

## FEEDING DIETS WITH REDUCED CALCIUM AND PHOSPHORUS ON HYBRID CONVERTER COMMERCIAL TURKEYS: TRIAL #1

Adequate calcium and phosphorus in turkey feeds are required for proper development and mineralization of bone. To successfully grow turkey males to 20 weeks of age and 20 kg body weight, strong sound legs are essential. Although the Hybrid Turkeys Commercial Nutrient Guidelines were revised in 2013, we have not investigated lowering calcium and phosphorus concentration in feeds fed to males. Also, since skeletal development in the commercial turkey is complete at 12 weeks of age, feeding diets much lower in calcium and phosphorus than our 2013 Nutrient Guidelines may be possible. Successfully feeding diets lower in calcium and phosphorus will reduce feed cost, improve feed mill processing efficiency, decrease barn litter moisture content, and result in improved digestion system health of the turkey.

The effect of reducing both calcium and phosphorus concentration in diets fed to Hybrid Converter commercial turkeys grown to 20 weeks of age was investigated. The trial was started on October 25, 2013 at the University of Warmia and Mazury in Olsztyn, Poland. A total of 420 male Hybrid Converter commercial turkeys, 1-day of age, were placed in equal numbers to 14 pens that were 10 m<sup>2</sup> each. All turkeys were fed diet 1 and diet 2 by kg feed allowance (Table 1). Beginning at diet 3, equal numbers of pens were assigned to either the control or test treatment diets and turkeys were fed the remaining diets by kg feed allowance. Test treatment diets had the same nutrient concentration as the control diets except calcium and phosphorus were decreased 10-15% (Table 2). All diets were formulated to available amino acids, and all diets contained phytase.

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

	Diet 1	Diet 2	Diet 3	Diet 4	Diet 5	Diet 6
Males, weeks of age	0-3	3-6	6-9	9-12	12-16	16-20
Males, kg feed allowance	1.04	3.18	5.79	8.84	15.75	19.54
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
Total lysine, %	1.74	1.58	1.47	1.32	1.06	0.89
Total arginine, %	1.74	1.58	1.47	1.32	1.06	0.89
Total methionine, %	0.66	0.60	0.56	0.50	0.42	0.37
Total methionine + cysteine, %	1.13	1.02	0.96	0.85	0.75	0.68
Total threonine, %	1.06	0.96	0.91	0.82	0.66	0.58
Total tryptophan, %	0.30	0.27	0.24	0.21	0.16	0.14
Total valine, %	1.22	1.10	1.06	0.95	0.77	0.68
Total isoleucine, %	1.04	0.95	0.88	0.79	0.63	0.54
Available lysine, %	1.56	1.41	1.32	1.17	0.95	0.79
Available arginine, %	1.58	1.43	1.33	1.18	0.96	0.80
Available methionine, %	0.63	0.57	0.53	0.47	0.40	0.34
Available methionine + cysteine, %	1.02	0.92	0.86	0.76	0.66	0.59
Available threonine, %	0.92	0.83	0.79	0.70	0.57	0.50
Available tryptophan, %	0.26	0.23	0.21	0.19	0.15	0.12
Available valine, %	1.08	0.98	0.93	0.82	0.68	0.60
Available isoleucine, %	0.97	0.88	0.82	0.73	0.59	0.49
Total sodium, %	0.16	0.16	0.17	0.17	0.17	0.17

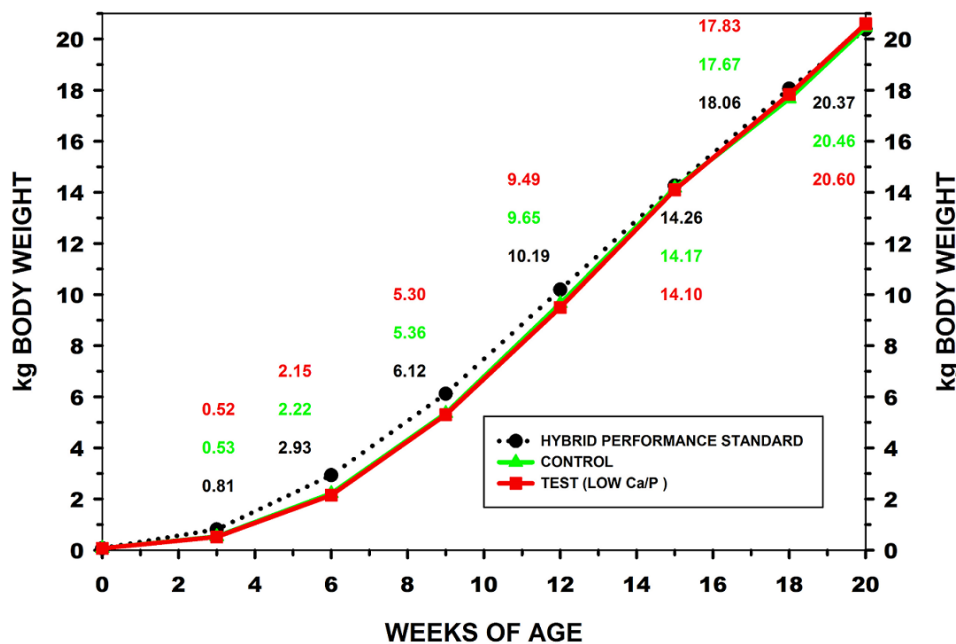
Chloride, % minimum	0.17	0.17	0.18	0.18	0.18	0.18
Chloride, % maximum	0.26	0.26	0.27	0.27	0.27	0.27

