ISSN: 2287-688X

Annals of
Plant Sciences

Volume 11, Issue 06 (2022) pp. 5176-5184

Research Article

# Growth performance, Biomass Production and Influence of Selected *Brachiaria* Cultivars on Milk Yield from Dairy Cows at Sokoine University Model Farm, Tanzania

**Ismail Saidi Selemani**

*Department of Animal, Aquaculture and Range Sciences, Sokoine University of Agriculture (SUA). P. O. Box 3004, Morogoro, Tanzania*

**Abstract**

The effect of climate change and variability has posed serious nutritional stress to livestock in tropical region. Although, high yielding fodder grass such as climate-smart *Brachiaria* have been recommended for smallholder dairy farming in semi-arid regions, little information is available with regard to growth habits, yield and their impacts on dairy productivity. The on-station experiments were conducted at Sokoine University Model Farm to investigate the growth characteristics of three *Brachiaria* cultivars and their influence on feed intake and milk yield of dairy cows. The Complete Randomized Design was used to examine the growth and yield attributes of three *Brachiaria* cultivars; *Brachiaria decumbens* cv. Basilisk (BdB), *Brachiaia brizantha cv.* Piata (BbP) and *Brachiaria brizantha cv.* Xaraes (BbX). The second experiment was feeding trial that used the two best selected Brachiaria cultivars (BdB & BbP); tested against two breeds of dairy cows (Friesian and Ayrshire) in terms of feed intake and milk yield using 2 × 2 factorial design. The results revealed significant higher numbers of tillers (46%) and leaves per plant (47%) for BdB. In addition the cultivar Basilisk exhibited significant higher above ground biomass yield (7545.2kg/ha) which was attributed to its morphological structure. Interestingly, dairy cows fed on Piata had relatively higher feed intake and milk yield. Establishment of BbP for smallholder dairy producers is recommended especially in areas characterized with sub-humid climate. Further studies on nutritional composition and digestibility of *Brachiaria* are recommended.

**Keywords:** *Brachiaria cultivars, Climate change, Feed intake, Fodder grass, Milk yield.*

## Introduction

Livestock production is one of the largest agricultural activities that employ at least 1.3 billion people globally and support the livelihoods of 600 million poor smallholder farmers in developing countries (Thornton, 2010). In Tanzania livestock sector contributes about 7.4% of the country's GDP (URT, 2019). The country has about 33.9 million cattle, 21.29 million goats and 8.5 million sheep of which more than 90% depends on natural pasture (URT, 2021). However, seasonal fluctuation in forage availability and quality is adversely affecting livestock production with significant drops in the country's DGP from 18% in 2006 (Kanuya. *et al*., 2006) to 7.4% in 2019 (URT, 2019). The effect of climate change and variability has posed severe nutritional stress to livestock in Africa particularly during dry season due to sharp decline in forage quantity and quality (Kanuya. *et al*., 2006; Selemani. *et al*., 2013). This has resulted into low milk production per cow ranging from 4 to 5L in dry season and 6 to 8L in wet season for dairy cows with genetic potential of producing at least 15L per cow/day (Mtengeti. *et al*., 2008). Currently, the Tanzania is producing only 3 billion litter of milk per year (URT 2021) which is far below the milk market demand. Low milk production is attributed to among other factors, poor availability of high quality forage resources.

***Corresponding Author:**
**Ismail Saidi Selemani;**



DOI: http://dx.doi.org/10.21746/aps.2022.11.6.4

High yielding fodder grasses such as "Climate-Smart *Brachiaria*" have been recommended for smallholder dairy farming in semi-arid areas because of their ability to tolerate drought (Djikeng. *et al*., 2014). Climate-Smart *Brachiaria* refers to high quality, climate resilient and productive *Brachiaria* genotypes that were selected and improved in Latin America (Djikeng. *et al*., 2014). The recommendation of *Brachiaria* is attributed to several desirable traits including its ability to adapt low soil fertility and acidity, tolerance to drought, shade and flooding, high biomass yield potential and ability to efficiently utilize Nitrogen (Ghimire. *et al*., 2015). Although *Brachiaria* is one of the most extensively studied tropical forage particularly in Brazil and Australia (Ghimire. *et al*., 2015), little information is available in Tanzania with regard to its growth habits, yield and its impacts on livestock productivity. The most common studied *Brachiara* species that have shown better adaptation to low soil fertility and drought condition in East Africa are *Brachiaria decumbens, Brachiaria brizantha*, *Brachiaria mutica* and *Brachiaria ruziziensis* (Ghimire. *et al*., 2015; Ondabu. *et al*., 2016). Little widespread adoption of *Brachiaria* practices in tropical regions is attributed to limited knowledge on the role of improved pasture to livestock production. The global increases in demand for animal-derived protein particularly milk (Henchion. *et al*., 2017 coupled with declining natural forage resources due to the effect of climate change and variability renewed the interest of researchers to come up with climate resilient forage with high impact on milk production. The current study investigated the growth and yield of three Brachiaria cultivars; *Brachiaria decumbens* cv. Basilisk *(*BdB), *Brachiaria brizantha cv.* Piata (BbP) *and Brachiaria brizantha cv.* Xaraes *(*BbX) in the first experiment and the two best cultivars (BdB and BbP) were tested (in the feeding trial experiment) on feed intake and influence on milk yield for selected dairy cows.

