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MORFOLOGIA DE LOS GRANOS DE POLEN DE LA FAMILIA VERBENACEAE DEL VALLE DE MEXICO*

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RESUMEN

Se estudia e ilustra la morfología del polen de diesisiete taxa de la familia Verbenaceae del Valle de México: *Bouchea prismatica* var. *brevirostra* Grenzebach, *Citharexylum affine* Don., *Lantana camara* L., *Lantana velutina* Mart. & Gal., *Lippia umbellata* Cav., *Phyla nodiflora* (L.) Greene, *Priva grandiflora* (Ort.) Moldenke, *Priva mexicana* (L.) Pers., *Verbena amoena* Paxton, *Verbena bipinnatifida* Nutt., *Verbena canescens* H.B.K., *Verbena carolina* L., *Verbena elegans* H.B.K., *Verbena gracilis* Desf., *Verbena litoralis* H.B.K., *Verbena menthaefolia* Benth., *Verbena recta* H.B.K., y *Verbena teucriifolia* Mart. & Gal. Se incluyen descripciones palinológicas de los taxa tomando en consideración la morfología del polen y los datos bibliográficos, además se hacen algunas interpretaciones de la posición taxonómica de las especies de esta familia en el área citada.

Las observaciones de los granos de polen se realizaron con el microscopio de luz.

PALABRAS CLAVE: morfología, Verbenaceae, Valle de México

ABSTRACT

Pollen grain morphology has been studied and illustrated of the following seventeen taxa of the Verbenaceae from the Valle de México: *Bouchea*

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* Trabajo apoyado por la Dirección de Estudios de Posgrado e Investigación del Instituto Politécnico Nacional
** Becarios de COFAA del I.P.N.

prismatica var. *brevirostra* Grenzebach, *Citharexylum affine* Don., *Lantana camara* L., *Lantana velutina* Mart. & Gal., *Lippia umbellata* Cav., *Phyla nodiflora* (L.) Greene, *Priva grandiflora* (Ort.) Moldenke, *Priva mexicana* (L.) Pers., *Verbena amoena* Paxton, *Verbena bipinnatifida* Nutt., *Verbena canescens* H.B.K., *Verbena carolina* L., *Verbena elegans* H.B.K., *Verbena gracilis* Desf., *Verbena litoralis* H.B.K., *Verbena menthaefolia* Benth., *Verbena recta* H.B.K., and *Verbena teucriifolia* Mart. & Gal. Besides taking in consideration pollen morphology and bibliographic data, some interpretations are made about the taxonomic position of the species belonging to this family in the Valle de México.

Observations of pollen grains were carried out with the light microscope.

KEY WORDS: morphology, Verbenaceae, Valle de México

INTRODUCCION

El presente trabajo forma parte de los estudios que sobre la flora palinológica en el Valle de México que vienen realizando Palacios-Chávez, *et al.* (1985).

La familia Verbenaceae comprende 98 géneros y 2614 especies (Lawrence 1951), distribuídas en casi todo el mundo. La mayoría son plantas herbáceas, sin embargo, algunos representantes presentan la forma arbórea o arbustiva. En el Valle de México prosperan ocho géneros con diesiocho especies (Rzedowski & Rzedowski 1985).

OBJETIVO

El propósito de este trabajo es dar a conocer la morfología de los granos de polen de la familia Verbenaceae del Valle de México y relacionarla con los estudios taxonómicos realizados en la familia.

ANTECEDENTES

Aunque es una familia representada por un buen número de géneros y especies a nivel mundial, son pocos los estudios palinológicos que se han realizado. Entre ellos podemos citar los de Erdtman (1966), quién estudia 40 géneros y 85 especies de diferentes partes del mundo. Palacios-Chávez (1966), describe e ilustra dos géneros y dos especies del Estado de Morelos. Huang (1972), describe nueve géneros y 25 especies para Taiwan. Markgraf & D'Antoni (1978), describe siete géneros y once especies para Argentina. Roubick & Moreno (1991), estudia siete géneros y ocho especies de la Isla Barro Colorado en Panamá. Palacios-Chávez, *et al.* (1991), describen trece géneros y diesisiete especies de la Reserva de la Biósfera de Sian

Ka'an, Quintana Roo, México, y Arreguín-Sánchez, *et al.* (1995), describen e ilustran seis géneros y diesisiete especies de la Estación de Biología Chamela, en Jalisco, México.

METODOLOGIA

Las muestras de polen se tomaron de las flores de ejemplares del área de estudio depositados en el Herbario de la Escuela Nacional de Ciencias Biológicas del Instituto Politécnico Nacional (ENCB), con excepción de *Lantana camara* L., que se registra para la Flora del Valle de México, sin encontrarse colectas recientes, lo que plantea la posibilidad de extinción de este taxa en la zona de estudio (Arroyo 1985), sin embargo, se consideró pertinente estudiarla de una región del estado de Hidalgo cercana al área de estudio con condiciones semejantes a las del Valle de México.

Los granos de polen se trataron con la técnica de la acetólisis de Erdtman (1943), para ser observados al microscopio de luz. Las laminillas se encuentran depositadas en la palinoteca de la Escuela Nacional de Ciencias Biológicas del Instituto Politécnico Nacional.

