# Milk Yield of Dairy Cattle Fed Common *Urochloa* Grass in Kenya

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**Abstract**

*Urochloa* grass mainly grown in South America, East Asia and Australia has its origin in East and Central Africa. Its success in South America for animal production triggered interest in Kenya where the main forage species Napier grass was threatened by head smut and stunt diseases. Therefore, a study was carried out at Mtwapa research station in the coastal lowlands of Kenya under controlled condition to compare the lactation performance of dairy cattle fed on *Urochloa hybrid* cv. Mulato II, *U. decumbens* cv. Basilisk, *U. brizantha* cvs. Piata, MG-4 and Xaraes with Napier grass. An on-farm participatory study was conducted in eastern midlands of Kenya where farmers compared their local feeds (varied mixtures of Napier grass, maize stover and natural pastures) with either Piata, Xaraes, MG-4 or Basilisk). Results from the on-station experiment showed no significant differences ($P < 0.05$) in daily milk yield between dairy cows fed Piata (4.7 kg) and those fed on Napier grass (4.6 kg) while cows fed on either Mulato II or Xaraes produced less ($P < 0.05$) milk; 4.4 and 3.6 kg respectively. In the farmers' trial, milk yield increased by 15 - 40% when they fed their cows on *Urochloa* grasses. The studies concluded that *Urochloa* grasses had potential to replace or compliment Napier grass in dairy feeding in Kenya towards increased milk production.

**Key words:** dairy cows, milk yield, lactation performance, feed intake, participatory evaluation, Kenya

## Introduction

Natural pastures are the main feed resource mainly under free-grazing system in coastal lowlands (Njarui et al. 2016). Milk production for local and exotic/crossbred cattle is low, ranging from 1.0 to 6.4 kg day$^{-1,}$ respectively (Ramadhan et al. 2008). Napier grass (*Pennisetum purpureum* Schumach.), has been promoted in Kenya as the basal feed for dairy cattle. The grass grows under a wide range of conditions and is a valuable forage for the cut-and-carry systems. Napier grass contributes about 10% of feed in coastal Kenya, 35 - 45% in northwestern highlands and about 50% in the central highlands (Njarui et al. 2016). Increased milk production has been recorded where lactating dairy cattle were fed Napier grass supplemented with forage legumes (Juma et al. 2006). Despite its wide promotion and positive effect on milk production, it is challenged by the stunting disease and head smut which calls for alternative grasses. *Urochloa* species are being re-introduced to the region as potential alternatives to Napier grass (Mureithi and Djikeng 2016). *Urochloa* species are native to eastern and central Africa and are extensively grown as livestock forage in South America and East Asia (FAO 2015). The annual dry matter yield ranges from 8 to 20 t/ha depending on moisture and nutrients (FAO 2015). *Urochloa* grasses are among the most nutritious forages in the humid tropics. For example, crude protein in *B. brizantha* ranges from 5 to 16% crude protein and about 58% *in vivo* organic matter digestibility (Heuzé at al. 2016). The current studies evaluated *Urochloa* grasses as basal feed for lactating cows under controlled conditions in coastal lowland Kenya and by farmers in mid-altitude eastern region.

## Materials and methods

### *On-station study*

The study was carried out at KALRO Mtwapa (3°56′ S, 39°44′ E) in the coastal lowlands at an altitude of 15 m above sea level. The site is characterized by light sandy soils and a mean annual rainfall of 1200 mm. The relative humidity ranges from 65 - 95% and the mean annual temperatures range from 24 to 29°C.Sixteen lactating Jersey cows with pre-experiment milk yield ranging from 4 to 5 kg/day and weighing 257 ± 38 kg were used in the experiment. The cows were divided into four groups balanced for milk yield and live weight. The cows were housed in individual feeding stalls and allowed a three weeks acclimatization period on the treatment diets. Napier grass (*Penissetum purpureum*), gliricidia (*Gliricidia sepium*) and grass cultivar (*B. hybrid* cv. Mulato II, *B. brizantha* cvs. Piata, Xaraes) were used for the experiment. The grasses were harvested daily and chopped with a motorized chaff cutter while Gliricidia leaves and stems of less than 5 mm diameter were harvested and wilted a day before feeding the cows. Four treatments (cvs. Mulato II, Piata, Xaraes and

Napier grass cv. Bana) were allocated to the four groups of cows in a completely randomized design. All cows were supplemented with 8 kg fresh gliricidia and 3 kg maize bran in two equal amounts daily at milking in all the groups. Each cow was allowed 60 g of a dairy mineral mix and clean cool water was provided *ad libitum*. Data was collected on feed intake and milk yield for 10 weeks. Composite samples of each feed (maize bran, gliricidia, grasses) were taken at three stages (onset, mid and end of the trial) for chemical analyses (Crude protein, Neutral detergent fibre, Acid detergent fibre, Acid detergent lignin, Ash, Calcium, Phosphorous and digestibility). Data on weight and chemical composition was analysed and means were separated using the least significant difference (LSD) at $P < 0.05$ (SAS, 2003)

