92 (22). The compound gave a positive Borntrager reaction. The echtiotoxic activity of juglone was determined on goldfish and the LD_{50} was calculated according to the method described by Weil.[7]

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[7] WEIL, C. S. (1952) *Biometric* **8**, 249.

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TRITERPENES AND FATTY ACIDS FROM *NEPETA ARAGONENSIS*

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Key Word Index—*Nepeta aragonensis*; Labiatae; triterpenes; fatty acids.

Plant. Nepeta aragonensis Lamk. *Source.* Reduced areas in the NE of the Iberian Peninsula. *Previous work.* None.

Present work. From the triterpene fraction, ursolic acid, betulin and uvaol have been isolated; this is the first time that the presence of betulin and uvaol is reported in plants of the *Nepeta* genus. The ursolic acid have been previously isolated from other species of this genus.[1,2]

GLC analysis of the methyl ester of the fatty acids fraction yielded the following results: myristic (17%), palmitic (80%), oleic (0·5%), linoleic (0·47%) and linolenic (1·2%) acids.

EXPERIMENTAL

Extraction. Finely divided aerial parts of *N. aragonensis* were extracted in a Soxhlet with MeOH. The extract was taken to dryness and the residue saponified with 4% ethanolic KOH isolating a neutral and an acid fraction.

Neutral fraction. Following column and preparative thin layer chromatography on SiO_2–$AgNO_3$ impregnated plates, betulin and uvaol were isolated. *Betulin* (most polar compound on SiO_2—$AgNO_3$ plates); m.p. 258–260° (from acetone:*n*-hexane); $[\alpha]_D^{23°}$ + 18° (*c* 1·1, Py). *Diacetyl derivative*: m.p. 220° (from MeOH); $[\alpha]_D^{23°}$ + 21° (*c* 0·8, $CHCl_3$); NMR (τ): 5·34 (2H, *d* with fine splitting, >C=CH_2), 5·45 (1H, *m*, >CHOAc), 5·93 (2H, Q_{AB}, *J* 12 Hz, =C=CH_2OAc), 7·95 and 7·97 (3H each, *s*,*s*, two Me–CO–O–), 8·31 (3H, bs, C=C=Me) and methyl singlets at 8·96 (1 –Me), 9·02 (1 –Me) 9·16 (3 –Me). [Found: C, 77·43; H, 10·26. Calc. for $C_{34}H_{54}O_4$: C, 77·52; H, 10·33%]. *Uvaol.* Thick oil; it did not crystallize. *Diacetyl derivative*: m.p. 151–153° (from MeOH); $[\alpha]_D^{23°}$ + 53° (*c* 0·7, $CHCl_3$); NMR (τ): 4·83 (1H, *m*, $W_{\frac{1}{2}}$ 9 Hz, olefinic), 5·47 (1H, *q*, $J_{aa'}$ 8 Hz, $J_{ae'}$ 6 Hz, axial proton >CHOAc), 6·15 (2H, Q_{AB}, *J* 12 Hz, =C=CH_2OAc), 7·97 (6H, *s*, two Me–CO–O–) and methyl singlets at 8·9 (1 –Me), 9·01 (2 –Me) and 9·13 (4 –Me). [Found: C, 77·31; H, 10·29. Calc. for $C_{34}H_{54}O_4$: C, 77·52; H, 10·33%].

Acid fraction. Silica gel column chromatography allows separation of ursolic acid and a mixture of fatty acids. The fatty acids were methylated with diazomethane and analyzed on GLC with standard conditions. The results have been quoted above.

[1] BRIESKORN, C. H. and EBERHARDT, K. H. (1953) *Arch. Pharm.* **286**, 124.
[2] ISAWA, K. and ARAKAWA, T. (1956) *Ann. Rept. Hoshi Coll. Pharm.* **5**, 25, (1957) *Chem. Abstr.* **51**, 3089b.

