organic phase was no longer fluorescent. The combined $CHCl_3$ extract was concd and chromatographed on a Si gel column Na_2CO_3 soln acidified and re-extracted with $CHCl_3$. The $CHCl_3$ extract was concd and chromatographed on a Si gel column (2.5 × 40 cm), eluting with $CHCl_3$.

Isolation and characterization. The early eluates gave crude crystals (250 mg), which were recrystallized from EtOH to yield **1**, as colourless needles, mp 129°; λ_{max}^{MeOH} nm: 222, 282, (log ε 4.408, 4.255); ν_{max} cm^{-1}: 3100, 3010, 2980, 2950, 2850, 1690, 1622, 1583, 1500, 833; PMR ($CDCl_3$) δ $_m$; 3.88 (3*s*, 9H, 3 × OMe), 6.36 (*d*, 1H, *J* = 16 Hz), 6.76 (*s*, 2H), 7.74 (*d*, 1H, *J* = 16 Hz), 9.5 (*br*, 1H, CO_2H); MS *m/e*: 238 M^+, 223, 195, 163; FS nm: 424; (Found C, 60.68; H, 6.07. $C_{12}H_{14}O_5$ requires C, 60.51; H, 5.88%). It was identical with 3,4,5-trimethoxycinnamic acid, which was derived from methylation of sinapic acid (TLC, IR, mmp). The later eluates afforded crude crystals (350 mg), which were recrystallized from EtOH to give **2** as colourless needles, mp 225°; λ_{max}^{EtOH} nm; 244, 274, 313, 343 *sh* (log ε 4.62, 4.13, 4.35, 4.10), $\lambda_{max}^{EtOH+NaOAc}$ nm; 240, 272 *sh*, 320 *sh*, 360 (log ε 4.66, 4.11, 4.07, 4.29); ν_{max} cm^{-1}: 3120, 3010, 2950, 2850, 1640, 1617, 1595, 1475, 1460, 1425, 1415, 1280, 1215, 1205, 1125; PMR ($CDCl_3$) δ_{ppm}: 3.7 (*s*, 3H, OMe), 3.8–3.83 (3*s*, 9H, 3 × OMe), 6.45 (1H, OH), 6.67 (*s*, 1H, C–4H), 6.87 (*s*, 1H, C–5H), 7.62 (*s*, 1H, C–8H); PMR (C_6D_6) δ_{ppm}: 3.07, 3.14, 3.73, 4.1 (each *s* and 3H, 4 × OMe); MS *m/e*: 332 M^+, 317, 302, 289, 274, 259, 167; FS nm; 454; (Found C, 61.27; H, 4.78. $C_{17}H_{16}O_7$ requires C, 61.45; H, 4.85%). The solid which was insol. in $Ba(OH)_2$ soln was extracted several times with MeOH, until the MeOH extract showed no fluorescence. The combined MeOH extracts were evapd *in vacuo* to give a resinous mass (240 g), which was suspended in 10% Na_2CO_3 soln (12 l.) and extracted with Et_2O. The Et_2O soln was concd and chromatographed on a Al_2O_3 column (2.5 × 40 cm) eluting with Et_2O. The early eluates gave crude crystals (2.1 g), which were recrystallized from EtOH to yield **3**, as colourless needles, mp 133°; λ_{max}^{MeOH} nm: 242, 256, 280, 310, 355 (log ε 4.51, 4.51, 4.45, 4.49, 3.78); ν_{max} cm^{-1}; 3040, 2980, 2950, 2850, 1652, 1615, 1595, 1480, 1470, 1460, 1422, 1360, 1285, 1145, 1030, 815; PMR (CH_2Cl_2) δ_{ppm}: 3.81–3.92 (4*s*, 12H, 4 × OMe), 6.65 (*s*, 1H, C–4H), 7.2 (*dd*, 1H, *J* = 1.5, 4.8 Hz, C–6H), 7.3 (*dd*, *J* = 0.5, 4.8 Hz, C–5H), 7.6 (*dd*, 1H, *J* = 0.5, 1.5 Hz, C–8H); MS *m/e*; 316 M^+, 301, 273, 258, 151; FS nm: 484; (Found: C, 64.52; H, 4.98. $C_{17}H_{16}O_6$ requires C, 64.55; H, 5.10%). It was identical with an authentic sample of 1,2,3,7-tetramethoxyxanthone (TLC, IR, and mmp). The later eluates gave crude crystals, which were recrystallized from EtOH to yield **4**. mp 183°; λ_{max}^{EtOH} nm. 247, 270 *sh*, 312, 342 *sh* (log ε 4.43, 3.96, 4.15, 3.86). $\lambda_{max}^{EtOH+NaOAc}$ nm 248, 272, 312, 343 *sh* (log ε 4.42, 3.95, 4.12, 3.83); ν_{max} cm^{-1}: 3010, 2970, 2950, 2850, 1642, 1620, 1610, 1595, 1510, 1475, 1425, 1280, 1270, 1220, 1130, 1060; PMR (CD_2Cl_2) δ_{ppm}: 3.81–3.85 (5 *s*, 15H, 5 × OMe), 6.68 (*s*, 1H, C–4H), 6.8 (*s*, 1H, C–5H), 7.58 (*s*, 1H, C–8H); PMR (C_6D_6) δ_{ppm}: 3.33, 3.37, 3.48, 3.79, 4.09 (each *s* and 3H, 5 × OMe); MS *m/e*: 346 M^+, 331, 315, 303, 288, 273, 181; FS nm: 468; (Found: C, 62.47; H, 5.27. $C_{18}H_{18}O_7$ requires C, 62.42; H, 5.44%). It was identical with the Me ether of **2**, which was derived from the treatment of **2** with CH_2N_2–MeOH.

