Organic LETTERS

Letter

pubs.acs.org/OrgLett

Dimeric *Erythrina* Alkaloids from the Flower of *Erythrina variegata*

Bing-Jie Zhang,[†,‡] Mei-Fen Bao,[†] Chun-Xia Zeng,[§] Xiu-Hong Zhong,[†,‡] Ling Ni,[†,‡] Ying Zeng,*[,†] and Xiang-Hai Cai*[,†]

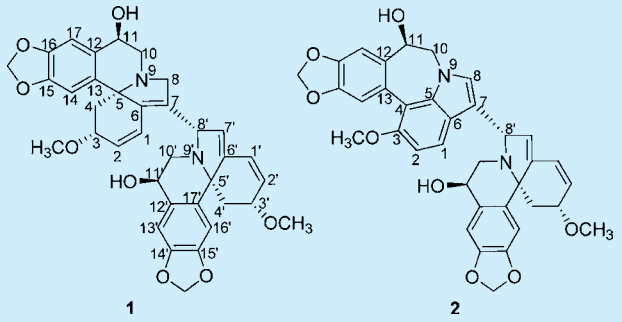
[†]State Key Laboratory of Phytochemistry and Plant Resources in West China, Kunming Institute of Botany, Chinese Academy of Scienes, Kunming 650201, People's Republic of China

[‡]University of Chinese Academy of Sciences, Beijing 100039, People's Republic of China

[§]Germplasm Bank of Wild Species in Southwest China Kunming Institute of Botany, Chinese Academy of Sciences, Kunming 650201, People's Republic of China

Supporting Information

ABSTRACT: Unprecedented dimeric *Erythrina* alkaloids, spirocyclic (6/5/6/6) erythrivarine A (**1**) and spiro-fused (6/5/7/6) rings erythrivarine B (**2**), were isolated from the cultivated plant, *E. variegata*. The structures were determined on the basis of 1D and 2D NMR, FTIR, UV, and mass spectroscopic data and X-ray crystal diffraction. The biogenetic relationship of **1** and **2** is proposed.



The *Erythrina* alkaloid is derived from two tyrosine units via oxidative coupling and intramolecular rearrangement and consists of approximately 80 alkaloids.[1] Folkers and co-workers first carried out the systematic phytochemical research on *Erythrina* alkaloids in the 1930s.[2] Later, Mondon and Ito as well as other scientists made some new progress.[3] In addition to the simple *Erythrina* alkaloid, this class of compounds also includes other types with a six-membered lactone and pyridine ring D, respectively. The *Erythrina* alkaloid produces anxiolytic-like activity,[4] induced sleep,[5] anticonvulsant actitivity,[6] neuronal nicotinic acetylcholine receptor antagonism,[7] leishmanicidal activity,[8] antifeedant activity,[9] and anticataract activity.[8] However, there has not been a star molecule or lead compound in the *Erythrina* alkaloid to date. Thus, pharmaceutical chemists have not paid much attention to the natural products. The *Erythrina* alkaloids possess 6/6/5/6 spirocyclic systems with stable 5*S* chiral centers,[11] seemingly exhibiting a not very diverse or fascinating molecular architecture. Nevertheless, the spirocyclic and aromatic skeletons in *Erythrina* alkaloids recently captured researchers' imaginations and due to their challenging polycyclic molecular architectures.[12] The polymerization of natural products is an approach not only to structural complexity but also to new bioactive compounds, such as the bisindoles vinblastine and vincristine.[13] To date, the reported so-called dimeric alkaloids that incorporated a tryptophan moiety are not true dimeric *Erythrina* alkaloids.[14] In contrast, skeletal rearrangement has served as the main pathway to structural diversity. For example, monoterpenoid quinoline alkaloids (e.g., camptothecin and quinine) resulted in monoterpenoid indole alkaloids via rearrangement. Until now, there have been no reported polymeric and/or rearranged *Erythrina* alkaloids. As part of a study on alkaloids from Yunnan plant resources, we reported three new representative alkaloids in 2007, 2008, and 2011.[15] In our continuing studies on the new alkaloids, two dimeric *Erythrina* alkaloids (**1** and **2**) have been isolated from cultivated *E. variegata* plants (Figure 1). This paper describes their isolation, structure determination, cytotoxicity, and possible biopathway.

