GROWTH PERFORMANCE AND SERUM ANTIOXIDANT PROPERTIES OF BROILER CHICKENS TO CLOVE AND CINNAMON POWDER AS ORGANIC GROWTH PROMOTER

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ABSTRACT
A study was conducted to determine the effect of dietary clove and cinnamon powder on the growth performance and antioxidant enzymes of broiler chickens. One hundred and eighty (180) 1-day-old broiler chicks were distributed into four (4) treatments. Treatment 1 (T1) diet contained antibiotics and served as the control; Treatment 2 (T2), Treatment 3 (T3) and Treatment 4 (T4) diets contained 1g, 2g and 3g/kg cloves and cinnamon powder, respectively. Growth performance data were collected on weight gain, feed intake, feed conversion ratio and survivability. Serum samples were collected and analysed for Superoxide dismutase (SOD), catalase (CAT) and glutathione peroxidase (GPx). All data collected were subjected to Analysis of Variance using SPSS. Significant ($p< 0.05$) means were separated using Duncan Multiple Range Test as contained in the software. Results at 42 days showed that Birds in treatment 2 had the highest ($p<0.05$) total and average water intake while birds in treatment 3 recorded the least water intake. Antioxidant properties of broiler chickens were effected especially the CAT enzyme and SOD. Catalase activity was significantly increased by the addition of 2 g/kg of clove and cinnamon powders, but not 1 g/kg or 3 g/kg. Superoxide dismutase activity was significantly decreased by the addition of all levels of the phytobiotics. It can be recommended that further studies should be carried out on the combinations of clove and cinnamon powder as an alternative to antibiotic growth promoter.
Keywords: **Antibiotics, Antioxidant, broiler chickens, clove, cinnamon**

INTRODUCTION

Antibiotics have been used with diverse benefits to humans and animals, yet, some studies have revealed that application at high dosage has resulted in increased antibiotic resistance (Furtula *et al*., 2010 and Forgetta *et al*., 2012) and the release of residues to the environment (Gonzalez and Hernandez, 2017) negatively affecting livestock and humans (Diarra *et al*., 2010). Stoppage of its usage has likewise resulted in predisposition to diseases and subsequent low productivity; necessitating the search for alternatives that are harmless to poultry, humans and the environment. Phytobiotics are medicinal substances desired for their antimicrobial, antioxidant, anti-parasitic and anti-inflammatory properties, and they have been successfully applied in poultry production; playing important role in increasing the production of antioxidant enzymes for improved performance and quality of products (Akyildiz and Denli, 2016; Karangiya *et al*., 2016). Cloves and cinnamon are explored for their biological significance. Cloves (*Syzygium aromaticum*) are consumed for their antioxidant (Mishra *et al*., 2016), antimicrobial (Rodriguez *et al*., 2014; Kammon *et al*., 2019) and fungicidal properties (Singh *et al*., 2007). Cinnamon possess appetite and digestion-stimulant properties (Tabback *et al*., 1999), anti-bacterial properties (Chang *et al*., 2001), antioxidant properties (Singh *et al*., 2007) and other medicinal properties like anti-ulcer, anti-diabetic, anti-inflammatory (Jakhetia *et al*., 2010). Recent studies have shown that cinnamon powder, cinnamaldehyde alone or in combination with other essential oils had a wide array of beneficial effects in poultry. Some of those effects include increased feed intake (Al-Kassie, 2009), improved growth performance and improved meat quality (Sang-Oh *et al*., 2013), improved performance and feed efficiency (Kamel, 2001), increased pancreatic and intestinal lipase activity (Kim *et al*., 2010), increased breast meat yield (Isabel and Santos, 2009), improvement in health status (Al- Kassie, 2009), This study explored the application of clove and cinnamon as phytobiotics on growth performance and serum antioxidant status of broiler chickens.

MATERIALS AND METHODS

One hundred and eight (108) 1-day-old Cobb-500 broiler chicks were purchased from a reputable hatchery and allotted to four treatments with three replicates of 9 birds per replicate raised in a deep litter system in a completely randomized design. The experiment lasted for 42 days. Clove and cinnamon powders of equal proportion were added to the diet at four levels (0, 1, 2 and 3 g/kg). Water and feed was given *ad-libitum*. Performance and some serum antioxidant indices data were analyzed using one-way ANOVA and significant means ($p<0.05$) were separated using Duncan's Multiple Range Test (Steel *et al*., 1997).

