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Evaluation of corn particle size on the growth performance, intestinal permeability, pellet quality, and litter moisture of turkey hens raised without antibiotics

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Primary Audience: Nutritionists, Researchers

SUMMARY

An experiment was conducted to determine the effects of corn particle size (**CPS**) on turkey hen poult performance, intestinal permeability (**IP**), and litter dry matter. A total of 1,584 Hybrid turkey hen poults were raised in floor pens from 0 to 42 d. Poults were fed a crumbled starter 1 and pelleted starter 2 diet. The experiment was a 2 × 2 factorial with CPS in diet phase starter 1 (fine and coarse) and CPS in diet phase starter 2 (fine or coarse), resulting in 4 treatments of 18 replicates of 22 turkeys. Corn was ground using a hammermill with a 4.76 mm screen (581 μm; fine) or a 6.35 mm screen (964 μm; coarse). Pellet quality was determined using pellet durability index (**PDI**), modified pellet durability index (**MPDI**), and New Holmen Pellet Tester (**NHPT**). Body weight and feed intake were measured on D0 and D42. Feed conversion ratio was calculated from 0 to 42 d. Litter dry matter content and IP were measured on D42. Data were analyzed using JMP Pro 16.0 ($P \leq 0.05$) and means were separated using Student's *t* test. Corn particle size did not impact starter 2 pellet quality (PDI, MPDI, and NHPT; $P > 0.05$). There were no interactions between dietary phase and CPS over 0 to 42 d. Overall, there was a CPS main effect over the starter 1 phase and hens fed coarse corn had decreased FI ($P \leq 0.01$) and BW ($P \leq 0.01$), however FCR was not affected ($P > 0.05$). Day 42 IP and litter dry matter content were not influenced by CPS in either diet phase ($P > 0.05$). These data indicate that coarse corn decreases both FI and BW of turkey hens when fed during starter 1, but had no effects on FCR, IP, and litter dry matter content when fed in starter 2. Although fine ground corn was needed to maximize performance in the starter 1 phase, coarse ground corn may be able to maintain turkey hen performance in the starter 2 phase while reducing milling costs.

Key words: corn particle size, pellet quality, performance, poult, turkey hen

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DESCRIPTION OF PROBLEM

The grinding of feed ingredients is required but adds to the costs of feed manufacture using specialized equipment, electricity, and labor.

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The cost of grinding decreases as ingredient particle size (**PS**) increases (Reece et al., 1986; Flores et al., 2021). Although coarse grinding of ingredients reduces milling costs, the effects of ingredient PS on bird performance and nutrient digestibility can vary.

Coarse particles in a mash diet have been shown to result in increased retention time in the gizzard, thus increasing gizzard weight while decreasing gizzard pH (Gabriel et al., 2003; Engberg et al., 2004). A lower pH was observed in the gizzards of broilers fed diets containing whole wheat as well as lower counts of lactose-negative enterobacteria, including *Salmonella*, in the gizzard ($P = 0.02$; Engberg et al., 2004). The low pH of the gizzard may kill the bacteria and prevent the bacteria from entering the distal portion of the intestine (Engberg et al., 2004). However, previous work has shown that pellets may not stimulate the gizzard to the extent of mash diets due to the breakdown of coarse particles that occurs during the pelleting process, resulting in decreased gizzard stimulation, higher pH, and the potential for harmful bacteria in the intestine (Gabriel et al., 2003; Engberg et al., 2004; Svihus et al., 2004).

There have been many published studies that have looked at ingredient PS and its effects on broiler performance and nutrient digestibility (Reece et al., 1986; Nir et al., 1994; Amerah et al., 2007; Amerah et al., 2008; Jacobs et al., 2010; Xu et al., 2015a,b; Rubio et al., 2020), but little work has been done with regards to ingredient PS in turkey diets. Previous work demonstrated that 1,094 μm corn reduced BWG compared to 606, 701, and 832 μm corn when fed to Hybrid Converter turkey hens from d 0 to 7 (Charbeneau and Roberson, 2004). Various corn particle sizes (380, 606, and 806 μm) were fed to BUT 9 male turkeys from 0 to 21d and the turkeys consuming the 606 μm corn had increased BWG and FI with no effect on FCR (Favero et al., 2009). These data indicate that coarse corn may decrease turkey performance over the starter period, but there is limited work that has investigated the effects over a longer feeding period. Therefore, an experiment was conducted to determine the effects of corn particle size on pellet quality, 0 to 42 d turkey hen performance, intestinal permeability, and litter dry matter.

