Effects of Polyethylene Glycol (PEG) on *In Vitro* Dry Matter and Nitrogen Digestibility of *Leucaena* Species and Signal Grass (*Brachiaria decumbens*)

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ABSTRACT

The tropical legume *Leucaena* contains condensed tannin (CT) that binds protein and other components of feed. In fact, *Leucaena* reduces digestibility of nutrients and depending on tannin content and astringency. Polyethylene glycol (PEG) has ability to neutralize CT by displacing protein-tannin complexes, as a consequence of CTs interact more strongly with PEG than they do with protein. *In vitro* studies were conducted to investigate the effect of polyethylene glycol (PEG) on *in vitro* digestibility of *Leucaena* species and grass. *In vitro* studies were conducted in two stages as described by Tilley and Terry (1963) and Jones *et al*. (1998).The results indicated that the digestibility vary depending on the nutrients content of forages and its CT content. Low tannin content of forages had a high digestibility of dry matter and nitrogen, and the rate of ammonia-N production. PEG consistently improved the digestibility of nitrogen and to some extent of dry matter, and the rate of ammonia-N production of tannin-containing forages but not non-tannin-containing of grass. The maximum values were 60.6%, 71.2% and 93.6 mg/d for corrected dry matter digestibility, nitrogen digestibility and the rate of ammonia-N production respectively, when PEG was included at rate of 200 mg/g samples of forages. High tannin content of forages required more PEG to neutralize the effect of tannin to the same extent of low tannin content forages. PEG, on the other hand, had no effect on digestibility and the rate of ammonia-N production on non tannin-containing grass.

Key words: in vitro, digestibility, condensed tannin, polyethylene glycol

INTRODUCTION

The tropical legume *Leucaena* contains condensed tannin (CT) concentrations which vary widely with species. Of the 26 species which have been studied, *Leucaena collinsii* has the lowest CT content while *Leucaena pallida* has the highest (Dalzell *et al*., 1998; McNeill *et al*., 1998). Tannins are known to affect the availability of nutrients by formation of soluble and insoluble complexes and their effects on the digestibility of nutrients will vary depending on tannin content and astringency (McNeill *et al*., 1998). *In vitro* studies by Makkar *et al*. (1995) have shown that CT influenced nutrient digestibility, to a great extent as measured by reduced gas production (fermentative activity). These researchers also noted that even at the same levels in feed, different tannins had different degrees of effect.

The use of polyethylene glycol (PEG) to neutralize CT has proved useful in further elucidating the specific nutritional consequences of dietary CT as PEG displaces protein-tannin complexes, as a consequence of CTs interact more strongly with PEG than they do with protein (Mangan, 1988). Palmer and Jones (2000) have shown that PEG improved the *in vitro* digestibility of nitrogen in *Calliandra* and most other legumes containing tannins. The objective of the present study was to investigate the effect of the level of PEG on the *in vitro* digestibility of a wide range of *Leucaena* species and a representative grass (*Brachiaria decumbens*) using the two stages digestion technique of Tilley and Terry (1963) and *in vitro* technique using PEG described by Jones *et al*. (1998b).

MATERIALS AND METHODS

Actively growing *Leucaena* species (*Leucaena pallida* K748, *Leucaena leucocephala* cv. Tarramba K636 and KX2 F1 hybrid of *Leucaena pallida* and *Leucaena leucocephala*) and signal grass (*Brachiaria decumbens)* were used as plant sources. Leaf and edible stem