

Some Quality Parameters of Selected Maize Hybrids from Serbia for the Production of Starch, Bioethanol and Animal Feed

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Abstract : Maize (*Zea mays* L.) is one of the most important cereal crops, and as such, one of the most significant naturally renewable carbohydrate raw materials for the production of energy and multitude of different products. The main goal of the present study was to investigate a suitability of selected maize hybrids of different genetic background produced in Maize Research Institute 'Zemun Polje', Belgrade, Serbia, for starch, bioethanol and animal feed production. All the hybrids are commercial and their detailed characterization is important for the expansion of their different uses. The starches were isolated by using a 100-g laboratory maize wet-milling procedure. Hydrolysis experiments were done in two steps (liquefaction with Termamyl SC, and saccharification with SAN Extra L). Starch hydrolysates obtained by the two-step hydrolysis of the corn flour starch were subjected to fermentation by *S. cerevisiae* var. *ellipsoideus* under semi-anaerobic conditions. The digestibility based on enzymatic solubility was performed by the Aufrère method. All investigated ZP maize hybrids had very different physical characteristics and chemical composition which could allow various possibilities of their use. The amount of hard (vitreous) and soft (floury) endosperm in kernel is considered one of the most important parameters that can influence the starch and bioethanol yields. Hybrids with a lower test weight and density and a greater proportion of soft endosperm fraction had a higher yield, recovery and purity of starch. Among the chemical composition parameters only starch content significantly affected the starch yield. Starch yields of studied maize hybrids ranged from 58.8% in ZP 633 to 69.0% in ZP 808. The lowest bioethanol yield of 7.25% w/w was obtained for hybrid ZP 611k and the highest by hybrid ZP 434 (8.96% w/w). A very significant correlation was determined between kernel starch content and the bioethanol yield, as well as volumetric productivity (48h) ($r=0.66$). Obtained results showed that the NDF, ADF and ADL contents in the whole maize plant of the observed ZP maize hybrids varied from 40.0% to 60.1%, 18.6% to 32.1%, and 1.4% to 3.1%, respectively. The difference in the digestibility of the dry matter of the whole plant among hybrids (ZP 735 and ZP 560) amounted to 18.1%. Moreover, the differences in the contents of the lignocelluloses fraction affected the differences in dry matter digestibility. From the results it can be concluded that genetic background of the selected maize hybrids plays an important part in estimation of the technological value of maize hybrids for various purposes. Obtained results are of an exceptional importance for the breeding programs and selection of potentially most suitable maize hybrids for starch, bioethanol and animal feed production.

Keywords : bioethanol, biomass quality, maize, starch

Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development

Conference Location : Chicago, United States

Conference Dates : December 12-13, 2020