## Material and Method

### Description of Study Area

The study was conducted at Magadu Livestock Unit in the Sokoine University of Agriculture (SUA) Model Training Farm, located at Morogoro region Tanzania. The farm is located in the slope of Uluguru Mountain between 37º39E and 06º5' S with elevation ranging from 500 to 600 metres above sea level. The study area had sub-humid climate with the average annual temperature ranging from 18ºC to 30ºC and the rainfall is bi-modal, ranging from 600-900mm per year (Paavola, 2008). Short rain is normally occurs in November to December while long rain occurs between March and May. The current experiment was conducted between March and May. The common vegetation type is grassland with scattered woody plants typically Acacia species such as *Acacia nilotica*, *Acacia tortilis* and *Acacia seyal*. The dominant key grasses are; Pitted beard grass (*Bothriochloa pertusa*), Buffel grass (*Cenchrus ciliaris*), Rhodes grass (*Chloris gayana*), Bermuda grass (*Cynodon dactylon*), Giant African Star grass (*Cynodon nlemfuensis*) and Giant rat's tail grass (*Sporobolus pyramidalis)* (Selemani, 2018). Although the area contains high nutritious and palatable legumes such as *Centrosema pubescens, Calopogonium mucunoides* and *Macroptilium atropurpureum*, it is heavily encroached by notorious invasive species such as *Lantana camara, Venonia glabra* and *Solanum incanum* (Selemani, 2018). Soil texture of the study area is dominated by sandy (12% clay, 4% silt, and 84% sandy) with pH of 6.6 (Kizima. *et al*., 2014). The common livestock managed in the farm are cattle, goats, sheep, and few horses.

### Experimental Design and Sampling Procedure

#### Growth Characteristics and Yield of *Brachiaria*

Prior to feeding trial, the growth and yield of climate-smart *Brachiaria* cultivars were studied for one growing season. The study used the Complete Randomized Design where three *Brachiaria* cultivars (BbP, BbX and BdB*)* were randomly replicated four times in each experimental plot. Each cultivar was sown in four sub-plots of 4 × 5 m. The distance between sub-plots was 1 m apart. The seedbeds

were prepared by using hand hoe and the pasture seeds were sown at the depth of 0.5 to 1 cm deep. The sowing rate was approximately 6 kg seeds/ha at specific rows maintained at 50 cm intervals between rows. The sowing in all experimental plots was done at the onset of the long rainy season in March 2019. The Triple Super Phosphate (250 kg/ha) was applied during sowing and Urea was used as top dressing fertilizer after 8 weeks of establishment. All sub-plots received similar agronomic management such as manual weeding using hand hoe.

Growth performance of each variety was monitored throughout the growing period from March to May. Data collection commenced one month after sowing and measurements were done for every two weeks. Number of individual plants were counted randomly using 0.5 x 0.5 m quadrat. Within the quadrat, four individual plants were selected randomly for height measurement and counting numbers of tillers and leaves per plant. Yield in terms of above ground biomass of each cultivar was estimated through Dry Matter (DM) determination of collected samples (free from weeds) in the laboratory. Fresh and green samples were collected from each cultivar within the 0.5 × 0.5m quadrat at ground level and weighed. Thereafter, each sample was chopped and from it, the fractions of samples were taken to the laboratory of the Department of Animal, Aquaculture and Range Sciences for DM determination. In the laboratory samples were forced-dried in oven at 105°C for 48h based on standard procedures (Brahmakshatriya and Donker, 1971). After drying to constant weight, samples were weighed again to determine DM content and results expressed in kg DM ha.

