MODELING OF EXTRACTION REMOVAL OF BIOLOGICALLY ACTIVE SUBSTANCES FROM JUNIPER BERRIES

Soldatkina L.M.[1], *Salamon I.*[2], *Novotna V.*[1], *Tutunnik T.*[1]
1 - Odessa I.I. Mechnikov National University
2 - University of Presov
soldatkina@onu.edu.ua

The genus *Juniperus L.* belongs to the family of Cupressaceae and comprises about 70 species which are widely distributed in the Northern Hemisphere. All over the world plants from this genus have always been regarded as a well-known traditional remedy due to their numerous therapeutic properties, such as: anti-inflammatory, antiseptic, diuretic, and analgesic. Nowadays, also juniper berries are used for flavoring different alcoholic drinks. For example, in Slovakia, the "Borovička", is the popular juniper brandy, well-known for its unique aroma with a nice juniper aftertaste, which is very good for appetite whetting.

The widespread use of juniper is primarily associated with the fact that it contains biologically active substances. Unfortunately, in our time information about modeling of extraction removal of biologically active substances from juniper berries is absent.

The main purpose of present research is to establish how temperature (t), solid-to-extragent ratio (N), concentration of extragent (C), and time (τ) affected on extraction of biologically active substances from berries of *Juniperus Communis L.* A full factorial experimental design analysis 2^4 was used to analyse main and interaction effects of the control factors on extraction.

Amongst the *Juniperus L.* genus, the most renowned species used in traditional medicine are Juniperus Communis L. In this study berries of *Juniperus Communis L.* from Ukraine and Slovakia were investigated. Ukrainian juniper berries (UJ) were collected in Crimea: production of "The Union of Afghan" (TU 15.8-30708085-004: 200). They were bought at the pharmacy. Slovak juniper berries (SJ) were collected in Slovakia (Chrámec, Teplá Dolina) during fruiting in October 2016.

Extracts have prepared from the dried and crushed juniper berries using maceration method with aqueous ethanol. The efficiency of extraction of biologically active substances from juniper berries was controlled due determining the concentration of flavonoids and the exit of extractive substances. We carried out a factorial design at two levels (high and low) which included 16 experiments and each experiment was repeated twice.

Studies have shown that the factorial design analysis is an important tool and can be used in order to obtain a mathematical model to predict the extraction removal of biologically active substances from plant extracts. It was determined that all investigated factors and their interactions affect the efficiency of extraction removal of biologically active substances from juniper berries.

The concentrations of the extragent, temperature, and time have the positive influence whereas the solid-to-extragent ratio has the negative influence on extraction removal of flavonoids from juniper berries. Obtained results showed that the influence of control factors increases in order: $N < \tau < t < C$ for SJ and $N < \tau < C < t$ for UJ.

The solid-to-extragent ratio, time, and temperature have the positive influence whereas concentration of the extragent has the negative influence on extraction removal of the exit of extractive substances. The results showed that the influence of control factors increases in order: $t < C < \tau < N$ for SJ and UJ.

In this study, we obtained the mathematical models that define the connection between the concentration of flavonoids and the exit of extractive substances from juniper berries and four control factors. A good agreement between the predicted results of the models and experimental data was demonstrated. The models can be used for prediction of the extraction removal of flavonoids and extractive substances considering optimal conditions of extraction.