

## Research Application Summary

### Effects of supplementation with leaves of *Bophia massaensis* (abovata) in beef cattle

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#### Abstract

The low animal productivity in the tropics is associated with several factors including seasonality and the qualitative variation of available fodder. A study was carried out at the Tchissola-k farm in the Municipality of Kahama, Angola from June to September 2017. The aim of the study was to evaluate the effect of supplementation with *Bophia massaensis* leaves of the Abovata genus on steers (Autoctone vs Nellore) weight gain. The results showed consumption of 20 to 30 kg/animal, and the animals of group 1 consumed biweekly 24.29 to 29.58 kg/animal, increasing their consumption as the days increased due to legume adaptability. As for group two, the consumption was 20.39 - 27.98 kg / animal, also increasing as the days of evaluation increased. The results indicate increase in live weight in the first two groups, 12,13 kg, 10.13 kg, respectively, and 2.88 kg, for the last group (third) where the weight gain was low, since the animals in this group consumed only pasture and with no supplementary feeding.

Keywords: Abovata, Angola, beef cattle, supplementation feeding, weight gain

#### Résumé

La faible productivité animale sous les tropiques est associée à plusieurs facteurs dont la saisonnalité et la variation qualitative du fourrage disponible. Une étude a été réalisée à la ferme Tchissola-k dans la municipalité de Kahama, en Angola, de juin à septembre 2017. Le but de l'étude était d'évaluer l'effet de la supplémentation avec des feuilles de *Bophia massaensis* du genre Abovata sur les bouvillons (Autoctone contre Nellore) gain de poids. Les résultats ont montré une consommation de 20 à 30 kg/animal, et les animaux du groupe 1 consommaient de 24,29 à 29,58 kg/animal toutes les deux semaines, augmentant leur consommation au fur et à mesure que les jours augmentaient en raison de l'adaptabilité des légumineuses. Quant au deuxième groupe, la consommation était de 20,39 à 27,98 kg / animal, augmentant également à mesure que les jours d'évaluation augmentaient. Les résultats indiquent une augmentation du poids vif dans les deux premiers groupes, 12,13 kg, 10,13 kg, respectivement, et 2,88 kg, pour le dernier ou troisième groupe où le gain de poids était faible, puisque les animaux de ce groupe ne consommaient que des pâturages et sans alimentation supplémentaire.

Mots-clés : Abovata, Angola, bovins de boucherie, alimentation complémentaire, augmentation de poids

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## Introduction

Animal productivity in the tropics is still low, mainly due to the seasonality and the low quality of fodder. The low productivity is due to nutritional imbalance and should be corrected through pasture and grazing management, accompanied by the strategic use of dietary supplementation as alternatives to reach higher rates of productivity and profitability. Approximately, production of 70 to 80% of annual tropical forage production is concentrated in the months of higher rainfall, only 20% in the dry season. The low performance of the animals in the dry seasons leads to increase in the slaughter age and consequently decrease in the quality of the meat produced. As such, the fluctuation in the food supply for the animals kept under pasture is a limiting factor that is reflected in low animal production (De Souza 2013).

Marques *et al.* (2013) indicated that since pastures form the basis of feeding livestock in tropical regions, animal performance is influenced by the interaction of available forage, consumption, digestion and nutritional requirements, which may or may not be satisfactory in the system of production. In the face of low performance, it is necessary to supplement the diet of the animals, but this should be technically and economically convenient. However, one of the determinants of animal production in a pasture supplementation system is to define the main objectives of this supplementation, and nutrient supply strategies must be established to enable the desired growth patterns in the production system. In this context, nutrient supply via supplementation may allow the differentiated performance of animals from simple weight maintenance, to moderate gains of 200-300 g / day to gains of 500-600 g / day (Paulino, 2001; Marques *et al.*, 2013).

According to the Ministry of Agriculture and Rural Development (“MINADER” Info-Angola, 2016), the Province of Cunene is located in the zone of sweet pastures that maintain palatability throughout the year, being that the pastures are located in areas of low altitude with rainfall less than 750 mm. Pastures represent the most practical and economical way to feed cattle and beef cattle must be maintained in this way. However, animals kept exclusively on pasture can not express their full potential, achieving low rates of weight gain throughout the year due to several factors of which pasture seasonality is a major constraint. The distortions associated with seasonality of production and nutritional value of forages need to be corrected through pasture management and grazing, as well as the strategic use of dietary supplementation as viable alternatives to maintain nutritional balance in animals (De Souza, 2011). This is because the reduced availability of pastures in the dry season is associated with low nutritive content of the pastures resulting in reduction of the weight of the animals kept under pasture. Therefore, the aim of this study was to evaluate the effect of supplementation with *Bophia massaensis* leaves of the Abovata genus on steers (Autoctone vs Nellore) weight gain.

