PERFORMANCE, IMMUNOLOGY AND ILEUM HISTOMORPHOLOGY OF BROILER CHICKENS FED DIETS SUPPLEMENTED WITH *SENNA ALATA*, *CHROMOLEANA ODORATA* AND THEIR COMBINATION

***Yahaya, M.O., Odetola, O.M., Saka, A.A., Awodola-Peters, O.O, and Bolarinwa, M.O.**
Federal College of Animal Health and Production Technology, Moor Plantation Ibadan
*Corresponding author: mariamosikwe@gmail.com

ABSTRACT
A 42day feeding trial was conducted to assess the efficacy of Chromoleana odorata (Siam weed), Senna alata(Ringworm bush) leaf and their combination on the growth performance, immunity and histomorphology of the ileum of broiler chickens. 100day old broiler chicks in four dietary treatments of twenty-five birds, replicated thrice with at least eight birds per replicate in a completely randomised design was used for the trial. Treatment one was control (T_1), T_2, 1.5g/kg Siam weed, T_3, 1.5g/kg Senna alata leaf and T_4, combination of 1.5:1.5g/kg Siam weed and Senna alata leaves. Data was collected on the feed intake, weight gain and feed conversion ratio. Blood sample was collected at day one (1), ten (10) and thirty-four (34) to assess immunoglobulin levels of the birds. At the end of the experiment two birds per replicate were sacrificed and sample of the ileum was taken in 10% formalin solution to the laboratory for assessment. Results of the study showed significance in the feed intake and feed conversion ratio with the Siam weed having the highest value for feed intake (2839.00g) and the combination having the least feed intake (2534.70g). The control group had the least feed conversion ratio (1.53). Results of the immunity studies showed control having the best values at day 34 (2.67) closely followed by Senna alata (1.00). The combination group did not show any immunity at day 34. Only the villi height to crypt depth ratio showed no significance for the histomorphology. It was concluded that Senna alata leaf can boost immunity in broiler chickens

Keywords: ***Senna alata, Histomorphology, Chromoleana odorata, Phytogenic properties***

INTRODUCTION

In recent years, there has been growing interest in the use of phytogenic feed additives, to enhance broiler chicken performance and health (Mench, 2011). The use of phytogenic feed additives, such as *Siam weed* and *Senna alata*, in poultry production has gained attention due to their potentials to improve feed efficiency, gut health, and immune function. Siam weed, also known as *Chromolaena odorata*, has been reported to have antimicrobial and anti-inflammatory properties, which can help to reduce the incidence of diseases in poultry. *Senna alata*, leaf on the other hand, has been shown to have antioxidant and phytogenic properties, which can help to improve the overall health and well-being of broiler chickens (Yahaya *et al*., 2023). Siam weed and *Senna alata* are plants with reported antimicrobial, anti-inflammatory, and antioxidant properties, making them potential candidates for use in poultry feed. However, there is limited research on the effects of this plant on the performance, immunology, and ileum histomorphology of broiler chickens.

Histomorphology of the gut is essential in understanding the effects of dietary supplements on the microstructure and function of tissues and organs (Kuter *et al.,* 2022). The small intestine is a critical organ for nutrient absorption, and any changes in its histomorphology can impact the overall health and performance of broiler chickens. Histological changes in these organs can indicate potential toxicity or damage caused by dietary supplements. The use of phytogenic feed additives like Siam weed and Senna alata may modulate the immune system and improve disease resistance in poultry (Ding *et al.,* 2022). This study seeks to assess the effects of *Senna alata*, Siam weed and their combination on the Performance, passive immunity, and histomorphology of the ileum of broiler chickens.

MATERIALS AND METHODS

Study area/ Duration of the Experiment: This study was conducted at the student experimental site of the Federal College of Animal Health and Production Technology Moor Plantation Ibadan. The experiment lasted for a period of Six (6) weeks.

Experimental Animals and their Management: 100day old broiler chicks were collected from a reputable hatchery and the birds were brooded based on treatment basis. The birds were divided into
Four (4) treatment groups of 25 birds each and these birds were replicated thrice with a minimum of eight (8) birds per replicate. Treatment one (1) was the control group, treatment two (2) had 1.5g/kg of feed Siam weed, treatment three (3) had 1.5g/kg *Senna alata* leaf per kg of feed and treatment four (4) had a combination of *Senna alata* and Siam weed in a ratio of (1.5:1.5g/kg of feed)

