

ESSENTIAL OIL OF CALENDULA OFFICINALIS

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ABSTRACT

The article presents the results of research into component composition of raw calendula's essential oil. The study was conducted by gas chromatography mass spectrophotometry method under the following conditions: column - CP-Wax58FFAPCB 24,5 mm x 250 mm x 0,20 mm nominal, the mobile-phase-He (helium), speed-column mobile phase -1.0 ml /min, volume sample injection - 5 mkl; resolutions (5:1), in the Split, high-boiling chamber -220°C, detector temperature 275°C; Aux-200°C, column temperature 70°C gradually increased from 10°C / min to 250°C, maintained to the end of analysis temperature regime (250°C) for 5 min.

In the course of the research the following substances were identified - 1H cyclopropazulen-0, 981%, α -amorphous-1, 926%, γ -cadinene-11, 598%, 1H-cyclopropazulen 4-oldecahydro-1-0.825% viridiflorol-2, 029%, β -cubeb -3.809%, T-1 muurololnaftalenol-8.522%.

In addition, it was ascertained that in different parts of the world calendula's essential oils differ from each other in qualitative composition and quantitative components.

UDC CODE & KEYWORDS

■ UDC: 615.074 ■ *Calendula officinalis* ■ Flower ■ Uzbekistan ■ Gazochromatomass - spectrophotometry ■ Essential oils

INTRODUCTION

Calendula officinalis (pot marigold) - *Calendula officinalis* L. belongs to the family Asteraceae- Asteraceae. *Calendula* genus includes about 20 species of annual grasses that grows wildly, mostly in the Mediterranean countries. *Calendula officinalis* L. is used as an anti-inflammatory and antiseptic agent in quinsy, tonsillitis and other inflammatory processes; as a wound healing agent in dentistry and gynecology; as an antispasmodic, choleric, antimicrobial, calming, hyposensitizing, antiviral, antitoxic agent in stomach, liver disorders and cardiac diseases, accompanied by palpitations, dyspnea and edemas. The results were confirmed by Ismagilov, Kostylev (2000) and Marczał, Cserjesi, Hethelyi & Petri (1987). In folk medicine calendula is used for treating malignant tumors.

Therapeutic characteristic of marigold are caused by the presence of biologically active substances (BAS) in its raw material, namely, carotenoids, flavonoids, triterpene saponins and a number of other accompanying substances. The results were confirmed by Ladygina (1992).

Taking into consideration the fact that the *Calendula officinalis* L. possesses a broad spectrum of action and is used in various industries, such as pharmaceutical and food industries, cosmetology, starting from 1961 this plant has been studying by many scientists, especially by foreign ones. For example, flowers of *Calendula officinalis* growing in Australia were used for isolating carotenoids - violaxanthin, eaksantin, β -carotene, lutein, and neurosporin, fiteon. The results were confirmed by Pettit, Herald & et al. (1980). The medicine "Karofilen ointment" was obtained on the basis of carotenoids, which is used for treating dermatitis, eczema and trophic ulcers as an anti-inflammatory agent (Milborrow, Swift & Netting, 1982).

Sterols were found in all organs of marigold, cultivated in Poland, and the highest level contained in the leaves - up to 18%. The results were confirmed by Kasprzyk, Janiszewska & Sobszyk (1973). Moreover, tocopherols were discovered in the *Calendula officinalis* L.'s leaves (Janiszowska, Rygier, 1985 and Janiszowska, Janiszowska, 1987).

Calendula officinalis also contains triterpene compounds. They are presented by the triterpene alcohols and oleanolic acid (in free form and in the form of esters, glycosides). The content of triterpene alcohols reaches 5%. The results were confirmed by Adler & Kasprzyk. (1975).

Coumarins as scopoletin, umbelliferone and esculetin were isolated from marigold flowers. The results were confirmed by Derkach, Komissarenko & Chornobay (1986). In addition, monoterpenelactone - lololid was also isolated, which owns antitumor activity (Pettit and et. al. 1980). Essential oil extracted from this plant has got high trichomonade activity (Marczał et al, 1987; Gracza, 1987).