MATERIALS AND METHODS

Corn and Experimental Diet Manufacture

The same batch of whole corn was used to manufacture the fine and coarse corn particle sizes (**CPS**) to ensure similar nutritional quality. Corn was ground at West Virginia University using a hammermill fitted with a 6.35 mm or 4.76 mm screen to produce coarse and fine corn PS, respectively. The corn was ground with the 4.76 mm screen twice. All corn was then transported to Virginia Tech for diet generation and bird feeding.

Diets were nutritionally similar and only differed in the CPS. Hybrid Turkey breeder recommendations were used as the basis for diet formulation with energy and digestible amino acids adjusted to align with industry practices at the time the experiment was conducted. A basal diet was manufactured with no corn and experimental diets were manufactured by adding corn to the basal diet. Mash diets were manufactured at Virginia Tech and then transported to a local toll milling facility to be pelleted and crumbled. Diets were sent to a commercial laboratory for nutrient analysis (University of Missouri; Table 1). Particle size of the corn and mash diets was determined by ASAE method S319.4 (ASABE, 2022). Dry sieving of the diets and corn was completed using a Ro-Tap tester plus agitators (Ro-Tap tester, Model RX-29, WS Tyler company, Mentor, OH). The Ro-Tap tester was fitted with a set of 14 sieves ranging from 4,760 μm to 38 μm and was used to shake 100 g samples for 10 min. A dispersing agent was not added to the samples. After 10 min, individual sieves were weighed to determine average PS for each dietary treatment and corn sample.

Pellet Quality Analyses

Pellets from the starter 2 diet were collected after feed manufacturing and sent to Pennsylvania State University for pellet quality analyses. All pellet quality analyses were conducted in duplicate. Pure pellets were obtained by using a No. 5 W. S. Tyler testing sieve (Mentor, OH). Pellet durability index and modified pellet durability index were conducted using a Pfost tumble box (Gamet Manufacturing Inc., Saint Paul,

Table 1. Composition of experimental diets containing 581 μm and 964 μm corn fed to Hybrid turkey hen poults from 0 to 42 d of age.[1]

	Starter 1		Starter 2	
Ingredient	581 μm	964 μm	581 μm	964 μm
	(%)			
Corn	42.37	42.37	43.89	43.89
Soybean meal (48% CP)	39.74	39.74	42.28	42.28
Poultry by-product meal	10.00	10.00	4.09	4.09
Soybean oil	3.37	3.37	4.73	4.73
Dicalcium phosphate	1.52	1.52	1.71	1.71
Limestone	1.30	1.30	1.60	1.60
Vitamin and mineral premix[2]	0.60	0.60	0.50	0.50
DL-Met (99%)	0.43	0.43	0.42	0.42
L-Lys•HCl (78.5%)	0.24	0.24	0.23	0.23
L-Thr (98.5%)	0.12	0.12	0.13	0.13
Sodium chloride	0.27	0.27	0.30	0.30
Sodium bicarbonate	0.04	0.04	0.11	0.11
Phytase[3]	0.01	0.01	0.01	0.01
Calculated nutrient content[4]				
Crude protein	27.50 (28.27)	27.50 (29.21)	26.00 (25.93)	26.00 (26.77)
ME (kcal/kg)	2,998	2,998	3,042	3,042
Calcium	1.40	1.40	1.39	1.39
Available phosphorous	0.73	0.73	0.68	0.68
Crude fat	7.12 (4.83)	7.12 (4.81)	7.80 (5.46)	7.80 (5.71)
Digestible Lys	1.66	1.66	1.59	1.59
Digestible Met	0.81	0.81	0.77	0.77
Digestible SAA[5]	1.15	1.15	1.09	1.09
Digestible Thr	1.05	1.05	1.01	1.01
Digestible Trp	0.29	0.29	0.29	0.29
Digestible Ile	1.05	1.05	1.03	1.03
Sodium	0.17	0.17	0.18	0.18
Chloride	0.25	0.25	0.24	0.24

