Comparison of Broiler Performance When Fed Diets Containing Event DP-3Ø5423-1, Nontransgenic Near-Isoline Control, or Commercial Reference Soybean Meal, Hulls, and Oil

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ABSTRACT DP-3Ø5423–1 (305423) is a genetically modified soybean that was produced by biolistic insertion of the *gm-fad2–1* gene fragment and *gm-hra* genes into the germline of soybean seeds. Expression of *gm-fad2–1* results in greater concentrations of oleic acid (18:1) by suppressing expression of the endogenous *FAD2–1* gene, which encodes an n-6 fatty acid desaturase enzyme that catalyzes desaturation of 18:1 to linoleic acid (18:2). The GM-HRA protein expressed by the *gm-hra* gene is a modified version of the soybean acetolactate synthase enzyme that is used as a selectable marker during transformation. A 42-d feeding trial was conducted with broiler chickens to compare the nutritional performance of 305423 soybeans with nontransgenic soybeans. Diets were prepared using processed fractions (meal, hulls, and oil) from 305423 soybean plants. For comparison, additional diets were produced with soybean fractions obtained from a nontransgenic near-isoline (control) and nontransgenic commercial Pioneer brand varieties (93B86, 93B15, and 93M40). Diets were fed to Ross × Cobb broilers (n = 120/group, 50% male and 50% female) in 3 phases. Starter, grower, and finisher diets contained 26.5, 23, and 21.5% soybean meal, respectively. Soybean hulls and oil were added at 1.0 and 0.5%, respectively, across all diets in each phase. No statistically significant differences were observed in growth performance (BW, mortality, feed efficiency), organ yield (liver and kidney), or carcass yield (breast, thigh, leg, wing, and abdominal fat) variables between broilers consuming diets prepared with isolated fractions from 305423 or near-isoline control soybean. Additionally, all performance and carcass variables from control and 305423 soybean treatment groups fell within tolerance intervals constructed for each response variable using data from broilers fed diets prepared with reference soybean fractions. Based on the results from this study, it was concluded that 305423 soybeans were nutritionally equivalent to nontransgenic control soybeans with a comparable genetic background.

Key words: soybean, high oleic, broiler performance, carcass yield

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INTRODUCTION

Soybeans (*Glycine max*) account for approximately 90% of total annual oilseed (soybeans, cottonseed, sunflower, and peanut) production in the United States (USDA Economic Research Service, 2007). Approximately 80% of soybean oil in the United States is used in food applications such as baking and frying fats and salad and cooking oils (American Soybean Association, 2007). Soybean oils with altered fatty acid profiles for food and industrial uses have been developed through traditional plant breeding methods and genetic engineering (Payne, 1997; Buhr et al., 2002; Burton et al., 2004). Soybeans with elevated proportions of oleic acid (HO soybeans) are particularly desirable for food applications because oils from these soybeans have a greater oxidative stability, which contributes to improved frying performance (Mounts et al., 1988; Neff et al., 1994; Warner et al., 1997).

Event DP-3Ø5423–1 (hereafter referred to as 305423) is a genetically modified (**GM**) soybean that was produced by insertion of the *gm-fad2–1* gene fragment and the *gm-hra* gene into the seed germline of soybean seeds. Expression of the *gm-fad2–1* gene fragment suppresses expression of the endogenous *FAD2–1* gene. This gene encodes a seed-specific n-6 fatty acid desaturase enzyme that catalyzes desaturation of oleic acid (18:1)

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to linoleic acid (18:2; Okuley et al., 1994; Heppard et al., 1996). Correspondingly, suppression of the *FAD2–1* gene expression results in increased levels of oleic acid and decreased levels of linoleic acid, linolenic acid, and to a lesser extent, palmitic acid in the seed (Buhr et al., 2002; Stoutjesdijk et al., 2002). The acetolactate synthase gene (*gm-hra*) was produced by isolating the herbicide-sensitive *gm-als* gene from soybean and changing 2 specific amino acids (Mazur and Falco, 1989; Green, 2007). The expression product of the *gm-hra* gene [acetolactate synthase protein (**GM-HRA**)] is used as a selectable marker during transformation. The soybean oil produced from this newly developed soybean will be marketed as TREUS High Oleic Soybean Oil.

The objective of this study was to evaluate the nutritional value of 305423 soybeans by comparing the growth performance and carcass yields of broiler chickens fed diets containing 305423 soybean fractions (meal, hulls, and oil) with those fed diets composed of nontransgenic control (comparable genetic background) soybean fractions or diets composed of nontransgenic commercial soybean fractions.

MATERIALS AND METHODS

Soybeans

Control soybeans (line 091) were nontransgenic with a genetic background comparable with 305423 soybeans that did not contain the coding sequences for the *gm-fad2–1* gene fragment or the GM-HRA protein (i.e., a near isoline of 305423 soybean). Test (305423) soybeans were obtained from plants containing the coding sequence for the *gm-fad2–1* gene fragment and the GM-HRA protein. Reference soybeans (Pioneer varieties 93B86, 93B15, 93M40) were commercially available nontransgenic soybeans that were not treated with herbicides. Soybean seeds for this trial were planted in isolated plots in November 2005 in a field trial near Santiago, Chile and harvested in April 2006.

Soybean Fraction Production and Characterization

Soybeans from control, reference, and 305423 plants were processed into meal, hull, and oil fractions under similar conditions at GLP Technologies (Navasota, TX). Identity preservation procedures were followed throughout the processing and inventory systems to maintain the identity of each soybean source and the resulting processed fractions. Event-specific real-time PCR testing confirmed the presence of the insert from event DP-3Ø5423–1 in 305423 test soybean meal and soy hull fractions and its absence from control and reference soybean meal and soy hull fractions (data not shown). All soybean meals and soy hulls (control, test, and references) were evaluated for nutrient proximate composition, calcium, phosphorous, and mycotoxin content at Cumberland Valley Analytical Services (Hagerstown, MD). Sample dry matter, protein, fiber, ash, and calcium and phosphorus were determined according to AOAC International (2000) methods 930.15, 990.03, 978.10, 942.05, and 985.01, respectively, whereas sample fat was determined according to AOAC (1990) method 920.39. Mycotoxins (methods 994.08, 995.15, and 986.17) and amino acids (methods 988.15, 982.30, and 994.12) were all determined as described by AOAC International (2000), with the latter analyses being conducted by Eurofins Scientific Inc. (Memphis, TN). Soy fractions and diet samples were analyzed for gross energy content with a bomb calorimeter (Parr Instruments Model 1271, Parr Instruments, Moline, IL) at Pioneer Hi-Bred (Urbandale, IA). Fatty acid compositions of soy oils and diet samples were determined at Pioneer Hi-Bred following the procedure of Park and Goins (1994). Hexane-extracted fatty acid methyl esters were analyzed by gas chromatography using an SP2560 column (model 6890, Hewlett Packard, Santa Clara, CA) for fatty acid methyl esters (100 m × 0.25 mm). Gas chromatography conditions were as follows: injected temperature, 250°C; detector temperature, 250°C; carrier gas, He; split ratio, 1/25; temperature program, 160°C, followed by an increase of 1°C/min to 190°C, then 4°C/min to 240°C, held for 20 min. Peaks were identified by comparison of retention times with those of the corresponding standards (GLC-463 and UC-59-M, Nu-Chek Prep Inc., Elysian, MN; individual conjugated linoleic acid (**CLA**) standards from Matreya Inc., Pleasant Gap, PA, were used to identify the mixed CLA standard UC-59-M). Identification of peaks included fatty acids between 10:0 and 22:6, including CLA isomers.