***Farmer evaluation of Urochloa***

The study was carried out in Kangundo sub- county in eastern midlands of Kenya by farmers who had been introduced to *Urochloa* grass cultivation in an earlier study to evaluate different cultivars. The smallholders practice mixed crop-livestock farming and keep different livestock species, with about 69% keeping about three dairy animals per farm (Njarui et al., 2016). Eighteen farmers who had planted more than 0.1 ha of any Urochloa cultivars were included in the study. All the lactating cows per farm in mid-lactation (3 and 6 months) were fed a mixture of Napier grass, natural pastures, hay, and milk yield recorded for three consecutive days. This was followed by feeding the cows on *Urochloa* grass for seven days. Milk yield for the last three days was compared with the initial three days milk yield. The mean milk yield per farm was calculated for the first three days when the cows were fed on local feeds and for the last three days, cows were fed on Urochloa grasses. The means were subjected to Analysis of Variance (ANOVA) using the Statistical Analysis System (SAS) (SAS, 2003).

**Results and Discussion**

**On station study**

***Feed composition***

Gliricidia had the highest CP (24.4%) and lowest NDF (34.9%) which was significantly ($P < 0.05$) different from the grasses. Its dry matter and organic matter digestibility were however similar ($P > 0.05$) to that of Napier grass, Mulato II and Piata and different ($P < 0.05$) from Xaraes (Table 1). Digestibility is positively affected by CP and negatively by NDF content. Xaraes had the lowest CP and digestibility and the highest NDF but these values were similar ($P>0.05$) to those recorded for Napier grass, Mulato II and Piata. Similarly, the grasses had similar ADF, ADL, Ca and P. The harvesting stage of the *Urochloa* grasses used in this study was variable. A composite sample of each harvested at three different stages was analyzed (Table 1). The CP and OMD values of the Urochloa cultivars in this study were lower than those reported by Nguku (2015) in the medium attitude Machakos. The CP was 6.9, 5.8, 5.6 and 4.9% for Napier grass, Mulato II, Piata and Xaraes which was like values reported in the current study (Table 1).

Table 1. Chemical composition and digestibility of the feeds

| | Composition on DM basis (%) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Feed | CP | NDF | Ash | DMD | OMD | ADF | ADL | Ca | P |
| Maize bran | 12.6 | 58.0 | 8.5 | 66.8 | 61.8 | 21.4 | 2.6 | 0.9 | 0.03 |
| *Gliricidia sepium* | 24.4 | 34.9 | 7.7 | 57.5 | 51.5 | 34.4 | 17.3 | 0.3 | 1.0 |
| *P. purpureum* cv. Bana | 6.8 | 67.3 | 7.9 | 48.6 | 43.3 | 50.1 | 14.0 | 0.1 | 0.3 |
| *U. hybrid* cv. MulatoII | 5.5 | 66.2 | 6.1 | 46.6 | 42.2 | 50.6 | 8.9 | 0.2 | 0.3 |
| *U. brizantha* cv. Piata | 5.3 | 68.9 | 5.0 | 43.2 | 40.0 | 52.5 | 13.6 | 0.1 | 0.2 |
| *U. brizantha* cv. Xaraes | 5.0 | 70.7 | 5.4 | 35.2 | 32.9 | 52.3 | 9.4 | 0.1 | 0.2 |
| LSD ($P < 0.05$) | 3.67 | 8.10 | 2.36 | 16.07 | 14.28 | 10.45 | 9.52 | 0.08 | 0.368 |

LSD Least significant difference

***Feed intake and milk yield***

The daily basal grass diet DM intake was similar ($P > 0.05$) for cows fed on Napier grass (5.7 kg) and those fed Piata (5.8 kg) and was different ($P < 0.05$) from that of cows fed Mulato II (6.3 kg) or Xaraes (6.4 kg). Mean daily milk production for all the cows was low (4.3 kg $cow^{-1}$), probably due to the late stage of lactation at the start of the experiment. Cows fed Piata (4.7 kg) and Napier grass (4.6 kg) was similar ($P > 0.05$).

However, cows fed on Mulato II (4.4 kg) and Xaraes (3.6 kg) produced less (P<0.05) milk daily compared to those fed on Piata and Napier grass (Table 2).

