

APRI FACTS

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FEEDING BLUEBERRY BY-PRODUCTS TO IMPROVE BROILER CHICKEN HEALTH AND MEAT QUALITY

Introduction

The Nova Scotia wild blueberry industry is growing at a rapid pace, due in part to the berry's high concentration of antioxidants and other bioactive molecules that are known to help prevent conditions such as heart disease and cancer. Broiler chickens are susceptible to heart disease in the form of sudden death syndrome and ascites and may benefit from the inclusion of antioxidants in their diet. Myofibrillar degradation, which is associated with poor breast meat quality, may also be reduced with the addition of dietary antioxidants. An animal's antioxidant defence system includes both enzymatic and non-enzymatic parts. The non-enzymatic system includes substances often found in fruits and vegetables, such as ascorbic acid, β -carotene, flavonoids and uric acid etc. By-products from the juice manufacturing industry are known to retain a high level of bioactive compounds and may be a natural and economical source of non-enzymatic antioxidant compounds. There currently is no information available on the suitability of blueberry by-products for broiler chicken diets. It is known that feeds high in fiber or non-starch polysaccharides can slow the growth of broiler chickens, while feed ingredients that are highly pigmented can alter the appearance of dermal tissues of chickens before and after processing. The objective of this project was to evaluate the

effect of feeding blueberry processing waste on broiler growth and meat quality.

Trial

Three trials were conducted at the NSAC to determine the digestibility of blueberry by-products in broiler diets and their effect on growth and meat quality. For the digestibility trial, 60 day-old male chicks were housed among 10 battery cages and fed either a standard starter diet or a starter diet supplemented with 30% freeze-dried blueberry processing waste product ('reel stock'). Celite, an inert digestibility marker, was added to each diet. Excreta samples were collected at 21 days to determine apparent metabolizable energy (ME) of the blueberry reel stock. Breast muscle samples were collected after cervical dislocation at day 21 to determine post-mortem pH decline. Two growth trials were conducted, with 912 male broiler chicks distributed among 24 floor pens and fed one of three isocaloric dietary treatments containing 0, 1.5 or 3% freeze-dried blueberry product. Birds were given ad libitum access to feed and water and were reared under a continuous lighting program. Skin colour of live birds was measured on the dorsal side of the foot at 14 and 20 days. Breast muscle samples were collected after commercial processing at day 35 to determine post-mortem pH decline.

Results

The freeze-dried blueberry processing waste product did not provide significant energy to the broilers (digestibility coefficient 0%; apparent ME 0%) and was therefore evaluated as an antioxidant compound instead of a nutritional supplement. Broiler growth performance was not consistent between the two floor pen trials (Table 1). In the first growth trial, the addition of blueberry reel stock did not affect growth rate, while in the second growth trial, birds given 1.5 or 3% blueberry reel stock were smaller from day 14 to market age than those fed the control diet. Chicks used in the second growth trial weighed approximately 10% less than those used in the first growth trial, which may explain the differing treatment effects between the two experiments. Feed conversion (1.88 g bird⁻¹) and percent mortality (1%) were unaffected by the addition of blueberry reel stock. Breast muscle post-mortem pH decline was unaffected by dietary treatment. Birds susceptible to protein damage are typically identified by pH readings below 5.80 at 15 min post-mortem; breast muscle samples in all three trials were above pH 6.0 regardless of dietary treatment. Dietary treatment did not have a strong effect on broiler skin colour, although the shank skin of birds fed the 3% blueberry product tended to be less red.

Table 1. Body Weight (g bird⁻¹) of Broilers Fed Blueberry Reel Stock.

	Day 14	Day 38
Trial 1		
0.0 % Reel Stock	323±26 ^a	1909±26 ^a
1.5 % Reel Stock	327±24 ^a	2010±24 ^a
3.0 % Reel Stock	326±23 ^a	1946±23 ^a
Trial 2		
0.0 % Reel Stock	368±11 ^a	1925±11 ^a
1.5 % Reel Stock	333±11 ^b	1877±11 ^b
3.0 % Reel Stock	332±11 ^b	1857±11 ^b

a-b; means±SEM within a column with different letters differ significantly (P<0.05)

¹Initial body weight (Day 0) 45.5±0.5g.

Industry Impact

Freeze-dried blueberry processing waste (blueberry reel stock) does not provide significant energy to broilers. Feeding blueberry reel stock at 1.5 or 3% may cause a reduction in broiler growth. However, there may be potential for this product in diets of poultry with lower growth rates such as laying hens or broiler breeders. Blueberry reel stock may affect broiler skin colour; whether this color change is undesirable to consumers has not been established. The value of blueberry reel stock as an antioxidant compound remains unclear. Despite rearing the broilers under a continuous lighting program there were very low levels of mortality in all treatments and the effect of blueberry reel stock on cardiac health could not be determined. Similarly, potential improvements to meat quality could not be measured as there were no poor quality samples in control or blueberry fed birds. Other types of blueberry processing waste products, for example those containing higher levels of antioxidants and lower levels of indigestible waste, may be of benefit to broiler cardiac health and meat quality and warrant investigation.

For more information on this project or any other project contact please contact apri@nsac.ca or phone 893-6657. These along with other fact sheets are available in PDF on our website.

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