Birds and Housing

Animal care and use practices during this trial conformed to the Guide for the Care and Use of Agricultural Animals in Agricultural Research and Teaching (FASS, 1999). Six hundred (50% males and 50% females) commercial broilers (Ross × Ross 308) were obtained at hatch (trial d 0) from a commercial Maryland hatchery and transported to Solution BioSciences Inc. (farm 1, Tyaskin, MD) in December 2006. Broilers were evaluated upon receipt for signs of disease or other complications that may have affected the outcome of the study. Following examination, broilers were weighed, identified with a wingband, and placed randomly in 0.914 m × 1.219 m (3 ft × 4 ft) floor pens at a density of approximately 0.305 m^2 (1.0 ft^2) of available floor space per broiler; new pine shavings with a minimal amount of saw dust was provided as litter. Pens were separated by a wire partition and did not touch other pens from any side to minimize potential for cross-contamination. Broilers were housed in a room containing forced air heaters and individual pen heat lamps with a cross-house ventilation system. A continuous 24-h lighting program was followed. Birds were observed 3 times daily for overall health, behavior and evidence of toxicity, and environmental conditions. No type of medication was administered during the entire feeding period. Mortalities were recorded, and complete necropsy examinations were performed on all broilers found dead or moribund. Carcasses of necropsied broilers were disposed of according to local regulations via composting. Drinking water was provided for ad libitum consumption.

Experimental Design

The experimental design for this study was a randomized complete block with 5 dietary treatments (control, 305423, and 3 commercial references). There were 10 broilers per pen (5 males and 5 females) and 12 pens (replicates) per treatment for a total of 120 broilers per treatment. Broilers were fed their respective dietary treatments from time of hatching (trial d 0) to 42 d of age.

Diets

Diets were fed in 3 phases: starter (d 0 to 21), grower (d 22 to 35), and finisher (d 36 to 42). To minimize the possibility of cross-contamination between diets, all diets were offered as a mash feed for ad libitum consumption. Starter, grower, and finisher diets were formulated to meet the nutrient requirements of a typical commercial broiler diet using the NRC Nutrient Requirements for Poultry (1994) as a guideline. Diets were prepared at the Pioneer Livestock Nutrition Center (Polk City, IA). Control, test, or reference soy fractions were added to the indicated diets in equal amounts; requirements for protein, lysine, methionine, cystine, calcium, and phosphorus were met by adjusting the concentrations of nonsoy ingredients. Within each phase, all diets were formulated to the same ME level: starter diets, 3,124 kcal of ME/kg; grower diets, 3,150 kcal of ME/kg; and finisher diets, 3,175 kcal of ME/kg. Starter, grower, and finisher diets for each soy source were mixed in the following order to minimize the potential for cross-contamination of nontransgenic soy with transgenic soy: control, 93B86, 93B15, 93M40, and 305423. Mixing equipment was flushed with nontransgenic soy hulls before diet preparation. All diets were prepared using a ribbon mixer (Sudenga M750, Sudenga Industries Inc., George, IA) that was cleaned between each diet (starter, grower, and finisher) using compressed air and vacuum; mixing equipment was flushed with nontransgenic soybean hulls between each soy source. Prepared diets were subsampled and samples composited for proximate (including calcium and phosphorus), amino acid, gross energy and fatty acid analyses as described previously. Event-specific real-time PCR testing confirmed the presence of the insert from event DP-3Ø5423–1 in 305423 test starter, grower, and finisher diets, and its absence from control and reference starter, grower, and finisher diets (data not shown).

Measurements

Body weights and feed weights (including amount of feed added and amount remaining) were determined every 7 d. Body weight gain, feed intake, and mortality-corrected feed:gain ratio (feed efficiency) were calculated for d 0 through 42. All surviving birds were killed on study d 42 by cervical dislocation and subjected to a gross necropsy. Carcass and carcass parts yield data were collected from 480 broilers (4 males and 4 females per pen); yield data included carcass yield (postchilled), thighs, breasts, wings, legs, abdominal fat (including fat around gizzard), kidneys, and whole liver. Combined total mass was recorded for all parts considered as pairs (i.e., legs, thighs, both sides of the breast). Kidney and liver weights were expressed as percentages of whole live bird weight. Carcass yield was expressed as the percentage of whole live bird weight, and parts yields were expressed as the percentage of postchilled dressed carcass weight. Birds and remaining test feeds were disposed of by composting, conforming to local and state regulations.

Statistical Analysis

The mean values of data from the 305423 soybean and control groups were calculated for each response variable to test the hypothesis that growth performance and carcass yield would be different between broiler chickens fed diets containing the processed fractions from 305423 soybeans and those fed diets containing nontransgenic near isoline control soy fractions. Data were analyzed using a mixed model ANOVA (PROC MIXED, SAS version 9.1 software, SAS Institute Inc., Cary, NC). Statistical analysis of live performance data was determined on a per pen basis and did not consider sex, whereas analysis of carcass data was determined on a per animal basis and did consider sex. The model used for live performance data analysis was $Y_{ij} = U + T_i + B_j + e_{ij}$, where Y_{ij} = observed pen response, U = overall mean, T_i = treatment effect, B_j = random block effect, and e_{ij} = residual error. The model used for carcass data analysis was $Y_{ijk} = U + T_i + B_j + TB_{ij} + e_{ijk}$, where Y_{ijk} = observed bird response, U = overall mean, T_i = treatment effect, B_j = random block effect, TB_{ij} = random treatment × block effect (referred to as pen), and e_{ijk} = residual error. TB_{ij} was used as the error term for the fixed effect of treatment (T_i), which allowed within-pen variability to become residual error. Estimate statements were used to generate the treatment comparisons for each live performance and carcass trait; differences between means were considered significant at $P \leq 0.05$.

