	(7.2)	(6.1)	(1.1)	(1.2)	(4.9)	(3.8)	(1.1)	(4.8)	(4.6)	(11.4)	(15.8)	(4.4)	(3.8)	(4.7)
Ensiled plus toasted	6.4	6.5	9.4	7.4	1.2	1.3	5.9	5.4	0.8	7.1	8.2	15.6	19.8	6.2	5.5	5.7
	(4.0)	(4.0)	(5.8)	(4.6)	(0.7)	(0.8)	(3.6)	(3.3)	(0.5)	(4.4)	(5.1)	(9.6)	(12.2)	(3.8)	(3.4)	(3.5)
Faba beans																
Native	14.4	7.0	12.3	10.0	1.5	1.7	7.3	6.3	1.9	7.7	7.4	18.2	25.9	7.7	7.2	8.1
	(8.7)	(4.2)	(7.4)	(6.0)	(0.9)	(1.0)	(4.4)	(3.8)	(1.1)	(4.6)	(4.5)	(11.0)	(15.6)	(4.6)	(4.3)	(4.9)
Ensiled	8.4	7.1	11.7	9.8	1.5	1.5	6.9	6.1	2.4	8.1	7.5	17.7	24.0	7.6	6.7	5.9
	(4.8)	(4.0)	(6.6)	(5.5)	(0.9)	(0.9)	(3.9)	(3.5)	(1.4)	(4.6)	(4.2)	(10.0)	(13.6)	(4.3)	(3.8)	(3.3)
Toasted	11.1	6.3	10.8	7.5	1.4	1.5	6.3	5.6	1.8	7.0	6.6	15.8	22.7	7.1	6.2	7.1
	(6.7)	(3.8)	(6.5)	(4.5)	(0.8)	(0.9)	(3.8)	(3.4)	(1.1)	(4.2)	(4.0)	(9.5)	(13.7)	(4.3)	(3.7)	(4.3)
Ensiled plus toasted	9.8	7.5	12.6	10.4	1.6	1.6	7.4	6.4	2.3	8.4	8.0	19.2	26.3	8.0	6.9	6.8
	(5.2)	(4.0)	(6.7)	(5.6)	(0.9)	(0.9)	(4.0)	(3.4)	(1.2)	(4.5)	(4.3)	(10.3)	(14.1)	(4.3)	(3.7)	(3.6)

Ala = alanine, Arg = arginine, Asp = aspartic acid, Cys = cysteine, Glu = glutamic acid, Gly = glycine, Ile = isoleucine, Leu = leucine, Lys = lysine, Met = methionine, Phe = phenylalanine, Pro = proline, Ser = serine, Thr = threonine, Trp = tryptophan, Val = valine.
Amino acid concentrations are given as g/kg dry matter and g/16 g nitrogen (in brackets). Treatments are specified in the text.

