Abstract

Single screw extrusion cooking of fish and rice flour blend with two fish varieties Bombay duck (*Harpodon nehereus*) and Khoira (Indopacific tarpon) were studied under the process variables in the range of temperature (100-200° C), screw speed (70-110 rev/min), fish content (5-45 %) and feed moisture content (20-60 %). The extrudate properties studied were expansion ratio (ER), bulk density (BD), hardness (H) and water solubility index (WSI). Experiments were conducted based on rotatable experimental design. The data were analyzed by contour maps. The problem was solved for optimizing the process variables using genetic algorithm (GA). The program developed in C and VC++ language can solve any order of the polynomial and any number of independent variables and is process independent. The optimum process conditions obtained using GA were pinpointed and were within the experimental zone. The common optimum process conditions were temperature 200° C, screw speed of 109.78 rev/min, fish content of about 45 %, and feed moisture content of 39.09 %. Temperature and feed moisture content influenced all the extrudate properties. Fish content of the feed played a major role in interacting with feed moisture content. The extrudate properties varied with change in fish variety and its composition. The loss of vitamins A and E (total tocopherols) was not appreciable during extrusion cooking but was significant at the end of 45 days of storage. Only treatment with sodium bisulfite but not extrusion cooking alone could remove fish flavor from the dry extrudates. Textural properties improved at high temperature, high fish content and medium moisture content in both the fish varieties. The dry extrudates can be stored inside low-density polyethylene (LDPE) of 150 μm thickness for a period of 15 days at 40 to 70 % relative humidity levels and at a temperature of 30° C without peroxide values exceeding 100 mg/kg. The product fried for 15 sec was most acceptable based on sensory analysis.

Keywords: Extrusion cooking, optimization, genetic algorithm, microstructure, fish flavor