BIOTECHNOLOGICAL ASPECTS OF SEAWEEDS PROCESSING OF ARCTIC SEAS

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Seas of Arctic zone – White Sea and Barents Sea – are practically a perennial source of algae. At present time to seaweed as to perspective raw material for receiving various on the properties and functions of biologically active substances and foodstuff interest of scientists and experts became more active. Seaweeds and products of their processing are widely used in medicine, biochemistry, genetic, microbiology and a lot of other fundamental and applied sciences.

Commercially important brown seaweeds of Arctic Russian Seas are Laminariales – *Laminaria saccharina* and *Laminaria digitata* and Fucales – *Fucus vesiculosus* and *Ascophyllum nodosum*. Considerable volumes of them are caught and processed annually for the purpose of producing a various production.

Analysis of Laminariales and Fucales chemical composition has shown that the content of mineral substances decreases and the quantity of organic components increases in tissue of seaweed to the end of a summer season.

The most appreciable changes with minerals substances in tissue at Laminariales. The content of minerals decreases from 28–30% in June to 18–19% in September that naturally leads to increase of the general content of organic substances in seaweed from 70 up to 82% (Repina et al., 2004; Podkorytova, 2005; Podkorytova et al., 2007).

The content of mineral components in *Fucales* decreases from 19–21.5% from June down to 17.9-18.2% in September. In the sum of organic substances the greatest share belongs to alginic acid which is structural polysaccharide of great importance at processing of algae.

Changes in contents of alginic acid in Laminariales are insignificant, and approximately equal 2–3%. In *Fucales*, especially in *A.nodosum,* this changes are strongly pronounced and reaches to 7%. Such information corresponds common opinion on biosynthesis of alginic acid which collects in brown seaweeds at summer and autumn seasons (Podkorytova, 2005). Exactly in this time seaweeds of White and Barents Seas are the most valuable raw materials for alginate receive.

At the process of biosynthesis brown seaweeds accumulates significant value of low-molecular carbohydrates, generally, mannitol. The content of mannitol in *L. saccharina* and *L. digitata* is a rather stable at summer season date which slightly grows by September up to 20–23% in *L. digitata* and to 19–20% in *L. saccharina*. Fluctuations in contents of mannitol in Fucales of the White Sea are insignificantly – 1–4% on extend of the summer season. In *F. vesiculosus* the content of mannitol hesitates between 5.7 and 9.9%. At the same time in *A. nodosum* fluctuations approximately equal 5.1–7.1%. In general *Laminariales* differs for their higher content of mannitol (4–5 times higher) compared to *Fucales*. The tendency of mannitol content increase is marked in *Laminariales* at the beginning of July and further – some decrease at the middle of July, which is probably related with usage of mannitol by seaweed for synthesis of structural polysaccharides (Repina et al., 2004).

At the process of biosynthesis of an organics in brown seaweeds the laminaran, which plays role of a spare substance, collects. The content of this low-molecular polysaccharide varies between 2% and 20% depending on a species of seaweeds (Zvyagintseva et al., 2002). As for laminaran of brown seaweeds of White Sea – its dynamics for Laminariales and Fucales simultaneously shows growth in 2–3 times by the end of summer season (Repina et al., 2004).

At this time Fucales are intensively investigated and used to receiving probiotics since they synthesize of polysaccharides sulphat known as fucoidan (Painter, 1983; Usov et al., 2001). These biopolymers show different biological activity: anticoagulant, antivirus, anticlerical, anti-inflammatory, antineoplastic etc. As a main source of this valuable polysaccharide we treat *F. vesiculosus,* which received its highest content form 13,4 to 16,5% with some growth by the autumn season. In *A. nodosum* noticed stable in content of this polysaccharide with some limits between 10.0–11.5%. Information about content of fucoidan reveals ability of complex usage of Fucales for the purpose of receiving extracts containing other probiotics – fucoidan and others (Repina et al., 2004; Podkorytova et al., 2007).

Laminariales and Fucales just slightly differ by content of protein. At the time the whole tendency of changing protein content – maximum in June and minimum in September – still traced. The content of Iodine in seaweeds is an indicator of value of this raw material as a natural source of iodine for normal functioning of human organism (Podkorytova et al., 2005). Content of Iodine in Laminariales is 2–3 times higher compared to *Fucales* and equals 0.23% in *L. digitata* at the middle of June. In *F. vesiculosus* maximum takes place at July and in *A. nodosum* at August.

Thus, system knowledge about of seaweed chemical composition, maximums of accumulation of important biocomponents and the biotechnological approach to their processing allows to carry out consecutive extraction of biologically active substances with receiving not only them in the allocated condition, but also drinks, the foodstuff possessing treatment-and-prophylactic properties and well influencing a human body.

On the basis of the researches certain patterns in accumulation of biologically active substances by brown seaweed of Arctic Seas in the process of their growth are determined and the new complex technology of brown seaweed processing of *Fucales* and *Laminariales* species with receiving of functional foodstuff (Repina et al., 2004) and probiotics to nutrition is developed (Usov et al., 2001).

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PROPERTIES AND FUNCTIONS OF VERY LONG POLYENOIC FATTY ACID CHAINS OF MEMBRANE LIPIDS (COMPUTER SIMULATION STUDY)

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Biological membranes are heterogeneous: they consist of various lipid molecules with various head groups and fatty acid (FA) chains, biomembranes include proteins as well as other molecules. Membrane lipids, being organized into a bilayer structure, serve as a basic matrix for other constituents. The most commonly occurring biomembrane FA chains have 12 – 22 carbons; they may contain 1 to 6 *cis* double bonds in various positions, i.e., the chains may be saturated, unsaturated or polyunsaturated (PU). As a rule, the double bonds of natural FAs are methylene-interrupted. Phospholipids (in particular phosphatidylcholine, PC) of some tissues were found to contain a series of unusial FAs with a chain longer than 22 carbon atoms, the so-called 'very long chain' (VLC) FAs. These chains (VLC FAs or VLC PUFAs) are important components of different classes of lipids in all organisms from bacteria to man (Řezanka, Sigler, 2009), in spite of the fact that VLC PUFAs are rare, they represent a minor component of the total fatty acids (~1 – 5%). For instance, marine sponges contain VLC PUFAs 26:3(n-7)*cis*, 28:3(n-9)*cis*, 30:3(n-7)*cis*, 30:4(n-6)*cis* and 30:5(n-3)*cis* (Litchfield et.al., 1979); see also data of the other authors (Joseph, 1979; Řezanka, 1989; Djerassi, Lam, 1991; Řezanka, Sigler, 2009). Marine dinoflagellates