Because the chance of falsely declaring a significant difference between 2 treatment means for at least one variable across a large number (20 or greater) of response variables is greater than 90% (Milliken and Johnson, 1992), false discovery rate (**FDR**) as described

Table 1. Analyzed nutrient composition (as-fed basis)[1] of meal and oil from 305423 soybean plants, nontransgenic near-isoline control soybean meal and oil, and meal and oil from commercial reference soybeans (93B86, 93B15, and 93M40)

Fraction	Control	305423	93B86	93B15	93M40
Meal					
Proximates					
Moisture, %	5.4	7.0	6.0	6.5	7.1
Protein, %	48.3	50.6	46.3	49.3	51.2
Fat, %	0.6	0.9	0.6	0.9	1.0
Fiber, %	2.3	1.9	2.5	2.8	2.2
Ash, %	6.1	5.3	6.0	5.2	5.8
Calcium, %	0.24	0.17	0.24	0.23	0.23
Phosphorus, %	0.89	0.78	0.84	0.87	0.86
Gross energy, kcal/kg	4,417	4,393	4,398	4,404	4,399
ME,[2] kcal/kg	2,575	2,561	2,564	2,567	2,565
Essential amino acids					
Arginine, %	3.72	4.27	3.54	3.84	4.01
Lysine, %	3.04	3.10	2.96	3.10	3.17
Histidine, %	1.30	1.37	1.24	1.32	1.35
Isoleucine, %	2.20	2.20	2.15	2.26	2.26
Leucine, %	3.88	3.92	3.72	3.91	4.01
Methionine, %	0.78	0.81	0.76	0.79	0.85
Phenylalanine, %	2.54	2.62	2.49	2.62	2.54
Threonine, %	2.05	2.03	1.96	2.03	2.13
Tryptophan, %	0.73	0.68	0.75	0.73	0.64
Valine, %	2.30	2.35	2.25	2.38	2.39
Nonessential amino acids					
Alanine, %	2.30	2.36	2.20	2.28	2.36
Aspartic acid, %	6.00	6.18	5.75	6.10	6.34
Cystine, %	0.70	0.71	0.69	0.72	0.75
Glutamic acid, %	9.69	10.19	9.37	10.01	10.41
Glycine, %	2.12	2.12	2.05	2.15	2.23
Proline, %	2.56	2.62	2.58	2.69	2.81
Serine, %	2.64	2.70	2.53	2.63	2.75
Tyrosine, %	1.67	1.70	1.64	1.71	1.75
Oil					
Gross energy, kcal/kg	9,150	9,254	9,314	9,214	9,168
ME,[2] kcal/kg	6,588	6,663	6,706	6,634	6,601
Fatty acid, % of total fatty acids					
Myristic acid (14:0)	0.08	0.06	0.07	0.08	0.08
Palmitic acid (16:0)	9.01	5.73	9.03	9.02	9.46
Palmitoleic acid (16:1)	0.07	0.06	0.09	0.08	0.08
Heptadecanoic acid (17:0)	0.11	0.75	0.10	0.10	0.10
Stearic acid (18:0)	6.22	5.51	4.57	4.87	5.83
Oleic acid (18:1)	24.25	72.66	23.25	22.60	22.46
Linoleic acid (18:2)	49.66	5.77	52.35	52.91	51.89
Total conjugated linoleic acid (CLA) (18:2)[3]	0.05	0.05	0.04	0.07	0.04
Linolenic acid (18:3)	8.77	5.86	8.90	8.66	8.52
Erucic acid (22:1)	ND[4]	ND	ND	ND	ND
Other fatty acids[5]	1.24	2.12	1.10	1.12	1.14

[1]Proximate and mineral analyses performed by Cumberland Valley Analytical Services (Hagerstown, MD). Gross energy and fatty acid analyses performed by Pioneer Hi-Bred International Inc. (Urbandale, IA). Amino acid analysis conducted by Eurofins Scientific Inc. (Memphis, TN). Each cell represents the mean of 2 samples.

[2]ME calculated for meal and oils using conversion factors based upon internal Pioneer Hi-Bred data.

[3]Sum of CLA isomers 18:2: *cis*-9, *trans*-11; unidentified isomer eluting from column between *cis*-9, *trans*-11 and *trans*-10, *cis*-12; *trans*-10, *cis*-12; and *trans*-9, *trans*-11.

[4]ND = not detected.

[5]Other fatty acids include 10:0, 12:1, 15:0, 15:1, 20:0, 20:2, 20:3, 20:4, 20:5, 22:0, 22:2, and 24:1.

by Benjamini and Hochberg (1995) was applied across all response variables analyzed. The FDR-adjusted P-value was reviewed if statistically significant differences ($P \leq 0.05$) generated from the estimate comparison statement were observed for a trait.

Data generated from broilers fed diets formulated with processed fractions from the reference soybeans (93B86, 93B15, and 93M40) were used in the estimation of experimental variability; least squares means were generated for each reference soybean treatment, but comparisons between reference soybean, control, and 305423 treatments were not included in the statistical output. Instead, data from the reference soybean groups were used primarily to construct a 95% tolerance interval containing 99% of the observed performance and carcass trait values from birds fed typical (nontransgenic commercial) soy diets, as described by Graybill (1976). These tolerance intervals were used to estimate the expected response range of broilers obtained from the same supplier and housed and fed under the same conditions as the control and 305423 broiler chickens. In the event of a difference still being statistically significant ($P \leq 0.05$) after FDR adjustment, data from control and 305423 groups were evaluated to determine whether or not the observed values were contained within the tolerance interval. If an observed response value for a treatment was contained within the tolerance interval, that value was considered to be similar to the response of broilers fed typical soy diets. Tolerance intervals for organ and carcass variables were created by sex due to expected yield differences between male and female broilers.

