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Assesment of Calcium and Phosphorus Digestibility in Tephrosia Candida Using Albino Rat

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Abstract: This paper reports the digestibility of Ca and P in Tephrosia candida.Tephrosia candida a widely available Legume in Nigeria and indeed West Africa contain % dry matter 60.0-80.0,Calcium 74.0-78.0 and Phosphorus 33.0-37.0 which can satisfy the recommended requirement of Ca and P for ruminants (Ca 0.18-1.04) (P 0.05-0.09) and monogastric (pig) (Ca 0.15-0.32,P 0.16-0.37) NRC, 1981.1985. When a compounded Tephrosia candida based diet ration (Tephrosia candida 30%, Glucose 69%, Groundnut oil 0.5%) was fed to albino rats, analysis of their faecal samples showed an almost 100% absorption of Ca and P by the rats; as the rats faecal output recorded an average of 0.067 of Ca and 0.032 of P. This study concludes that Tephrosia candida contains a readily available digestible Ca and P that can be a source of these essential minerals in animal feed.

Key words: Calcium · phosphorus · digestibility · Tephrosia candida · absorption · faecal output

INTRODUCTION

The greatest value of forages from shrubs and especialy tree legumes is their role as dietary Nitrogen, energy, minerals and vitamins.Many trees and shrubs species have been documented as useful animal fattener [1-3]. In the tropics where there are regular feed shortages and droughts, subsistence feeding mainly on straw results in reduced live weight and perpetual low productivity of animals. Davendra [4] further stressed that severe nutritional limitation is associated with delayed age at first parturition and increased gestation intervals. The importance of minerals in the diets of animals cannot be overemphazied Nutritional deficiency of minerals in the body could result in nutritional disorders, toxicity, diseases, High mortality and low performance. However these changes can be controlled optimally by suppling the animals with an acceptable non toxic ration which contain the required mineral as well as other nutrients in adequate proportions and available form [5, 6].

The cheapest source of easily extracable and good quality protein to satisfy nutritional requirement for maintenance and production of animals is Leguminous tree fodder known as 'Multipurpose tree species (MPTS). [7, 8]. The advantages of using MPTS are their availability and accessibility on farms, medicinal activities (laxatives) on the alimentary system and total feed cost.Leuceana leucocephala is an example on of MPTS. Daniel [9] included Tephrosia spp,a legume on the list of MPTS.

It is note worthy that the use of shrubs and tree fodder is extended to non ruminant production. Odunsi *et al.* [10], reported that leaf meal of wild sunflower is a valuable supplement in the diet for laying hens and a cheap means of enhancing egg yolk coloration, but it should be emphazied that inclusion of the leaf meal of cassava in the diets of poultry, decreases growth rate and egg production [8, 11, 12].

Tephrosia specie is a tropical legume that belongs to the family of leguminosae,having over 300 species dispersed throughout the tropics.It also occur in South Africa, subtropical Australia and North America [13].

Some of the common species include Tephrosia Bracteolate (TB) Tephrosia linearis (TL), Tephrosia Vogeli (TV), Tephrosia Purpureum (TP) and Tephrosia Candida (TC), It is widely seen as weed along road sides in the middle belt zone of Nigeria and also grown locally in Cameroun [9], He further reported that Tephrosia candida is suitable for alley farmingsystems in the humid and sub-humid zones of Africa.

Because of the potentials exibited, such as easy establishment,rapid regeneration after prunning use as fuel,nitrogen fixing abilityand serve as cover crop.This enhances soil fertility and moisture conservation [14].

Unlike most other forage legumes there is paucity of documented information on production, management and utilization of Tephrosia species by livestock. The potential of this species for improvment and livestock production is yet to be exploited.

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The present study examines the availability of Ca and P in Tephrosia candida at different ages ranging from 3-7 months. Digestibility of Ca and P in this Tephrosia candida was assesed with albino rats to elucidate the potentials of Tephrosia candida in livestock.

MATERIALS AND METHODS

Tephrosia candida used in the present study was raised from seeds. The seeds were planted after holing and scarification in a sand paper box. Seed broadcast was 75 kg/100 m using a 1.5x1.5 m spacing.

The planting was done in May 2000. The first harvest was done 3 months after planting (August 2000) and subsequent harvestings followed in September, October, November and December of the same year.

Weeding of each plot was carried out mechanically with hoe and cutlass when required.At the time of harvest 11 replicates were collected and analysed for their contents of Ca and P and dry matter yeild.

The total DM was determined from the samples by taking a known weight from each sample and oven dry for 48hrs at 60 to constant weight.Dried samples for each month were milled, bulked and stored for analysis.

