Composition profile of shrimp waste collected from retail markets

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Shrimp waste, including the head and exoskeleton, is an important discard from local retail shops as well as from seafood processing industry. It has gained global interest from research as well as sustainability point of view (Mathew *et al.,* 2020). Currently, shrimp processing waste is utilized for the production of shrimp meal and chitin. As a country, India has a huge amount of shrimp discards, especially from seafood export industries which offer no difficulty in sourcing the raw material for secondary fish processing industries. ICAR-CIFT expand is actively working on various aspects of utilization of shrimp processing discards including process development, development of machinery and product innovation (Prabhu and Radhakrishnan, 1975; Joshy *et al.,* 2016; Renuka *et al.,* 2020).

This present report is on the proximate composition of shrimp discards collected from local fish retail shops. The waste collected comprises of head waste and cuticles. Thorax and cuticles were manually separated and excess moisture was removed using tissue paper. To obtain the shrimp head extract, the whole waste was ground in a household blender and squeezed by placing between two layers of cheese cloth. From the shrimp extract, the protein isolate was prepared by adjusting the pH to 4.5 followed by centrifugation to collect the pellet, referred as isolate. The proximate composition was analysed as described in AOAC (2019). Chitin content was calculated from alkali-insoluble nitrogen content using the factor value of 14.51(Díaz-Rojas *et al.,* 2006). Protein content was calculated after subtracting the chitin nitrogen and multiplying the value with the factor of 6.25.

The compositional data was generated parts wise which is essential as a baseline information for obtaining better insight into the process as well as product development. It is well established that the proximate composition is subjected to variation with reference to species, size, age, sex, feeding ground, body parts, biological stages, storage conditions, pre-treatments, state of raw material etc. Despite such variations, from the commercial point of view, making such data available for the use of stakeholders will open new innovative thinking and expand the uses of whole waste/parts for different purposes. Among the parts/products evaluated, the moisture content was high (more than 80%) in shrimp protein extract and followed by whole waste. The lowest moisture content was found in the thorax followed by the cuticle. This information will be much useful while designing the dryers and developing any preservation techniques. Adjusting the pH followed by centrifugation to obtain the shrimp pellet, reduces the moisture content from shrimp protein extract by 12%. Hence, such operation can be employed to reduce the volume of material, for further processing. However, one should be careful in assessing recovery of the protein from such biological fluid (supernatant).

Among the samples studied, the highest protein content was found in isolate (15.00%; w.b). The cuticle has got around 11% proteins. The whole waste had an average protein content of

5.6%. Generally, in retail shops, the wastes are kept along with wash water which is likely to increase the water holding of proteins resulting in lower protein content on the basis of unit mass. However, in the present study care was taken to drain the excess free flow water while collecting the samples. The whole shell waste contained average protein content of 6.80%. Protein recovery is an active area of research as it has many applications including in food, feed and agricultural industries.

Chitin content was found to be highest in the thorax followed by cuticle. The appendages also contribute to significant amount of chitin as revealed by the head sample prepared without thorax. The average chitin content in whole waste was 4.31%. The crude lipid was highest in protein isolate. This could be due to emulsification, interaction with protein molecules and entrapment while proteins form aggregates at iso electric pH (4.5). It should be mentioned that in the present study isolate was prepared by direct pH lowering without alkali solubilisation. In general, the shell fraction had very low lipid content and the least was recorded for cuticle.

Ash content was highest in the thorax (21%), followed by whole shell waste (14%). In the commercial conventional chitin process, HCl is employed to demineralize the chitin. The whole shell waste contained 4.54% ash. The processor should be careful in using the acid with reference to type, strength and volume depending on the type of raw material used. Fresh whole shell waste requires less acid, compared to soluble protein removed whole shell waste (thorax, cuticle and appendages). However, the interference of protein in demineralizing the whole waste as raw material cannot be ruled out. It may equalize a certain amount of HCl to make it unavailable for demineralization reaction.

