EFFECT OF VARYING FERTILIZER APPLICATION ON FODDER YIELD AND MINERAL COMPOSITION OF COWPEA PLANT AS FEED FOR SAHELIAN GOAT

***Gumel, A.M., Suleiman. A.S., Muhammad. A.S., Abdul'aziz. A., Yunusa. K., Babandi. B., Ya'u. M.S., Mamuda. I., Dahiru. M., Abdulkadir. U. and Sulaiman. U.U.**
Department of Animal Health and Production, Binyaminu Usman Polytechnic PMB 013 Hadejia, Jigawa State
**Corresponding author email address: adamuhammadgumel1991@gmail.com (+2348132803922)*

ABSTRACTs
In jigawa state, pasture farmers do not use any form of potassium and phosphorus source fertilizer, they entirely rely on the natural available soil potassium and phosphorus and this has resulted in lower yields of legumes pasture. Therefore, a study was carried out to evaluate the effect of Muriate of Potash (MOP) and Triple Super Phosphate (TSP) with combination ratio (1:1) in a completely randomized design (CRD), consisting of four treatments replicated four times. The combinations were applied after two and five weeks of planting. Fertilizer was weighed and applied evenly to individual treatments(T1 0.3kg, T2 0.5kg, T3 0.7kg and T4 0.9kg). Experimental plants were harvested at age of seven weeks. Plants were harvested by uprooting completely. Parameters observed were fresh fodder weight, dried fodder weight and mineral analysis. The result showed significant ($p < 0.05$) difference on fresh and dried fodder on root weight (RW) of the experimental plants, whereas no significant ($p >0.05$) difference was observed in (SW, LW, WPW and MC). The result on minerals analysis also shows significance ($p < 0.05$) difference in some minerals (Mg and Zn), whereas no significant ($p >0.05$) difference was observed on (Ca, K, P). This study revealed that, there is a little disparity on the varying level of fertilizer (Mop & Tsp combination) on cowpea pasture plant, in which there is no significance difference ($p>0.05$) on stem weight, leaves weight, whole plant weight, moisture content, calcium (Ca), potassium (K) and phosphorous (P). The study show significance difference ($p<0.05$) on root weight, magnesium (Mg) and zinc (Zn). Treatment (T3) with 0.7kg MOP & TSP combination (1:1) will be recommended for both fodder yield and mineral composition as observed in the study.
Keywords: Cowpea, effect, fertilizer, fodder, mineral.

INTRODUCTION

Most African countries including Nigeria are presently in the midst of food and feed crises. Legumes in particular are used as green manure cover crops, and rotation with cereal crops (Omokanye, 2001). Cowpea (*Vigna unguiculata*) is one of the important fodder legume crops grown round the globe (Sebetha *et.al.,* 2010) for multiple uses such as green fodder and hay for livestock, green pods and grain rich in protein as vegetable and protein source for human consumption. Most of livestock owners grow fodder cowpea as an intercrop with other crops and fodder cowpea forms an integral component of crop livestock farming system (Singh and Tarawali, 2011). Cowpea pasture plant is a heat and drought-tolerant annual legume adapted to a wide range of soil and climate conditions (Singh *et al.,* 2010). In livestock production, cowpea is fed as fresh forage, hay, stover's, or haulms. Cowpea is highly nutritious, contains good quality proteins and carbohydrates (Sreerama *et al.,* 2012), and has been suggested as a protein supplement for improved nutrition of ruminants (Etana *et al.,* 2013). Cowpea pasture plants are grazed by sheep and goats (Mubi *et al.*, 2015; Adjei-Fremah, 2016) as a summer legume. More recently, cowpea used as a summer finishing diet in cattle resulted in improved meat quality and marbling score, and higher consumer steak preference (Schmidt *et al.*, 2013). It is important to understand goat growth and health performance when allowed to graze fresh cowpea pasture. Cowpea is an important grain legume in tropical and subtropical regions where there is a shortage of animal protein (Tshovhote *et al.,* 2013). Singh *et al.* (2010) reported that cowpea is an important fodder crop for livestock and has been proposed as a possible alternative source of protein and energy for livestock during winter and dry seasons.

