HERBAL BIOFLAVONOIDS AS THE PERSPECTIVE SOURCE FOR PRODUCTION OF FOOD ADDITIVES

Simakhina G.O., Naumenko N.V.
National University of Food Technologies, Kyiv, Ukraine

Introduction. Since the natural antioxidants do not cause any undesirable side effects, they have more preferences in comparison to those synthetic. Today, the scientists' attention is more and more drawn to P-active substances of phenolic origin (bioflavonoids): catechinins, anthocyanins, leucoanthocyanins, flavone glycosides, chlorogenous acid and others. There are many evidences advocating this fact. The objectives of this work are to choose the optimum parameters of maximal bioflavonoid extraction from 10 samples of medicinal herb with subsequent practical use in production of natural food additives.

Materials and methods. Medicinal herbs: nettle (*Urtica*), oregano (*Origanum vulgaris)*, melissa (*Melissa officinalis*), thyme (*Satureja hortensis*), salvia (*Salvia officinalis*), blossoms of St. John's wort (*Hypericum perforatum l.*), leaves of birch (*Betula pubescens*), blossoms of chamomile (*Chamomilla recutita*), leaves of salvia (*Salvia*), dead nettle (*Herba leonuri*), blossoms of immortelle (*Helichrysum arenarium l. Moench*.).

The dried raw materials (leaves and blossoms) with humidity of 10…12 percents were used to obtain the herbal extractions. The water-and-alcohol extractions were obtained by counter-flow extracting until the amount of dry substances reached 15…18 percents, depending on the sort of raw [3]. To establish the optimal indices of the main parameters of herb extraction process, the impact of the factors like dispersion level, extraction duration, correlation between raw material and the extracting substance, and alcohol concentration in the extracting substance on bioflavonoid output was studied. The amount of bioflavonoids was determined by the colorimetric method based on formation of flavonoid-and-aluminum complex [2].

Results and discussions. At the first stage of the research, we determined the optimum parameters to directly impact the bioflavonoid output from the herbal raw materials. Since BAS of herbs mostly belong to thermo labile substances [1], extraction was conducted with a temperature of 35…40 °C. There was confirmed that the bioflavonoid amount in extractions from raw materials with particle dispersion of 1…3 mm is practically identical, but in case of larger particle size it lowers by 12 percents. The optimal concentration of alcohol in water-and-alcohol solution is averred 70 percents, on account of the fact that in 30 percents and 50 percents the rate of extracted bioflavonoids is lower, correspondingly, by 15 percents and 11 percents.

In water extraction, it was only 6 percents of bioflavonoids to diffuse into the extract. The mitigation of bioflavonoid output after extraction by pure alcohol can be explained by the fact that the significant amount of bioflavonoid substances transformed into constrained state. The largest part of bioflavonoids was extracted in proportion between the raw material and extracting substance of 1: 10 and 90-minute duration of the process. These results complement the information presented in [2], which affirmed that far higher output of bioflavonoid substances is provided after extraction of plants by 70-percent water-and-alcohol solution than by water or

absolute alcohol. Statistical procession of the attained results evidences that the average relative error with probability of 95 percents is defined as 3.6 %.

Therefore, the further researches were accomplished with the following parameters: dispersion of herbal particles – 1…3 mm, alcohol concentration in water-and-alcohol solution – 70 percents, Proportion between raw material and an extracting substance – 1: 10, duration of the process – 90 minutes, temperature of the process – 35…40 °C (Table 1).

Table 1

Percentage of extraction of bioflavonoids from plant raw materials

Raw materials	Optical density, units	Bioflavonoid amount / 100 g		Bioflavonoid extraction percentage
		In raw	In potions	
1. St. John's wort blossoms	0.38	3.890	3.286	84.48
2. Black currant leaves	1.68	1.281	0.885	69.06
3. Melissa leaves	0.49	1.685	1.159	68.81
4. Thyme leaves	1.53	1.470	0.996	67.74
5. Salvia leaves	1.42	0.634	0.409	64.62
6. Immortelle blossoms	1.88	2.638	1.702	64.52
7. Oregano blossoms	1.72	2.980	1.175	39.44
8. Chamomile blossoms	1.44	0.472	0.139	29.46
9. Dead nettle herb	1.44	0.462	0.132	28.63
10. Birch leaves	0.47	0.825	0.203	24.62

Conclusions. All of the researched plants have different grade of antioxidant effectiveness that can be conditioned by bioflavonoid amount. According to this index, we composed a scale of their comparative assessment:

St. John's wort > oregano > immortelle > melissa > thyme > black currants > birch > salvia > chamomile > nettle.

Thenceforth, the first five of this scale are alleged to be the most effective out of the herbs researched, so they would be widely and successfully used in production of food additives with antioxidant action as the constituents of a diet minimizing toxic influence of free-radical processes on human organism.

References:

1. Dekebo A. Plant Extracts [Electronic Resource]. 2023. URL: https://www.academia.edu/56811493/Introductory_Chapter_Plant_Extracts (access date 24.03.2024)
2. Inglett G.E., Chen D., Berhow M., Lee S. Antioxidant activity of commercial buckwheat flours and their free and bound phenolic compositions. *Food Chemistry*. 2011. Vol. 125, issue 3. P. 923–929.
3. Pezzani R., Salehi B., Vitalini S et al. Synergistic Effects of Plant Derivatives and Conventional Chemotherapeutic Agents: An Update on the Cancer Perspective. *Medicina (Kaunas)*. 2019. Vol. 55, issue 4. P. 110–120.