PJN
ISSN 1680-5194

PAKISTAN JOURNAL OF NUTRITION

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Pakistan Journal of Nutrition 6 (6): 603-606, 2007
ISSN 1680-5194

Haematology and Serum Biochemistry of Grower Pigs Fed Varying Levels of *Ipomoea asarifolia* Leaf Meal

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Abstract: Thirty-two large white x Hampshire weaner pigs aged 8-9 weeks with average weight of 18kg were used in a 56 day feeding trial to evaluate the effect of dietary inclusion levels of *Ipomoea asarifolia* Leaf Meal (IALM) on the haematology and serum biochemistry of weaner pigs. The pigs were separated into four groups and further replicated 4 times in a completely randomized design and fed diets containing 0, 5, 10 and 15% levels of IALM which represented treatments 1, 2, 3 and 4 respectively. The pigs were adequately housed, while feed and potable water were supplied *ad libitum*. Other standard management practices were adequately put in place. At the end of the 56 days, 4 pigs were randomly sampled from each treatment (1 per replicate) and blood collected through venepuncture on veins at backside of the ears. The samples were analyzed for haematology and serum biochemistry. All data were subjected to analysis of variance. Results show that most haemotological parameters were influenced by the varying levels of the treatment indicating significant differences ($p<0.05$) between treatments except for Hb and MCH. Also, white blood cell differentials significantly differed ($p<0.05$) between treatments. There were no deleterious effect on the haematology and serum biochemistry of growing pig.

Key words: Haematology, serum biochemistry *Ipomoea asarifolia* leaf meal, grower pigs

Introduction

The use of unconventional sources of feedstuff to feed livestock has effectively moderated the cost of non-ruminant livestock production. Some of those feedstuff are agro by-products and leaves of some legumes and browse plants. There is thus the need to evaluate the effect of these unconventional feeds on the health status of the livestock.

Madubuike and Ekenyem (2006) had stated that haematology and serum biochemistry assay of livestock suggests the physiological disposition of the animals to their nutrition. Esonu *et al*. (2001) had stated that haematological constituents reflect the physiological responsiveness of the animals to its internal and external environment, which include feed and feeding. Furthermore, some scientists have studied the effects of various feed on the haematology and serum biochemistry of livestock and concluded that feed ingredients including unconventional sources affect animal physiology.

Esonu (2001) had stated that raw mucuna beans contain high level of anti-trysin activity, phytate, cyanide and tarmin, which limits its use in animal feeding.

Awosanya *et al*. (1999) have observed the dependence of blood protein and creatinine on the quality of dietary protein while Iyayi (2001) feeding swine with cassava leaf supplement found that SGOT and SGPT were significantly lowered while serum total protein was significantly increased.

So having evaluated *Ipomoea asarifolia* Leaf Meal in grower pig production and found it suitable for pig production, it becomes imperative to further evaluate the effect of IALM on the haematology and serum biochemistry of pigs so as to establish its implication on physiology and health status of the animals.

Materials and Methods

Preparation of the leaf meal: Fresh blooming leaves of *Ipomoea asarifolia* were harvested green from the bush and fallow sections of Imo State University premises and environs, chopped to facilitate drying and spread on concrete floor of well ventilated room for four days until they become crispy. The dried leaves were then milled using a hammer mill with a sieve size 3.15mm to produce the leaf meal (IALM). The chemical composition of the IALM (Table 1) was determined by the standard method of AOAC (1995) and mineral analysis by methods of Grueling (1966) while gross energy was determined with a Gallen Kamp oxygen adiabatic bomb calorimeter.

Preparation of experimental diets: With the results of the analysis, *Ipomoea asarifolia* leaves were then incorporated into the experimental diets 1, 2, 3 and 4 at levels 0, 5, 10 and 15% respectively with 0% level as the control.

Siting, procurement and rearing of weaner pigs: Thirty-two large white×Hampshire weaner pigs aged 8-9 weeks and having average initial weights of 18kg were procured locally and reared at the pig production unit of the Imo State University, Teaching and Research Farm,

Table 1: Proximate Composition of IALM

Nutrient	Value
Crude fibre	16.90
Crude protein	32.00
Ash	7.10
Ether extract	7.60
Moisture	15.00
NFE	20.79
Metabolisable energy Kcal/kg	2768.00
Minerals	Values %
Calcium	0.50
Magnesium	0.63
Sodium	0.29
Potassium	0.50

