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Essential Oil Components in Herb Teas (Rose and Rosehip)

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The purpose of this study was to characterize the aromas of rose tea and rosehip tea. Aroma compounds were extracted by simultaneous distillation and extraction method using a Likens and Nickerson's extraction apparatus. The concentrated aroma extracts were analyzed and identified by GC and GC-MS. Thirty-eight compounds, including phenylethyl alcohol, citronellol, menthol, menthone, linalool and geraniol, were isolated and identified in rose tea. Thirty-six compounds, including menthol, α-anethole, α-terpinolene, menthone, linalool and 6-methyl-5-heptene-2-one, were isolated and identified in rosehip tea. Large amounts of phenyl ethyl alcohol and citronellol were found in rose tea, while large amounts of menthol and α- anethole were found in rosehip tea.

Key words : Essential oil, rose tea, rosehip tea, phenylethyl alcohol, citronellol

Introduction

The rose tea and rosehip tea are well known as herbal teas widely commercialized in Europe and USA. In Korea, mainly the imported products are used as tea. The rose tea has been prepared by drying rose flowers and petals, which have good aroma. The rose petals can lower fever, remove the effect of toxins, boost immunity, and rebalance the bacterial population in the intestine [2]. The Rosehip (*rosa* spp) is the pod of rose flower (especially the wild or dog rose), which is known as rose haws. Though too tart to eat raw, the ripe pinkish fruit of the rose is used in making tea, wine, jams and jellies [18]. It tastes sweet, sour and tangy, has a sweet and sour aroma. Rose and rosehip can help calm the mind and body, lift the mood, and promote restful sleep [2]. Roship is rich in vitamin C [19], and it also contains carotenoids [17], folate, tannins, catechins, and proanthocyanins [16]. Rosehip tea has long been used as a supplement for vitamin C in many European countries. It also has been used as folk medicine for haemorrhoids, eczema, fever and diarrhea in Erzurum of Turkey [16]. Its antimutagenic activity of towards indirect mutagens might be higher than on the antimutagenic activity on direct mutagens because it contains tannins, catechins and proanthocyanins [19]. Gao et al. [15] have reported that the rosehip extracts showed high antioxident activity because they contain high contents of antioxidants such as vitamin C, carotenoids and phenolics. Rose tea is often used as tea blends in China and Korea by adding it to green tea because it has beautiful color along with its fragrance like jasmine tea. Rosehip tea also is used as herb tea blends by adding it to other herb teas. Some chemical analyses [17,19] and medicinal analyses [15,16] have been conducted on rose tea and rosehip tea, and although aroma components of fresh rose have been reported [3,4], there is little information available on aroma components of rose tea and rosehip tea. we investigated the aroma components of rose tea and rosehip (*Rosa* cannina) tea.

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Materials and Methods

Materials

Rose tea and rosehip tea (herbra Co.) respectively were purchased from a department store (2006 commercial products imported by Germany).

Reagents

Authentic flavor compounds were purchased from Sigma-Aldrich Chemical Co., Wako Co. (Osaka, Japan), Tokyo Kasei (Tokyo, Japan).

Preparation of flavor concentrates

A modified Likens and Nickerson methods, using a simultaneous distillation and extraction apparatus was to extract volatile compound from samples. Fifty grams of each sample was added to 1 l distilled water containing 5 μl of tridecane as an internal standard. Diethyl ether (50 ml) was used for extraction. The steam distillation and extraction was

continued for 1 hr. The extract was dried over anhydrous sodium sulfate and the solvent was removed by the distillation of diethyl ether [12].

Instrumental methods and identification of flavor concentrates

A gas chromatograph (Shimadzu model 9A) equipped with FID and a HP-5 fused silica capillary column (30 m´0.25 mm i.d.´0.25 μm film thickness) was used. The oven temperature was held at 60°C for 5 minutes and then programmed to 220°C by 2°C/ min. Nitrogen was used as a carrier gas and the flow rate was 1.0 ml/min. The GC-MS system consisted of a Hewlett-Packard 6890 GC/5973 MS (ionization voltage: 70eV). The GC conditions were the same as those for the corresponding GC analysis, except that helium was used as the carrier gas. Components were identified tentatively by matching the mass spectra with those of reference compounds in the data system of Wiley library [6]. Relative indices were determined by using n-paraffins C_6 - C_{26}.

