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Two new steroidal saponins from the rhizomes of *Dioscorea zingiberensis*

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[ABSTRACT]

AIM: To investigate the chemical constituents of *Dioscorea zingiberensis* C. H. Wright.

METHODS: The compounds were isolated by various chromatographic techniques, and the structures of the new steroidal saponins were elucidated by extensive 1D- and 2D-NMR, MS, and IR spectral analysis.

RESULTS: The 70% EtOH extract of the rhizomes of *Dioscorea zingiberensis* afforded two new steroidal saponins, zingiberenosides A (**1**) and B (**2**), along with eight known analogues, 3*β*, 26-dihydroxy-25(*R*)-furosta-$\triangle^{5,20(22)}$-diene-3-*O*-*α*-L- rhamnopyranosyl-(1⟶2)-*O*-*β*-D-glucopyranoside (**3**), methyl parvifloside (**4**), deltoside (**5**), methyl deltoside (**6**), zingiberensis new saponin (**7**), deltonin (**8**), progenin III (**9**) and diosgenin-diglucoside (**10**).

CONCLUSION: Two new steroidal saponins were isolated from *Dioscorea zingiberensis* and their structures determined.

[KEY WORDS] *Dioscorea zingiberensis*; Dioscoreaceae; Steroidal saponins; Zingiberenoside

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Introduction

Dioscorea zingiberensis C. H. Wright, common name 'Huang Jiang', is a perennial herb, and is distributed widely in Henan, Hubei, Sichuan, and the south of Shanxi provinces [1-2]. It is used to treat cough with lung heat, pyretic stranguria, anthracia, swelling, ulcers, and sprains. As an important species of the Dioscoreaceae, *D. zingiberensis* has attracted much attention for the high content of diosgenin and steroid saponins [3], as well as excellent pharmacologic action, such as reducing the content of cholesterol in blood [4], and decreasing stenocardia and regulating metabolism [5]. Furthermore, its total steroidal saponins could treat atherosclerosis, high blood fat, wheeze, inflammation. and tumors [6-7]. Previous phytochemical investigations of its rhizomes led to the isolation of several steroidal saponins [5, 8-15]. In this paper, the isolation and structural elucidation of two new steroidal saponins and eight known derivatives from the 70% EtOH extract of the dried rhizome of *D. zingiberensis* are reported.

Results and Discussion

A 70% EtOH extract of the commercially available rhizomes of *D. zingiberensis* was fractionated by macroporous resin and silica gel, and then separated by ODS column chromatography and semi-preparative HPLC to afford two new steroidal saponins, zingiberenoside A (**1**) and zingiberenoside B (**2**), together with eight known analogues (Fig. 1). The structures of the new compounds were elucidated by extensive 1D- and 2D-NMR, MS, and IR spectral analyses.

Compound **1** was obtained as a white amorphous powder, and was deduced to possess a furostanol group based on TLC using Ehrlich's reagent [20]. The IR spectrum showed absorp-

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These authors have no conflict of interest to declare.