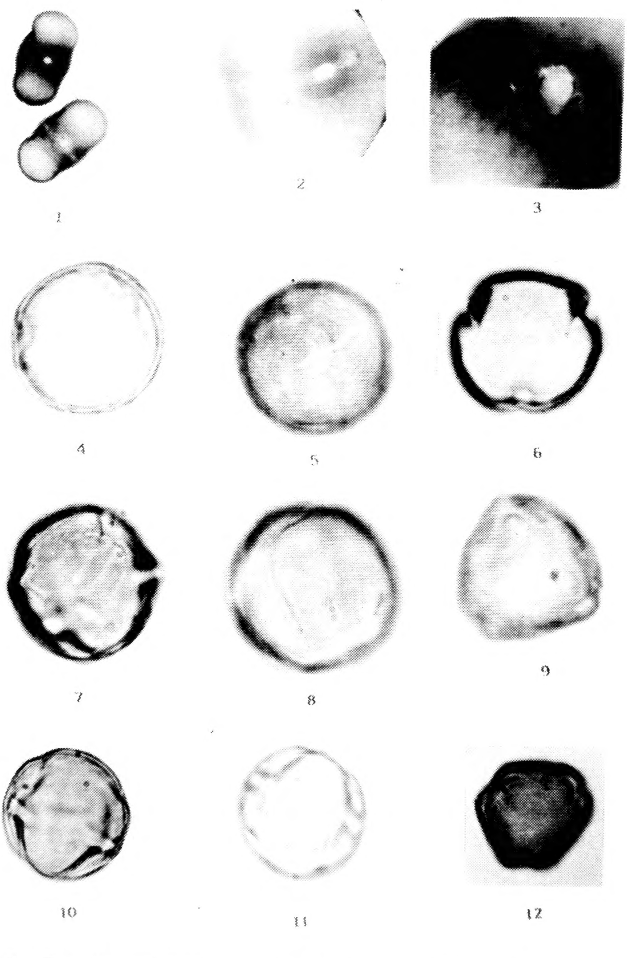
DESCRIPCION DE LOS GRANOS DE POLEN

Bouchea prismatica var. *brevirostra* Grenzebach. Cerro Mesa La Ahumada, Municipio de Huehuetoca, Edo. México, *C. Romero 241*. Lámina I, Figuras 1 a 3.

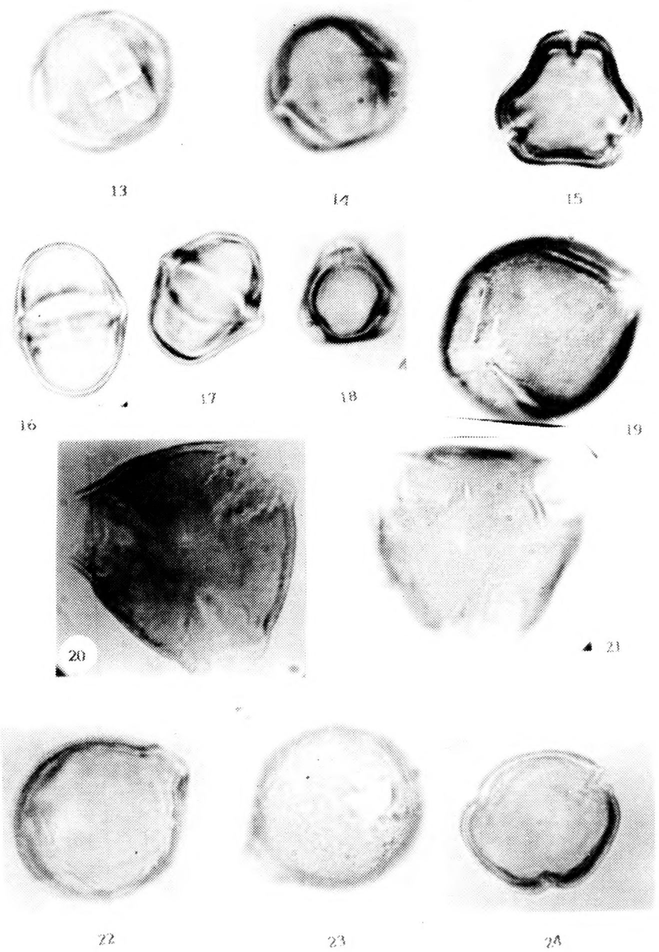
Polen triporado, tectado, prolato de 75(80)86 × 46(55)63 μ. P/E= 1.45. Vista polar poco frecuente. Exina de 6.5 μ de grosor, nexina dos veces más delgada que la sexina, con la superficie escabrosa. Poros de 6.0(7.0)9.5 μ de diámetro, cubiertos con membranas lisas y costa.

Citharexylum affine Don. Cerro Sacramonte, Municipio Amecameca, Edo. México, *J. Rzedowski 22844*. Lámina I, Figuras 4 a 6.

