DOI: https://doi.org/10.5564/mjas.v21i02.907

SAPROPEL IN THE TECHNOLOGY OF PRODUCTION OF SEA-BUCKTHORN SEEDLINGS

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ABSTRACT

The biological effects of sapropel in the technology of growing sea- buckthorn seedlings are studied. It is established that the rooting of green cuttings of the studied varieties on the sapropelic substrate is higher compared to the classic version – peat + sand by 2,0 – 31,3%. It is revealed that the composition of the substrate, the use of the root formation stimulator and varietal characteristics of culture influence the further development of plants grown by the non-transplant method at the place of green cuttings rooting. The most positive effect on the quality of the sea-buckthorn planting material is obtained on the substrate of peat + sand. It is recommended to use the sapropel-based substrate for rooting of the sea-buckthorn stem cuttings in the production conditions, and to apply the transplant method for seedlings further growing.

KEY WORDS: sapropel, sea buckthorn, green cuttings, rhizogenesis, root formation stimulator, seedlings.

Only 15,6% of the recommended level of fruit and berries consumption per year is provided due to own production in the Siberian federal district (Mistratova, 2013). It is scientifically proved that in Siberia berry and fruit plants accumulate significantly more vitamins and other biological compounds, therefore, they have high nutritional value. In addition, fruit and berry plantings carry out the sanitary-hygienic function, purify the air from dust and aerosols, absorb them, simultaneously generating volatile substances that kill bacteria. Therefore, the presence and the expansion of the gardens using planting material grown in the conditions of sharp continental climate of the region are the integral part of agriculture development in general and maintaining a desirable level of ecological situation in the region. Sea-buckthorn refers to the number of valuable berry crops in the Krasnoyarsk Territory. Among the

garden plants, cultivated in the region, it is the most winter-hardy: it can withstand the temperature drop up to – 50^0 C. Sea-buckthorn berries are the unique natural multivitamin: 100 g of berries contain up to approximately 450 mg% of ascorbic acid (Kolesnikova, 2006). Green cutting is the main method for sea-buckthorn seedlings growing. The soil substrate has a significant influence on the rooting of cuttings. Its upper layer, in which the formation of callus and roots of the planted green cuttings is taking place, must have favorable water-physical properties, be cheap and easy to use. Currently, various materials of inorganic and organic origin, characterized by different efficiency, are used as a substrate. Sea-buckthorn has specific requirements for the soil substrate because of the peculiarities of the root system functioning. There are large reserves of sapropelic raw material in the Krasnoyarsk Territory (organic-mineral sediment deposits containing proteins, fats, and biologically active substances (vitamins, growth stimulators, enzymes, hormones, antibiotics, etc.) and humic acids, as well as the vital macro- and microelements) (Sendrukov, 1999; Yamskikh, 2001) and its application as substrate for rooting of sea-buckthorn green cuttings, in our opinion, seems to be promising. Therefore, the aim of this work is to study the influence of the sapropelic substrate on the rooting of green cuttings and planting material quality of sea-buckthorn. The objects of the research are nutrient substrates, obtained from local agricultural raw materials. As a control, we used the traditionally recommended substrate peat + sand in a volume ratio of 1:1 for the rooting of green cuttings. For the second variant of the experiment we used the substrate of sapropel in a pure form (deposit Lake Small Kyzykul of Minusinsk district in the Krasnoyarsk Territory). The green cutting was carried out according to the standard technique (Tarasenko, 1991). The accounting area of plots was 1 $м^2$, repeatability of the experiment was triple, and placement was systematical. Before planting the cuttings were treated with a stimulator of root formation – hetero-auxin in a dose of 20 mg/l, exposition was 16 hours. The length of the cuttings was 15 cm. The scheme of the sea-buckthorn planting was 7×5 cm. The quality of seedlings was tested in accordance with OST 10130-88. The varieties of sea-buckthorn were Businka, Chuiskaya and Zolotistaya. The reaction of the sea-buckthorn varieties on the substrate is different. So in the control variant (peat+sand) rhizogenesis of cuttings of Businka varieties constituted 77,8 %, other varieties had lower indicator: Chuiskaya – 68,7 %, Zolotistaya – 66,7 %. The sapropelic substrate appeared to be more favorable medium for the rooting of two varieties of Businka and Chuiskaya. Although the effect for Businka varieties is negligible – the increase in the survival of the cuttings is just within 2,0 %. The reaction of Chuiskaya varieties is more vivid: sapropel has contributed to the better rooting of cuttings by 31,3% in relation to the peat and sand mixture. The rooted cuttings in the second year of studies were grown further on the site of rooting, because the transplantation into the open ground hinders the development of plants and reduces the yield of standard seedlings. In addition, according to T. M. Barybkina (2011), cultivation by the non-transplant method allows to reduce the technological cycle of production by one year. Favorable winter conditions had a positive impact on the over-wintering of the rooted cuttings – the safety was 100 %. For Businka varieties the use of the sapropel as a substrate is better for rhizogenesis, but is not effective for producing of sea-buckthorn planting material, the output of non-standard seedlings on all variants of the experiment was higher than 50, 0 % (table 1). When growing seedlings of Zolotistaya sea-buckthorn varieties on the allotment and in the variant with sapropelic substrate we obtained 51, 1 – 79, 4% of non-standard seedlings (table 2).

