

# APRI FACTS

*Atlantic Poultry Research Institute*



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## **GROWTH PERFORMANCE AND MUSCLE PROTEIN TURNOVER OF TWO BROILER CHICKEN STRAINS FED SUPPLEMENTAL TRYPTOPHAN**

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### **Introduction**

Excessive excitable behaviour of broiler chickens reared in confined housing systems has been a concern of broiler producers in the Atlantic region. This behaviour results in increased activity that is associated with skin lesions, carcass downgrades and the need for carcass trimming. Dietary tryptophan can have a sedative effect on birds, and has been used to reduce levels of aggressive behaviour in broiler breeders and to reduce excitability in laying hens. Stress (or excitable behaviour) can lead to accelerated metabolism, a build-up of lactic acid and damage to muscle tissue. It was hypothesized that using tryptophan to reduce stressful behaviour would provide a nutritional means to improve carcass quality, increase product value and reduce the need for trimming. This study was conducted to examine the effect of supplemental tryptophan on the growth rate of two strains of broiler chicken and to monitor skeletal muscle damage and muscle protein turnover.

### **Trial**

Two trials were conducted at the NSAC using 376 male and 376 female broiler chicks of two different strains. Birds were separated into 8 pens and given ad libitum access to feed and

water. Starter, grower and finisher diets contained one of two levels of dietary tryptophan, either a standard commercial level (0.25%) or a level 6g/kg above the standard level (0.84%). Blood samples were collected from four birds per pen on days 21 and 35. Plasma creatine kinase activity was determined as a measure of muscle damage. Four birds per pen were euthanized at 38 days, and breast muscle samples were collected at 15min post mortem. Enzymes involved in breast muscle protein turnover were monitored as an indicator of meat quality.

### **Results**

The effect of tryptophan supplementation on broiler weight gain and feed consumption was complex and appeared to be both strain and sex specific. Tryptophan supplementation had no effect on day 38 weights of male broilers, or on strain 2 female broilers (Table 1). However, strain 1 female broilers fed high levels of tryptophan were significantly lighter than those receiving no supplemental tryptophan. Strain 1 broilers receiving a high level of tryptophan had lower feed consumption than those receiving no supplemental tryptophan (Table 2). Tryptophan supplementation had no effect on feed consumption of strain 2 broilers

**Table 1. The effect of level of tryptophan, sex and strain on day 38 broiler weight (g).**

Strain	Tryptophan			
	Low <sup>1</sup>		High	
	Male	Female	Male	Female
1	1777.50 <sup>ab</sup>	1841.33 <sup>a</sup>	1724.00 <sup>ab</sup>	1592.77 <sup>c</sup>
2	1827.43 <sup>ab</sup>	1697.57 <sup>bc</sup>	1728.73 <sup>ab</sup>	1703.70 <sup>bc</sup>
SE ± 23.03				

*a-c* Means in a column or row followed by no common letter are different at  $P \leq 0.05$ .

<sup>1</sup>Low=0g/kg, high=6g/kg.

**Table 2. The effect of level of tryptophan and strain on broiler feed consumption during the finisher period (g).**

Strain	Tryptophan	
	Low <sup>1</sup>	High
1	1211.40 <sup>a</sup>	1122.90 <sup>b</sup>
2	1157.76 <sup>ab</sup>	1159.13 <sup>ab</sup>
SE ± 19.09		

*a-b* Means in a column or row followed by no common letter are different at  $P \leq 0.05$ .

<sup>1</sup>Low=0g/kg, high=6g/kg.

Bird mortality was affected by broiler strain. Strain 1 males consuming a high level of tryptophan had a higher percentage of deaths than strain 2 males on the same dietary treatment. Tryptophan supplementation had no effect on broiler mortality. The effect of tryptophan supplementation on plasma creatine kinase (CK) activity was sex and strain specific. Low CK activity indicates an animal may be more resistant to breast muscle damage and better able to cope with pre-slaughter stress. Strain 1 females fed a high level of tryptophan had lower CK activity than strain 2 females fed the same diet. Strain 1 males fed a low level of tryptophan had higher CK activity than strain 2 males fed the same diet.

## Industry Impact

Nutritional modification is a practical means to improve growth rate and livestock performance and can be easily implemented by producers. Further research is required to determine the effects of dietary tryptophan supplementation on broiler growth and stress response. A high level of tryptophan increased mortality and decreased growth and feed conversion in strain 1 female broilers, but not in strain 2. Female broilers had lower plasma CK activity than males, and therefore appear better able to cope with preslaughter stress. Strain 1 broilers receiving no supplemental tryptophan may be less able to cope with preslaughter stress due to higher plasma CK activity. Although tryptophan may increase the cost of feed for producers, it appears that supplementing this amino acid may reduce stressful behaviour in certain strains, therefore improving carcass quality, increasing product value and reducing the cost of labour to trim damaged carcasses. Further research on how tryptophan, strain and sex interact to influence stress and skeletal muscle damage will provide valuable information that could be used to improve product quality and yield.

For more information on this project or any other project contact please contact [apri@nsac.ca](mailto:apri@nsac.ca) or phone 893-6657.

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