ASSESSMENT OF EUPHORBIA HIRTA ON THE INTESTINAL MICROBIOTA AND VILLI MORPHOMETRY OF RABBIT BUCKS

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ABSTRACT

The experiment was conducted at Federal University Dutsin-Ma, Kastina State to evaluate the effect of Euphorbia hirta as a natural growth promoter on the performance, intestinal microbial, and morphometry of rabbit bucks. A total number of 18 composites breed of rabbits of approximately 4 months of age were used for this study. They were randomly allotted into three (3) dietary treatment (T1, T2 & T3) in a completely randomized design (CRD) with 0g, 5g, and 10g of Euphorbia hirta powder as an additive and was replicated into three (3) consisting of two (2) rabbits per replicate. At the end of the trial period, 2 rabbits from each treatment were randomly selected and sacrificed, the intestines were trimmed. The result obtained indicates that there were significant (P > 0.05) differences on villus height andintestinal microbialof Rabbit bucks fed Euphorbia hirta supplementsin which T3 shows a higher value obtained while T2 and T1 shows lower value.The result further revealed that there was significant (P > 0.05) differences of Villus width of Rabbit bucks fed Euphorbia hirta supplements in which the highest value was recorded in T3 followed by T1 and T2 with 160.4, 120.8 and 105.0 respectively. The result of the study also revealed that there was significant (P > 0.05) differences of Bacteroidetes on Classes predominant in which the highest value was recorded in T3 followed by T2 and T1 with the lowest value 21.70, 11.40 and 7.12 respectively. Highest Mollicutes of Classes predominantwere recorded in T3 (8.90), T1 (7.800) while lowest Mollicutes were obtained in T2 (6.900).

KEYWORDS

Euphorbia hirta, microbiota, morphometry, rabbit, growth promoter

1. INTRODUCTION

The applications of antimicrobials had been pronounced to be very best and successful chemotherapies against disease causing organisms (Guyue*et al*., 2014).These antimicrobials have made significant impact to the eradication, prevention, control and treatment of infectious diseases in most farm animals today (Omoikhoje*et al*., 2019). The existence of antimicrobial resistant, non-pathogenic commensal bacterial in farmanimals are considered a setback, as it provides a pool of transmissibleresistance genes (DeFrancesco *et al*., 2004).Moreover, there exist the issues of residual effects of drugs on human and animal products as well as high cost of the drug and possible area coverage (Musa, 2023). It was reported that by 2050, over 75% of human death will occur as a result of antibiotics resistance than cancer (ARCN, 2024). It was howeverknown that, medicinal plants are still being used to address animal health issues in

livestock industries (Omoikhoje*et al.,* 2019). Drugs and antibiotics are being used in animal feed to maximize production and control of diseases.Plants extractsfrom herbs and spices which are known to have medicinal properties can be utilize as alternatives to control diseases. These extracts and spices are known to have contained bioactive compounds many more that have inhibitory functions against disease (Musa, 2023).

The call for ajustifiable, safer, easily available and natural alternatives to synthetic growth promoters in livestock production is in the high demand. With so much worries and concerns over the potential and harmful adverse effects of synthetic additives, exploring natural solutions to this problems such as *Euphorbia hirta* can provide a relief and valuable insights into more safer, healthier, economically viable and more environmentally friendly growth promotion strategies in rabbit farming (Musa, 2023).

Understanding the effects of *Euphorbia hirta* on the performance of rabbit bucks, including body weight gain, feed intake, and feed conversion efficiency, can help optimize their growth potential and overall production efficiency (Musa, 2023).More so, the intestinal microbiota stance a higher chance in nutrient utilization, immune function, and overall health in animals. The applications of natural growth promoters, such as *Euphorbia hirta*, may modify the composition and activity of the intestinal microbiota in rabbit bucks. Investigating the effects of *Euphorbia hirta* on the intestinal microbiota composition and diversity can provide an insights into its potential role in improving nutrient digestion, absorption, and overall gut health in rabbits (Musa, 2023).

Plant derived natural products signify an attractive source of antimicrobial agents which are natural, have less or no and a manageable side effects and are available at affordable prices. Most of these plant extracts have also been utilized as feed additives and have been proven to enhance gut integrity of Monogastric animals. Plants extracts and spices from herbs which are known to have medicinal properties are importance as alternatives in livestock sector. One of such plants is *Eurphobiahirta* (Musa, 2023).