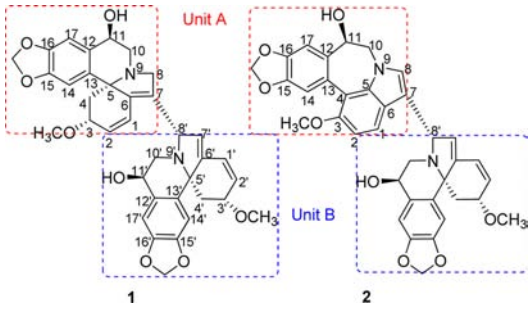


Figure 1. Structure of erythrivarines A and B.

The dried and powdered flowers[16] of *E. variegata* L. (10.0 kg) were extracted with MeOH (25 L × 3) at room temperature, and the solvent was evaporated under reduced pressure. The residue was dissolved in 2% acetic acid and partitioned twice with EtOAc. The water layer was subsequently basified using ammonia−water to pH 8−9 and then again partitioned twice with EtOAc,

Received: November 3, 2014
Published: December 3, 2014

dx.doi.org/10.1021/ol503190z | *Org. Lett.* 2014, 16, 6400−6403

Table 1. ^{1}H and ^{13}C NMR Assignments of Alkaloids 1 and 2[a]

entry	δ_H (1)	δ_C (1)	δ_H (2)	δ_C (2)
1	6.91 (dd, 10.2, 1.8)	123.9 (d)	7.62 (d, 8.4)	120.9 (d)
2	5.93 (d, 10.2)	132.5 (d)	6.94 (d, 8.4)	108.0 (d)
3	3.76 (m)	77.0 (d)		153.5 (s)
4	2.38 (dd, 10.8, 4.8)	41.0 (t)		112.5 (s)
	1.70 (t, 10.8)			
5		69.6 (s)		135.9 (s)
6		137.7 (s)		124.3 (s)
7		136.5 (s)		115.4 (s)
8	3.92 (d, 13.8)	60.2 (t)	7.03 (s)	130.0 d
	3.61 (d, 13.8)			
10	3.54 (d, 12.6)	53.6 (t)	4.45 (dd, 11.4, 1.2)	60.0 (t)
	2.69 (dd, 12.6, 4.8)		4.15 (dd, 11.4, 8.4)	
11	4.74 (m, overlap)	64.5 (d)	4.99 (dd, 8.4, 1.2)	70.4 (d)
12		133.1 (s)		138.8 (s)
13		132.5 (s)		124.3 (s)
14	6.71 (s)	105.5 (d)	7.38 (s)	112.8 (d)
15		147.3 (s)		146.8 (s)
16		147.3 (s)		147.6 (s)
17	7.06 (s)	107.3 (d)	7.26 (br s)	104.4 (d)
$-CH_2-$	5.97 (s)	101.5 (t)	6.04 (d, 1.2)	102.0 (t)
	5.96 (s)		6.01 (d, 1.2)	
3-OMe	3.27 (3H)	55.4 (q)	3.82 (3H, s)	57.5 (q)
11-OH	4.69 (d, 4.8)			
1′	6.52 (dd, 10.2, 2.4)	125.4 (d)	6.64 (dd, 9.6, 2.4)	125.7 (d)
2′	6.01 (d, 10.2)	133.3 (d)	6.09 (d, 9.6)	132.2 (d)
3′	3.82 (m)	76.6 (d)	3.93 (m)	77.0 (d)
4′	2.44 (dd, 11.4, 5.4)	41.5 (t)	2.49 (dd, 11.0, 5.4)	42.8 (t)
	1.72 (t, 11.4)		1.91 (t, 11.0)	
5′		68.6 (s)		68.6 (s)
6′		143.5 (s)		142.0 (s)
7′	5.39 (s)	125.9 (d)	5.76 (s)	129.3 (d)
8′	4.96 (s)	67.0 (d)	5.19 (s)	67.7 (d)
10′	3.40 (dd, 12.6, 4.8)	52.3 (t)	3.35 (dd, 13.2, 4.8)	51.7 (t)
	2.74 (d, 12.6, 5.4)		2.77 (dd, 13.2, 6.0)	
11′	4.73 (m, overlap)	64.5 (d)	4.73 (m)	65.0 (d)
12′		133.1 (s)		133.3 (s)
13′		132.5 (s)		132.5 (s)
14′	6.74 (s)	105.0 (d)	6.82 (s)	106.1 (d)
15′		147.3 (s)		147.4 (s)
16′		147.3 (s)		147.3 (s)
17′	7.01 (s)	107.1 (d)	7.07 (s)	108.0 (d)
$-C'H_2-$	5.95 (2H, br s)	101.5 (t)	5.97 (2H, s)	101.8 (t)
3′-OMe	3.27 (3H, s)	55.4 (q)	3.32 (s)	56.3 (q)
11′-OH	4.57 (d, 4.8)			