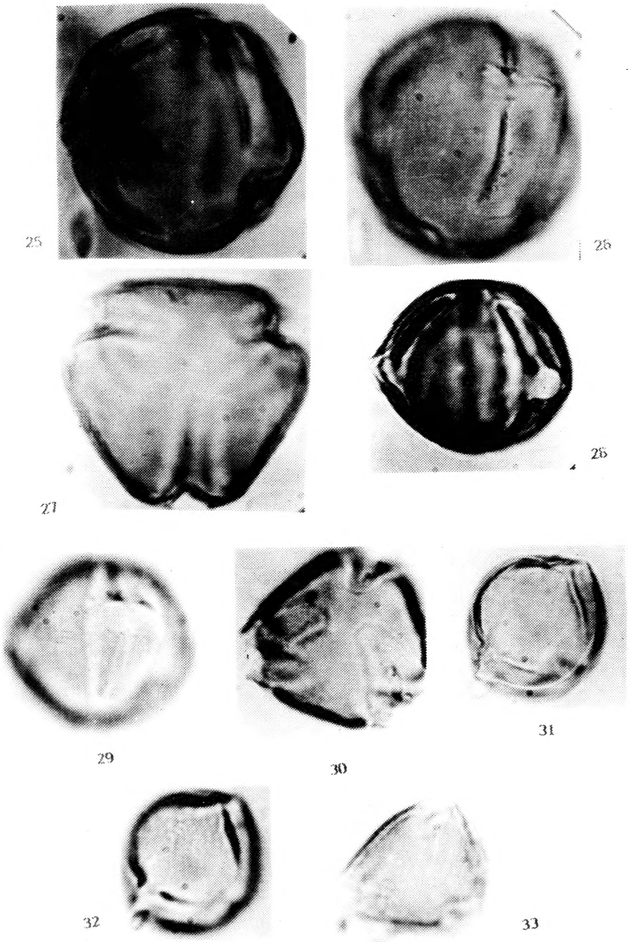
Polen tricolporado, tectado, esferoidal de 25.5(27.5)30.0 × 25.5(26.8)28.7 μ. P/E= 1.02. Vista polar circular de 25.3(26.5)28.0 μ. Exina de 2 μ de grosor, nexina y sexina de igual espesor, con la superficie escabrosa. Colpos con membranas lisas. Colpos transversales de 4.0(4.5)5.0 × 5.0(5.5)6.0 μ. Indice del área polar 0.64, grande.



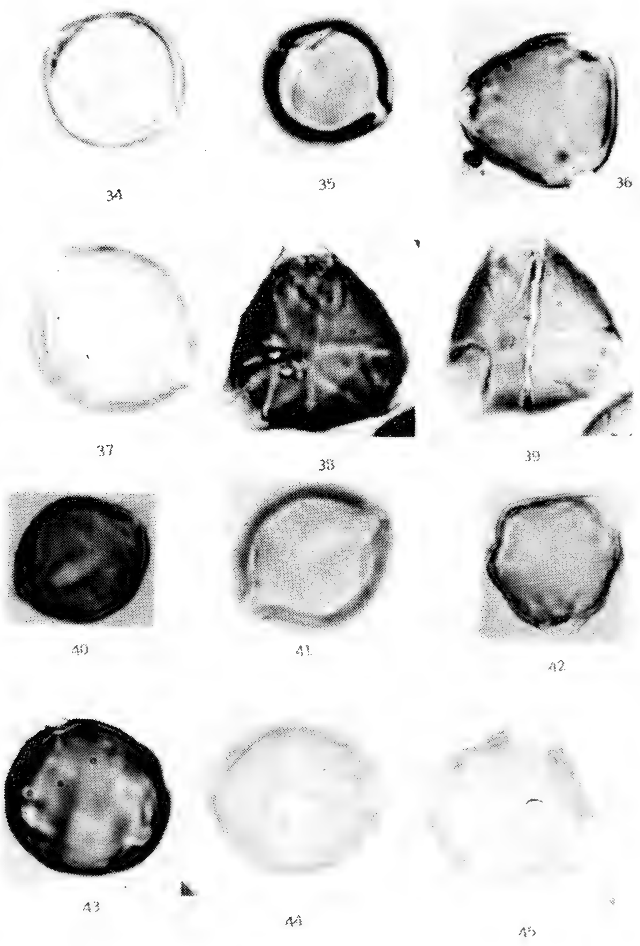
LAMINA I. *Bouchea prismatica* var. *brevirostra*: 1.- Grano completo a seco débil; 2.- Detalle de dos poros a seco fuerte; 3.- Detalle de un poro. *Citharexylum affine*: 4.- Vista ecuatorial acercamiento superficial de la exina; 5.- Vista ecuatorial mostrando aberturas y ornamentación; 6.- Vista polar, ornamentación. *Lantana camara*: 7.- Vista ecuatorial mostrando las aberturas; 8.- Vista ecuatorial mostrando la ornamentación; 9.- Vista polar, mostrando ornamentación. *Lantana velutina*: 10.- Vista ecuatorial mostrando el grosor de la exina y aberturas; 11.- Vista ecuatorial mostrando la ornamentación y aberturas; 12.- Vista polar, mostrando la ornamentación.



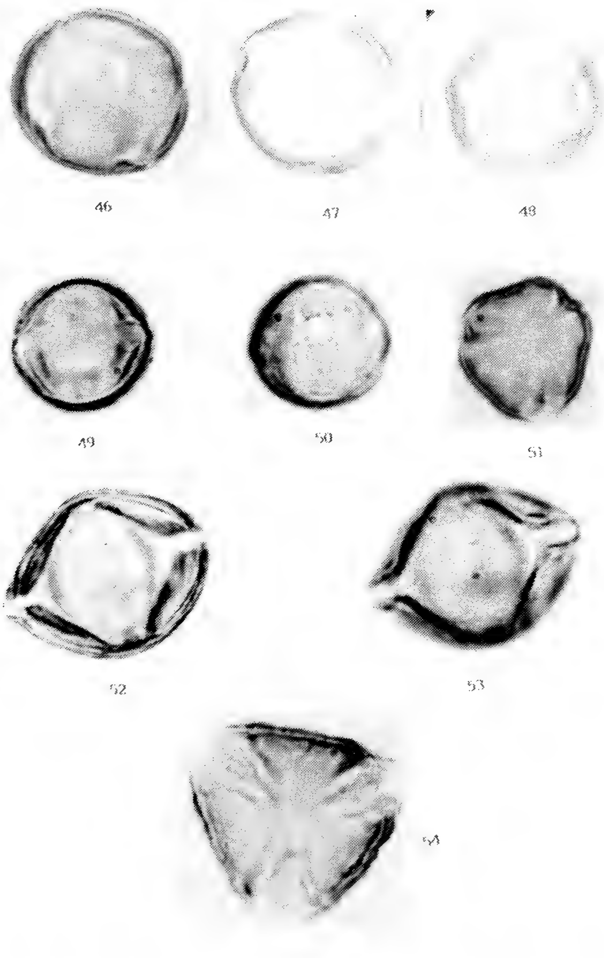
LAMINA II. *Lippia umbellata*: 13.- Vista ecuatorial mostrando las aberturas; 14.- Vista ecuatorial mostrando la ornamentación y aberturas; 15.- Vista polar mostrando el grosor de la exina. *Phyla nodiflora*: 16.- Estefanocolporado mostrando aberturas; 17.- Estefanocolporado, sección óptica; 18.- Vista polar superficial. *Priva grandiflora*: 19.- Vista ecuatorial mostrando aberturas y ornamentación; 20.- Vista polar mostrando la exina; 21.- Vista polar mostrando la ornamentación. *Priva mexicana*: 22.- Vista ecuatorial mostrando las aberturas; 23.- Vista ecuatorial mostrando aberturas y ornamentación; 24.- Vista polar mostrando grosor de la exina.