2. MATERIALS AND METHODS

2.1. Experimental Site

The experiment was conducted at poultry unit of the Department of Animal Science, Faculty of Agriculture Federal University Dutsin-ma, Kastina State.Dutsin-Ma a local government area in Katsina State North-western Nigeria. It lies between latitude 12026’00’’N and longitude 007029’00’’E. The people are predominantly farmers, cattle rearers and traders (Baraya*et al.,* 2020). The mean annual Temperature ranges from 29°C-45°C. The region experienced the highest Air temperature which normally took place around April/May and the lowest occurs sometimes around December through the February (Abaje, *et al.,* 2014). The coldest month of a year is between January/February while the hottest month April while the vegetation of the area is the Sudan Savanna type which combines the characteristics and species of both the Guinea and Sahel Savanna (Liberty and Bello 2022).

2.2. Experimental Animals

Eighteen(18) rabbits of approximately 4 months of age were sourced from a reliable source and were acclimatized for two(2) weeks on which the rabbits were given prophylactic treatments with antibiotic and albendazole against the possible bacteria and parasites infestation.

2.3. Procurement and Processing of Euphorbia Hirta

*Euphorbia hirta*plants were purchased from traditional medicine vendors in Dutsin-Ma Wednesday market. The plant was brought to the pasture unit technical staff for identification. The plant was sorted for inert materials, dried, and processed by grinding it to fine particle size using mortar and pestle. The powdered was preserved in a polyether bags and stored till time for ration formulation.

2.4. Experimental Design

Eighteen rabbits were randomly selected and assigned into three (3) treatments with three (3) replicationsin a completely randomized design (CRD) with 0g, 5g, and 10g of *Euphorbia hirta* powder as an additive. With each treatment consisting of two (2) rabbits per replicate. Feed and water were given to rabbit's *ad-libitum*

2.5. Data Collection

2.5.1. Intestinal Microbial Counts

Two (2) rabbits from each treatment were randomly selected and sacrificed.The intestines weretrimmed and bacterial cell species in the ileum and caecum were determined. Tissues were preserved in the tissue sampling bottles and were transported to Department of Human AnatomyLaboratory,Ahmadu Bello University Zaria for total bacteria counts, and *Salmonella, Staphylococcus* and *Escherichia coli*were isolated from the samples using different selective media for isolation of bacteria groups and characterization based on sugars fermentation using Microbact 12E kit and conventional biochemical methods. Media used were Eosin Methylene Blue Agar, Mannitol Salt Agar and *Salmonella Shigella* Agar.

2.5.2. Villi MorphometricCharacterization

Intestinal segmentsof approximately 2cm in length were collected from the rabbit and used for carcass characteristics to evaluate villi characterization. Morphometric measurements that were evaluated include villi height, villi width, crypt depth, surface area, perimeter and the ratio of villi height to villi depth.

2.5.3. Statistical Analysis

All data from the experiment were statistically analysed using the General Linear Model Procedure of Statistical Analysis System Software package while significant difference between treatments means was separated using Least Significant Differences (SAS, 2002).

3. RESULTS AND DISCUSSION

The result on the assessment of *Euphorbia hirta* supplements on Intestinal Histomorphology of Rabbit Bucks were presented in table 1 below. The result reveals that there were significant (P> 0.05) differences on villus height (Intestinal Histomorphology) of Rabbit bucks fed *Euphorbia hirta* supplements, where T3 have the highest value followed by T2 and T1 had lower value 590.5 and 412.5 and 353.0 respectively.The result further reveals that there were significant (P> 0.05)differences of Villus width of Rabbit bucks fed *Euphorbia hirta* supplements where the highest value recorded were in T3, T1 and T2 with 160.4, 120.8 and 105.0 respectively.

Highest Villus density of *Euphorbia hirta* supplements on Intestinal Histomorphology of Rabbit Bucks were recorded in T3 (23.25) followed by T2 (17.10) while the lowest Villus density were obtained in T1 (15.77).The result further reveals that there were significant (P> 0.05)difference in Crypt depth of Rabbit bucks fed *Euphorbia hirta* supplements with highest value recorded in T3, T2 (116.0&111.8)and the lowest recorded in T1 (103.0) respectively.

