

Study of Volatiles from the flower of *Bouvardia longiflora* using Electronic Nose and HS-SPME-GC-MS

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Abstract

Bouvardia is a genus of flowering plants in the Rubiaceae family. It contains about 50 species of evergreen herbs and shrubs native to Mexico and Central America, with one species extending into the southwestern United States. They grow to 0.6–1.5 m tall. The leaves are opposite or in whorls of 3–5, ovate to lanceolate, 3–11 cm long. The flowers are in terminal, generally many-flowered clusters; the corolla has a large tube and four spreading lobes; flower color ranges varies between species, with white, yellow, pink, and red all found. Among them a few species of *Bouvardia* have a floral scent and flavor. This study was determining for change of fragrance pattern according to flowering stage using electronic nose from the flower of *B. longiflora*. And, the use of headspace-solid phase microextraction (HS-SPME) coupled to gas chromatography and mass spectrometry (GC/MS) allowed the identification of twenty-one volatile compounds emitted by *B. longiflora*. The major floral scent were linalool, isobutyl benzoate, α -farnesene, and (3E,7E)-4,8,12-Trimethyl-1,3,7,11-tridecatetraene.

Introduction

Bouvardia longiflora

- Bouvardia* is a genus of flowering plants in the Rubiaceae family. They produce clusters of tubular flowers in white, pink and red. Flowers can be single or double blooms. The plant blooms during summer to early winter. *B. longiflora* is very fragrant, but most hybrids have very little or no scent.



Results

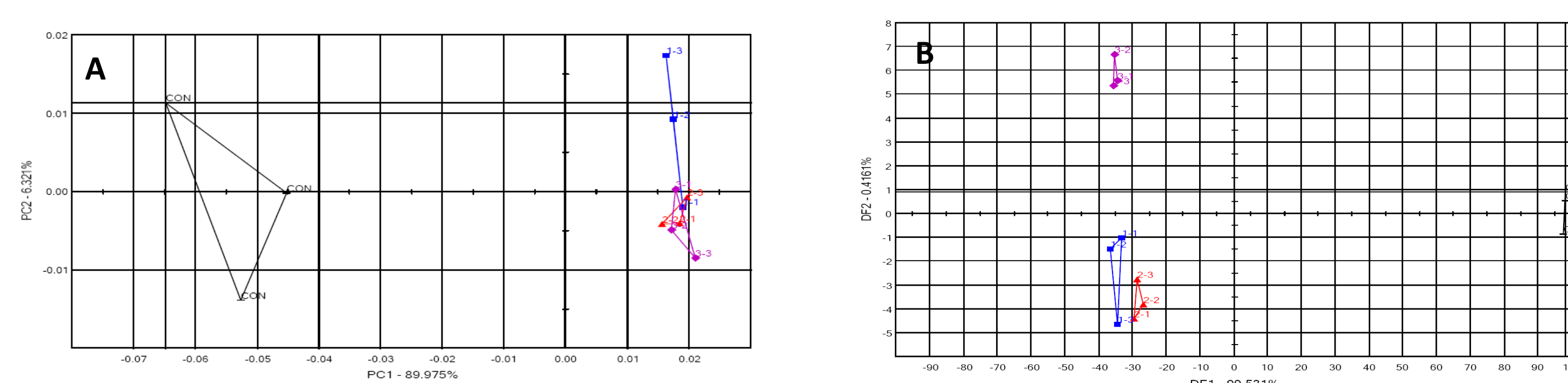
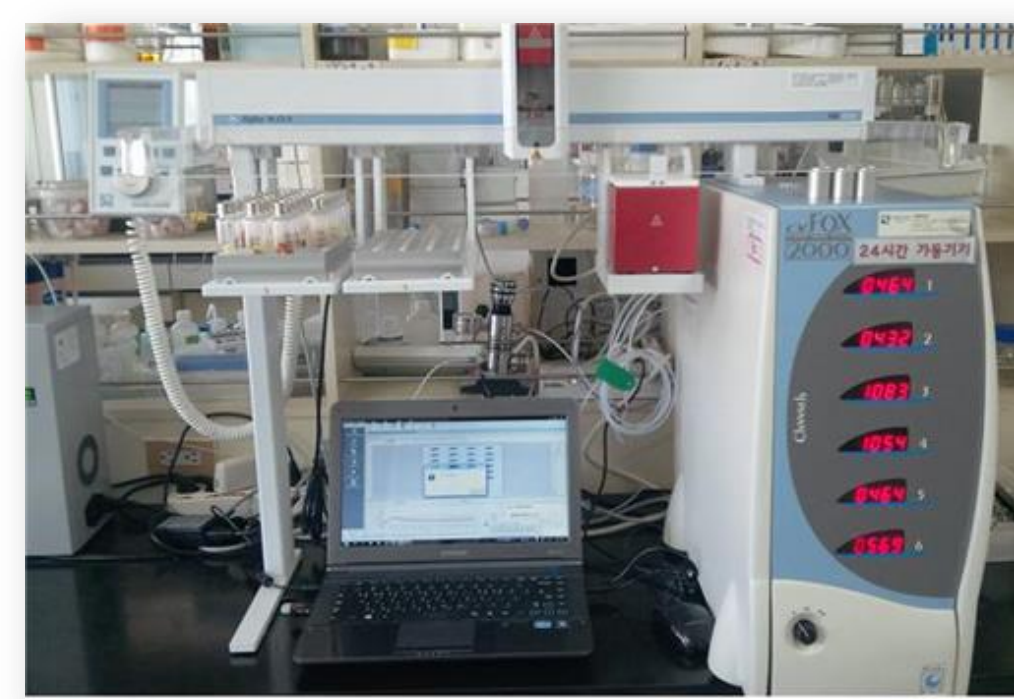


