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IN VITRO GAS PRODUCTION AND SHORT-CHAIN FATTY ACID PRODUCTION FROM TROPICAL FORAGE LEGUMES INCUBATED WITH AND WITHOUT POLYETHYLENE GLYCOL

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Introduction

- Tropical forage legumes (TFL) are commonly of superior nutritional quality than tropical forage grasses, but may contain considerable levels of tannins, hampering nutrient degradation and digestion.
- Nevertheless, tannin concentration and activity may differ between different TFL species, their stage of maturity, and between fresh or ensiled forages.

Objective

To evaluate the effects of polyethylene glycol (PEG) supplementation in young or old TFL that were either fresh or ensiled on *in vitr*o gas production (IVGP) and short-chain fatty acid (SCFA) production.

Materials and methods

Pennisetum purpureum
[*Pennisetum purpureum* Schumach.]

Setaria spachelata
[*Setaria sphacelata* (Schumach.) Stapf & C.E. Hubb. var. Anceps]

Maturity:
- medium

Forage type:
-fresh

Arachis pintoi
[*Arachis pintoi* Krapov. & W.C. Greg.]

Glycine max
[*Glycine max* (L.) Merr.]

Maturity:
- young
- old

Forage type:
- fresh
- silage

Results (cont.)

Table 2. *In vitro* ruminal fermentation parameters of the samples.

Variable	PEG	Species								SEM	*P*-value				
		Pennisetum	Setaria	Arachis				Soybean							
Maturity		medium	medium	young		old		young		old					Species* Maturity*
Type		fresh	fresh	fresh	silage	fresh	silage	fresh	silage	fresh	silage		Species	Maturity	Type	PEG	Type*PEG
IVGP8 (ml/350 mg DM)	-	12.0	4.34	9.52	8.87	9.71	11.2	15.2	8.76	11.4	8.70	0.56	<.001	0.08	<.001	0.02	<.001
	+	12.7	4.19	9.74	8.96	13.6	13.7	14.7	8.96	12.1	8.21						
IVGP24 (ml/350 mg DM)	-	32.1	26.8	26.8	30.9	33.4	36.0	35.5	26.6	29.7	25.7	0.77	<.001	<.001	<.001	0.07	<.001
	+	32.9	24.7	29.5	30.8	38.1	39.5	35.5	27.3	29.2	25.0						
SCFA (mmol/30 ml)	-	0.71	0.58	0.58	0.68	0.74	0.80	0.79	0.58	0.65	0.55	0.02	<.001	0.002	<.001	<.001	<.001
	+	0.66	0.49	0.59	0.62	0.77	0.80	0.71	0.54	0.58	0.50						

Arachis: *Arachis pintoi*; DM: dry matter; IVGP8: *in vitro* gas production after 8 h of incubation; IVGP24: *in vitro* gas production after 24 h of incubation; PEG: polyethylene glycol; Pennisetum: *Pennisetum purpureum*; SCFA: short-chain fatty acid; SEM: standard error of the mean; Setaria: *Setaria spachelata*; Soybean: *Glycine max.*

Materials and methods (cont.)

- *Pennisetum purpureum* and *Setaria sphacelata* were collected as control from El Salvador and Indonesia, and both TFL were collected from Brazil.
- Each forage sample (350 mg) was incubated individually without and with PEG supplementation (750 mg; molecular mass 4000) in triplicate in 2 independent runs in the Hohenheim gas test.
- Six syringes of blanks were prepared and contained only the rumen-fluid medium and no feed material.
- The IVGP was calculated by subtracting values for the blank.
- The cumulative IVGP was recorded after 8 and 24 h of incubation and total SCFA production was calculated according to Getachew et al. (2002).
- All data were analyzed using the mixed procedure of SAS with species, maturity stage, type of forage conservation, PEG supplementation, and their interactions as fixed effects and run as random effect.
- Least squares means were compared at $P < 0.05$.

Results

Table 1. Chemical compositions of the samples (g/kg DM).

Samples	DM (g/kg FM)	CP	aNDFom	ADF	ADL
Pennisetum medium fresh	944	79.9	551	323	32.1
Setaria medium fresh	938	94.7	564	308	22.8
Arachis young fresh	927	236	343	275	280
Arachis young silage	925	240	332	268	275
Arachis old fresh	928	196	365	277	369
Arachis old silage	927	197	340	265	342
Soybean young fresh	924	159	376	310	238
Soybean young silage	895	172	360	298	227
Soybean old fresh	927	174	377	333	237
Soybean old silage	897	179	367	330	230

ADF: acid detergent fiber; ADL: acid detergent lignin; aNDFom: amylase–treated, ash–corrected neutral detergent fiber; Arachis: *Arachis pintoi*; CP: crude protein; DM: dry matter; FM: fresh matter; Pennisetum: *Pennisetum purpureum*; Setaria: *Setaria spachelata*; Soybean: *Glycine max.*

Conclusions

- Tannins are more active in old than young *Arachis pintoi* and more active in fresh than ensiled *Arachis pintoi*.
- Tannins have no effect on *in vitro* fermentation in *Glycine max* and tropical forage grasses i.e. *Pennisteum purpureum* and *Setaria sphacelata*.

Reference

Getachew, G., Makkar, H.P.S., Becker, K. (2002). Tropical browses: Contents of phenolic compounds, *in vitro* gas production and stoichiometric relationship between short chain fatty acid and *in vitro* gas production. *J. Agric. Sci.* 139:341–352. doi:10.1017/S0021859602002393.

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