[1]Diets only varied in corn particle size for starter 1 and starter 2.
[2]Provided per kg of diet: vitamin A, 1,320,000 IU; vitamin D3, 440,000 ICU; vitamin E, 2860 IU; menadione, 176 mg; biotin, 6.6 mg; vitamin B12, 1.9 mg; choline, 71.5 g; niacin, 6.6 mg; pantothenic acid, 1.8 g; selenium, 40 mg; riboflavin, 880 mg; Cu, 4.4 g; Fe, 45 g; I, 135 mg; Mn, 44 g; Zn, 44 g; Co, 4.4 g.
[3]Quantum blue (500 FTU/kg) was formulated to provide 0.10% of calcium and nonphytate phosphorus.
[4]Values within parentheses are analyzed values for complete diets.
[5]SSA: sulphur amino acids.

MN). The New Holmen Pellet Tester was used to determine pellet survivability (New Holmen's Pellet Tester, TekPro Ltd., Norfolk, UK).

Experimental Design

All animal procedures used in the experiment were approved by the Virginia Tech Animal Care and Use Committee. A total of 1,584 one-day-old Hybrid turkey hens were randomly allocated to floor pens (4.5′ x 8′) with 18 replicate pens per treatment and 22 birds per pen. The experiment was a 2 × 2 factorial with CPS in starter 1 vs CPS in starter 2 as main effects. Each experimental unit received one of 2 dietary treatments varying only in CPS (fine or coarse) from 0 to 21 (starter 1) and 22 to 42 (starter 2) d of age. The experiment was a randomized complete block design with the experimental unit being the pen. Experimental diets were randomly assigned to pens within blocks that were arranged within the building by location. Birds were fed ad libitum and provided a crumbled starter 1 diet from D0 to 21 and a pelleted starter 2 diet from D22 to 42. Water was provided ad libitum throughout the experiment with nipple drinkers in each pen. Temperature and lighting were adjusted according to breeder recommendations and the age of the bird (Hendrix Genetics, 2021).

Turkey Performance

Feed intake (**FI**) was determined at the end of each diet phase and reported from 0 to 42 d. Feed intake was calculated by subtracting the weight of the remaining feed at the end of the period from the amount of feed added to the feeder over the duration of the feeding phase. Initial body weight (**BW**) was measured on D0 and final weights were determined on D42. Feed conversion ratio (**FCR**) was calculated and reported over the 0 to 42 d period. Due to the factorial analysis across the feeding phases, data were not calculated for the individual 0 to 21 and 22 to 42 d periods. Data for the 0-21 d period weres not analyzed as part of the factorial and was analyzed only using the CPS over the starter 1 p.

Intestinal Permeability

A FITC-dextran (**FITC-d**) assay was used to estimate intestinal permeability in turkeys on D42 (Baxter et al., 2017). The large insoluble dextran molecule has limited ability to pass through the tight junctions in the intestine and pass into the blood in a healthy bird. However, intestinal structure is compromised when a bird is presented with a challenge and the dextran molecule can pass through the tight junctions, resulting in an increased concentration in the blood. On D42, one turkey per pen was orally gavaged with 8.32 mg/kg of FITC-d that was dissolved in ultra-pure water. Approximately 1 h after FITC-d inoculation, blood was collected from the brachial vein and was allowed to clot at room temperature in serum tubes. Blood samples were centrifuged at 2,000 × *g* for 10 min at 4°C to isolate serum from the blood. Serum was diluted 1:5 in 0.9% saline to a total volume of 100 μL in a 96 well flat bottom black plate. A multi-mode plate reader (Infinite M200 Pro, Tecan, Morrisville, NC) was used to analyze serum for FITC-d at an excitation wavelength of 485 nm and emission wavelength of 528 nm. A standard curve was generated by adding known amounts of FITC-d to sera collected from turkeys that had not received a dose of FITC-d.