RESULTS

Soybean Fractions and Diet Composition

Nutrient profiles of the control, test, and reference soybean meals were comparable for most analytes (Table 1). Slight variations in protein concentrations were observed between control, test, and reference meals; however, these differences were not significant because the protein content in the prepared diets was similar regardless of source (see below). Protein, fat, energy, and fiber concentrations varied between control and test soy hull sources (data not shown); however, the variability was within the range of variability observed with the reference soy hulls and these macronutrient concentrations were similar in the prepared diets. Concentrations of nutrients such as protein, fat, and energy, were higher in all soy hull sources than typically observed in commercial soy hulls. This indicates that the hulls contained a higher amount of bean meat that was likely attributable to incomplete separation between the hulls and beans during processing. Accordingly, the quantity of soybean hulls was limited to 1.0% across all diets regardless of source. None of the soybean meals or soy hulls contained measurable concentrations of mycotoxins (data not shown). Metabolizable energy values calculated for ration formulation from the analyzed gross energy values of the oils (Table 1) indicated that soy oil values (6,588 to 6,706 kcal of ME/kg) were lower compared with typical crude or refined soy oil values (8,370 to 10,212 kcal of ME/kg; NRC, 1994). The lower energy content of all soy oils reflected the fact that the oils were only degummed and not further refined; because of the lower nutritional quality relative to typical crude or refined soy oil, quantities of the soy oils were limited to 0.5% across all diets. As expected, oleic acid (18:1) level was higher, and levels of linoleic (18:2), linolenic (18:3), and palmitic (16:0) acids were lower in 305423 oil than in control and reference oils. Levels of heptadecanoic acid (17:0) were also higher in 305423 oil relative to control and reference soybean oils.

The compositions of the starter, grower, and finisher diets were formulated based on the analyzed concentrations of the nutrients (Tables 2, 3, and 4). The nutrient, gross energy, and amino acid concentrations of the diets produced using processed fractions from the control, test, and reference soybeans were all similar in corresponding feeding phases. Fatty acid profiles of the prepared starter, grower, and finisher diets reflected the differences in concentrations observed in the control, test, and reference soybean oils.

Performance Response Variables

There were no statistically significant differences in growth performance variables (BW, mortality, and mortality-adjusted feed efficiency) between animals consuming diets produced with the control or 305423 soybean fractions (Table 5). Further, all growth performance measures for broilers fed control and 305423 diets fell within the tolerance intervals calculated for this study using data obtained from broilers consuming diets produced with nontransgenic commercial reference soybean fractions.

Organ and Carcass Yields

Kidney and liver yields were not significantly different between control and 305423 groups, and values for all groups fell within the tolerance intervals calculated for this study using data obtained from broilers consuming diets produced with nontransgenic reference soy fractions (Table 5).

No statistically significant differences were observed for carcass, breast, thigh, wing, or abdominal fat (Table 5) yields between the control and 305423 groups, and all values for control and 305423 groups fell within the tolerance intervals calculated for this study. Overall leg yields and leg yields for male broilers were not significantly different between control and 305423 groups. Leg yield was higher ($P \leq 0.05$) in females from the 305423 group compared with the control diet group. However, this difference was not significant when the P-value was adjusted using FDR, indicating that the significance reported for the unadjusted P-value was likely due to the chances of finding a significant difference given the large number of response variables evaluated in this trial. Further, all leg yield values for both the control and 305423 groups were within the tolerance interval calculated for this study using data obtained from broilers consuming diets produced with nontransgenic reference soy fractions.

DISCUSSION

Guidelines to assess the safety and nutritional quality of the food and feed fractions obtained from GM crops with modified input traits, such as insect resistance and herbicide tolerance, are based on the concept of demonstrating nutritional equivalency between transgenic crops and their nontransgenic counterparts [European Food Safety Authority (EFSA), 2006a,b; International Life Sciences Institute (ILSI), 2003; Organisation of Economic Co-operation and Development (OECD), 1993]. These guidelines recommend evaluating the whole grain or processed feed fraction composition using a defined list of components with

Table 2. Ingredient[1] and analyzed nutrient[2] (as-fed basis) compositions of starter diets containing meal, hulls, and oil from 305423 soybean plants, nontransgenic near-isoline control soybean meal, hulls, and oil, and meal, hulls, and oil from commercial reference soybeans (93B86, 93B15, and 93M40)

Item	Control	305423	93B86	93B15	93M40
Ingredient, %					
Maize	62.693	63.539	61.759	63.221	63.992
Soybean meal	26.500	26.500	26.500	26.500	26.500
Soybean hulls	1.000	1.000	1.000	1.000	1.000
Soybean oil	0.500	0.500	0.500	0.500	0.500
Commercial soybean oil	0.050	0.232	0.050	0.050	0.167
Protein blend	4.868	4.070	5.699	4.536	3.754
DL-Methionine	0.222	0.243	0.202	0.227	0.229
L-Lysine-HCl	0.097	0.109	0.100	0.090	0.090
Limestone	1.326	0.994	1.453	1.130	0.986
Di-Cal 18[3]	1.642	1.708	1.637	1.650	1.683
Choline-Cl	0.037	0.036	0.039	0.037	0.036
NaCl	0.440	0.443	0.436	0.435	0.438
VTM Premix[4]	0.625	0.625	0.625	0.625	0.625
Analyzed nutrient and fatty acid compositions					
Proximates					
Moisture, %	10.6	10.6	10.7	10.7	10.7
Protein, %	22.0	21.6	21.9	21.5	21.5
Fat, %	3.2	3.5	3.3	3.3	3.5
Fiber, %	1.8	1.8	2.0	2.0	1.9
Ash, %	5.7	4.7	5.4	5.2	5.1
Calcium, %	1.00	0.81	1.05	0.94	0.87
Phosphorus, %	0.75	0.72	0.74	0.73	0.74
Gross energy, kcal/kg	3,987	3,992	3,964	3,988	3,984
Essential amino acids					
Arginine, %	1.30	1.23	1.15	1.16	1.19
Histidine, %	0.42	0.45	0.46	0.45	0.44
Isoleucine, %	0.78	0.71	0.75	0.74	0.70
Leucine, %	1.67	1.58	1.63	1.60	1.58
Lysine, %	1.05	0.94	0.95	0.95	0.91
Methionine, %	0.57	0.58	0.54	0.53	0.59
Phenylalanine, %	0.90	0.90	0.93	0.91	0.91
Threonine, %	0.69	0.69	0.73	0.72	0.71
Tryptophan, %	0.28	0.28	0.29	0.27	0.27
Valine, %	0.97	0.88	0.94	0.91	0.85
Nonessential amino acids					
Alanine, %	1.09	1.00	1.01	0.99	0.99
Aspartic acid, %	1.93	1.82	1.83	1.85	1.85
Cystine, %	0.43	0.40	0.44	0.41	0.41
Glutamic acid, %	3.41	3.40	3.27	3.36	3.42
Glycine, %	0.87	0.81	0.85	0.82	0.82
Proline, %	1.19	1.32	1.20	1.28	1.27
Serine, %	1.03	1.02	1.09	1.08	1.03
Tyrosine, %	0.54	0.50	0.52	0.52	0.52
Fatty acid, % of total fatty acids					
Myristic acid (14:0)	0.16	0.13	0.18	0.15	0.13
Myristoleic acid (14:1)	0.01	0.01	0.01	0.01	0.01
Palmitic acid (16:0)	14.00	12.03	14.03	13.64	13.49
Palmitoleic acid (16:1)	0.42	0.36	0.50	0.40	0.35
Heptadecanoic acid (17:0)	0.17	0.32	0.18	0.16	0.15
Stearic acid (18:0)	3.57	3.18	3.32	3.14	3.42
Oleic acid (18:1)	24.71	39.98	24.28	24.38	24.12
Linoleic acid (18:2)	50.61	38.16	50.86	51.98	52.15
Total conjugated linoleic acid (CLA) (18:2)[5]	0.18	0.11	0.18	0.12	0.12
Linolenic acid (18:3)	3.60	2.87	3.77	3.70	3.70
Eicosenoic acid (20:1)	0.03	0.03	0.03	0.03	0.03
Erucic acid (22:1)	ND[6]	ND	ND	ND	ND
Other fatty acids[7]	1.03	0.97	1.02	0.98	0.92

