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Efficacy of Christmas melon and neem extracts on the growth performance, carcass characteristics and cost benefit of broiler chickens as alternative to new castle and infectious bursal disease vaccines

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Abstract

The experiment was carried out to investigate the effects of Christmas melon and Neem extract on the growth performance, carcass characteristics, organ characteristics and cost benefits of broiler chickens. The experiment employed a completely randomized design. All data generated were subjected to analysis of variance. A total of one hundred day old Abor Acre broiler chickens were used in this study, the birds were weighed on arrival to the brooding pen to know the initial weight of the birds; the birds were fed with formulated broiler diets for both starter and finisher phases for the 56 days the experiment lasted. The birds were divided in to 4 treatments, replicated five times with 5 birds per replicate. Treatment I the control diet (placed on normal Lasota and Gumboro vaccines), treatment II were placed on Christmas melon extract (CME), Treatment III were placed on Neem Extract (NE), Treatment IV were on mixture of 1:1 Christmas melon and Neem Extract. All the parameters examined on the performance had statistical similar values when compared ($p>0.05$) with the birds on the control. The production cost of birds on Treatment II, III, and IV reduced but not statistically ($p>0.05$) when compared to the control birds. Furthermore, the birds on treatment II were more profitable when compared to other treatments. It was concluded that replacement of Lasota and Gumboro vaccines with Neem Extract and Christmas melon in broiler production enhanced the growth performance and antioxidant capacity of the birds without any deleterious effect on their health status.

Keywords: Christmas melon; Gumboro vaccine; Lasota vaccine; Neem extract; Carcass characteristics; Cost benefit; Infectious Busal Disease vaccines

1. Introduction

Natural feed additives derived from plant sources have proven to be a valuable source for broiler breeders (Onibi, et al., 2009). The high cost of feeding birds cum high cost of medication have caused poultry production in many parts of the world to become a losing venture especially in the developing countries like Nigeria (Oni, et al., 2005). Disease outbreak is also a great challenge in poultry production (Mirzaei-Aghsaghali, 2012). Many diseases caused by bacteria, viruses, fungi and parasites have been identified in poultry production with various ways of combating them through the use of one drug or the other (antibiotics, anti viral and anti protozoa) as the case may be. However, the high cost of these drugs is discouraging; this has necessitated poultry farmers to resolve to the use of available novel herbs so as to lessen the impact of high costs of drugs.

However, Infectious Bursal Disease commonly called Gumboro disease and Newcastle disease have been scientifically declared incurable (Pattinson,1993; PHU, 2023), this appears to be true, as the only current way to prevent these is through the correctly periodic administration of IBD vaccine and Lasota vaccine. The problems associated with the use

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of these vaccines as stated by James and Roth (1999) includes the vigorous principles that must be followed in which if not strictly followed can lead to the outbreak of the diseases that are to be prevented due to vaccine failure. Some of these principles are (i) the instruction on the vial should be carefully read and understood, (ii) vaccination should be done early in the morning or late in the evening, (iii) sick animals should not be vaccinated, (iv) the vaccines should be properly constituted to avoid over/under dose, (v) the unused vaccines should be stored in a refrigerator, (vi) the Val should be burnt or buried after use (Gingerich, 1997).

The higher percentage of poultry farmers in Nigeria are illiterate (Central Bank of Nigeria, 2012; Ugwuja and Onwuachu 2020). These principles have made the use of vaccines difficult for the average Nigeria farmers as 75% of Nigeria poultry farmers are women while 25% are men out of which only 10% are educated/ trained farmers (Ogunlena and Muklita 2009; FAO,2010). Furthermore, being an educated or professional poultry farmer does not prevent one from becoming a vaccination failure victim as the epileptic supply of electricity in Nigeria could lead to poor storage where the vaccines are being sold, in this scenario, the vaccines are not expired but no longer good. If these poorly stored vaccines are administered, vaccination failure may occur. In order to avoid these rigorous principles required in vaccination of birds, this study was conducted to examine the efficacy of Christmas melon and neem extracts on the growth performance, carcass characteristics and cost benefits of broiler chickens as alternative to Newcastle and Infectious Bursal Disease Vaccines.

2. Materials and Methods

The study was carried out at the Poultry Unit of the Agricultural Technology Departmental Teaching and Demonstration Farm, Akanu Ibiam Federal Polytechnic, Unwana, Ebonyi State, Nigeria. The study was carried out from February to July, 2023.

The poultry house was thoroughly washed and fumigated. It was allowed to stay for two weeks before the arrival of the experimental birds. A total number of one hundred day old broiler chicks of Arbo Acre breed were used in the experiment. Twenty five birds distributed to four medical treatments each (5 birds per replicate, 25 birds per treatment) in a completely randomized design.

A fresh fruit of Christmas melon of 250 gram weight was harvested around Akanu Ibiam Federal Polytechnic Unwana, the back cover (Epicarp) was carefully removed using a sharp knife, the remaining part weighed 170g was cut into smaller sizes and soaked in 340cl of water being 100% of the weight for seven days after which it was blended, In same manner, Fresh Neem seeds (Dongoyro) of 500g was harvested and soaked in 1 liter of water for seven days and blended. T1 was normal Lasota and Gumboro vaccines, T2 (Christmas melon extract) T3 (Neem extract) and T4 (combination of Christmas melon and Neem extract). The treatments were applied at the interval of seven days for the period of four weeks, that is, day 7, 14, 21 and 28 from the arrival at 10ml per replicate.