LAMINA III. *Verbena amoena*: 25.- Vista ecuatorial, sección óptica; 26.- Vista ecuatorial mostrando ornamentación y aberturas; 27.- Vista polar, sección óptica. *Verbena bipinnatifida*: 28.- Vista ecuatorial, mostrando la exina y aberturas; 29.- Vista ecuatorial mostrando ornamentación y aberturas; 30.- Vista polar mostrando la ornamentación. *Verbena canescens*: 31.- Vista ecuatorial mostrando las aberturas; 32.- Vista ecuatorial mostrando la ornamentación y aberturas; 33.- Vista polar, mostrando la ornamentación.



LAMINA IV. *Verbena carolina*: 34.- Vista ecuatorial mostrando grosor de la exina; 35.- Vista ecuatorial mostrando aberturas y ornamentación; 36.- Vista polar superficial. *Verbena elegans*: 37.- Vista ecuatorial mostrando ornamentación y aberturas; 38.- Vista polar superficial; 39.- Vista polar mostrando ornamentación. *Verbena gracilis*: 40.- Vista ecuatorial mostrando aberturas; 41.- Vista ecuatorial mostrando ornamentación; 42.- Vista polar superficial. *Verbena litoralis*: 43.- Vista ecuatorial superficial; 44.- Vista ecuatorial mostrando aberturas y ornamentación; 45.- Vista polar superficial.



LAMINA V. *Verbena menthaefolia*: 46.- Vista ecuatorial superficial; 47.- Vista ecuatorial mostrando las aberturas y ornamentación; 48.- Vista polar, mostrando la ornamentación. *Verbena recta*: 49.- Vista ecuatorial mostrando las aberturas; 50.- Vista ecuatorial mostrando las aberturas y ornamentación; 51.- Vista polar, mostrando la ornamentación. *Verbena teucriifolia*: 52.- Vista ecuatorial mostrando aberturas y grosor de la exina; 53.- Vista ecuatorial mostrando ornamentación y aberturas; 54.- Vista polar superficial.

Lantana camara L. 7 Km al NNE de Tasquillo, Edo. de Hidalgo, *L. González 2972*. Lámina I, Figuras 7 a 9.

Polen tricolporado a veces tetracolporado, tectado, esférico, de 34(38)42 μ de diámetro. P/E= 1.0. Vista polar semiangular de 33(37)43 μ de diámetro. Exina de 2.4 μ de grosor, sexina ligeramente de mayor espesor que la nexina, superficie escabrosa. Colpos cubiertos con membranas lisas, colpos transversales de 8.0(8.5)9.0 μ de largo por 1.0 a 1.5 μ de ancho con membranas lisas. Indice del área polar 0.52, grande.

Lantana velutina Mart. & Gal. Cerca de La Candelaria, Distrito Federal, *J. Rzedowski 22146*. Lámina I, Figuras 10 a 12.

Polen tricolporado a veces tetracolporado, tectado, esferoidal, de 30.6(32.0)37.5 × 30.6(33.5)39.0 μ. P/E= 0.95. Vista polar angular de 27.0(33.0)37.5 μ de diámetro. Exina de 1.7 μ de grosor, sexina y nexina de igual espesor, superficie escabrosa. Colpos cubiertos con membranas lisas, colpos transversales de 8(9)10 μ de largo por 5(6)7 μ de ancho con membranas lisas. Indice del área polar 0.70, grande.

Lippia umbellata Cav. Cerro Tenayo, Municipio de Tlalmanalco, Edo. México, *J. Rzedowski 28722*. Lámina II, Figuras 13 a 15.

Polen tricolporado, tectado, esferoidal de 23.8(27.7)32.5 × 25.5(30.7)36.0 μ. P/E= 0.90. Vista polar angular de 22.0(28.0)30.5 μ de diámetro. Exina de 1.7 μ de grosor, sexina y nexina de igual espesor, superficie escabrosa. Colpos cubiertos con membranas lisas, colpos transversales de 13(14)15 μ de largo por 3(4)5 μ de ancho. Indice del área polar 0.75, grande.

Phyla nodiflora (L.) Greene. Ixtapan, Municipio de Atenco, Edo. México, *A. Ventura 4071*. Lámina II, Figuras 16 a 18.

Polen estefanocolporado, tectado, prolato de 28(34)35 × 21(24)28 μ. P/E= 1.41. Vista polar angular de 23(24)28 μ de diámetro. Exina de 5.1 μ de grosor, sexina y nexina de igual espesor, psilada. Colpos longitudinales de 20(26)28 × 3(4)5 μ. Colpos transversales zonados con membranas lisas.