Litter Dry Matter

Litter samples were collected from each pen on D42 to determine dry matter content. A composite litter sample was collected by taking litter from the center of the pen and the center of each quadrant when the pen is divided into 4 equal squares (Sizmaz et al., 2022). Areas near drinkers were avoided. Samples were mixed for each pen to create one composite sample. Approximately 100 g of each sample was weighed into an aluminum weigh dish and oven dried at 100°C for 24 h. All samples were conducted in duplicate. Dried samples were then weighed and litter dry matter was calculated using the following equation:

$$\left(Dry\ wt\ of\ litter\ (g)/Wet\ wt\ of\ litter\ (g)\right) \times 100\%$$

Statistical Analysis

Feed and pellet quality data were analyzed as a one-way ANOVA in JMP Pro 16.0 (SAS Institute Inc., Cary, NC). Performance data, intestinal permeability, and litter dry matter were analyzed as a 2 × 2 factorial with CPS in the starter 1 phase (581 and 964 μm) and CPS in the starter 2 phase (581 and 964 μm) as main effects in JMP Pro 16.0. Data for the starter 1 phase could not be analyzed as a factorial and was therefore analyzed using only the starter phase 1 particle size as a secondary analysis using JMP Pro 16.0. This one-way ANOVA resulted in 36 replicate pens for each of the 2 treatments. If significance was detected for any of the above ANOVA, ($P \leq 0.05$), means were separated using Student's t-test (Sarsour and Persia, 2022). Trends were accepted at $P \leq 0.10$. All performance data were analyzed using the pen as the experimental unit.

RESULTS AND DISCUSSION

Corn Particle Distribution and Starter 2 Pellet Quality

The PS distribution of the corn used in the starter 1 and starter 2 diets is shown in Figure 1A. Particle size of the corn averaged

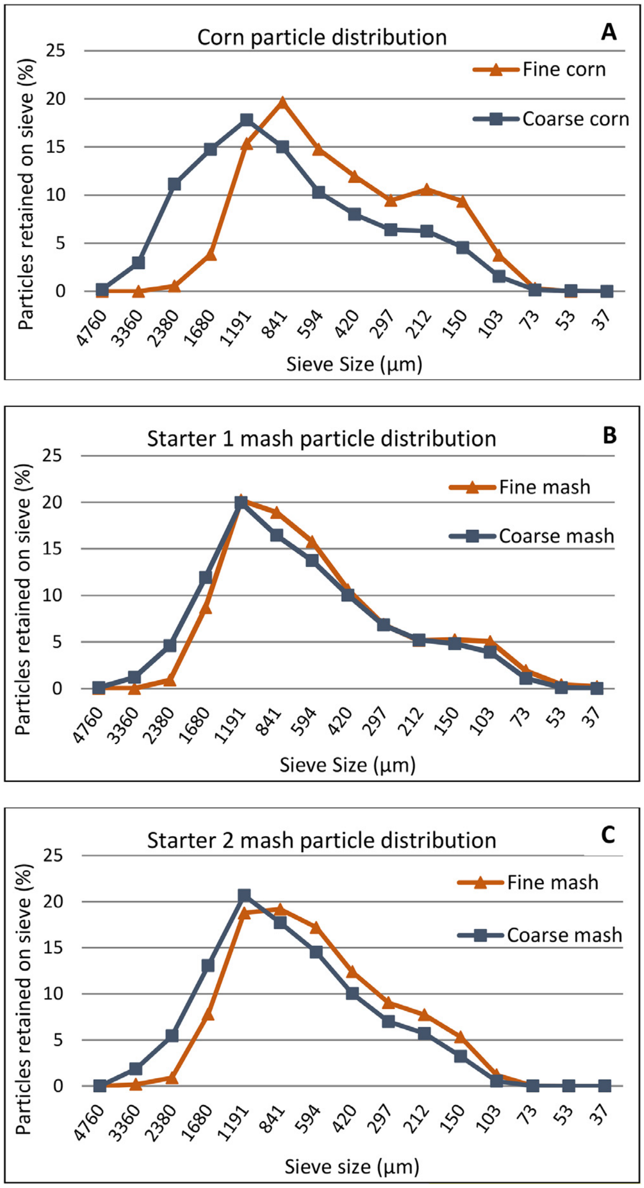

Figure 1. Particle distribution of corn (A), starter 1 mash feed (B), and starter 2 mash feed (C). Percentages retained on each sieve for each treatment represent the averages across 2 replicates.

