Study of carbohydrates of vegetable marrow leaves by GC/MC

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Introduction. Vegetable marrow (*Cucurbita pepo* L. var. *giromontia* Duch.) of *Cucurbitaceae* family is a monoecious species grown as a vegetable. The vegetable marrow edible fruit and seeds contain phytochemicals that impart many pharmacological properties. Epicarp of fruits showes a higher carotenoid content (β-carotene, lutein, neoxanthin, violaxanthin, etc.). The raw vegetable marrow fruit with skin is a rich source of water 95%, protein 1%, fats 0.1%, minerals (Ca, Fe, Mg, P, K, Na, Zn, Cu, Mn), vitamins (C, group B), fiber 0.9%, carbohydrates 2-3%, aminoacids, etc. [1]. Fruits are recommended in dietary food for convalescents, people with strict diets and in infant food. They also have antisclerotic and considerable diuretic actions. The seeds of vegetable marrow have an anthelminthic activity [1].
It was observed that there is a lack of experiments providing information on the carbohydrates content of vegetable marrow leaves. Thus, the aim of this study was to identify and assay of carbohydrates by gas chromatography/mass spectrometry method (GC/MS) of vegetable marrow leaves.
Materials and methods. The research used raw material, which was harvested in 2019 in Kharkiv region (Ukraine). The monosaccharides composition was determined by GC/MS method on gas chromatograph Agilent 6890N with 5973inert mass detector (Agilent Technologies, USA). Samples were analyzed on a capillary column HP-5MS of 30 m in length and an internal diameter of 0.25 mm, a thickness of the stationary phase is 0.25 μm. The first set up oven temperature at 160°C and held for 8 min, then raised to 240°C at the rate of 5°C/min and kept at this point for 6 min. At a constant flow rate of 1.2 sm^3/min was used Helium as the carrier gas. Detection was performed in the SCAN mode at the width range of 38–400 m/z. Sample preparation was carried out according to the method described in [2]. Identification of monosaccharides was based on comparing their retention times with retention times of standards of the mass spectral library NIST 02. Quantification was done by using sorbitol added to the sample [2].
Results and discussion. The GC/MS method was used to determine the qualitative composition and quantitative content of carbohydrates in vegetable marrow leaves. Free carbohydrates included D-arabinose, D-glucose, D-galactose and D-saccharose. D-rhamnose, D-arabinose, D-xylose, D-mannose, D-glucose, D-galactose and D-fructose were identified in the raw material after acidic hydrolysis and derivatization with acetylated aldononitriles. Free carbohydrate D-saccharose was present in vegetable marrow leaves in the greatest amount (11.09mg/g). D-glucose 1.38mg/g, D-galactose 0.11mg/g and D-arabinose 0.09mg/g were predominant ones in the vegetable marrow leaves. Also, monosaccharides were identified in the vegetable marrow leaves after hydrolysis. D-glucose (32.39mg/g), D-galactose (8.26mg/g), D-arabinose (2.84mg/g), D-xylose (2.68mg/g), D-rhamnose (2.37mg/g), D-mannose (1.25mg/g) and D-fructose (0.53mg/g) dominated in the raw material.
Conclusions. The carbohydrates qualitative composition and quantitative content of vegetable marrow leaves were determined by the GC/MS method. Four free carbohydrates were determined in the study material as the result of the experiment. In this raw material 7 carbohydrates were identified after acidic hydrolysis. To sum up, we suggest that the vegetable marrow is a promising plant for medicinal purposes because of its remarkable role in a variety of biological functions.

References

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