Priva grandiflora (Ort.) Moldenke. 6 Km al E San Francisco Chimalpa, Edo. México, *J. Rzedowski 22899*. Lámina II, Figuras 19 a 21.

Polen tricolporado, tectado, suboblato de 34.0(39.6)42.5 × 37.5(44.5)49.5 μ. P/E= 0.88. Vista polar angular de 32.0(44.2)47.6 μ de diámetro. Exina de 1.7 μ de grosor, sexina y nexina de igual espesor, superficie escabrosa. Colpos cubiertos con membranas lisas. Colpos transversales de 13(14)15 μ de largo por 6.5(7.5)8.5 μ de ancho. Indice del área polar 0.45, media.

Priva mexicana (L.) Pers. Rancho El Conejo, Delegación Xochimilco, Distrito Federal, *A. Ventura 2969*. Lámina II, Figuras 22 a 24.

Polen tricolporado, tectado, subprolato de 30.0(34.5)39.0 × 34.0(38.7)42.5 μ. P/E= 0.89. Vista polar angular de 35.7(41.5)44.5 μ de diámetro. Exina de 1.7 μ de grosor, sexina y nexina de igual espesor, superficie escabrosa. Colpos cubiertos con membranas lisas. Colpos transversales de 8.5(9.0)10.0 μ de largo por 3(4)5 μ de ancho. Indice del área polar 0.7, grande.

Verbena amoena Paxton. Cerro Chiquihuite, Sierra de Guadalupe, Distrito Federal, *L. Paray 2928*. Lámina III, Figuras 25 a 27.

Polen tricolporado, tectado, esferoidal de 39.0(46.4)52.7 × 42.5(45.5)49.5 μ. P/E= 1.01. Vista polar circular de 39.0(45.5)51.0 μ de diámetro. Exina de 1.7 μ de grosor, sexina y nexina de igual espesor, superficie psilada. Colpos cubiertos con membranas lisas. Colpos transversales de 18.0(19.0)20.5 μ de largo por 5(6)7 μ de ancho. Indice del área polar 0.38, media.

Verbena bipinnatifida Nutt. 7 Km al N de Huehuetoca, Edo. México, *R. Cruz 562*. Lámina III, Figuras 28 a 30.

Polen tricolporado, tectado, suboblato de 25.5(31.1)35.7 × 35.7(40.0)44.2 μ. P/E= 0.77. Vista polar angular de 35.7(38.5)47.5 μ de diámetro. Exina de 3.4 μ de grosor, sexina y nexina de igual espesor, superficie escabrosa. Colpos con membranas lisas. Colpos transversales de 11(12)14 μ de largo por 5(6)7 μ de ancho. Indice del área polar 0.31, media.

Verbena canescens H.B.K. 5 Km al W de San Juan Teotihuacán, Edo. México, *R. Cruz 712*. Lámina III, Figuras 31 a 33.

Polen tricolporado, tectado, suboblato de 23.8(27.0)29.0 × 32.3(34.5)37.5 μ. P/E= 0.78. Vista polar angular de 22.0(32.2)36.0 μ de diámetro. Exina de 1.7 μ de grosor, sexina y nexina de igual espesor, superficie escabrosa. Colpos cubiertos con membranas lisas. Colpos transversales de 7.0(8.0)8.5 μ de largo por 5(6)7 μ de ancho. Indice del área polar 0.60, grande.

Verbena carolina L. 2 Km al S de Zempoala, Edo. de Hidalgo, *R. Hernández 4813*. Lámina IV, Figuras 34 a 36.

Polen tricolporado, tectado, esferoidal de 22.0(27.7)36.0 × 25.5(28.2)32.5 μ. P/E= 0.98. Vista polar angular de 22.1(28.0)30.5 μ de diámetro. Exina de 3.4 μ de grosor, sexina y nexina de igual espesor, superficie psilada. Colpos cubiertos con membranas lisas. Colpos transversales de 8.5(9.0)10.5 μ de largo por 6.5(7.0)8.5 μ de ancho. Indice del área polar 0.53, grande.

Verbena elegans H.B.K. 2 Km al WSW de Real del Monte, Municipio de Real del Monte, *M. Medina 583*. Lámina IV, Figuras 37 a 39.

Polen tricolporado, tectado, suboblato de 29.0(34.1)39.0 × 37.5(43.5)46.0 μ. P/E= 0.78. Vista polar angular de 36(48)51 μ de diámetro. Exina de 3.4 μ de grosor, sexina y nexina de igual espesor, superficie escabrosa. Colpos cubiertos con membranas lisas. Colpos transversales de 12.0(13.0)13.5 μ de largo por 5(6)7 μ de ancho. Indice del área polar 0.40, media.

Verbena gracilis Desf. Lomas, Distrito Federal, *E. Lyonnet 1562*. Lámina IV, Figuras 40 a 42.

Polen tricolporado, tectado, esferoidal de 18.5(25.3)36.0 × 18.5(25.5)30.5 μ. P/E= 0.99. Vista polar angular de 22.0(27.5)32.5 μ de diámetro. Exina de 1.7 μ de grosor, sexina y nexina de igual espesor, superficie granular. Colpos cubiertos con membranas lisas. Colpos transversales de 10(11)12 μ de largo por 5(6)7 μ de ancho. Indice del área polar 0.58, grande.

Verbena litoralis H.B.K. 1 Km al SE de Cahuacán, Edo. México, *E. Lagunez 87*. Lámina IV, Figuras 43 a 45.