The result- obtained reveals that there were significant (P> 0.05)difference in VH and CD of Rabbit bucks fed *Euphorbia hirta* supplements where T3 have the highest value followed by T2 and T1 with the lowest value (5.085&3.695) and (3.435). The result of Peyer's patches *Euphorbia hirta* supplements on Intestinal Histomorphology of Rabbit Bucks has no significant difference.The result of Nodes *Euphorbia hirta* supplements on Intestinal Histomorphology of Rabbit Bucks has no significant difference.In contrary to the findings of Liu, *et al.* (2018) who reported that supplementing mixtureI increased duodenal VCR in 35-day-old rabbit compared to control group, but mixture II and antimicrobial had no effect on this index.

Table 1: The result on Effect of *Euphorbia hirta* supplements on villi morphometry of Rabbit Bucks.

Parameters	T1	T2	T3	SEM	LOS
Villus height (µm)	354.0^{a}	412.5^{a}	590.5^{b}	19.26	*
Villus width (µm)	120.8^{b}	105.0^{a}	160.4^{c}	3.54	*
Villusdensity*	15.77^{a}	17.10^{a}	23.25^{b}	1.224	*
Crypt depth (µm)	103.0^{a}	111.8^{b}	116.0^{b}	2.76	*
VH:CD	3.435^{a}	3.695^{a}	5.085^{b}	0.184	*
Peyer'spatches	2.500	3.000	1.500	1.000	NS
Nodes	0.500	0.500	0.000	0.500	NS

PLATES: microscopic view of Plate 1, 2 and 3 showing Villi morphometry in Rabbit bucks fed 0g/kg, 5g/kg and 10g/kg of *Euphorbia hirta*in treatment 1, 2 and 3 respectively.

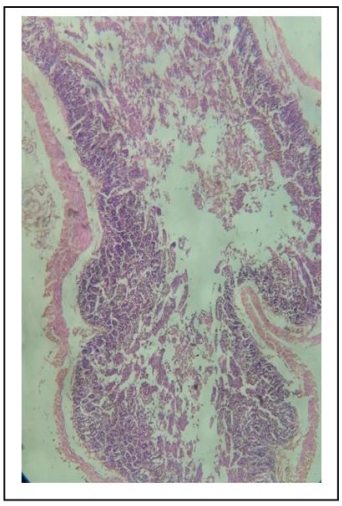

Plate3: Intestinal histology of rabbit in T3

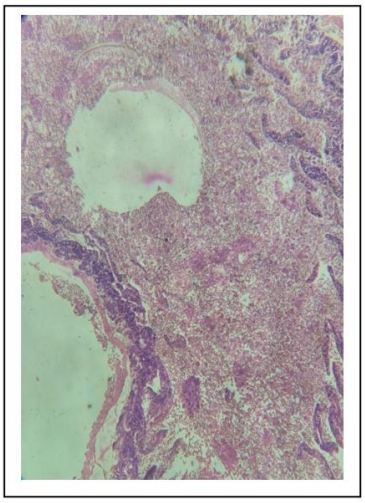

Plate 2: Intestinal histology of rabbit in T2

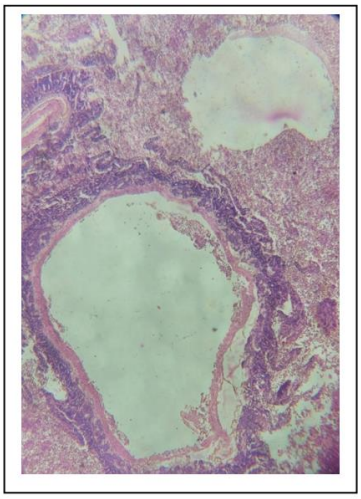

Plate 1: Intestinal histology of rabbit in T1

The result on Effect of *Euphorbia hirta* supplements on Intestinal Microbiota of Rabbit Bucks

The result revealed that there were significant differences of Bacteroidetes on Classes predominant in which the highest value was recorded in T3 followed by T2 and T1 with the lowest value 21.70, 11.40 and 7.12 respectively.The result revealed that there were significant differences of Clostridia on Classes predominant in which the highest value was recorded in T1, T2 and T3 has the lowest value respectively (78.50), (70.60) and (68.50) respectively. Highest Mollicutes of Classes predominantwere recorded in T3 (8.90), T1 (7.800b) while lowest Mollicutes were obtained in T2 (6.900).

