

The Possibility of Using Specific Markers of Certain Types of Medicinal Plant Raw Material for the Analysis of Multicomponent Plant Teas and Phytoteas

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Abstract—Thirteen multicomponent plant teas and phytoteas are studied to determine specific components in the given product. The validity of the chromato-mass-spectrometry method based on markers contained in the plant raw material for the external control of the composition of plant teas, phytoteas, and other phytopreparations is shown.

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The method of gas chromatography with mass-selective detection was used earlier to show that only fourteen plants out of forty officinal types of drug plants contain specific substances exclusively characteristic of a specific raw material type. These specific substances can be used to control the quality of multicomponent plant preparations.

In this work, attention is given to studying certain multicomponent plant teas and phytoteas of different suppliers to determine the presence of specific components in the given product. Thirteen plant teas and phytoteas containing the claimed plant raw material with specific volatile substances were chosen as test objects (Table 1).

The extraction of plant raw material, sampling, and measurements were performed according to the methods and under the conditions we described earlier [4] for multicomponent plant raw material.

RESULTS AND DISCUSSION

The comparative analysis of a gastrointestinal tea of two different manufacturers (sample no. 1 produced by St.-Mediafarm, CJSC, and sample no. 2 produced by Krasnogorskleksredstva, OJSC) allowed for identifying markers of all plants, except for mint leaves, in both samples. Markers of sweet flag rhizomes (β -cedrene, α -cedrenol) and chamomile flowers (ayapanin) were found in sample no. 1. Another substance, neo-isopulegol, was detected instead of the mint leaf markers, which was a marker of lemon balm herb not indicated by the manufacturer in the tea formulation. Sample no. 2 also contained markers of sweet flag rhizomes (β -

cedrene, isolongifolene) and chamomile flowers (ayapanin). Neo-isopulegol was also detected; the manufacturer did not indicate the lemon balm herb in the tea formulation [5].

The analysis of gastric tea no. 3 produced by Krasnogorskleksredstva, OJSC, confirmed the presence of all plants containing indicator substances. Pulegon(-) and piperiton(-) (mint leaf markers), β -cedrene (sweet flag rhizome marker), guaicol, and 1,2,3,4-tetrahydroquinoline (markers of valerian rhizomes and roots) are identified.

All markers of plants indicated by the manufacturer (Zdorov'e, LLC) were identified in breast tea no. 3: α -chimalchene (anise fruit marker), α -dimethylstyrene and eucarvone (pine bud marker), and vinylguaiaicol confirming the presence of sage leaves.

The formulation of breast tea no. 4 manufactured by Krasnogorskleksredstva, OJSC, also corresponds to that indicated by the manufacturer, which is confirmed by the presence of pulegon(-) and piperitone(-) evidencing the presence of mint leaves, analgite (viola herb marker), and ayapanin exclusively characteristic of chamomile flowers.

The comparative analysis of nervine tea no. 2 of two different manufacturers (sample no. 1 produced by Krasnogorskleksredstva, OJSC, and sample no. 2 produced by St.-Mediafarm, CJSC) allowed for identifying all markers only in one of the two samples. Sample no. 1 contained pulegon(-) and piperitone(-), which confirmed the presence of mint leaves, but no markers of valerian rhizomes and roots could be detected. Mint leaf markers (pulegon(-) and piperitone(-)) and markers of valerian rhizomes and roots (valeranone and guaicol) were also found in sample no. 2. The detection of neo-isopulegol in both samples, which is a marker of the lemon balm herb, is of particular interest. No man-

Table 1. Specific volatile products of the medicinal plant raw material types used