[1]Diets were formulated to contain: ME, 3,124 kcal/kg; protein, 22.00%; lysine, 1.20%; and methionine+cystine, 1.02%.

[2]Proximate and mineral analyses performed by Cumberland Valley Analytical Services (Hagerstown, MD). Gross energy and fatty acid analyses performed by Pioneer Hi-Bred International, Inc. (Urbandale, IA). Amino acid analysis conducted by Eurofins Scientific Inc. (Memphis, TN). Each cell represents one (n = 1) determination.

[3]Di-Cal 18 purchased from Agritronics Corporation (Elkhart, IA).

[4]Poultry VTM 88 vitamin and trace mineral premix purchased from Archer Daniels Midland (Quincy, IL).

[5]Sum of CLA isomers 18:2: *cis*-9, *trans*-11; unidentified isomer eluting from column between *cis*-9, *trans*-11 and *trans*-10, *cis*-12; *trans*-10, *cis*-12; and *trans*-9, *trans*-11.

[6]ND = not detected.

[7]Other fatty acids include 10:0, 11:0, 12:0, 12:1, 13:0, 15:0, 20:0, 20:2, 20:3, 20:4, 20:5, 22:0, 22:3, 22:4, 24:0, and 24:1.

Table 3. Ingredient[1] and analyzed nutrient[2] (as-fed basis) compositions of grower diets containing meal, hulls, and oil from 305423 soybean plants, nontransgenic near-isoline control soybean meal, hulls, and oil, and meal, hulls, and oil from commercial reference soybeans (93B86, 93B15, and 93M40)

Item	Control	305423	93B86	93B15	93M40
Ingredient, %					
Maize	67.183	68.271	66.364	67.640	68.547
Soybean meal	23.000	23.000	23.000	23.000	23.000
Soybean hulls	1.000	1.000	1.000	1.000	1.000
Soybean oil	0.500	0.500	0.500	0.500	0.500
Commercial soybean oil	0.050	0.050	0.050	0.050	0.050
Protein blend	4.016	3.295	4.747	3.731	3.021
DL-Methionine	0.193	0.212	0.175	0.197	0.199
L-Lysine-HCl	0.149	0.160	0.152	0.143	0.143
Limestone	1.465	1.009	1.573	1.292	1.064
Di-Cal 18[3]	1.537	1.594	1.533	1.544	1.573
Choline-Cl	0.016	0.014	0.017	0.015	0.014
NaCl	0.392	0.395	0.389	0.387	0.390
VTM Premix[4]	0.500	0.500	0.500	0.500	0.500
Analyzed nutrient and fatty acid compositions					
Proximates					
Moisture, %	10.7	10.8	10.7	11.6	10.8
Protein, %	19.9	19.5	19.6	19.5	19.1
Fat, %	3.1	3.4	3.1	3.3	3.5
Fiber, %	1.8	1.9	2.0	1.9	1.8
Ash, %	5.2	4.1	5.0	4.9	4.9
Calcium, %	0.99	0.84	1.06	0.92	0.83
Phosphorus, %	0.68	0.69	0.69	0.70	0.70
Gross energy, kcal/kg	3,963	3,961	3,950	3,968	3,968
Essential amino acids					
Arginine, %	1.03	1.10	1.02	1.09	1.08
Histidine, %	0.41	0.41	0.42	0.41	0.40
Isoleucine, %	0.65	0.65	0.69	0.65	0.63
Leucine, %	1.47	1.47	1.51	1.49	1.46
Lysine, %	0.85	0.85	0.91	0.86	0.87
Methionine, %	0.51	0.52	0.46	0.52	0.52
Phenylalanine, %	0.81	0.81	0.84	0.83	0.81
Threonine, %	0.64	0.61	0.66	0.65	0.63
Tryptophan, %	0.25	0.24	0.25	0.25	0.24
Valine, %	0.80	0.80	0.86	0.80	0.86
Nonessential amino acids					
Alanine, %	0.92	0.92	0.94	0.93	0.92
Aspartic acid, %	1.63	1.63	1.65	1.66	1.67
Cystine, %	0.38	0.36	0.39	0.38	0.36
Glutamic acid, %	2.97	3.09	3.01	3.13	3.16
Glycine, %	0.73	0.72	0.77	0.76	0.73
Proline, %	1.14	1.33	1.24	1.25	1.19
Serine, %	0.95	0.98	0.98	0.96	0.93
Tyrosine, %	0.44	0.45	0.43	0.47	0.45
Fatty acid, % of total fatty acids					
Myristic acid (14:0)	0.14	0.12	0.16	0.13	0.12
Myristoleic acid (14:1)	0.01	ND	0.01	0.01	0.01
Palmitic acid (16:0)	13.94	12.13	13.84	13.60	13.54
Palmitoleic acid (16:1)	0.34	0.34	0.42	0.35	0.30
Heptadecanoic acid (17:0)	0.15	0.31	0.16	0.14	0.13
Stearic acid (18:0)	3.41	2.97	3.08	2.98	3.14
Oleic acid (18:1)	24.84	39.67	24.77	24.35	24.16
Linoleic acid (18:2)	51.46	38.64	51.56	52.34	52.46
Total conjugated linoleic acid (CLA) (18:2)[5]	0.12	0.10	0.11	0.15	0.15
Linolenic acid (18:3)	3.59	2.84	3.59	3.63	3.62
Eicosenoic acid (20:1)	0.03	0.03	0.03	0.03	0.03
Erucic acid (22:1)	ND[6]	ND	ND	ND	ND
Other fatty acids[7]	0.96	0.94	0.97	0.93	0.91

[1]Diets were formulated to contain: ME, 3,150 kcal/kg; protein, 20.00%; lysine, 1.12%; and methionine+cystine, 0.92%.

