ECONOMICS OF USING VARIOUS CORN ORIGINS IN BROILER PRODUCTION

EXAMINING RESULTS FROM THE TRIAL'S SECOND YEAR

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Corn is an important ingredient in poultry diets, which presents digestibility and nutritional advantages compared to other grains. Its rich carbohydrate content, composed of highly digestible starch, makes it a significant energy source in animal feeds and provides a cost-effective advantage for feed mills around the world. When mixed with soybean meal and other micro-ingredients (vitamins, minerals, synthetic amino acids, etc.), it produces nutritionally balanced diets, making it indispensable for broiler feeds. Regions are known for their fertile soil and favorable climates that plant corn once or twice a year, making this important ingredient to the poultry industry available all year around. However, corn quality exhibits variation depending on origin, and its nutritional content can be influenced by genetics, cultivation practices, growing conditions, post-harvest processing, and storage, among others. To improve production efficiency, poultry producers should meticulously select the origin of their corn when formulating poultry diets to optimize performance, feed efficiency, and nutrient digestibility. Although individual differences among birds might seem minor, they yield substantial benefits across the entire meat production system. Gaining an understanding of these variations is paramount in poultry production. Opting for high-quality corn sources enhances profitability, emphasizing the critical role of well-informed feed choices.

EFFECTS OF CORN ORIGIN ON BROILER PERFORMANCE

In a previous article (Garcia et al., 2023), we reviewed partial experimental results of Vargas et al. (2023) on the effects of various corn origins on broiler performance. That study involved feeding broilers diets with corn from three origins procured at a feed miller's warehouse in Colombia. The corn originated from the United States (U.S.), Argentina (ARG), and Brazil (BRA), was exported to Colombia, re-imported to the United States, ground at the Northern Crops Institute, and sent to Auburn University to run trials to assess growth performance, carcass traits, and nutrient digestibility. Results showed no significant differences in body weight or body weight gain for broilers fed corn from different origins. However, feed intake was influenced. U.S. corn-fed broilers consumed less feed from 1 to 35 days of age compared to Argentinian or Brazilian corn-fed broilers, affecting the feed conversion rate (FCR). Broilers consuming diets with Argentinian corn displayed increased feed intake and less favorable conversion rates, whereas feed efficiency remained consistent for broilers fed with U.S. and Brazilian corn. This experiment was repeated a year later, and the results obtained are in Table 1.

YEAR TWO RESULTS

Corn samples were sourced from two U.S. origins: domestically obtained (USA-L) and re-imported (USA-R), Argentina (ARG) and Brazil (BRA) corn, all collected from a feed miller in Cartagena, Colombia, re-imported to the United States and sent to Auburn University to run trials to assess growth performance, carcass traits, and nutrient digestibility.

In terms of body weight and body weight gain, the new study found no statistical differences among birds fed diets with corn from different origins. However, birds fed diets with USA-L corn consumed less feed throughout the entire growth phase (days 1 to 35) compared to those fed Argentinian or Brazilian corn. Interestingly, these differences in intake were more significant as the birds grew larger, with no significant intake differences between 1 and 21 days of age.

TABLE 1

Performance of YPM x Ross 708 male broilers fed with diets of corn from different origins from 1 to 35 days of age.

Treatment	BW[1], g/bird				BWG[2], g/bird			FI[3], g/bird			FCR[4], g:g		
	1 d	10 d	21 d	35 d	1-10 d	1-21 d	1-35 d	1-10 d	1-21 d	1-35 d	1-10 d	1-21 d	1-35 d
USA-L[5]	39	276	998	2445	237	959	2406	276	1219	3372[b]	0.996	1.223	1.376[c]
USA-R[6]	39	270	984	2438	231	945	2399	269	1196	3396[ab]	0.999	1.214	1.385[bc]
ARG	39	275	993	2488	236	954	2449	275	1218	3470[a]	1.000	1.223	1.397[ab]
BRA	39	271	992	2462	232	953	2422	273	1222	3463[a]	1.011	1.226	1.401[a]
SEM[7]	0.187	2.073	8.791	19.008	2.050	8.799	19.011	1.848	8.622	23.795	0.005	0.004	0.004
P-VALUE	0.392	0.153	0.731	0.263	0.153	0.730	0.260	0.0735	0.140	0.012	0.115	0.141	<0.0001

[a-b]Least square means within a column with different superscripts differ significantly ($P \leq 0.05$)
[1]Body weight
[2]Body weight gain
[3]Feed intake
[4]Feed conversion ratio corrected for mortality
[5]Corn produced in the U.S.
[6]Corn produced in the U.S. sent to Colombia and reimported
[7]Standard error of the mean

The differences in feed intake had a direct impact on FCR, which is a critical measure of efficiency. The birds fed diets with U.S. corn exhibited better efficiency compared to those fed Brazilian corn, regardless of whether the corn was sourced directly from the U.S. or re-imported. Furthermore, it is worth emphasizing that for birds fed Argentinian corn, the differences in FCR were only observed when compared to local U.S. corn and not when compared to re-imported U.S. corn. This study's findings reinforced the significance of corn's origin in poultry diets and its potential influence on feed intake and FCR. This has important implications for poultry producers, as optimizing feed efficiency is crucial for reducing production costs and increasing overall profitability. Understanding the effects of corn origin on broiler performance aids in making informed decisions when selecting feed ingredients, ultimately achieving better performance results. Further research in this area may provide valuable insights into maximizing efficiency and enhancing the sustainability of the industry.