Plant raw materials	Compound	Class
Sweet flag rhizomes (<i>rhizomata calami</i>)	isolongifolene	naphthalene derivative
	β -cedrene	azulene derivative
	α -cedrenole	azulene derivative
Anise fruit (<i>fructus anisi</i>)	α -chimachalene	benzocycloheptene derivative
Birch buds (<i>gemmae betulae</i>)	longicycline	azulene derivative
Rhizomes and roots of valerian	guaiol	azulene methanol derivative
	1,2,3,4-tetrahydroquinaldine	quinoline derivative
	valeranone	naphthalenone derivative
Melilot herb (<i>herba militoti</i>)	hydrocumarine	cumarine derivative
Linden flowers (<i>flores tiliae</i>)	β -patchoulene	methane azulene derivative
Balm lemon	neoisopulegene	terpenoid
Mint herb	(-)-piperitone; (-)-pulegon	terpenoids
Camomile flowers	ayapanin	cumarine derivative
Pine buds (<i>gemmae pini</i>)	eucarvon	Cycloheptane derivative
	α -dimethylstyrene	Benzene derivative
Viola herb (<i>herba violae</i>)	analgit	Benzoic acid derivative
Sage herb	4-vinylguaiacole	Phenol derivative
Brotherwort herb (<i>herba thymi serpylli</i>)	cis-nerolidone	dodecatriene derivative
Gum leaves (<i>folia eucalypti</i>)	epiglobulol	azulene derivative

ufacturer indicated this raw material in the tea formulation. Research of markers during the studies of choleric tea no. 2 manufactured by Zdorov'e, CJSC, demonstrated the presence of pulegon(-)- characteristic of mint leaves. One must also mention the identification of neo-isopulegol, which is an indicator component of the lemon balm herb, not indicated by the manufacturer in the tea formulation.

The comparative analysis of nervine tea no. 3 of two different manufacturers (sample no. 1 produced by Krasnogorskleksredstva, OJSC, and sample no. 2 produced by Zdorov'e, CJSC) did not evidence the brotherwort herb marker in any of the samples. A marker of melilot herb (hydrocoumarin) and also markers of valerian rhizomes and roots (valeranone and 1,2,3,4-tetrahydroquinaldine) are found in sample no. 1. Sample no. 2 also contained markers of valerian rhizomes and roots (valeranone), guaicol, and hydrocoumarin, which confirmed the presence of the melilot herb.

The study of the component composition of dietary supplement Comforting Phytotea No. 2, manufactured by St.-Medofarm, CJSC, showed the presence of α -cedrenol (sweet flag rhizome marker) and ayapanine (chamomile flower marker). No mint leaf markers were detected. However, the presence of neoisopulegol, a

lemon balm herb marker, is noticeable, which the manufacturer did not indicate within the dietary supplement formulation.

Indicator components of chamomile flowers (ayapanine), mint leaves (piperitone(-)-), linden flowers (β -patchoulene), and lemon balm herb (neoisopulegol) were found during the analysis of the Opalikhovskii tea formulation manufactured by Krasnogorskleksredstva, OJSC. It is of interest that the manufacturer does not indicate the lemon balm herb in the tea formulation. The presence of the sage herb within the tea was also not confirmed.

The search for markers in the studies of dietary supplements Pneumonic Phytotea Travnik, manufactured by NPP Zdorov'e natsii, Ltd. Comp., showed the presence of only cis-nerolidol characteristic of the brotherwort herb. No markers of sweet flag rhizomes were detected. The obtained results are presented in Table 2.

Thus, we showed the possibility of using chromatomass-spectrometry for Outdoor control of the composition of multicomponent plant teas, phytoteas, and other phytopreparations using the earlier found specific volatile substances (markers) contained in the plant raw material.

Table 2. Summary table of the results of identification of specific markers in multicomponent plant teas and phytoteas

Sample no. / Plant	1	2	3	4	5	6	7	8	9	10	11	12	13	Marker
Sweet flag	*	*	*			*				*				Isopongifolene/ β -cedrene/ α -cedrenol
Anise	-/+	+/-	-/+	*		-/+				-/-				α -chimachalene
Birch				+										Longicycline
Valerian			*				*	*				*	*	Guaiol/valeranone/tetrahydroquinoline
Melilot			+/-				+/-	-/-				+/-	-/+	Hydrocumarine
Linden									*			+		β -patchoulene
Lemon balm	+	+				+	+	+	+		+			Neo-isopulegol
Mint	*	*	*		*	*	*	*	*		*			(-)-piperitone/(-)-pulegon
Chamomile	-/-	-/-	+/+		+/+	-/-	+/+	+/+	+/-		-/+			Ayapanin
Pine				*		+			+					Eucarvone/ α -dimethylstyrene
Viola				+/+	*									Analgite
Sage				*	+				*					4-vinylguaiaicol
Brotherwort				+					-					<i>cis</i> -nerolidol
Gum tree										+		*	-	Epiglobulol

* The asterisk in the table cell indicated the component claimed at the label.

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