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XANTHONES FROM *LAWSONIA INERMIS*

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Key Word Index—*Lawsonia Inermis* (*syn. L. alba*); Lythraceae; lawsone (2-hydroxy-1, 4-naphthaquinone); laxanthone-I (1, 3-dihydroxy-6, 7-dimethoxyxanthone); laxanthone-II (1-hydroxy-3, 6-diacetoxy-7-methoxyxanthone).

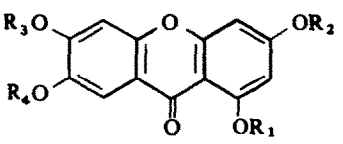
Abstract—Two new xanthones isolated from *Lawsonia inermis* have been characterised as 1, 3-dihydroxy-6, 7-dimethoxyxanthone and 1-hydroxy-3, 6-diacetoxy-7-methoxyxanthone and named laxanthone-I and II, respectively.

This communication describes the isolation and structural elucidation of two new xanthones from *Lawsonia inermis* (Syn. *L. alba*) commonly known as henna. Uses of this plant are described in ref. [1] and previous work

in refs [2–8]. The whole plant (2 kg) was extracted exhaustively with hot EtOH and the solvent-free extract chromatographed over Si gel. The petrol eluate gave lawsone, mp 190° [8]. The C_6H_6 eluate on rechromatography over Si gel followed by eluation with petrol–C_6H_6 (1:3) gave two compounds laxanthone-I and II.

Laxanthone-I (**1**). Brownish-green ferric reaction and spectral data showed a chelated OH. Methylation of **1** with CH_2N_2 gave a Me ether (**1a**) identical with synthetic 1-hydroxy-3, 6, 7-trimethoxyxanthone [9] indicating it to be a 1, 3, 6, 7-tetraoxygenated xanthone. Acetylation of **1** with Ac_2O–Py gave an acetate (**1b**) which was shown by PMR to contain two methoxyls and two acetoxyls. The signals at δ 6.76 and 6.8 assigned to C-2 and C-4 *meta*-coupled protons, had values lower than those noted in the case of **1a**. These shifts were therefore attributed to the presence of the two acetoxyls at the C-1 and C-3 positions. Furthermore, laxanthone-I and its acetate were identical with synthetic 1, 3-dihydroxy-6, 7-dimethoxyxanthone and its diacetate [9]. **1**, $C_{15}H_{12}O_6$; mp 286–7°; ν_{max}^{KBr} 3400 (OH), 1750, 1650, (conj. CO) cm^{-1}; λ_{max}^{MeOH} 240, 310, 360 nm; + $AlCl_3$ 230, 265, 335, 380 nm. MS. 288 (M^+), 273, 260, 245, 217 and 203. **1a**, $C_{16}H_{14}O_6$; mp 218–9°; PMR (δ; $CDCl_3$): 3.87–3.95 (9H, s, 3X-OMe), 6.27 (1H, *d*, J = 2Hz, C_2-H), 6.37 (1H, *d*, J = 2Hz, C-4-H), 7.08 (1H, s, C-5-H), 7.57 (1H, s, C-8-H), 13.03 (1H, OH). **1b**, $C_{19}H_{16}O_8$; mp 208–9°; PMR (δ; $CDCl_3$); 2.3 (3H, s, C-3-OAc), 2.47 (3H, s, C-1-OAc), 3.95–4 (6H, s, 2x-OMe), 6.76 (1H, *d*, J = 2Hz, C-2-H), 6.8 (1H, *d*, J = 2Hz, C-4-H), 7.17 (1H, s, C-5-H), 7.45 (1H, s, C-8-H).

