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LINACEAE

THE *C*-GLYCOSYLFLAVONOIDS OF FLAX, *LINUM USITATISSIMUM*

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Abstract—The *C*-glycosylflavonoids of the leaves and stems of more than 30 anthocyanin-distinguishable genetic lines of *Linum usitatissimum* are all identical: orientin, isoorientin, vitexin, isovitexin, lucenin-1 and -2, vicenin-1 and -2.

EXTENSIVE genetic information[1] has been accumulated for *Linum usitatissimum* because of the commercial importance of this flax. For several years one of us (J.D.) has been concerned with the relative commercial value of more than 30 well-established genetic lines[1] of this species; all these varieties differ in their petal anthocyanins. It is well documented that the leaf flavonoids of higher plants are often of value for resolving evolutionary relationships among plant taxa.[2] Therefore, it was of interest to identify the leaf flavonoids of these 30-odd flax genetic lines and determine whether or not any of the several genes known to control the synthesis of the petal anthocyanins affected the leaf flavonoid chemistry. We now report the *C*-glycosylflavonoids of the leaves and stems of *L. usitatissium*, var. Crista. These data extend the previous incomplete investigations of the *C*-glycosylflavonoids of other *Linum* species[3] and differ slightly from the previous investigation of young shoots of another variety of *L. usitatissimum* (var. Bison, Bombay or Koto).[4]

FLAVONOID IDENTIFICATIONS AND DISCUSSION

The two-dimensional paper chromatographic flavonoid patterns for the mature leaves and stems of more than 30 anthocyanin-distinguishable genetic lines of *L. usitatissimum* were identical with regard to their flavonoids when the chromatograms were viewed under UV light alone or with ammonia vapor.* Eight *C*-glycosylflavonoids were isolated from the two-dimensional paper chromatograms obtained from the leaf and stem material of *L. usitatissimum*, variety *Crista*; the compounds were identified by UV spectral analysis.[5]

* The flavonoids of the petals of more than 20 of these genetic lines also did not exhibit any variation; our preliminary results for the petals indicate the presence of isoorientin, vitexin, isovitexin, vicenin-1 and -2 along with three other as yet unidentified flavonoids.

[1] F. PLONKA and C. ANSELME, *Les varietés de lin et leurs principales maladies cryptogamiques INRA*, Paris (1956).

[2] K. R. MARKHAM, T. J. MABRY and W. T. SWIFT, Jr., *Phytochem.* **9**, 2359 (1970).

[3] D. E. GIANNASI and C. M. ROGERS, *Brittonia* **22**, 163 (1970).

[4] R. K. IBRAHIM, and M. SHAW, *Phytochem.* **9**, 1855 (1970); R. K. IBRAHIM, *Biochim. Biophys. Acta* **192**, 549 (1969).

[5] T. J. MABRY, K. R. MARKHAM and M. B. THOMAS, *The Systematic Identification of Flavonoids*, Springer-Verlag, New York (1970).

Moreover the compounds were either unchanged upon acid hydrolysis or yielded the expected C-6, C-8 pair of *C*-glycosyl isomers. Finally, the compounds were identical by paper co-chromatography (in two solvent systems) with authentic samples.* Thus, the mature leaves and stems of *L. usitatissimum* contain orientin, isoorientin, vitexin, isovitexin, lucenin-1, -2, vicenin-1 and -2.

EXPERIMENTAL

Most of the genetic lines of *L. usitatissimum* were provided by F. Plonka, Institut National de la Recherche Agronomique, Versailles, France; others were obtained from the plant collection available in the senior author's Research Station. All of the two-dimensional paper chromatographic, hydrolytic and UV spectral analyses were carried out by standard procedures.[5]

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* Samples of several of the *C*-glycosylflavonoids were available from the flavonoid collection of T.J.M.; however, all the compounds were available in chromatographic quantities from Mark Bierner who had previously identified them in various species of *Helenium* (Compositae). The latter work is unpublished.

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MALPIGHIACEAE

ALKALOIDS OF THE LEAVES OF *BANISTEREOPSIS ARGENTEA*

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Plant. Banistereopsis argentea Spring ex Juss.

Occurrence. The species is now being grown in Indian Botanic Gardens, Howrah.[1]

Uses. Members of the genus *Banistereopsis* are used in the preparation of narcotic and/or hallucinogenic decoctions by certain Colombian and Peruvian Indian tribes.[2]

Previous work. A preliminary report based on this work has recently been presented.[3]

Leaves. Total alkaloids, 0·02%.

Defatted (petroleum 60–80°) plant material (1·8 kg) hot extracted with EtOH. EtOH-extract concentrated under reduced pressure, the residue taken up in AcOH (4%, 200 ml), clarified acidic solution extracted with $CHCl_3$ at two pH levels (4 and 9), H_2O-soluble bases isolated through their reineckates.[4]

[1] The plant material was obtained through the kind courtesy of Mr. R. Biswas, Indian Botanic Gardens, Howrah.

[2] A. D. MARDEROSIAN, *Lloydia* **30**, 23 (1967).

[3] S. GHOSAL and U. K. MAZUMDER, *Abstracts, Convention of Chemists*, IIT, Madras (1970).

[4] S. GHOSAL, P. K. BANERJEE and S. K. BANERJEE, *Phytochem.* **9**, 429 (1970).