**Feeding Trial Experiment**

The experimental design followed 2 × 2 factorial arrangements with two factors; two breeds of dairy cows and two selected best *Brachiaria* cultivars (BdB and BbP) with high growth performance recorded from experiment one. Sixteen dairy cows (8 Friesian and 8 Ayrshire breed) were selected for feeding trial at SUA Model Training Farm. Out of 16 cows, eight dairy cows (4 Friesian and 4 Ayrshire breed) were fed BdB and other eight (4 Friesian and 4 Ayrshire breed) were fed BbP (harvested and chopped daily from University Model Farm) for four weeks consecutively. Each experimental animal was confined in a separate pen whereas feed and water were offered *ad libtum*. I addition to *Brachiaria* (as test diet) all experimental animals were supplemented equally with concentrate diet (approximately 4 kg/animal/day). The concentrate diet was formulated using the following locally available feed ingredients; maize bran (70%), sunflower seed cake (27%), pre-mineral mixed (2%) and salt (1%). Data collection on feed intake and milk yield commenced after two weeks of feed familiarization. Feed refusals were collected daily at 6:00 am before next feed offered for estimation of feed intake. Milk yield were recorded daily for four weeks consecutively.

## Data Analysis

The Proc Mixed Model of SAS 2004 described by Montgomery (2012), was employed to analyse the main fixed effect of different *Brachiaria* cultivars on the growth attributes and yield. The statistical model used for determination of influence of *Brachiaria* cultivars on growth and yield was; Responses (Growth and Yield) = General Mean + *Brachiaria* Cultivars + Sub-plots + Residual. The sub-plots and Residual were treated as random effect in this model. For feeding trial, the Proc Mixed Model of SAS (2004) was used to evaluate the interaction effects of Breed and *Brachiaria* species on feed intake and milk yield under the following model; Responses (feed intake and milk yield) = General mean + *Brachiaria* cultivars (BdB and BbP) + Dairy cow Breed (Friesian and Ayrshire breed) + Individual Cows (16 animals) + Brachiaira cultivars*Dairy cow Breed + Residual. Under this model individual cows and Residual were treated as random effect. In cases where significances were determined, Least Square Difference (LSD) was applied (at 5%) to discriminate the differences among the mean values. The distribution of data for dependent

variables were checked by the Anderson-Darling test using PROC of SAS 2004 and were found normally distributed.

## Results

The results on growth attributes indicated that, the mean number of tillers per plant, number of leaves per plant and plant heights differ significantly among different *Brachiaria* cultivars. Although numbers of germinated seedlings did not vary significantly among the cultivars, the BdB had significantly higher number of tillers (14.95 ± 0.87) and leaves per square meter (56.09 ± 3.76) for (Table 1). Nevertheless, BbP exhibited significantly higher mean plant height (88.66 ± 1.82 m) compared to other cultivars.

**Table1:** Growth characteristics of *Brachiaria* species at Magadu Livestock Unit_SUA Morogoro

| Species | BdB | BbP | BbX | Significance at 5% |
|---|---|---|---|---|
| Plant number/m² | 3.66 ± 0.14 | 3.50 ± 0.14 | 3.77 ± 0.14 | 0.512 |
| Tiller number/plant | 14.95 ± 0.87a | 8.83 ± 0.87b | 8.29 ± 0.87b | <.0001 |
| Number of leaves/m² | 56.09 ± 3.76a | 30.97 ± 3.76b | 32.09 ± 3.76b | <.0001 |
| Mean Height (cm) | 59.29 ± 1.82c | 88.66 ± 1.82a | 77.57 ± 1,82b | <.0001 |

BdB = *Brachiaria* decumbens cv. Basilisk, BbP = *Brachiaria* brizantha cv. Piata, BbX = *Brachiaria* brizantha cv. Xaraes

Generally, the number of tillers per plant were found to increase with increasing time from the first week of data collection (one month after planting). There was consistence pattern of tillering behaviour for three *Brachiaria* species recorded within six weeks. The BdB was consistently recorded to have higher number of tillers per plants for the period of six weeks (Figure 1).

