Growth Performance and Haematological Profile of Growing Rabbits Fed Groundnut, Lablab and Moringa Forage Meal Based Diets

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Abstract

Forages abound in nature and form a major component of feed for livestock and are implicated in improved rabbit production. This study was designed to determine the effect of groundnut (Arachis hypogea), lablab (Lablab purpureus) and moringa (Moringa oleifera) forage meal based diets on growth performance and haematological profile of growing rabbits. Forty-eight (48) weaner crossbred (New Zealand White X Chinchilla) 6 to 7 weeks old rabbits; made up of twenty-four each of male and female rabbits with average initial weight of 1.56 kg. The rabbits were randomly allocated to four forage types made up of a control (concentrate only), groundnut (Arachis hypogea), moringa (Moringa oleifera) and lablab (Lablab purpureus) forage meals incorporated at 10% substitution of the control concentrate diet to form complete diets, and sex (male and female) in a completely randomized design. Live weight, final weight, and average weight gain at week 9, total weight gain at week 18 and average daily gain were productive parameters measured. Haematological parameters measured were WBC, lymphocytes, RBC, Hb, PCV, MCV, MCHb and its concentrations as well as platelets. Results obtained indicated that forage type had significant (P<0.05) effect on final weight, total weight gain at week 18 and average daily gain of the animals; being higher (P<0.05) in rabbits fed the different forages compared to those fed the control diet. Live weight and average weight gain at week 9 were not significant (P>0.05). Sex had significant (P<0.05) effect only on live weight at week 9; females were heavier (P<0.05) than the males. Lymphocytes, mean corpuscular haemoglobin and its concentrations were significantly (P<0.05) influenced by forage type. Lymphocytes were lowest on lablab forage meal diet, while MCHb and MCHb concentration were highest on moringa forage meal diet. O*ther haematological parameters were statistically (P>0.05) similar. Sex had no effect (P>0.05) on the haematological parameters. There was significant (P<0.05) interaction between forage type and sex, only on white blood cells (P<0.05). Male and female rabbits fed concentrate and lablab had similar WBC, while females on groundnut forage had higher WBC than males and males on moringa had higher WBC than females. Other haematological parameters were statistically (P>0.05) similar. It is concluded that lablab, groundnut and moringa forage meal based diets positively influenced final weight, total weight gain and average daily gain of rabbits. Rabbits fed moringa forage meal diet had more oxygen-carrying capacity in the red blood cells compared to the control diet; evidenced in their improved mean corpuscular haemoglobin and its concentrations.*

Keywords: Forage types, sex, growth, haematology, rabbits

Running title: Growth and haematology of growing rabbits fed groundnut, lablab and moringa forage meal based diet

Performance de croissance et profil hématologique des lapins en croissance nourris avec des régimes à base de farine de cacahuète, lablab et moringa

Résumé

Les fourrages abondent dans la nature et constituent un élément majeur de l'alimentation du bétail, contribuant à une meilleure production de lapins. Cette étude a été conçue pour déterminer l'effet des régimes à base de farine de cacahuète (Arachis hypogea), lablab (Lablab purpureus) et moringa (Moringa oleifera) sur la performance de croissance et le profil hématologique des lapins en croissance. Quarante-huit (48) lapins croisés (New Zealand White X Chinchilla) âgés de 6 à 7 semaines, composés de vingt-