[a]Data were recorded in acetone-d_6 on Bruker Avance-III 600 MHz spectrometers (^{1}H, ^{13}C, $^{1}H-^{1}H$ COSY, HSQC, HMBC, ROESY); chemical shifts (δ) are given in parts per million with references to the most downfield signal of acetone-d_6 (δ 2.04 ppm) for ^{1}H and to the center peak of the downfield signal of acetone-d_6 (δ 30.0 ppm) for ^{13}C. Multiplicities and J values (in Hz) are given in parentheses.

affording the aqueous phase and EtOAc phase (total alkaloids). The total alkaloids (120 g) were collected and then dissolved in MeOH, and the resulting solution was subjected to column chromatography (CC) over silica gel with $CHCl_3$/MeOH as eluent (from $CHCl_3$ to $CHCl_3$/MeOH (5/1)) to afford seven fractions (I–VII). Erythrinine (alkaloid **3**; 31.2 g) was crystallized from fraction III. Fraction IV (8.5 g) was further chromatographed on a C_{18} MPLC colunm using aqueous methanol (1/9–1/0) as eluent to give the six subfractions IV-1–IV-6. Subfraction IV-6 (2.4 g) was subjected to CC over silica gel and eluted with $CHCl_3$/acetone (4/1, v/v) to afford four subfractions (A–D). Fraction D (24 mg) was further purified by a preparative column with gradient flow from 70% to 80% aqueous methanol to give **2** (10 mg). Fraction V (12 g) was subjected on Rp-18 silica gel CC and eluted with 10–100% aqueous methanol to give the six subfractions V-1–V-6. Fraction V-4 (0.8 g) was placed on a Sephadex LH-20 column, eluted with 50% aqueous methanol, and then purified by a C_{18} HPLC column with 60–70% aqueous methanol to afford **1** (16 mg).

The UV absorptions of **1**[17] at 204, 238, and 289 nm indicated a tetrahydroisoquinoline chromophore.[18] However, its IR absorption bands at 3441 cm^{-1} and at 1629, 1503, and 1482 cm^{-1} resulted from the –OH and aromatic rings, which were consistent with the characteristics of an *Erythrina* alkaloid. The

dx.doi.org/10.1021/ol503190z | Org. Lett. 2014, 16, 6400–6403

HRESIMS (m/z 625.2546) and ^{13}C NMR spectroscopic data (Table 1) of **1** established the molecular formula $C_{36}H_{37}N_2O_8$ $[M + H]^+$, appropriate for 20 degrees of unsaturation. In the ^1H NMR spectrum of **1** (Table 1), four singlets (δ_H 7.06, 7.01, 6.74, 6.71), four doublets (δ_H 6.91 (d, J = 10.2 Hz), 5.93 (d, J = 10.2 Hz), 6.52 (d, J = 10.2 Hz), 6.01 (d, J = 10.2 Hz)), two methylenedioxy groups (δ_H 5.97, 5.96, and 5.95 × 2), and two methoxyl groups (δ_H 3.27 × 2) indicated that **1** might be an *Erythrina* alkaloid dimer. In the ^{13}C NMR spectrum (Table 1 and Figure S-2 (Supporting Information)), 13 quaternary carbons (δ_C 147.3 × 4, 143.5, 137.7, 136.5, 133.1 × 2, 132.5 × 2, 69.6, 68.6), 7 methylenes (δ_C 101.5 × 2, 60.2, 53.6, 41.5, 52.3, 41.0), 14 methines (δ_C 133.6, 132.5, 125.4, 123.9, 125.9, 107.3, 107.1, 105.5, 105.0, 77.0, 76.6, 67.0, 64.5 × 2), and 2 methoxyl groups (δ_C 55.4 × 2) further suggested that **1** was a dimeric alkaloid, consisting of an erythrinine unit.[19] The C-11/11′ hydroxyl groups were determined using the HMBC correlations of 11-OH (δ_H 4.69)/C-10 (δ_C 53.6) and C-12 (δ_C 133.1), and of 11′-OH (δ_H 4.57)/C-10′ (δ_C 52.3) and C-12′ (δ_C 133.1). Two typical C-3(3′) methoxyl groups were supported by HMBC correlations of δ_H 3.76 (H-3)/δ_C 69.6 (C-5), 123.9 (C-1), and 55.4 (OMe) and of δ_H 3.82 (H-3′)/δ_C 68.6 (C-5′), 125.4 (C-1′) and 55.4. The 11(11′)-OH that resonated at δ_H 4.74/4.73 was assigned as β because of ab δ_H 4.76 (H-11) in the β isomer and ab δ_H 4.14 in the α isomer.[20] This presumption was supported by the ROESY correlations of H-11(11′)/H-4(4′) (Figure 2). The OMe groups