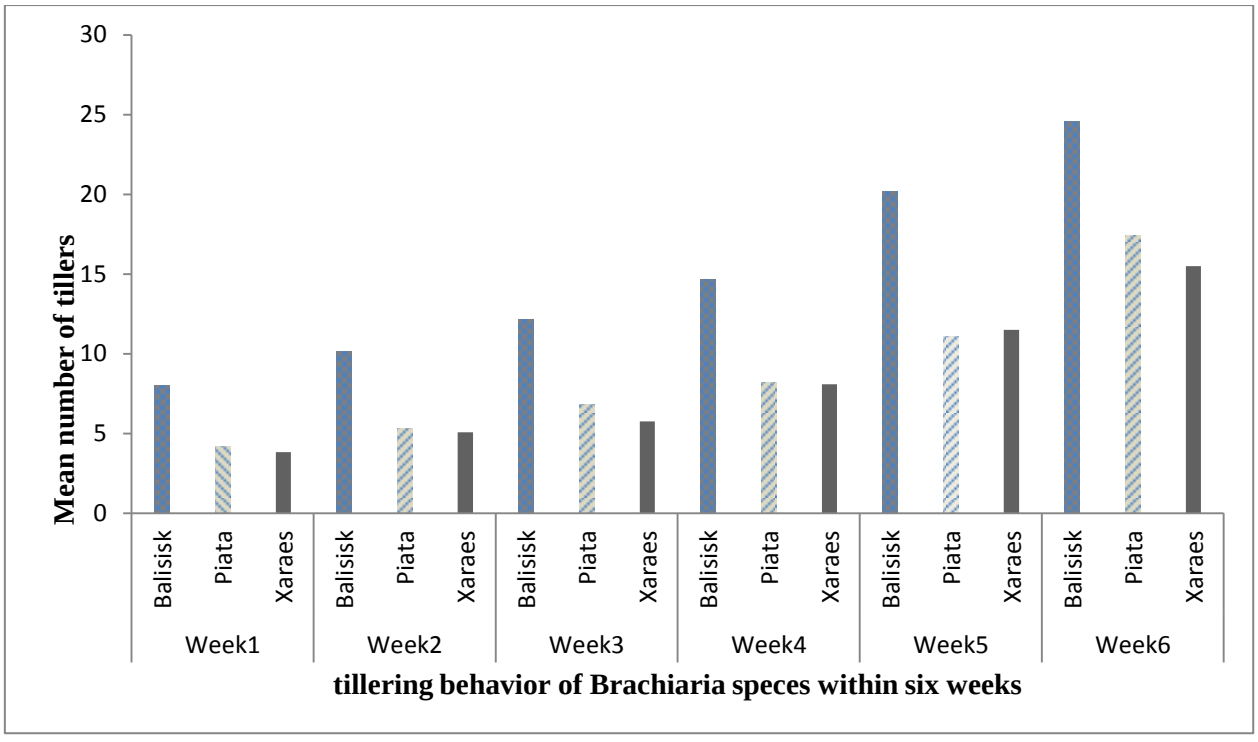


**Figure 1:** Number of tillers per plant recorded within six weeks consecutively

The above ground biomass production ranged from 7049 to 7545 kg/ha with mean value of 7268.67kg/ha. The above-ground biomass was significantly higher for BdB (7545.2 kg) followed by BbP (7212.9 kg) (Figure 2). The BbX was the least in terms of biomass yield (7049.17 kg).