## Materials and Methods

**Characterization of the study area.** The present work was carried out for three months, i.e., June-September 2018 at Fazenda Tchissola-K, located 50 km east of the Municipality of Cahama, in the Province of Cunene, Angola. The farm has the objective of producing meat under extensive grazing system with sweet natural pasture and covers 9 000 hectares. The farm has infrastructures adapted to the production process, such as liquid nitrogen plant, clinical analysis laboratory, water boreholes, manholes and facilities for the accommodation of civil servants

**Climate.** The region has a semi - arid climate with an average annual temperature of 22 ° C in the North, to 24 ° C in the southern end, with higher values in the rainy season and minimums in the dry season. The warmest month is October, with June and July being the coldest months of the year. The average relative humidity varies between 40 and 50%, with the lowest values coinciding with the dry season (Diniz, 1973). The region is characterized by relative scarcity of precipitations and great irregularity in its distribution but with precipitation values decreasing from 800-700mm in the North end, to 400mm in the South. The rainy season comprises a period of five months (November to March), with October and January as the transition months.

**Vegetation.** Diniz (1973) identified five cartographic units of the vegetation for this zone distributed as woody and shrubby formations of *Colophospermum mopane*, Acacia, *Spirostachys*; formations of *Colophospermum mopane*; savannah forest of *Acacia kirkii*; woody scrub with *Baikiaea plurijuga*; and grassy communities with *Acacia albida*. The same author also explained that the vegetation is influenced by climatic conditions: The woody shrub or shrub-tree, density is variable according to the characteristics of the soil; and the grasses, essentially constituted by grasses of small size and common.

In Cunene Province, most of the territory is filled with a mosaic of dry forest and savanna, showing a typical formation of small forests of *Colophospermum mopane* (omutiati), important for feeding the cattle, and several species of acacias. The province is located in the sweet pasture zone, which maintains palatability throughout the year and is located in areas of lower altitude, which gives them good conditions for cattle breeding (Info-Angola, 2015).

**Characteristics of the herd.** The farm had a herd composed of several breeds for the purpose of raising beef cattle including some crosses to improve weight gain and increase the profitability of the farm. Twelve crossbred steers (Autoctone vs Nelore) with 18 months of age 175 kg were selected for inclusion in the supplementation scheme, observing the following criteria: Body conditions (2.5 - 3); Sex (M); Age (18 months); Crossed genotype (Nelore vs Autochthonous); Standard Weight (175kg).

**Methodology.** Twelve bulls divided into three groups of four animals each were selected for this experiment. The animals were kept in the pasture in the morning at 7 a.m and returned to the individual bays at 1700, where they were supplemented with 2 kg of the *Baphia massaensis* daily for the first group. The second group received 3kg of the same legume. This procedure was repeated during the time of the trials (90 days-June-September).

The third group did not receive any type of supplementation, and only consumed pasture in the field, and all the animals had water available. Spheres for the control of weight gain were done biweekly, where the first 15 days were for legume adaptation and the other 90 days were for the actual experiment. The samples (leaves) of the legume were harvested in the field in the morning in fresh condition (young and green), that is, before flowering with a height of 50cm. After collection in the fields the pasture samples were carried in a bag of raffia, and on the same day transported to CEPTA in Huambo, where they were dried in an electric oven for 18 hours. The dry matter (100g) were placed in sealed plastic bag and on the third day were sent to the CTAEX laboratory of the National Technological Center Agroalimentar de Extremadura, where the nutritional composition, fat, protein, carbohydrate and energy, and total crude fiber (%) were determined as shown in Table 1.

**Table 1. Methods used for the nutrient content determination**

Determination	Methodology
Total crude fiber (%)	Gravimetry
Nutritional composition	Soxhlet
Humidity (g / 100)	Kjeldahl
Fat (g / 100)	Gravimetry
Protein (g / 100)	Calculation
Ashes (g / 100)	Calculation
Carbohydrates (g / 100)	Calculation
Energy (Kj / 100)	Calculation
Energy (Kcal / 100)	Calculation

Data on the weight gain indicators of the animals were obtained biweekly for all animals with the Coemina (2000) brand scale and this was done during the study period of 90 days. Three quantitative variables were evaluated from the 12 steers aged 18 months; weight (kg); body condition and food consumption in grams per day.

