

## Breeding of seabuckthorn for biomass

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Traditionally, the major product from seabuckthorn is fruits. It is known that leaves and branches are a valuable raw material for obtaining biologically active substances. In leaves, it has been found a wide range of unsaturated fatty acids and other compounds, which have anticancer and antioxidant properties. In cortex serotonin contents, this hormone is an important neurotransmitter in animal and plant organisms; it is involved in transmitting neural impulses. However, processing of biomass doesn't have yet common practice. This is probably caused by undeveloped industrial technologies of cultivation and processing of it. Green biomass of seabuckthorn generally is removed at harvesting as the by-products. Nevertheless, the ways of extracting valuable substances from biomass have been studied and interest in this research increases.

In selection story, a task to obtain forms with abundant biomass that is suitable for industrial harvest and processing is never set.

During the last few years, we tried to select seabuckthorn that is suitable for harvesting of biomass. Yang green first-year branches with leaves and lignified second-year branches without leaves were considered as raw material. Known cultivars, plants from seeds, seabuckthorn from other geographical regions were tested as source for biomass. Selection criterion were quantity and length of shoots, their good regeneration after cutting, weight of fresh and dried biomass. The first breeding step is visual estimate of plants; plants with abundant biomass are selected; the second step — checking of regeneration; observations of new growing after maximal cutting of leaves and branches is carried out; and the third step — measuring of fresh and dried biomass weight per each plant. Plants that showed good survival after cutting and excellent growth of new shoots are selected for further work. In our case, quantity and quality of fruit are not taken in account. Harvesting of biomass is led by cutting with creation of a special form for further appropriate harvesting. Namely, green biomass from each plant is trimmed not completely but only horizontally and sides. This provides new growing biomass and its suitable harvest in the next year.

Very different results in indexes of green biomass are obtained. Some plants from seeds of cultivars 'Ziryanka' and 'Kapriz' showed the good regeneration and quite high output of biomass, 0.7–2.2 kg of fresh and 0.3–0.8 kg of dry from each plant. Geographically remote cultivar 'Yantarnaya Yagoda' (from the city Michurinsk) showed remarkable biomass growing, 2.5 kg of fresh and 1.0 kg of dried per plant. It should be noted that fruit of this cultivar don't repine in Siberian conditions because a short vegetative period as compared with Michurinsk. However, they could be used specifically for biomass obtaining as high-growing plants with long branches and big leaves. Some local cultivars with good growth of branches could be considered as source of biomass. Cultivars 'Ziryanka', 'Zarnitza' and 'Sibirsky Rumyanetz' gave 0.8–1.2 kg of fresh and 0.4–0.6 kg of dried green biomass. Seabuckthorn from China (Qinghai-Tibetan Plateau) have a rich content of biologically active substances, but short branches (to 15 cm), small leaves and very great amount of thorns.

The harvest of lignified branches for obtaining of serotonin should be carried out in the early spring or the later autumn when leaves are absent. All cultivars and forms can give 0.3–0.5 kg of branches, cultivar 'Yantarnaya Yagoda' showed the output of lignified branches — to 1 kg.

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It is necessary to develop a special cultivation of seabuckthorn to harvest biomass in industrial scale. This may be dense planting with formation special sphere of plants that suitable for mechanic harvesting. There is a method of horticulture cultivation as “meadow garden”. The top of young plants are bent to ground, further vertical shoots covers all planted plot. This way could be used for cultivation of seabuckthorn for both fruit and biomass. At present time, we test this method on some cultivars. In this year, we obtained green sprouts and leaves from cultivar ‘Yantarnaya Yagoda’. The output of biomass was 7 kg of fresh and 3 kg dried biomass from 10 m<sup>2</sup>. At biomass harvesting, to choose method of mechanic cutting is easier, as the main task are only branches and leaves without fruit.

In perspective, it is possible to use male seabuckthorn plants for setting up plantations for biomass. Their advantage is the absent of fruit that can disturb at biomass harvesting. For this case, existing male cultivars (‘Aley’, ‘Gnom’) or specially selected forms could be used.

Thus, there is a practical sense to led the breeding of seabuckthorn and develop the special cultivation technologies for obtaining of biomass as row material for pharmacological industry.

**Keywords:** alternative usage, *Hippophae*, male plants, technical cultivars