The present report form a baseline information on shrimp waste which are used by stakeholders, researchers and students towards shrimp waste utilization, process innovation and product development.

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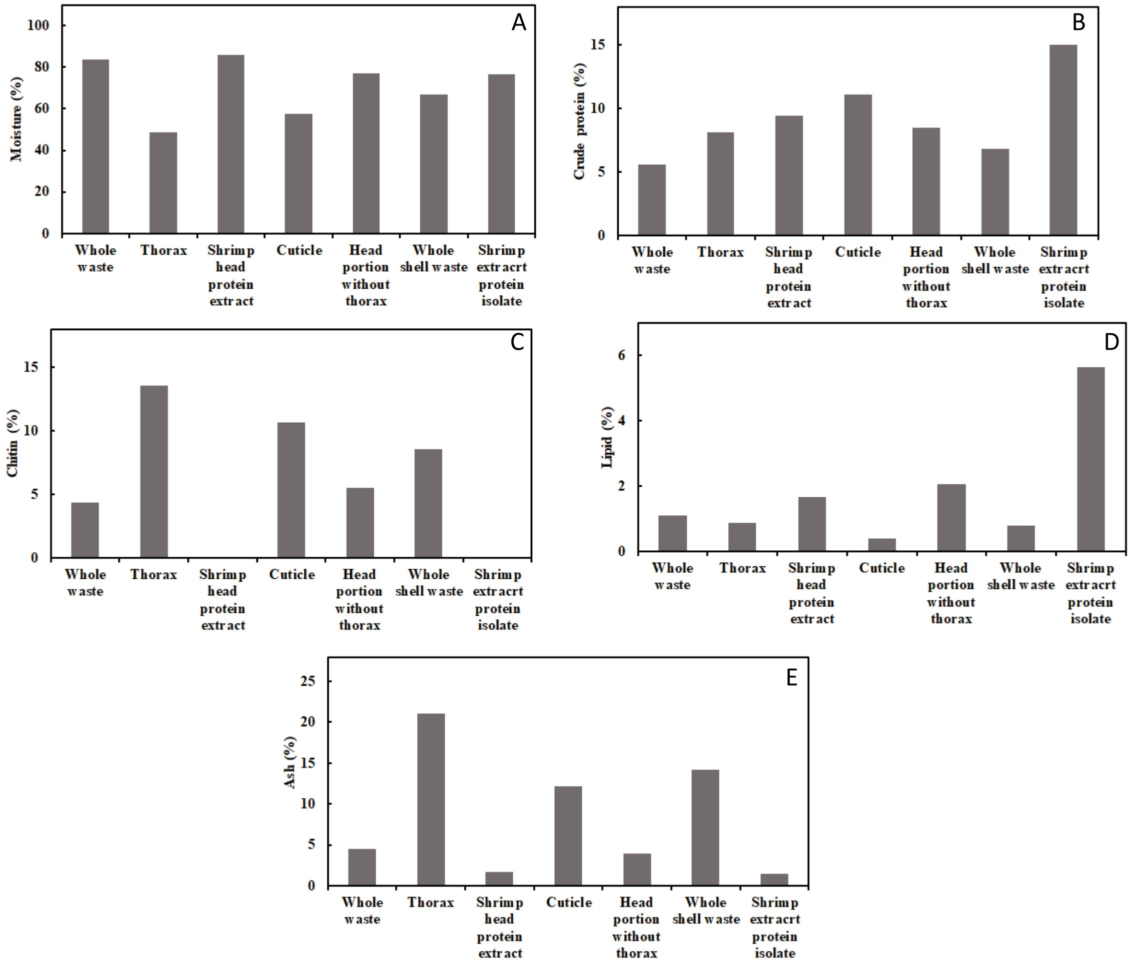

Fig.1 *Proximate profile of shrimp waste. (A) Moisture content; (B): Crude protein (%); (C): Crude Chitin (%); (D): Lipid; (E): Ash content (%)*