A feed was compounded using these samples as follows;

(a) Tephrosia candida (dried)	=	30.5%
(b) Glucose	=	69.0%
(c) Groundnut oil	=	0.5%
		100%

A sample of this feed was analysed for their contents of Ca and P usin AOAC, [15]. This procedure involved digesting the samples (1.08g) with concentrated nitricperchloric acid mixture (20;5 v/v). The digest was made up to the mark in a standard volumetric flask with deionized water.Contents of Ca and P in the feed were estimated by atomic absorbtion spectrophotometer, model 420 (Gallen-Kamp and Co. Ltd,Christopher street London Ec2 England.

Fifteen young male albino rats about 5 months old housed in metobolic cages were fed for a period of 14days with the compounded feed and their faeces collected daily. The faecal samples were dried,bulked and analysed for their contents of Ca and P.The values of Ca and P obtained from the feed and faecal samples were subjected to t-test analysis. Treatment means were sinificant were compared using the Duncan multiple range test [16].

RESULTS AND DISCUSSION

From this table it was observed that the highest total dry matter of 2.25 g for Teprosia Candida (TC) was recorded at month 6 of growth.The differences in the values of dry matter content varied significantly ($P<0.05$).

It was also observed that Ca content 0.78g/100gDM was highest at month 7 of growth, while Phosphorus value of 0.37 g/100 gDM was highest at month 6 of growth. The apparent differences In the content of Ca and P were not however significant ($P>0.05$).

This observation on Ca and P is contrary to the report of Gomide [17] which stated that the mineral content of forages declines with maturity due to Increase in proportion of stem which generally contains lower amount of minerals. However the result agrees with the studies of Ammerman *et al*. [18] which did not observe any difference in the Ca concentration of forages with increasing maturity.

With regards to P,the findings of Gomide [17] and Minson [19] disagrees with present observation as their report showed that P concentration declines as plant increases in size and advances towards maturity.

Table 1: Summary of Ca and P contents (g /100 gDM) in Tephrosia candida at different stages of growth (n = 11)

Stages of Growth (months)	3	4	5	6	7	Mean	Sem
Dry matter	0.87e	1.72d	1.95c	2.25a	2.20b	1.80	0 O41b
CA	0.74	0.78	0.76	0.75	0.78	0.76	0.038
P	0.33	0.36	0.33	0.37	0.35	0.35	0.024

*Means along the same row with different subscripts are significantly different ($P<0.05$)

Table 2: The chemical composition of the Tephrosia candida Based diet fed to the fifteen experimental rats

Crude protein	10.9
Crude fibre	10.1
Ether extract	4.8
Ash	6.5
Nitrogen free extract	67.7
Mineral ca	0.9
P	0.37

Table 3: Ca and P Content in faecal output

	Faecal	
Mineral	Intake	Output
Ca	0.9	0.067
P	0.37	0.032

From table 2 it can be noted that the dry matter ranges from 0.87-2.25 g. The Ca content of TC ranges from 0.74-0.78/100 gDM irrespective of the age. These values satisfy the Ca requirement of ruminant to a large extent,which is recommended as 0.18-0.1.04% [20]. It also satisfies the Ca requirement of monogastrics which was recorded by NRC, [21] as 0.05-0.09. The P concentration of Tephrosia candida ranges from 0.33-0.35 g/100 gDM which could satisfy the dietary requirement of P by ruminants when compared with recommended value of 0.16-0.37% [22]; it also satisfies dietary requirement of monogastrics when compared with recommended values of 0.32-1.5% [21].

From this table it is noted that the Ca and P contents reduced in the faecal output by almost 100% (Ca 0.09-0.67 and P 0.37-0.032). This observation was highly significant ($P<0.01$) and this suggest that Ca and P are readily absorbed by the rats, hence Tephrosia candida can be used as good mineral supplement source in animal feed. Since it is relatively cheaper than the conventional source such as Groundnut cake. Tephrosia candida can therefore be recommended.

CONCLUSION

From the fore going analysis of digestibility of Ca and P in Tephrosia candida it is concluded that Tephrosia candida has a potential in livestock production, since when used as a feed ingredient, it successfully yeilded Ca and P and it is easily digestible in the experimental rats. Age of Tephrosia candida plant did not significantly affect the Ca and P content. This suggests that Tephrosia candida can be harvested at any time for the production of animal feed.The alues obtained in this study for Ca (0.76) satisfy Ca requirement for ruminants 0.18-1.04% and monogastrics 1.5-0.32% [21].

The values obtained in this study for P (0.35) satisfy P requirement for ruminants 0.16-0.37% and monogastrics 0.15-0.32% [21]. In the present study Ca and P were almost 100% absorbed by the albino rats fed with Tephrosia based diet.Considering the abundance of Tephrosia candida in Nigeria and its relative ease of harvesting it is to be recommended as a good substitute for the expensive conventional feed ingredients in Nigeria.

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