[2]Proximate and mineral analyses performed by Cumberland Valley Analytical Services (Hagerstown, MD). Gross energy and fatty acid analyses performed by Pioneer Hi-Bred International Inc. (Urbandale, IA). Amino acid analysis conducted by Eurofins Scientific Inc. (Memphis, TN). Each cell represents one (n = 1) determination.

[3]Di-Cal 18 purchased from Agritronics Corporation (Elkhart, IA).

[4]Poultry VTM 88 vitamin and trace mineral premix purchased from Archer Daniels Midland (Quincy, IL).

[5]Sum of CLA isomers 18:2: *cis*-9, *trans*-11; unidentified isomer eluting from column between *cis*-9, *trans*-11 and *trans*-10, *cis*-12; *trans*-10, *cis*-12; and *trans*-9, *trans*-11.

[6]ND = not detected.

[7]Other fatty acids include 10:0, 11:0, 12:0, 12:1, 13:0, 15:0, 20:0, 20:2, 20:3, 20:4, 20:5, 22:0, 22:3, 22:4, 24:0, and 24:1.

Table 4. Ingredient[1] and analyzed nutrient[2] (as-fed basis) compositions of finisher diets containing meal, hulls, and oil from 305423 soybean plants, nontransgenic near-isoline control soybean meal, hulls, and oil, and meal, hulls, and oil from commercial reference soybeans (93B86, 93B15, and 93M40)

Item	Control	305423	93B86	93B15	93M40
Ingredient, %					
Maize	71.108	71.094	70.647	71.147	71.480
Soybean meal	21.500	21.500	21.500	21.500	21.500
Soybean hulls	1.000	1.000	1.000	1.000	1.000
Soybean oil	0.500	0.500	0.500	0.500	0.500
Commercial soybean oil	0.340	0.798	0.204	0.513	0.743
Protein blend	1.955	1.385	2.614	1.729	1.110
DL-Methionine	0.216	0.233	0.199	0.219	0.221
L-Lysine-HCl	0.223	0.233	0.226	0.218	0.217
Limestone	0.868	0.911	0.827	0.882	0.907
Di-Cal 18[3]	1.439	1.494	1.435	1.446	1.473
NaCl	0.350	0.353	0.347	0.346	0.348
VTM Premix[4]	0.500	0.500	0.500	0.500	0.500
Analyzed nutrient and fatty acid compositions					
Proximates					
Moisture, %	10.9	10.7	11.0	11.1	10.8
Protein, %	17.6	17.6	17.3	17.8	17.5
Fat, %	3.5	3.5	3.6	3.7	4.2
Fiber, %	1.7	2.3	1.9	2.3	1.8
Ash, %	4.3	3.8	4.1	4.0	4.2
Calcium, %	0.74	0.69	0.70	0.70	0.74
Phosphorus, %	0.67	0.66	0.64	0.66	0.68
Gross energy, kcal/kg	3,994	4,003	3,964	3,989	3,984
Essential amino acids					
Arginine, %	0.92	1.09	0.90	0.94	0.93
Histidine, %	0.38	0.38	0.38	0.37	0.37
Isoleucine, %	0.56	0.59	0.60	0.56	0.54
Leucine, %	1.33	1.35	1.35	1.33	1.32
Lysine, %	0.83	0.85	0.88	0.83	0.82
Methionine, %	0.53	0.53	0.50	0.52	0.53
Phenylalanine, %	0.72	0.74	0.74	0.73	0.73
Threonine, %	0.58	0.55	0.57	0.57	0.56
Tryptophan, %	0.23	0.22	0.22	0.22	0.22
Valine, %	0.68	0.71	0.73	0.69	0.65
Nonessential amino acids					
Alanine, %	0.84	0.85	0.85	0.84	0.84
Aspartic acid, %	1.49	1.52	1.49	1.48	1.51
Cystine, %	0.32	0.31	0.34	0.31	0.30
Glutamic acid, %	2.76	2.92	2.78	2.86	2.91
Glycine, %	0.63	0.63	0.65	0.64	0.62
Proline, %	1.02	1.22	1.11	1.10	1.15
Serine, %	0.83	0.78	0.82	0.79	0.78
Tyrosine, %	0.42	0.42	0.41	0.41	0.38
Fatty acid, % of total fatty acids					
Myristic acid (14:0)	0.10	0.08	0.11	0.09	0.08
Myristoleic acid (14:1)	ND	ND	ND	ND	ND
Palmitic acid (16:0)	12.98	11.51	13.27	12.89	12.60
Palmitoleic acid (16:1)	0.24	0.20	0.31	0.21	0.19
Heptadecanoic acid (17:0)	0.11	0.24	0.12	0.11	0.10
Stearic acid (18:0)	3.20	3.08	2.81	2.95	3.24
Oleic acid (18:1)	25.06	37.16	24.61	24.70	24.72
Linoleic acid (18:2)	52.88	42.74	52.67	53.75	53.76
Total conjugated linoleic acid (CLA) (18:2)[5]	0.11	0.05	0.19	0.10	0.09
Linolenic acid (18:3)	3.25	2.60	3.44	3.39	3.26
Eicosenoic acid (20:1)	0.03	0.03	0.03	0.03	0.03
Erucic acid (22:1)	ND[6]	ND	ND	ND	ND
Other fatty acids[7]	0.83	0.80	0.88	0.81	0.78

[1]Diets were formulated to contain: ME, 3,175 kcal/kg; protein, 18.00%; lysine, 1.08%; and methionine+cystine, 0.85%.

[2]Proximate and mineral analyses performed by Cumberland Valley Analytical Services (Hagerstown, MD). Gross energy and fatty acid analyses performed by Pioneer Hi-Bred International, Inc. (Urbandale, IA). Amino acid analysis conducted by Eurofins Scientific Inc. (Memphis, TN). Each cell represents one (n = 1) determination.

[3]Di-Cal 18 purchased from Agritronics Corporation (Elkhart, IA).