ECONOMIC SIGNIFICANCE

Even slight variations in individual bird feed intake can add up over time, with significant implications on overall feed consumption and costs. This is due to the multiplier effect that is at play – any individual variation is multiplied across the entire population, leading to a significant cumulative effect on both feed utilization and associated costs. This becomes especially noteworthy in extensive commercial broiler operations, where thousands or tens of thousands of birds are raised within a singular production cycle.

DIFFERENCE BETWEEN USA AND BRAZILIAN CORN FROM 1 TO 35 DAYS OF AGE

Feed conversion rate (FCR) of Brazilian corn - Feed conversion rate (FCR) of USA corn
Difference = 1.401 - 1.385 = 0.016

DIFFERENCE BETWEEN USA AND ARGENTINIAN CORN FROM 1 TO 35 DAYS OF AGE

Feed converstion rate (FCR) of Argentinian corn - Feed converstion rate (FCR) of USA corn
Difference = 1.397 - 1.385 = 0.012

POULTRY FARM WITH 60,000 BROILERS

Assuming a broiler farm with 60,000 new broiler chicks added per cycle with seven cycles per year and feed costs of $0.50/kg on average, the total cost savings with different FCRs can be calculated as follows:

Birds per cycle (A) 60,000	U.S. Corn - Re-imported	ARG Corn	BRA Corn
Feed conversion rates (B)	1.385	1.397	1.401
Feed costs per kg (C)	$0.50	$0.50	$0.50
Feed to achieve 2.4 kg gain per broiler (kg)	3.324	3.3528	3.3624
Feed cost per broiler	$1.662	$1.676	$1.681
Annual costs of feed (7 cycles)	$698,040	$704,088	$706,104
Increased annual feed costs versus U.S. corn		**$6,048**	**$8,064**

ANNUAL FEED COST CALCULATIONS

Feed required to get 2.4 kg of gain per broiler = (2.4 kg/FCR[(B)]) = XX kg of feed per broiler

Feed costs to get 2.4 kg of gain per broiler = XX kg of feed per broiler * $0.50/kg[(c)] = $YY

Total feed costs of producing 60,000 broilers per cycle, with 7 cycles per year = $YY * 60,000[(A)] broilers per cycle * 7 cycles per year = $ZZ per year for feed

With a lower feed conversion rate of 1.385, the use of U.S. corn is expected to result in cost savings of approximately:

$6,084 per year over Argentinian corn for a poultry farm raising 60,000 chicks per cycle, with seven cycles per year.
$8,064 per year over Brazilian corn for a poultry farm raising 60,000 chicks per cycle, with seven cycles per year.

POULTRY FARM WITH 1,200,000 BROILERS

Assuming an integration of 1,200,000 chicks entering per cycle with seven cycles per year and feed costs of $0.50/kg on average, the total cost savings with different FCRs can be calculated as follows:

Birds per cycle (A) 1,200,000	**U.S. Corn - Re-imported**	**ARG Corn**	**BRA Corn**
Feed conversion rates (B)	1.385	1.397	1.401
Feed costs per kg (C)	$0.50	$0.50	$0.50
Feed to achieve 2.4 kg gain per broiler (kg)	3.324	3.3528	3.3624
Feed cost per broiler	$1.662	$1.676	$1.681
Annual costs of feed (7 cycles)	$13,960,800	$14,081,760	$14,122,080
Increased annual feed costs versus U.S. corn		**$120,960**	**$161,280**

ANNUAL FEED COST CALCULATIONS

Feed required to get 2.4 kg of gain per broiler = (2.4 kg/FCR[(B)]) = XX kg of feed per broiler

Feed costs to get 2.4 kg of gain per broiler = XX kg of feed per broiler * $0.50/kg[(c)] = $YY

Total feed costs of producing 1,200,000 broilers per cycle, with 7 cycles per year = $YY * 1,200,000[(A)] broilers per cycle * 7 cycles per year = $ZZ per year for feed

With a lower feed conversion rate of 1.385, the use of U.S. corn is expected to result in cost savings of approximately:

$120,960 per year over Argentinian corn for a poultry farm raising 1,200,000 chicks per cycle, with seven cycles per year.

$161,280 per year over Brazilian corn for a poultry farm raising 1,200,000 chicks per cycle, with seven cycles per year.

CONCLUSION

Feed constitutes a substantial segment of the expenditure in broiler production, and optimizing feed efficiency holds the potential for substantial economic gains. The pursuit of better feed efficiency can yield reduced feed costs and heightened profitability for poultry operations. Moreover, this endeavor contributes to mitigating the ecological footprint of broiler production. A reduction in feed consumption translates to diminished waste and a lowered demand for non-renewable resources. Enhanced feed efficiency ensures that broilers maintain optimal body condition, a pivotal facet for overall bird health and well-being. Conversely, subpar feed efficiency can trigger malnourishment, sluggish growth, and health complications. Given the competitive nature of the broiler industry, augmenting feed efficiency confers a strategic edge to farmers. The ability to yield more meat with less feed empowers them to present their products at a more affordable price, facilitating an expanded market presence. In totality, feed efficiency stands as a pivotal determinant in the sustainability of broiler production.

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