Data was collected on performance by noting the feed intake, taking weights on weekly basis and noting weight changes and also calculating the feed conversion ratio. On the first day of the experiment, blood sample was collected from the jugular vein of the birds and put into plain bottles for serum analysis to ascertain the immune status of the birds as at day old. At day ten (10) blood samples were collected again for a repeat of the serum analysis of the immune status of the birds. At the end of the six weeks, two birds per replicate were slaughtered and samples from the ileum of the small intestine were collected and transported to the laboratory for histomorphological studies. All data collected were subjected to analysis of variance using (SAS, 2005) and significant means were separated using Duncans multiple range test (DMRT) of the same statistical Package. 1.53)

RESULTS AND DISCUSSIONS

Table 1: Growth Performance of broiler chicken fed Siam weed, *Senna alata* leaves and their combination

Parameters	Treatments				SEM	P-value
	T1	T_2	T_3	T_4		
Initial weight (g)	34.67	37.00	35.33	39.67	1.13	0.46
Final weight (g)	2023.67	1966.67	1883.33	1983.33	28.77	0.33
Total weight gain (g)	1663.3	1550.00	1480.00	1586.70	36.91	0.40
Feed intake (g)	2546.70^{b}	2839.00^{a}	2562.00^{b}	2534.70^{b}	48.78	0.05
FCR (%)	1.53^{b}	1.84^{a}	1.73^{ab}	1.61^{ab}	0.05	0.05

FCR: Feed conversion ratio

The growth performance of broiler chickens feed diets containing *Siam weed*, *Senna alata* and their combination based diets showed a significant effect in values obtained for feed intake and feed conversion ratio ($P < 0.05$) Treatment two (2) (treatment with Siam weed) had the highest value for the feed intake (2839.00g) and the treatment with *Senna alata* had the least feed intake (1883.33g). The result of the Siam weed treatment agrees with the reports of Sanjyal and Sapkota (2011) who reported that inclusion of medicinal plant extracts in poultry diets impacted positively on the metabolism by reducing stress and microbial activity thereby increasing feed intake. Studies have shown that phytogenic feed additives like those derived from Siam weed can stimulate appetite and improve feed intake due to their aromatic properties. (Windisch *et. al*., 2008). The feed conversion ratio (FCR) was also significantly influenced with treatment two (T_2) the highest FCR (1.84) indicating less efficiency in converting feed to body mass compared to the control treatment and treatment four(T_4) which had lower values. This report aligns with that of Aderemi *et al*., 2014 who observed that combining different phytogenic additives can optimize growth performance by enhancing nutrient absorption and utilization.

Table 2: **Immunology of broiler chickens fed diets containing *Siam weed*, *Senna alata* and their combination**.

Days	Treatments				SEM	P.Value
	T_1	T_2	T_3	T_4		
1	4.00	4.67	4.00	4.00	3.39	0.42
10	6.00	6.00	6.00	6.00	0.00	0.42
34	2.67^{a}	0.33^{bc}	1.00^{b}	0.00	0.33	0.00

T_1 –control, T_2—1.5g/kg Siam weed, T_3—1.5g/kg Senna alata and T_4-- 1.5: 1.5 combination

Table two shows the passive immunity levels of broiler chickens. The values obtained at day one were to assess the level of maternal immunity present in the birds. At day 10 the immunity status of the birds increased which was contrary to the expectation that maternal immunity of broiler chickens drops between day 9 and day 10. The increase in immunity of the broiler chickens may be attributed to the feed the broiler chicks consumed during this period. During the experimental period only the control treatment was administered vaccines and medications. At day 34 the control group had the highest immune status (2.67). this was closely followed by treatment three(T_3) where the birds were administered *Senna alata* leaf meal. This result is in line with the reports of Yahaya *et al*., (2023) who stated that *Senna alata* possess phytochemical compounds which can stimulate immune responses in broiler chickens. Treatment two (T_2) where the birds were administered Siam weed leaf also showed a response in the immune status but not up to the control of the *Senna alata* group. Treatment four (T_4) which was the combination group with Siam weed and *Senna alata* did not show any immunity at all meaning the combination of both leaf meals is antagonistic.

