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# PHENOLIC COMPOUNDS FROM *CALLISTEMON CITRINUS* LEAVES AND STEMS

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## ABSTRACT

In the search for bioactive constituents from Vietnamese plants, the leaves and stems of *Callistemon citrinus* (Curtis) Skeels were selected for chemical investigation. Phytochemical analysis of plant led to the isolation of eight phenolic compounds including two flavonoids (eucalyptine (**1**) and 8-demethyleucalyptine (**2**)), two alcohols (blumenol A (**3**), *n*-tetratriacontanol (**4**)), three benzoic acid derivatives (acid gallic (**5**), methyl gallate (**6**) protocatechuic acid (**7**)), one sterol (*β*-sitosterol (**8**)), and along with one sesquiterpene (2,6,10-bisabolatriene (**9**)). The structures of the natural compounds were determined from the spectroscopic evidences including 1D- and 2D-NMR and ESI-MS.

*Keywords*: *Callistemon citrinus* (Curtis) Skeels, flavonoid, triterpenoid.

## 1. INTRODUCTION

The Myrtaceae family in Vietnam comprises about 30 genera, several of which are very common and widely distributed throughout the country such as *Eucalyptus, Rhodomyrtus, Syzygium,* and *Callistemon* [1]. Species *Callistemon citrinus* (Curtis) Skeels, local name "Tram bong do", is grown as ornaments in Vietnam for its beautiful form, glossy green foliage and red, bottle-brush like flowers. Phytochemical studies of *Callistemon* species have led to the isolation

and characterization of flavones [2], acylphloroglucinols [3, 4], triterpenoids [5], neolignans [6], essential oil, steroids and saponins [7].

In previous papers, we reported the isolation of acylphloroglucinol derivatives and triterpenoids with soluble epoxide hydrolase inhibitory activity [8] as well as flavonoids with inhibitory effect on NO production in LPS-activated RAW264.7 macrophage [9] from *Callistemon citrinus* leaves and stems. In this study, we describe the isolation and structural elucidation of eight phenolic compounds, including two flavones (eucalyptin (**1**) and 8-demethyleucalyptin (**2**)), two alcohols (blumenol A (**3**), tetratriacontan-1-ol (**4**)), three benzoic acid derivatives (gallic acid (**5**), methyl gallate (**6**) and protocatechuic acid (**7**)), one sterol ($\beta$-stigmasterol (**8**)) along with one sesquiterpene (2,6,10-bisabolatriene (**9**)). The structures of the natural compounds were identified by spectroscopic evidences including 1D- and 2D-NMR and ESI-MS.

## 2. MATERIALS AND METHODS

### 2.1. General experimental procedures

$^{1}$H-NMR (500 MHz), $^{13}$C NMR (125 MHz) spectra were measured on a Bruker AVANCE 500 spectrometer. The ESI-MS spectra were obtained with a ESI-MicroQ-TOF III (Bruker Daltonics Inc.) and a FT-ESI-MS (Varian Inc.) mass spectrometer. UV and IR spectra were obtained on a JASCO V-630 and an Impact 410 Nicolet FT-IR spectrometer, respectively. Column chromatography (CC) was carried out on silica gel (Si 60 $F_{254}$, 230-400 mesh, Merck). All solvents were distilled before use. Precoated plates of silica gel 60 $F_{254}$ were used for analytical purposes. Compounds were visualized under UV radiation (254, 365 nm) and by spraying plates with 10% $H_2SO_4$ followed by heating with a heat gun.

### 2.2. Plant material

The leaves and stems of *Callistemon citrinus* (Curtis) Skeels were collected in Hue province, Vietnam. The plants were identified by the botanist Dr. Tran The Bach (Institute of Ecology and Biological Resources, VAST). A voucher specimen (HCTN-2118) is deposited in the herbarium of the Institute of Natural Products Chemistry, VAST, Hanoi, Vietnam.