Table 2. Classes' predominant in percentage (%)

Parameters	**T1**	**T2**	**T3**	**SEM**	**LOS**
Bacteroidetes	7.12^{a}	11.40^{b}	21.70^{c}	0.006	*
Clostridia	78.50^{c}	70.60^{b}	68.50^{a}	0.006	*
Mollicutes	7.800^{b}	6.900^{a}	8.908^{c}	0.005	*

The result reveals that there were significant differences on Ruminocccaceae of Texa predominant where T1 and T3 has the highest value while T2 have the lowest value (51.50), (47.70) and (45.61) respectively. Highest Lachnospiraceae of texa predominantwere recorded in T3 and T1 while T2 have the lowest value, (39.61), (34.61) and (29.80) respectively.

Table 3: Texa predominant %

Parameters	**T1**	**T2**	**T3**	**SEM**	**LOS**
Ruminococcaceae	51.50^{d}	45.61^{c}	47.70^{a}	0.354	*
Lachnospiraceae	34.61^{c}	29.80^{a}	39.61^{d}	0.006	*

The result on Effect of *Euphorbia hirta* supplements on Relative abundance of other genera of Rabbit Bucks were presented in table 3 below.The result revealed that there were significant differences of Escherichia coli on relative abundance of other genera in which the highest value was recorded in T1, T3 and T2 has the lowest value 12.10, 11.21 and 10.91 respectively.

The result obtained reveals that there were significant differences inBlaucia on relative abundance in which the highest value were recorded in T2 (4.210), T3 (3.700) while the lowest value obtained was in T1 (3.105). The result of the study also reveals that there were significant differences in *Fibrobacter succinogenes* on Relative abundance with T1 having the highest value followed by T2 while T3 have the lowest value (22.05,21.80b&17.91) respectively.Highest *Ruminococcusflavefaciens* in Relative abundance were recorded in T1 (16.20) and T3 (15.61) while the lowest *Ruminococcusflavefaciens* on Relative abundance were obtained in T2 (15.10).

The result of the present study reveals that there were significant difference in *Butyrivibriofibrisolvens* on Relative Abundance were T1 have the highest value (1.905) than T2 (1.900), while T3 have the lowest value (0.505).The result further reveals that there were no significant difference in *Oscillospira*on Relative Abundance.The result reveals that there were significant difference in *Clostridium* on Relative Abundance with T2 having the highest value (17.16) followed by T1 (17.05) while T3 have the lowest value (12.05).Highest*Coprococcusspp* of Relative abundance were recorded in T3 (8.505) followed by T1 (6.205), while the lowest value obtained in T2 (5.805).The result obtained further reveals that there were significant differences on Relative Abundance in which the highest value recorded in T3 (21.41), while the lowest were found in T2 (15.71).

Table 4: Relative abundance of other genera %

Parameters	T1	T2	T3	SEM	LOS
Escherichia coli	12.10^{c}	10.91^{a}	11.21^{b}	0.006	*
Blaucia	3.105^{a}	4.210^{c}	3.700^{b}	0.008	*
Fibrobacter succinogenes	22.05^{c}	21.80^{b}	17.91^{a}	0.035	*
Ruminococcusflavefaciens	16.20^{c}	15.10^{a}	15.61^{b}	0.003	*
Butyrivibriofibrisolvens	1.905^{c}	0.900^{a}	1.505^{b}	0.035	*
Oscillospira	5.405	6.000	7.205	3.54	NS
Clostridium	17.05^{b}	17.16^{b}	12.05^{a}	0.093	*
Coprococcusspp	6.205^{b}	5.805^{a}	8.505^{c}	0.007	*
Cyanobacteria spp	16.20^{b}	15.71^{a}	21.41^{c}	0.007	*

4. CONCLUSION

It is therefore, concluded that supplementation of *euphorbia hirta*at 10%/kg diet carried out in this study proved to have a positive effecton villi which plays a role on feed conversion efficiency. Therefore, it could be further concluded that supplementation of *euphorbia hirta* at lower percentage had considerate changes on villi.

RECOMMENDATION

Villi aids in increasing the surface area within the small intestine for more efficient feed absorption and at 10%/kg diet showed more and intact villi, it is therefore recommended that *euphorbia hirta*should be incorporated into Rabbit diet at considerate percentage, particularly at 10%/kg diet (which were the highest level of inclusion) for optimal growth performance, however further studies are therefore encouraged with the increasing level of inclusion.

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