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NOTE

Chemical Constituents of *Salvia przewalskii* Maxim.

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In order to investigate the biologically active constituents of the *Salvia przewalskii* Maxim., a new diterpenoid, named isoganxinonic acid A (**1**), together with γ-linolenic acid (**2**), tanshinol B (**3**), cryptotanshinone (**4**), paeoniflorin (**5**), protocatechualdehyde (**6**), protocatechuic acid (**7**), caffeic acid (**8**), rosmarinic acid (**9**) and salvianolic acid B (**10**), were isolated from 50 % ethanol extract of the roots and rhizomes of *S. przewalskii* and their structures were identified by MS and NMR spectra. Compound **5** was reported from *Labiatae* for the first time.

Key Words: *Salvia przewalskii* Maxim., Labiatae, Diterpenoid, Isoganxinonic acid A.

Salvia przewalskii Maxim. named Ganxishuweicao, Dazidanshen, Zidanshen or Gansudanshen, which is widely distributed in Gansu, Sichuan, Yunnan and Tibet provinces of the western areas of China[1]. The roots and rhizomes of this plant have been used as a substitute of "Dan-Shen", a commonly used crude material of traditional Chinese medicine[2, 3].

In present study on a rat model of immune complex glomerulonephritis of the *S. przewalskii* extract the results of the experiment showed that 20 and 40 days' treatment with *S. przewalskii* extract at 50, 100 mg/kg doses significantly reduce the UP excretion and kidney wet weight and *S. przewalskii* extract is effective to maintain kidney function, as ameliorated the levels of TSP, SA, SC and SUN[4]. In order to investigate the biologically active constituents of the *S. przewalskii*, we isolated and identified 10 compounds from 50 % ethanol extract *i.e.*, isoganxinonic acid A(**1**), γ-linolenic acid (**2**)[5], tanshinol B (**3**)[6], cryptotanshinone (**4**)[7], paeoniflorin (**5**)[8], protocatechualdehyde (**6**)[9], protocatechuic acid (**7**)[10], caffeic acid (**8**)[11], rosmarinic acid (**9**)[12] and salvianolic acid B (**10**)[13]. Compound **1** is a new compound and compound **5** is obtained from *Labiatae* for the first time.

The roots and rhizomes of *S. przewalskii* were collected from Wen county of Gansu province, China and identified by Prof. Zhang Hanming, School of Pharmacy, Second Military Medical University.

Extraction and isolation: The dried powder roots and rhizomes of *S. przewalskii* (10 kg) were percolated with 50 % ethanol solution (150 L) at room temperature. The solvent was evaporated under reduced pressure to yield the extract (1.2 kg). The extract (100 g) was subjected to chromatograph over the macroporous adsorptive resin sequentially eluting with water, 50, 70 and 95 % ethanol solution. The eluting solution of 50 % ethanol was evaporated to give a residue (50 g). The residue was purified by column chromatography with silica gel and Sephadex LH-20 or RP-18 to yield compound **1** (10 mg), **2** (600 mg), **3** (20 mg), **4** (20 mg), **5** (120 mg), **6** (40 mg), **7** (40 mg), **8** (60 mg), **9** (80 mg), **10** (40 mg).

Compound **1** was obtained as a red powder. The HRESI-MS gave the molecular formula to be $C_{18}H_9O_5$ (*m/z* 305.0436 $[M-H]^-$, calcd. for $C_{18}H_9O_5$: 305.0450). The ^1H NMR spectrum of **1** gave a methyl group signal [δ 2.68 (3H, s)] and 6 aromatic proton signals [δ 9.42 (1H, d, J = 9.0 Hz), 8.73 (1H, s), 8.50 (1H, d, J = 9.0Hz), 8.17 (1H, d, J = 9.0 Hz), 7.65 (1H, dd, J = 7.2, 9.0 Hz), 7.53 (1H, d, J = 7.2 Hz)]. The ^{13}C NMR and DEPT spectra of **1** gave 18 carbon signals, including a methyl at δ 19.6, 6 methines at δ 122.4, 125.3, 129.4, 130.2, 131.8, 153.5 and 11 quaternary carbons at δ 118.3, 124.1, 126.1, 130.4, 133.8, 135.3, 135.4, 154.5, 161.8, 176.8, 179.2. The ^{13}C NMR spectra of **1** was closely similar to the carbon skeleton of phenanthraquinone of *p*-quinone[14]. The ^1H-^1H COSY correlations between H-1 (δ 9.42) and H-2 (δ 7.65), H-2 (δ 7.65) and H-3 (δ 7.53), H-6 (δ 8.50) and H-7 (δ 8.17) and the HMBC correlations between H-1 (δ 9.42) and C-9 (δ 135.3), H-2 (δ 7.65) and C-10 (δ 130.4), H-3 (δ 7.53) and C-4 (δ 135.4), H-6 (δ 8.50) and C-4 (δ 135.4), H-7 (δ 8.17) and C-5 (δ 126.1), C-9 (δ 135.3), C-14 (δ 179.2) were observed,

which confirmed that the carbon skeleton of phenanthraquinone of *p*-quinone existed.

