

Annotation

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Global trends of bioethanol production and using sugar beet and rhizocarpous chicory as raw materials in Ukraine

The necessity of using various raw materials for bioethanol production and their effectiveness in scientific studies is considered by the leading scientists, in particular V.V. Khareba [1] Ya.B. Blum, H.H. Heletukha, I.P. Hrygoriuk and others [2], M. Kaletnik [3], M.P. Kovalko, O.M. Kovalko [4] M.V. Roik, V.L. Kurylo, O.M. Ganzhenko [5] and many others. However, the choice of raw materials for bioethanol production in the conditions of Ukraine and way of its processing is debatable, therefore this topic is relevant.

The aim of this work is to analyze current bioethanol production in the world and in Ukraine using the methods of analysis, synthesis and generalization. Sugar beet and rhizocarpous chicory in experiments were grown by the method of state variety testing.

Priority in the world production of motor fuels is making biological types - bioethanol, ETBE (ethyl tertiary butyl ether), biodiesel, biogas and so on. This is facilitated by the presence of almost six specialized ethanol plants with a total capacity of more than eighty million tons. Now the largest global producers of ethanol are the United States (54.3%) and Brazil (33.7%). The share of other countries is much less and in China, in particular, it is made 2.8% of the total, in Canada – 1.8%, and in other countries – 7.4% (Fig.). According to the prognosis of the International Energy Agency in future ethanol production will continue growing and by 2020 it will be 188–282 billion liters.

The work on studying efficiency of ethanol production from various plant crops has been begun in Ukraine. The high yield of ethanol per unit of area is obtained by cultivating sugar beet. However, it is advisable to create new varieties and hybrids for this purpose. Our work was started in 2008 at Department of Genetics, Plant Selection and Biotechnology of Uman National University of Horticulture with selection materials of Ukrainian Scientific Institute of Selection. Crossing between tetraploid forms of fodder beet and donors of resistance to glyphosates and high-sugar sterile one-seeded forms with earlier obtained hybrids of fodder beet that are resistant to herbicides of continuous action was carried out.

Certain hybrid combinations formed sugar amount in the harvest which provided conditional bioethanol yield per hectare at a level of 3.8–4.2 tons and energy accumulation in it 95-105 GJ/ha in the conditions of 2015.

Another source of bioethanol can be rhizocarpous chicory. Inulin is converted into fructose, and then – in alcohol. On average for three years high content of inulin was found in roots of *Horpacea* offshoots – 18.2%. These materials provided a high yield of ethanol per unit area – 3.92 t/ha. The nearest to the best indicators of bioethanol yield per unit area were obtained growing *Slezka* x *Fredonia* offshoots – 3.89 t/ha.

Given the fact that the indicator of energy accumulation is calculated by bioethanol output per unit area, distribution of selection materials was similar. Therefore, less energy (94.9 GJ/ha) was accumulated in roots of *Cassel* x *Fredonia* that have a low content of inulin and weight per unit area was formed not the smallest.

Key words: bioethanol, selection, sugar beet, rhizocarpous chicory.