**Statistical analysis.** For the statistical analysis of the results obtained, a database was created in the Microsoft Office Excel 2013 program. The software Infostat version 2.0 - 2013 was used for the processing, where the daily consumption and the weight gain of the animals were evaluated.

## Results

The results of the proximate analysis for *B. massaiensis* (obovata) are shown in Table 2. The results are similar to those obtained by Cordeiro (2012), who performed a similar study with the same plant species in the Tunda dos Gambos. Table 3 also compares obovata with two other legumes.

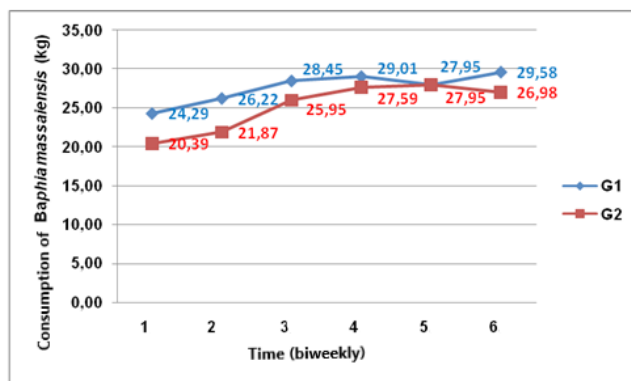
**Table 2. *Baphia massaiensis* (obovata)**

Determination	Methodology	Results
Total crude fiber (%)	Gravimetry	47,76%
Nutritional Composition	Soxhlet	
Humidity (g / 100)	Kjeldahl	8,31
Fat (g / 100)	Gravimetry	1,5
Protein (g / 100)	Calculation	7,69
Ashes (g / 100)	Calculation	1,73
Carbohydrates	Calculation	80,76
Energy (Kj / 100)	Calculation	1535,39
Energy (Kcal / 100)	Calculation	367,32

**Table 3. Comparison of *Baphia massaiensis* (obovata) with other legumes**

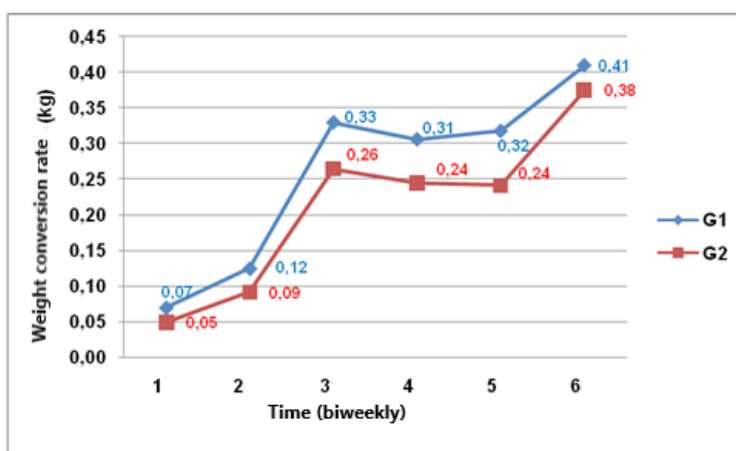
Legume Name	% Gross Protein
<i>Baphia Massaiensis</i> (Abovata)	16,1
<i>Leucaena</i> ( <i>Leucaena spp</i> )	14,7
<i>Gliricidia</i>	25

In Figure 1, it can be observed that food consumption was stable during the study period, where the results showed a consumption of 20 to 30 kg. The animals in Group 1 consumed biweekly 24.29 to 29.58 kg, increasing their consumption as the days increased due to legume adaptability. In the case of Group 2 consumption varied from 20.39 to 27.98, increasing also their consumption as the days of evaluation increased, which demonstrated that this type of pasture enhances increase weight gain of the animals in periods of nutritional deficiency. These results further show that there was considerable increase in consumption as the days went by, which shows good palatability of this legume influencing increased consumption and subsequently weight gain rate in the study groups.