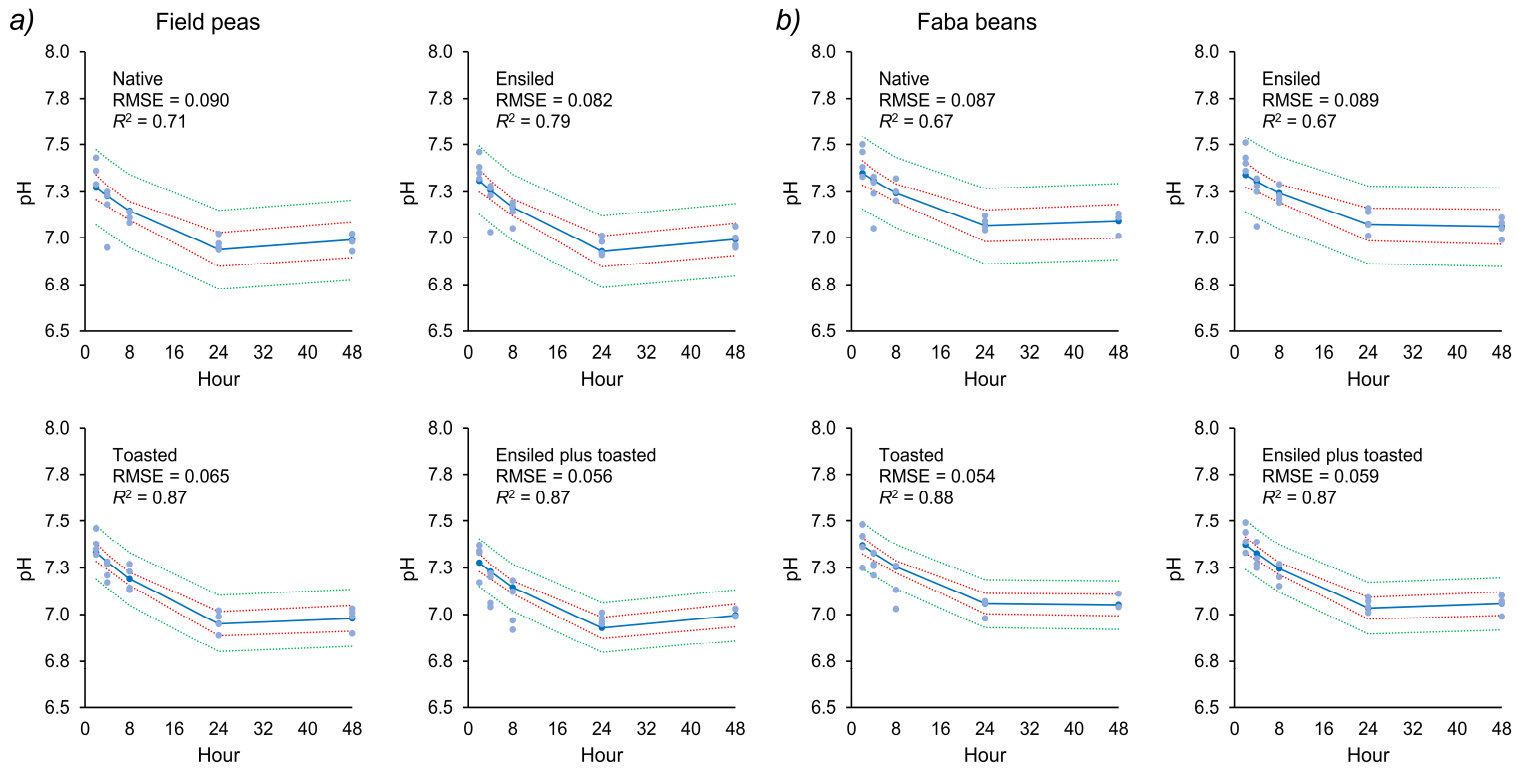

Figure S1. Measured and predicted pH-values during 48 h incubation of native, ensiled, and thermally treated partial-crop field peas (a) and faba beans (b) in a ruminal fluid batch-culture system. RMSE = root mean square error. Blue circles mark the dependent variable (i.e., measured pH-values), the solid blue line marks the predicted pH using quadratic regression, the centred dashed red lines mark 95% confidence limits of the mean, and the outer dashed green lines mark 95% prediction limits. Treatments are specified in the text.