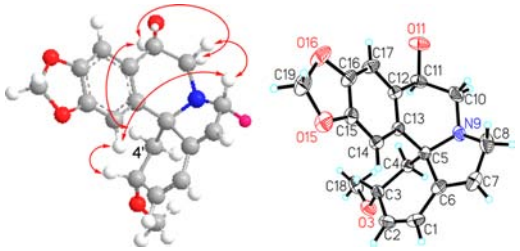


Figure 2. Key ROESY correlations of unit B in **1** and structure determined by X-ray diffraction of the erythrinine (**3**) unit of **1** and **2**.

at C-3(3′) were α-oriented through the ROESY correlations of H-3(3′)/H-14(14′). Alkaloid **1** lacked a methylene group and a singlet sp^2 methine signal on the basis of a comparison with the ^{13}C NMR data from a pair of erythrinines; instead, δ_C 67.0 (d) and 136.5 (s) were present in **1**. Additionally, the HMBC correlations from a singlet at δ_H 4.96 (s, H-8′) to δ_C 60.2 (C-8), 136.5 (C-7), 137.7 (C-6), 143.5 (C-6′), 52.3 (C-10′), 68.6 (C-5′), and 125.9 (C-7′) indicated that both units were connected via C-7/8′. H-8′ was determined to be the α configuration through the NOEs of H-8′/H-10′β, H-10′α/H-11′, and H-8′/14′, which was its preferred conformation. Unfortunately, attempts to prepare a single crystal of this molecule have not been successful. However, the X-ray diffraction of the alkaloid **3**[21] unit of **1** ($[\alpha]_D^{22}$ = 206° (c 0.36, CH_3OH), for NMR spectral data see Figures S-14 and S-15 in the Supporting Information) (Figure 2) indicated that its configuration was 3*R*,5*S*,11*R*: namely, erythrinine. In addition, the configuration of C-5 was *S* in all reported *Erythrina* alkaloids. Nevertheless, the absolute configuration of **1** was determined to be 3(3′)*R*,5*R*,5′*S*,8′*S*,11-(11′)*R* rather than 3(3′)*R*,5(5′)*S*,8′*S*,11(11′)*R* due to polymerization. All the signals of ^1H and ^{13}C NMR were assigned by HSQC, HMBC, $^1H-^1H$ COSY, and ROESY spectra.

The HRESIMS (m/z 621.2229) of **2**[22] suggested the molecular formula as $C_{36}H_{33}N_2O_8$ $[M + H]^+$: two additional degrees of unsaturation in comparison to **1**. The partial signals in the ^1H and ^{13}C NMR spectrum of alkaloid **2** (Table 1 or Figures S-7 and S-8 in the Supporting Information) were close to those of **1**, also possessing an erythrinine unit. In comparison with the ^{13}C NMR data of erythrinine, the remaining data for **2** resulted from sp^2 signals, except for an oxymethine (δ_C 70.4) and nitrogen-substituted methylene (δ_C 60.0), which were coupled with each other in the $^1H-^1H$ COSY spectrum (Figure 3). In addition, a