Table 2: Ingredient composition of the experimental pig grower diet

Ingredients	T_1	T_2	T_3	T_4
Cassava chips	25.00	25.00	25.00	25.00
Groundnut cake	15.00	10.50	5.00	0.00
Leaf meal (IALM)	0.00	5.00	10.00	15.00
Soya bean meal	3.00	3.00	3.00	3.00
Palm kernel cake	10.00	10.00	10.00	10.00
Deoiled PKC	15.35	15.35	15.35	15.35
Spent grain	20.00	20.00	20.00	20.00
Fish meal	5.00	5.00	5.00	5.00
Oyster shell	3.00	3.00	3.00	3.00
Limestone	3.00	3.00	3.00	3.00
Common salt	0.30	0.30	0.30	0.30
L-lysine	0.06	0.06	0.06	0.06
Dl-methionine	0.04	0.04	0.04	0.04
Premix	0.25	0.25	0.25	0.25
Total kg	100.00	100.00	100.00	100.00
Calculated nutrient composition of the diets				
Dry matter	84.10	83.75	83.40	83.05
Crude protein	18.64	17.99	17.34	16.69
Metabolisable energy	2388.85	2395.25	2400.00	2408.05
Ether extract	4.36	4.45	4.53	4.61
Crude fibre	9.38	9.98	10.57	11.17

Premix supplied per kg of feed. Vit. A 10,000 iu, Vit D_3 2,000 iu, Vit E 5 iu, Vit K 2mg, Riboflavin 420mg, Vit B_{12} 0.01mg, panthotenic acid 5mg, nicotinic acid 20mg, folic acid 0.5mg, chlorine 3mg, mg 55mg, Fe 20mg, Cu 10mg, Zn 50mg, iodine 0.8mg

Owerri, Nigeria for ten weeks to determine the effect of different levels of IALM on haematology and serum biochemistry of grower pigs.

Owerri is located on longitudes 7°01', 06°E and 7°03' 00°E and latitudes 5°28' 24'N and 5°30' 00N. The weaner pigs were assigned to four dietary treatments containing 0, 5, 10 and 15% levels of IALM and each treatment was further replicated 4 times in a completely randomized design with 2 pigs per replicate. Housing and rearing were according to Ekenyem (2006).

Blood collection and analysis: Blood was collected from four pigs per treatment via venepuncture behind the ears to aspirate 7mls using a 10ml syringe, for haematological studies according to the methods of Okeudo *et al.* (2003).

Based on the proximate analysis of IALM (Table 1), the following diets are formulated (Table 2).

Thee (3) hours of their collection for total erythrocyte, harmatocrit PCV, haemoglobin (Hb), erythocyte sedimentation (ESR) and differential leucocyte count according to the methods described by Dein (1984). Erythrocyte (RBC) count was done in a haemocytometer chamber with Nat and Hedrics diluents to obtain 1:200 blood dilution. The number of leucocytes was estimated as total WBC×200. PCV was measured with micro haematocrit, with 75×16mm capillary tubes filled with blood and centrifuged at 3000rpm for 5 minutes.

The differential counts of leucocytes was made from blood stained with Wrights dye and each type of cell counted with laboratory counter. Haemoglobin concentration (HBC) was measured by the Cyammet haemoglobin methods. Some haematological parameters such as Mean Corpuscular Haemoglobin (MCH) was also calculated. Erythrocyte sedimentation rate was determined within six hours of sample collection according to the methods described by Orji *et al.* (1986). The clothing time was also determined using the glass slide method (Benjamin, 1961).

The coagulated blood was subjected to standard methods of serum separation of the harvested Total Serum Protein (TSP) and Total Serum Electrolyte (TSE). TSP was determined by the Gorlberge refractometer method to obtain concentrations (g/dl) per blood sample. The standard flame photometer (Gallen camp) was used to determine (Na^+) iron and potassium (K^+) ion.

Data were analyzed by one way analysis of variance according to the methods of Steel and Torrie (1980) and differences in means separated by Duncan's multiple range test as outlined by Onuh and Igwemma (1998).

Results

The haemoglobin (Hb) and MCH values did not vary ($p>0.05$) between treatments. However, significant differences were found between the treatment means of other haematological parameters. Results generally showed that values of the parameters were influenced by IALM (Table 3).

The serum biochemistry of the experimental pigs is shown in Table 4. Cholesterol, creatinine and total protein had similar values ($p>0.05$) between treatments but significant differences ($p<0.05$) were found between the treatment means of other serum biochemistry parameters. Increasing levels of IALM increased values of most serum biochemistry parameters.