### 2.3. Extraction and isolation

Dried powdered leaves and stems of *C. citrinus* (3.2 kg) were extracted with MeOH over the period of 5 days at room temperature and concentrated under reduced pressure to yield a black crude MeOH extract (190 g). This crude MeOH extract was suspended in hot MeOH-water (1:1, v/v) and successively partitioned with *n*-hexane, dichloromethane (DCM), ethyl acetate (EtOAc) and water. The resulting fractions were concentrated under reduced pressure to give the corresponding solvent-soluble fractions *n*-hexane (27.3 g), DCM (63.0 g), EtOAc (55.4 g), and water.

The *n*-hexane fraction (27.0 g) was chromatographed on a silica gel column, using solvent gradients of *n*-hexane – EtOAc (1:0, 40:1, 20:1, 10:1, and 5:1, v/v, 1.0 L each) to afford 5 subfractions (H1 to H5). The sub-fraction H4 was rechromatographed on silica gel column, eluting with DCM – EtOAc (20:1, v/v) to yield compound **1** (11.0 mg) and sub-fraction H4A, which was further purified on a silica gel column eluting with $CHCl_3$–EtOAc (15/1, v/v) to get

compound **9** (5.6 mg). A precipitate from the sub-fraction H3 was filtered and washed by *n*-hexane (1 mL × 2) to yield **4** (12.8 mg). The residue was separated by CC on silica gel, eluting with acetone–MeOH (1/4, v/v) to give compound **7** (15.7 mg) and **8** (7.2 mg).

The DCM fraction (63.0 g) was subjected to chromatography on a flash silica gel column (400 – 630 mesh), eluted with gradient DCM – methanol (1:0, 40:1, 20:1, 10:1, 5:1, 2.5:1, 1:1 and 0:1, v/v, 1.5 L each) to afford 6 subfractions (Fr. D1 to D6). The subfraction D1 (10.2 g) was subjected to silica gel CC, eluted with an isocratic solvent mixture of *n*-hexane-DCM-acetone (1:2:0.1, v/v/v), to afford 12 subfractions (D1A to D1L). The subfraction D1C was eluted with isocratic solvent system of *n*-hexane – DCM (1:3, v/v) on a silica gel column (230 – 400 mesh) to yield compound **2** (6.1 mg).

The EtOAc fraction (55.4 g) was chromatographed on a flash silica gel column (400 – 630 mesh) eluting with gradients of $CH_2Cl_2$-MeOH (1:0 ~ 0:1, v/v) to afford 7 subfractions (E1~E7). The subfraction E3 was subjected to column chromatography on silica gel eluting with $CH_2Cl_2$-MeOH (15:1) to afford 2 subfractions E3A and E3B. The subfraction E3B was further separated on a silica gel column eluting with a mixture of *n*-hexane - $Me_2CO$ (2:1), to yield compounds **6** (99.0 mg) and **3** (4.9 mg). The subfraction E4 was subjected to column chromatography on silica gel eluting with gradients of $CHCl_3$-MeOH-$H_2O$ (4:1:0.1 – 3:1:0.1, v/v/v) to obtain 6 subfractions (E4A - E4F). The subfraction E4C was subjected to CC on silica gel eluting with an isocratic mixture of $Me_2CO$-$CHCl_3$-$H_2O$ (2:1:0.1, v/v/v), to afford 6 subfractions (E4C1~E4C6). The subfraction E4C1 was chromatographed over a RP-18 column, eluting with MeOH-$H_2O$ (1:1, v/v) to obtain 4 subfractions (C1A~C1D). The subfraction C1A was rechromatographed over a RP-18 column eluting with MeOH-$H_2O$ (1:3) to yield compounds **5** (123.0 mg).

