Mixtures of tropical forages of different quality: do they act additively or synergistically on *in vitro* ruminal fermentation? (Mischungen tropischer Futtermittel unterschiedlicher Qualität: wirken sie additiv oder synergistisch auf die Fermentationseigenschaften *in vitro*?). A. Jayanegara*, Svenja Marquardt, M. Kreuzer and F. Leiber – Zürich

It has rarely been studied whether combinations of tropical forages differing in phenolic composition result in synergistic effects on ruminal fermentation properties. In the present study, four contrasting plants were tested *in vitro* alone and in mixture to determine in particularly whether the effects on CH_4 emission and digestibility are really synergistic or simply additive.

Methods: Leaves of four tropical plant species, namely *Carica papaya* (P), *Clidemia hirta* (H), *Eugenia aquea* (A) and *Swietenia mahagoni* (M), known to be contrasting in content of phenolic compounds, were collected from the area of Bogor, Indonesia. The plants were analyzed for their nutritional (proximate) composition and several phenolic fractions. Approximately 200 mg DM of either single plants or mixtures were incubated *in vitro* (24 h, 39 ºC) with 30 ml of ruminal fluid/ buffer mixture (1:2; v/v) using the Hohenheim Gas Test protocol. The mixtures contained equal proportions of plants, and included all possible combinations (PH, PA, PM, HA, HM, AM, PHA, PHM, PAM, HAM and PHAM). The experiment was conducted in four replicates (runs). After incubation, gas production was recorded and CH_4 was measured. *In vitro* organic matter digestibility (IVOMD) was calculated by an equation based on gas production and proximate analysis. Data were analyzed by ANOVA, followed by Tukey's test, using SAS software version 9.2.

Results: *C. papaya* contained high CP and low NDF, but low contents of phenolic fractions (Table 1). The other plants were relatively poor in CP contents as compared to *C. papaya*, but contained very high amounts of total phenols (TP; >150 g/kg DM) with different major phenolic fractions. *C. hirta* was particularly high in hydrolysable tannins, *E. aquea* was high in non-tannin phenols and *S. mahagoni* was high in condensed tannins.

Table 1: Chemical composition of the experimental plants (in g/kg dry matter)

Plant	CP	EE	NDF	TP
C. papaya	386	47	154	25
C. hirta	129	22	232	216
S. mahagoni	112	45	281	207
E. aquea	100	35	479	169

CP, crude protein; EE, ether extract; NDF, neutral detergent fiber; TP, total phenols.

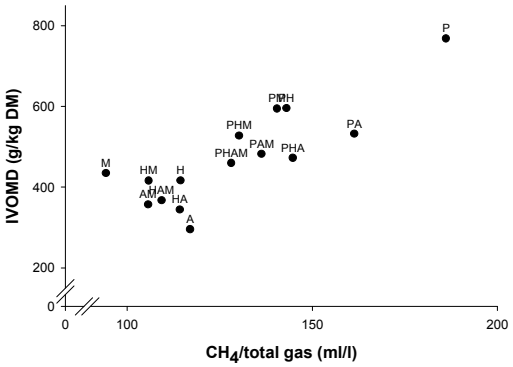

Figure 1: CH_4/total gas production and IVOMD of different plant mixtures.

When incubated alone, *C. papaya* resulted in a higher (P<0.05) CH_4/total gas proportion and IVOMD than the other three plants. Combining *C. papaya* with any other plant reduced (P<0.05) CH_4/total gas and IVOMD. This effect appeared to be additive rather than synergistic, as the values for the mixtures appear mostly linearly between those of the corresponding single plants (Fig. 1).

Conclusion: The present findings do not support the hypothesis that combining tropical plants with different amounts and types of phenolic compounds acts synergistically in promoting a high IVOMD and a low CH_4 emission. This was also true for other fermentation variables (data not shown).

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