Scientific Report *on the*
implementation of the project
"Valorization of Chitinous Material from Recyclable Waste by Using It in a Some Potential Biological Applications (ReWaChi)"
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Optimisation of chitosan extraction from marine litter (environmental or food sources) and from capsules of *Rapana venosa* eggs

Abstract

The study conducted this year led to the following conclusions:

- Recoverable waste for the production of chitin or chitosan from sources such as recycled food residues from shellfish consumption, according to the data analysed in the food preferences questionnaire, can reach approximately 200 g/month/person.
- Preparation both in the private environment and in restaurants can offer the opportunity to collect and capitalize, in the short term, a consistent recyclable quantity, in the coastal area, especially in the summer season, per 1000 consumers are approximated a possible biomass of 54.5 kg / month of which 10.9 kg is the recoverable waste.
- The most important means of assessing and collecting environmental waste is associated with the tracking of release effects, given the change in predictable and unpredictable seasonal physico-chemical factors with major potential, respectively, the storm.
- Differences in the frequency of waste are correlated with natural factors (sediment, substrate, abundance of species, their ecology or biology). The observations allow anticipation of obtaining varied biomass and a specific composition for each station and harvest season.
- The most abundant are the bio-wastes from the natural environment, from the Năvodari sector, near the artificial dam, where a wide range of factors are concentrated, also favoring the level of possibilities of occasional or post-storm extraction.
- *R. venous* provides a considerable mass of organic waste, consisting of empty egg capsules, distinguishing an agglomeration in the upper portions of the supralitoral, respectively the beach accessible to rapid harvesting.
- The deproteinization treatment influences the degree of deacetylation, this being the maximum when the concentration of NaOH is 5% and the processing temperature is low, the conditions in the treatment with the HCl solution do not significantly affect the degree of deacetylation.
- When both the molar mass of chitosan and the degree of deacetylation are important, then the conditions in the acidic treatment become important. The concentration of HCl may vary within the studied limits, but acid treatment should be carried out in a single step when aiming for a chitosan with a high degree of deacetylation and high molar mass, while for a chitosan with a high degree of deacetylation, but small molar mass, acid treatment should be carried out with more concentrated solution of HCl and at least two repetitions. For the latter case, the contribution of the factors "HCl concentration" and "number of acid treatments" is significant.
- Good yields in obtaining chitosan, by chemical extraction from capsules of *R. venosa* eggs are obtained at the temperature of 90 °C, and the concentration of deproteinization solutions, regardless of the value, has the same influence. Thus, the extraction process can be considered as optimised, in terms of efficiency, by using a minimum NaOH concentration, at the processing temperature, of 90 °C.
- The evolution of the deacetylation degree with the variation of the two factors (the concentration of NaOH and the ratio of NaOH : chitin (v:m)) shows a continuously increasing variation of DD with the increase of both factors. In the field under investigation, the maximum DD value is at point $x_1 = 1$, $x_2 = 1$ corresponding to a concentration of 55 % NaOH and a V:m ratio of 15:1. As the experiment carried out at this point led to an average value of 99%, this is basically considered the optimal point.
- The experiments of the functionalization of chitosan have shown that with the proposed method it is possible to graft molecules on the chitosan chain.