

Isolation of meconic acid from *Papaver*, section *Macrantha* (*Oxytona*)

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Since the isolation of meconic acid from *Papaver somniferum* L. by Serturmer in 1805, the presence or absence of this compound in the latices of other plants of the genus *Papaver* does not appear to have been investigated. It is, in fact, a popularly stated view that meconic acid is characteristic of *P. somniferum*, and can thus be used to confirm the presence of opium or other extracts of *P. somniferum* in a drug sample (Wallis, 1967; Trease & Evans, 1972).

Whilst investigating the alkaloidal content of *P. bracteatum* Lindl. we found that approximately 50% by dry weight of the latex was composed of thebaine (Fairbairn & Helliwell, 1975, 1976); high latex thebaine contents had also been obtained by other workers (Shargi & Lalezari, 1967; Cheng, 1972). To maintain the acid/base balance in the latex of *P. bracteatum*, a significant quantity of acid must also be present, as is found in *P. somniferum*, where sulphuric and meconic are the principal acids. It was therefore decided to investigate whether meconic acid occurred in the former and related species.

Meconic acid is readily detectable by the development of a deep purple-red coloration with ferric chloride reagent. Aqueous extracts of latex from both *P. bracteatum* and the closely related *P. pseudo-orientale* (Fedde) Medw. (Goldblatt, 1974) developed this characteristic coloration with ferric chloride reagent.

To extract any meconic acid which might be present, 6.65 g of fresh *P. bracteatum* latex were treated by the method of Miyamoto & Brochmann-Hanssen (1962). The crystals obtained were purified by two recrystallizations from water and dried over silica gel at room temperature. For comparison, meconic acid was extracted from 8.00 g of *P. somniferum* latex by the same method (Miyamoto & Brochmann-Hanssen, 1962).

The meconic acid extracted from *P. somniferum* and

the unknown acid extracted from *P. bracteatum* demonstrated the following characteristics:

(i) both gave a deep red-purple coloration with ferric chloride reagent;

(ii) the ultraviolet spectra in both 0.1 N hydrochloric acid ( $\lambda_{\max} = 236$  nm) and 0.1 N sodium hydroxide solution ( $\lambda_{\max} = 249$  nm) were identical and showed the same  $\lambda_{\max}$ , and bathochromic shift reported by Miyamoto and Brochmann-Hanssen for pure meconic acid (Miyamoto & Brochmann-Hanssen, 1962);

(iii) thin-layer chromatographic analysis on microcrystalline cellulose in the solvent system: water-ethyl acetate-ethanol-0.88 ammonia (40:35:65:10) of the acid extracted from *P. bracteatum* indicated a single component with an  $R_F$  value ( $R_F = 0.60$ ) identical to that given by the meconic acid extracted from *P. somniferum*.

The mass spectra (run on an AEI MS 902 instrument at 70 eV and an inlet temperature of 120°) were determined and gave the following:

*Meconic acid* (extracted from *P. somniferum*) molecular weight 200,  $m/e$ : 200 ( $M^+$ ; 14%), 156 ( $M^+ - 44(-CO_2)$ ; 57%), 154 (9%), 115 (14%), 69 (100%). *Acid* extracted from *P. bracteatum*  $m/e$ : 200 ( $M^+$ ; 11%), 156 ( $M^+ - 44$ ; 28%), 154 (11%), 115%, 69 (100%).

Similar results for coloration with ferric chloride reagent, ultraviolet spectra and thin-layer chromatography were also obtained from an acid extracted by the same procedure (Miyamoto & Brochmann-Hanssen, 1962) from the latex of *P. pseudo-orientale*.

It is therefore concluded that meconic acid is present in at least two of the species of *Papaver*, Section *Macrantha* (*Oxytona*) (no plants of *P. orientale* L. were available and that the detection of meconic acid in a drug sample is not conclusive evidence of the presence of opium or other *P. somniferum* extract).

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## REFERENCES

- CHENG P. C. (1972). *Cultivation and Analysis of Papaver bracteatum Lindl.*, M. S. Thesis, University of Mississippi.
- FAIRBAIRN, J. W. & HELLIWELL, K. (1975). *J. Pharm. Pharmac.*, **27**, 217-221.
- FAIRBAIRN, J. W. & HELLIWELL, K. (1977). *Ibid.*, in the press.
- GOLDBLATT, P. (1974). *Ann. Mo. bot. Gdn.*, **61**, 264-296.
- MIYAMOTO, S. & BROCHMANN-HANSEN, E. (1962). *J. pharm. Sci.*, **51**, 552-554.
- SERTURMER, F. W. A. (1805). *Journ. Pharm.*, **13**, 234-236.
- SHARGH, N. & LALEZARI, I. (1967). *Nature*, **213**, 1244.
- TREASE, G. E. & EVANS, W. C. (1972). *Pharmacognosy*, pp. 420-421. 10th Edn. London. Baillière, Tindall.
- WALLIS, T. E. (1967). *Textbook of Pharmacognosy*, p. 448, 5th Edn. London. Churchill.