APRI FACTS

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FACTSHEET #46
May 2021

EFFECT OF DIETARY ENERGY DENSITY AND FOLIC ACID ON WHITE STRIPING OCCURANCE AND GROWTH PERFORMANCE OF BROILER CHICKENS

Introduction

White striping (WS) is an emerging disorder in poultry which negatively affects the visual appearance and nutritional value of broiler breast meat. It is characterized by the occurrence of varying degrees of white striations parallel to muscle fibers resulting in increased stiffness, stickiness and chewiness in the affected fillets. Although the exact cause of WS is still unknown, there are reports that it is associated with oxidative stress and inflammation and is more prevalent in birds fed high energy density diets (Kuttappan et al. 2016). Oxidation occurs as our cells use glucose to make energy; when our immune system is fighting bacteria; when our bodies are detoxifying; and, when we are under stress. This process of oxidation results in the production of free radicals which are necessary for cell repair. However, if we produce too many free radicals the repair process is overwhelmed and oxidative stress results (Wilson 2015). Folic acid (FA) is a water-soluble B vitamin that may have an impact of anti-oxidation (Brattstrom 1996). Folic acid requirement of broiler chickens was established in the 1990's at between 1.3 and 3 mg/kg (Whitehead et al. 1995). This may be inadequate with today's fast-growing and high breast yield chickens.

Objective

To investigate the effect of increasing levels of FA supplementation on the occurrence of WS in broiler chickens fed a high energy density diet (HE) or a normal energy density diet (NE).

Industry Impact

A treatment for the occurrence of WS is significant as meat with the WS defect is downgraded or even discarded in the processing plant resulting in a considerable loss to the poultry industry. As well, WS has a negative impact on consumer perception because it affects the physical appearance of the broiler breast meat.

Trial

Day-old male and female broiler chicks (Ross 308) were randomly sorted into eight dietary treatments, with eight replicate pens per treatment. Each pen consisted of 25 birds. The treatments consisted of two energy levels (Normal Energy-NE and High Energy-HE), each with four varying levels of FA supplementation (2.2, 5, 10 and 15 ppm). The NE diet was formulated to meet typical industry nutrient standards and the HE diet was formulated to contain an additional 100 Kcal/kg of metabolizable energy above the NE diet. Feed

intake, body weight, and mortality were recorded weekly. On day 42 of age, two male and two female chickens per pen were randomly selected and euthanized for WS evaluation. Body weight gain (BWG) and feed conversion ratios (FCR) were calculated.

Table 1: Effect of Folic Acid Levels on White Striping Occurrence in Broiler Chickens

	Folic Acid (ppm)	WS[1] score	WS[2], % Normal	Moderate	Severe	Extreme
Male	2.2	1.38	18.8	34.4	37.5	9.40
	5	1.21	18.1	43.8	31.3	6.31
	10	1.31	12.5	46.9	37.5	3.12
	15	1.41	6.50	50.0	40.6	3.10
	SEM[3]	0.14	5.60	8.88	8.08	3.87
Female	2.2	1.41[a]	3.12[b]	53.1	37.5	6.31
	5	0.97[b]	28.1[ab]	59.4	9.4	3.13
	10	0.98[b]	18.8[ab]	59.4	18.8	3.10
	15	0.94[b]	37.5[a]	34.4	25.0	3.10
	SEM	0.14	6.94	9.15	8.54	3.93

1 White striping. 2 Percentages of normal, moderate severe and extreme white striped breast fillets. 3 Standard error of the mean. In a column, means assigned different lowercase letters are significantly different, $P < 0.05$.

Results

- As outlined in Table 1, Irrespective of energy level, dietary inclusion of 5 to 15 ppm FA reduced WS in female broiler chickens but did not affect the male chickens.

- Birds fed HE diets had better FCR than those on NE diets.

References

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Funding

Canadian Agricultural Partnership – Advancing Agricultural Research and Innovation Initiative, Country Ribbon Inc., Eden Valley Poultry, Nadeau Poultry Farm Ltd