8 flavonoids were discovered by chromatography method on paper in the inflorescences of *Calendula*. Content of total flavonoids in its raw material varies depending on the species and population from 0.26 to 0.91%. The results were confirmed by Peneva, Ivancheva, Vitkova & Kozovska (1985).

For the first time Kurkin and Sharova (2007) isolated two flavonoids from the marigold (sort "Kalta"), which is cultivated in the Russian Federation.

The authors Ivashenko S.A. and others (2000) studied the quantitative content of carotenoids and flavonoids in the inflorescence of some sorts of *Calendula officinalis*, raised in Central Kazakhstan Research Institute of Agriculture.

After that they selected three kinds with high content of carotenoids (to 0.65%) and two sorts with the same content of flavonoids (up to 0, 84%).

At the present time the drug "Kaleflon" is used in medicinal practice, which contains flavonoids and it is utilized for treating gastritis, gastric and duodenal ulcers, and its tincture, which is applied as the anti-inflammatory and wound healing agents (Mashkovskii, 1998).

It should be noted that the above-mentioned studies were conducted mainly on the *Calendula* growing in other parts of the world. The scientific researches, devoted to the study of local sorts of *Calendula*, are scanty.

Methods

Pot marigold's flowers collected in the botanical garden of Tashkent were utilized for studying of volatile components. It was necessary to carry out qualitative analysis of the essential oil in order to study component composition of the plant. For conducting the research the sample of raw plant was prepared and drying was carried out by air-curing method.

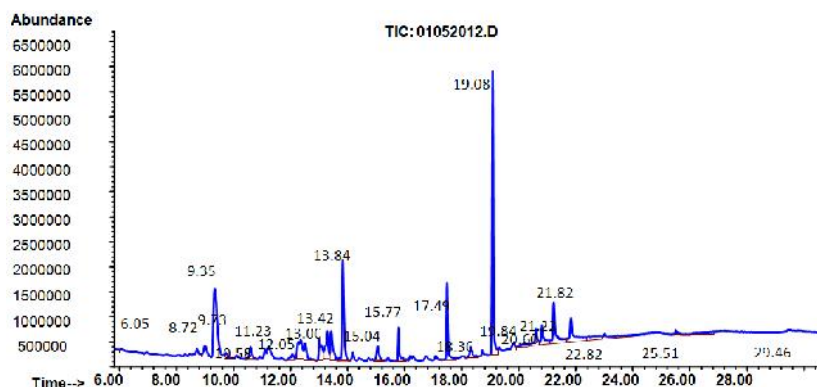
Extractions of essential oils were obtained by steam distillation of plant substance and then it was measured according to method 1 of the State Pharmacopoeia of the USSR (1990). Obtained essential oil was 0.1 ml. The essential oil content in the volume of weight per cent based on absolutely dry raw material was 0.25%. Essential oil was dissolved in hexane and the compositional study was performed by gas chromatography mass spectrophotometry method under the following conditions:

- Column - CP-Wax58FFAPCB 24,5 mm x 250 mm x 0,20 mm nominal;
- The mobile-phase-He (helium);
- Speed-column mobile phase -1.0 mL /min;
- Volume sample injection -5 mkl; resolutions (5:1), in the Split;
- High-boiling chamber -220°C;
- Detector temperature 275°C; Aux-200°C;
- Column temperature 70°C gradually increased from 10°C / min to 250°C, maintained to the end of analysis temperature regime (250°C) for 5 min.

The identification of the obtained substances in the sample was performed using the program Willey -275.llibrary.

The component composition of calendula's essential oil is presented in the chromatogram (Figure 1).

