

## Effects of plant-based diets on the bacterial counts and bacterial community composition of beluga sturgeon (*Huso huso*)

Roohi, M.<sup>1\*</sup>, Agh, N.<sup>2</sup>, Rezazadbari, M.<sup>3</sup>

<sup>1</sup>Department of Microbiology, Urmia Branch, Islamic Azad University, Urmia, Iran

<sup>2</sup>Department of Artemia and Aquatic Animals, Urmia Lake Research Institute, Urmia University, Iran

<sup>3</sup>Department of Food industry, Faculty of Agriculture, Urmia University, Iran

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### Abstract:

**BACKGROUND:** In recent years, many studies have been conducted on finding a suitable replacement for fish meal to supply the needs of aquaculture feed industry. **OBJECTIVES:** The present study was performed to examine the effect of replacing fish meal and fish oil with plant sources on bacterial counts in intestinal contents and mucus and bacterial composition in Beluga sturgeon. **METHODS:** Beluga sturgeons with a mean initial weight of  $133 \pm 5$  g were distributed into 18 (300 L) tanks (30fish/tank) and were fed experimental diets for 60 days. The control diet contained only fish meal and fish oil as the primary source of protein and lipid, while the experimental diets contained 0, 40, 60, 80 and 100 percent plant protein sources (wheat gluten, corn gluten and soybean meal) and 20% vegetable oil blend (canola, sunflower, cotton and safflower oils) respectively. **RESULTS:** Results showed that replacement of 80% fish meal and fish oil with plant sources didn't have significant effect on final weight ( $235 \pm 17$  g) compared to control group ( $256.1 \pm 10$  g) in a 60 days trial. Replacement of fish meal with 100% plant proteins in combination with 80% vegetable oils resulted in significantly lower final weight ( $225.7 \pm 11$  g), compared to other treatments including control group ( $p < 0.05$ ). Replacing 80% fish oil with vegetable oils resulted in a significant reduction of bacterial count in intestinal contents and a significant increase in percentage of Entrobacteriaceae sp. However, no significant differences were detected in bacterial counts of mucus in experimental treatments compared to control ( $p > 0.05$ ). Replacement of 60, 80 and 100% fish meal and 80% fish oil with plant sources significantly decreased bacterial counts in intestinal contents and intestinal mucosa compared to control group ( $p < 0.05$ ). Also this replacement cause significant change in bacterial composition of intestine. **CONCLUSIONS:** The results suggested that using plant sources in juvenile Beluga sturgeon diet decreases the bacterial count in the intestinal contents and mucus and changes the composition of intestinal micro flora.

**Keyword:** bacterial community, beluga sturgeon, fish meal, microbial counts, plant sources

### Figure Legends and Table Captions

**Table 1.** The amount (%) of protein and oil sources used in the experimental groups.

**Table 2.** Combination of ingredients of experimental groups (percent of total food).

**Table 3.** Belugas growth indices after 8 weeks fed with experimental diet. The values represent the mean  $\pm$  SD of three replicates of each treatment. The numbers in each column with different letters are significantly different ( $p < 0.05$ ).

**Table 4.** The number of bacterial colonies in intestinal content and mucosa of the Beluga at the end of trial (mean  $\pm$  SD). The values represent the mean  $\pm$  SD of three replicates of each treatment. The numbers in each column with different letters are significantly different ( $p < 0.05$ ).

**Figure 1.** The combination of bacteria isolated from the Belugas intestinal contents at the end of period.

**Figure 2.** Combination of isolated bacteria from Belugas intestinal mucus at the end of trial.



\*Corresponding author's email: [goronika\\_mrp@yahoo.com](mailto:goronika_mrp@yahoo.com), Tel: 0443-3467097, Fax: 0443-3440295

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