After the broiler starter phase, the birds were fed with broiler finisher diets for 28 days.

Table 1 Composition of experimental diets (g/100 g) for broiler starter and finisher

Ingredient	Starter Quantity per kg	Finisher Quantity per kg
Maize	45.00	50.00
Soya bean meal	34.75	30.00
Palm karnnel cake	9.00	8.00
Wheat offal	5.00	5.50
Fish meal	2.00	2.00
Bone meal	3.00	3.25
Salt	0.50	0.50
Methionine	0.25	0.25
Lysine	0.25	0.25
Vitamin premix	0.25	0.25
Total	100	100

Data on growth performance of the experimental birds were obtained from weekly feed intake records. They were used to calculate the feed conversion ratio (ratio of feed intake to weight gain) at the end of the experiment. The birds were starved of feed for 6 hours prior to slaughtering at the end of 56th day, 5 birds per treatment were randomly selected and bled by severing the jugular vein to obtain data for carcass and organ characteristics. The cost benefits analysis was done by cost of feed per kg weight multiplied by feed conversion ratio to get cost of bird/kg weight, furthermore, the cost of total feed intake was obtained by multiplying average feed intake by cost of feed per kg: The data collected on the performance carcass and organ characteristics of the experimental birds were subjected to Analysis of Variance (ANOVA) using SPSS statistical package (SPSS 16.0 for widows Inc. Chicago IL, USA). Duncan's Multiple Range Test was used to separate significant mean differences. Significant differences were considered at 95 % level.

3. Results and discussion

The results of proximate and phytochemical compositions of Christmas melon extract(CME) and Neem extract (NE)are shown in Table 2 are 3

Table 2 Proximate analysis in Christmas melon, neem extracts and combination of Christmas melon and neem extracts (CME+NE)

Proximate Composition (%)	CME	NE	CME+ NE
Moisture content	10.92	7.45	8.20
Crude protein	19.43	21.05	17.72
Crude fibre	26.10	33.94	20.33
Ether extract	4.92	4.00	4.20
Ash	5.03	3.23	4.00
Carbohydrates	16.98	3.14	10.41

NV= Normal conventional vaccines, CM= Christmas melon, NE= Neem extract, CM+NE= combination of Christmas melon and neem extracts

Table 3 Phyto-chemicals composition of Christmas melon, neem extracts and combination of Christmas melon and neem extracts (CME+NE)

Phytochemicals (mg/100 g)	CME	NE	CME+NE
Flavonoid	5.00	4.20	4.50
Phytate	20	17.82	19.10
Oxalate	4.72	3.89	4.01
Phenol	1.50	1.66	1.60

NV= Normal conventional vaccines, CM= Christmas melon, NE= Neem extract, CM+NE= combination of Christmas melon and neem extracts

Table 2 and 3 revealed the results of the proximate analysis and phyto-chemicals in Christmas melon, neem extracts and combination of Christmas melon and neem extracts (CME+NE). The results demonstrate that all the experimental materials have appreciable quantity of protein, fibre and carbohydrates which is an added advantage when used in broiler production as these nutrients are much required in broiler production at both starter and finisher phases of production. The high contents of these nutrients in the experimental materials agree with the report of Daramola et al., (2018) who postulated that most fruits and seeds are rich sources of these nutrients. Furthermore, the high contents of Phytochemicals such as flavonoids, oxalate, phenol and phenolic acid in the experimental materials are of great benefits to health and play an active role in the management of some diseases. This is in line with Farombi and Owoeye (2011) who reported that Flavonoids from vegetables including phenolic acids had inhibitory activity against bacteria. They further postulated that Flavonoids have been found useful in drug preparation, in food, feed and beverages.

Table 4 Effect of herbal supplementation on growth performance of broiler finisher phase

Parameters	NV	CME	NE	CM + NE	SEM
Average initial weight (kg)	0.040	0.040	0.040	0.040	0.00
Average final Live-weight (kg)	2.80	2.66	2.62	2.62	0.03
Average daily weight gain (kg)	0.47	0.46	0.47	0.44	0.50
Average daily feed intake(kg)	0.82	0.62	0.77	0.69	0.07
Feed conversion ratio(kg)	1.80	1.34	1.64	1.53	0.17
Mortality	0.20	0.40	0.20	0.40	0.13

NV= Normal conventional vaccines, CM= Christmas melon, NE= Neem extract, CM+NE= combination of Christmas melon and neem extracts ,SEM= Standard error of mean

Table 4 revealed the results of the growth performance of broiler chickens placed on three herbal medicines as alternative to Gumboro and Lasota vaccines. No significant difference was observed among all the treatments for all the parameters examined. This is an indication that the experimental materials did not have any negative impacts on the growth performance of the experimental birds. The comparable performance of the experimental birds with the control could be attributed to the increased secretion of digestive enzyme and enhanced nutrition utilization in liver as reported by Khan et al., (2012). Furthermore, the assertion of Onibi et al., (2009) who argued that medicinal plants may be used as alternative to antibiotic growth promoters because they exhibit antimicrobial properties and thus can form integral part of poultry nutrition could be justified.