581 μm for the fine corn and 964 μm for the coarse corn. As expected, 964 μm corn inclusion in the starter diets increased the PS of the mash diet ($P \leq 0.05$; Table 2; Figures 1B and 1C). Particle size of starter 1 and 2 mash diets containing the 581 μm corn was 690 and 736 μm, respectively, and the PS of starter diets containing 964 μm corn was 795 and 879 μm, respectively. Although starter 2 mash diets differed in PS, there were no differences in starter 2 pellet quality for NHPT, PDI, or MPDI ($P > 0.05$). Data from the current experiment agree with previous literature in broiler diets showing no differences in pellet quality in diets containing 629, 763, 814, or 1,779 μm corn (Rubio et al., 2020). Previous work has demonstrated that the pelleting process may minimize differences in particle distribution because coarse particles are more susceptible to grinding by the pellet mill due to frictional forces within the

Table 2. Effect of corn particle size (**CPS**) on mash particle size (**MPS**), pellet durability index (**PDI**), Modified pellet durability index (**mPDI**) and New Holmen pellet tester (**NHPT**) of starter feed fed to Hybrid turkey hens from 0 to 21 and 22 to 42 d of age.

Dietary phase CPS	Starter 1 MPS	Starter 2 MPS	Starter 2 PDI[1]	Starter 2 mPDI[2]	Starter 2 NHPT[3]
	(μm)	(μm)	(%)	(%)	(%)
581 μm	690[b]	736[b]	77.8	63.1	58.0
964 μm	795[a]	879[a]	77.0	67.1	65.3
Pooled SEM	10	8	1.5	2.0	3.6
P-value					
CPS	0.02	$\leq$ 0.01	0.77	0.19	0.18

[a-b]Means within a column that do not share a common superscript differ ($P \leq 0.05$).

[1]PDI was determined using 500 g of sifted pellets in a P:Fost tumbler box (Gamet Manufacturing Inc., Saint Paul, MN) to tumble for 10 min at 53 RPM.

[2]mPDI was similar to PDI but modified by adding 5 hexagonal nuts before tumbling.

[3]NHPT (TekPro Ltd., Norfolk, UK) was determined using 100 g of sifted pellets with 30 seconds of forced air.

pellet die (Svihus et al., 2004; Amerah et al., 2007). Diets containing 490 μm and 796 μm corn were pelleted and wet sieving demonstrated that final diet particle sizes were reduced to 253 μm and 299 μm, respectively (Naderinejad et al., 2016). Recent research from Bonilla (2022) demonstrated that the degree of grinding that occurs during pelleting increases as the PS of the mash diet increases. These data indicate that diet particle size after pelleting is an important consideration when discussing ingredient PS.

Turkey Performance

There were no interactions throughout the 0-42d experiment so only the main effects are discussed. Birds fed 964 μm corn during the starter 1 phase had a lower BW at D42 ($P < 0.01$; Table 3) than those fed 581 μm corn. There were no differences in any of the other measured performance parameters including FI, FCR, and mortality from 0 to 42d ($P > 0.05$). Previous work demonstrated a linear decrease in BWG when Hybrid Converter

Table 3. Effect of corn particle size (**CPS**) across both the starter phase 1 and 2 feeding periods on the feed intake (**FI**), body weight (**BW**), feed conversion ratio (**FCR**), and mortality of Hybrid turkey hen poults from 0 to 42 d of age.[1]

