

## ABSTRACT

Fish farming is faced with the challenge of high cost of feeds because of the cost of high quality protein needed for formulation of the feeds. Thus, there is urgent need for alternative protein sources. The effects of substituting freshwater shrimp meal (FWSM) with black soldier fly larvae meal (BSFM) or adult cricket meal (ACM) on physico-chemical properties of hot-extruded fish feed pellets were investigated. The FWSM protein in a 26 g/100 g protein fish feed formulation was substituted at 0, 25, 50 and 75%, and moisture content of the formulated blends adjusted to 10, 20 or 30 g/100 g prior to extrusion. Floatability, expansion rate, bulk density, durability index, water absorption index, water solubility index, and water stability of extruded pellets were determined. Sinking velocity and the total suspended and dissolved solids in water were determined for the optimal pellets. Pellet floatability was not influenced by the type of insect meal but the interaction between level of inclusion and moisture content of the feed at extrusion. Pellets with high floatability >90% were produced from all feed blends at 30 g/100 g moisture content. Expansion ratio, was not influenced by type of insect meal or the level of inclusion but by the moisture content whereby feed blends extruded at 30 g/100 g moisture gave pellets with high expansion ratio ~60%. Bulk density was influenced by the interaction of the three factors. Pellet durability and water absorption indices were not influenced by the investigated factors or their interactions. Processed pellets were generally highly durable (99%) out of water, but the stability in water was significantly influenced by the interaction of type of insect meal level of inclusion and moisture content at extrusion. Water solubility increased with increasing extrusion moisture. Overall, it was possible to process good quality extruded pellets with 75% BSFM or 75% ACM at 30 g/100 g feed moisture.

**Keywords:** aquafeed, extrusion, edible insects, processing