

6-METHOXYAPIGENIN FROM THIRTY-FOUR SPECIES OF COMPOSITAE

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HISPIDULIN (6-methoxy-5,7,4'-trihydroxyflavone) known for its cytotoxic properties,¹ was first identified from the leaf extract of *Ambrosia hispida*,² and was later detected in a number of other Compositae species: *Iva nevadensis*,³ and *I. hayesiana*,⁴ *I. frutescens*,⁵ *Ambrosia ambrosioides*,⁶ *Gaillardia fastigiata*,⁷ *Eupatorium cuneifolium*¹ and *E. rotundifolium*,¹ *Flourensia cernua*,⁸ *Hymenoxys odorata*⁹ and *H. richardsonii* var. *floribunda*⁹ and *Helenium autumnale*.¹⁰

As the result of several separate biochemical systematic investigations of still other genera in the Compositae, we can now report the occurrence of hispidulin in 34 additional species of *Ambrosia*, *Gaillardia*, *Helenium*, *Hymenoxys*, *Plummera* and *Ratibida* (Table 1). It is of particular interest to note that, with the exception of the *Eupatorium* species, all of the Compositae genera in which hispidulin has been found are recognized as members of two closely related tribes, the Helenieae and Heliantheae. Although hispidulin appears to be widespread in these two tribes, it is not restricted to the Compositae; it has also been reported from the Scrophulariaceae (*Digitalis lanata*)¹¹ and the Pedaliaceae (*Pedaliium*

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murex),¹² the Plantaginaceae (*Plantago major* var. *asiatica*)¹³ and the Bignoniaceae (*Millingtonia hortensis*).¹⁴

TABLE 1. NEW REPORTS FOR HISPIDULIN

Species	Voucher No.*	Species	Voucher No*
Tribe Heliatheae		<i>H. elegans</i> var. <i>amphibolum</i>	Biernern & Averett 232a
<i>Ambrosia dumosa</i>	Barbour Az-T-002	<i>H. laciniatum</i>	Gentry 5951
<i>Ratibida columnaris</i>	Watson 781	<i>H. linifolium</i>	Turner 4995
Tribe Helenieae		<i>H. mexicanum</i>	Biernern & Turner 119
<i>Gaillardia aestivalis</i>	Averett & Watson 537	<i>H. microcephalum</i> var. <i>microcephalum</i>	Biernern & Averett 38
<i>G. mexicana</i>	Turner 6209	<i>H. microcephalum</i> var. <i>ooclinium</i>	Biernern & Whiffin 289
<i>G. multiceps</i>	Powell & McAfee 1318	<i>H. pinnatifidum</i>	Biernern, Northington & Flyr 213
<i>G. pinnatifida</i>	Averett & Watson 514	<i>H. puberulum</i>	Biernern & Watson 134
<i>G. powellii</i>	Turner 6035	<i>H. quadridentatum</i>	Grashoff 442
<i>G. pulchella</i>	Averett 562	<i>H. thurberi</i>	Palmer 255
<i>G. suavis</i>	Watson 564	<i>H. vernale</i>	Biernern, Northington & Flyr 202
<i>Helenium</i> ¹¹ <i>amarum</i>	Biernern 144	<i>Hymenoxys anthemoides</i>	Legname & Cuzzo 7174
<i>H. arizonicum</i>	Deaver 6033	<i>H. cabreriae</i>	Sanderson 364
<i>H. autumnale</i>	Biernern & Averett 162	<i>H. robusta</i>	Sanderson 345
<i>H. badium</i>	Biernern & Biernern 80	<i>H. rusbyi</i>	Sanderson 180
<i>H. bigelovii</i>	Robbins 2108	<i>H. tweediei</i>	Sanderson 303
<i>H. bolanderi</i>	Biernern 133	<i>Plummera ambigens</i>	Turner 5714
<i>H. brevifolium</i>	Biernern, Northington & Flyr 222	<i>P. floribunda</i>	Turner 5731
<i>H. campestre</i>	Biernern, 252		
<i>Helenium</i> ¹⁵ <i>elegans</i> var <i>elegans</i>	Biernern & Averett 74		

* All vouchers are deposited in the University of Texas at Austin Herbarium.

EXPERIMENTAL

The plant extractions were carried out by standard procedures¹⁶ and, in all cases, hispidulin was identified by chromatographic and UV properties (a standard set¹⁶ of six UV spectra were recorded in each instance). The NMR and MS data for our material were in accord with published spectra.^{2,17}

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