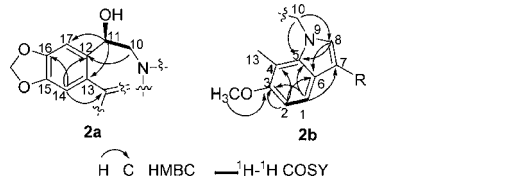


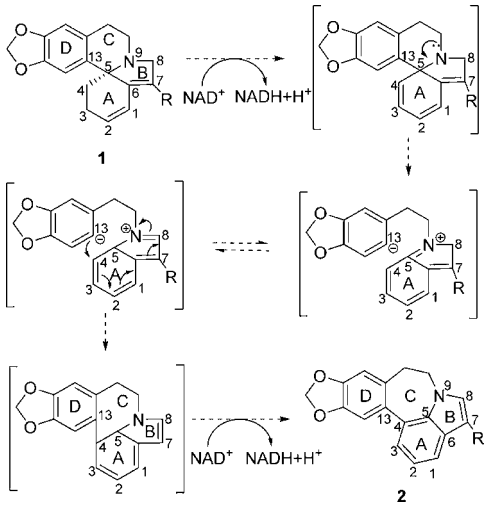
Figure 3. Key HMBC and $^1H-^1H$ COSY correlations of structural fractions of erythrivarine B (**2**).

missing sp^3 quaternary signal of ab δ_C 67 (C-5) in **2** indicated the erythrinine skeleton rearranged at the bond concerned with C-5. In the HMBC spectrum, the correlations from δ_H 4.99 (H-11) to δ_C 104.4 (d) and 124.3 (s) were assigned to the two carbon signals to C-17 and C-13, respectively. Another singlet at δ_H 7.38 (H-14) showed the same correlations to δ_C 147.6 (s), 138.8 (s), and 112.5 (s), and the the three carbon signals were assigned to C-16, C-12, and C-4, respectively. Thus, the **2a** moiety was determined (Figure 3). One of a pair of olefinic protons at δ_H 6.94 (d, J = 8.4 Hz) correlated with C-4, and δ_C 124.3 (s) and 153.5 (s), together with the other proton at δ_H 7.62 (d, J = 8.4 Hz), correlated with δ_C 153.5 (s) and 135.9 (s), suggesting the presence of another benzene ring adjacent to C-13. The methoxy was positioned at C-3 because of its HMBC correlation with δ_C 153.5. The signal at δ_H 4.45 (H-10) showed HMBC correlations to δ_C 130.0 (d) and 135.9 (C-5), and the fourth carbon was assigned to C-8. In addition, the correlation between δ_H 7.03 (H-8) and δ_C 124.3 (C-6) indicated the presence of a pyrrole ring, considering its degree of unsaturation. The proposed pyrrole ring was confirmed by the HMBC cross peaks of δ_H 7.62 (H-1) with δ_C 115.4 (C-7) and of δ_H 5.19 (H-8′) in the erythrinine unit with C-7, C-6, and C-8. These cross peaks and the correlations of δ_H 7.03 with δ_C 67.7 (C-8′) indicated that both units were connected via C-7/8′. Thus, **2b** was determined. Alkaloid **2** was sequentially named as erythrivarine B.

The skeleton of alkaloid **1** consisted of two 6/6/5/6-ring spiro benzylisoquinolines (**3**), while **2** possessed a new 6/7/5/6 fused ring system. Alkaloid **2** had the same stereoconfiguration as **1** on the basis of the chemical shifts, ROESY correlations, and biosynthetic pathway. This new fused ring system might be derived from the erythrinine unit via oxidation and rearrangement. First, oxidation of **1** by NAD^+ (or FAD) gave a triene system, 3,4-dehydro erythrivarine A. Then an intermediate with a C_5/N_9 iminium ion and an anion in the benzene ring was generated. Simultaneously, the C_5/N_9 iminium ion in the intermediate tautomerized to C_8/N_9, which was a better conjugation system. Subsquently, attack from the anion in the benzene ring at the ring A and successive migration of the double bonds yielded the new seven-membered ring C. Finally, the A ring was oxidated again by NAD^+ (or FAD) to produce **2** (Scheme 1). Thus, the genus *Erythrina* of the family leguminosae could be considered as a possible new source for unique natural products.

dx.doi.org/10.1021/ol503190z | *Org. Lett.* 2014, 16, 6400−6403

Scheme 1. Possible Skeletal Rearrangement between 1 and 2



Alkaloids **1** and **2** were evaluated for their cytotoxicity against three human cancer cell lines, HeLa, SGC-7901 gastric cancer, and A-549 lung cancer, using the MTT method reported previously.[15a] Unfortunately, none of them showed positive activity.

■ ASSOCIATED CONTENT

Supporting Information

Figures giving 1D and 2D NMR data of erythrivarines A and B. This material is available free of charge via the Internet at http://pubs.acs.org.

