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POTENTIAL RAW SOURCES OF CHITOSAN AND APPROACHES TO ITS PRODUCTION

In the conditions of acute shortage of natural resources and exacerbation of environmental problems the special value is acquired by research, allow mastering and introducing new technologies for obtaining biopolymers from renewable natural sources of raw materials. A special place among biopolymers is occupied by chitin and its very common modification, chitosan. Biopolymer chitin generates a linear aminopolysaccharide consisting of N-acetyl-2-amino-2-deoxy-O-glycopyranose units.

According to the chemical structure, it is close to cellulose and only inferior to its prevalence in nature [1]. The structure of chitin is a crystal lattice, and therefore the degrees of solubility and swelling of chitin in various media are rather low.

Chitosan is a product of chitin deacetylation and is the most studied of its water-soluble derivative (fig.1). In prevalence, it is second only to cellulose and is reproduced in nature from completely renewable natural raw materials [1].

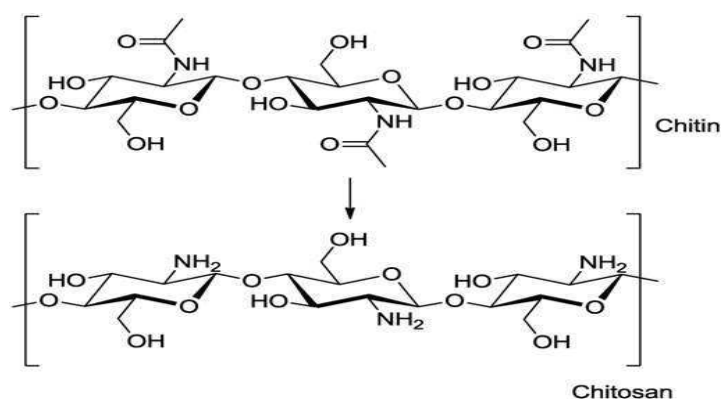


Figure 1 - Structure of chitin and chitosan

Increasing interest in chitosan is due to the expansion of its practical application as a specific sorbent, biologically active compound, etc. Chitosan is able to enter into reactions of both intermolecular interaction with polyelectrolytes, forming interpolymer complexes as well the complexation with metal ions [2].

A special kind of chitosan is “*Apis mellifera* bee”, more potent biologically active substance than crustaceans chitosan. A significant reserve of raw materials for the production of chitosan is the sub-population of bees *Apis Mellifera*.



Figure 2 – *Apis Mellifera* Honey bees (bringing honey)

In this connection, it is quite reasonable to obtain reproducible biopolymers of chitin and chitosan from beeswax *Apis mellifera*. (*Apis mellifera*) Honeybees, mainly failed during the wintering period and falling to the bottom of the shelter. In summer, the death of bees is much more significant than in winter, but less noticeable, as they usually die outside the shelter. Apisan is obtained from beeswax, or as it is called scientifically low-molecular chitosan-melanin complex [3].

In the summer during the active harvest and in the spring after wintering, the bee family is renewed by almost 60-80%. The strength of the bee family (the mass of worker bees in the bee family, measured in kg) is, on average, 7.5-8 kg. This makes it possible to treat bee shavers as a new promising source of chitin and chitosan along with traditional types of raw materials [4].

We used dry bee-picking, collected during the spring renovation of the bee family and containing a significant amount of chitin. Raw material is a black-brown mass with a specific smell. On a detailed examination, whole undeveloped bees and various parts of bees (head, chest, legs, abdomen, wings, etc.) are seen. Beespine contains the minimum amount of mineral substances, since the cuticle of insects is practically not mineralized. The mass of the undercoat was dried at a temperature of about 35°C, with a thin layer. The dried raw material mass of 30 g was crushed and demineralized (DM), followed by deproteinization (DP) according to the following scheme [5].

Demineralization (DM) was carried out according to the Hackman method by treating bees with 2M hydrochloric acid for 5 hours at room temperature. Deproteinization was carried out by treating the ground raw material with 1N sodium hydroxide solution for 1 hour at 80°C.

The mass was filtered and dried at room temperature. Each process was followed by washing the raw material to neutral reaction of the wash water (pH = 7).

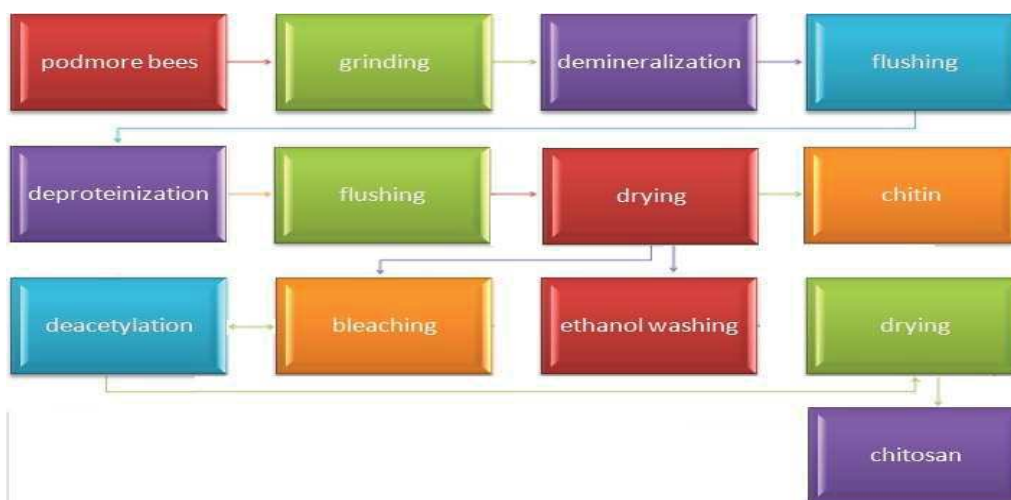


Figure 3 - Outline scheme for the production of chitin and chitosan

Thus, biopolymers of chitin and chitosan were obtained and characterized on the basis of a new advancing source - dry *Apis mellifera* honeybee. Taking into account the natural origin of *Apis mellifera* Honeybees and its degree of renewability, it can be concluded that this raw material is of great importance as a raw material for the production of polyelectrolytes with a set of unique properties.

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