

Effect of Slow and Rapid Peroxidation of Corn Oil on the Performance and Energy Storage of Broiler Chicks

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Summary and Implications

The extraction of corn oil from DDGS has led to an increase in the utilization of coil oil in poultry diets. This corn oil has the opportunity to undergo peroxidation during storage or processing. Therefore it is important to understand the effects of peroxidation of corn oil on growth and performance of broiler chicks. Broiler chicks were provided corn-soybean based diets containing unperoxidized corn oil (UPO), slowly peroxidized corn oil (SO; heated for 72 h at 95°C), and rapidly peroxidized corn oil (RO; heated for 7 h at 185°C). Corn oil was added at a 5% inclusion 0-14 d and 10% inclusion 15-27 d. A fourth treatment consisted of a supplemental oil-free diet to be used to determine the apparent metabolizable energy nitrogen corrected (AMEn) of each corn oil diet. As expected the diets without supplemental oil resulted in reduced performance, but no significant differences were observed among oil-supplemented birds for body weight gain, feed intake, or feed conversion ratio (FCR). There was a significant difference in abdominal fat pad (AFP) weights of the broilers fed RO corn oil compared to the birds fed UPO corn oil. Analysis of samples for AMEn content is underway and will be reported shortly. Corn oil peroxidation status had minimal effects on broiler performance, but did result in differences in energy utilization as indicated by AFP weight.

Introduction

There has been a recent trend to use more corn oil in poultry diets to meet the caloric demands of production. This need has been met through the use of dried distiller's grains with solubles (DDGS) or corn oil extracted from DDGS (DCO). The unintended consequence of using these feed ingredients has resulted in the use of oil with a higher potential for peroxidation. Oxidized oils have the potential to adversely affect body weight gain, feed conversion, and other performance parameters. The objective of this

experiment was to determine the effects of peroxidative status in corn oil on broiler performance and energy utilization.

Material and Methods

Two hundred forty male Ross 708 hatching chicks were randomly selected and placed into one of four treatment groups. Each experimental unit consisted of 6 broiler chicks with 10 replicates for each of the treatments. The treatment diets contained either UPO corn oil, SO corn oil, or RO corn oil at 5% inclusion 0-14 d and 10% inclusion 15-27 d. The fourth treatment diet was free of supplemental oil and used for AMEn determination by the difference method. All diets were formulated to meet or exceed the NRC nutrient requirements of the birds. The supplemental oil containing diets (UPO, SO, RO) were isonitrogenous. Chicks were housed in Petersime battery cages with continuous light, supplemental heat, and *ad libitum* access to feed and water. Body weight gain, feed intake and FCR were measured for the 0-14 and 0-27 d periods. AFP and excreta collection were performed on day 27. ANOVA and Student's t-test were used to analyze the data and separate the means if significant (significance determined at $P \leq 0.05$).

Results and Discussion

As expected, birds fed the supplemental oil-free diet exhibited lower performance and smaller AFP compared to birds offered the oil-supplemented diets. There were no significant differences among oil-supplemented birds for body weight gain, feed intake, or FCR (Table 1), although birds fed either peroxidized corn oil source consistently resulted in the numerically poorest performance. Figure 1 shows a significant reduction in AFP weight of birds fed the RO corn oil compared to birds fed the UPO corn oil, with birds fed the SO corn oil having intermediate AFP weights. These data suggest that the peroxidized oil might have a reduced metabolizable energy value in broiler diets based on the reduced storage in the AFP that will be validated with AMEn determination.

Acknowledgements

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Table 1. Effect of peroxidized corn oil on average body weight gain, feed intake, and feed conversion ratio of broiler chicks from 0-14 and 0-27 days.

	0-14 days			0-27 days		
	BWG, g/ck	FI, kg/pen	FCR	BWG, g/ck	FI, kg/pen	FCR
Oil-free	335	2.81	1.40 ^A	950 ^B	9.09	1.60 ^A
UPO	362	2.76	1.27 ^B	1071 ^A	9.04	1.41 ^B
SO	346	2.69	1.29 ^B	1032 ^A	8.87	1.43 ^B
RO	349	2.73	1.31 ^B	1023 ^A	8.86	1.44 ^B
Pooled SEM	7.5	0.046	0.018	22.4	0.153	0.016
<i>P</i> -value	0.10	0.32	<0.01	<0.01	0.64	<0.01

Different superscript letters denote statistically significant differences ($P < 0.05$) between treatment group values. UPO = unperoxidized corn oil; SO = slowly peroxidized corn oil (heated for 72 h at 95°C); RO = rapidly peroxidized corn oil (heated for 7 h at 185°C).

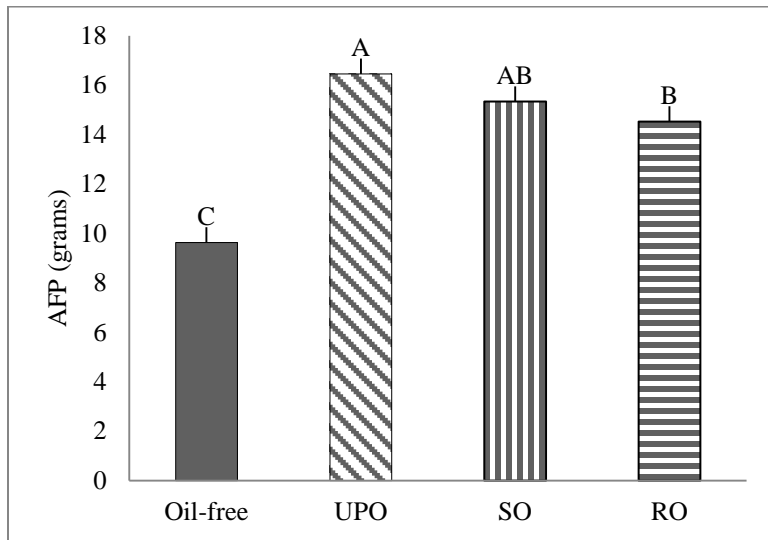


Figure 1. Mean abdominal fat pad (AFP) weights of broiler chicks fed varying levels of peroxidized corn oil from 0-27 days. Different superscript letters denote statistically significant differences ($P < 0.05$) between treatment group values. UPO = unperoxidized corn oil; SO = slowly peroxidized corn oil (heated for 72 h at 95°C); RO = rapidly peroxidized corn oil (heated for 7 h at 185°C).