Improving pulse palatability & health benefits to increase pulse market share of pet foods

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SPG Contributions	Project Status	Duration/Timeline of Project (Year to Year)	Co-funders	Total Project Cost
$305,377.00	Completed	January 2016 – August 2019	Natural Science and Engineering Research Council (NSERC)	$574,285.00

Project Description

The objective of the project was to improve the taste of pet foods and to increase the production value of aquaculture feeds that contain pulse starches. Previous studies from the research group have shown that using pulse starches in both dog and cat foods improves health (better weight control and less diabetes). However, cats did not like the taste of the test diets containing pulse starches. Moreover, fish in general, but particularly salmonids such as trout show a maximum tolerance for dietary pulse starch inclusion of ~30% at which point production (growth) starts dropping, likely due to hyperglycemia. Through matching funds from the Natural Sciences and Engineering Research Council, the research team added parallel experiments examining use of fermented pea starch in aquaculture diets for rainbow trout and tilapia to the SPG-funded pet food project.

The hypothesis was that fermenting pulse starches prior to use in pet and aquaculture feeds will improve taste and decrease anti-nutritional factor content, without losing any health or production benefits.

Outcome

Pea starch was used as a representative pulse starch and fermented with a common nutritional supplement yeast, Torula yeast (Candida utilis).Fermentation with Candida utilis decreased levels of some anti-nutritional factors (tannins and polyphenols), yet increased the protein content by up to 5%. Surprisingly fermentation also decreased the resistant starch fraction while increasing the rapidly digestible starch fraction, suggesting that glycemic responses might worsen after consuming fermented pea starch compared to unfermented pea starch. After fermentation, pea starch was used in a whole diet for dogs and cats at 30% inclusion, trout at 0-30% inclusion, and tilapia at 0-50% inclusion, then compared to diets using unfermented pea starch and corn-containing diets. A series of taste tests were performed in the dogs and cats, then checked for short-term and long-term health benefits. Results clearly showed that both cats and dogs prefer the taste of diets formulated with fermented pea starch over unfermented pea starch. Moreover, while the glycemic response was not changed with fermentation, there were clear indications after long-term feeding with fermented peas compared to unfermented peas, of improved metabolic health (lower leptin, lower levels of inflammation as indicated by white blood cell numbers) and even weight loss in cats and dogs. These health benefits of fermented pea starch containing diets were related to promising changes in the intestinal microbiome and intestinal health. In trout and tilapia, the fermented pea diets were tolerated as well or better than unfermented pea diets at maximum starch inclusion, but both pea-containing diets (fermented or unfermented) were better than a corn containing diet based on weight gain. The increased weight gain in these fish species may have been related to slight improvements in pea starch digestibility in both fish species, but was not related to improvements in glucose tolerance. In conclusion, fermentation of pea starch with Candida utilis looks like a highly promising technique for creating a value-added pulse product for use in both pet food and aquaculture feed industries that has not only enhanced health/production benefits, but also improved palatability.

Research Objective

OBJECTIVE 1
To develop and refine a pulse fermentation facility.

OBJECTIVE 2
To test for improvements in pea palatability and enhanced health benefits in cats and dogs.