### 2.4. **Spectral and physical data**

*2.4.1 Eucalyptin* (**1**) pale lemon yellow powder, $C_{19}H_{18}O_5$ (M=326). $^1$H-NMR (500 MHz, $CDCl_3$), $\delta$(ppm): 6.60 (s, 1H, H-3), 7.85 (d, 2H, *J* = 9.5 Hz, H-2′,6′), 7.01 (d, 2H, *J* = 9.5 Hz, H-3′,5′), 12.87 (s, 5-OH), 3.80 (s, 3H, 7-$OCH_3$), 3.89 (s, 3H, 4′-$OCH_3$), 2.20 (s, 3H, 8-$CH_3$), 2.38 (s, 3H, 6-$CH_3$). $^{13}$C-NMR (125 MHz, $CDCl_3$), $\delta$(ppm): 163.8 (s, C-2), 104.0 (d, C-3), 183.2 (s, C-4), 157.3 (s, C-5), 114.1 (s, C-6), 162.6 (s, C-7), 107.4 (s, C-8), 152.9 (s, C-9), 108.8 (s, C-10), 123.8 (s, C-11), 127.9 (d, C-2′,6′), 114.5 (d, C-3′,5′), 159.8 (s, C-4′), 60.4 (q, 7-$OCH_3$) , 55.5 (q, 4′-$OCH_3$), 8.5 (q, 8-$CH_3$), 8.3 (q, 6-$CH_3$). ESI-MS (*m/z*): 327 $[M+H]^+$.

*2.4.2 8-demethyleucalyptin* (**2**) white powder, $C_{18}H_{16}O_5$ (M=312). $^1$H-NMR (500 MHz, DMSO-$d_6$), $\delta$(ppm): 6.86 (s, 1H, H-3), 6.92 (s, 1H, H-8), 8.05 (d, 2H, *J* = 9.5 Hz, H-2′,6′), 7.10 (d, 2H, *J* = 9.0 Hz, H-3′,5′), 13.05 (s, 5-OH), 3.86 (s, 3H, 7-$OCH_3$), 3.91 (s, 3H, 4′-$OCH_3$), 1.99 (s, 3H, 6-$CH_3$). $^{13}$C-NMR (125 MHz, DMSO-$d_6$), $\delta$(ppm): 163.0 (s, C-2), 103.7 (d, C-3), 181.9 (s, C-4), 162.3 (s, C-5), 107.5 (s, C-6), 163.3 (s, C-7), 90.3(s, C-8), 155.4 (s, C-9), 104.4 (s, C-10), 122.8 (s, C-1′), 128.2 (d, C-2′, 6′), 114.5 (d, C-3′, 5′), 157.4 (s, C-4′), 56.3 (q, 7-$OCH_3$), 55.5 (q, 4′-$OCH_3$), 7.2 (q, 6-$CH_3$). ESI-MS (*m/z*): 313 $[M+H]^+$.

*2.4.3 Blumenol A* (**3**) white powder, $C_{13}H_{20}O_3$ (M = 224). $^1$H-NMR (500 MHz, MeOD-$d_4$), $\delta$(ppm): 2.50 (1H, d, *J* = 17.0 Hz, H-6a), 2.19 (1H, dd, *J* = 6.5, 17.0 Hz, H-6b), 5.90 (1H, m, *J* = 1.5 Hz, H-2), 5.80 (1H, m, *J* = 16.0 Hz, H-7), 5.82 (1H, m, *J* = 16.0, 4.5 Hz, H-8), 4.34 (1H, m, *J* =4.5; 6.5 Hz, H-9), 1.26 (3H, d, *J* = 6.5 Hz, H-10), 1.04 (3H, s, H-11), 1.06 (3H, s, H-12), 1.93 (3H, d, *J*=1.5 Hz, H-13). $^{13}$C-NMR (125 MHz, MeOD-$d_4$), $\delta$(ppm): 201.2 (s, C-1),

42.4 (s, C-5), 50.7 (t, C-6), 127.1 (s, C-2), 167.4 (s, C-3), 79.9 (s, C-4), 129.9 (d, C-7), 136.9 (d, C-8), 68.6 (d, C-9), 23.8 (q, C-10), 24.5 (q, C-11), 23.4 (q, C-12), 19.5 (q, C-13).

*2.4.4 Tetratriacontan-1-ol* (**4**) white powder, $C_{34}H_{70}O$ (M=494). $^1$H-NMR (500 MHz, $CDCl_3$): 3.64 (2H, t, *J* = 6.5 Hz, H-1), 1.55 (4H, m, H-2&3), 1.25-1.34 (60H, H-4÷H-33), 0.88 (3H, t, *J* = 6.5 Hz, H-34); ESI-MS (*m/z*): 493 $[M-H]^-$.