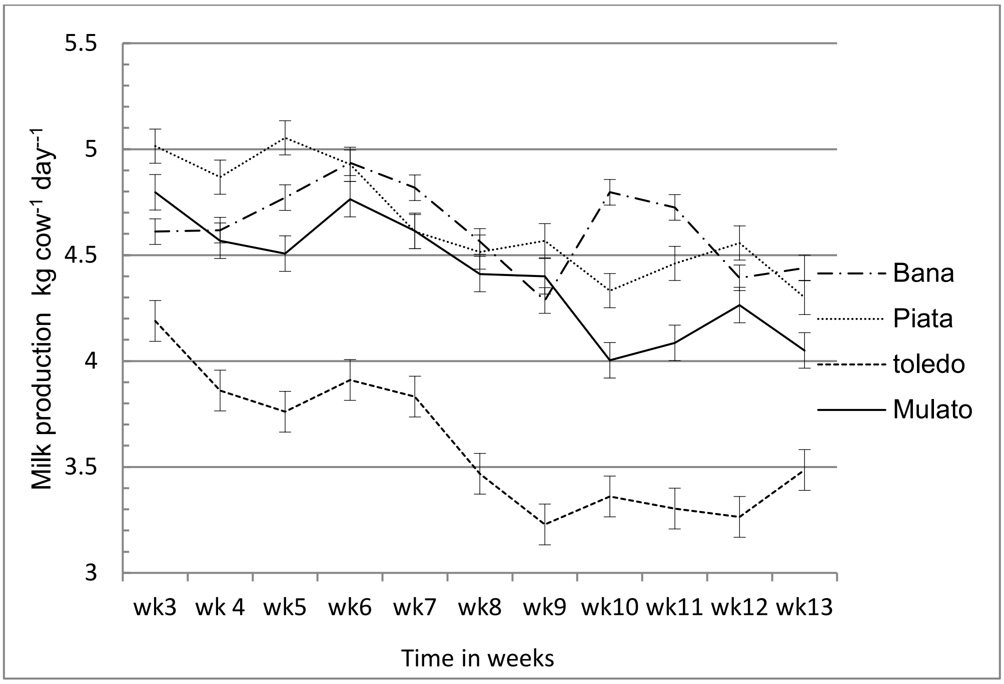
Table 2. Daily basal grass diet intake (kg DM) and milk yield (kg) per cow

| Treatment | Grass DM intake | Total DOM intake | Milk yield |
|---|---|---|---|
| *U. brizantha* cv. Piata | 5.8 | 5.3 | 4.7 |
| *P. purpureum* cv. Bana | 5.7 | 5.5 | 4.6 |
| *U. hybrid* cv. Mulato II | 6.3 | 5.1 | 4.4 |
| *U. brizantha* cv. Xaraes | 6.4 | 4.9 | 3.6 |
| LSD (P < 0.05) | 0.29 | - | 0.14 |

LSD, Least significant difference

Total Digestible Organic Matter (DOM) intake = Dry Matter (DM) intake*Digestibility for grass, gliricidia and maize bran

Cows fed on Xaraes had the highest DM intake and the lowest milk yield, while the digestible organic matter (DOM) intake was 2.5, 2.7, 2.3 and 2.1 kg for cows fed on Bana, Mulato II, Piata and Xaraes respectively. The DOM intake was positively related to milk yield; thus, Xaraes had the lowest DOM intake and lowest milk yield. The milk yield from cows fed Piata was comparable to cows fed Bana (Figure 1).




Bana = Napier grass

**Figure 1. Milk production from Jersey cows fed different *Urochloa* grasses and Napier grass in coastal lowlands, Kenya**

**On farm study**

Out of the 18 farmers who registered for the feeding trial, only data from 12 farms with adequate *Urochloa* to last one week were analysed. Farmers used Piata, Xaraes, MG4 and Basilisk depending on what they had planted. Milk production increased from 4 to 4.6 litres/cow per day for low yielding animals, representing a 15% increase and from 9 to 12.6 litres/cow per day for the relatively higher yielding dairy cattle representing a 40% increase (Figure 2). This indicates that *Urochloa* is superior to the locally available feeds used by the farmers in the area during the study period.

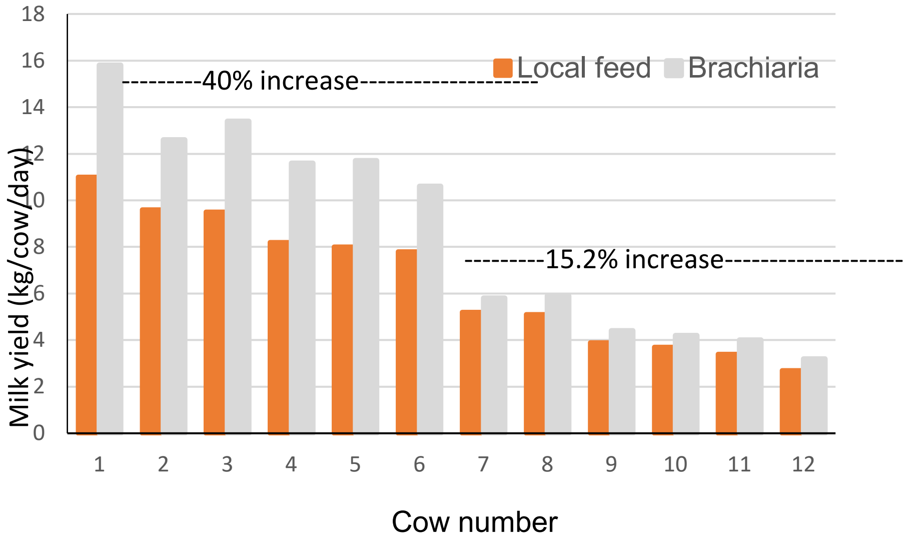



**Figure 2: Milk yield from cows fed local feeds or Urochloa**

## Conclusion

Urochloa accessions Piata and Mulato have potential to replace Bana in dairy feeding especially in areas where it is threatened by head smut and stunting disease.

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