Polen estefanocolporado a veces tricolporado, tectado, esferoidal de 38.0(42.7)47.3 × 43.0(44.4)46.5 μ. P/E= 0.96. Vista polar circular de 43.0(46.8)51.5 μ de diámetro. Exina de 3.3 μ de grosor, sexina tres veces más gruesa que la nexina, superficie escabrosa. Colpos cubiertos con membranas lisas. Colpos transversales de 8.0(8.5)9.5 μ de largo por 6.5(7.0)7.5 μ de ancho. Indice del área polar 0.62, grande.

Verbena menthaefolia Benth. 20 Km al NE de Texcoco, Edo. de México, *M.A. Hernández 67.* Lámina V, Figuras 46 a 48.

Polen estefanocolporado, tectado, esferoidal de 39.5(41.4)43.0 × 36.5(48.2)50.0 μ. P/E= 0.85. Vista polar circular de 37.0(41.5)45.5 μ de diámetro. Exina de 2.5 μ de grosor, sexina y nexina de igual espesor, superficie psilada. Colpos cubiertos con membranas lisas. Poros lalongados de 7.5(9.5)10.0 μ de largo por 6.0(6.5)7.5 μ de ancho. Indice del área polar 0.70, grande.

Verbena recta H.B.K. Pares, Distrito Federal, *E. Matuda 18986.* Lámina V, Figuras 49 a 51.

Polen tricolporado, tectado, esferoidal de 28.5(30.0)32.0 × 31.0(34.4)37.0 μ. P/E= 0.87. Vista polar circular de 30.5(32.5)36.5 μ de diámetro. Exina de 1 μ de grosor, sexina y nexina de igual espesor, superficie escabrosa. Colpos cubiertos con membranas lisas. Colpos tranversales de 10.0(10.5)11.0 μ de largo por 4.0(4.5)5.0 μ de ancho. Indice del área polar 0.39, media.

Verbena teucriifolia Mart. & Gal. Llano Grande, Municipio de Ixtapaluca, *E. Ventura 1296.* Lámina V, Figuras 52 a 54.

Polen tricolporado, tectado, esferoidal de 44.0(46.6)50.0 × 49.0(51.3)52.5 μ. P/E= 0.90. Vista polar circular de 45(47)50 μ de diámetro. Exina de 2.5 μ de grosor, sexina y nexina de igual espesor, superficie escabrosa. Colpos cubiertos con membranas escabrosas. Colpos transversales de 9.0(9.5)10.0 μ de largo por 6.5(7.0)7.5 μ de ancho. Indice del área polar 0.41, media.

CONCLUSIONES

En la clasificación taxonómica establecida por Briquet (1897), los géneros del Valle de México pertenecen a la

SUBFAMILIA VERBENOIDEAE y a las tribus:
- Lantanae: *Bouchea, Lantana, Lippia*
- Citharexyleae: *Citharexylum*
- Priveae: *Priva*
- Euverbeneae: *Verbena*

El género *Phyla* no es considerado en este sistema de clasificación.

Al comparar estas subdivisiones con la morfología del polen se observa que el polen es tricolporado, estefanocolporado y triporado, así *Bouchea prismatica* lo presenta triporado, Arreguín-Sánchez, *et al.* (1995), señalan que otros autores describen los granos de polen de esta especie como tricolporado; y al comparar la morfología polínica con los trabajos taxonómicos del género *Bouchea* se encuentra que esta especie tiene tres variedades (Moldenke 1940) y posiblemente la variación en las aberturas de los taxa se deba a que existe una relación entre la morfología del polen y las variedades de esta especie.

Lantana y *Lippia* presentan polen muy semejante al de *Citharexylum* y *Verbena*, con granos tricolporados con superficie escabrosa; los dos primeros géneros pertenecen a la tribu Lantanae, el tercer género a la Citharexyleae y *Verbena* a Euverbeneae, esto indicaría que no existe correspondencia entre la morfología polínica y las subdivisiones de la familia.

El género *Priva*, perteneciente a la tribu Priveae y representada en el Valle de México por *Priva grandiflora* y *P. mexicana*, presenta una situación muy peculiar, algunas especies de este género descritas para Sian Ka'an, Quintana Roo y Chamela, Jalisco, presentan polen triporado, en cambio en las especies del Valle de México es tricolporado, muy parecido al polen de *Verbena, Citharexylum, Lantana,* y *Lippia*. En trabajos taxonómicos del género *Priva* existen dos secciones, la *Eupriva* donde se incluyen especies como *P. luppulaceae*, descrita con anterioridad con polen triporado y la sección *Aparinaria* con *P. mexicana* en donde es tricolporado. *Priva grandiflora* no se incluye en el trabajo taxonómico de Moldenke (1936), pero por la morfología del polen esta especie se podría incluir dentro de la misma sección que *P. mexicana*.

Phyla, género no considerado en la clasificación de Briquet (1897) pero por sus características bien podría ubicarse en una subfamilia diferente a las consideradas por Briquet (1897).

En el polen estudiado se encontraron tres tipos polínicos: el triporado presente en *Bouchea prismatica*, el estefanocolporado en *Phyla nodiflora* y el polen tricolporado o tetracolporado presente en los géneros *Citharexylum, Lantana, Lippia, Priva,* y *Verbena*, con ornamentación psilada o escabrosa. Dentro de este grupo polínico los granos presentan mucha similitud, por lo que resulta difícil separar estos taxa por medios palinológicos.

