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Short Communication

Suggested method for evaluation of agarwood oil quality

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After making GC-MS analysis on Agarwood essential oil (obtained from hydrodistillation) we have data of volatile organic compounds (while non-volatile and semi-volatile compounds, phenylethyl chromones for instance, obtained from Solvent extraction and TLC analysis). From volatile organic compounds said above we pay attention to the so-called *Key compounds* and *Dominant compounds* which are defined as follows:

Key compound (KC for short) is the term that includes:

- Sesquiterpenes (having a common molecular formula $C_{15}H_{24}$)
- Sesquiterpenoids (having a common molecular formula $C_{15}H_{24}O$)
- Sesquiterpene alcohols (having a common molecular formula $C_{15}H_{26}O$)

in which Sesquiterpenoids and Sesquiterpene alcohols are called **Dominant compound** (DC for short).

Practical experiences: The higher content of dominant compound the better aromatic scent and therapeutic effects [(1) (2) (3) (4)]

Definition of ∑ , α and β:

$\sum = [C_{15}H_{24}] + [C_{15}H_{24}O] + [C_{15}H_{26}O]$; $\alpha = \frac{[C15H24O] + [C15H26O]}{[C15H24]}$; $\beta = \frac{[C15H24O] + [C15H26O]}{\sum}$ (easily seen $\beta = \frac{\alpha}{\alpha+1}$)

in which [X] is the content (%) of X.

A suggested method for evaluation of agarwood essential oil quality:

An agarwood essential oil is evaluated in good quality if $\alpha \geq 5.25$ *(or* $\beta \geq 0.84$*)*
on condition that:

- $\sum \geq 65\%$
- *Total content of all GCMS identified compounds ≥ 70%*
- *Total content of all other aromatic ketones (Benzylacetone for example) ≥ 3%*
- *Total content of all fatty acids/aldehydes ≤ 15%*
- *No allergen*
- *No toxin*

Examples of quality evaluation for 11 agarwood essential oils

Oil name		Content of key compounds					Aromatic compounds		Fatty acid & deriv...	Other comp -ound	Aller -gen	Toxin	Total	Price (USD/ liter)
		$C_{15}H_{24}$	$C_{15}H_{24}O$	$C_{15}H_{26}O$	$\sum^{(*)}$	$\alpha^{(*)}$	Benzy Dibenz	Other						
Grade A_{2015}	Compound quantity	4	6	5	15	3.8012	2	0	0	6	0	0	23	N/A
	Total content (%)	16.65	15.53	47.76	79.94		7.18	0	0	11.71	0	0	98.83	
Grade S_{2015}	Compound quantity	3	6	4	13	5.7981	2	0	0	8	0	0	23	15000
	Total content (%)	11.84	15.06	53.59	80.49		7.43	0	0	12.08	0	0	100	
Sample A_{2017}	Compound quantity	4	5	4	13	6.1765	2	2	3	2	0	0	22	12000
	Total content (%)	6.46	21.12	18.78	46.36		3.02	10.51	14.31	9.68	0	0	83.88	
Grade S_{2017}	Compound quantity	4	7	4	15	8.9519	1	0	1	1	0	0	18	15000
	Total content (%)	6.65	38.62	20.91	66.18		1.06	0	4.08	0.75	0	0	72.07	
Grade A_{2017}	Compound quantity	4	7	3	14	6.0550	2	0	4	2	0	0	22	12000
	Total content (%)	6.54	23.18	16.42	46.14		2.84	0	8.56	4.44	0	0	61.98	
Mala	Compound quantity	10	19	8	37	5.7608	1	0	0	1	0	0	39	8500
	Total content (%)	11.62	46.42	20.52	78.56		0.96	0	0	5.15	0	0	84.67	
Cvh5	Compound quantity	2	4	1	7	0.7466	1	0	2	5	0	0	15	8000
	Total content (%)	43.96	25.48	7.34	76.78		7.79	0	11.55	3.55	0	0	99.67	
IOO	Compound quantity	6	3	1	10	0.1117	0	0	0	6	0	1	17	N/A
	Total content (%)	77.42	8.09	0.56	86.07		0	0	0	12.05	0	1.88	100	
CAi1	Compound quantity	10	6	1	17	0.5652	1	0	2	2	0	0	22	N/A
	Total content (%)	55.08	29.63	1.5	86.21		2.21	0	5.79	3.93	0	0	98.14	
Cvb5	Compound quantity	7	5	1	13	1.2622	1	0	0	4	0	0	18	9400
	Total content (%)	38.40	39.36	9.11	86.87		3.84	0	0	9.27	0	0	99.98	
BNF3	Compound quantity	5	12	1	18	1.4237	0	0	5	6	0	0	29	5000
	Total content (%)	23.06	30.32	2.51	55.89		0	0	29.16	14.03	0	0	99.08	

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