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DETERMINATION OF CAROTENOIDS IN EXTRACTS FROM SPECIES OF *TAGETES* AND *CALENDULA*

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Introduction

Carotenoids are natural pigments responsible for many of the red, orange and yellow hues of plant leaves, fruits and flowers. About 40 carotenoids are present in the typical human diet and only 20 of them have been found in human blood and tissues. In human body, β-carotene is broken down by β-carotene dioxygenase into two retinyl molecules, which are later reduced to vitamin A (retinol). Over the last decade, there has been increased recognition that lycopene plays an important role in preventing the development of coronary disease and retarding the progression of atherosclerosis. The antioxidant activity of lycopene is almost twice as high as that of β-carotene and has the greatest synergism with vitamin E. Lutein and zeaxanthin are the major constituents of macular pigment, which is responsible for fine-feature vision. Given their accumulation in the retina, has been investigated how consumption of these carotenoids may prevent and/or slow the progression of age-related macular degeneration, the leading cause of blindness in older adults. Nowadays, many of ongoing research has focused on the identification of foremost sources of carotenoids for the use in ophthalmology for the treatment of age related ocular diseases. *Tagetes* and *Calendula* genus are considered an important source of carotenoid pigments, especially of the yellow carotenoids (α-, β-carotenes) and xanthophylls (lutein, zeaxanthin,violaxanthin). *C. officinalis* L. is considered to offer protection against some cancers, UV-induced skin damage, coronary heart disease, cataracts and molecular degeneration.

Material and methods

Plant material. Flowers of the species *Tagetes patula* L., *Tagetes erecta* L., *Calendula officinalis* L. and the varieties of *Calendula officinalis* L. Diana and Natali were collected, in the complete flowering phase, from the collection of the Scientific Center for Cultivation of Medicinal Plants of Nicolae Testemitanu SUMPh.


T. patula


T. erecta

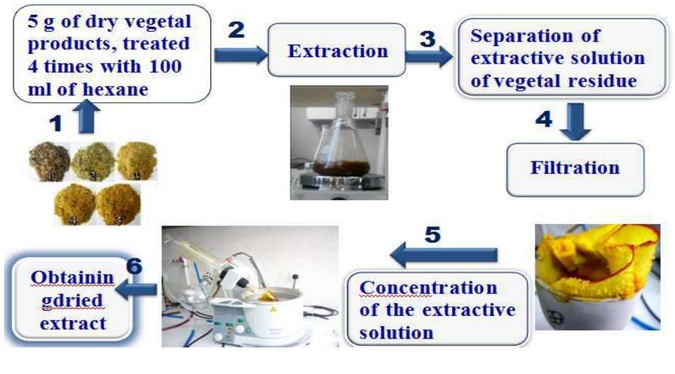

C. officinalis L.


C. officinalis L. vraiety Diana


C. officinalis L. variety Natali

Dry extracts of flowers harvested in the budding-flowering phase, were obtained by repeated maceration and rotary evaporation, subjected to phytochemical evaluation by thin-layer chromatography (TLC) and UV-VIS spectrophotometry, equivalent to ß-carotene.

The technological process of dry extract production through dynamyc fractional maceration



Results

The TLC assay revealed the presence of β-carotene under the described chromatographic conditions through the determination of retention factors.The results of the qualitative study of the analyzed vegetal products are presented in *table 1*. Following the analysis of visible light chromatograms, were observed in all studied products yellow spots,where the retention factors (Rf) corresponded to the Rf of the reference substance β-carotene. It was shown that the clearest separation of β-carotene in hexane solutions from *Tagetes* and *Calendula* flowers occurred in the mobile phase hexane:ethyl acetate (50:50 v/v). The migration of the chromatographic systems was 10 cm.

Table 1. Values of Rf of β-carotene spots separated by TLC in the extractive solutions from *Tagetes* sp. and *C. officinalis*L. varieties

Nr.	Extractive solutions obtained from vegetal product - flores / reference substance	Mobile phases/Rf of β-carotene		
		Hexane- ethyl acetate (50:50)	Hexane- ethyl acetate (80:20)	Hexane- ethyl acetate - propanol-2 (75:18:7)
1	T.patulaL.	0.90	0.77	0.89
2	T.erecta L.	0.90	0.76	0.89
3	C. officinalis L.	0.90	0.76	0.87
4	C. officinalis L. variety Diana	0.89	0.77	0.86
5	C.officinalisL. variety Natali	0.90	0.77	0.87
9	β-caroten – reference substance	0.90	0.75	0.87

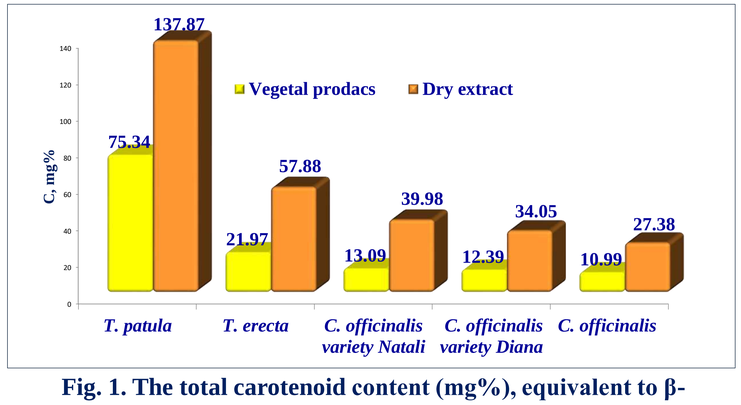


Fig. 1. The total carotenoid content (mg%), equivalent to β-carotene, in vegetal products (*flores*) and in dry extracts

Total carotenoid content of the extraction samples, obtained from the under consideration vegetal products, was evaluated spectrophotometrically. The highest level of carotenoid content was identified in *T. patula* L. flowers (75.34 ± 2.15 mg%) and with a slighter quantity in *T. erecta* L. (21.97 ± 0.84 mg%). The study of total carotenoid content for the *Calendula* species, revealed a top contentin *C. officinalis* L. variety Natali (13.09±3.23mg%), followed by *C. officinalis* L. variety Diana (12.39 ± 1.98 mg%) and *C. officinalis* L. (10.99 ± 0.06 mg%) (Fig. 1).

Conclusions

In this work, during the phytochemical evaluation, we have determined that the richest in carotenoids are the dark orange inflorescences of the species *T. patula*L., followed by *C. officinalis* L. varieties Natali and Diana, which recommends them to be grown for medicinal use. The results indicate that the flowers of *Tagetes* species and *C. officinalis* L. varieties, cultivated in the Republic of Moldova, can be used as vegetal products with high carotenoid content in the pharmaceutical, cosmetic and food industries.