Maize grain as raw material for bioethanol and DDGS production

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Abstract

The maize grain is one of the best renewable raw material for ethanol production, due to the high content of starch in grain. The suitability of 20 maize hybrids from MRI was investigated for bioethanol and DDGS production. The optimization process of enzymatic hydrolysis and fermentation of whole grain flour obtained from the selected maize hybrids by using thermostable enzyme α-amylase Termamyl SC and glucoamylase SAN Extra L, as well as the production microorganism - yeast Saccharomyces cerevisiae var. ellipsoideus was conducted. The starch content varied from 69.60% (ZP 484) to 74.68% (ZP808). Hybrid ZP 484 (7.66%) has the lowest ethanol content after 48h fermentation and hybrid ZP434 (8.96%) the highest one. Volumetric productivity varied from 1.66 gl⁻¹ h⁻¹ (ZP341) to 1.87 gl⁻¹ h⁻¹ (ZP434). The highest bioethanol yield and highest bioethanol yield per arable land have hybrid ZP434 as well as energy effectiveness. The hybrid ZP434 was selected as the most promising bioethanol producer. Bioethanol produced from starchy parts of grain leaving valuable by-products as distillers' dried grain with solubles (DDGS). Its product contains a large amount of protein, ruminal undegradable protein and high energy making them a unique feed ingredient. During bioethanol fermentation maize grain proteins remain in DDGS and further are enriched by yeast proteins. DDGS sample have a high content of protein (29.58% - 36.08%) i.e. threefold higher than in maize grain. DDGS as by product of bioethanol processing could be used as feed staff of many domestic animals.

Key words: alternative fuel, bioethanol, DDGS, maize, starch