Fig. 1. Principle component analysis (A) and discriminant factor analysis (B) plots of the scent from the flowers in *B. longiflora*

Method

➤ Electronic-nose (E-nose) system



- Analysis System - Sensor array system aFox 2000 6 channel (Alpha MOS, France)
- Head space system accessories procedures were performed with PAL SyrHS 5.0 mL (Kit HS Syringe 5.0 mL of CombiPAL)
- Data analysis - discriminant function analysis (DFA)

➤ HS-SPME-GC-MS system

- Analysis System - 7000c triple quadrupole GC/MS (Agilent, USA)
- SPME system - Gerstels multipurpose Sampler (MPS)
- HS-SPME procedures were performed with Supelco SPME fiber, coated with polydimethylsiloxane (PDMS, 75 μ m).



➤ Analytical conditions with the HS-SPME-GC-MS system

sample	<i>Bouvardia longiflora</i>
fiber	75 μ m PDMS
equilibrate time	60 min
equilibrate temperature	25 $^{\circ}$ C
system	7000c triple quadrupole GC/MS (Agilent, USA)
column	DB-5MS column (30 m \times 0.25 mm I.D. \times 0.25 μ m micro ns, Agilent Technologies)
carrier gas (He)	1ml/min
oven temperature	60 ~ 250 $^{\circ}$ C, 3 $^{\circ}$ C/min
injector temperature	250 $^{\circ}$ C
injection type	splitless
EI-MS electron energy	70 eV
Ion source and connection parts temperature	250 $^{\circ}$ C

