



EFFECT OF RED OSIER DOGWOOD EXTRACT ON GROWTH PERFORMANCE, BLOOD BIOCHEMICAL PARAMETERS, AND GUT FUNCTIONALITY OF BROILER CHICKENS CHALLENGED OR UNCHALLENGED WITH *SALMONELLA ENTERITIDIS* LIPOPOLYSACCHARIDE

Introduction

The search for alternatives to antibiotics in poultry production continues to be an ongoing challenge. The industry is working to find antibiotic replacements that ensure the production of healthy birds and ensure that intestinal pathogenic bacteria do not cause food-borne infections for humans. Dr. Adewole and her team of graduate students are investigating feed additives to determine their potential to replace the use of in-feed antibiotics in chicken production. Red osier dogwood (ROD; *Cornus stolonifera*) is a naturally growing ornamental shrub found in all provinces in Canada. ROD is a novel feed ingredient which is high in polyphenols, known for their antioxidant and health properties. Scales (2015) found that ROD added to the diets of weaned pigs reduced antibiotic usage. As well, Amarokoon (2017) reported that it provided protection to weanling pigs against oxidative stress induced by *E. coli* infection. This study investigated ROD's antioxidant and antimicrobial effects on broiler chickens when their immune system is stressed with an injection of *Salmonella Enteritidis* lipopolysaccharide (SE-LPS), a biomolecule produced when the SE bacterium is broken down. This is not a live form of the SE bacterium but a metabolite that can have a negative impact on bird health.

Objective

The objective of this study was to investigate the potential of ROD extract at 0.3% and 0.5% as an alternative to in-feed antibiotics on growth performance, blood biochemical parameters, gut health, and antioxidant status of broiler chickens challenged with SE-LPS.

Industry Impact

This study indicates that dietary supplementation of ROD extract at 0.3% or 0.5% can be used to replace antibiotics in broiler chicken nutrition without a negative impact on growth performance.



Photo 1: Injecting SE-LPS

Trial

Day old broiler chickens (Cob 500) were randomly assigned to eight treatment groups containing eight replicate cages of 6 birds each. There were two groups (challenged and unchallenged) and 4 dietary treatments as follows:

Diet 1 (NC) – Negative control i.e., corn-wheat soybean-based diet

Diet 2 (BMD) – NC diet plus 0.05% BMD (antibiotic)

Diet 3 (ROD 0.3) – NC diet plus 0.3% ROD Extract

Diet 4 (ROD 0.5) – NC diet plus 0.5% ROD Extract

The unchallenged group was fed the above diets and on d 13 and 20 were given an injection of a buffered saline solution. The challenged group was given an injection of SE-LPS on d 13 and 20.

Average body weight (ABW) and average feed intake (AFI) were determined weekly on a cage basis, and mortality was recorded daily to correct for AFI and feed conversion ratio (FCR). On d 21, 80 birds (ten birds from each treatment) were randomly selected, individually weighed, and euthanized. On Day 36, two birds were randomly selected from each pen and euthanized. Blood samples and ceca content were collected, and gut morphology was examined. The following parameters were determined: feed intake, body weight, body weight gain, feed conversion ratio, organ weights, concentration of SCFAs, blood chemistry and identification of gut microbiota.

Results

- On d 7, there were no differences in the performance measures between any of the dietary treatments as well as between the groups that were challenged and unchallenged with SE-LPS.
- On d 14 and 21 both 0.3% and 0.5% inclusion levels of ROD extract were found to marginally improve average weight gain of unchallenged birds compared to other dietary treatments in the unchallenged group.
- Average weight gain on d 14 and feed conversion ratio on d 21 was found to be improved among the unchallenged birds compared to the challenged group, which indicates that the injection of SE-LPS reduced nutrient utilization from the feed.
- Growth performance throughout the study of the birds fed the 0.3% and 0.5% ROD diet compared favorably with those fed the antibiotic (BMD) diet, regardless of whether the birds were challenged with SE-LPS or not.
- Results indicate that supplementation of ROD at the 0.3% and 0.5% level is sufficient to maintain and improve healthy gut structure compared to the birds fed the BMD diet. However, results were best using the 0.3% level.

- Dietary supplementation of 0.3% and 0.5% ROD extract improved good gut microflora, Lactobacillus, without compromising the birds' immune system.

Table 1. Effect of red osier dogwood extract on growth performance of broiler chickens challenged with SE-LPS from Day 0 to 21

		¹ Basal	BMD	0.3% ROD	0.5 % ROD
² AFI (g/bird)	U	1096	1169	1173	1114
	C	1162	1155	1115	1114
AWG (g/bird)	U	652.6 ^b	765.7 ^a	742.6 ^{ab}	697.9 ^{ab}
	C	690.2	721.7	671.0	665.7
FCR	U	1.70	1.53	1.59	1.60
	C	1.69	1.61	1.67	1.68
Mortality (%)	U	0.00	0.00	0.00	0.00
	C	0.00	0.00	0.00	0.00

1 - Basal, negative control diet, BMD (bacitracin methylene disalicylate) antibiotic diet, 0.3% ROD, diet containing 0.3% red osier dogwood extract, 0.5% ROD, diet containing 0.5% ROD

2 – AFI – Average Feed Intake, AWG – Average Weight Gain, FCR – Feed Conversion Ratio

In a row, means assigned different lowercase letters are significantly different, $P < 0.05$ (Tukey's procedure)

References

Amarakoon, A. M. S. B. K. 2017. Regulation of oxidative stress in weaned piglets challenged with *Escherichia coli*. *MSc thesis, University of Manitoba*.

Scales, R. 2015. Anti-oxidant properties of *Cornus sericea*, US Patent 20150093460.

Researcher and Cooperators

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