**Table 2:** Nutrient composition of control and test diets.

Control diet specifications	Diet 1	Diet 2	Diet 3	Diet 4	Diet 5	Diet 6
Total calcium (analytical, without phytase), %	1.35	1.26	1.18	1.06	0.88	0.80
Total calcium (analytical, with phytase), %	1.25	1.16	1.08	0.96	0.78	0.70
Available phosphorus, %	0.72	0.67	0.59	0.53	0.44	0.41

Test diet specifications	Diet 1	Diet 2	Diet 3	Diet 4	Diet 5	Diet 6
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 in calcium and phosphorus from control, %	0	0	10	15	15	15

Weekly body weight was similar in both treatments (Figure 1). Compared to the Hybrid performance standard, both treatments were below body weight standard until 14 weeks of age, at which time body weight most closely reflected performance standard to 20 weeks of age. Mortality was 12.95% and 12.05% at 20 weeks for the control and test treatments, respectively. We did not see any signs of calcium and/or phosphorus deficiency in poult from either treatment. Feed conversion ratio (kg feed/kg body weight), corrected for mortality, culls and females; was  $2.505 \pm 0.062$  and  $2.477 \pm 0.026$  for control and test treatments, respectively.



**Figure 1:** Body weight of Hybrid Converter males fed control and test (low calcium and phosphorus) diets compared to Hybrid current performance standard. Numerical values for body weight for both treatments and Hybrid performance standard are listed.

Mineral concentration in the tibia bone was measured from 7 poult selected at 20 weeks of age for each treatment. Ash, calcium and phosphorus concentrations were similar for both treatments (Table 3). Footpad scores (Hocking, P.M., *et al.*, 2008) were excellent and similar for both treatments ( $1.299 \pm 1.024$  and  $1.468 \pm 1.195$  for control and test treatments, respectively). Carcass yield results averaged from 7 poult for each treatment were similar (Table 4).

**Table 3:** *Tibia mineral concentration at 20 weeks of age.*

% in tibia	Control	Test
Ash	63.14 ± 0.40	63.05 ± 0.26
Calcium	22.82 ± 0.58	23.16 ± 0.25
Phosphorus	10.68 ± 0.17	10.82 ± 0.19

**Table 4:** *Carcass yield at 20 weeks of age.*

Carcass yield	Control	Test
Slaughter weight (kg)	20.50 ± 0.238	20.614 ± 0.212
Carcass weight (kg)	16.410 ± 0.347	16.407 ± 0.310
Dressing %	80.05 ± 1.40	79.59 ± 1.32
*Breast muscle %	24.68 ± 1.33	23.47 ± 0.93
*Thigh muscle %	10.84 ± 0.56	11.06 ± 0.79
*Drumstick muscle %	7.90 ± 0.58	8.40 ± 0.57

\*Body weight before slaughter = 100%.

### Conclusion

Diets fed from 6 weeks of age that are lower in calcium and phosphorus by 10-15% compared to 2013 Hybrid Nutrient Guidelines, can be successfully fed to Hybrid Converter males. The lower calcium and phosphorus treatment achieved similar bodyweight at 20 weeks as those fed diets with calcium and phosphorus levels from the 2013 Hybrid Nutrient Guidelines. Tibia mineral concentration and carcass yield were unaffected by the lower dietary calcium and phosphorus levels tested. The lower calcium and phosphorus treatment reduced feed cost per kg body weight gain by 2.23% compared to the control treatment. We are currently assessing much lower dietary calcium and phosphorus levels, than that tested in this trial, in Hybrid Converter males from 9-20 weeks of age. Similar investigations will also be done using Converter females as well.

### References:

Hocking, P.M., R.K. Mayne, R.W. Else, N.A. French, and J. Gatcliffe (2008). Standard European footpad dermatitis scoring system for use in poultry processing plants. *World's Poultry Science Journal* 64 (3):323-328.