*2.4.5. Gallic acid* (**5**) white powder, $C_7H_6O_5$ (M=170). $^1$H-NMR (500 MHz, MeOD-$d_4$), $\delta$(ppm): 7.00 (2H, s, H-2, -6). $^{13}$C-NMR (125 MHz, MeOD-$d_4$), $\delta$(ppm): 170.5 (s, C-7), 110.4 (d, C-2,-6), 146.5 (s, C-3, -5), 139.7 (s, C-4), 122.0 (s, C-1).

*2.4.6. Methyl gallate* (**6**) white powder, $C_8H_8O_5$ (M=184). $^1$H-NMR (500 MHz, MeOD-$d_4$), $\delta$(ppm): 7.00 (2H, s, H-2, -6), 3.77 (3H, s, H-8). $^{13}$C-NMR: (500 MHz, MeOD-$d_4$), $\delta$(ppm): 169.1 (s, C-7), 52.3 (q, C-8), 110.1 (d, C-2, -6), 146.6 (s, C-3, -5), 139.8 (s, C-4), 121.5 (s, C-1).

*2.4.7. Protocatechuic acid* (**7**) white powder, $C_7H_6O_4$, (M=154). $^1$H-NMR (500 MHz, MeOD-$d_4$), $\delta$(ppm): 7.93 (COO*H*), 7.45 (1H, s, H-2), 6.81 (1H, d, *J* = 8.0 Hz, H-5), 7.44 (1H, d, *J* = 8.0 Hz, H-6). $^{13}$C-NMR (125 MHz, MeOD-$d_4$), $\delta$(ppm): 170.4 (s, C-7), 115.8 (d, C-6), 117.8 (d, C-5), 123.4 (s, C-4), 146.1 (s, C-3), 123.9 (d, C-2), 151.5 (s, C-1).

*2.4.8. β-sitosterol* (**8**) white powder, $C_{29}H_{50}O$ (M=414). $^1$H-NMR (500 MHz, $CDCl_3$), $\delta$(ppm): 3.52 (1H, tt, *J* = 6.5, 11.0 Hz, H-3), 5.35 (1H, brd, *J* = 6.5 Hz, H-6), 0.68 (3H, s, H-18), 1.01 (3H, s, H-19), 0.90 (3H, d, *J* = 7.0 Hz, H-21), 0.83 (3H, d, *J* = 6.5 Hz, H-26), 0.81 (3H, d, *J* = 7.0 Hz, H-28), 0.85 (3H, d, *J* = 7.0 Hz, H-29).

*2.4.9. 2,6,10-bisabolatriene* (**9**) colourless oil, $C_{15}H_{24}$ (M=204). $^1$H-NMR (500 MHz, $CDCl_3$), $\delta$(ppm): 2.01 (2H, quint. *J* = 7.5 Hz, H-1); 5.10 (1H, H-2); 2.07 (2H, quint., *J* = 7.5 Hz, H-4); 2.07 (2H, quint., *J* = 7.5 Hz, H-5); 1.99 (2H, quint., *J* = 8.0 Hz, H-8); 1.99 (2H, quint., *J* = 8.0 Hz, H-9); 5.10 (1H, H-10); 1.60 (3H, s, H-12); 1.60 (3H, s, H-13); 1.60 (3H, s, H-14); 1.68 (3H, s, H-15). $^{13}$C-NMR (125 MHz, $CDCl_3$), $\delta$(ppm): 26.7 (t, C-1); 124.3 (d, C-2); 135.1 (s, C-3); 28.3 (t, C-4); 26.8 (t, C-5); 124.2 (s, C-6); 134.9 (s, C-7); 39.8 (t, C-8); 39.7 (t, C-9); 124.4 (d, C-10); 131.2 (s, C-11); 16.1 (q, C-12); 16.0 (q, C-13); 25.7 (q, C-14); 17.7 (q, C-15) ; ESI-MS (*m/z*): *m/z* 205 $[M+H]^+$.