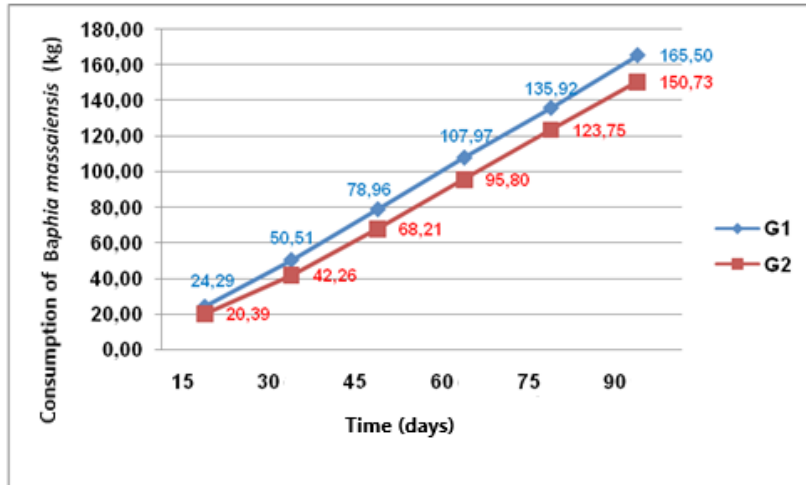
**Figure 1. Quantity of *Baphia massaiensis* (obovata) (kg) consumed per animals biweekly**

Figure 2 shows that as the animals consumed the legume, the feed conversion rate increased, thus resulting in very considerable weight gain per animal. This indicates that the pasture had a positive effect on the increase in the weight of the animals. For the two groups a more favorable increase was observed the case of Group 1 due to the higher consumption of this legume in comparison to Group 2 where smaller quantity was consumed which also shows that when there is excess food the animals are satisfied and become selective.



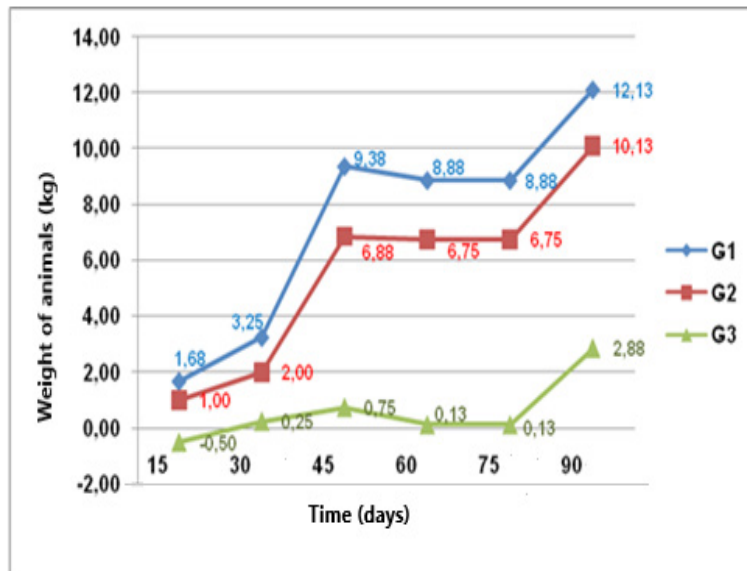
**Figure 2. Consumption of *Baphia massaiensis* (kg) by the two animal groups**

Figure 3 shows a gradual increase in the food consumption by the animals whereby the first group consumed 165.50 kg out of the 180 kg given, which is 91.6%, while group 2 consumed 150.73 kg of 270 kg given, which is 55.6%. This shows that group 1 had higher legume consumption, having left only 14.5 kg unconsumed, representing 8%. In the second group, 120 kg were left at the end of the evaluation period, representing 44.4% unconsumed.



**Figure 3. Cumulative amount of food consumed per animal during the experiment period**

Figure 4 shows that during the period, there was increased weight gain for the first two groups. However, for the last group (third) the weight gain was low, since the same group consumed only pasture and there was no supplementary feed provided.



**Figure 4. Weight of the animals for each group during the evaluation period**

Table 4 shows the variation in the weight of the animals studied. The animals in Group 1 fed different amounts of *Baphia massaiensis* (obovata) achieved higher weights than in the case of the other two groups. This shows that this type of feed had a positive effect on the increase in the animals' weight. The results agree with those of De Oliveira (2014) who also recommended the use of legumes for the supplementation feeding of animals in the dry season in order to maintain adequate levels of meat production. The use of this practice in grazing sheep is an alternative that can improve the productive indexes and maintain the supply of animals during the year.

**Tabela 4. Weights of the groups of animals during the study period**

Groups of animals	N	Averages
1	4	12,13a
2	4	10,13b
3	4	2,88c
DMS	0,95	
EE	0,69	
CV%	13,9	

\* Different letters in the same column indicate significant differences (p <= 0.05)

## Conclusions

The animals of groups one and two exhibited increase in weight in the period from June to September, in comparison of the control group which did not receive supplementary feed. The animals in the first two groups had excellent consumption resulting in gradual weight increase as the weeks passed, showing the high palatability of this legume.

## Acknowledgement

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