quatre mâles et femelles, avec un poids initial moyen de 1,56 kg. Les lapins ont été répartis de manière aléatoire en quatre types de fourrage, comprenant un contrôle (concentré uniquement), de la farine de cacahuète, de la farine de moringa et de la farine de lablab incorporées à 10 % en substitution du régime concentré de contrôle pour former des régimes complets, et selon le sexe (mâle et femelle) dans un design complètement aléatoire. Le poids vif, le poids final et le gain de poids moyen à la semaine 9, le gain de poids total à la semaine 18 et le gain quotidien moyen étaient les paramètres productifs mesurés. Les paramètres hématologiques mesurés étaient les WBC, lymphocytes, RBC, Hb, PCV, MCV, MCHb et leurs concentrations ainsi que les plaquettes. Les résultats obtenus indiquent que le type de fourrage avait un effet significatif (P<0,05) sur le poids final, le gain de poids total à la semaine 18 et le gain quotidien moyen des animaux ; étant plus élevé (P<0,05) chez les lapins nourris avec les différents fourrages comparés à ceux nourris avec le régime de contrôle. Le poids vif et le gain de poids moyen à la semaine 9 n'étaient pas significatifs (P>0,05). Le sexe avait un effet significatif (P<0,05) uniquement sur le poids vif à la semaine 9 ; les femelles étaient plus lourdes (P<0,05) que les mâles. Les lymphocytes, l'hémoglobine corpusculaire moyenne et ses concentrations étaient significativement (P<0,05) influencés par le type de fourrage. Les lymphocytes étaient les plus bas dans le régime à base de farine de lablab, tandis que MCHb et sa concentration étaient les plus élevés dans le régime à base de farine de moringa. Les autres paramètres hématologiques étaient statistiquement (P>0,05) similaires. Le sexe n'avait pas d'effet (P>0,05) sur les paramètres hématologiques. Une interaction significative (P<0,05) entre le type de fourrage et le sexe a été observée, uniquement sur les globules blancs (P<0,05). Les lapins mâles et femelles nourris avec le concentré et le lablab avaient des WBC similaires, tandis que les femelles nourries avec du fourrage de cacahuète avaient un WBC plus élevé que les mâles et que les mâles nourris avec du fourrage de moringa avaient un WBC plus élevé que les femelles. Les autres paramètres hématologiques étaient statistiquement (P>0,05) similaires. Il est conclu que les régimes à base de farine de lablab, de cacahuète et de moringa influençaient positivement le poids final, le gain de poids total et le gain quotidien moyen des lapins. Les lapins nourris avec un régime à base de farine de moringa avaient une plus grande capacité de transport d'oxygène dans les globules rouges par rapport au régime de contrôle ; cela se manifeste par une amélioration de l'hémoglobine corpusculaire moyenne et de ses concentrations.

Mots-clés : Types de fourrage, sexe, croissance, hématologie, lapins

Introduction

Inadequate protein intake especially that of animal origin is the most nutritional problem in Nigeria (Fielding, 1991). An average Nigerian for instance consumes less than 10% of animal protein daily which falls short of the Food and Agriculture Organization's recommendation of 27 g as the animal daily protein requirement for human beings (FAO/WHO, 2001). There is therefore a gaping need for food of plant and animal origin and a panacea for protein shortage is to target livestock species such as rabbits. Rabbits are very prolific with short generation interval. They utilize high-quality feed materials and forages at affordable prices. They are the most productive meat producing animal among all domesticated animals. Rabbit production represents one of the alternatives to feeding the growing human population: it offers both good revenues and animal protein for the household. Increased rabbit production is one sure way of meeting the animal protein requirements of the populace (Iyeghe–Erakpotobor *et al.,* 2002).

Feeding is one major factor of production management in livestock farming and the use of feed materials such as forages that are not in great demand or in competition with humans is a way of reducing the cost of feed. The performance of rabbit depends mainly on the quality of feed and other management practices (Omole *et al.,* 2007). Despite the potential of exploiting a large number of feedstuffs and the limited maintenance requirements of amino acids and vitamins, rabbit feeding still poses a great challenge in intensive rearing system (Xiccato and Trocino, 2010). The use of leguminous plants (such as groundnut, moringa and lablab forages) and their residues as supplement in animal production have been described by several authors (Aduku *et al.,*

1986; Dematerowa *et al.,* 1991; Manyuchi *et al*., 1997; Savadogo *et al*., 2000; Iyeghe-Erakpotobor, 2006; Omoikhoje *et al.,* 2006) .

Haematology refers to the study of the numbers and morphology of the cellular elements of the blood (Baglin *et al.,* 2015). The blood volume of a healthy rabbit is approximately 55 to 65 mL/kg, and 6 to 10% of the blood volume may be safely collected (Alessandro, 2007) for clinical or pathological examinations. Some internal and external factors such as age, sex, breed, circadian rhythms, stress, haemolysis among others, all affect heamatological and serum biochemical parameters in rabbits. Haematological markers that have levels above or below the normal ranges can be used to diagnose disorders such as immunological and cardiovascular disease in rabbits (Evans *et al.,* 1999). Deviation from normal values blood could serve as a reflector of the metabolic stage of an animal as well as quality of feed (Abdulazzez *et al.,* 2016). They are thus, used to determine systemic relationships and physiological adaptations in the body of the animals due to environmental, nutritional and/or pathological factors (Afolabi *et al.,* 2010; Saulawa *et al.,* 2012). This is very important because the potential value of non-conventional feed ingredients (such as groundnut, lablab and moringa forages) depend on their nutritive value, availability and safety to animal health (Adejinmi *et al.,* 2011). The effects of any feed ingredient including medicinal plants on the haematological factors of the livestock are of immense assistance in deciding whether or not such a feed ingredient will be safe as feedstuff or not (Mitruka and Rawnsley, 1997). This study was therefore designed to determine the effect of feeding rabbits with groundnut, lablab and moringa forage meal diets on productive performance and haematological profile of growing rabbits.

