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CHEMICAL CONSTITUENTS OF *Alhagi pseudalhagi*

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Alhagi pseudalhagi (Bieb.) Fisch. (Leguminosae) is widely distributed in the European and southern part of Russia and Central Asia [1].

Decoctions of *A. pseudalhagi* have long been used in folk medicine as a cholegogic and astringent for cholitis, gastritis, and stomach ulcers; to reduce water loss [2]; for hemorrhoids and wound dressing [3]; for dysentery, nasopharynx diseases, angina, and extremity eczema [4]; and as an antipyretic [5].

Steroids [6], alkaloids and other N-containing compounds [7], catechins [8], and flavonoids were isolated from the plant. Essential oil (0.8%), coumarins (0.21%), and tanning agents (4.7%) were observed [9, 10].

We studied the aerial part of *A. pseudalhagi* collected during flowering in Turpan District, Xinjiang Autonomous Region, PRC. Ground air-dried raw material (800 g) was extracted exhaustively with EtOH (70%) at room temperature. The combined extracts were vacuum distilled. The condensed liquor was diluted with water and worked up successively with petroleum ether, EtOAc, and *n*-BuOH.

The EtOAc and *n*-BuOH fractions were chromatographed over a column of silica gel using petroleum ether:EtOAc (1) and $CHCl_3$:MeOH (2). Chromatographic separation of the EtOAc fraction (system 1, 9:1–2:1) isolated **1**–**4**; of the *n*-BuOH fraction (system 2, 9:1–1:1), **5**–**7**.

The isolated compounds were identified using UV (with added NaOAc, $AlCl_3$/HCl, CH_3ONa, CH_3COONa/H_3BO_3), PMR, ^{13}C NMR, IR, and mass spectra, which were compared with the literature.

Ferulic acid (**1**), mp 168–169°C. EI-MS *m/z*: 193 $[M - H]^-$, 195 $[M + H]^+$, 217 [M + Na], MW 194. IR spectrum (KBr, ν_{max}, cm^{-1}): 3435. PMR spectrum (400 MHz, $CDCl_3$, δ, ppm, J/Hz, 0 = HMDS): 3.85 (3H, s, OMe), 6.37 (1H, d, J = 16, H-7), 6.79 (1H, d, J = 8.0, H-5), 7.08 (1H, dd, J = 8.0, 1.6, H-6), 7.28 (1H, d, J = 1.6, H-8), 7.49 (1H, d, J = 16, H-2), 9.57 (1H, s, COOH), 12.14 (1H, s, 4-OH).

^{13}C NMR spectrum (100 MHz, $CDCl_3$, δ, ppm): 111.3–149.3 (7 C from aromatics and carboxyl), 168.2 (C-OH), 55.8 (OCH_3) [11].

***β*-Sitosterol** (**2**), $C_{29}H_{50}O$, mp 131–132°C, identified by direct comparison with an authentic sample [12].

Isorhamnetin (**3**), $C_{16}H_{17}O_7$, yellow crystals, mp 273–275°C, UV spectrum (MeOH, λ_{max}, nm): 256, 374.

PMR spectrum (400 MHz, $CDCl_3$, δ, ppm, J/Hz, 0 = HMDS): 3.86 (3H, s, OMe), 6.18 (1H, d, J = 2.0, H-6), 6.47 (1H, d, J = 2.0, H-8), 6.93 (1H, d, J = 8.4, H-5′), 7.70 (1H, dd, J = 8.4, 2.0, H-6′), 7.75 (1H, d, J = 2.0, H-2′), 9.45 (1H, s, 3-OH), 9.76 (1H, s, 4-OH), 10.78 (1H, s, 7-OH), 12.47 (1H, s, 5-OH) [13].

***β*-Sitosterol *β*-D-glucopyranoside** (**4**), $C_{35}H_{60}O_6$, mp 276–278°C. UV spectrum (EtOH, λ_{max}, nm): 202 (0.385). IR spectrum (KBr, ν_{max}, cm^{-1}): 3747, 3419, 2932, 1650, 1458, 1367, 1074, 1022, 622. PMR and ^{13}C NMR spectral data for **4** agree fully with those published [14].

5-Hydroxymaltol (**5**), colorless crystals, mp 189–191°C, MW 142. PMR spectrum (400 MHz, DMSO-d_6, δ, ppm, J/Hz, 0 = HMDS): 2.2 (3H, d, J = 2.8, CH_3-2), 7.9 (1H, d, J = 2.8, H-6), 8.7 (1H, s, 3-OH), 8.9 (1H, s, 5-OH).

^{13}C NMR spectrum (100 MHz, $CDCl_3$, δ, ppm): 168.6 (C-4), 149.3 (C-6), 144.3 (C-2), 141.5 (C-3), 139.0 (C-5).

PMR and ^{13}C NMR spectral data for **5** agreed fully with those published [15].

Saccharose (**6**), $C_{12}H_{22}O_{11}$, mp 188–190°C.

Alhagidin (**7**), $C_{34}H_{44}O_{20}$ [16].

IR spectrum (KBr, ν_{max}, cm^{-1}): 3450 (OH), 2911 (OCH_3), 1640, 1605 (C=O), 1514, 1334, 1270, 1200, 1131, 1090. UV spectrum (MeOH, λ_{max}, nm): 268.

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PMR spectrum (400 MHz, DMSO-d_6, δ, ppm, J/Hz, 0 = HMDS): 1.11 (3H, d, J = 5.0, CH_3), 2.70 (1H, dd, J = 2.0; 10.4, H-3), 3.10 (1H, m, H-3), 3.78 (3H, s, OCH_3), 3.22–4.58 (glucose, rhamnose, and galactose protons), 5.18 (1H, br.s, rhamnose anomeric proton), 5.22 (1H, br.s, glucose anomeric proton), 5.40 (1H, m, H-2), 5.43 (1H, m, galactose anomeric proton), 6.10 (1H, d, J = 2.0, H-6), 6.16 (1H, d, J = 2.0, H-8), 6.78 (3H, m, H-2′, H-5′, H-6′), 9.10 (1H, br.s, OH-3′), 12.12 (1H, br.s, OH-5).

^{13}C NMR spectrum (100 MHz, $CDCl_3$, δ, ppm): 78.70 (C-2), 42.20 (C-3), 197.27 (C-4), 163.15 (C-5), 97.10 (C-6), 164.94 (C-7), 96.11 (C-8), 164.05 (C-9), 102.62 (C-10), 131.05 (C-1′), 114.25 (C-2′), 149.11 (C-3′), 146.22 (C-4′), 112.23 (C-5′), 118.15 (C-6′), 99.50 (C-1″), 72.5 (C-2″), 77.11 (C-3″), 71.12 (C-4″), 76.06 (C-5″), 66.20 (C-6″), 100.50 (C-1‴), 70.41 (C-2‴), 69.66 (C-3‴), 72.18 (C-4‴), 68.45 (C-5‴), 17.76 (C-6‴), 93.12 (C-1⁗), 69.12 (C-2⁗), 68.78 (C-3⁗), 70.33 (C-4⁗), 69.38 (C-5⁗), 60.51 (C-6⁗), 55.45 (OCH_3).

Acid hydrolysis of **7** produced hesperitin, D-galactose, D-glucose, and L-rhamnose.

Ferulic acid, β-sitosterol β-D-glucopyranoside, 5-hydroxymaltol, and saccharose were isolated for the first time from *A. pseudalhagi*.

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