## 3. RESULTS AND DISCUSSION

Compound (**2**) was isolated from the dichloromethane (DCM) fraction of the methanolic extract of *Callistemon citrinus* leaves and stems. Three compounds (**3**, **5** and **6**) were isolated from the EtOAc fraction and five compounds (**1**, **4**, **7**, **8** and **9**) were obtained from the *n*-hexane fraction.

Compounds **1** and **2** are two flavones (Fig. 1). While compound **1** was obtained from *n*-hexane fraction, compound **2** was isolated from EtOAc fraction of the methanolic extract of *C. citrinus* leaves. The 1D-NMR spectra including $^1$H, $^{13}$C and DEPT of two compounds are very similar. The $^1$H spectrum of **1** showed a low-field singlet signal ($\delta_H$ 12.87, 5-OH), two doublet aromatic proton signals characteristic of a *para*-substituted B-ring, two methoxy groups ($\delta_H$ 3.89, and 3.80) and two singlet methyl substituents ($\delta_H$ 2.38 and 2.20). $^{13}$C-NMR analysis of **1** revealed the presence of 19 carbons including one carbonyl ($\delta_C$ 183.2), four methines of a *para*-

substituted B-ring, one A-ring aromatic methine, two methoxyl, and two C-methyl carbons. Molecular formula of **1** was determined to be $C_{19}H_{18}O_5$ based on the quasi – molecular ion peak observed at *m/z* 327 $[M+H]^+$ in positive mode electrospray ionization (ESI-MS) mass spectrometry. From the 1D-NMR and ESI-MS spectral data, compound **1** was identified as 5-hydroxy-7,4′-dimethoxy-6,8-dimethylflavone with common name as eucalyptin [10]. Similarly, molecular formula of **2** was $C_{18}H_{16}O_5$, based on the ESI-MS quasi – molecular ion peak at *m/z* 313 $[M+H]^+$, indicating the absence of one methyl group in comparison with that of eucalyptin (**1**). In the NMR spectra of **2**, the absence of one C-methyl signal, resulting in the shift of C-8 signal to the upfield region ($\delta_C$ 90.3 in **2** vs. 107.4 in **1**), and the addition of one proton in the aromatic field ($\delta_H$ 6.92, H-8), as well as by comparison with spectral data reported in the literature, confirmed the structure of compound **2** as 5-hydroxy-7,4′-dimethoxy-6-methylflavone or 8-demethyleucalyptin [10].

Compound **3** was isolated as white powder from the EtOAc fraction. The $^1$H-NMR spectrum of **3** showed characteristic signals of four methyl groups at $\delta_H$ 1.26 (3H, d, *J* = 6.5 Hz, H-10), 1.04 (3H, s, H-11), 1.06 (3H, s, H-12), and 1.93 (3H, d, *J*=1.5 Hz, H-13); one methylene at $\delta_H$ 2.50 (1H, d, *J*=17.0 Hz, H-6a), 2.19 (1H, d, *J* = 17.0; 6.5 Hz, H-6b) and four methines at $\delta_H$ 5.90 (1H, m, H-2), 5.80 (1H, d, *J*=16.0 Hz, H-7), 5.82 (1H, dd, *J* = 16.0, 4.5 Hz, H-8), 4.34 (1H, m, *J* = 6.5, 4.5 Hz, H-9). The strong coupling constant (*J* = 16.0 Hz) of protons H-7 and H-8 indicated the *trans*-configuration of $C_7$=$C_8$ double bond. $^{13}$C-NMR/DEPT spectra of **3** showed 13 cacbons (1 x CO, 3 x $C_4$, 4 x CH, 4 x $CH_3$ and 1 x $CH_2$). The analysis of HMBC spectrum indicated the presence of a 3,5,5-trimethyl-2-cyclohexene-1-one unit and a 3-hydroxy-1-butenyl side chain. Comparison of the spectral data with those in the literature, compound **3** was determined as blumenol A [11].