■ AUTHOR INFORMATION

Corresponding Authors

*E-mail for Y.Z.: biochem@mail.kib.ac.cn.
*E-mail for X.-H.C.: xhcai@mail.kib.ac.cn.

Notes

The authors declare no competing financial interest.

■ ACKNOWLEDGMENTS

This project was supported in part by the National Natural Science Foundation of China (Nos. 21172225, 31370377), the Young Academic and Technical Leader Raising Foundation of Yunnan Province (No. 2010CI049), and *XiBuZhiGuang* Project of Chinese Academy of Sciences. The authors are grateful to Dr. Bing Wu and Dr Xiao-Nian Li, Kunning Institute of Botany, Chinese Academy of Sciences, for help with the biosynthetic pathway and X-ray diffraction, respectively.

■ REFERENCES

(1) Tang, Z. R.; Wang, L. Q.; Ye, G. D. *Guangzhou Chem. Ind.* **2012**, *40*, 43−46.

(2) Folkers, K.; Major, R. T. *J. Am. Chem. Soc.* **1937**, *59*, 1580−1581.

(3) (a) Mondon, A.; Faro, H. P.; Boehme, K.; Hansen, K. F.; Seidel, P. R. *Chem. Ber.* **1970**, *103*, 1286−1289. (b) Ito, K.; Furukawa, H.; Haruna, M.; Ito, M. *Yakugaku Zasshi* **1973**, *93*, 1674−1678.

(4) (a) Rodrigues Serrano, M. A.; de Luca Batista, A. N.; Bolzani, V. d. S.; Santos, L. d. A.; de Campos Nogueira, P. J.; Nunes-de-Souza, R. L.; Latif, A.; Arfan, M. *Quim. Nova* **2011**, *34*, 808−811. (b) Flausino, O., Jr.; Santos, L. d. A.; Verli, H.; Pereira, A. M.; Bolzani, V. d. S.; Nunes-de-Souza, R. L. *J. Nat. Prod.* **2007**, *70*, 48−53.

(5) Ozawa, M.; Honda, K.; Nakai, I.; Kishida, A.; Ohsaki, A. *Bioorg. Med. Chem. Lett.* **2008**, *18*, 3992−3994.

(6) Faggion, S. A.; Siqueira Cunha, A. O.; Fachim, H. A.; Gavin, A. S.; dos Santos, W. F.; Soares Pereira, A. M.; Beleboni, R. O. *Epilepsy Behavior* **2010**, *20*, 441−446.

(7) Crestey, F.; Jensen, A. A.; Borch, M.; Andreasen, J. T.; Andersen, J.; Balle, T.; Kristensen, J. L. *J. Med. Chem.* **2013**, *56*, 9673−9682.

(8) Callejon, D. R.; Riul, T. B.; Feitosa, L. G. P.; Guaratini, T.; Silva, D. B.; Adhikari, A.; Shrestha, R. L.; Marques, L. M. M.; Baruffi, M. D.; Lopes, J. L. C.; Lopes, N. P. *Molecules* **2014**, *19*, 5692−5703.

(9) Cornelius, W. W.; Akeng'a, T.; Obiero, G. O.; Lutta, K. P. *Rec. Nat. Prod.* **2009**, *3*, 96−103.

(10) Umamaheswari, M.; Asokkumar, K.; Sivashanmugam, A. T.; Subhadradevi, V.; Neethu, M. *Bangladesh J. Pharmacol.* **1985**, *5*, 77−81.

(11) Buckingham, J. *Dictionary of Natural Products on CD-ROM*; CRC Press: Boca Raton, FL, 2006.

(12) (a) Kalaitzakis, D.; Montagnon, T.; Antonatou, E.; Vassilikogiannakis, G. *Org. Lett.* **2013**, *15*, 3714−3717. (b) Tietze, L.; Tolle, L.; Kratzert, D.; Stalke, D. *Org. Lett.* **2009**, *11*, 5230−5233.

(13) Kam, T. S. Alkaloids. *Chem. Biol. Perspect.* **1999**, *14*, 285−435.

(14) Ramirez, A.; Garcia-Rubio, S. *Curr. Med. Chem.* **2003**, *10*, 1891−1895.