Discussion

All haemotological parameters analyzed showed significant difference ($p<0.05$) between treatments except MCH, PCV, Hb, MCHC had values within normal ranges for pigs of that age (Maercks, 1979) while RBC had higher values. This could be attributed to normal oxygen carrying capacity of the pigs (Iyayi, 2001). White blood corpuscles and monocytes had lower values than the normal ranges while neutrophils eosinophils and

Table 3: Haematological parameters for grower pigs fed varying levels of IALM

Parameters	T_1	T_2	T_3	T_4	SEM
PCV (%)	37.50^{a}	35.75^{ab}	35.00^{b}	31.50^{c}	0.59
RBC×10 12/l	11.50^{a}	10.75^{ab}	9.50^{bc}	8.25^{c}	0.45
HB (g/dl)	12.50^{a}	12.00^{a}	11.75^{a}	11.50^{a}	0.43
MCV (g/dl)	37.50^{a}	36.00^{ab}	$34.5b^{c}$	33.50^{c}	0.52
MCH (u/g)	12.25^{a}	11.75^{a}	11.50^{a}	11.50^{a}	0.27
MCHC (%)	35.75^{a}	33.75^{a}	32.00^{b}	31.75^{b}	0.42
WBC×10_3/l	8.00^{d}	8.25^{cd}	8.98^{ab}	9.75^{a}	0.40
Blood coagulation time (sec)	31.75^{c}	30.50^{c}	35.00^{b}	38.25^{a}	0.90
Neutrophil (%)	53.00^{b}	51.50^{c}	54.25^{ab}	54.75^{a}	0.47
Lymphocytes %	37.00^{a}	33.25^{b}	36.25^{a}	33.00^{b}	0.64
Eosinophil %	7.00^{b}	8.50^{a}	4.75^{c}	7.25^{ab}	0.42
Basophil (%)	Nil	Nil	Nil	Nil	Nil
Monocyte (%)	2.75	3.25	3.50	3.00	0.37

abc: means within same row with different superscripts are significantly different ($p<0.05$)

Table 4: Serum biochemistry parameters for grower pigs fed varying levels of IALM

Parameter	T_1	T_2	T_3	T_4	SEM
Sodium mm/dl	44.25^{bc}	44.25^{bc}	46.50^{ab}	42.50^{c}	0.76
Potassium mm/dl/l	0.85^{b}	0.78^{b}	1.21^{a}	1.25^{a}	0.05
Bicarbonate HC_{03}mm/dl/l	10.55^{d}	11.60^{ab}	11.48^{bc}	11.63^{ac}	0.09
Chloride	23.75^{ab}	21.75^{c}	23.25^{bcd}	24.00^{ad}	0.58
Cholesterol mg/dl	10.50^{a}	10.75^{a}	10.25^{a}	10.75^{a}	0.26
Urea mg/g	8.28^{a}	9.10^{b}	9.35^{a}	9.15^{ab}	0.08
Creatinine mg/dl	24.00^{a}	23.00^{a}	23.00^{a}	23.75^{a}	0.38
Total protein mg/dl	55.75^{a}	54.00^{a}	54.00^{a}	55.75^{a}	0.73
Inorganic phosphorus mg/dl	4.43^{a}	4.35^{a}	3.45^{b}	3.70^{c}	0.07

abc: means within same row with different superscripts are significantly different ($p<0.05$)

lymphocytes had slightly lower values (Heath and Olusanya, 1985).

Values for WBC and blood coagulation time appeared to increase with increasing levels of IALM which implies that the leaf has substance which interferes with clothing. Also, PCV, Hb, MCV, MCH, MCHC showed that additional IALM in pig diets reduced their values. All the serum electrolytes analyzed showed significant differences ($p<0.05$) between treatment means, but the difference did not follow a regular pattern, thereby confirming that the dietary inclusion of *Ipomoea asarifolia* Leaf Meal did not affect the serum electrolytes. Serum cholesterol was also similar ($p>0.05$) between treatments thus assuring health safety of the leaf meal with the pigs. Creatinine and total protection did not significantly differ ($p>0.05$). This could be a confirmation that the protein in all treatments from IALM is good quality.

Iyayi and Tewe (1998), Awosanya *et al.* (1999) had observed the dependence of blood protein and creatinine on the quality of dietary protein. However, inorganic phosphorous, alkaline, phosphatase showed significant mean differences ($p<0.05$). Sastry and Aggrawal (1992) fed different forms of neem leaf meal to pigs and reported that blood enzyme profiles were similar while Sokumbi and Egbunike (2000) reported similar trend for rabbits fed diets containing 5% and 10% neem leaf meal.