Results and Discussion

The identified components are shown in Table 1. Thirty eight compounds including 9 ketones, 11 alcohols, 6 aldehydes, 8 hydrocarbons, 3 esters and 1 acid were identified in rose tea. Thirty six compounds including 11 ketones, 8 alcohols, 7 aldehydes, 6 hydrocarbons, 2 esters and 2 acid were identified in rosehip tea. The terpene alcohol compounds identified in two samples were 1,8-cineole, linalool, phenylethyl alcohol, menthol, α-terpineol, citronellol, geraniol and α-anethole. Linalool, α-terpineol, phenylethyl alcohol, citronellol and geraniol are known as rose alcohol [3]. Linalool has may lily floral aroma and α-terpineol has lilac floral aroma [1]. Phenylethyl alcohol has mild rose-floral aroma, and geraniol has a sweet rose-aroma, but citronellol has sweeter and fleshy rose aroma than geraniol [1]. The order of total amounts in three compounds with rose aroma were phenylethyl alcohol> citronellol> geraniol in rose tea. Particularly, the content of phenylethyl alcohol was remarkably high (62% of total alcohols) in rose tea. In the case of flesh rose flower, the order of total contents in three compounds were citronellol +nerol> geraniol> phenylethyl alcohol [3]. Linalool, geraniol and phenylethyl alcohol were also found in Korean green tea made from the tea flush of the earlier crop as a native variety [9]. Anethole with sweet anise aroma [1] was found in two samples, which was found

Table 1. Essentials oil compounds identified in rose tea and rosehip tea

t_R (min)	RI[1)]	Compounds	Concentration	
			Rose tea	Rosehip tea
11.262	849	Furfural	4.07	0.40
12.165	858	2-Hexanal (*E*)	1.96	0.05
18.482	968	Benzaldehyde	0.75	0.17
20.238	989	6-Methyl-5-hepten-2-one	-	1.56
20.798	1000	2,4-Heptadiene (*E,E*)	0.64	0.14
21.745	1015	2,4-Heptadiene (*E,Z*)	0.37	0.07
23.058	1035	Limonene	0.40	0.50
23.308	1039	1,8-Cineole	1.23	0.45
24.125	1050	Phenylacetaldehyde	1.65	0.09
26.200	1078	Linalool oxide (*Z*)	0.44	0.09
27.375	1093	Linalool oxide (*E*)	2.02	1.13
28.048	1102	Linalool	5.65	1.68
28.350	1107	Nonanal	0.93	0.09
29.228	1120	Phenylethyl alcohol	60.36	1.18
31.457	1152	Camphor	1.95	0.42
32.062	1161	1-Menthone	7.98	2.54
32.830	1171	5-Methyl-2-(1-methylethyl) cyclohexanone	2.46	1.22
33.367	1172	Menthol	8.12	4.35
33.730	1178	γ-Terpinene	1.77	-
34.658	1194	α-Terpineol	1.49	0.25
35.730	1220	Decanol	0.13	-
37.168	1232	Citronellol	11.84	0.97
38.135	1246	Pulegone	0.73	0.13
38.983	1258	3-Methyl-6-(1-methyl)-2-cyclohexen-1-one	3.13	0.27
39.225	1261	Geraniol	5.09	0.32
40.917	1285	α-Terpinolene	0.10	3.61
41.228	1289	α-Anethole	4.33	3.81
41.783	1296	Theaspirane	0.66	0.47
42.112	1301	I.S	100	100
43.383	1322	2,4-Decadienal	0.37	0.04
45.600	1355	Decanoic acid	0.53	0.13
46.332	1367	Geranyl acetate	0.18	0.12
50.228	1426	Caryophyllene	0.22	0.04
51.700	1450	Ethyl nonanoate	1.34	0.05
52.027	1455	Neryl acetone	0.27	0.35
52.263	1459	Farnescene	1.05	0.22
54.367	1491	β-Ionone	-	0.14
57.902	1544	Phenylethyl tiglate	0.93	0.09
58.748	1584	Nerolidol	0.07	-
62.917	1638	δ-Selinene	0.27	-
64.010	1658	β-Eudesmol	0.26	-
64.292	1663	Dodecanoic acid	-	0.13

[1)]RI (Retention Indices) were determined by using n-paraffins C_6 - C_{26}.