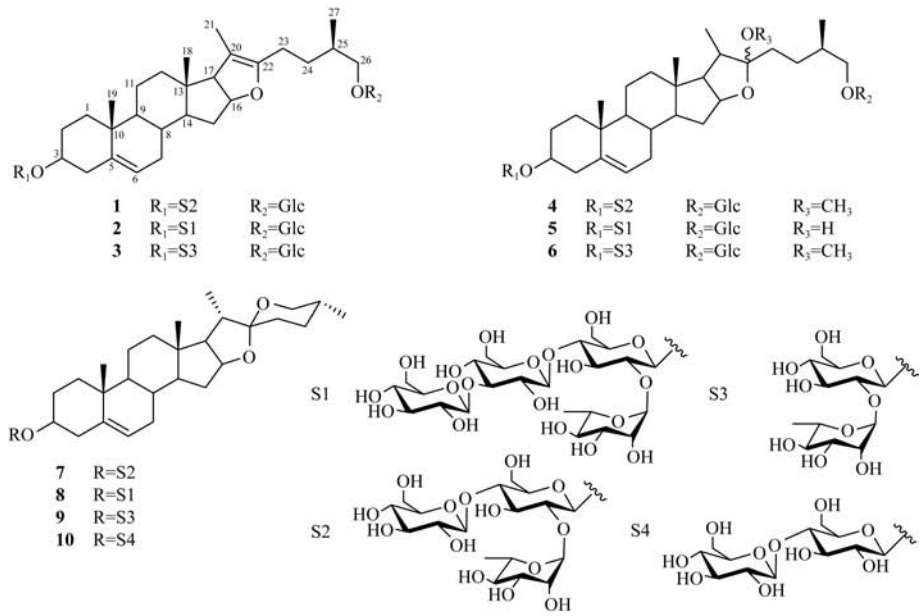

Fig. 1 Structures of compounds 1−10

tion bands of hydroxyl (3 421 cm^{-1}), methyl (2 930 cm^{-1}), and olefinic (1 644 cm^{-1}) groups. The molecular formula was assigned to be $C_{51}H_{82}O_2$ on the basis of positive HRESI-MS $[M + Na]^+$ ion peak at *m*/*z* 1069.520 32 (Calcd. 1069.519 54). The ^1H and ^{13}C NMR (pyridine-d_5, 500/125 MHz) data (Tables 1 and 2), assigned by ^1H-^1H COSY, HSQC, and

Table 1 ^{13}C NMR data for the aglycone of compounds 1−10 (in pyridine-d_5, 125 MHz)

No.	1	2	3	4	5	6	7	8	9	10
1	37.9	37.9	37.9	37.8	37.9	37.8	37.8	37.8	37.8	37.8
2	30.5	30.5	30.6	30.5	30.5	30.5	30.5	30.5	30.5	30.9
3	78.4	78.4	78.7	78.5	78.6	78.6	78.7	78.5	78.6	78.7
4	39.3	39.3	39.4	39.3	39.3	39.3	39.3	39.3	39.3	39.6
5	141.2	141.2	141.2	141.2	141.2	141.2	141.2	141.1	141.2	141.2
6	122.2	122.2	122.2	122.2	122.2	122.1	122.1	122.1	122.1	122.1
7	32.8	32.8	32.8	32.5	32.0	32.0	32.7	32.6	32.7	32.7
8	31.8	31.8	31.8	32.0	31.2	31.2	32.0	32.0	32.0	32.0
9	50.7	50.7	50.7	50.7	50.7	50.7	50.6	50.6	50.6	50.6
10	37.5	37.5	37.5	37.4	37.6	37.5	37.5	37.5	37.4	37.5
11	21.6	21.6	21.6	21.4	21.4	21.4	21.5	21.4	21.5	21.5
12	40.0	40.0	40.0	40.1	40.1	40.3	40.2	40.2	40.2	40.2
13	43.8	43.8	43.8	41.2	41.1	41.1	40.8	40.8	40.8	40.8
14	55.3	55.3	55.3	56.9	56.9	56.9	57.0	57.0	57.0	57.0
15	34.9	34.8	34.9	32.7	32.6	32.8	32.6	32.7	32.6	32.6
16	84.8	84.8	84.8	81.6	81.6	81.4	81.5	81.5	81.5	81.5
17	64.9	64.9	64.9	64.6	64.2	64.5	63.3	63.2	63.2	63.2
18	14.5	14.5	14.5	16.6	16.6	16.6	16.7	16.7	16.7	16.7
19	19.8	19.8	19.8	19.7	19.7	19.7	19.7	19.7	19.7	19.8
20	103.9	103.9	103.9	40.9	40.8	40.0	42.3	42.3	42.4	42.3
21	12.2	12.2	12.1	16.6	16.8	16.6	15.4	15.4	15.4	15.4
22	152.8	152.7	152.8	113.0	111.0	113.0	109.6	109.6	109.6	109.6
23	33.9	33.9	33.8	37.4	37.5	37.6	32.2	32.2	32.2	32.2
24	24.1	24.1	24.1	28.5	28.7	28.5	29.6	29.6	29.6	29.6
25	31.8	31.8	31.8	34.6	34.6	34.6	30.9	31.0	30.9	30.9
26	75.3	75.3	75.3	75.6	75.6	75.6	67.2	67.2	67.2	67.2
27	17.7	17.7	17.7	17.5	17.8	17.5	17.7	17.7	17.7	17.7
$-OCH_3$				47.6		47.6				