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Effects of cutting growth stages and stay heights on the silage quality of *Pennisetum purpureum* NP cv. TS3 (1)

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Abstract

Napier grass (*Pennisetum purpureum*) cultivated in the tropical and subtropical regions are renowned for its vigorous growth, high nutritive contents and palatability. The aim of the study was to determine the effects of cutting growth stages and stay heights on silage quality of Napier grass cv. TS3 (NP cv.TS3), that was a dwarf plant type of Napier grass and named in 2009. The 3 × 2 factorial design by completely randomized design (CRD) with 3 replications of each treatment was conducted at the Livestock Research Institute, Council of Agriculture, Executive Yuan, Taiwan, R.O.C. Treatments applied were cutting growth stages at the 30, 60 or 90 days and stay heights with 10 and 20 cm. The results showed that crude protein (CP) contents of silage decreased as the cutting growth stages were extended from 30 to 90 days. The contents of neutral detergent fiber (NDF), hemicellulose (HC) and water soluble carbohydrate (WSC) decreased, too. However, the contents of minerals and acid detergent fiber (ADF) increased during ensiling. No significant difference ($P > 0.05$) was found on the pH values of silages among cutting growth stages. The lactic acid content of silage cut at 60 days interval was higher than that of cut at 30 days ($P < 0.05$). There was no significant difference among cutting growth days on the Flieg's scores. The cutting at 60 days and the stay height with 10 cm might be the most optimum for producing high forage yield with high quality for NP cv. TS3.

Key words: Cutting stage, *Pennisetum purpureum*, Silage quality, Stay height.

Introduction

Elephant grass bears the name Napier grass (*Pennisetum purpureum*) to pay tribute to Colonel Napier of Rhodesia currently known in Zimbabwe who carried out remarkable work to notify the Rhodesian agricultural department on the nutritive value of the grass (Singh *et al.*, 2013).

Napier grass grows around the tropical and subtropical regions in the world. It is often used as forage by cut and carry system and grazing (Wijitphan *et al.*, 2009). The plant species and the harvested growth stage were two principal management factors that could have significant impact on the herbage chemical contents, which could affect the silage fermentation characteristics, dry matter recovery and aerobic stability (McEniry *et al.*, 2013). High quality silage was dependent on the quality of the source material used for ensiling which guarantee optimal nutrient concentration (Khalili *et al.*, 2005; Fan *et al.*, 2018; Fan *et al.*, 2019). Silage quality would be affected by harvest stage, while prolonging the primary growth harvest would cause negative consequences on dry matter intake (Kuoppala *et al.*, 2008). Herbage harvested at an early stage tended to be more difficult to ensile for the greater demand of lower pH values by fermentation acids. Extended harvest date inevitably causes a marked increase on dry matter content of the silage. However, it could cause a decrease in the crude protein and NH_3-N contents (Woodard *et al.*, 1991; Perculija *et al.*, 2011; Bijeliæ *et al.*, 2015). Cheng and Chen (1997)

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