Materials and Methods

Experimental Location

The experiment was conducted at the Rabbit Unit, Swine and Rabbit Research Programme of National Animal Production Research Institute (NAPRI), Shika, Zaria. Shika is located in the Northern Guinea Savannah on latitude 11° 12'N and longitude 7°33" with altitude of about 610 mm above sea level (Ovimaps, 2016). The temperature varies from 14°C during the early dry season (November–January) and 39.3°C during the late dry season (February to April) (Ovimaps, 2016).

Sourcing and Processing of Test Ingredients

Moringa forage was purchased from the market in Giwa, Giwa local Government Area, Kaduna State. The groundnut haulm was obtained from the Rabbit Research Unit, Swine and Rabbit Research Programme, NAPRI plot while lablab forage was obtained after seed harvesting from the Feed and Nutrition Research Program (FNRP), NAPRI demonstration plots. The forages were air dried in a well-ventilated room to maintain greenish colour and quality. The forages were milled and bagged before use.

Experimental Animals and Management

This study utilized forty-eight (48) weaner crossbred (New Zealand White X Chinchilla) 6 to 7 weeks old rabbits; made up of twenty-four each of male and female rabbits. The rabbits having an average initial weight of 1.56 kg were sourced from the Rabbit Research Unit, Swine and Rabbit Research Programme, NAPRI, Shika-Zaria. The animals were weighed and randomly allocated to three forage types and a no forage control (concentrate alone) in a 4x2 factorial arrangement in a completely randomized design. The factors were forage type (concentrate diet (control), *Lablab, groundnut and moringa* forage meals) and sex (male and female rabbits).

The forage diets were compounded by substituting 10% of the concentrate diet with the respective forage meal to form complete diets. The experimental diets were offered at 150 g/rabbit/day in the morning at 08:00 am in flat bottomed earthen feeders with curved rim, while clean water was supplied in the same earthen pots *ad libitum* daily at 08:00 am. The rabbits were allowed to adjust to the experimental diets for one week, thereafter data collection commenced for twelve weeks.

Measurement of productive and haematological parameters

The rabbits were weighed at weekly interval using Camry Table Scale (capacity of 20kg, Camry Emperors, China) to obtain the weight gain which was calculated by the subtraction of the initial body weight from the final body

weight, all in kilogrammes. Feed was measured daily before feeding and feed leftovers also were weighed after feeding and recorded. Proximate composition of the concentrate diet and forages was analysed according to AOAC (2006). Blood samples, with 5 mL of blood were collected from the marginal ear veins of the rabbits into labelled bijou bottles containing an anticoagulant ethylene diamine tetra-acetic acid (EDTA) to determine the PCV, RBC, Hb, WBC, Lymphocytes, MCV, MCHb, MCHb concentration and platelets. The PCV, RBC, WBC and Hb values were determined using the Wintrobe's microhaematocrit, improved Neubauer haemocytometer and cyanomethaemoglobin methods, respectively (Coles, 1986). The MCH was calculated according to Bush (1991).

Statistical Analysis

Data collected were subjected to factorial analysis of variance (ANOVA) using the SAS (2001). Significant differences in means between the treatments were separated using Pairwise difference (SAS, 2001). Haematological parameters were analysed using repeated measures. Shapiro-Wilks test was used to test the assumptions of normality for the levels of the independent variables.

