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The Effect of Chromolaena Odorata (Siam Weed) On the Haematological Profile and Growth Performance of Rabbits

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Abstract: *An experiment which lasted for two months was conducted to evaluate the haematological indices and body weight changes of rabbits fed with Chromolaena odorata leaf meal (COLM), 48 rabbits consisting of 27 males and 21 females and of mixed breeds, aged 6-8 weeks and weighing 400 - 800 g were randomized into four experimental diets groups of 0, 10, 20, and 30% in a completely randomized design. Each treatment was replicated 4 times with three rabbits per replicate. Samples of blood were collected monthly from the ear vein of the rabbits for haematological studies and the growth study was determined using a weighing scale. Among all the haematological parameters evaluated in this study, red blood cell counts (RBC), white blood cell counts (WBC), platelets and lymphocytes showed significant ($P < 0.05$) difference. An increase in the RBC and lymphocyte values were obtained at 10% COLM treatment group and thereafter a significant ($P < 0.05$) decline was observed at higher inclusion rate. The numerical values of haemoglobin and packed cell volume which correlates with RBC also showed an initial increase up to 10% followed by a decrease at higher level of inclusion of COLM. WBC counts were significantly ($P < 0.05$) lower in rabbits fed with COLM than in the control. As the inclusion level of COLM increases results of platelets showed a decreasing significant ($P<0.05$) difference. All growth parameters studied showed a decreasing significant ($P<0.05$) difference following higher COLM rate. These results revealed that COLM significantly decreased the growth and feed intake of rabbits but with an enhanced haematological traits at 10% inclusion level. In conclusion, 10, 20 and 30% inclusion levels of COLM do not support appreciable growth performance but haematology at 10%, therefore, research should be geared towards assessing the medicinal effects of C. odorata rather than nutritional.*

Keywords: *Rabbits, Chromolaena odorata , heamatology and body weight changes.*

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I. Introduction

Chromolaena odorata (siam weed) is widely spread throughout the tropics and is subjected to series of processes to determine its acceptability in the animal feed industry for poultry and livestock. The phytochemical screening of the leaves of C. *odorata* revealed the presence of alkaloids, cyanogenic glycosides, flavonoids (aurone, chalcone, flavone and flavonol), phytates, saponins and tannins (Akinmutimi and Akufo, 2006; Igboh *et al.,* 2009). The assessment of nutritive value of C. *odorata* (Apori *et* al., 2000), showed that it is a plant that has good potential for feeding livestock due to its high crude protein (CP), low fibre and low extractable phenolic contents. Its' dry matter (DM) and CP contents are highly degradable and the protein contains about 56% amino acids (Apori *et* a, 2000). This has placed a demand on C. *odorata* to be considered as a potential feed supplement for livestock in the tropics where feed for livestock production is always a problem.

However, it is not all about identifying and introducing a novel feed supplement into the feed industry but also the consideration of its safety with regards to the potential toxicities that may be associated with it which may ultimately affect its effective utilization. This is because although plants generally contain some bioactive properties believed to be responsible for their desirable effects, they also contain some phytotoxins and other heavy metal contaminants whose toxicological actions have always been ignored. Thus, with in-depth studies, the possible benefits or limitations likely to emanate with feeding C. *odorata* to livestock will be revealed and potential remedial measures to address the limitations may be found.

Furthermore, haematological features have attracted many workers to look at their indices in order to make clinical predictions of the physiological status and nutritional evaluations of an animal (Kerr *et* al., 1982; Aderemi, 2004; Ogbuewu *et al.,* 2009). The blood profile varies with certain conditions such as stress, infections and toxicity (Khan and Zafar, 2005). Dietary materials have also been reported to have measurable effects on blood constituents (Church *et al.,* 1984). Therefore, this study was designed to evaluate the effect of C. *odorata* on the haematological and growth performance parameters of rabbits.

II. Materials And Methods

Collection and preparation of *Chromolaena odorata* leaf meal (COLM)

The leaf meal used for this study was prepared by cutting the stems of nearly matured and just maturing C. *odorata* plants from the environment of the University of Benin, Benin city, Nigeria with the leaves intact and sun dried for 3-4 days. The dried leaves were handpicked directly into jute sacks and later milled. The leaf meal obtained there-from was incorporated with other feed ingredients to compound the treatment diets used in this study.

Experimental diet

The test diets fed to the rabbits during the period of the experiment contained four (4) varying levels of 0, 10, 20 and 30% inclusion level of COLM as presented on Table 1.