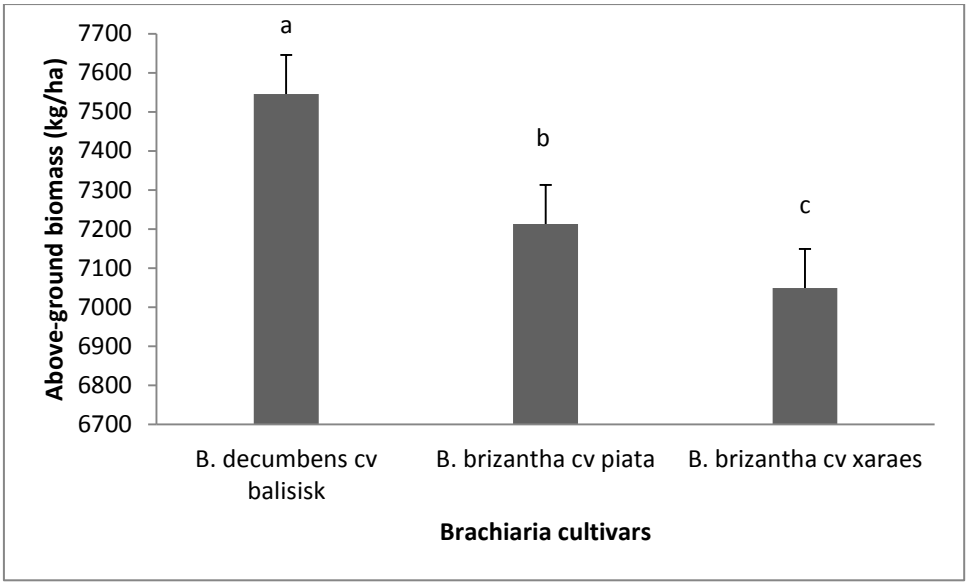


**Figure 2:** Above-ground biomass yield for three Brachiaria cultivars

Two *Brachiaria* cultivars (BdB and BbP) tested during feeding trial indicated significant differences in terms of feed intake. Generally, the highest feed intake was recorded from BbP when compared to BdB. Although littlie interaction effects between breed of dairy cows and *Brachiaria* species was found, the main fix effects of breed and *Brachiaria* species show significant differences such that Ayrshire fed BbP had significantly higher intake compared to the rest of groups (Table 2).

The milk yield varied significantly among breed of dairy cows fed different cultivars of *Brachiaria.* It was found that, Ayrshire exhibited higher milk yield potential with an average of 11.28L/cow/day against Friesian cows that produced only 8.12L/cow/day. However, within individual breeds, animals fed BbP found to produce significantly higher milk compared to those fed BdB (Table 2).

**Table 2:** Interaction effects of Breed and diet on feed intake and milk yield

| | **Interaction of Breed and diet** | | | | | |
|---|---|---|---|---|---|---|
| | **Ayrshire*BdB** | **Ayrshire*BbP** | **Friesian*BdB** | **Friesian*BbP** | **MSE** | **P value** |
| Feed intake (Kg/Animal/day) | 37.17b | 39.2a | 37.26b | 37.76b | 0.21 | 0.0048 |
| Milk yield (L/Animal/day) | 10.66b | 11.91a | 6.57c | 9.67b | 0.37 | <.000 |

BdB = *Brachiaria decumbens* cv. Basilisk, BbP = *Brachiaria brizantha* cv. Piata

## Discussion

The distinct growth habits were determined among the tested *Brachiaria* cultivars with signal grass (BdB) being superior in terms of growth and yield. The significantly higher numbers of tillers and leaves for BdB was indication of its reproductive and productive potential. The tillering behaviour of this cultivar was noted to be consistently increasing exponentially with time over the period of data collection. These findings were in line with those of Monteiro. *et al*., (2016) who established high number of productive tillers for *B. decumbens* compared to other *Brachiaria* species. Chung. *et al*., (2018) attributed the productive potential of *B. decumbens* with its aggressive growth habits and wide range of adaptation to varied soil types and environments. In addition to its adaptive ability, the signal grass reported to

grow in a wide range of altitudes ranging from 500 to 2300 m asl. (Njarui. *et al*., 2016) which was within the range of the study area's altitude that lies on the slopes of mount Uluguru with altitudes of 500 – 600 m asl.

The significantly higher above ground biomass for BdB (of about 7.5t/ha) was attributed to its tillering behaviour and decumbent habit. It is extremely productive tropical grass due to its high growth habit and adaptation to wide range of environment (Chung. *et al*., 2018). These findings were in line with those of Rodrigues. *et al*., (2014), who found significantly higher biomass for BdB against the cultivar Piata in Brazil. However, the findings of the current study on biomass yield was contrary to those of Gichangi. *et al*., (2017) and Silva. *et al*., (2013) who reported significant higher biomass of cultivar Piata when compared to signal grass. The notable disparity could be due to variations in climatic conditions in tropical regions (where the current study was conducted) against the highly controlled greenhouse experimental reported by Silva. *et al*., 2013 whereas moisture contents of soil was maintained through irrigation to approximately 80% of field capacity. The significantly lower above ground biomass from BbX in this study concurred with study of Selemani, 2021, who reported low value of cultivar Xaraes across three eco-climatic zones of Tanzania (humid, sub-humid and semi-arid condition). The productivity of cultivar Xaraes is highly sensitive to climatic conditions as confirmed by Garay. et al., (2017), who found relatively higher total dry matter accumulation of this cultivar only in the humid tropics of Ecuador.