Results and Discussion

Effects of different forage types and sex of rabbit on growth performance of growing rabbits are presented in Table 1. The results indicated that final weight, total weight gain at week 18 and average daily gain were significantly ($P<0.05$) affected by forage type; being significantly ($P<0.05$) higher in rabbits fed the three forage meal diets (groundnut, moringa and lablab) than the concentrate diet. However, final weight was significantly ($P<0.05$) lower on moringa than lablab forage meal diet, and lowest on the concentrate diet than the forage meal diets. This result could be attributed to increased fibre content of the diets, better utilization of the feed by the

Table 1: Effects forage type and sex on growth performance of growing rabbits

Parameter	Concentrate	Forage type			P value	Sex of rabbit		P value
		Groundnut forage	Moringa forage	Lablab forage		Male	Female	
IW (kg)	1.56±0.14	1.51±0.12	1.40±0.12	1.78±0.12	0.181	1.44±0.09	1.68±0.09	0.066
FW (kg)	1.92±0.13^{c}	2.59±0.11^{ab}	2.40±0.12^{b}	2.80±0.12^{a}	0.0002	2.37±0.09	2.48±0.08	0.273
LW9 (kg)	2.01±0.15	2.26±0.13	2.14±0.14	2.50±0.14	0.114	2.08±0.10^{b}	2.37±0.10^{a}	0.052
WG9 (g)	450.00±147.32	747.50±126.16	736.61±130.58	720.00±131.77	0.405	640.00±96.98	687.05±92.76	0.728
ADG9 (g/d)	7.14±2.34	11.86±2.00	11.69±2.07	11.43±2.09	0.405	10.16±1.54	10.90±1.47	0.728
TWG18	381.87±141.35^{b}	1078.33±121.05^{a}	1002.68±125.30^{a}	1025.00±126.43^{a}	0.003	914.85±93.05	829.09±89.00	0.674
ADG (g/d)	3.90±1.09^{b}	8.56±0.93^{a}	7.96±1.00^{a}	8.14±1.00^{a}	0.012	7.32±0.71	6.95±0.69	0.859

^{abc}: Means with different superscripts in the same row are significantly (P<0.05) different; IW=Initial weight, FW=Final weight, LW9=Live weight at week 9, WG9=Weight gain at week 9, ADG9=Average daily gain at week 9, TWG18=Total weight gain at week 18, ADG=Average daily gain

rabbits or reduction in metabolizable energy content of the diets. Inclusion of forages in rabbit diets increased digestibility of dry matter, ether extract, crude protein, crude fibre and nitrogen free extractives (Iyeghe-Erakpotobor *et al*., 2006). It may also be that the rabbits had to increase intake to meet the energy deficit (Iyeghe-Erakpotobor *et al.*, 2015). According to Makkar (2012), forages are rich in carotenoids and also contain good quality protein of high digestibility for livestock. The improved body weight observed in the forage treated rabbits showed that the levels selected did not exert any harmful effect on the animals and their metabolic processes, could be said to be normal according to Lilibeth and Glorina (2010). Increased nutrients digestibility were also reported by Khayyal *et al*. (2015) in ruminants fed forages. Improvement in feed utilization and productive performance were recorded in goats (Sultana *et al.*, 2015), sheep (Fadiyimu *et al.*, 2010) cows (Mendieta-Araica *et al.*, 2011) and rabbits (Iyeghe-Erakpotobor *et al*., 2006) fed forages.

Significantly higher final weight observed in rabbits fed lablab forage meal diet (and those fed groundnut forage meal diet) compared to those fed concentrate and moringa forage meal diet however, could be attributed to high crude protein contents of the forages. Higher final weight observed in rabbits fed Lablab forage diet agrees with the findings of Eduvie *et al.* (2002) who reported mean body weight gain (g/day) of lactating cows in agro pastoral herds supplemented with lablab. Abdou *et al.* (2011) also recorded significant improvements in the weight gain of lambs fed groundnut haulms.

Only live weight at week 9 was significantly ($P>0.05$) affected by sex effect; being significantly higher in female rabbits than males. These results agree with the findings of North *et al.* (2019); Rotimi and Ati (2020) and Rotimi (2021) who observed that female rabbits were significantly heavier than the males. However, these results were contrary to the findings of Murshed *et al.* (2014) and Fadare (2015) who reported significantly higher weights in male rabbits than in the females. This result confirms the occurrence of sexual dimorphism in the rabbits studied, as reported by Rotimi, (2021). Murshed *et al.* (2014) reported slightly lower but non-significant different slaughter and carcass weights in male than in female rabbits. Similarly, North *et al.* (2019) reported no sex effect on live weight in rabbits. There appears to be a phase in which this higher weight in female rabbits becomes lower than the males as was observed from week 9 to week 18 in this study. Fadare (2015) reported that the ability to tolerate heat differs between male and female rabbits in the humid tropical environment characterized with high ambient temperature and relative humidity. This could be a reason for the changes in response to growth by the rabbits.