Table 5 Carcass characteristics of broiler chickens placed on Christmas melon and neem extracts as alternative to gumboro and lasota vaccine

Parameter	NV	CME	NE	CM + NE	SEM
Live weight (kg)	2.43^{a}	2.43^{a}	2.47^{a}	2.73^{b}	0.04
Dress weight (kg)	2.23^{ab}	2.20^{ab}	2.17^{a}	2.40^{b}	0.04
Eviscerated weight(kg)	2.00	1.88	1.97	2.17	0.05
Breast weight	0.43^{a}	0.40^{a}	0.47^{a}	0.49^{b}	0.04
Thigh weight	0.37^{a}	0.38^{a}	0.45^{a}	0.60^{b}	0.03
Wing weight	0.28^{ab}	0.25^{ab}	0.20^{a}	0.30^{b}	0.16
Back weight	0.53	0.43	0.45	0.30	0.04
Shank weight	0.15	0.13	0.12	0.10	0.01
Head weight	0.15	0.13	0.12	0.10	0.01
Neck weight	0.10^{a}	0.12^{ab}	0.15^{b}	0.12^{ab}	0.07

Different superscripts within each row indicate significant differences ($P<0.05$). Without superscripts= not significant,SEM= standard error of mean, NV= Normal conventional vaccines, CM= Christmas melon, NE= Neem extract, CM+NE= combination of Christmas melon and neem extracts

Table 5 revealed the results of the carcass characteristics of broiler chickens placed on three herbal medicines as alternative to Gumboro and Lasota vaccines. The values recorded for the birds on combination of Christmas melon and Neem extracts for the live weight, breast weight, thigh and neck weight were significantly higher than the control values. However, the values recorded for all the treatments on dressed weight, eviscerated weight, wing weight, backweight, shank weight and head weight were similar to the control weight.

Table 6 Organs characteristics of broiler chickens placed on CME, NE and CME+ NE

Parameter	NV	CM	NE	CM+NE	SEM
Gizzard(g)	70.40	67.00	65.20	66.80	2.17
Heart(g)	7.80	8.20	7.60	8.40	0.21
Liver(g)	36.80	32.60	32.60	34.00	0.88

NV= Normal conventional vaccines, CM= Christmas melon, NE= Neem extract, CM+NE= combination of Christmas melon and neem extracts ,SEM= standard error of mean

As revealed in Table 6, no significant difference was observed among all the treatments for all the parameters examined. This is an indication that the experimental materials did not have any negative impacts on the health status of the experimental birds.

Table 7 Cost benefits of broiler chickens placed on CME, NE and CME+ NE

Parameter	NV	CM	NE	CM+ NE
DOC cost (₦)	520	520	520	520
Cost of feed/kg (₦)	392	392	392	392
Cost of vaccination/bird (₦)	100	0	0	0
Feed intake cost/bird (₦)	720.03	544.41	676.12	605.88
Feed cost/kg weight gain (₦)	705.6	525.25	642.88	599.76
Cost of production (₦)	1,340.03	1,064.41	1,196.12	1,125.88
Sales price/kg (₦)	1,500	1,500	1,500	1,500
Average sales price/ bird (₦)	4,200	3,990	3,930	3,930
Profit (₦)	2,859.97	2,925.59	2,733.88	2,804.12

DOC= Day old chicks, NV= Normal conventional vaccines, CM= Christmas melon, NE= Neem extract, CM+NE= combination of Christmas melon and neem extracts

As revealed in Table 7, the least cost of production and highest profit made was observed in the birds placed on Christmas melon. However, the control birds had highest cost of production when compared to other treatments but were more profitable than the birds on Neem extract and combination of Christmas melon and neem extract. The highest production cost observed in the control could be attributed to the fact that both Gumboro and Lasota vaccines were purchased unlike the Christmas melon and neem which were freely harvested. It was further revealed that the experimental materials positively affected the cost of feed intake per kg and cost of weight gain per bird. This suggests that the experimental materials used in this study had some digestion aided enzymes which made the tested animals to utilize the feed better than the control birds. This is in line with Sanjyal and Sapkota (2011), who argued in their work that inclusion of medicinal plant extracts in poultry diets impacted the metabolism by reducing stress and microbial activity therefore improved the feed intake and conversion ratio.

4. Conclusion

The results of the present study showed both Christmas melon and neem extracts better alternatives to the conventional Gumboro and Lasota vaccines in term of cost. It is therefore recommended that poultry farmers should take the advantage of these novel substances to reduce production cost and without any fear of vaccines failure.

Compliance with ethical standards

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Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of ethical approval

All animals care and experimental protocols were ethically reviewed and approved by the Animal option of Agricultural Technology Department of Akanu Ibiam Federal Polytechnic Unwana, Ebonyi state,Nige Nigeria. This study does not involve any human testing.

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