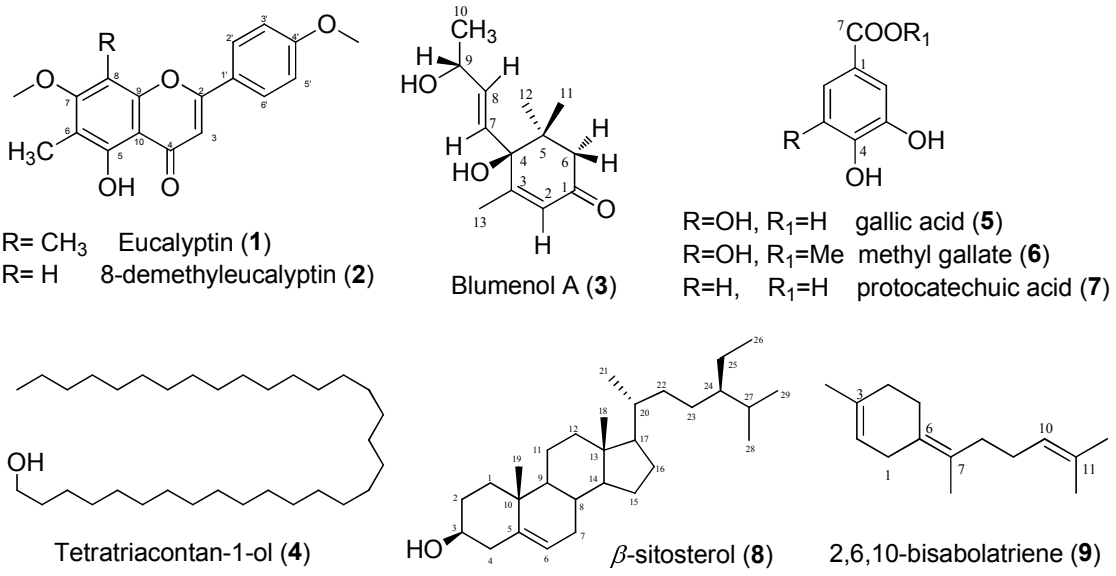


*Figure 1*. Structures of isolated compounds (**1-9**).

Compound **4** was obtained as white powder from *n*-hexane fraction. $^1$H-NMR spectrum of **4** presented signals of hydroxymethylene protons at $\delta_H$ 3.64 (2H, t, *J* = 7.0 Hz, H-1); two methylenes at $\delta_H$ 1.56 (4H, t, *J*=7.0 Hz, $H_2$-2,3), sixty consecutive methylene protons at $\delta_H$ 1.25 – 1.26 (60H, s) and one methyl group ($\delta_H$ 0.88, 3H, t, *J* = 7.0 Hz, H-34). These data suggested

that **4** was a long-chain alcohol. The ESI-MS spectrum of **4** in negative mode showed a pseudomolecular ion peak at *m/z* 493 $[M-H]^-$, indicating the molecular formula of **4** as $C_{34}H_{70}O$. Compound **4** was determined to be *n*-tetratriacontanol, other name sapiol [12].

Compound **5** and **6** were isolated from ethyl acetate fraction. The $^{13}$C-NMR and DEPT spectra of compounds **5** and **6** showed signals of a carbonyl group ($\delta_C$ 169.1 - 170.5, C-7), two pairs of equivalent carbons at $\delta_C$ 110.4 (d, C-2, C-6), 146.5 (s, C-3, C-5) and two quarternary carbons at $\delta_C$ 139.7 (s, C-4) / 122.0 (s, C-1), belonging to a 3,4,5-trisubsituted benzoic acid derivative. The $^1$H- and $^{13}$C-NMR spectra also showed the presence of a methyl group in compound **6**. From spectroscopic evidences, compound **5** was identified as 3,4,5-trihydroxy benzoic acid or gallic acid [13] and compound **6** was its derivative as 3,4,5-trihydroxy-methylbenzoate or methyl gallate [14].