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NOMENCLATURAL COMBINATIONS IN THE *ANDROPOGON GERARDII* COMPLEX (POACEAE: ANDROPOGONEAE)

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ABSTRACT

The following nomenclatural changes in Poaceae are proposed: ***Andropogon gerardii*** F. Vitman subsp. ***hallii*** (E. Hackel) *comb. et stat. nov.*; ***Andropogon gerardii*** F. Vitman subsp. × ***chrysocomus*** (G. Nash) *comb. et stat. nov.*; and ***Andropogon hondurensis*** (R. Pohl) *comb. et stat. nov.* A key is provided to separate the taxa.

KEY WORDS: *Andropogon, Andropogon chrysocomus, Andropogon gerardii, Andropogon gerardii* subsp. × *chrysocomus, Andropogon gerardii* subsp. *hallii, Andropogon gerardii* var. *hondurensis, Andropogon hallii, Andropogon hondurensis*, Andropogoneae, nomenclature, Poaceae

Andropogon gerardii F. Vitman subsp. ***hallii*** (E. Hackel) J. Wipff, *comb. et stat. nov.* BASIONYM: *Andropogon hallii* E. Hackel, Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften, Mathematish-naturwissenschaftliche Classe, Abteilung 1, 89:127. 1884. *Andropogon hallii* E. Hackel var. *flaveolus* E. Hackel, Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften, Mathematish-naturwissenschaftliche Classe, Abteilung 1, 89:128. 1884. *Sorghum hallii* (E. Hackel) K.E.O. Kuntze, *Revisio Generum Plantarum* 2:791. 1891. TYPUS: UNITED STATES. Nebraska: 1862, *E. A. Hall & J. P. Harbour 651* (Isotype: NY!,US!).

Andropogon hallii E. Hackel var. *incanescens* E. Hackel, Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften, Mathematish-naturwissenschaftliche Classe, Abteilung 1, 89:128. 1884. TYPUS: Unknown.

Hackel, in 1884, only listed one collection (*E. A. Hall & J. P. Harbour 651*) after the description of both var. *flaveolus* and var. *incanescens*. He separated the two taxa by spikelet length and inflorescence pubescence color: yellow (var. *flaveolus*) or white-gray (var. *incanescens*). Since the cited specimen has golden yellow pubescence, the type specimen then must refer to var. *flaveolus* (= var. *hallii*) and not var. *incanescens*.

Andropogon hallii E. Hackel var. *muticus* E. Hackel, *in* A.L. De Candolle & C. De Candolle (Eds.), *Monographiae Phanerogamarum* [Andropogoneae] 6:444. 1889. TYPUS: UNITED STATES. Colorado: Brighton, *G. Vasey* (Isotype: US).

Andropogon geminata E. Hackel *ex* W. Beal, *Grasses of North America* 2:55. 1896. TYPUS: UNITED STATES. Texas: *G. Nealley* (Isotype: US!).

Andropogon paucipilus G. Nash, *in* N. Britton, *Manual of the Flora of the Northern United States and Canada* 70. 1901. *Andropogon provincialis* J. de Lamarck var. *paucipilus* (G. Nash) M. Fernald & L. Griscom, Rhodora 37:147. (1935). *Andropogon gerardii* F. Vitman var. *paucipilus* (G. Nash) M. Fernald, Rhodora 42:258. 1943. TYPUS: UNITED STATES. Nebraska: Grant Co., In the Lake Region of Grant County, 3 miles N.E. of Whitman, in valley, 31 July 1893, *P.A. Rydberg 1607* (LECTOTYPE: NY!).

Nash (1901) did not cite any specimens, so the above specimen can not be the holotype [Article 9.1 and Note 1 (*International Code of Botanical Nomenclature*, 1994)]. Nash (1912) did designate a lectotype for this name by effectively publishing [Articles 7.10 and 7.11 (*International Code of Botanical Nomenclature*, 1994)] the following type information, "TYPE LOCALITY: Three miles northeast of Whitman, Grant Co. Nebraska." There is only one specimen at NY in the type collection with this information on the label, therefore this specimen is the lectotype for *Andropogon paucipilus*. There is another specimen at NY with the same collector and collection number (*P.A. Rydberg 1607*) as the lectotype, but it has a different location (Nebraska; Hooker Co.) and collection date (27 July 1893). This specimen is not the type and has caused some confusion. The specimen at US, designated as the type, is the same as the second specimen at NY (Nebraska, Hooker Co., 27 July 1893, *P.A. Rydberg 1607*), so the specimen at US is not a type specimen.

Andropogon gerardii F. Vitman subsp. × ***chrysocomus*** (G. Nash) J. Wipff, *comb. et stat. nov.* [*A. gerardii* subsp. *gerardii* × *A. gerardii* subsp. *hallii*]. BASIONYM: *Andropogon chrysocomus* G. Nash *in* N. Britton, *Manual of the Flora of the Northern United States and Canada* 70. 1901. *Andropogon provincialis* J. de Lamarck var. *chrysocomus* (G. Nash) M. Fernald & L. Griscom, Rhodora 37:147. 1935. *Andropogon gerardii* F. Vitman var. *chrysocomus* (G. Nash) M. Fernald, Rhodora 45:258 1943. TYPUS: UNITED STATES. Kansas: Stevens County, *M.A. Carleton 343* (LECTOTYPE: NY!).

Nash (1901) did not cite any specimens, so the above specimen can not be the holotype [Article 9.1 and Note 1 (*International Code of Botanical Nomenclature*, 1994)]. Nash (1912) did designate a lectotype for this name by effectively publishing [Articles 7.10 and 7.11 (*International Code of Botanical Nomenclature*, 1994)] the following type information, "TYPE LOCALITY: [Stevens County]. Kansas." There is only one specimen at NY in the type collection, so this specimen is the lectotype for *A.* × *chrysocomus*.