Laxanthone-II (**2**). Brownish-green ferric reaction and spectral data showed a chelated OH. It did not undergo methylation with CH_2N_2 indicating that it contained only a chelated OH. The two consecutive losses of 42 a.m.u. in its MS, showed the possibility of the presence of two acetoxyl functions. Further, hydrolysis of **2** with EtOH–HCl gave **2a** which underwent methylation with CH_2N_2 to give a Me ether identical with **1a** indicating that **2** was also a 1, 3, 6, 7-tetraoxygenated xanthone. Acetylation of **2** and **2a** with Ac_2O–Py gave an acetate (**2b**) which was shown by PMR to contain one methoxyl and 3 acetoxyls. Hence, laxanthone-II had one methoxyl and two acetoxyls at the C-3, 6 and 7 positions whereas C-1 contained a chelated OH. Since the signals at δ 6.9 and 6.96 assigned to the *meta*-coupled protons had values lower than those noted in the case of **1a**, **2b** probably also had two acetoxyl functions at the C-1 and 3 positions as observed in the case of **1b**. The remaining acetoxyl and methoxyl were placed at C-6 and 7 respectively on the basis of the following considerations. The hydrolysis product (**2a**) and the acetate (**2b**) of laxanthone-II on comparisons with the synthetic isometric samples, were found to be different from 1, 6, 7-trihydroxyxanthone-3-methoxyanthone (**3**) [10] and 1, 3, 7-trihydroxy-6-methoxyxanthone (**4**) [9] and their triacetates but identical with 1, 3, 6-trihydroxy-7-methoxyxanthone (**2a**) [10] and its triacetate. Furthermore laxanthone-II was considered to be 1-hydroxy-3, 6-diacetoxy-7-methoxyxanthone (**2**). **2**. $C_{18}H_{14}O_8$; mp 180–1°; ν_{max}^{KBr} 3400 (OH), 1750, 1656 (conj. CO) cm^{-1}; λ_{max}^{MeOH} 240, 300, 360 nm; + $AlCl_3$ 240, 270, 325, 380 nm. MS. 358 (M^+), 316, 274, 259, 245, 231, 217 and 203. **2a**: $C_{14}H_{10}O_6$; mp 304° (decomp.). **2b**: $C_{20}H_{16}O_9$: mp 191–2°; PMR (δ; $CDCl_3$: 2.35 (6H, s, 2x-OAc), 2.47 (3H, s, C-1-OAc), 3.96 (3H, s, OMe), 6.9 (1H, *d*, J = 2Hz, C-2-H), 6.96 (1H, *d*, J = 2Hz, C-4-H), 7.48 (1H, s, C-5-H), 8.04 (1H, s, C-8-H).



1, $R_1 = R_2 = H$; $R_3 = R_4 = Me$
1a, $R_1 = H$; $R_2 = R_3 = R_4 = Me$
1b, $R_1 = R_2 = COMe$; $R_3 = R_4 = Me$
2, $R_1 = H$; $R_2 = R_3 = COMe$; $R_4 = Me$
2a, $R_1 = R_2 = R_3 = H$; $R_4 = Me$
2b, $R_1 = R_2 = R_3 = COMe$; $R_4 = Me$
3, $R_1 = R_3 = R_4 = H$; $R_2 = Me$
4, $R_1 = R_2 = R_4 = H$; $R_3 = Me$

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