Table 1. Percentage Composition of Experimental Diets.

Ingredients	Diet I	Diet II	Diet III	Diet IV
Maize	27.50	24.00	19.00	12.50
COLM	-	10	20	30
Groundnut cake	11.00	11.00	10.00	10.00
Dried brewers grain	24.50	17.50	10.50	-
Palm kernel cake	34.00	28.00	17.00	14.00
Wheat offal	-	6.50	20.50	30.50
Bone meal	2.50	2.50	2.50	2.50
Salt	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25
Calculated nutrient composition				
Energy (ME kcal kg^{-1})	2460.50	2505.90	2511.60	2508.70
Crude protein (%)	18.23	18.22	18.26	18.18
Crude fibre (%)	10.08	10.00	10.10	10.20

Management of experimental animals

A total of 48 rabbits consisting of 27 males and 21 females and of mixed breeds, aged 6-8 weeks and weighing 400 -800 g were used in this study. The rabbits were housed in a dwarf walled rabbitry, the hutches with dimension 60 x 60 x 80cm and raised on wooden stand of about 75 cm high, were arranged on a concrete floor in the rabbitry. They were quarantined for 3 weeks during which they were treated with Ivomec$^{(R)}$ injection for the control of internal and external parasites. The experimental animals were given *ad libitum* access to water. Commercial diet (15% crude protein and 2500 kcal kg^{-1} metabolizable energy) was supplied throughout the quarantine period before the introduction of the experimental diets.

Experimental design

The rabbits were randomly assigned to four treatment groups. Each treatment was replicated 4 times with three rabbits per replicate in a Completely Randomized Design (CRD).

Data collection

Blood samples were collected from the ear vein and emptied into Ethytene Diamine Tetra Acetic Acid (EDTA) bottles for haematological evaluation. The blood samples were analysed for red blood cells (RBC), white blood cells (WBC), pack cell volume (PCV), platelets, haemoglobin concentration and erythrocyte indices. While mean cell haemoglobin (MCH), mean cell volume (MCV), and mean cell haemoglobin concentration (MCHC) were calculated as described by Jain (1986). Differential leukocyte counts were determined by scanning Giemsa's stained slides (Schalm *et al,*, 1995). The quantity of feed consumed was monitored daily and the rabbits were also weighed once a week to determine weight gain.

Statistical analysis

The data obtained was subjected to one way analysis of variance (ANOVA) using the GenStat 17th edition statistical package. Where significant difference were observed at 5% probability level and Duncan multiple range test option of the same statistical software was used to separate the treatment means.

III. Results And Discussion

The result of the effects of COLM on the haematological indices of rabbit is presented in Table 2. Among all the haematological parameters evaluated in this study, RBC, WBC, platelets and lymphocytes showed significant ($P < 0.05$) differences. A progressive increase in the RBC values were obtained up to the 10% COLM treatment group and thereafter a significant ($P < 0.05$) decline was observed at higher inclusion rate. This threshold of RBC tolerance with a corresponding numerical decrease in haemoglobin concentration

beyond 10% COLM inclusion level may indicate a reduction in the oxygen carrying capacity of the blood. Earlier works reported by Sajise *et al.* (1974) and Akinmutimi (1992) postulated that the conversion of bxyhaemoglobin to methaemoglobin could cause poor carriage of oxygen (tissue anoxia). This has been implicated to be the cause of sudden death of animals that accidentally feed on Chromolaena *odorata* (Sajise *et al.,* 1974).

Table 2. Haematological components of rabbits fed graded levels of COLM.

PARAMETER	0%	10%	20%	30%	SEM
Hb (g/dl)	10.35	12.96	10.25	10.20	0.89
PCV(%)	32.00[b]	40.00[a]	31.50[b]	30.00[b]	3.82
RBC(xl0^6/mm^3)	4.84[b]	5.90[a]	4.62[b]	4.61[b]	0.21
WBC(x10^3/mm^3)	11.32[a]	7.76[b]	7.33[b]	6.79[b]	1.25
Platelets (µl)	128000[a]	99500[b]	60500[C]	52000[C]	4685.97
MCV(fl)	64.5	66.8	61.6	64.7	3.15
MCH(pg)	22.00	21.95	21.80	21.15	1.04
MCHC (%)	34.00	35.40	33.15	32.60	2.85
Neutrophils (%)	25.15	22.12	21.55	24	1.11
Lymphocytes (%)	73.50[c]	92.00[a]	75.00[c]	87.00[b]	2.55
Eosinophils (%)	1.00	1.50	2.00	2.00	0.52