Ursolic acid. M.p. 290° (from $CH_3OH:H_2O$); $[\alpha]_D^{23°}$ + 70° (*c* 0·2, MeOH); NMR (τ): 0·71 (1H, *bs*, –COOH), 4·70 (1H, *m*, $W_{\frac{1}{2}}$ 9 Hz, olefinic), 6·80 (1H, *q*, $J_{aa'}$ 9·3 Hz, $J_{ae'}$ 6 Hz, axial >CHOH) and methyl singlets at 8·91 (1 –Me), 9·03 (2 –Me), 9·10 (2 –Me) and 9·23 (2 –Me). [Found: C, 78·45; H, 10·40. Calc. for $C_{30}H_{48}O_3$: C, 78·89; H, 10·59%].

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ISOFLAVONOIDS OF *DALBERGIA PANICULATA* SEEDS

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Key Word Index—*Dalbergia paniculata*; Leguminosae; dalpatien; caviunin; dalpanol-*O*-glucoside.

Plant. Dalbergia paniculata Roxb. *Source.* Madanapalle, A.P., India. *Previous work.* On seeds,[1,2] on root,[3] on flowers,[4] on wood,[5,6] and on bark.[7]

Present work. Shade dried, ripe seeds were extracted successively with light petrol, C_6H_6 and $CHCl_3$. The light petrol extract on chromatography over neutral alumina yielded, (a) an aliphatic alcohol (0·0055%), m.p. 80–81°, $C_{30}H_{60}O_2$, ν_{max} (KBr) 3400, 1737, 1472, 1462, 723 and 712 cm^{-1}. (b) Dalpatien, (0·0027%), identified as 6,2′-dimethoxy-4′,5′-methylene-dioxy-7-hydroxyisoflavone by m.p., m.m.p., co-chromatography, UV and superimposable IR spectra with an authentic sample of the aglycon of dalpatin.[2] NMR (DMSO-d_6) τ 1·89 (*s*, 2-H), 2·58 (*s*, 5-H), 3·03 (*s*, 6′-H), 3·13 (*s*, 8-H), 3·18 (*s*, 3′-H), 3·98 (*s*, –O–CH_2–O–), 6·10 (*s*, 6-OMe), and 6·33 (*s*, 2′-OMe).

The benzene extract gave dalpanol[1] and the mother liquor on alkali fractionation yielded caviunin.[8]

The chloroform extract deposited a light brown crystalline solid, purified by polyamide column chromatography to yield a colourless crystalline solid (0·0004%) (Found: C, 60·60, H, 5·83. $C_{29}H_{34}O_{12}$ requires: C, 60·63, H, 5·92), m.p. 203–204°, $[\alpha]_D^{34}$ –215·4° (*c* 0·26, 80% MeOH), R_f 0·9 (TLC, polyamide, EtOH–H_2O, 3:2). It gave reddish brown Molisch, blue-green Durham, green Roger–Calamari test and negative ferric reaction. λ_{max} (MeOH): 218 (log ϵ 4·33), 237 (4·13), 245 sh. (4·04), 295 (4·22) nm. ν_{max} (KBr): 3400 br., 1675, 1615: 1520, 1465, 1350, 1305, 1205, 1192, 1170, 1080 br. and 810 cm^{-1}.

[1] ADINARAYANA, D., RADHAKRISHNIAH, M., RAJASEKHARA RAO, J., CAMPBELL, R. and CROMBIE, L. (1971) *J. Chem. Soc.* **1C**, 29.
[2] ADINARAYANA D. and RAJASEKHARA RAO, J. (1972) *Tetrahedron* **28**, 5377.
[3] ADINARAYANA, D., RAHDAKRISHNIAH, M. and RAJASEKHARA RAO, J. (1971) *Curr. Sci.* **40**, 602.
[4] ADINARAYANA, D. and RAJASEKHARA RAO, J. (1972) *8th Intern. Symp. Chem. Natural Prod.* p. 96, I.U.P.A.C., New Delhi (Feb. 1972).
[5] NARAYANAN, V. and SESHADRI, T. R. (1970) *Indian Acad. Wood Sci.* **1**, 1.
[6] SESHADRI, T. R. (1972) *Phytochemistry* **11**, 881.
[7] NARAYANAN, V. and SESHADRI, T. R. (1971) *Indian J. Chem.* **9**, 14.
[8] GOTTLIEB, O. R. and MAGALHAES, M. T. (1961) *J. Org. Chem.* **26**, 2449.