MATERIALS AND METHODS

Description of the study area

This research was carried out at the Agricultural Extension Management (AEM) Research Farm of Binyaminu Usman polytechnic Hadejia, Jigawa State. The area lies between latitude 12.45□6N and longitude 10.04□4E. Materials uses for the experiment were cowpea seed, fertilizer (Muriate of Potash and Triple Super Phosphate), weighing scale, scissors and laboratory oven. Seeds were sourced from Jigawa Agricultural Supply Company (JASCO) Gumel, the fertilizer were directly purchased from the Agronomy farm, old faculty building Bayero University Kano. The experimental design was a completely randomized design (CRD) consisting of four (4) treatments according to different levels of fertilizer (0.3kg, 0.5kg, 0.7kg and 0.9kg) applied and replicated four (4) times. The total land area for the experiment was 4.85m x 4.85m. The experimental land was divided in to 4 experimental plots (T_1, T_2, T_3 and T_4) 1.21m x 1.21m each. A Combinations of Muriate of Potash (MOP) and Triple Super Phosphate (TSP) with combination ratio (1:1) were applied after two and five weeks of planting respectively. Fertilizer was weighed and applied evenly to individual treatment (T_1 0.3kg, T_2 0.5kg, T_3 0.7kg and T_4 0.9kg). Experimental plants were harvested at the age of seven (7) weeks. The plants were harvested by uprooting the plant completely from the base of root.

Data collection

Harvested plants were cut into three parts (root, stem and leaves). Fresh cut plants were weighed using a sensitive weighing scale and recorded. Samples of each plant were oven dried at 95°F for 72 hours. Dried cut plants were also weighed using a sensitive weighing scale. The dried cut part of plants were grinded using motor and pestle, 12 samples (i.e. three samples from each treatment) were labeled and stored in a sealed polythene bag and taken to Bayero University Kano, for mineral analysis, the mineral content of cowpea fodder was analyzed using AAS (Atomic Absorption Spectrophotometer) equipment. Calcium, magnesium and zinc were analyzed using (AAS), Phosphorous was determined according to the vanado-molybdophosphoric acid method using spectrophotometer, while the photometer was used to estimate potassium content.

Data analysis

The data were subjected to analysis of variance (ANOVA) in completely randomized design (CRD) of GENSTAT (2014), where significant differences between means were separated using Duncan Multiple Range Test (DMRT) at 5% probability level.

RESULT AND DISCUSSION

The effect of varying fertilizer (Mop &Tsp) on fresh fodder weight was presented in Table 1. No significant ($p>0.05$) difference was observed on fresh stem weight, fresh leaves weight and whole fresh plant weight. The significant ($p<0.05$) difference was only observed on fresh root weight with the highest 6.05g at (T_3) with 0.7kg of Mop &Tsp combination ratio (1:1), while (T_4) with 0.9kg of Mop &Tsp combination ratio (1:1) at the lowest which is 2.35g. This research can be married with finding of Vassanthini and Premanandarajah (2020), which investigate that, there was a significance difference of fresh root weight on the use of muriate of potash (MOP) on cowpea fresh (vegetative) fodder. Rombeld and kirkby (2010) stated that potassium is essential for the growth translocation of photo-assimilate in root growth and increase supply of potassium increase the root surface and root water intake. Phosphorus is essential for development of cell nuclei, cell division and development of meristematic tissue (sites of new growth such as stem and root tip and is therefore very important early in plant development to promote good root and plant growth (Pain,1978).

Table 1: Effect of varying fertilizer application (MOP & TSP) on cowpea fresh fodder weight

PARAMETERS	TREATMENTS				P-value
	$T_1$0.3kg (MOP&TSP)	$T_2$0.5kg (MOP&TSP)	$T_3$0.7kg (MOP&TSP)	$T_4$0.9kg (MOP&TSP)	
RW (g)	3.03[b]	5.83[a]	6.05[a]	2.35[b]	0.008
SW (g)	30.75[a]	78.22[a]	86.15[a]	42.85[a]	0.120
LW (g)	38.55[a]	69.45[a]	84.35[a]	39.55[a]	0.086
WPW (g)	72.20[a]	153.50[a]	176.60[a]	84.60[a]	0.091

[a, b, c, d] Means with different superscripts along columns differ significantly at ($P < 0.05$). RW: Root Weight, SW: Stem Weight, LW: Leaves Weight, WPW: Whole Plant Weight.