The DM intake by animals is influenced by several factors including the physical and agronomic characteristics of feed and nutrient composition of diet. In this context the dairy cows have shown high preference to cultivar Piata against Basilisk which could probably be associated to its morphological structure having higher leaf to stem ratio (Montagner. *et al*., 2013). Montagner. *et al*., (2013) also reported higher DM intake of BbP by beef steer which was associated to its structural characteristics and higher leaf to stem ratio. The morphological structure and appearance of cultivar Piata with green leaves throughout growing season presumably attracts the dairy cows. In addition to attractive physical characteristics, Costa. *et al*., (2014) reported that BbP has best chemical composition when compared to other cultivars such as Marandu and Xaraes. It has an average Crude Protein (CP) and Total Digestible Nutrient (TDN) of 12.82% and 59.43% respectively when compared to BbB with 9.8% CP and 52% TDN (de Macêdo. *et al*., 2016 and Nguku. *et al*., 2016). According to Baumont. *et al*., (2000) ingestibility of green forage depends on its nutritive value which is defined by chemical composition and digestibility of feed. Having higher CP and TDN implies that, BbP is highly palatable species to animals.

The notable relatively high feed intake recorded from Ayrshire when compared to those of Friesian was associated to their higher nutritional requirements caused by their relatively higher milk yield. Dairy cattle with relatively higher feed intake tend to have higher milk production, if other factors are not limiting. Mutimura. *et al*., (2021) reported the linear relationship between higher voluntary DM intake of the cultivar piata and milk yield up to 50%. In another study Mutimura. *et al*., (2018) concluded that supplementation of dairy cows with BbP resulting into higher milk yield compared to Napier grass. The higher performance of cultivar Piata in terms of milk yield could also be linked with its higher nutritive value because the efficiency of forage conversion into animal's products depends not only on amount but also the quality of feed offered. Maia. *et al*., (2014) reported relatively higher in vitro dry matter digestibility of cultivar Piata which was associated with its high Crude Protein (CP) contents and low crude fiber fraction. The knowledge of interaction between feed quality and efficiency of feed utilization is crucial for improving milk production per unit area. With increasing livestock population in Tanzania coupled to shrinkage of grazing land, the high yielding

pasture species such as cultivar Piata can be used to produce relatively higher milk yield.

## Conclusion

The current study investigated the growth, yield and contribution of *Brachiaria* cultivars on milk yield from two dairy cow breeds (Friesian and Ayrshire) at SUA Model Farm. Out of three tested *Brachiaria* cultivars, the BdB was found to outperform others in terms of growth and biomass production. The outstanding performance of BdB was linked to its aggressive growth habit and ability to adapt wide range of environment. On the other hand, feeding trial indicated that BbP demonstrated promising results in terms of milk yield. The higher milk yield of the selected dairy cows was associated to higher feed intake demonstrated by animals fed BbP. Although, the current study demonstrates that BbP has potential for increasing milk production for small holder dairy producers especially in areas where land is a limiting factors, further studies on nutritional values and economic effectiveness of feeding *Brachiaria* cultivars are imperative.

## Acknowledgement

The InnovAfrica project is highly acknowledged for providing research funds that facilitated accomplishment of this paper. The InnovAfrica project team member in Tanzania, Prof D. Mwaseba, Prof. S. Nchimbi, Prof. C. Sanga, Prof. J. Hella, Dr. A. Kyraruzi, Dr. A. Nyambilila, Dr. F. Nandonde, Dr. J. Longo and Mr. K. Mapunda are highly appreciated for their novel input and guidance during experimental period. This experiment would not be successfully without permission from the Department of Animal, Aquaculture and Range Sciences that provided permission to conduct experiment at the Model farm and offering experimental animals. The author is grateful to Mr. Msimu Charles and Miss. Agnes Kais for their assistance during data collection.

## Animal Welfare Statement

The authors confirm that the ethical policies of the journal, as noted on the journal's author guidelines page, have been adhered. The authors confirm that they have followed EU standards for the protection of animals used for scientific purposes. Feeding trial was conducted in accordance to the approved Tanzania Animals' Welfare Act No. 19 of 2008.

## Statement of Animal Rights

This manuscript does not contain clinical studies or patient data. Feeding trial was conducted in accordance to standard animals' nutritional requirements.