The HMBC correlations between H-15 (δ 8.73) and C-17 (δ 161.8), C-12 (δ 154.5), C-13 (δ 124.1), C-16 (δ 118.3) were showed that not only a furan ring was present, but also the carbonyl group of C-17 was located at β-position of the furan ring. The HMBC correlations between H-3 (δ 7.53) and C-18 (δ 19.6), H-18 (δ 2.68) and C-3 (δ 129.4), C-4 (δ 135.4), C-5 (δ 126.1) and the NOESY correlations between H-18 (δ 2.68) and H-6 (δ 8.50), H-3 (δ 7.53) showed that the linkage position of the methyl group of C-18 was at C-4. From these evidences, the structure of **1** was established as Fig. 1.

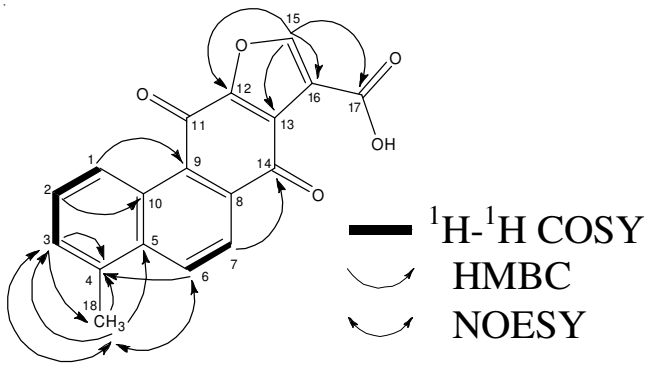

Fig. 1. key correlations in ^{1}H-^{1}H COSY, HMBC and NOESY of compound **1**

Compound **1**, red powder. UV(CH_3OH) λ_{max}(log ε): 332 (2.56), 286 (4.26), 263 (4.13) nm; IR (KBr, ν_{max}, cm^{-1}): 3150, 3010, 2915, 2838, 1708, 1670, 1640, 1579, 1410, 1040, 918, 839, 696; ESI-MS *m/z*: 305.1 $[M-H]^-$, HRESI-MS *m/z*: 305.0436 $[M-H]^-$ (calcd. for $C_{18}H_9O_5$, 305.0450); ^{1}H NMR (600 MHz, DMSO-d_6, δ, ppm, J/Hz): 9.42 (1H, d, *J* = 9.0, H-1), 7.65 (1H, dd, *J* = 7.2, 9.0, H-2), 7.53 (1H, d, *J* = 7.2, H-3), 8.50 (1H, d, *J* = 9.0, H-6), 8.17 (1H, d, *J* = 9.0, H-7), 8.73 (1H, s, H-15), 2.68 (3H, s, H-18); ^{13}C NMR (150 MHz, DMSO-d_6, δ, ppm): 125.3 (C-1), 130.2 (C-2), 129.4 (C-3), 135.4 (C-4), 126.1 (C-5), 131.8 (C-6), 122.4 (C-7), 133.8 (C-8), 135.3 (C-9), 130.4 (C-10), 176.8 (C-11), 154.5 (C-12), 124.1 (C-13), 179.2 (C-14), 153.5 (C-15), 118.3 (C-16), 161.8 (C-17), 19.6 (C-18).

Conclusion

In conclusion, we isolated 10 compounds from 50 % ethanol extract of *S. przewalskii*, isoganxinonic acid (**1**) was identified as a new compound and paeoniflorin (**5**) was obtained from *Labiatae* for the first time.

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REFERENCES

1. Flora Reipublicae Popularis Sinicae, Beijing, Science Press (1977).
2. Jiangsu New Medicinal College. Dictionary of Tradition Chinese Medicine, Shanghai Science and Technology Press, p. 479 (1986).
3. J.-B. Zhao, *J. Chin. Med. Mater.*, **26**, 529 (2003).
4. L.-N. Sun, W.-S. Chen, Y. Yang, *et al.*, Patent CN, 101181349 (2008).
5. H.-T. Wang, Q.-L. Shi and W.-P. Yin, *Chin. Tradit. Herb. Drugs*, **32**, 291 (2001).
6. S.-Y. Ryu, Z.-S. No, S-H. Kim and J.W. Ahn, *Planta Med.*, **63**, 44 (1997).
7. S. Yao and Y.-L. Lu, *Hubei J. Tradit. Chin. Med.*, **28**, 54 (2006).
8. Y. Jin, A.E. John and N.I. Magdy, *Phytochemistry*, **29**, 3859 (1990).
9. Z.-J. Zou and J.-S. Yang, *West China J. Pharm. Sci.*, **23**, 265 (2008).
10. X.-L. Wang, K.-B. Yu and S.-L. Peng, *China J. Chin. Mater Med.*, **33**, 1415 (2008).
11. X.-D. Zheng and H.-B. Hu, *Chem. Res.*, **17**, 85 (2006).
12. X.-K. Zheng, Q. Li and W.-S. Feng, *Chin. Pharm. J.*, **39**, 335 (2004).
13. Z.-J. Wu, M.-A. Ouyang and C.-R. Yang, *Acta Bot. Yunnan*, **21**, 512 (1999).
14. H. Kakisawa, T. Hayashi and T. Yamazaki, *Tetrahedron Lett.*, **10**, 301 (1969).

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