FEEDING DIETS WITH REDUCED CALCIUM AND PHOSPHORUS ON HYBRID CONVERTER COMMERCIAL TURKEYS: TRIAL #3

In the previous trial with Hybrid Converter commercial males, we determined that calcium and phosphorus can be decreased from those values obtained from our 2013 Commercial Nutrient Guidelines without any negative effect on body weight gain, feed conversion or leg soundness. Depending on the diet, the decrease in calcium and phosphorus was 10-40%. It was stated in that trial report that the same reductions in calcium and phosphorus would likely also apply to Hybrid Converter commercial females. To validate this statement, we repeated the previous male trial but for this trial used Hybrid Converter commercial females.

The trial was started on February 3, 2015, at the University of Warmia and Mazury in Olsztyn, Poland. A total of 448 Hybrid Converter commercial female turkeys, 1-day of age, were placed in equal numbers to 28 pens that were 4 m^2 each. All turkeys in this trial were fed diets 1 to 3 (Table 1). Beginning at diet 4, equal numbers of pens were assigned to 4 treatments. The individual pens were allocated at this time to specific treatments so that the body weight of the turkeys was equivalent for each treatment. The control (treatment 1) was the same calcium and phosphorus decrease in Trial #1 that resulted in no difference in growth, feed conversion and tibia mineralization compared to turkeys fed diets formulated to the 2013 Hybrid Commercial Nutrient Guidelines. Treatments 2 to 4 in this trial differed from the control in that the calcium and phosphorus decreases were greater (Table 2). All diets were fed by feed amounts as indicated in Table 1, and, all diets contained phytase. All diets contained no meat by-products as mandated by current European regulations, and were manufactured in a feed mill located in Poland.

Table 1: *Nutrient concentration and feed allowance for all experimental diets.*

	Diet 1	Diet 2	Diet 3	Diet 4	Diet 5	Diet 6
Females, weeks of age	**0-3**	**3-6**	**6-8**	**8-10**	**10-14**	**14-16**
Females, kg feed allowance (Converter)	**0.94**	**2.69**	**3.14**	**4.11**	**10.09**	**5.54**
Crude Protein, %	**26.5**	**24.0**	**21.3**	**19.2**	**16.6**	**15.1**
ME, MJ/kg	**11.51**	**11.72**	**12.14**	**12.56**	**12.87**	**13.19**
ME, kcal/kg	**2750**	**2800**	**2900**	**3000**	**3075**	**3150**
Available lysine, %	**1.56**	**1.41**	**1.32**	**1.17**	**0.95**	**0.79**
Total lysine, %	**1.74**	**1.58**	**1.47**	**1.32**	**1.06**	**0.89**
Total sodium, %	**0.16**	**0.16**	**0.17**	**0.17**	**0.17**	**0.17**

Table 2: *Calcium and phosphorus concentrations for all experimental diets.*

	Diet 1	Diet 2	Diet 3	Diet 4	Diet 5	Diet 6
TREATMENT 1						
Total calcium (analytical, without phytase), %	**1.35**	**1.26**	**1.06**	**0.90**	**0.75**	**0.70**
Total calcium (analytical, with phytase), %	**1.25**	**1.16**	**0.96**	**0.80**	**0.65**	**0.60**
Available phosphorus, %	**0.72**	**0.67**	**0.53**	**0.45**	**0.37**	**0.35**
% decrease from 2013 Hybrid Nutrient Guidelines	**0**	**0**	**10**	**15**	**15**	**15**

TREATMENT 2						
Total calcium (analytical, without phytase), %	**1.35**	**1.26**	**1.06**	**0.82**	**0.68**	**0.62**
Total calcium (analytical, with phytase), %	**1.25**	**1.16**	**0.96**	**0.72**	**0.58**	**0.52**
Available phosphorus, %	**0.72**	**0.67**	**0.53**	**0.41**	**0.34**	**0.31**
% decrease from 2013 Hybrid Nutrient Guidelines	**0**	**0**	**10**	**22.5**	**22.5**	**22.5**
TREATMENT 3						
Total calcium (analytical, without phytase), %	**1.35**	**1.26**	**1.06**	**0.74**	**0.62**	**0.56**
Total calcium (analytical, with phytase), %	**1.25**	**1.16**	**0.96**	**0.64**	**0.52**	**0.46**
Available phosphorus, %	**0.72**	**0.67**	**0.53**	**0.37**	**0.31**	**0.28**
% decrease from 2013 Hybrid Nutrient Guidelines	**0**	**0**	**10**	**30**	**30**	**30**
TREATMENT 4						
Total calcium (analytical, without phytase), %	**1.35**	**1.26**	**1.06**	**0.74**	**0.56**	**0.48**
Total calcium (analytical, with phytase), %	**1.25**	**1.16**	**0.96**	**0.64**	**0.47**	**0.38**
Available phosphorus, %	**0.72**	**0.67**	**0.53**	**0.37**	**0.28**	**0.24**
% decrease from 2013 Hybrid Nutrient Guidelines	**0**	**0**	**10**	**30**	**35**	**40**

All feeds were formulated to available amino acids. Amino acid to lysine ratios were as detailed in 2013 Hybrid Nutrient Guidelines. Diets 1 to 3 are the same for all treatments. Treatment differences begin at Diet 4.

Body weights of the turkeys for each treatment were not significantly (P>0.05) different at any time measured (Table 3). Liveability was 100% for all treatments except for treatment 4 which was 96.42%. Unfortunately, culling due mostly to pendulous crop was high from 71 days of age and ranged from 8.04% in treatments 2 and 4 to 17.86% in treatment 1. The culling appeared to be unrelated to the treatment effects. Feed conversion (corrected for mortality) at 16 weeks of age was similar for all treatments (P=0.668), and was; 2.388 ± 0.065 for treatment 1; 2.394 ± 0.025 for treatment 2; 2.383 ± 0.039 for treatment 3; and 2.411 ± 0.039 for treatment 4.

