SUMMARY

The aim of the study was to develop an innovative, enzymatic-physical pumpkin seed oil production technology. It is based on most predisposed to the oil industry pumpkin genotype selection, enzymatic maceration of pulp from raw pumpkin seed conditions optimization, and centrifugation technique for released from seed cells oil isolation. The principal stage of the work is to optimize the maceration conditions, the aim of which was to maximize oil yield with its expected oxidative stability level maintaining (comparable to other oils). It was also assumed that the oil yield should not be lower than obtained under typical industrial conditions of pumpkin seed oil pressing, and the oil will be characterized by a high bioactive compound content.

In the first stage of the study the chemical composition of eight breeding lines of pumpkin seeds (L193, L199, L206, L225, L235, L238, L245, L250) and 4 oil-pumpkin varieties (Junona, Miranda, Herakles and Gleisdorf) was determined, with particular attention to the lipophilic fraction. Based on statistical analysis of results for the second stage distinguished by the highest lipid content Herakles variety was selected. The seed pulp of this variety was enzymatic modified using a combination of pectinolytic, cellulolytic and proteolytic commercial enzymes. The varying factors of this stage of the study were: the enzyme preparation composition (1, 2 or 3 combined preparations), the total dose of preparations (2, 4, or 6% relative to the weight of the pulp) and maceration process conditions (pH in the range 4.5 - 5.5, the temperature in the range of 45 - 55ºC and the time of maceration in the range 6 - 18 hours). The results of maceration conditions optimization using Response Surface Methodology showed that the pH, temperature and time of maceration equal to pH= 5.25; 54.02ºC and 15.35 hours, respectively, conductive to maximize the pumpkin oil yield. Oil obtained by this technology is characterized by the lipophilic bioactive compounds content comparable to that in other pumpkin oils. It has also relatively low values of hydrolytic and oxidative degradation, and is oxidative stable in comparing to commercial pumpkin seed oil or extracted oil (with hexane or petroleum ether). The by-product of the technology was the protein-fibre preparation. Due to the fractional composition of proteins, amino acid composition and a high concentration of dietary fiber it can be used, e.g. in food or pharmaceutical industry as a raw material for the production of protein hydrolysates, food additives and functional ingredients. This preparation can be also used without refining as pumpkin flour in bakery, confectionery, meat industry, etc., or as animal feed.

The pumpkin seed oil production proposed technology seems to be a good alternative to industrial pressing process. It is a technology almost non-waste, and pulp maceration condition optimization increases its economic efficiency. It can be implemented by small pumpkin seed oil producers and, after adaptation to the process conditions, can also be used to other bio-oils obtaining.