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Introduction

Wild growing plants still represent relevant source of herbal substances for folk medicine and phytotherapy in a case of problems with their cultivation. The plants are often applied in combinations and they are used for treatment of various mild symptoms of respiratory, digestive and nerve system or some skin problems. For ensuring of safety and efficacy of these herbal substances and preparations, the harvested parts should meet conditions required by specific directions stated in appropriate guidelines like supranational and national pharmacopoeias.

Selected herbal substances

Hyperici herba is harvested as flowering stem of St. John's wort (*Hypericum perforatum* L.) that is used in phytotherapy of depression and other problems like insomnia. Glands create typical dots, darker ones contain naphthodianthrone, like hypericin, and various secondary metabolites that could participate on antidepressive effect.



Matricariae flos are dried flowers of chamomile (*Matricaria chamomilla* L.) that contain essential oils and flavonoids. This herb finds its application in treatment of spasms and various inflammations. Essential oils are obtained by steam distillation providing typical blue colour due to the content of chamazulene



Plantaginis folium is acquired from nonflowering plants of *Plantago lanceolata* L. Herbal substances are components of cough mixtures with regard to mucilages but they also find application in treatment of minor wounds. Beside these compounds, different metabolites like iridoids, flavonoids or derivatives of o-hydroxycinnamic acids, such as acteoside, can be found.



Sambuci nigrae flos is herbal substance that is harvested during late spring from elderberry (*Sambucus nigra* L.) and is also used in preparation of syrups with typical aroma and flavour. The flowers provide mostly flavonoids and phenolic acids and they found their application in diuretic and diaphoretic medicaments.

Material and methods

Plant samples were collected in Vestec near Prague during spring and summer of 2019 and individual samples were processed and dried according to requirements of companies that buy wild growing herbs. The characterization and assays of samples were performed according Czech Pharmacopoeia 2017. Identification of herbal substances was performed by macro- and microscopical observation, assays of impurities were made for total ash and water content, and content of secondary metabolites was evaluated by UV/Vis spectrophotometry.

Fig. 1. Macroscopic analysis



Fig. 2 Microscopic analysis

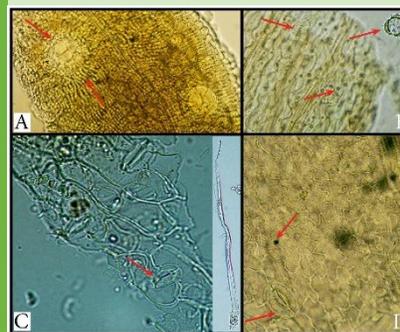


Fig. 3. Water content in dried sample

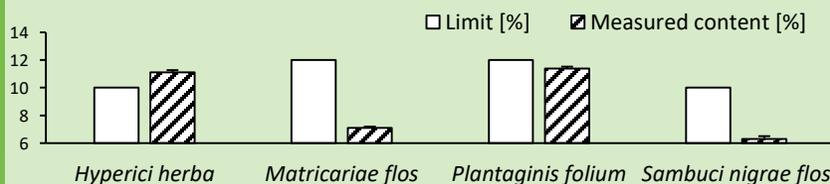


Fig. 4. Content of total ash after combustion in muffle furnace

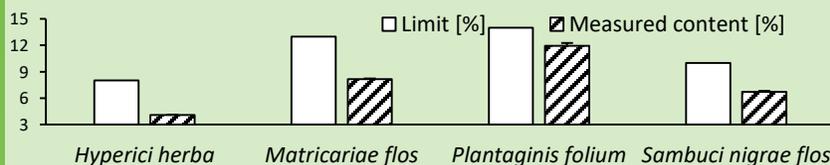
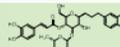


Fig. 5. Content of representative metabolites in the herbal substances

Plant part	Secondary metabolites	Min. limit	Measured content
Hyperici herba	hypericin 	0,08 %	0,33%
Matricariae flos	chamazulene 	4 ml	1 ml
Plantaginis folium	mucilages	6	9
	acteoside 	1,5 %	4,3 %
Sambuci nigrae flos	isoquercitroside 	0,8 %	2,09 %

Results and conclusion

Herbal substances are identified by various anatomical traits that are observable on different magnification. Red arrow points to black coloured glands on leaves of *H. perforatum* (Fig 1. A) and these structures are also apparent (Fig. 2A) with palisade parenchyma on microscopic level. Flower of chamomilla is composed by concave receptacle forming anthodium (Fig. 1B); detail of ovary skin shows glandular trichomes, druses of calcium oxalate and spiky pollen grains (Fig 2B). There are light green lines of veins on the abaxial side of *Plantago* leaves (Fig. 1C) with trichomes. Stomata are mostly of diacytic type (Fig. 2C), sometimes anomocytic. Elderberry flower has five joined leaves at their base with the five stamens (Fig. 1D). On microscopic slide, epidermal cells have irregularly thickened walls with crystals sand of calcium oxalate and anomocytic stomata. Determination of water content (Fig 3.) and total ash (Fig. 4) showed that harvesting, processing and storage, with exception of *Hyperici herba*, met required conditions. All herbs, minus chamomile, from the area of interest also contained adequate concentrations of monitored metabolites (Fig. 5). The content of secondary metabolites is dependent on many factors like phenological phase of plant, stage of ripeness, genetic and environmental factors including possible abiotic and biotic stress.

It can be assumed that plants from this locality have potential as source of herbal substances with appropriate quality, which can be verified by further tests.

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