Figure 1: Chromatogram of calendula's essential oil



Source: Authors

Results and Discussion

We researched chemical composition of the essential oils derived from marigold flowers, gathered in Tashkent. In various regions of the world output of essential oils was the following: 0.08% in Iran, 0.09% in South Africa, and 0.1% in Brazil. The results were confirmed by Gazim, & et al. (2008).

The component composition of essential oils of calendula, growing in Tashkent, was determined on the basis of conducted research. More than 18 components were found by GC/ MS method in the local calendula's essential oils, and 7 of them were identified. Prevailing compounds of them are curdler 1H cyclopropazulen-0, 981%, α -amorphous-1, 926%, γ -cadinene-11, 598%, 1H-cyclopropazulen 4-oldecahydro-1-0.825% viridiflorol-2, 029%, β -cubeb -3.809%T-1 murololnaftalenol-8.522% (Table 1).

The data in Table 1 show that calendula's essential oils differ both in qualitative composition and quantitative content of components. It is revealed that in Brazil sesqui terpenhydrocarbons, preferably - β -cadinene (22.5%) and α -kadinol (20.4%) are dominated in calendula's essential oils, and these components are stable under ordinary conditions. They possess anti-allergic and anti-inflammatory actions. In monoterpene part of calendula's essential oil, raised in South Africa, α -thujone is predominant (26.9%). High levels of β -caryophyllene (20.1%) and β -farnesene (43.8%) compounds of essential oils are found in *Calendula* in Iran. Differences in the content of the individual components are probably related to the location of the plant's growing.

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Table 1: Component composition of calendula's essential oils, growing in various regions of the world

The components of calendula's essential oils	Russia	Iran	South Africa	Brazil	Uzbekistan
α -amorphen	+	–	–	–	+
γ -kadinen	+	–	+	+	+
Viridiflorol	+	–	–	+	+
1H-ciclopropazulen 4-ol, dekadidro-1	–	–	–	–	+
T-muurolo-1-naftalenol	–	–	+	–	+
Leden1H- ciclopropazulen	–	–	–	+	+
β -kubeben	–	–	–	–	+
Germakren D	+	+	+	–	–
α -kubeben	+	–	–	–	–
kopfen	+	–	–	–	–
γ -selinen	+	–	–	–	–
β -kariofillen	–	+	+	–	–
β -farnezen	–	+	–	–	–
α -pinen	–	+	+	–	–
α -humulen	–	+	+	–	–
β -bisabolen	–	+	–	–	–
Germacren B	–	+	–	–	–
α -kopaen	–	–	+	–	–
1,8-Cineol	–	–	+	–	–
δ -kadinen	–	–	+	+	–
Sabinen	–	–	+	–	–
α - Tuyon	–	–	+	–	–
α -kalakoren	–	–	–	+	–
α -kadinol	–	–	–	+	–
γ -muurolen	–	–	–	+	–
epi- α -muurolo-1	–	–	–	+	–
α -muurolen	–	–	–	+	–

Source: Authors

The composition of calendula's essential oils in Uzbekistan differs from other types by absence of hydrocarbon germakren D and a number of alcohols which are typical for other types of calendula. Components of amorphous α - and T-1 muurolo-1- naphthalenol, exert actions accelerating tissue regeneration and epithelializations, they also possess antimicrobial and anti-edematous action. It should be noted that in the essential oils of calendula in Uzbekistan viridiflorol component is presented, which has got strong anti-infective action.

Conclusion

It was revealed more than 18 components, of which 7 are identified in the process of studying the chemical composition of calendula's essential oil, growing in Uzbekistan by GC/ MS method and comparison with its closest sorts (Russia, Iran, Brazil and South Africa).

It was established that both qualitative composition and quantitative content of sesquiterpenoids of calendula's essential oils growing in Uzbekistan are significantly different. It should be noted that the calendula flowers' essential oils in Russia and Uzbekistan are very close in qualitative composition.

At the present time research works are being conducted in order to obtain pharmaceutical compositions based on Calendula officinalis's essential oils in Uzbekistan.

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