Role of formulation and processing on nutrients and anti-nutrient factors during small scale commercial extruded kibble manufacturing

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Background: Extruded kibble is the most widely used commercial pet food. Concerns regarding grain-free/legume-rich (gf/lg) diets have arisen, including the effects of ingredient composition and small-scale commercial extrusion processes on post-extrusion nutrients and anti-nutrient factors (ANF), specifically phytic acid and lignin.

Hypothesis: We hypothesized that nutrient profiles and ANF of finished kibble were not affected by ingredient composition or size of manufacturing plant.

Materials and Methods: Four new diets were designed to be either gf/lg or grain-inclusive in combination with either high-or-low animal protein (diets 1-4). These diets were manufactured in a small-scale plant. Finished samples were analyzed for AAFCO nutrient profile, heavy metals, toxins, and ANF. Additionally, a finished, grain-inclusive, commercially available product from a large-scale plant was analyzed (diet 5). Statistical analyses were performed using a 2x2 factorial design.

Results: Moisture, protein, fat, fiber, and ash did not change among diets 1-4 ($p > 0.05$). No change in gelatinized starch was noted between gf/lg diets and grain-inclusivie diets ($p = 0.2$). Grain-inclusive diets (1, 2 and 5) had vomitoxin <0.5 mg/kg, which was not detectable in gf/lg diets (3 and 4). Heavy metals were not detectable, except for cadmium (<0.05 mg/kg) in any diet. ANF were not detectable in diets 1-4; however, diet 5 had lignin detectable at 2.2% (N <0.5%) on a dry matter basis (finished product). Biogenic amine index was <2.0 in diets 1-4 and 8.8 in diet 5 (<2, acceptable, >10, advanced decomposition).

Conclusions: These preliminary results suggest that gf/lg ingredient profiles do not negatively impact macronutrients during extrusion process. Both gf/lg diets and grain-inclusive diets had >90% starch gelatinization, suggesting comparable digestibility. In conclusion, results suggest that diets from small-scale plants are not at a higher risk for abnormal ANF or nutrient compositions, which may affect nutrient absorption.