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In Vitro Fermentation of Lablab and Jack Bean with Polyphenols Affected by Ensiling Conditions

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Abstract

Many tropical forage legumes may contain substantial amounts of protein-binding polyphenols. Yet, ensiling may modify the concentration of polyphenols in forage legumes. Thus, it is expected that ensiling length will elevate polyphenol activities in forage legumes, thereby binding the proteins available and reducing rumen fermentation. An experiment was conducted to assess the *in vitro* fermentation of lablab and jack bean forage with and without polyethylene glycol (PEG) addition as affected by ensiling length and storage temperature. Samples of lablab and jack bean forages utilised consist of fresh forage, forages wilted for 6 h and forage that were ensiled indoor or outdoor for 75 and 180 days. Total phenols (TP) and tannins were analysed in all samples. Forage samples (375 mg) were incubated *in vitro* in buffered ruminal fluid with or without PEG (750 mg) in triplicate for 24 h in three runs. After 24 h of incubation, cumulative gas production (GP) was recorded, and short-chain fatty acid (SCFA) and ammonia-nitrogen (NH₃-N) concentrations were determined. Data were analysed using the GLIMMIX procedure of SAS in a 2 × 4 factorial design and their interactions. There was an interaction effect between ensiling length and storage temperature for TP and tannin concentrations of lablab ($p < 0.05$) and for TP concentration of jack bean ($p < 0.01$). Tannin concentration in jack bean increases with ensiling length ($p < 0.01$). There was an interaction between ensiling length and PEG for NH₃-N concentration for lablab ($p < 0.05$). Variable effects of ensiling length were observed for GP, NH₃-N, and SCFA for lablab and jack bean. For lablab, the GP with PEG was greater than without PEG ($p < 0.01$). Branched-chain fatty acid (BCFA) concentrations of lablab and iso-butyrate concentration of jack bean with PEG was lower than without PEG ($p < 0.01$). The results suggest that conservation conditions did not protect the biological reactivity of the tannin present in lablab as there is a weaker affinity for protein as seen in the BCFA concentrations. The amount of tannin present in both legumes and the type of tannin could be the reason for the weaker affinity.

Keywords: Forage conservation, legumes, polyphenol, ruminal fermentation, tannin