RESULTS AND DISCUSSION

Result obtained (Table 1) indicate total water intake, average water intake and survivability were influenced ($p<0.05$). Total water intake was higher in broiler chickens fed 1 g of clove and cinnamon powders (13.88L/bird). Findings reveal dietary supplementation with cinnamon essential oil and other plant extracts improved the growth performance of broilers (Al-Kassie 2009; Tiihonen *et al.,* 2010) while clove powder supplementation improved consumption (Agostini *et al;* 2012; Arif *et al*., 2022). Least total water intake (12.33L/bird) was recorded for birds fed diet containing clove-cinnamon powders at 2 g. Average water intake was higher in chickens fed diet containing 1g of clove and cinnamon powder (0.33L/bird) with the least value recorded for birds fed diet containing 2g of cloves and cinnamon powder (0.30L/bird). Survivability was higher ($p<0.05$) among birds fed clove and cinnamon powders (1: 1 g) than the Control on antibiotics (88.89%).

Table 1: Effect of Cloves and Cinnamon powder as Feed additives on Growth Performance of Broiler Chickens at 42 days

	Inclusion level				
Parameters	0g	1g	2g	3g	SEM
Initial body weight (g)	44.96	44.26	40.30	43.26	0.76
Final body weight (g)	2086.67	2176.67	1993.33	2010.00	35.75
Total body weight gain (g)	2041.70	2132.41	1953.04	1966.74	35.60
Average body weight gain (g)	48.61	50.77	46.50	46.83	0.85
Total feed intake (g)	4010.11	4129.52	3934.85	4147.56	45.89
Average feed intake (g)	95.48	98.32	93.69	98.75	1.09
Total water intake (L)	13.14^{ab}	13.88^{a}	12.33^{b}	13.08^{ab}	0.21
Average water intake (L)	0.31^{ab}	0.33^{a}	0.30^{b}	0.31^{ab}	0.00
Feed conversion ratio	1.97	1.94	2.02	2.11	0.04
Survivability (%)	88.89^{b}	100.00^{a}	92.59^{ab}	92.59^{ab}	1.65

^{a,b};Means that do not share a letter within a row are significantly different
SEM= Standard Error Mean

Addition of cloves beyond 2% reportedly had a negative effect on performance of broiler chickens (Al-Mufarrej *et al.,* 2019), contradicting the findings of Isabel and Santos (2009) that dietary supplementation with a blend of cloves and cinnamon essential oils improved feed conversion ratio. Catalase (CAT), glutathione peroxidase (GPx) and superoxidase dismutase (SOD) values for blood of chickens fed clove and cinnamon powders is presented (Table 2). Serum SOD and CAT were affected ($p<0.05$). Birds fed 2 g each of clove and cinnamon powders per kg of feed had the highest CAT (0.16) compared to 0.4 recorded for groups fed 1 g/kg. High CAT value is inversely correlated to SOD. Serum SOD – highest for the control (6.50) decreased with increasing inclusion levels. Clove and cinnamon powders contain compounds with antioxidant properties, such as eugenol and cinnamaldehyde (Chang *et al.,* 2001; Shan *et al.,* 2005), that can protect cells against oxidative damage.

Table 2. Effect of clove and cinnamon powder on some antioxidant poperties of broiler chickens

Parameters (U/mg)	Level of inclusion				SEM	P-value
	0g/kg (control)	1g/kg	2g/kg	3g/kg		
CAT	0.06^{ab}	0.04^{b}	0.16^{a}	0.10^{ab}	0.03	0.05
SOD	6.57^{a}	2.28^{b}	1.33^{b}	1.83^{b}	0.71	0.00
GPX	11.51	12.78	13.24	12.93	0.67	0.35

^{a,b};Means that do not share a letter within a row are significantly different SEM= Standard Error Mean Catalase = CAT Glutathione Peroxidase = Gpx Superoxidase Dismutase = SOD

Anti-inflammatory properties of clove and cinnamon reduces oxidative stress and subsequent oxidative damage (Jakhetia *et al.,* 2010; Farhath *et al.,* 2013). The CAT (catalase) activity was significantly increased by the addition of 2g/kg of clove powder, while SOD (superoxide dismutase) activity was significantly decreased by the increased levels of clove powder and cinnamon powder which indicated an efficient boost in antioxidant capacity of the broiler chickens. This study negate the study of Stefan *et al.* (2009) who revealed cinnamon addition had no significant effect on SOD and CAT, but support the study of Mahrous *et al.* (2017), that clove administration significantly improved the antioxidant potential of broiler chickens in dose-dependent manner. Cinnamon oil supplementation appears the most effective among the tested essential oils (Nancy *et al*., 2020), buttressed by the report of Sadeghi and Moghaddam, (2018) that reported significant impact of cinnamon powder on blood SOD and CAT, respectively.

CONCLUSION

It can be recommended that further studies should be carried out on the combinations of clove and cinnamon powder as an alternative to antibiotic growth promoter

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