CPS		0 to 42d FI	42d BW	0 to 42d FCR	0 to 42d mortality[2]
Starter 1	Starter 2	(kg)	(kg/bd)	(kg/kg)	(%)
581 μm	—	68.8	2.49[a]	1.349	4.67
964 μm	—	67.2	2.44[b]	1.352	4.92
Pooled SEM		0.70	0.014	0.004	N/A
Starter 1	Starter 2				
—	581 μm	68.1	2.47	1.354	5.05
—	964 μm	67.9	2.46	1.347	4.55
Pooled SEM		0.70	0.014	0.004	N/A
Starter 1	Starter 2				
581 μm	581 μm	69.3	2.50	1.350	4.55
581 μm	964 μm	68.4	2.48	1.348	4.80
964 μm	581 μm	67.0	2.44	1.358	5.56
964 μm	964 μm	67.5	2.44	1.347	4.29
Pooled SEM		1.00	0.020	0.006	N/A
P-value					
Starter 1 CPS		0.12	$\leq$ 0.01	0.58	0.67
Starter 2 CPS		0.87	0.71	0.30	0.93
Starter 1 CPS x Starter 2 CPS		0.46	0.50	0.48	0.83

[a-b]Means within a column that do not share a common superscript differ ($P \leq 0.05$).

[1]IBW (g/bird): 56.2g ($P = 0.48$; SEM = 0.14).

[2]Mortality data were arcsin transformed before analysis to ensure normality.

Table 4. Effects of corn particle size (**CPS**) across the starter 1 feeding period on the feed intake (**FI**), body weight (**BW**), feed conversion ratio (**FCR**), and mortality of Hybrid turkey hen poults from 0 to 21 d of age.[1,2]

CPS	0 to 21 d FI	0 to 21 d BW	0 to 21 d FCR	0 to 21 d mortality[3]
	(kg)	(kg/bd)	(kg/kg)	(%)
581 μm	16.4[a]	0.683[a]	1.244[a]	3.9
964 μm	15.9[b]	0.658[b]	1.264[b]	4.2
Pooled SEM	0.18	0.005	0.005	NA
P-value				
Starter 1 CPS	0.05	$\leq$ 0.01	0.01	0.80

[a-b]Means within a column that do not share a common superscript differ ($P \leq 0.05$).

[1]IBW (g/bird): 56.2g ($P = 0.48$; SEM = 0.14).

[2]The 2 treatments were analyzed as a one-way ANOVA without factorial analysis over the first 21 d period resulting in 36 replicate pens for each treatment.

[3]Mortality data were arcsin transformed before analysis to ensure normality.

turkeys were fed increasing CPS of 606, 701, 832, and 1,094 μm corn from 0 to 7d ($P < 0.01$) and 0 to 15d ($P = 0.02$; Charbeneau and Roberson, 2004). When BUT 9 male turkeys were fed 606 μm corn from 1 to 21d, they had increased BWG and FI compared to birds fed 380 and 806 um corn ($P < 0.01$), however, there were no differences in FCR ($P > 0.05$; Favero et al., 2009). Similar responses in broilers have been shown with a reduced BWG when fed diets containing 1,387 or 600 μm corn compared to 858 or 300 μm corn from 0 to 21 d (Jacobs et al., 2010; Chewning et al., 2012). The difference in PS preference between broilers and turkeys may be due to beak size and the mechanoreceptors of the beak, which has been reported to affect FI (Moran, 1982). In an attempt to also show the starter 1 phase data, the most sensitive growth period for poults, a secondary analysis was completed with just starter 1 CPS as the treatments (Table 4). Turkey poults that consumed 964 μm corn during the starter 1 phase had lower BWG and FI as well as an increased FCR compared to those fed 581 μm corn ($P \leq 0.05$). The reduced performance with larger particle size corn agrees with previous reports demonstrating that coarse corn decreased BW in poults when fed from 0 to 15 or 0 to 21 d ($P \leq 0.05$; Charbeneau and Roberson, 2004; Favero et al., 2009). Data from the current experiment and previous research indicate that feeding coarse corn early decreases BW in both broilers and turkeys. However, there were no differences in the current experiment in FI, BWG, or FCR when poults were fed 581 or 964 μm corn in the starter 2 phase ($P > 0.05$; data not shown). This indicates that turkeys may be fed fine corn (581 μm) during the starter 1 phase to improve performance and coarse corn (964 μm) after starter 1 to save costs at the feed mill and maximize turkey performance in the starter 2 phase.

