



## Red Osier Dogwood Extract for *Salmonella* Challenged Broilers

### Introduction

Dr. Adewole and her team of graduate students continue to search for alternatives to the use of growth promoting antibiotics. Much of her research has focused on feed additives. One such product is Red Osier Dogwood extract (ROD). Red osier dogwood belongs to the genus *Cornus* and the leaves, bark and stems are known to contain high levels of antioxidants. It is a naturally growing shrub that can be found throughout North America and is extremely hardy; with the ability to withstand unfavorable cold temperatures and thrive in several soil conditions with varying nutrient levels and pH. In a previous study, the results of which are outlined in Factsheet #50, Dr. Adewole, and her graduate student, Taiwo Erinle found conclusively that supplementation of ROD extract at 0.3% or 0.5% can be used to replace antibiotics in broiler chicken nutrition without negatively impacting growth performance. To reevaluate the efficacy of ROD as an antibiotic alternative, this study challenged the birds with live *Salmonella* enteritidis rather than the inactive form of *Salmonella* which was utilized in the previous study. Also, this study used a different antibiotic treatment, Trimethoprim-sulfadiazine (TMP/SDZ), which is a category 3 antibiotic that is more commonly used by the industry to control *Salmonella* infection rather than bacitracin methylene disalicylate (BMD), which was used in the previous study.

### Objective

To determine the effect of ROD extract on growth performance, blood parameters, gut morphology and *Salmonella* excretion of broiler chickens challenged with SE; and, to compare the effect of ROD versus an antibiotic on gut microbiota when challenged with SE.

### Industry Impact

Conclusively, inclusion of ROD extract improved gut structure and the body's immune system and it acted very similarly to the antibiotic treatment in terms of the abundance and diversity of good bacteria in the gut.



**Photo: Dr. Adewole and her research team**

### Trial

Three hundred eighty-four, one-day-old, male Ross 308 broiler chicks were randomly assigned to one of four dietary treatments: 1) Corn-wheat-soybean meal-based Negative control (NC), 2) NC + 0.075 ppm of Trimethoprim-sulfadiazine (TMP/SDZ)/kg of diet, 3) NC + 0.3% ROD extract, and 4) NC +

0.5% ROD extract. On day 1 of the trial, the group was split again into the noninfected treatment and the infected treatment groups. The noninfected birds were orally challenged with 0.5 ml of sterile saline and the infected group were orally challenged with 0.5 ml/bird of  $3.1 \times 10^5$  CFU/ml of SE.

To confirm the absence of SE in the purchased day-old chicks, papers containing fecal samples were collected and analyzed from the chick delivery boxes. To assess secreted *Salmonella*, cloacal swabs were collected on all birds 1-, 5-, 12- and 18-day post-infection.

Average weight gain (AWG), average feed intake (AFI), feed conversion ratio (FCR), and mortality were determined weekly. On day 21, ten chickens/treatment were euthanized to perform blood analysis, gut morphology, and gut microbiota analysis.

## Results

- ✓ There was no presence of SE in all the cloacal swab samples taken throughout the study for all treatments. This was contrary to what was expected. It could be that the level of SE inoculation was not sufficient to cause infection but was high enough to stimulate the immune response in the chickens as evidenced by the production of white blood cells.
- ✓ Dietary supplementation of 0.3% and 0.5% ROD extract did not affect the growth performance of birds with or without SE infection and as a result, will not cause consequential production losses.
- ✓ ROD extract had a significant positive impact on gut structure. This is important because the gut is

involved in the digestion and absorption of nutrients and serves as a barrier which allows the transportation of important nutrients while blocking intestinal pathogens.

- ✓ It was anticipated that the ROD and antibiotic treatments would increase the production of white blood cells, such as leukocytes (LEU) and monocytes (MON). This is important as they are a marker of the body's attempt to fight infection. The 0.3% ROD treatment stimulated the production of LEU and MON in the SE-infected birds, whereas the 0.5% ROD treatment lowered LEU and MON but was comparable to the antibiotic and control treatments. As well, the 0.3% ROD treatment has a positive impact on white blood cell and immunoglobulin counts when compared to the antibiotic treatment, suggesting that it promotes antibody production more effectively than the 0.5% treatment. Further research is required to determine the optimal inclusion level of ROD in poultry diets.
- ✓ Both levels of ROD acted very similarly to the antibiotic treatment in the abundance and diversity of good bacteria in the gut indicating that it has a similar biochemical and physiologic effect as the antibiotic treatment.

## Researchers and Cooperators

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