

Effects of the extruder die temperature on some physical properties of extruded fish feed pellets containing wheat flour and corn flour as starch sources

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Extruding process is a very complicated process where product quality is highly variable depending on the type of extruder, screw speed, and configuration, temperature profile on the barrel, die profile, feed rate, and feed moisture. The objective of this research was to evaluate the effect of the extruder die temperature on moisture content (MC), expansion ratio (ER), floatability (F) and bulk density (BD) of the extrudates. Finely ground fish meal (CP 60 %, Maldive product) 22 %, plant protein sources (CP 84 %) 17 %, de-fatted soya (CP 47 %) 10 %, shrimp head 7.5 %, rice bran 14 %, wheat flour 17.5 %, corn flour 7.5 %, vitamin and mineral 2.0 %, dicalcium phosphate 0.5 % and fish oil 2.0 % were mixed while adding water to achieve targeted moisture of 400 g/kg wet basis using a dough mixer. Approximately 5 kg sample of each replicate was extruded in duplicates (n= 6) using a single-screw extruder. The barrel temperature was set at 100 °C, 120 °C and 140 °C while the same die temperatures were tested as three treatments during this study. Data collected from the study were analyzed using one-way ANOVA while Tukey's HSD test was performed to examine the significant differences at $P= 0.05$. The highest F (80 %), ER (1.13) and lowest BD (412.00 g/L) as well as the lowest MC (5.74 %) values were noted in pellets that were extruded at the die temperature of 120 °C. Increasing die temperature from 120 °C to 140 °C, F and ER values were significantly decreased by 12.50 and 9.73 % respectively. Similarly, BD and MC values were significantly increased to 9.17 and 4.88 % respectively. The results of this study elucidated negative effect of increased die temperature higher than 120 °C on the physical properties of the extruded pellets. Moreover, it is recommended to use a single screw extruder at 120 °C as suitable die temperature and moisture level of 400 g/kg, for producing floating pellets in diets containing wheat flour and corn flour as starch sources.

Keywords: bulk density, die temperature, expansion ratio, floatability, moisture content

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