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# FORAGE BASED TOTAL MIXED RATIONS ON MILK PRODUCTION

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## Introduction

The total milk production in the year 2018 in Sri Lanka was 471.6 million litres. However, this was only 45% of the national requirement. Thus 99,028 metric tons of milk powder were imported to meet the gap (Central Bank of Sri Lanka, 2018). The above report further stated that the Government has taken measures in 2018 to introduce newly developed pasture species with the aim of feeding the upgraded cattle to increase the domestic milk production. The new species introduced included Napier (*Pennisetum puerperium*) hybrids obtained from India. These hybrid pastures are high in dry matter content and palatability (Premaratne & Premalal, 2006; Somasiri et al., 2010). Thus, they are popular with the dairy farmers. And the grasses are mostly cut and fed or fed as silage.

Feeding forage based total mixed rations (TMR) is a trend in many medium and large-scale dairy farms in Sri Lanka. The main objectives of feeding TMR are to increase the daily milk production and to enhance the cow body condition score (BCS). Sri Lanka has two distinctive drought seasons; January to March and June to September (Punniyawardena, 2008). During these periods body condition score (BCS) of the dairy cows drops drastically due to lack of quality and quantity of feeds. The objective of the present research was to introduce a grass based TMR to enhance the existing milk production and quality.

## Materials and Methods

A medium-scale farm situated at the intermediate zone (7.4322° N, 80.4438° E, altitude 66 m) was selected for the research. Two TMRs (TMR1 and TMR2) were formulated according to NRC (2001). The composition of the rations is given in Table 1.

Table 1: Composition (percentage) of the Total Mixed Rations (TMR1 and TMR2)

| Raw ingredient | TMR1 | TMR2 |
|---|---|---|
| Chopped maize fodder (*Zea maize*) | 55.5 | 10 |
| Chopped hybrid Napier CO3 (*Pennisetum perpureum X Pennisetum americarnum)* | 13.8 | 25 |
| Chopped guinea grass *(Panicum maximum)* | - | 20 |
| Commercial Cattle feed | 11.1 | - |
| Beer pulp | 11.28 | 4 |
| Dhal meal *(Cajanus cajan)* | 5.55 | - |
| Coconut poonac *(Cocos nucifera)* | - | 20 |
| Rice bran *(Oryza sativa)* | - | 10 |
| Maize meal | - | 10 |
| Mineral mixture | 2.77 | 1 |

TMR 1 had a crude protein (CP) of 8.2% and metabolizable energy (ME) content of 2603.9 kcal/kg while TMR 2 had CP of 7.5% and ME content of 2616.0 kcal/kg.
Eighteen Friesian crossbred lactating cows of age 3.5 years, having an average body weight of 418±13 kg and Body Condition Score of 2.7±0.05, were selected for the research. The initial average milk yield was 9.5±4.12 litres (mean ± SE). The cows were randomly assigned into two treatments (TMR1 and TMR2). Each treatment had three replicates. The treatments were arranged according to a Randomized Complete Block Design. A preliminary period of 7 days was given for the cows to get used to the TMRs. Machine milking was practised twice a day, early morning (3.30 a.m.) and late afternoon (3.30 p.m). Water was provided *ad-lib*. Data such as daily milk yield and feed intake were collected for 5 weeks.

**Results and Discussion**

Effect of Treatment on Milk Yield and Composition

Table 2: Effect of TMR1 and TMR2 on milk yield and composition

| Parameter | Treatment | | |
|---|---|---|---|
| | TMR1 | TMR2 | SE |
| Feed intake (kg as fed basis) | 33.7[b] | 34.8[a] | 0.06 |
| Milk yield (L) | 10.15[b] | 12.01[a] | 0.24 |
| Feed conversion efficiency (FCE) | 0.643[a] | 0.683[a] | 0.0008 |
| Milk composition (%) | | | |
| Fat | 4.54[b] | 4.86[a] | 0.0016 |
| SNF | 8.84[b] | 9.05[a] | 0.00046 |
| Protein | 3.41[b] | 3.65[a] | 0.0081 |

[a b] means within the same row with different superscripts are significantly different ($p < 0.05$).

The cows fed TMR2 had higher ($p<0.05$) feed intake and milk yield than the cows fed TMR1 (Table 2). Supporting the above findings higher milk yields have been obtained by Scharen et al., (2016), Hernandex-Ortega et al., (2014) and Mohammad et al., (2017) by feeding TMR based rations than feeding concentrates and roughages separately. Milk composition data were also higher in TMR2 cows than TMR 1. Similarly, Mohammad et al., (2017) reported that cows fed on TMR had higher ($p<0.05$) total milk fat percentage than feeding concentrates and roughages separately. Bargo et al., (2002) reported that TMR feeding produced 38% more fat than cows on pasture feeding.

However, the feed conversion efficiency (FCE) and BCS (TMR1 2.74±0.0014 and TMR2 2.87±0.0014) were not different between the treatments. The two TMRs had similar efficiencies but TMR2 provided comparatively better results than TMR 1. Khan et al., (2010), Verma et al., (1999), Kolver and Muller, (1998) and Devries and Gill, (2012) suggested that the high performance due to TMR may be due to high palatability and enhanced digestion as a result of low particle sizes. However Felton and Devries, (2010) observed a lower feed intake in TMR compared to conventional feeding. They suggest that it may be a result of high moisture content in TMR reducing the voluntary intake. Feeding TMR is very effective in the Sri Lankan context because it avoids the fluctuations of feed quality and quantity in drought season and high rainfall season where it is difficult to allow the animals to graze outside.

In the extensive management systems in the intermediate zone of Sri Lanka, dairy cows are allowed to undertake tethered grazing under coconut plantations or roadsides or in government lands. The milk production is marginal in this system. However, the majority of the farmers practise semi intensive management system where the cows are allowed to graze during the day and stall-fed at night with concentrates and silage. Thus, the milk production is comparatively high. The cut-and-carry system with

stall-feeding at night with concentrates is practiced in the intensive system (Samarajeewa et al., 2003; Premaratne et al., 2013). However, the labour costs of cut and carry are high if family labour is scarce. Total mixed ration feeding avoids sending the animals for grazing thus it reducers the energy waste of walking and consequent compromises on milk production.

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