(15) (a) Cai, X. H.; Bao, M. F.; Zhang, Y.; Zeng, C. X.; Liu, Y. P.; Luo, X. D. *Org. Lett.* **2011**, *13*, 3568−3571. (b) Cai, X. H.; Feng, T.; Liu, Y. P.; Du, Z. Z.; Luo, X. D. *Org. Lett.* **2008**, *10*, 577−580. (c) Cai, X. H.; Du, Z. Z.; Luo, X. D. *Org. Lett.* **2007**, *9*, 1817−1820.

(16) The flowers of *E. variegata* were collected in February 2014 in Simao of Yunnan Province, People's Republic of China, and identified by Dr. Chun-Xia Zeng. A voucher specimen (Cai20140207) has been deposited in the State Key Laboratory of Phytochemistry and Plant Resources in West China, Kunming Institute of Botany, the Chinese Academy of Sciences.

(17) Erythrivarine A: white powder; $[\alpha]_D^{23} = -165°$ (*c* 0.10, CH_3OH); UV (CH_3OH) λ_{max} 204 (4.22), 238 (3.88), and 289 (3.46) nm; IR (KBr) ν_{max} 3441, 2924, 1629, 1503, 1482, 1234, 1100, and 1040 cm^{-1}; ^1H and ^{13}C NMR data, Table 1; positive ESIMS *m*/*z* 625 $[M + H]^+$, HRESIMS *m*/*z* 625.2546 $[M + H]^+$ (calcd for $C_{36}H_{37}N_2O_8$ 625.2550).

(18) Ozawa, M.; Kawamata, S.; Etoh, T.; Hayashi, M.; Komiyama, K.; Kishida, A.; Kuroda, C.; Ohsaki, A. *Chem. Pharm. Bull.* **2010**, *58*, 1119−1122.

(19) (a) Ito, K.; Furukawa, H.; Tanaka, H. *J. Chem. Soc. D* **1970**, *17*, 1076−1077. (b) Ito, K.; Furukawa, H.; Tanaka, H. *Yakugaku Zasshi* **1973**, *93*, 1215−1217.

(20) (a) Juma, B. F.; Majinda, R. R. T. *Phytochemistry* **2004**, *65*, 1397−1404. (b) McPhail, A. T.; Onan, K. D.; Gross, P. M. *J. Chem. Soc., Perkin Trans. 2* **1977**, 1156−1161.

(21) (a) Crystal data for cu_wec1_0m: $C_{18}H_{19}NO_4$, M = 313.34, monoclinic, a = 19.1884(7) Å, b = 9.1223(3) Å, c = 8.7982(3) Å, α = 90.00°, β = 90.5400(10)°, γ = 90.00°, V = 1539.99(9) Å^3, T = 296(2) K, space group C2, Z = 4, μ(Cu Kα) = 0.784 mm^{-1}, 7056 reflections measured, 2563 independent reflections (R_{int} = 0.0376). The final R1 value is 0.0391 ($I > 2\sigma(I)$). The final wR2(F^2) value is 0.1043 ($I > 2\sigma(I)$). The final R1 value is 0.0392 (all data). The final wR2(F^2) value is 0.1045 (all data). The goodness of fit on F^2 is 1.079. The Hooft parameter is 0.14(6) for 1147 Bijvoet pairs. The CCDC deposit number is 1022542. Copies of these data can be obtained, free of charge, on application to the CCDC via www.ccdc.cam.ac.uk/conts/retrieving.html (or Cambridge Crystallographic Data Centre, 12 Union Road, Cambridge CB2 1EZ, U.K., fax +44 1223 336033, e-mail deposit@ccdc.cam.ac.uk). (b) Hooft, R. W. W.; Straver, L. H.; Spek, A. L. *J. Appl. Crystallogr.* **2008**, *41*, 96−103.

(22) Erythrivarine B: yellow powder; $[\alpha]_D^{23} = -114°$ (*c* 0.10, CH_3OH); UV (CH_3OH) λ_{max} 203 (4.01), 233 (3.80), 297 (3.30), 312 (3.31), and 438 (2.43) nm; IR (KBr) ν_{max} 3441, 1629, 1503, 1480, 1235, 1098, and 1038 cm^{-1}; ^1H and ^{13}C NMR data, Table 1; positive ESIMS *m*/*z* 621 $[M + H]^+$, HRESIMS *m*/*z* 621.2229 $[M + H]^+$ (calcd for $C_{36}H_{33}N_2O_8$ 621.2237).