DEVELOPMENT OF A SMALL-SCALE FISH FILLETING MACHINE FOR ROHU (LABEO ROHITA) FISH

Jairaj P. (16AG90J07)

ABSTRACT

Indian major carps (IMCs) viz. rohu (*Labeo rohita*), catla (*Catla catla*) and mrigal (*Cirrhinus mrigala*) are the important freshwater species cultured in India and most of the Asian countries. In India and other developing countries, they are marketed locally with minimal processing and no value addition due to the lack of suitable and affordable processing machines. Processing and value addition needs to be encouraged through the development of small-scale and affordable fish processing machines for small and marginal fish processing industry. Therefore, the present study was undertaken to design and develop a small-scale rohu fish filleting machine considering the morphometric measurements and mechanical properties of rohu fish. The process optimization, performance evaluation and cost economics of the developed machine were also carried out. The developed machine can be used for catla, mrigal and other fish species with little or no adjustments having similar morphometric measurements.

Twenty five random samples of rohu fish were selected at their harvestable size with weight ranging from 290 g to 2100 g. The morphometric measurements of rohu fish were the total length (45.89 \pm 5.68 cm), standard length (37.54 \pm 4.17 cm), head length (9.35 \pm 1.04 cm), body depth (10.14 \pm 1.63 cm), body thickness (5.9 \pm 0.85 cm) and backbone thickness (11.2 \pm 4.91 mm). Mechanical properties including the angle of repose over steel surface (20° to 22°) and specific filleting force (5 N/kg) were also recorded. The measured morphometric and mechanical properties of rohu fish were used in the design and development of a small-scale rohu fish filleting machine. Process optimization was performed by Inscribed Central Composite Design in Response Surface Methodology for the developed machine. Rotational speed of blades, conveyor speed and water flow rate were taken as process variables, and performance index of the machine was taken as response for the optimization. The responses of the machine at its optimal settings were found to be 33 ± 1 fish/min as capacity, 82.48 ± 0.97 % as overall filleting efficiency, 54.54 ± 0.87 as quality index value of fillets and 93.16 ± 0.28 W h as energy consumption of the machine. The total cost of the developed machine was calculated to be INR 70000 and the cost for filleting a rohu fish of by the machine was estimated as INR 0.06 compared to INR 1.04 by manual filleting of same sized rohu fish (700 g to 800 g weight). The performance and cost economics results indicated that the developed machine is an efficient and cost-effective one, and it can be easily adopted by small or marginal fish processing industries in India.

Keywords: Indian Major Carps; Rohu Fish; Morphometric Analysis; Small-scale Fish Filleting Machine; Process Optimization; Performance Index; Cost Economics