

SUMMARY

The study material consisted of potatoes with coloured and light flesh and starch isolated from them. The first aim of the study was to compare potatoes with red, purple and yellow flesh in terms of nutrient content, quantitative and qualitative profile of phenolic compounds and overall antioxidant potential. The second aim was to compare the starch from potatoes with light and coloured flesh in terms of granule size, amylose and amylopectin content, molecular masses of these polymers, content of non-carbohydrate components, in other words the factors that will determine basic physicochemical characteristics of starch, i.e. swelling, gelatinization, retrogradation, rheological properties and gel texture.

It was found that the potatoes with purple and red flesh were characterized by lower contents of starch and soluble dietary fiber fraction, and higher contents of ash and total sugars, with an unchanged content of protein and fat in comparison to the potatoes with light flesh.

It was shown that the content of chlorogenic acid was 3.5-4 times higher in potatoes with purple flesh and 7 times higher in potatoes with red flesh than in those with light flesh. The presence of anthocyanins was observed only in the potatoes with red and purple flesh. Pelargonidin and peonidin predominated in potatoes with red flesh, while petunidin and malvidin derivatives were present in those with purple flesh. The highest content of all phenolic compounds (phenolic acids, flavonoids, flavonols and anthocyanins) was observed for the Magenta Love cultivar with red tubers and the Lord cultivar with light flesh.

Potatoes with coloured flesh showed 4 times higher antioxidant activity as measured by the method with synthetic ABTS radical compared to potatoes with light flesh. The antioxidant activity of potatoes with red and purple flesh was 1.5 to 2 times higher in the FOMO method and 3 to 15 times higher in the FRAP method as compared to potatoes with light flesh.

It was found that the size of starch granules isolated from potatoes with yellow, red and purple flesh was similar in terms of average and minimum diameter and the maximum size of starch granules isolated from coloured potato varieties was higher than that from potato varieties with light flesh. On the other hand, the proportion of small (< 30 μm), medium (30-70 μm) and large (> 70 μm) starch granules from potatoes with purple flesh was similar in both vegetation seasons (2016 and 2017), as opposed to starch granules obtained from potatoes with light and red potato flesh.

The amylose content was higher in starch from light potato cultivars compared to that obtained from tubers with coloured flesh, but its average molecular weight was slightly lower.

The starch isolated from potatoes with light and coloured flesh had comparable protein and fat contents, as opposed to the amount of ash, which was higher in starches from potatoes with red/purple flesh than in those with light flesh, which also resulted in a higher amount of phosphorus in such starches.

It was shown that the solubility and water binding capacity of starch isolated from potatoes with red and purple flesh was higher than these parameters determined for potatoes with light flesh in almost the whole temperature range analysed (from 25 °C to 95 °C), especially at higher temperatures 75 and 95 °C.

Starch isolated from potatoes with light flesh was characterized by significantly higher values of gelatinization enthalpy than starch from potatoes with coloured flesh, which was probably related to the phosphorus content of this type of starch.

A proportional relationship was observed between the viscosity of the starch paste at 50 °C in the pasting characteristics and the shear stress (at a maximum shear rate of 100 s^{-1}) of the pastes determined by rheological measurements, with significantly higher values of the above mentioned parameters recorded for starches isolated from coloured flesh potatoes than yellow ones, except for Blue Star and Tajfun. Moreover, it was shown that the pastes prepared from potato starch with light and coloured flesh were characterized by the properties of non-newtonian, pseudo-plastic, shear-thinning fluids with anti-thixotropic properties.

An increase in the hardness of gels made of starch isolated from light and coloured potatoes was found during their storage, which confirms the occurrence of starch retrogradation. The increase in the hardness of gels after 24 and 168 h of storage was definitely greater for starch from red and purple potato varieties than for yellow ones.

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