## References

1. Baumont, R., Sophie, P., Michel, M. and Pierre, M.F. "How forage characteristics influence behaviour and intake in small ruminants: a review." *Livestock Production Science* 64.1 (2000): 15-28.
2. Brahmakshatriya, R.D. and Donker, J.D. "Five methods for determination of silage dry matter." *Journal of Dairy Science* 54.10 (1971): 1470-1474.
3. Chung, E.L.T., Michael, P., Frisco, N., Anjas, A. S., Faez, F. A. J. and Teck, C. L. "Can treatment of Brachiaria decumbens (signal grass) improve its utilisation in the diet in small ruminants?—a review." *Tropical animal health and production* 50.8 (2018): 1727-1732.
4. Costa, K. A. P., Eduardo, d. C. S., Gustavo, A. S. and Patrícia, S. E. "Nutritional characteristics of Brachiaria brizantha cultivars subjected to different intensities cutting." *American Journal of Plant Sciences* 5 (2014):1961-1972.
5. de Macêdo, J. D. B., Fábio, A. T., Fabiano, F. Silva., Aureliano, J. V. P., Poliana, B. A. and Paulo, V. N. N. "Ingestive behavior of heifers on Brachiaria pasture deferred with different periods of sealing." *Semina: Ciências Agrárias* 37.6 (2016): 4725-4284.
6. Djikeng, A., Idupulapati, M. R., Donald, M. N., Mupenzi, M., John, C., Sita, R. G., Linda, J. "Climate-smart *Brachiaria* grasses for improving livestock production in East Africa." *Tropical Grasslands – Forrajes Tropicales* 2(2014): 38−39
7. Garay, J.R., Santiago, J. C., Pedro, Z. F., Martin, A. I. H., Juan, C. M. G., Ricardo, P. G. D. and Eugenia, G. C. R. "Dry matter accumulation and crude protein concentration in Brachiaria spp. cultivars in the humid tropics of Ecuador." *Tropical Grasslands-Forrajes Tropicales* 5.2 (2017): 66-76.
8. Ghimire, S., Donald, M. N., Mupenzi, M., Juan, A. C., Linda, J., Elias, M. G. and Suliana, T. "Climate-smart *Brachiaria* for improving live-