Table 3: *Body weights of female turkeys (kg/poult).*

Weeks of age	Treatment 1	Treatment 2	Treatment 3	Treatment 4	P value
0	**0.062 ± 0.000**	**0.062 ± 0.001**	**0.062 ± 0.000**	**0.062 ± 0.001**	**0.807**
3	**0.720 ± 0.029**	**0.718 ± 0.016**	**0.713± 0.007**	**0.715 ± 0.024**	**0.921**
6	**2.295 ± 0.073**	**2.296 ± 0.107**	**2.277 ± 0.066**	**2.281 ± 0.083**	**0.964**
8	**3.865 ± 0.132**	**3.868 ± 0.120**	**3.862 ± 0.116**	**3.866 ± 0.151**	**0.999**
10	**5.676 ± 0.218**	**5.733 ± 0.170**	**5.713 ± 0.110**	**5.716 ± 0.189**	**0.943**
13	**8.469 ± 0.212**	**8.602 ± 0.220**	**8.547 ± 0.235**	**8.534 ± 0.267**	**0.768**
16	**10.981 ± 0.242**	**11.089 ± 0.257**	**11.098 ± 0.198**	**10.949 ± 0.277**	**0.580**

Carcass yield results at 16 weeks of age were not significantly (P>0.05) different among treatments (Table 4). In the slaughter house, all poults were numerically scored for footpad dermatitis by two independent persons. The scoring was done according to the method outlined by Hocking *et al.*, 2008. The footpad scores were significantly (P<0.05) different among treatments. Footpad scores ranged from 0.360 ± 0.482 (treatment 1) to 1.355 ± 0.702 (treatment 4). It cannot be explained why treatment 4 had the worst footpad score, although its value is still acceptable from a commercial and practical perspective. Dry matter concentration in fecal droppings collected at 4, 8, 12 and 16 weeks of age were not significantly (P>0.05) different among treatments.

Table 4: *Carcass yield of female turkeys.*

Measurement	Treatment 1	Treatment 2	Treatment 3	Treatment 4	P value
Live body weight (kg)	11.000 ± 0.306	11.056 ± 0.313	11.129 ± 0.304	10.986 ± 0.212	0.754
Carcass weight w/o neck, chilled (kg)	8.902 ± 0.255	9.033 ± 0.224	9.109 ± 0.304	8.955 ± 0.226	0.462
Dressing, %	80.929 ± 1.069	81.496 ± 0.924	81.845 ± 1.195	81.512 ± 0.634	0.386
Breast muscle, % live weight	22.330 ± 0.707	22.234 ± 1.836	23.620 ± 1.751	23.015 ± 1.148	0.301
Thigh muscle, % live weight	5.472 ± 0.345	5.479 ± 0.349	5.332 ± 0.226	5.375 ± 0.212	0.728
Drumstick, % live weight	4.025 ± 0.391	3.975 ± 0.254	3.811 ± 0.177	4.081 ± 0.221	0.305

7 poults per treatment measured

Tibia ash, calcium and phosphorus were significantly ($P<0.05$) different among treatments (Table 5). Treatment 2 poults had the lowest tibia minerals compared to the other treatments. We, however, noticed no leg problems in poults at any time during this experiment for any of the treatments.

Table 5: *Tibia mineralization of female turkeys.*

Measurement	Treatment 1	Treatment 2	Treatment 3	Treatment 4	P value
Ash, %	67.17 ± 0.52	65.40± 1.14	66.83 ± 0.39	66.50 ± 0.56	0.001
Calcium, %	25.07 ± 0.35	24.86 ± 0.45	25.63 ± 0.28	25.49 ± 0.46	0.004
Phosphorus, %	12.24 ± 0.24	12.09 ± 0.22	12.51 ± 0.15	12.46 ± 0.11	0.001

7 poults per treatment measured

Economic returns at 16 weeks of age were better in some treatments with lower calcium and phosphorus in feed. Feed cost per kg body weight relative to treatment 1 was 0.13% lower in treatment 2, 0.93% lower in treatment 3, and 1.26% higher in treatment 4. The fact that treatment 4 had the worst economic return of all treatments is not easily explained even though this treatment did have the highest footpad score compared to other treatments.

The present trial indicates that dietary calcium and phosphorus can be safely decreased below that stated in our 2013 Commercial Nutrient Guidelines for Hybrid Converter females. This conclusion is the same as we had for Hybrid commercial males fed the same diets in the previous trial.

The calcium and phosphorus adjustment from our 2013 Hybrid Commercial Nutrient Guidelines can be implemented for feeds fed from 6 weeks of age. In this trial, the vitamin D_3 amounts in feed for all treatments were 5,000 IU/kg in diets 1 to 3; and, 4,800 IU/kg in diets 4 to 6. We have not investigated the effect of much lower vitamin D_3 and/or other vitamin levels in feed on poults fed diets formulated with calcium and phosphorus concentrations well below our guidelines. We have not repeated this trial with Hybrid XL or Grademaker females, however, reduction of calcium and phosphorus in amounts similar at least to that of treatment 1 or 2 are likely feasible to apply to these strains.

Practical application of this research data should always be done carefully and conservatively by a professional nutritionist to avoid any potential flock performance problems. A conservative approach in applying this data would be to not exceed treatment 2 reductions of calcium and phosphorus. It may be safest to achieve these calcium and phosphorus reductions by gradually testing the effect on your flock in perhaps 5% incremental reductions at a time, applied to diets 3-6.