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BRIEF COMMUNICATIONS

ORGANIC ACIDS OF MEDICINAL PLANTS.
3. *Matricaria recutita* and *M. matricaroides*

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Chamomile (*Matricaria recutita* L.) and pineapple weed [*M. matricaroides* (Less.) Porter] are known medicinal plants of the Asteraceae family. The first plant is certified. The second is used as a substitute [1]. The chemical composition of the biologically active substances in flowers of both species is well studied [2-4]. Only the phenolcarboxylic acids of the acid complex have been studied. Data on the di- and tricarboxylic acids (OA) of these species have not been reported.

Paper chromatography [5] found that the OA complexes of *M. recutita* and *M. matricaroides* flowers are identical and consist of five compounds. Separation of the OA fractions by preparative chromatography [6] isolated from *M. recutita* flowers five compounds that were identified as tartaric (Tar), citric (Cit), malic (Mal), malonic (Mln), and succinic (Suc) acids. Four compounds were isolated from *M. matricaroides*. Suc was not found. The chemical structures and purities were established by melting points of the compounds and their derivatives, melting-point depression of mixed samples, chromatographic mobilities, and ^{13}C NMR spectroscopy.

The quantitative composition [7] showed that the total content of OA (X_{Σ}) in both species was almost the same (7.15-7.37%) (Table 1). A large part of the OA were found in a bound form (X_b, 62-74%). Free-acid forms (X_f) comprised less than one third of the total acid content. The average coefficients of the forms ($k^f = X_f/X_b$) for *M. recutita* and *M. matricaroides* were 0.67 and 0.37%, respectively.

The specific profile of the OA (Table 2) showed that Tar was present in the studied species only as a bound form. Before ion exchange (IE), it could not be observed even with a significantly concentrated extract ($k^f = 0$). Low coefficients were noted for Cit in *M. recutita* (0.18-0.20) and Mal in *M. matricaroides* (0.34-0.37). This indicates that both compounds in these samples are present primarily as bound forms.

Tar dominated the OA complexes in both instances. However, Suc dominated before IE in *M. recutita*; Cit, in *M. matricaroides*. The ratios of free acids Cit:Mal:Mln:Suc were 1.36:2.96:2.14:1.00 and 6.17:5.25:2.17:1.00 for *M. recutita* and *M. matricaroides*, respectively. The overall ratios Tar:Cit:Mal:Mln:Suc were 8.03:5.47:2.83:1.78:1.00 and 11.93:4.19:6.63:1.11:1.00, respectively. OA were isolated from *M. recutita* and *M. matricaroides* flowers for the first time.

TABLE 1. Group Composition of *M. recutita* and *M. matricaroides* Flower Acid Complex (min—max)/x

Species	X_{Σ}, %	X_f, %	X_b, %	k^f
M. recutita	7.16-7.30	2.21-2.83	4.47-5.03	0.63-0.74
	7.23	2.52	4.75	0.67
M. matricaroides	7.15-737	1.91-2.00	5.15-5.44	0.36-0.38
	7.26	1.95	5.31	0.37

x is the average value; X_{Σ}, the total content of organic acids; X_f, the content of free-acid forms; X_b, the content of bound-acid forms; k^f, the form coefficients.

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TABLE 2. Specific Composition of *M. recutita* and *M. matricaroides* Flower Acid Complex (min—max)/x

Acid	*M.recutita*			*M. matricaroides*		
	before IE, %	after IE, %	k^f	before IE, %	after IE, %	k^f
Tartaric	-	2.83-2.94	0	-	3.16-3.30	0
		2.89			3.22	
Citric	0.37-0.40	1.95-2.01	0.18-0.20	0.72-0.75	1.11-1.18	0.63-0.67
	0.38	1.97	0.18	0.74	1.13	0.64
Malic	0.78-0.87	0.97-1.10	0.78-0.87	0.62-0.65	1.75-1.81	0.34-0.37
	0.83	1.02	0.81	0.63	1.79	0.35
Malonic	0.60-0.62	0.35-0.45	0.58-0.75	0.24-0.27	0.25-0.35	0.74-0.96
	0.61	0.40	0.66	0.26	0.31	0.87
Succinic	0.27-0.29	0.34-0.40	0.73-0.85	0.11-0.13	0.23-0.29	0.38-0.52
	0.26	0.36	0.79	0.12	0.27	0.45

x is the average value; before IE, content of OA before IE; after IE, content of OA after IE; k^f, the form coefficients.

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