stock production in East Africa: Emerging opportunities." *Proceedings of 23rd International Grassland Congress* (2015).
9. Gichangi, E.M, Donald, M. N. and Mwangi, G. "Plant shoots and roots biomass of Brachiaria grasses and their effects on soil carbon in the semi-arid tropics of Kenya." *Tropical and Subtropical Agroecosystems* 20.1 (2017): 65-74.
10. Henchion, M., Maria, H., Anne, M. M., Mark, F. and Brijesh, T. "Future protein supply and demand: strategies and factors influencing a sustainable equilibrium." *Foods* 6.7 (2017): 53.
11. Kanuya, N. L., Matiko, M.K., R. Nkya., Bittegeko, B.P., Mgasa, M.N., Reksen, O. & Ropstad, E. "Seasonal changes in nutritional status and reproductive performance of Zebu cows kept under a traditional agro-pastoral system in Tanzania." *Tropical Animal Health and Production* 38.6 (2006): 511-519.
12. Kizima, J.B., Mtengeti, F.J. & S. Nchimbi-Msolla. "Seed yield and vegetation characteristics of Cenchrus ciliaris as influenced by fertilizer levels, row spacing, cutting height and season." *Livestock Research for Rural Development* 26.8 (2014): 148.
13. Maia, G.A., Kátia, A. P. C., Eduardo, C. S., Patrícia, S. E., José, F. N., Matheus, G. R. "Yield and Chemical Composition of Brachiaria Forage Grasses in the Offseason after Corn Harvest." *American Journal of Plant Sciences* 5 (2014): 933-941.
14. Monteiro, L.C., Jaqueline, R. V., Sanzio, C. L. B., Cacilda, B. V., Celso, D. F., Gleiciane, L. B. and Cláudia, B. L. "*Brachiaria decumbens* intraspecific hybrids: characterization and selection for seed production." *Journal of Seed Science,* 38.1(2016): 62-67.
15. Montagner, D.B., Valeria, P.E., Teresa, C. G. and Nayana, N. N. "Dry matter intake by beef steers on piata palisadegrass (B. brizanza cv piata) pasture." *Tropical Grassland-Forrajes Tropicales* 1(2013): 106-108.
16. Montgomery, D.C. "Design and analysis of experiments." *International Student Version, Wiley Inc., New York, USA* (2001).
17. Mtengeti, E. J., Phiri, E. C., Urio, N. A., Mhando, D. G., Z. Mvena., R. Ryoba., R. Mdegela., Singh, B. R., M. Mo., A. Wetlesen. and T. L∅rken. "Forage availability and its quality in the dry season on smallholder dairy farms in Tanzania." *Acta Agriculturae Scand Section A* 58 (2008): 196-204.
18. Mutimura, M., Cyprian, E., Idupulapati, M. R. and Ignatius, V. N. "Effects of supplementation of Brachiaria brizantha cv. Piat_a and Napier grass with Desmodium distortum on feed intake, digesta kinetics and milk production in crossbred dairy cows." *Animal Nutrition*, 30 (2018): 1-5.
19. Mutimura, M. and Sita, G. "Brachiaria grass for sustainable livestock production in Rwanda under climate change." *Handbook of climate change management. Switzerland: Springer Nature* (2021): 1-17.
20. Nguku,S.A, Musimba, N.K.R., Donaldm, N. N, and Royford, M. M. "The Chemical Composition and Nutritive Value of Brachiaria Grass Cultivars at Katumani Dryland Research Station in South Eastern Kenya." *Journal of Advances in Agriculture* 5.2(2016): 707-717.
21. Njarui, D.M.G., M. Gatheru., Ghimire, S.R. & Mureithi, J.G. "Effects of seasons and cutting intervals on productivity and nutritive value of Brachiaria grass cultivars in semi-arid eastern Kenya." *Proceedings of the workshop held in Naivasha, Kenya* (2016).
22. Ondabu, N., S. Maina, W. Kimani., Njarui, D.M.G., A. Djikeng. & Ghimire, S.R. "Genetic diversity of Brachiaria grass ecotypes in Kenya." *Proceedings of the workshop held in Naivasha, Kenya* (2016): 14.
23. Paavola, J. "Livelihoods, vulnerability and adaptation to climate change in the Morogoro region, Tanzania." *Environmental Science & Policy* 11.7 (2008): 642–654.
24. Rodrigues, R.C., Thiago, V. S., Maria, A. M., Jocélio, S. A., Rogério, P. L., Clésio, S. C., Maria, E. O., Michelle, O. P. and Ivan, B.M. S. "Agronomic, morphogenic and structural characteristics of tropical forage grasses in northeast Brazil." *Tropical Grasslands – Forrajes Tropicales* 2.2 (2014): 214−222.
25. SAS. "SAS/STAT. User's guide." *SAS Institute Inc., (Cary, NC, USA)* (2004).
26. Selemani, I.S. "Growth Performance and Yield of Three Brachiaria Cultivars Subjected to Different Eco-Climatic Zones of Tanzania Subjected to Different Eco-Climatic Zones of Tanzania." *The XXIV International Grassland Congress / XI International Rangeland Congress Proceedings* (2021): 1-4.
27. Selemani, I.S. "Ecological implications of bush encroachment on foraging behavior of dairy cows and goats at SUA farm, Morogoro, Tanzania." *Tropical Grasslands-Forrajes Tropicales* 6.3(2018): 169-176.
28. Selemani, I.S., Lars, O. E., Øystein, H., Tormod, Å., Ephraim, M. and Daniel, M. "Variation in quantity and quality of native forages and grazing behavior of cattle and goats in Tanzania." *Livestock Science* 157.1 (2013): 173-183.

29. Silva, M.F., Edson, P., Dorismar, D. A., Cláudio, M. V. and Ignacio, A. "Morphogenetic characteristics of three *Brachiaria brizantha* cultivars submitted to nitrogen fertilization." *Anais da Academia Brasileira de Ciências* 85.1(2013): 371-377.
30. Thornton, P. "Livestock production: recent trends, future prospects." *Philosophical Transaction of the Royal Society B* 365(2010): 2853–286.
31. United Republic of Tanzania (URT). "Tanzania Livestock Master Plan 2017/2018 to 2021/2022. Ministry of Livestock and Fisheries." *Government Report* (2019).
32. United Republic of Tanzania (URT). "The budget of the Ministry of Livestock and Fisheries 2020/2021. Ministry of Livestock and Fisheries." *Government Report* (2021).

**Source of support:** Nil;
**Conflict of interest:** The authors declare no conflict of interests.

**Cite this article as:**
Ismail, S.S. "Growth performance, Biomass Production and Influence of Selected Brachiaria Cultivars on Milk Yield from Dairy Cows at Sokoine University Model Farm, Tanzania." *Annals of Plant Sciences.*11.06 (2022): pp. 5176-5184.

DOI: http://dx.doi.org/10.21746/aps.2022.11.6.4