plaques préparatives. Ils sont ensuite éventuellement purifiés par cristallisation.

Sont ainsi isolés, avec les pourcentages indiqués par rapport aux A.T. et par ordre de polarité croissante: à partir des écorces de tige, *six* alcaloïdes: A (6%); B (12%); C (20%); D (<1%); E (<1%); F (<1%); à partir des feuilles *deux* alcaloïdes: B (13%); C (29%) et à partir des écorces de racine: *trois* alcaloïdes: A (8%); C (30%); E (<1%).

Un alcaloïde (C) est présent dans les trois organes; deux alcaloïdes (A et E) sont présents dans les écorces de tige et racine; et un autre (B) est présent dans les écorces de tige et feuilles. Ces six alcaloïdes ainsi isolés ont été identifiés à des alcaloïdes connus par comparaison directe (ccm, UV, IR, MS, $[\alpha]_D$) avec l'échantillon de référence A = (−)voacangine; B = (−)voacangarine; C = (−)ibogaïne; D = (−)iboxygaïne; E = (−)descarbométhoxyvoacamine; F = ibolutéine.

CONCLUSION

Chimiotaxinomie: particulièrement riche en ibogaïne, le *P. speciosa* se range dans le taxon des *Pandaca* renfermant essentiellement des alcaloïdes du type 'iboga': *P. eusepaloïdes* [3, 4], *P. crassifolia* [3, 4], *P. retusa* [5, 6], *P. ochrascens* [4] et *P. stellata* [3, 4].

REFERENCES

1. Hoizey, M. J., Quirin, F. et Olivier, L. (1971) *Plant. méd. Phytothérapie* **5**, 99.
2. Markgraf, F. (1970) *Adansonia* **10**, 23.
3. Hoizey, M. J., Olivier, L., Debray, M.-M., Quirin, M. et Le Men, J. (1970) *Ann. Pharm. Fr.* **28**, 127.
4. Panas, J. M., Richard, B., Sigaut, C., Debray, M.-M., Le Men-Olivier, L. et Le Men, J. (1974) *Phytochemistry*, à paraître.
5. Picot, F., Boiteau, P., Das, B. C. et Potier, P. (1973) *Phytochemistry*, **12**, 2517.
6. Le Men-Olivier, L., Richard, B. et Le Men, J. (1974) *Phytochemistry*, **13**, 280.

Phytochemistry, 1975, Vol. 14, pp. 580–581. Pergamon Press. Printed in England.

STEROIDS OF *CANNABIS SATIVA* ROOT

DAVID J. SLATKIN, JOSEPH E. KNAPP and PAUL L. SCHIFF, JR.

Department of Pharmacognosy, School of Pharmacy, University of Pittsburgh, Pittsburgh, Pennsylvania 15261 U.S.A.

and

CARLTON E. TURNER and M. LEONARD MOLE, JR.

Research Institute of Pharmaceutical Sciences, School of Pharmacy, University of Mississippi, University, Mississippi 38677 U.S.A.

(*Received* 12 *July* 1974)

Key Word Index—*Cannabis sativa*; Cannabinaceae; marijuana; root; steroids; stigmast-4-en-3-one; campest-4-en-3-one; stigmast-4,22-dien-3-one; stigmast-5-en-3β-ol-7-one; campest-5-en-3β-ol-7-one; stigmast-5,22-dien-3β-ol-7-one.

Plant. Cannabis sativa L. Cannabinaceae (root). *Source.* Research Institute of Pharmaceutical Sciences, University of Mississippi; Lot Me-A(2)-C-69 grown in 1971. *Previous work.* On roots: friedelin [1], epifriedelinol [1], *N*-(*p*-hydroxy-β-phenylethyl)-*p*-hydroxy-*trans*-cinnamamide [1], choline [2], and neurine [2].

Present work. The dried, ground roots were extracted by percolation with MeOH. After removal of the solvent *in vacuo* at 40°, the residue (2·8%) was partitioned between H_2O and $CHCl_3$ to give fractions of 0·35 and 1·6%, respectively. The $CHCl_3$ fraction was then partitioned between light petrol. and 10% aq. MeOH and the light petrol. fraction (0·11%) was chromatographed over silicic acid.

Elution with light petrol–$CHCl_3$ (1:9) gave a sterol mixture which crystallized from MeOH:

m.p. 135–136°; ν_{max}^{KBr} 3450, 2960, 1460, 1375 and 1061 cm^{-1}. GC–MS analysis showed the mixture to be composed of sitosterol (52%) (M^+ 414), campesterol (28%) (M^+ 400), and stigmasterol (20%) (M^+ 412). The spectra were consistent with those of authentic samples.

Elution with $CHCl_3$ gave a fraction which, on preparative TLC over silica gel G using EtOAc–$CHCl_3$ (1:9), afforded a steroidal mixture which crystallized from MeOH; m.p. 90–91°; $[\alpha]_D^{26}$ +80·3° (*c* 0·94, $CHCl_3$); λ_{max}^{MeOH} 243 nm (log ε 4·20); ν_{max}^{KBr} 2940, 2870, 1665, 1616, 1440 and 1375 cm^{-1}. GC–MS analysis showed the mixture to be composed of stigmast-4-en-3-one(sitost-4-en-3-one) (49%) (M^+ 412), campest-4-en-3-one (28%) (M^+ 398), and stigmast-4,22-dien-3-one (23%) (M^+ 410). Direct comparison (m.p., m.m.p., IR, GC–MS) with an authentic sample confirmed the identity.

Further elution with $CHCl_3$ gave a fraction which, on preparative TLC over silica gel G using EtOAc–$CHCl_3$ (1:9), gave a steroidal mixture which crystallized from light petrol. (45 mg); m.p. 127–129°; $[\alpha]_D^{25}$ −74·1° (*c* 1·0, $CHCl_3$); λ_{max}^{MeOH} 238 nm (log ε 4·02); ν_{max}^{KBr} 3420, 2960, 2938, 2830, 1663, 1625, 1460, 1385 and 1062 cm^{-1}. GC–MS analysis showed the mixture to be composed of stigmast-5-en-3β-ol-7-one (7-keto-β-sitosterol) (53%) (M^+ 428), campest-5-en-3β-ol-7-one (25%) (M^+ 414), and stigmast-5,22-dien-3β-ol-7-one (22%) (M^+ 426). Direct comparison (m.p., m.m.p., IR, GC–MS) with an authentic sample [3] confirmed the identity.

Acknowledgements—The authors are grateful to Dr. S. J. Stohs, Department of Medicinal Chemistry and Pharmacognosy, College of Pharmacy, University of Nebraska-Lincoln for the sample of sitost-4-en-3-one; Mr. John Naworal, Graduate School of Public Health, University of Pittsburgh for determining the MS. The mass spectrometer facility was supported by Research Grant RR-00273 to the University of Pittsburgh from the National Institutes of Health. This investigation was supported in part by Research Grant 5S01RR05455-10 from the National Institutes of Health, Education and Welfare, Contract HSM-42-70-109 from the National Institute on Drug Abuse and The Research Institute of Pharmaceutical Sciences, School of Pharmacy, University of Mississippi.

REFERENCES

1. Slatkin, D. J., Doorenbos, N. J., Harris, L. S., Masoud, A. N., Quimby, M. W. and Schiff, P. L. Jr. (1971) *J. Pharm. Sci.* **60,** 1891.
2. Mole, M. L. Jr. and Turner, C. E. (1973) *Acta Pharm. Jugoslav.* **23,** 203.
3. Bishara, R. H. and Schiff, P. L. Jr. (1970) *Lloydia* **33,** 477.