

Impact

India has a potential of producing 10,000 tonnes of chitin per annum from the prawn shell itself. Other unutilized sources like squilla are also available. At present, the chitin /chitosan industry in India is utilizing only less than 20% of the shell waste with an earning of Rs. 100 crores annually. This has solved the environmental problem significantly in addition to job and income generation. India has the potential of meeting the increasing demand of chitin/chitosan by utilizing the unutilized resources.



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UTILISATION OF PRAWN SHELL WASTE-CHITIN, CHITOSAN AND GLUCOSAMINE HYDROCHLORIDE



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Utilisation of Prawn shell waste- Chitin, Chitosan and Glucosamine hydrochloride

The shrimp processing industry in India turns out more than 1.25 lakh tonnes of head and shell waste per annum. Until recently, it was creating enormous environmental pollution problems. Nearly 7,000 tonnes of chitin can be produced from the prawn shell which is thrown out as waste now. Another alternate source is the squilla, which is a by-catch in shrimp trawlers, which is now discarded. Chitin is extracted from the prawn shell as this is the raw material for production of chitosan and glucosamine hydrochloride. Chitin is a macromolecular linear polymer of anhydro-N-acetyl D-glucosamine whereas chitosan is its deacetylated form. Glucosamine hydrochloride is produced by the hydrolysis of chitin by hydrochloric acid. During the extraction of chitin, the protein in the shell can also be recovered for use in animal feeds.

CIFT has developed technology for production of chitin, chitosan and glucosamine hydrochloride from prawn shell waste. The laboratory method worked out for preparation of chitosan is summarised below.

Method of preparation:

- Treat the washed prawn shell with 1.25 N hydrochloric acid (commercial) at room temperature for 2 hours so as to remove the calcium and other mineral contents in the residue completely. Wash the residue free of acid.
- Boil the acid treated shell (demineralised shell) in about 3 per cent solution of sodium hydroxide (quantity just enough to immerse the shell) for about 30 minutes. Drain off the

solution and repeat the treatment with the residue. Treatment with sodium hydroxide removes the protein content of the shells. Wash it free of alkali. **The residue obtained is almost pure chitin.**

- Treat the chitin at 95°C to 100°C with 1:1 solution of sodium hydroxide for 90 minutes. Wash with water till it is free from alkali and then dry to get the final product, chitosan. (Test the completion of the reaction by testing the solubility of the product in 1% acetic acid. Chitosan readily dissolves in dilute acetic acid giving a viscous solution).

The yield of chitosan is about 4% the weight of the fresh prawn shell and 20% of the dry shell.

Uses

Chitosan finds use as a sizing material for rayon and other synthetic fibres, cotton, wool etc. It may also be used in the preparation of cosmetics and pharmaceuticals and also as a water clarifying agent. Chitosan dissolves easily in dilute solutions of organic acids to give viscous solutions. It can be precipitated by neutralising the solution with alkali.

Studies have also shown the effectiveness of medical application of chitosan in the form of chitosan impregnated gauze and chitosan film for treatment of chronic wounds and external ulcers, to arrest/minimise bleeding in neurosurgery, as artificial skin and kidney membrane, in plastic surgery, as contact lens, in periodontal application etc.

The application of glucosamine hydrochloride is also as a dietary supplement, mainly in controlling arthritis. The demand is increasing day by day and it is estimated to be more than 2000 tonnes per month.