[2)]Peak area of each compound/peak area of internal standard (I.S)×100.

also in chamomile tea [13]. 1,8-Cineole, known as the major constituent of eucalyptus [1], was found in small amount in two samples, which was the main aroma components of the lotus flower [10]. A small amount of Nerolidol and eudesmol was found in rose tea only. Nerolidol is the component of flower aroma in green tea, which has strong potent cytotoxic activity in volatile compounds of green tea [11]. A greater amount of Nerolidol is contained in green tea of improved variety than of native variety [5,9]. Eudesmol is sesquiterpene alcohol having sweet and woody odor and identified in angelica species [8]. The content of total alcohols in rose tea was at 7.5 ratio higher than those of rosehip tea. Ketone compounds identified in rose tea were linalool oxide(Z), linalool oxide(*E*), camphor, menthone, 5-methyl-2-(1-methylethyl)cyclohexanone, pulegone, 3-methyl-6-(1-methyl) -2-cyclohexen-1-one, theaspirane, neryl acetone. 6-Methyl-5-hepten-2-one and β-ionone in ketones were found in rosehip tea and not in rose tea. Menthole, menthone, camphor and pulgone having similar mint-like odor were identified in two samples, which were also identified in hibiscus tea [7].

The content of total ketone compounds in rose tea was 2.4 times higher than that of rosehip tea. Aldehydes compounds identified in two samples were furfural, 2-hexenal, benzaldehyde, phenylacetaldehyde, nonanal, 2,4-decadienal and phenylethyl tiglate. The content of total aldehydes in rose tea was 12.7 times higher than those of rosehip tea. Hydrocarbone compounds identified in rose tea were heptadiens, limonene, terpinolene, caryophyllene and farnescene. Terpinene was found in rose tea but not in rosehip tea.

Caryophyllene has a woody and spicy odor [14]. Ester and acids compounds identified in two samples were geranyl acetate, phenylethyl tiglate and decanoic acid. The content of total these compounds in rose tea was 5.0 times higher than those of rosehip. The aroma compound analysis of rose tea and rosehip tea revealed that both samples contain 33 same aroma compounds, but the aroma compounds and sensory odor in both samples were little different. The main aroma compounds identified in rose tea resembled with those of fresh rose, which contained phenylethyl alcohol, citronellol, linalool and geraniol known as rose alcohols. The main aroma compounds identified in rosehip were known as spicy odor

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초록 : 로즈차와 로즈힙차의 휘발성 향기 성분

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식용장미인 로즈차와 야생장미 열매인 로즈힙(*rosa* spp)을 건조시킨 허브차는 오래 전부터 미국과 유럽 등에서 식용되어 왔고 우리나라에도 수입되어 판매된다. 본 연구는 허브차의 기호성에 영향을 미치는 향기 성분을 동시증류추출(SDE)장치를 사용하여 추출하고 gas chromatography와 GC-mass spectrometry를 사용하여 분석 한 결과, 로즈차와 로즈힙차에서 각각 38 종류와 36종류의 향기성분을 동정하였다. 로즈차의 향기성분으로 중요한 화합물은 phenylethyl alcohol, citronellol, menthol, menthone, linalool 및 geraniol 등이었는데 특히 장미향을 띄는 phenylethyl alcohol과 citronellol은 많은 함량 포함되어 있었다. 한편, 로즈힙차에는 menthol, α-anethole, α-terpinolene, menthone, linalool 및 6-methyl-5-heptene-2-one 등이 포함되어 있었는데. 특히 청량감 있는 페프민트 향인 menthol과 달콤한 아니스와 같은 향인 α-anethole은 다소 많은 함량 포함되어 있었다.