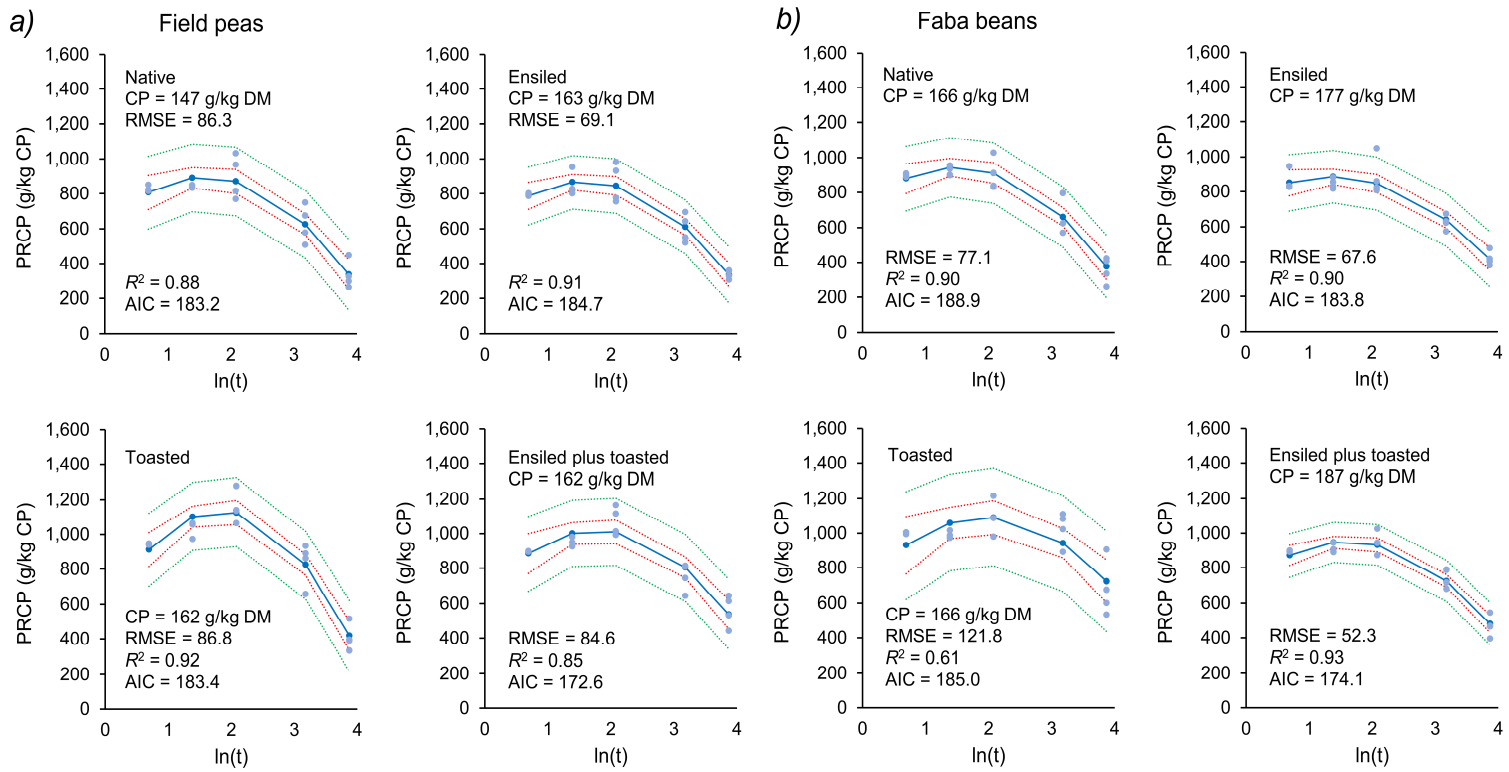

Figure S2. Measured and predicted concentrations of post-ruminal crude protein (PRCP) during 48 h incubation of native, ensiled, and thermally treated partial-crop field peas (a) and faba beans (b) in a ruminal fluid batch-culture system on CP basis plotted on a log time scale (ln(t)). DM = dry matter, CP = crude protein, RMSE = root mean square error. Akaike information criterion (AIC) and Mallows's *Cp* criterion were used to assess whether a linear, quadratic, or linear plus quadratic model best fits. *Cp* was 3.0 for all models selected; in all cases, the linear plus quadratic model had the best fit. Blue circles mark the dependent variable (i.e., measured PRCP), the solid blue line marks the predicted PRCP concentration, the centred dashed red lines mark 95% confidence limits of the mean, and the outer dashed green lines mark 95% prediction limits. Treatments are specified in the text.