Possibilities of Bioethanol Production from Brown Seaweeds

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The aim of the work is to analyze the possibilities of producing bioethanol from brown seaweeds from the point of view of feedstocks preliminary processing, technological scheme, the use of strains of microorganisms for the fermentation process, identifying the advantages and disadvantages of the obtained bioethanol and assessing the global warming potential.

Seaweeds in Russia

Seaweed feedstocks

Pre-treatment: washing with sea water, drying in the sun and wind, grinding

Hydrolysis: thermal dilute acid and/or enzymatic hydrolysis.

Fermentation: it is preferable to use Saccharomyces cerevisiae or Escherichia coli.

Bioethanol production: distillation yields up to 96% bioethanol.

Biochemical composition of brown seaweeds

Global warming potential

The main benefits derived from the use of seaweed as a feedstock: they don’t use agricultural land, fertilizers, pesticides and water. Seaweeds have a much higher photosynthetic efficiency (6–8%) than land biomass (2%). Bioethanol derived from brown seaweeds and land-based feedstocks can have significantly different global warming potentials (GWPs), since the GWP of bioethanol is influenced by biomass cultivation and bioethanol production. Bioethanol from seaweed has no carbon debt as no crop area is used for its production.

Conclusions:

Considering all the difficulties and potentials of bioethanol production from brown seaweeds, over time, it is possible to transfer research from laboratories to industry and further construction of the first seaweed enterprises producing bioethanol.