[4]Poultry VTM 88 vitamin and trace mineral premix purchased from Archer Daniels Midland (Quincy, IL).

[5]Sum of CLA isomers 18:2: *cis*-9, *trans*-11; unidentified isomer eluting from column between *cis*-9, *trans*-11 and *trans*-10, *cis*-12; *trans*-10, *cis*-12; and *trans*-9, *trans*-11.

[6]ND = not detected.

[7]Other fatty acids include 10:0, 11:0, 12:0, 12:1, 13:0, 15:0, 20:0, 20:2, 20:3, 20:4, 20:5, 22:0, 22:3, 22:4, 24:0, and 24:1.

Table 5. Growth performance[1], prechill organ yields[2], and postchill carcass and parts yields[3] of broilers fed diets containing meal, hulls, and oil from 305423 soybean plants, non-transgenic near-isoline control soybean meal, hulls, and oil, and meal, hulls, and oil from commercial reference soybeans (93B86, 93B15, and 93M40)

							Commercial references[4]		
Item	Control	305423	SEM	FDR *P*-value[5]	Raw *P*-value[6]	Tolerance interval[7]	93B86	93B15	93M40
Growth performance									
Initial weight (g), d 0	48.0	47.8	0.2	0.84	0.47	45.5 to 49.9	47.8	47.7	47.5
Final weight (g), d 42	1,905.5	1,862.3	19.8	0.58	0.13	1,643.8 to 2,119.8	1,885.6	1,880.7	1,879.2
Mortality[8] (%)	0.83	0.83	0.97	1.00	1.00	0.00 to 13.48	0.83	1.67	1.67
Feed:gain[9] (g/g), 0 to 42 d	1.857	1.867	0.015	0.84	0.63	1.690 to 2.049	1.863	1.880	1.866
Prechill organ yields									
Kidney (%)									
Overall[10]	2.12	2.12	0.05	0.99	0.98		2.06	2.06	2.06
Males	2.10	2.05	0.07	0.97	0.63	0.84 to 3.41	2.15	2.08	2.15
Females	2.15	2.19	0.07	0.97	0.66	0.67 to 3.33	1.97	2.04	1.98
Liver (%)									
Overall	3.54	3.47	0.06	0.97	0.39		3.65	3.51	3.54
Males	3.47	3.47	0.08	0.99	0.99	1.96 to 5.14	3.63	3.47	3.55
Females	3.61	3.47	0.08	0.97	0.21	2.02 to 5.15	3.67	3.54	3.54
Postchill carcass and parts yields									
Carcass (%)									
Overall	71.00	70.64	0.33	0.97	0.43		71.54	70.84	70.49
Males	70.52	70.44	0.46	0.97	0.90	62.45 to 80.30	72.11	71.21	70.81
Females	71.48	70.85	0.46	0.97	0.32	61.38 to 79.69	70.96	70.47	70.18
Breast (%)									
Overall	26.48	26.65	0.21	0.97	0.58		26.66	26.28	26.89
Males	26.71	26.93	0.29	0.97	0.60	20.81 to 32.36	26.58	26.26	26.90
Females	26.25	26.36	0.29	0.97	0.77	20.93 to 32.36	26.74	26.29	26.89
Thigh (%)									
Overall	15.86	16.03	0.15	0.97	0.41		15.85	16.00	15.93
Males	16.10	15.94	0.20	0.97	0.57	11.79 to 20.10	15.81	16.09	15.93
Females	15.62	16.12	0.20	0.97	0.0813	12.06 to 19.76	15.89	15.91	15.93
Leg (%)									
Overall	14.31	14.59	0.13	0.97	0.0910		14.18	14.41	14.54
Males	14.35	14.42	0.17	0.97	0.78	10.90 to 17.64	13.92	14.33	14.56
Females	14.26	14.77	0.17	0.97	0.0320[11]	10.98 to 17.97	14.44	14.48	14.52
Wing (%)									
Overall	10.48	10.55	0.07	0.97	0.50		10.37	10.51	10.62
Males	10.55	10.51	0.10	0.97	0.78	8.31 to 12.51	10.20	10.48	10.54
Females	10.41	10.59	0.10	0.97	0.21	8.30 to 12.87	10.54	10.53	10.70

Continued

Table 5 (Continued). Growth performance[1], prechill organ yields[2], and postchill carcass and parts yields[3] of broilers fed diets containing meal, hulls, and oil from 305423 soybean plants, nontransgenic near-isoline control soybean meal, hulls, and oil, and meal, hulls, and oil from commercial reference soybeans (93B86, 93B15, and 93M40)

Item	Control	305423	SEM	FDR *P*-value[5]	Raw *P*-value[6]	Tolerance interval[7]	Commercial references[4]		
							93B86	93B15	93M40
Abdominal fat (%)									
Overall	1.52	1.45	0.04	0.97	0.18		1.50	1.47	1.50
Males	1.57	1.49	0.05	0.97	0.29	0.46 to 2.48	1.48	1.45	1.49
Females	1.47	1.41	0.05	0.97	0.40	0.50 to 2.51	1.51	1.49	1.52

[1]Control, 305423, 93B86, 93B15, and 93M40 treatment growth performance means represent 12 pens per treatment group with 10 birds/pen.

[2]Prechill organ yields calculated as percentage of live bird weight. Control, 305423, 93B86, 93B15, and 93M40 treatment means represent 12 pens per treatment group with 8 birds/pen.

[3]Carcass yield calculated as percentage of live bird weight; parts yield calculated as percentage of postchill carcass weight. Control, 305423, 93B86, 93B15, and 93M40 treatment means represent 12 pens per treatment group with 8 birds/pen.

[4]Commercial reference least square means included for reference purposes only. The comparison of interest is control versus 305423.

[5]*P*-value adjusted using false discovery rate.

[6]Nonadjusted *P*-value.

[7]Lower and upper limits of a 95% tolerance interval on 99% of the observed performance, organ yield, and carcass and parts yield trait values from birds fed 93B86, 93B15, and 93M40 reference soybean diets.

[8]Negative lower limit of tolerance interval set to zero.

[9]Feed:gain calculated as grams of feed intake per gram of BW gain.

[10]Treatment × sex interaction ($P < 0.05$) observed in statistical analysis for estimation of experimental variability. Statistical contrast between control and 305423 demonstrated treatment × sex interaction was not significant ($P = 0.49$) between those 2 treatments.