Effects of forage type and sex on haematological profile of growing rabbits is presented in Table 2. The results indicated that only lymphocytes, mean corpuscular haemoglobin and mean corpuscular haemoglobin concentration were significantly ($P<0.05$) affected by forage type. Rabbits fed concentrate diet as well as those fed groundnut and moringa forage meal diets had significantly ($P<0.05$) higher lymphocytes than those fed lablab forage meal diet. However, mean corpuscular haemoglobin and mean corpuscular haemoglobin concentration of rabbits fed moringa forage meal based diet were significantly higher than those fed concentrate diet as well as those fed groundnut and lablab forage meal diets. Haematology, the branch of biology (physiology), is concerned with the study of morphology and physiology of blood, blood-forming organs and blood diseases (Moore *et al.*, 2016) and deals with many aspects of those diseases which affect the blood such as anaemia (Otto *et al.*, 2017). NseAbasi *et al.* (2014) suggested that haematological parameters are good indicators of the physiological status of farm

animals. High percentage of white blood cells especially lymphocytes are associated with the ability of animals to perform well under very stressful conditions (Ojo and Adetoyi, 2017). Hence, the significantly lower lymphocyte count observed in rabbits fed lablab suggest that the animals' immune system was slightly compromised.

Mean corpuscular haemoglobin (MCH) quantifies the amount of haemoglobin per red blood cell while mean corpuscular haemoglobin concentration quantifies the amount of haemoglobin per unit volume of blood. Both parameters are used in elucidating the aetiology of anaemia. In the current study, it was observed that rabbits fed moringa forage had significantly higher mean corpuscular haemoglobin and its concentration compared to those fed concentrate diet and the other forage meal diets. Moringa has been reported to effectively increase haemoglobin concentration/level (oxygen-carrying capacity of the red blood cells) in anaemic females (Thounaojam and Reena, 2022). The mean corpuscular haemoglobin or "mean cell haemoglobin" (MCHb), is the average mass of haemoglobin per red blood cell in a sample of blood (Wikipedia, 2013a). It is reported as part of a standard complete blood count. Lower MCHb observed in rabbits fed concentrate diet as well as in those fed groundnut and lablab forage meal diets in this study indicates that the rabbits might slightly be anaemic. Gersten (2009) reported that low MCHb in animals indicates hypochromic anaemia. Sex had no significant ($P>0.05$) effect on all the haematological parameters measured.

Interaction between forage type and sex on haematological profile of growing rabbits is presented in Table 3. There was significant ($P<0.05$) interaction between forage type and rabbit sex only on white blood cells of the rabbits. Male and female rabbits fed concentrate diet and lablab forage meal diet had similar ($P>0.05$) white blood cell count, while females on groundnut forage meal diet had higher ($P<0.05$) white blood cell count than males and also, male rabbits on moringa forage meal diet had higher ($P<0.05$) white blood cell count than female rabbits. Male rabbits fed moringa forage meal diet had significantly ($P<0.05$) higher WBC than those fed groundnut and lablab forage meal diets, while female rabbits fed groundnut forage meal diet had significantly($P<0.05$) higher WBC than those fed concentrate, moringa and lablab forage meal diets. This result might suggest that male rabbits on groundnut and lablab forage meal diets and female rabbits on moringa and lablab forage meal diets, with lower white blood cell count had no infection, inflammation or immune system disorders. White blood cells, or leucocytes are cells of the immune system involved in defending the body against both infections, disease and foreign materials (Wikipedia, 2013b; Octura *et al.*, 2014). It is not clear what might be the cause for the high WBC in male rabbits on moringa forage meal diet and female rabbits on groundnut forage meal diets, especially when no effect of sex of rabbit was observed in this study.

