

FLAVONOIDS AND AFFINITIES OF *COREOPSIS BIGELOVII*

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In this note we wish to report the flavonoids of *Coreopsis bigelovii* (A. Gray) H. M. Hall and how these findings bear upon the relationship of section *Pugiopappus* (A. Gray) Blake within the genus. Ten compounds were isolated and identified. Compounds present in floral tissue were: coreopsin, sulfurein, marein, maritmein, stillopsin and luteolin 7-*O*-glucoside. The same compounds were found in leaf tissue along with butein 4'-*O*-diglucoside, lanceoletin (aglycone only), 6-hydroxy-luteolin 7-*O*-glucoside and 8-methoxybutin. We cannot state with certainty that 8-methoxybutin occurs naturally in the plant. The major compounds present were coreopsin and stillopsin whose structures were determined by NMR and UV spectral data [1]. The structures of all other compounds were deduced from UV and chromatographic data. 8-Methoxybutin, lanceoletin and butein 4'-*O*-diglucoside were present in the smallest concentrations.

In a recent paper, Crawford [2] described the isolation of okanin 4'-*O*-diglucoside from *C. petrophiloides* (section *Pseudo-Agarista*) and suggested that diglycosides and other complex glycosyl derivatives may be restricted to primitive sections of *Coreopsis*. His suggestion was based upon the occurrence of such derivatives only in members of the three most primitive sections: *Anathysana*, *Electra* and *Pseudo-Agarista* [3]. Our observation of butein 4'-*O*-diglucoside in *C. bigelovii*, section *Pugiopappus* casts doubt on the validity of that generalization since section *Pugiopappus* is "... moderately advanced", according to Smith [3]. *Coreopsis bigelovii* does not, however, appear to produce acylated glycosides as seen in members of sections *Anathysana* and *Electra* [4].

Crawford [2] also pointed out that *O*-methylated anthochlors were only known from members of section *Coreopsis* (*C. grandiflora*, *C. lanceolata*, *C. nuecensis* and *C. saxicola*). Our finding of lanceoletin in a member of section *Pugiopappus* requires reappraisal of that generalization. The presence of lanceoletin in *C. bigelovii* might be taken to indicate a closer relationship between sections *Pugiopappus* and *Coreopsis*, but this seems unlikely in view of significant morphological and cytological differ-

ences between these taxa as discussed by Smith [3]. Further generalizations about the significance of *O*-methylated anthochlor distribution must await wider surveys in the genus, with care given to the likelihood of these compounds being present in low concentration.

Smith [3] considered sections *Pugiopappus* and *Euleptosyne* to be closely related having apparently arisen from a common ancestor. Both groups have $x = 12$ and a series of morphological characters in common. In view of these similarities, it is noteworthy that members of both sections possess the rare chalcone stillopsin (3,4,2',4',5'-pentahydroxychalcone 4'-*O*-glucoside) which is otherwise not known in Compositae [5].

EXPERIMENTAL

Coreopsis bigelovii (A. Gray) H. M. Hall was collected 23 April, 1978, 0.8 mile south of Pyramid Lake, Los Angeles Co., California. A voucher (BAB-1177) has been deposited in UBC. Flavonoids were isolated and purified according to ref. [6]. TLC solvent systems are also described therein. 1 g dry wt of floral tissue yielded 70 mg *n*-butanol soluble phenolics, while 320 mg of phenolics were obtained from 4.2 g of dried bracts, leaves and stems.

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