AGRICULTURAL RESEARCH FOUNDATION
FINAL REPORT
FUNDING CYCLE 2014 – 2016

TITLE: Enhancing the Nutritive Value of Oil Seeds in Poultry Diets

RESEARCH LEADER: Gita Cherian

COOPERATORS: None

SUMMARY: Feed represents over 65% -70% of production costs of poultry. Much of the energy and protein provided to poultry in the Pacific Northwest is through corn and soybean imported from the Midwest. Considering the high demand of corn and other oil crops for biofuel production, finding alternate sources of energy and protein will reduce production costs. Flaxseed (*Linum usitatissimum L.*) is an oilseed which contains 24% protein, 35% oil, and 6% crude fiber. The fats in flaxseed contains over 54% α-linolenic acid (18:3n-3), the major omega-3 fatty acid in human diets. Several authors investigated the use of flax seed in broiler diets and reported significant depressed growth and carcass yield when included over 10% of the diet. The poor growth rates were attributed to the presence of anti-nutritional factors such as cyanogenic glycosides, linatine and nonstarch polysaccharides (NSP) that were present in flaxseed. Monogastric animals like chicken are less tolerant to these of anti-nutritional factors and are therefore sensitive to dietary flaxseed affecting their growth and gut health. Oil is the main energy source in flaxseed, with oil droplets located in the cotyledon cells that are surrounded by the thick walls of NSP. Poultry do not possess endogenous enzymes capable of cleaving and digesting cell wall components, which limits oil exposure to digestive enzymes and reduce optimum energy utilization from flaxseed. Use of carbohydrase enzyme to enhance the digestibility of flaxseeds in broiler diets were investigated. The results from the current study revealed that feeding broilers diets containing whole flax seed with carbohydrase enzymes can provide the consumer with a poultry meat product that is enriched in n-fatty acids without depressing growth performance of the birds.

OBJECTIVES:
Objectives: To determine the effect of dietary flaxseeds with enzymes on bird performance, nutrient digestibility, meat fatty acids and oxidative stability.

PROCEDURES:
Day-old chicks (n=240, Ross) were raised in a floor pens fed a commercial starter diet. On day 5, the birds were weighed and distributed into 16 pens. Each pen will be considered as one replicate and there were four replicate pens with 20 birds each for the three test diets. Birds were fed a corn-soy control or test diet containing 15% flax seeds with (0.1%) or without enzymes (omegazyme). All diets were formulated to contain 3,200-3,000 kcal/kg of ME and 22-20% CP during starter and grower phase. The test diets were fed from day 5-21 and from day 21- 39 of growth. Birds had free access to feed and water throughout the study period. The

birds were weighed at day 5, 21 and 39 of growth. At the end of feeding trial meat and tissue samples were harvested and subjected to lipid and fatty acid and meat lipid stability analysis. The nutrient digestibility assay was conducted in diet and in excreta.

SIGNIFICANT ACCOMPLISHMENTS:

Two graduate students and 1 post-doctoral fellow and was part of the current project.

Provided laboratory analytical skills and research internship opportunities to 3 OSU undergraduate students and 1 international exchange student on lipids and fatty acid metabolism in poultry.

Two oral and 1 poster was presented at the 2015 Poultry science annual meeting in Louisville, KY (details on poster shown below).

The oral presentation by graduate student Brian Head (#3) was selected as best presentation in the metabolism and nutrition section at the 2015 Poultry science annual meeting.

Presentations at National meetings related to the current project (* indicates graduate student)

1. Apperson, K. D*., and G. Cherian. 2015. Effect of whole flax seed and enzyme addition on production performance and tissue fatty acids in broiler chickens. Poultry Science Association annual meeting, Louisville, KY. July 27-30. (oral).

2. Apperson, K. D*., and G. Cherian. 2015. Effect of flax seed and enzyme supplementation on gastrointestinal morphology, excreta characteristics, and production performance in broiler chickens. Poultry Science Association annual Meeting, Louisville, KY. July 27-30. (poster).

3. Head, B. A*., K. D. Apperson, and G. Cherian. 2015. Hepatic triacylglycerol content and fatty acid distribution in lipid classes: effect of dietary flax seed and carbohydrase enzyme in broiler chickens. Poultry Science Association annual meeting, Louisville, KY. July 27-30. (oral, received certificate of excellence for the best graduate student presentation).

Three abstracts were published related to the current project.

Published abstracts:

1. Apperson, K. D and G. Cherian. 2015. Effect of whole flax seed and enzyme addition on production performance and tissue fatty acids in broiler chickens. Poult Sci. 94 (E-Suppl.1) p. 31. #85.

2. Apperson, K. D., and G. Cherian. 2015. Effect of flax seed and enzyme supplementation on gastrointestinal morphology, excreta characteristics, and production performance in broiler chickens. Poult Sci. 94: (E-Suppl.1) p. 127. #377P.

3. Head, B. A., K. D. Apperson, and G. Cherian. 2015. Hepatic triacylglycerol content and fatty acid distribution in lipid classes: effect of dietary flax seed and carbohydrase enzyme in broiler chickens. Poult Sci. 94 (E-Suppl.1) p. 31. #86.

Thesis:

Karen Apperson, conducted part of the MS research studies related to the current project and successfully defended MS thesis in May 2015 on "Enzyme supplementation of broiler diets containing whole flax seed as a means to increase n-3 fatty acids in human diets".

Brian Head is conducting a part of his graduate studies research work on carbohydrase enzymes and omega-3 fatty acid metabolism in meat-type chickens (in progress).

BENEFITS & IMPACT:

The impact of omegazyme enzyme on nutrient digestibility in flax seed was determined. This information will allow us to formulate diets that can enhance omega-3 fatty acids in poultry meat without affecting bird performance and health. With the global population rise, many countries are increasing poultry production to improve human nutrition and attain food security. Exploring the ways to enhance nutritional value of oil seeds using exogenous enzymes will benefit human nutrition with wholesome health-promoting poultry products enriched with n-3 fatty acids at a lower cost. As feed represents over 65-70% of the cost of poultry production, the results obtained will reduce food production cost while achieving greater independence of food supply.

ADDITIONAL FUNDING RECEIVED DURING PROJECT TERM:

None

FUTURE FUNDING POSSIBILITIES:

We are looking into other funding from private and government sources.