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DEVELOPMENT OF A METHOD FOR THE QUANTITATIVE DETERMINATION OF CHAMAZULENE IN THE ESSENTIAL OIL OF *Artemisia jacutica*

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In view of the development of a method for obtaining an essential oil with a high chamazulene content possessing an anti-inflammatory and wound-healing action [1, 2] the necessity has arisen for the standardization of the essential oil with respect to its biologically active constituent — chamazulene.

Known methods for the quantitative determination of an azulene in essential oils and cosmetic articles [3, 4] are lengthy and laborious and involve the use of organic solvents (toluene).

We have developed a procedure for the quantitative determination of chamazulene in essential oils and cosmetic articles which uses a standard sample of chamazulene obtained by column chromatography on silica gel.

The purity of the standard sample obtained was checked on a Chrom-5 instrument. Capillary column 25 m long, polymethylsiloxane, column temperatures 60-220°C (6°C/min), 220-250°C (10°C/min), evaporator temperature 240°C, detector 170°C, rate of flow of carrier gas 1.3 ml/min, chart speed 6 mm/min. The components were identified from their retention times. The proportion of the main component — chamazulene — in the sample was 97.12%.

The results of a study of the UV spectra of alcoholic solutions of a chamazulene-containing essential oil and of solution of the isolated chamazulene sample showed that they each had a main absorption maximum at a wavelength of 282 nm, which permitted us to conclude that it was possible to use this compound as a standard sample for the quantitative determination of chamazulene in essential oils.

In the development of the analytical procedure we used 95% ethyl alcohol. The standard chamazulene was used for plotting a calibration graph.

The metrological characteristics of the procedure for determining chamazulene in an essential oil are given below:

n	f	$\bar{x}$	$S\bar{x}$	$P\%$	$t(P,f)$	Δx	$E\%$	$\bar{E}\%$
10	9	27.49	0.0088	95	2.26	0.0628	0.228	0.072

The error of a single determination at a confidence interval of 95% does not exceed 0.228. Experiments with additions of the chamazulene sample to a weighed amount of essential oil showed that the error of analysis was within the limits of error of a single determination, which shows the absence of systematic error in the use of the procedure developed.

Procedure for the Quantitative Determination of Chamazulene. About 0.002 g (accurately weighed) of an essential oil is dissolved in 10 ml of 95% ethyl alcohol. The optical density of the solution is measured on a SF-46 spectrophotocolorimeter at a wavelength of 282 nm in a cell 10 mm thick. The comparison solution used is 95% ethyl alcohol.

The chamazulene content (as % on the weight of the essential oil) is calculated from the formula

$$X = \frac{C \times V \times 100\%}{M},$$

where C is the calculation factor from the calibration graph; V is the volume of the solution; M is the weight of essential oil.

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TABLE 1. Quantitative Levels of Chamazulene in the Essential Oils of Some Representatives of the Family Asteraceae

Plant species	Site and time of collection	Chamazulene content, % of the weight of essential oil
Artemisia jacutica Drob.	Republic of Sakh, Ust'-Aldynskii region, village of Sottintsy, June 11, 1993	46.24
A.jacutica Drob.	Tomsk, experimental plot of the Siberian Botanical Garden, Tomsk State University, August 12, 1993	55.82
A. macrocephala Jaeq.	Republic of Altai, Kosh-Agachkii region, village of Uzun-Tal, August 17, 1972	10.12
Achillea millefolium L.	Tomsk province Tomskii region, environs of the village of Anikino, July 21, 1993	8.15
Matricaria recutita L.	Novosibrisk province, Siberian Zonal Experimental Station, July 15, 1993	4.25

Using the procedure developed, we have determined the quantitative levels of chamazulene in samples of essential oils obtained by steam distillation from the herb *Artemisia jacutica,* both wild-growing and cultivated under the conditions of southern Siberia, and from *A. macrocephala*, *Achillea millefolium* L., and *Matricaria recutita*. The results of the analyses are given in Table 1.

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