[11]Statistically significant difference, nonadjusted *P*-value ≤ 0.05.

known nutritional or anti-nutritional impact (OECD, 2001). Although the ingredient list is extensive, it is possible that other unspecified components could potentially impact the nutritional quality of the grains or processed feed fractions obtained from GM crops. Therefore, animal feeding trials have sometimes been conducted to evaluate the wholesomeness of grains or processed feed fractions from GM crops to determine if the particular genetic modification could have potentially resulted in unintended changes that could impact the nutritional quality of the grains or processed feed fractions.

The broiler chicken model has been used in nutritional equivalency evaluations with whole grains and processed fractions from GM plants because of their rapid growth and reported sensitivity to nutritional deficiencies. Many broiler chicken feeding trials conducted with crops from insect-resistant, herbicide-tolerant, or stacked trait grains reported no differences in nutritional performance and carcass variables between broilers consuming diets formulated with grains or processed fractions from transgenic crops and those consuming diets with nontransgenic grains or processed fractions (Brake and Vlachos, 1998; Brake et al., 2003, 2005; Taylor et al., 2003a,b,c, 2004, 2005, 2007; McNaughton et al., 2007a,b).

Recently published guidelines (ILSI, 2007) for the safety assessment of crops with modified output traits (i.e., altered amino acid or fatty acid profiles) recommend evaluating performance measures (weight gain, feed intake, and feed efficiency) to determine whether modifications to the fatty acid profile of oilseeds have unfavorable effects on their nutritional value. In accordance with these guidelines, the current study was conducted to compare the nutritional performance of processed feed fractions from genetically modified 305423 high oleic acid soybean with processed feed fractions from its near-isoline control soybean when fed to broiler chickens in commercial-type diets.

The nutritional composition of the soybean meal and hull fractions from 305423 soybeans and control soybeans were compared in the current study, along with that of processed fractions of 3 additional non-GM commercial reference soybeans (93B86, 93B15, and 93M40). Information about soybean fraction nutrient composition used to formulate broiler chicken diets is limited primarily to nutritional proximates, amino acids, calcium, phosphorous, and gross energy values. Because no compositional differences in these key nutrients were observed between the soybean meal and hull fractions from the different soybean sources used in this study, the processed fractions from these different soybeans were considered suitable for use in the production of commercial-type broiler chicken diets (McNaughton et al., 2007a,b).

Despite limiting the inclusion of control, test, and reference oils to 0.5% of all diets, differences in the fatty acid profiles of the source oils were reflected in the fatty acid profiles of all 305423, control, and reference diets, with higher oleic (18:1) and heptadecanoic (17:0) acid and lower palmitic (16:0), linoleic (18:2), and linolenic (18:3) acid values observed for 305423 diets. The metabolic basis for elevated concentrations of heptadecanoic acid (17:0) in 305423 soybean oil have not been investigated in detail but are believed to be attributable to an increase in the concentration of 2-ketobutyrate relative to pyruvate, resulting from expression of the GM-HRA protein (Ibdah et al., 1996). 2-Ketobutyrate reacts with pyruvate dehydrogenase to form the 3-carbon compound propionyl-CoA, as opposed to the 2-carbon acetyl-CoA formed from reaction with pyruvate. Fatty acid biosynthesis that starts with propionyl-CoA results in fatty acids with an odd number of carbons, such as pentadecanoic (15:0) and heptadecanoic acids (17:0). Therefore, the increased concentrations of 17:0 in 305423 soybean oil was not considered unexpected. Phetteplace and Watkins (1990) fed broilers diets with 17:0 levels ranging from 0.11 to 2.56% of total fatty acids and found no significant differences in body, liver, or fat pad weights. Similarly, work with rats found no negative effect on BW or feed efficiency when 17:0 was fed at levels up to 16% of dietary fatty acids (Anderson and Volpenhein, 1979). Results from the present study confirm these results as no significant differences in BW, liver weights, or feed efficiency were observed.

The performance of the chickens fed different diets in this study was compared using standard nutritional performance variables and organ and carcass yields. No biologically significant differences in BW, weight gain, or carcass yields were observed between broiler chickens consuming diets prepared with processed soybean fractions from 305423, near isoline control or reference soybeans. Although one of the goals of changing the fatty acid profile of 305423 soybeans through biotechnology is to obtain a healthier fatty acid profile, the response variables of nutritional performance studies conducted in broiler chickens do not include variables intended to demonstrate improved health. Accordingly, the results from the current study are consistent with feeding trials conducted with an earlier transgenic high oleic soybean (>80% 18:1, event DD-Ø26ØØ5–3), which demonstrated similar weight gains and feed conversion between groups of broilers fed diets with meal from high oleic soybeans or its parental nontransgenic line (Araba and Lohrmann, 1997). These results are consistent with study-specific response variables of livestock species including pigs, lactating dairy cows, and feedlot steers where no differences were observed between groups consuming diets containing HO soybean event DD-Ø26ØØ5–3 and control diets (Loughmiller et al., 1998; Luhman and Feng, 1998; Felton and Kerley, 2004). Further, other poultry feeding studies conducted with feedstuffs with increased oleic acid levels have demonstrated similar performance to control diets. Replacing varying levels of typical oleic acid corn with a high oleic acid high oil corn showed no effects on the performance and egg production of laying hens or performance of turkey toms (Ergul et al., 2000; Stilborn et al., 2001).

In this study, liver and kidney yields were similar between broiler chickens consuming diets formulated with processed fractions obtained from 305423 soybeans and those consuming diets formulated with feed fractions from near isoline nontransgenic control soybeans. Liver and kidney yields are indicators of broiler health from dietary inadequacies or the presence of dietary contaminants such as mycotoxins (Velu et al., 1971; Edrington et al., 1997; Morris et al., 1999; Carew et al., 2005; Farran et al., 2005). Further, these organ weights are routinely measured as overall health indicators in nutritional performance trials of transgenic grains in other species such as rodents (Hammond et al., 2004; MacKenzie et al., 2007; Malley et al., 2007). Results from the current study are consistent with those of previous studies in which no biologically significant differences in organ yields were observed between broilers fed diets prepared with transgenic grain or feed fractions and those fed diets with grain or feed fractions from the nontransgenic controls (McNaughton et al., 2007a,b).

Statistical analysis of the data in this study led to the rejection of the hypothesis of expected growth performance and carcass yield differences between birds fed 305423 processed fractions and those fed nontransgenic near isoline control fractions. The results from this study demonstrated that the processed fractions obtained from soybeans containing event DP-3Ø5423–1 are nutritionally equivalent to the fractions obtained from a near isoline nontransgenic control and commercially available nontransgenic reference soybeans.

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