On the other hand, Gangapadhyay (1981) had observed depressions in plasma protein concentration in Murrah Milch buffaloes on replacement of concentrate mixture with 15 and 20 parts of neem seed cake and Verma *et al.* (1995) in growing goats on replacement of concentration mixture with 15 and 25 parts of water washed neem seed kernel cake. It becomes clear that the values of serum protein were still normal at the levels of IALM inclusion.

Conclusion: Values of haematological parameters were influenced by the varying levels of the treatments and significant differences ($p<0.05$) were found between them except Hb and MCH. White blood cell differentials were not influenced by treatment. Therefore, inclusion of IALM up to 15% in diets of growing pigs, made pig production cheaper (Ekenyem, 2006) and had no deleterious effect on the haematology and serum biochemistry of growing pigs.

References

AOAC, 1995. Association of Official analytical chemists. Official methods of analysis. 7th Edition, Washington D.C.

Awosanya, B., J.K. Joseph, D.F. Apata and M.A. Ayoola, 1999. Performance, blood chemistry and carcass quality attributes of rabbits fed raw and processed pueraria seed meal. Trop. J. Anim. Sci., 2: 89-96.

Benjamin, M.M., 1961. Veterinary clinical pathology. 2nd Edition, Ames Iowa. The Iowa State University Press, U.S.A.

Dein, F.J., 1984. Laboratory Manual of Avian Haematology. Association of Avian Veterinarians East North Port, U.S.A.

Ekenyem, B.U., 2006. An Assessment of Ipomoea asarifolia leaf meal as feed ingredient in grower pig diet. Pak. J. Nutr., 5: 39-42.

Esonu, B.O., O.O. Enenalom, A.B.I. Udedibie, U. Herbert, C.F. Ekpor, I.C. Okoli and F.C. Iheukwumere, 2001. Performance and blood chemistry of weaner pigs fed raw mucuna (velvef bean) meal. Trop. Anim. Prod. Invest., 4: 49-55.

Gangapadhyay, P., 1981. Studies on biochemical constituents of blood with incorporation of Neem seed cake in the ration of Milch Murray buffaloes. Indian J. Anim. Health, 2: 61-63.

Grueling, H.T., 1966. The chemical analysis of tissues. Mimeo No. 6622. Agronomy department, Cornell University Ithaca, New York, USA.

Heath, E. and S. Olusanya, 1985. Anatomy and Physiology of tropical livestock. International Tropical Agriculture series, Longman London and New York.

Iyayi, E.A. and O.O. Tewe, 1998. Serum total protein, urea and creatinine levels as indices of quality of cassava diets for pigs. Trop. Vet., 16: 59-67.

Iyayi, E.A., 2001. Cassava leaves as supplements for feeding weaner swine. Trop. Anim. Prod. Invest., 4: 141-150.

Madubuike, F.N. and B.U. Ekenyem, 2006. Haematology and Serum Biochemistry characteristics of broiler chicks fed varying dietary levels of *Ipomoea asarifolia* Leaf Meal. Int. J. Poult. Sci., 5: 09-12.

Maerck Veterinary Manual, 1979. Merch and Company Inc. Rahway, NJ. USA, pp: 21.

Okeudo, N., I.C. Okoli and G.O.F. Igwe, 2003. Haematological characteristics of ducks, *Carmia moschata* of South Eastern Nigeria. Tropiculturra, 21: 61-65.

Onuh, M.O. and A.A. Igwemma, 1998. Applied Statistical techniques for business and basic sciences. CRC Publishers, Owerri, Nigeria, pp: 350.

Orji, B.I., G.C. Okeke and O.O. Ojo, 1986. Haematological studies on the guinea fowl, *Numida meleagri pallas*: effect of age, sex and time of breeding on protein and electrolyte levels in blood serum of guinea fowls. Nigeria J. Anim. Prod., 13: 100-106.

Sastry, R.B. and A.K. Aggrawal, 1992. Utilization of water washed neem seed kernel as protein source for pigs. J. Appl. Anim. Res., 1: 103-107.

Sokumbi, O.A. and G.N. Egbunike, 2000. Physiological responses of growing rabbits to neem *Azadirachta indica* leaf meal based diets. Haematology and serum biochemistry. Trop. Anim. Prod. Invest., 3: 81-87.

Steel, R.G.D. and J.H. Torrie, 1980. Principles and Procedures of Statistics: A biometrical approach, 2nd Edition, McGraw-Hill Book Company, New York, pp: 633.

Verma, A.K., R.B. Sastry and D.K. Aggrawall, 1995. Feeding of water washed neem *Azadirachta indica* seed kernel cake to growing goats. Small Ruminant Resources, 15: 105-114.