[a,b,c,]Means bearing different letters of superscript within the same raw differ significantly (P < 0.05)

The WBC counts were significantly (P < 0.05) lower in rabbits fed with COLM than in the control, thus, inferring a probable reduction in WBC at higher COLM inclusion levels. At a reduced WBC concentration, the rabbits may therefore be susceptible to a pathological case of leucopaenia and a compromise of the rabbit's immune response which could predispose them to diseases. However, the higher significant (P < 0.05) difference observed for lymphocytes level at 10% COLM before the irregular decline in concentration at higher inclusion level, may suggest an optimum inclusion level of 10% which seemed to support a desirable health status as indicated by the haematological indices studied.

The significant (P < 0.05) reduction in platelets count at higher inclusion level of COLM may have a bearing with the results of biochemical parameters of rabbits fed *C. odorata*, studied by Oas, Imasuen and Nwokoro (2015) which implicated renal dysfunction. This is further affirmed by the report of Lamb and Price (2012) who asserted that in renal failure, organic acids such as guanidinosuccinic and phenolic acids are normally retained in the blood and that these acids have deleterious effects on all platelet functions and are often associated with a bleeding diathesis. These authors further reported that platelets integrity tends to be affected at greater urea nitrogen which also conforms to the results of biochemical parameters studied by Imasuen and Ansa (in press), who observed significant (P < 0.05) increase in urea in rabbits fed COLM.

Table 3. Growth performance and feed intake of rabbits fed graded levels of COLM.

PARAMETER	0%	10%	20%	30%	SEM
Initial weight (kg)	0.60	0.50	0.60	0.50	0.13
Final weight (kg)	1.59a	1.19b	1.03b	0.98b	0.12
Weight gain (kg)	0.99a	0.69b	0.53c	0.48c	0.03
Feed intake/rabbit/day	127.66a	96.67b	94.33c	51.67c	1.97

[a,b,c]Means bearing different letters of superscript within me same row differ significantly (P < 0.05)

The result of growth performance of rabbits fed COLM is as shown in Table 3. There were significant (P < 0.05) differences between the treatment means for all the parameters evaluated. The feed intake significantly (P < 0.05) decreased as the level of the test ingredient increased. The low feed intake of the rabbits placed on the test diets as opposed to the control diet is in agreement with earlier studies (Aro, 1990 in layer chicken; Akinmutimi, 1992 in albino rats; Bamikole *et al.,* 2004 and Akinmutimi and Akufo, 2006 in rabbits; Ekenyem *et at.,* 2010 in finisher broiler chicken) who reported a decline in feed intake when COLM was fed to animals. This may be attributed partly to low palatability of C. *odorata* and the presence of antinutritional factors such as tannin, cyanogenic glycosides, phytic acid and nitrate as chemically analyzed by Akinmutimi and Akufo (2006). Devendra (1995) and Aletor and Fasuyi (1997) reported tannin to cause poor palatability in diets containing it in high quantity, due to its stringent property as a result of its ability to bind with the protein of saliva and mucosa membrane.

The weight gain which cumulatively affected the final live weight followed similar trend like that of feed intake which decreased as the quantity of the test ingredient increased in the diets. This could be attributed to the effect of poor feed intake as well as poor nutrient utilization due to inherent antinutritional factors present in the test diets. C. *odorata* contains cyanogenic glycosides and on hydrolysis may have released hydrogen cyanide (HCN), a substance reported to have the ability to cause marked weight reduction by precipitating methionine deficiency in an otherwise balanced diet (Aletor and Fasuyi, 1977). Phytin on the other hand, exerts its antinutritional ability by chelating proteins forming compounds that are not readily broken down, hence loss

of protein as well as its component amino acid leading to poor growth and weight gain (Akinmutimi, 2004). This result agrees with the findings of Akinmutimi and Akufo (2006) but disagrees with Bamikole *et al*. (2004) who reported good performance for weight gain at 30% dietary level of COLM. This could be due to variable stage of harvest of C. *odorata* which may possess variable nutritional and antinutritional composition and thus resulting in varied growth performance result of rabbits fed with COLM.

IV. Conclusion

In conclusion, 10, 20 and 30% inclusion levels of COLM do not support appreciable growth performance but haematological profiles at 10%, therefore, research should be geared towards assessing the medicinal effects of C. *odorata* rather than nutritional.

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