Table 1.

The quality of sea-buckthorn planting material of Businka varieties, %

Growth stimulators	1 sort	2 sort	Non-standard
Substrate – peat + sand			
1. Control (water)	15,3	10,0	74,7
2. IAA (indole acetic acid)	18,5	14,5	68,0
Substrate - sapropel			
1. Control (water)	0	20,0	80,0
4. IAA (indole acetic acid)	10,2	35,5	54,3

The treatment of cuttings with hetero-auxin solution affected the biometric parameters of the planting material – marketability of seedlings was higher in comparison with cuttings soaked the in water. The yield of seedlings of the 1st and 2nd sort amounted to 46, 4 – 48, 9%.

Table 2.

The quality of sea-buckthorn planting material of Zolotistaya varieties, %

Experiment variants	1 sort	2 sort	Non-standard
Substrate – peat + sand			
1. Control (water)	9,6	14,2	76,2
2. IAA (indole acetic acid)	31,4	17,5	51,1
Substrate - sapropel			
1. Control (water)	5,0	15,6	79,4
2. IAA (indole acetic acid)	4,0	42,4	53,6

For Chuiskaya varieties (table 3) the substrate peat + sand with the treatment of cuttings with hetero-auxin also proved to be more effective, the output of high-quality planting material was 60, 3 %. Summarizing, we should note that the use of sapropel-based substrate as a medium for the rooting of sea-buckthorn green cuttings is appropriate. All the studied varieties showed the better survival rate on it compared to the classic version – peat + sand. It is established that the development of seedlings grown from green cuttings is affected by the substrate composition, the use of root formation stimulator and varietal characteristics of culture. The most positive effect on the quality of sea-buckthorn planting material was obtained on the substrate of peat+sand.

Table 3.

The quality of sea-buckthorn planting material of Chuiskaya varieties, %

Experiment variants	**1 sort**	**2 sort**	**Non-standard**
Substrate – peat + sand			
1. Control	12,5	15,0	72,5
2. IAA (indole acetic acid)	28,0	32,3	39,7
Substrate - sapropel			
1. Control	3,6	18,0	78,4
2. IAA (indole acetic acid)	0	20,0	80,0

It is reasonable to use the sapropel-based substrate for the rooting of sea-buckthorn stem cuttings in the production, but in the second year of further growing of seedlings it is recommended to use the transplant method in the technology of sea-buckthorn green cutting.

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