Intestinal Permeability

No main effects were observed for intestinal permeability measured on D42 ($P > 0.05$; Table 5). Data are limited in turkey models, but previous work in broilers demonstrated that inclusion of coarse particle corn in a pelleted diet decreased gizzard pH when fed over a 21-d period ($P < 0.05$; (Naderinejad et al., 2016). Additionally, whole wheat inclusion in broiler diets has been shown to reduce gizzard pH, resulting in reduced counts of harmful bacteria such as *Salmonella* in the gizzard (Gabriel et al., 2003; Engberg et al., 2004), however this has not been reported in turkeys. For the current experiment, the hypothesis was that increased corn particle size would further engage the gizzard resulting in intestinal health and structural benefits downstream. The lack of difference in intestinal permeability (FITC-D absorption into the blood stream) did not support the hypothesis and might suggest that the response is more localized or is lost in the intestine. However, pelleted diets containing coarse particles may not stimulate the gizzard to the extent of mash diets due to a greater degree of grinding that occurs in the pellet die (Svihus et al., 2004).

Table 5. Effect of corn particle size (**CPS**) across both the starter phase 1 and 2 feeding periods on gut permeability (Serum FITC-Dextran) and litter dry matter of Hybrid turkey hen poults at 42 d of age.[1]

CPS		Serum FITC-dextran	Litter dry matter[2]
Starter 1	Starter 2	(ng/ml)	(%)
581 μm	—	179.9	66.4
964 μm	—	177.3	68.3
Pooled SEM		3.33	N/A
Starter 1	Starter 2		
—	581 μm	181.0	67.0
—	964 μm	176.2	67.6
Pooled SEM		3.33	N/A
Starter 1	Starter 2		
581 μm	581 μm	184.6	67.2
581 μm	964 μm	175.1	65.5
964 μm	581 μm	177.3	66.8
964 μm	964 μm	177.3	69.8
Pooled SEM		4.70	N/A
P-value			
Starter 1 CPS		0.59	0.13
Starter 2 CPS		0.31	0.62
Starter 1 CPS x Starter 2 CPS		0.32	0.07

[1]IBW (g/bird): 56.2g ($P = 0.48$; SEM = 0.14).
[2]Litter dry matter data were arcsin transformed before analysis to ensure normality.

Litter Dry Matter

There was a trend for birds that were fed 964 μm corn during both the starter 1 and starter 2 phases to have higher litter dry matter at 42 d ($P = 0.07$). Whole wheat inclusion in broiler diets increased retention time in the gizzard and lowered gizzard pH, thus decreasing harmful bacteria counts, such as *Salmonella,* in the gizzard (Engberg et al., 2004). This reduction in bacteria could positively impact intestinal microbial populations and improve gut health, although this has not been demonstrated in turkeys. The presence of harmful bacteria in the intestines could lead to diarrhea and increased fecal water content which may decrease litter dry matter (Collett, 2012). Inclusion of 50% coarse corn (1,100−1,300 μm) in broiler diets has been shown to increase litter dry matter and decrease litter nitrogen (Xu, 2014; Wang-Li et al., 2020), possibly due to an increase in nitrogen retention by the bird (Parsons et al., 2006). In contrast, litter dry matter was not different at 35d when broilers were fed diets containing 941 or 2,982 μm corn ($P = 0.73$; Kheravii et al., 2017), however, it is important to note the variation in PS across previous work and the current experiment. Although increased corn PS in broiler diets may reduce harmful bacteria and improve litter dry matter, there are limited data focusing on how ingredient PS affects microbial populations and subsequent litter dry matter in turkeys.

CONCLUSIONS AND APPLICATIONS

1. Pellet quality was not affected when turkey starter 2 diets containing 581 or 964 μm corn were pelleted.
2. Although 581 μm corn is beneficial when fed during the starter 1 phase, 964 μm corn may be able to maintain performance at breeder standards in the starter 2 phase while decreasing milling costs.
3. Corn particle size (581 um, 964 um) did not alter intestinal permeability in 42d old turkey hen poults.

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DISCLOSURES

We wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

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