

SUMMARY

Soy is a plant whose seeds are characterized by high nutritional value and the possibility of wide use. It is a high-protein raw material, which is why it successfully replaces animal protein in many diets. In addition, numerous epidemiological studies and associated meta-analyses suggest that a soy-rich diet reduces the risk of chronic non-communicable diseases, i.e. heart disease, diabetes, osteoporosis and some cancers.

Due to the possibility of soybean cultivation in Poland, the aim of this study was obtain extracts from this plant of healthy and nutritional properties.

An analysis of the chemical composition of soybean seeds of twelve varieties grown in equal climatic conditions was carried out. The profile and content of active compounds in extracts from various anatomical parts of soybean Aldana were compared. Extracts were prepared using water, 1% HCOOH in water and 80% solution of ethanol in water. The ability of the analyzed extracts to inhibit the activity of digestive enzymes involved in carbohydrate and fat metabolism was also determined. In addition, for the first time the *in vitro* cytotoxicity of ethanol extract from pods and its fractions with variable lipophilicity, against prostate and colorectal cancer cells and normal cells was tested.

Based on the obtained research results, it was found that soybean seeds grown in Polish climatic conditions had a similar protein and fat content and fatty acid composition to soybean seeds grown in other countries. The content of bioactive compounds and the antioxidant potential of soybean seeds depended on the variety and varied in its anatomical parts. Soybean varieties GL-Melanie, Madlen and Petrina exhibited the most predominant contents of isoflavones, in particular genistein. Quantitative and qualitative changes in isoflavones have also been shown between the analyzed anatomical parts of soybeans, as well as during seed growth. The most effective solvent for phenolic compounds extraction from seeds and pods was water, while in the case of leaves it was 80% aqueous ethanol. This solvent also proved to be the most effective in isolating antioxidant compounds from all anatomical parts of soybeans. Antioxidant activity determined by the DPPH and ABTS assay demonstrated by the analyzed extracts showed considerable differences mainly depending upon the polyphenolic compounds content in the tested plant material. The use of non-toxic solvents for human health made it possible to obtain from Aldana, Petrina and Sculptor seeds dry extracts with a high content of polyphenols, which showed high antioxidant activity. Extracts from soybean leaves and pods, which are a waste product, were characterized by a higher total content of phenolic compounds with antioxidant properties compared to seeds. The most effective inhibitors of α -amylase activity were: aqueous extract of mature Aldana soybean seeds and water extract with 1% addition of HCOOH from Madlen soybean seeds. α -glucosidase activity was most strongly inhibited by ethanol extract from leaves, and lipase by water extract with 1% addition of HCOOH from Aligator soybean. The colorimetric MTT assay used to assess the cytotoxicity of the ethanol extract of pods and its fractions with variable lipophilicity showed that the initial extract and the water-methanol fraction inhibited the growth of prostate cancer cells depending on the applied concentration.

Soybeans, as well as leaves and pods, which are a waste product, might be useful material for obtaining preparations with anti-radical, anti-cancer properties and inhibiting the activity of digestive enzymes. They can also be an active food additive or component of a dietary supplement.