Table 3 shows the effects of *Chromoleana odorata* leaf, *Senna alata* and their combination on the gut morphology of broiler chickens. The control treatment had the highest values for all parameters measured. Treatment three (T_3)

had a value lower (2808.10nm) than the control (3199.07 nm) but higher than the other treatments for the villi height. Morphological parameters i.e. villus height and crypt depth are responsible for vigorous functioning of intestine by facilitating larger surface area for better absorption of nutrient (Awad *et al*.,

Table 3: Histomorphology of the small intestine of broiler chicken fed diets containing Siam weeds, *Senna alata* and their combination

TRTS	T_1	T_2	T_3	T_4	SEM	P. Value
Villi height (nm)	3199.07[a]	2491.88[c]	2808.10[b]	1827.55[d]	107.26	0.01
Villi width (nm)	201.20[a]	195.47[a]	210.16[a]	155.99[b]	4.93	0.01
Cyptal depth (nm)	709.81[a]	497.71[c]	598.31[b]	364.66[d]	29.32	0.00
Cyptal width (nm)	201.19[a]	195.24[a]	211.00[a]	155.05[b]	5.09	0.00
Villi Height/Cyptal width (nm)	4.55	5.11	4.79	5.03	0.15	0.60
Muscle thickness (nm)	247.52[a]	194.59[c]	224.05[b]	240.21[a]	4.71	0.01

[abc] means along the row denotes significant differences.

2009). Treatment three (T_3) had the highest value for the villi width (210.16nm). The cryptal depth had treatment three(T_3) having a value of (598.31) which was the closest to the control treatment with the highest value (709.81). The application of phytobiotics in poultry diets increases villus height with deeper crypt and enhanced the digestive enzymes secretion such as proteases and amylases, to promote the growth and production performance of chickens along with enhanced absorptive cell growth in the gastrointestinal tract (Abudabos *et al*., 2018). Phytobiotics or plant derived compounds alone and in combinations have been proved to enhance growth performance, production, and health of animals (Rahimi *et al*., 2011). Values obtained for the combination of *Chromoleana odorata* and *Senna alata* leaf meals had the least values showing that the combination was not favourable to the digestion and absorption of the feed supplied to the broiler chickens.

CONCLUSION

It was concluded from this study that the use of *Senna alata* leaf mean aided the immune status of broiler chickens and also improved feed absorption of the birds**.**

REFERENCES

Abudabos, A.M., Alyemni, A.H., Dafalla, Y.M., Khan, R.U., 2018. The effect of phytogenics on growth traits, blood biochemical indices and intestinal histology in broiler chickens exposed to *Clostridium perfringens* challenge. J. App. Animal Res. 46 (1), 691–695. https://doi.org/10.1080/09712119.2017.1383258

Aderemi,F.A.,Tewe, O.O and Fetuga,B.L (2014). Influence of phytogenic feed additives in poultry production. *Journal of Animal Feed Science and Technology* 150(1-2), (1-9)

Awad, W.A., Ghareeb, K., Abdel-Raheem, S., Böhm, J., 2009. Effects of dietary inclusion of probiotion and synbiotic on growth performance, organ weights, and intestinal histomorphology of broiler chickens. Poultry Sci. 88 (1), 49–56.

Ding, Kang-Ning; Lu, Meng-Han; Guo, Yan-Na; Liang, Shao-Shan; Mou, Rui-Wei; He, Yong-Ming He; Tang, Lu-Ping (2022). "Resveratrol relieves chronic heat stress-induced liver oxidative damage in broilers by activating the Nrf2-Keap1 signaling pathway". Ecotoxicology and Environmental Safety. 249: 114411.

Kuter, Eren; Cengiz, Özcan; Köksal, BekirHakan; Sevim, Ömer; Tatlı, Onur; Ahsan, Umair; Güven, Gülşen; Önol, Ahmet Gökhan; Bilgili, Sacit F. (December 28, 2022). "Litter quality and incidence and severity of footpad dermatitis in heat stressed broiler chickens fed supplemental zinc". Livestock Science. 267: 1491–1499.

Mench A. B (2011). "The use of dietary chromium associated with vitamins and minerals (synthetic and natural source) to improve some quality aspects of broiler thigh meat reared under heat stress condition". *Italian Journal of Animal Science*. 20 (1): 1491–1499.

Rahimi, S., Teymouri, Z.Z., Karimi, T.M., Omidbaigi, R., Rokni, H., 2011. Effect of the three herbal extracts on growth performance, immune system, blood factors and intestinal selected bacterial population in broiler chickens

Sanjyal, S. and Sapkota, S. (2011). Supplementation of broilers diet with different sources of growth promoters. Nepal Journal of Science and Technology, 12:41– 50.

SAS (2005). Statistical analysis Systems

Windisch, W., Schedle, K., Plitzer, C., and Kroismayr,A.(2008). Use of phytogenic products as feed additives for swine and poultry. Journal of Animal Science 86(14_suppl.) E140- E148.

Yahaya M.O., Bolu, S.A and Awodola-Peters, O.O. (2023). Growth performance and carcass characteristics of broiler chickens fed diets supplemented with *Senna alata* leaf meal. *Nigerian Journal of Animal Production* 1315-1318