Table 2: Effect of forage type and sex on haematological profile of growing rabbits

		Forage type				Sex		
Parameter	Concentrate	Groundnut	Moringa	Lablab	P value	Male	Female	P value
WBC (10^9/L)	6.28±0.62	5.99±0.68	7.3±0.68	5.04±0.68	0.146	6.31±0.50	6±0.436	0.647
Lymphocytes (%)	56.67±2.45^{a}	52.68±2.71^{a}	52.94±2.70^{a}	44.36±2.70^{b}	0.014	52.71±2.998	50.62±1.731	0.432
RBC (10^{12}/L)	4.2±0.41	4.29±0.52	2.77±0.52	4.19±0.52	0.122	3.96±0.384	3.77±0.331	0.704
Hb (g/dL)	11.19±0.50	10.46±0.55	10.68±0.55	10.16±0.55	0.553	10.36±0.407	10.88±0.353	0.335
PCV (%)	28.1±3.07	29.15±3.40	19.02±3.39	29.01±3.39	0.112	27.41±2.504	25.23±2.170	0.513
MCV (*fl*)	68.39±5.54	68.49±6.13	70.85±6.11	80.60±6.11	0.437	70.55±4.516	73.61±3.914	0.611
MCHb (*pg*/cell)	38.14±14.18^{b}	35.1±15.69^{b}	83.9±15.65^{a}	22.13±16.24^{b}	0.043	46.02±11.567	43.62±10.258	0.877
MCHb conc. (g/dL)	53.87±16.68^{b}	50.68±18.46^{b}	110.36±18.42^{a}	30.03±18.42^{b}	0.022	59.99±13.61	62.48±11.796	0.891
Platelets (10^9/L)	248.6±59.82	305.19±66.21	399.82±66.04	217.63±66.04	0.299	309.59±48.803	276.03±42.297	0.666

^{abc}Means with different superscripts in the same row are significantly (P<0.05) different. WBC=White blood cells, Lymph=Lymphocyte count, RBC=Red blood cells, Hb=Haemoglobin, MCV=Mean corpuscular volume, MCHb=Mean corpuscular haemoglobin, MCHb conc.=Mean corpuscular haemoglobin concentration

Table 3: Interaction between forage type and sex on haematological profile of growing rabbits

Forage type	**Concentrate**		**Groundnut**		**Moringa**		**Lablab**		
Sex	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	P value
WBC (10^9/L)	6.4±0.92^{ab}	6.17±0.81^{b}	4.92±1.09^{c}	7.06±0.81^{a}	8.98±1.00^{a}	5.61±0.92^{bc}	4.92±1.00^{c}	5.16±0.92^{bc}	0.0491
Lymph ?(%)	60.14±3.67	53.19±3.24	52.16±4.35	53.2±3.24	56.03±3.97	49.84±3.67	42.5±3.97	46.23±3.67	0.3945
RBC (10^{12}/L)	4.22±0.70	4.18±0.62	4.89±0.83	3.69±0.62	2.5±0.76	3.04±0.70	4.22±0.76	4.15±0.70	0.6833
Hb (g/dl)	11.3±0.75	11.09±0.66	10.94±0.88	9.98±0.66	9.82±0.81	11.54±0.75	9.38±0.81	10.93±0.75	0.2350
PCV (%)	27.71±4.60	28.49±4.06	34.32±5.45	23.99±4.06	17.83±4.97	20.2±4.60	29.78±4.97	28.23±4.60	0.5513
MCV (*fl*)	66.97±8.30	69.81±7.32	70.42±9.82	66.56±7.32	74.95±8.97	66.74±8.30	69.87±8.97	91.34±8.30	0.3399
MCHb (*pg*/cell)	35.37±21.27	40.91±18.76	22.42±25.16	47.78±18.76	104.25±22.97	63.56±21.27	22.03±22.97	22.23±22.97	0.5069
MCHb conc. (g/dL)	51.39±25.02	56.36±22.07	31.84±29.61	69.52±22.07	125.13±27.03	95.59±25.02	31.6±27.03	28.46±25.02	0.6410
Platelets (10^9/L)	210.43±89.73	286.78±79.13	297.60±106.16	312.78±79.13	553.50±96.91	246.14±89.73	176.83±96.91	258.43±89.73	0.1251

^{abc}Means with different superscripts in the same row are significantly (P<0.05) different. WBC=White blood cells, Lymph=Lymphocyte count, RBC=Red blood cells, Hb=Haemoglobin, MCV=Mean corpuscular volume, MCHb=Mean corpuscular haemoglobin, MCHb conc.=Mean corpuscular haemoglobin concentration

Conclusion

The use of groundnut, lablab and moringa forage meals in diets of growing rabbit diets is shown to positively influence final weight, total weight gain and average daily gain of rabbits. Rabbits fed moringa forage meal diet had more oxygen-carrying capacity in the red blood cells as shown in their higher mean corpuscular haemoglobin and its concentration. It is recommended that rabbits could be fed these forages in concentrate diet to improve their productive performance and haematological profile.

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