Weight, SW: Stem Weight, Lw: Leaves Weight, WPW: Whole Plant Weight, MC: Moisture Content.
The effect of varying fertilizer (Mop &Tsp) on cowpea dried fodder weight was presented in Table 2. No significant ($p>0.05$) difference was observed on dried stem weight, dried leaves weight, whole dried plant weight and the moisture content. The significant ($p<0.05$) difference was only observed on dried root weight with the highest 1.63g at (T_2) with 0.5kg of Mop &Tsp combination ratio (1:1), while (T_4)with 0.9kg of Mop &Tsp combination ratio (1:1) at lowest 0.725g. This research also agreed with the finding of Vassanthini and Premanandarajah (2020).

Table 2: Effect of varying fertilizer application (MOP & TSP) on cowpea dried fodder weight

PARAMETERS	TREATMENTS				P-value
	$T_1$0.3kg (MOP&TSP	$T_2$0.5kg (MOP&TSP)	$T_3$0.7kg (MOP&TSP)	$T_4$0.9kg (MOP&TSP)	
RW (g)	0.85^{c}	1.63^{a}	1.48^{ab}	0.73^{b}	0.038
SW (g)	5.58^{a}	15.28^{a}	16.68^{a}	7.93^{a}	0.108
LW (g)	10.35^{a}	22.35^{a}	26.78^{a}	11.88^{a}	0.084
WPW (g)	16.88^{a}	39.35^{a}	45.00^{a}	20.73^{a}	0.088
MC (g)	55.35^{a}	114.15^{a}	131.40^{a}	63.92^{a}	0.095

$^{a, b, c, d}$ Means with different superscripts along columns differ significantly at ($P < 0.05$). RW: Root

The effect of varying fertilizer (Mop &Tsp) on cowpea fodder minerals was presented n Table 3.No significant ($p>0.05$) difference was observed on Calcium (Ca), Potassium (K) and Phosphorous (P). The significant ($p<0.05$) difference was observed on Magnesium (Mg) with highest 4.98mg/kg at (T_2) with 0.5kg of Mop &Tsp combination ratio (1:1), while (T_4) with 0.9kg at the lowest 4.24mg/kg. Another significant ($p<0.05$) difference was also observed on Zinc (Zn) with highest 1.93mg/kg at (T_2) with 0.5kg of Mop &Tsp combination ratio (1:1), while (T_1) with 0.3kg of Mop &Tsp combination ratio (1:1) at the lowest 1.49mg/kg. This research disagreed with the finding of Ayodele and Oso (2014), in which there is significant difference ($p<0.05$) on Calcium (Ca), Phosphorous (P), Potassium (K) and Magnessium (Mg), when different phosphorous source (SSP & TSP) were used.

Table 3: Mineral composition of cowpea fodder at different levels of fertilizer application (MOP & TSP)

PARAMETERS	TREATMENTS				P-value
	$T_1$0.3kg (MOP&TSP)	$T_2$0.5kg (MOP&TSP)	$T_3$0.7kg (MOP&TSP)	$T_4$0.9kg (MOP&TSP)	
Ca (mg/kg)	20.17^{a}	22.31^{a}	21.30^{a}	18.69^{a}	0.078
K (mg/kg)	30.67^{a}	30.96^{a}	29.31^{a}	31.00^{a}	0.327
Mg(mg/kg)	4.97^{ab}	4.98^{a}	4.36^{b}	4.24^{b}	0.045
P(mg/kg)	5.09^{a}	5.48^{a}	5.55^{a}	4.96^{a}	0.282
Zn(mg/kg)	1.49^{b}	1.93^{a}	1.65^{ab}	1.80^{ab}	0.054

$^{a, b, c, d}$ Means with different superscripts along columns differ significantly at ($P < 0.05$). Ca: Calcium, K: Potassium, Mg: Magnessium, P: Potassium, Zn: Zinc

CONCLUSION AND RECOMMENDATION

It is concluded that, significant difference ($p<0.05$) was only observed on root weight for both fresh and dried forage and regarding the minerals analysis, significant differences was observed on Magnessium (Mg) and Zinc (Zn). Based on the research, treatment (T_3) with 0.7kg MOP & TSP combination (1:1) will be recommended for both fodder yield and mineral composition as observed in the study.

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