Compound **7** was also obtained from *n*-hexane fraction. The $^1$H- and $^{13}$C-NMR spectra of **7** were similar to those of gallic acid **5**, except for the presence of a proton substituted for an hydroxy group at carbon C-5 ($\delta_C$ 117.8). In agreement with that, the $^1$H-NMR spectrum of **7** showed signals of three aromatic methine protons at $\delta_H$ 7.45 (s, H-2), 6.81 (d, $J$ = 8.0 Hz, H-5) and 7.44 (d, $J$ = 8.0 Hz, H-6), belonging to a 3,4-disubsituted benzoic acid. In comparison to literature, compound **7** was identified as 3,4-dihydroxybenzoic acid, trivial name protocatechuic acid.

Compound **8,** obtained as white powder from *n*-hexane fraction, was elucidated as *β*-sitosterol on the basis of the NMR data and comparison with the data reported in the literature [15].

Compound **9** was obtained as colourless oil from *n*-hexane fraction of methanol extract of *C. citrinus* leaves. From ESI-MS ion peak at *m/z* 205 $[M+H]^+$, the molecular fomular of **8** was identified as $C_{15}H_{24}$ (M=204). The $^1$H NMR spectrum of **9** contained the signals of four quartenary methyls at $\delta_H$ 1.68 (3H, s, $H_3$-15) / 1.60 (9H, s, $H_3$-12, $H_3$-13 and $H_3$-14), five methylene at $\delta_H$ 1.99 -2.07; and two methines at $\delta_H$ 5.10 (2H, s, H-2, -10). These data, together with the presence of 15 carbon signals in the $^{13}$C NMR spectrum (4 x $C_4$, 2 x CH, 5 x $CH_2$, 4 x $CH_3$) suggested that **9** was a sesquiterpene. By comparison of the spectroscopic data with those published in literature, compound **9** was identified as 2,6,10-bisabolatriene [16].

## 4. CONCLUSION

In the search for bioactive constituents from Vietnamese plants, the leaves and stems of *Callistemon citrinus* (Curtis) Skeels were selected for chemical investigation. From the methanolic extract of this species, solvent-soluble fractions with increased polarity were produced including *n*-hexane, dichloromethane, ethyl acetate and water. Phytochemical analysis of different fractions of the plant led to the isolation of eight phenolic compounds including two flavones (eucalyptin (**1**) and 8-demethyleucalyptin (**2**)), two alcohols (blumenol A (**3**), *n*-tetratriacontanol (**4**)), three benzoic acid derivatives (acid gallic (**5**), methyl gallate (**6**) and protocatechuic acid (**7**)), one sterol (*β*-sitosterol (**8**)), along with one sesquiterpene (2,6,10-bisabolatriene (**9**)). The structures of the natural compounds were determined from the spectroscopic evidences including 1D- and 2D-NMR and ESI-MS.

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## TÓM TẮT

### CÁC HỢP CHẤT PHENOL PHÂN LẬP TỪ LÁ VÀ CÀNH LOÀI *CALLISTEMON CITRINUS*

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Từ lá và cành loài Tràm bông đỏ *Callistemon citrinus* (Curtis) Skeels tám hợp chất phenol và một hợp chất sesquiterpene đã được phân lập và xác định cấu trúc bao gồm hai flavon (eucalyptine (**1**) và 8-demethyleucalyptine (**2**)), hai hợp chất alcol (blumenol A (**3**), *n*-tetratriacontanol (**4**)), ba dẫn xuất của acid benzoic (acid gallic (**5**), methyl gallate (**6**) và acid protocatechuic (**7**)), một hợp chất sterol (*β*-sitosterol (**8**)) và một sesquiterpene (2,6,10-bisabolatriene (**9**)). Cấu trúc hóa học của các hợp chất trên được xác định nhờ các phương pháp hóa lý và phương pháp phổ bao gồm phổ cộng hưởng từ nhân 1 chiều, 2 chiều và phổ khối lượng.

*Từ khóa: Callistemon citrinus* (Curtis) Skeels, flavonoit, triterpenoit.