EXTRACTION OF CHITOSAN FROM CERTAIN INSECTS

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Abstract. In this article, the results of determining the deacetylation level of chitosan biopolymer isolated from Leptinotarsa decemlinaeata using potentiometric titration and elemental analysis method are presented.

Key words: Chitin, Chitosan, Melolontha melolontha, Leptinotarsa decemlinaeata, Eurygaster integriceps, degree of deacetylation, potentiometric titration, elemental analysis.

The raw materials of chitin are diverse and widely distributed in nature. According to scientists, its reproduction in the world ocean is equal to 2.5 billion tons per year, and the annual world production potential of chitin is about 200 thousand tons.

It is not for nothing that scientists say that chitosan is a substance of the 21st century. Currently, chitosan research is conducted in 15 countries, more than 70 areas of its practical application have been identified.

Chitin, a substance widely distributed in nature, belongs to the class of biopolymers and is found in various crustaceans, insects and fungi. Natural resources can contain 30-40% protein, 30-50% $CaCO_3$ and $Ca_3(PO_4)_2$, 20-30% chitin. Chitosan substance is obtained by deacetylation of chitin substance several times with NaOH solution based on several steps. Chitosan was first used in Japan for its metal binding properties, and today the polymer is found in everything from surgical sutures, antibiotics to food products, dietary supplements and cosmetics. Depolymerized products of chitosan are non-toxic, non-allergic, biologically active, biocompatible, have no adverse effects on natural microorganisms, have antioxidant, antihypertensive, anticoagulant properties, anti-diabetes, anti-obesity, anti-allergy, anti-inflammatory, anti-cancer, neuroprotective and metalloprotein matrix inhibitory properties. widely used in pharmaceuticals, biomedicine, food industry, perfumery, biotechnology. Also, due to the high biological activity of chitosan and its derivatives, it is important in the prevention and treatment of chronic diseases. Chitin and chitosan are insoluble in water and most other organic solvents [1,2].

One of the easiest and most traditional methods of obtaining chitin for industrial use is from the shells of hunted shrimps. According to the experiment, it is possible to extract chitin biomass from domesticated insects with high reproductive ability, which are prone to reproduction, or widely distributed wild

insects in the conditions of Uzbekistan. These pests include bees and other types of wasps, mulberry silkworms, houseflies, beetles, and grasshoppers.

Chitosan is a linear heteropolysaccharide, mainly composed of units of 2-amino-2-deoxy-β-D-glucopyranose residues linked by a β-(1→4)-glycosidic bond. Some units consist of 2-acetamido-2-deoxy-β-D-glucopyranose residues[3;10].

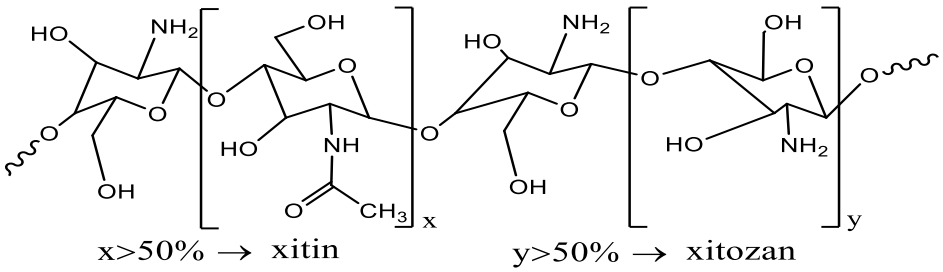
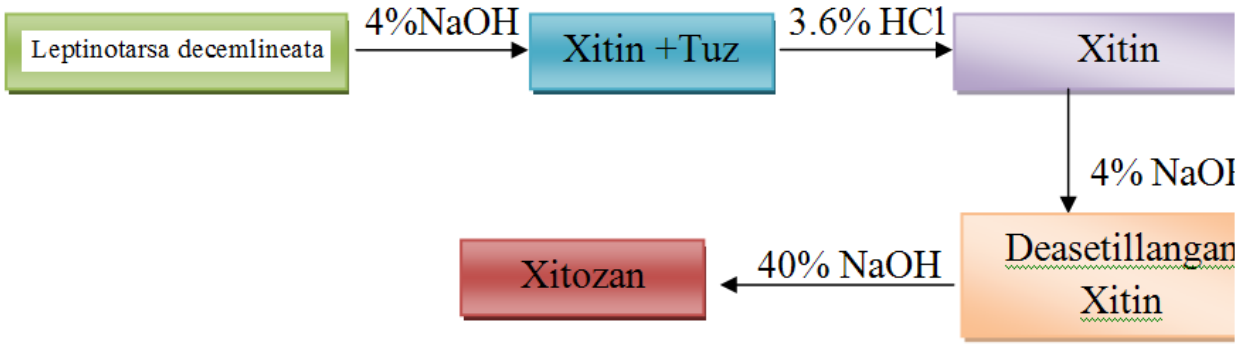


Figure 1. Chemical structure of chitosan biopolymer.

Based on the above information, we set out to isolate chitin and then chitosan from the composition of various insects widely distributed in our Republic. The chitosan extraction process (in the case of the Colorado beetle Leptinotarsa decemlineata) can be described using the following scheme:



The obtained results are presented in the following table:

№	The type of insect taken for the experiment	Amount received (grams)	Amount of product formed by treatment with NaOH and HCl and by deacetylation (grams)		
			3,6% HCl	4% NaOH	40% NaOH
1	*Melolontha melolontha*	100,0	56,355	19,624	15,193
2	*Leptinotarsa decemlinaeata,*	100,0	41,705	14,610	13,441
3	*Eurygaster integriceps*	100,0	46,113	17,035	10,302

References:

1. В.П.Варламов, А.В.Ильина, Б.Ц.Шагдарова, А.П.Луньков, И.С. Мысякина. Хитин/хитозан и его производные: фундаментальные и прикладные аспекты. Успехи биологической химии, т. 60, 2020, 317-368 с.
2. Гальбрайх Л.С. Хитин и хитозан: строение, свойства, применение. Соросовский образовательны й журнал, том 7, №1, 2001. с.51-56.
2. Sannan T., Kurita K., Ishakura Y. Studies on chitin. Solubility change by alkaline treatment and film casting // Die Makromolekulare Chemie. Short Communication- 1975.-vol.176. №4 p.1191-1195.
3. Плиско, Е.А. Изучение хитозана / Е.А. Плиско, Л А. Нудьга. С.Н. Данилов/Высокомолекулярные соединения. - 2001. - Вып. 3.- С.70-87.
4. Sh.Karimov, A.Xaitbayev. Xitozan ajratib olish usullarini optimallash. FarDU ilmiy xabarlar. 2022-yil 6-son. 472-475 b.