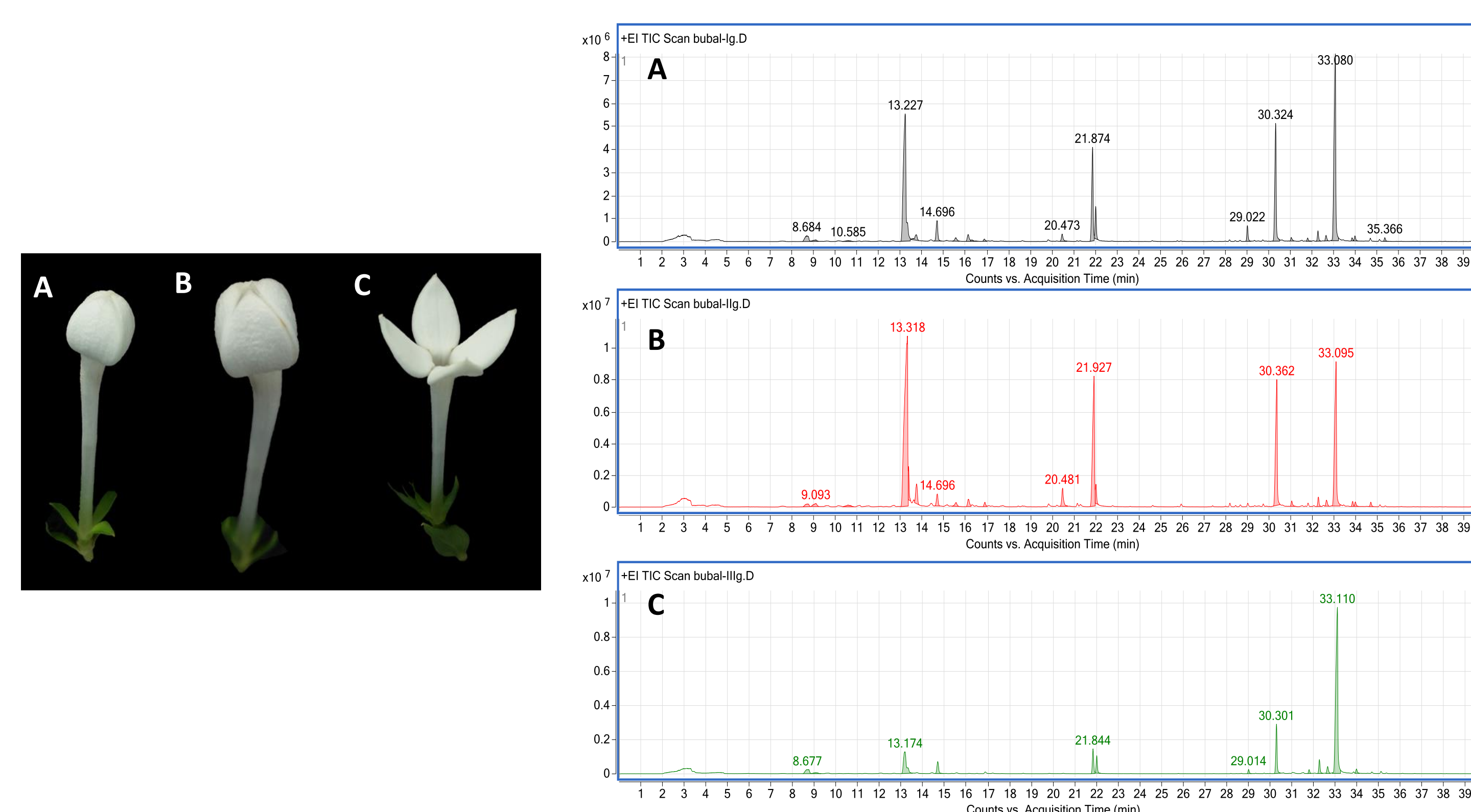


Fig. 2. Total ion chromatograms of stage I (A), stage II (B), and stage III (C) obtained by SPME of the *B. longiflora* analyzed.

Table 1. Percentages of floral scent in flowering stage of *Bouvardia longiflora*.

peak	RI	compound	Relative content (%)		
			I	II	III
1	948	(\pm)- α -Pinene	0.37	0.51	
2	958	b-Myrcene	0.50	0.68	0.85
3	1071	1,1-Dimethyl-3-methylene-2-vinylcyclohexane	1.37		
4	1082	Linalool	32.63	36.50	12.24
5	1112	2-Methyl-7-endo-vinylbicyclo[4.2.0]oct-1(2)-ene	1.18		
6	1115	(E)-4,8-Dimethylnona-1,3,7-triene		2.31	
7	1131	7,6-ethenyl-2,2,6-trimethylloxan-3-ol	1.23		
8	1138	2,2,4-Trimethyl-3-cyclohexene-1-carboxaldehyde		0.57	
9	1167	2,6-Dimethyl-3,7-octadiene-2,6-diol	0.35		
10	1173	(3R,6S)-2,2,6-Trimethyl-6-vinyltetrahydro-2H-pyran-3-ol		0.98	
11	1178	trans-Linalool 3,7-oxide		2.06	
12	1183	Isobutyl benzoate	12.20	15.82	6.02
13	1186	2,6-Dimethyl-3,7-octadiene-2,6-diol		0.44	
14	1333	(6E)-8-hydroxylinalool		1.79	
15	1407	2,8,8-Trimethyl-4-methylene-2-vinylbicyclo[5.2.0]nonane		0.43	
16	1458	α -farnesene	15.59	13.85	11.52
17	1494	β -Farnesene		0.86	
18	1566	(3E,7E)-4,8,12-Trimethyl-1,3,7,11-tridecatetraene	29.88	18.73	64.89
19	1575	2,8,8-Trimethyl-4-methylene-2-vinylbicyclo[5.2.0]nonane			1.18
20	1577	(Z)- γ -Bisabolene	0.33	0.94	
		Total	95.63	96.47	96.70

Reference

Hamada Y and Tahata H (1990) Studies on commercial values and qualities of cut flowers on Bouvaedias, *Bouvaedia hybrida* Hort. Bulletin of the Tokyo-to Agricultural Experiment Station, 22, 39-52.

Yuying Li, Hong Ma, Youming Wan, Taiqiang Li, Xiuxian Liu, Zhenghai Sun and Zhenghong Li (2016) Volatile Organic Compounds Emissions from *Luculia pinceana* Flower and Its Changes at Different Stages of Flower. Molecules, 21, 531; doi:10.3390/molecules21040531