The specimen at US designated as the type has the same location, collector and collection number, but a different collection date (24 July 1891). Also, this US specimen is *Andropogon gerardii* subsp. *hallii*, not *A. gerardii* subsp. × *chrysocomus*.

Andropogon gerardii subsp. *gerardii* and subsp. *hallii* are morphologically distinct and occupy different habitats, but morphological intergradation between these taxa in sympatric areas has been well documented (Romberg 1954; Satterwhite 1970; Kestner 1973; Barnes 1986). Subspecies *gerardii* is widely distributed in moist prairie sites in North America while subsp. *hallii* is restricted to sandy soils in the Great Plains (Chase 1951). In Nebraska, subsp. *gerardii* is confined to mesic, subirrigated Sandhill meadows or to finer textured soils in higher precipitation areas outside the Sandhills, whereas subsp. *hallii* is restricted to coarse textured soils in the Sandhills Region (Pool 1914; Tolstead 1942; Satterwhite 1970; Kestner 1973; Barnes 1986). Romberg (1954) found plants intermediate in morphology (subsp. × *chrysocomus*) growing on disturbed roadsides in the Sandhills. Kestner (1973) found subsp. × *chrysocomus* on isolated dune systems outside of the Sandhills. Barnes (1986) found that in the Sandhills (Nebraska) subsp. *hallii* was restricted to the upland sand dunes, subsp. *gerardii* to adjacent, subirrigated meadows, and subsp. × *chrysocomus* was only found in narrow zones of 5-10 m in width at dune/meadow interfaces, between subsp. *gerardii* and subsp. *hallii*.

In a reciprocal transplanting experiment using seedlings and adult plants, Barnes (1985) found severe mortality occurred in all of the subspecies on the dry, upland dunes, but was especially pronounced in subsp. *gerardii* and × *chrysocomus*. Likewise, when subsp. *hallii* was transplanted into the meadows there was also a high mortality. Barnes (1985) suggested that selection for drought resistant genotypes could be an important mechanism controlling habitat assortment of bluestem types along this gradient.

Barnes (1986), studying the *Andropogon gerardii* complex along a dune/meadow gradient, reported considerable variation and intergradation in morphology in the complex along the gradient. However, there was very little overlap between the dune (ridge and mid-slope), subsp. *hallii*, and meadow (high and low meadow), subsp. *gerardii*, populations in morphological characters commonly used to separate the two taxa. Subspecies *gerardii* populations had: 1) awns 12.1-21.3 mm long; 2) ligule 0.8-2.3 mm long; 3) inflorescence pubescence was sparse and pale, and 2.2-4.2 mm long; and 4) rhizome internodes not exceeding 2 mm in length. Subspecies *hallii* populations had: 1) awns absent or present, if present less than 8 mm long; 2) ligule 2.5-4.4 mm long; 3) inflorescence pubescence was dense, yellow, and 3.7-6.6 mm long; and 4) rhizome internodes often exceeding 20 mm in length. Barnes (1986) also reported that plants collected at the low slope and transition (dune/meadow interface) sites were morphologically intermediate between subsp. *gerardii* and subsp. *hallii*, and it was concluded that these were the result of hybridization between subsp. *gerardii* and subsp. *hallii*.

Artificial hybridization experiments between subsp. *gerardii* and subsp. *hallii* showed that the two taxa were completely interfertile and produced fertile progeny with morphological characters intermediate between the two parents (Peters & Newell 1961). These taxa also interbred naturally when placed in close proximity to one another in gardens (Newell & Peters 1961). Newell & Peters (1961) reported that the cross compatibility of the two subspecies, and resulting hybrid vigor and fertility of the progeny was such that hybridization between superior clones of the two taxa offered the "opportunity for improvement through the development of synthetic varieties [commercial] and hybrid combinations of characters essential for increased utilization of bluestem as a forage crop." This work lead to the development and release of a commercial variety, "Champ" Bluestem (Newell 1968), which is a hybrid (subsp. × *chrysocomus*) between subsp. *hallii* and subsp. *gerardii.*

Andropogon hondurensis (R. Pohl) J. Wipff, *comb. et stat. nov.* BASIONYM: *Andropogon gerardii* F. Vitman var. *hondurensis* R. Pohl, *in* G. Davidse & R. Pohl, Novon 2(2):108. 1992. TYPUS: HONDURAS. Road to Teupasenti, open pine forest, 1,350 m, 22 June 1980, *R.W. Pohl & L.G. Clark 14011* (HOLOTYPE: ISC!).

Davidse & Pohl (1992) separated *Andropogon gerardii* var. *hondurensis* from the rest of the *A. gerardii* complex by the following characters: 1) plants smaller and more slender; 2) smaller sessile spikelets averaging ca. 5 mm; and 3) lower glumes of the sessile spikelets are flat, while those of *A. gerardii* found in Canada, the United States, and México are sulcate. Shape of the first glume of the sessile spikelet is a very important diagnostic character in the Andropogoneae.

Clayton & Renvoize (1986) considered the shape of the sessile spikelet lower glume to be the main source of variation in *Andropogon* and based their sectional classification on this character. The first glume of the sessile spikelet of *A. hondurensis* is significantly different from that of *A. gerardii.* The first glume of *A. hondurensis* is flat with intercarinal veins in the center of the glume, whereas the first glume of *A. gerardii* is conspicuously grooved (sulcate) and without intercarinal veins in the groove. The difference between the first glume of the sessile spikelet of *A. hondurensis* and *A. gerardii* alone justify the recognition of *A. hondurensis* at the specific level. In addition there is a significant difference in anther length between *A. hondurensis* (1.0-1.2 mm long) and *A. gerardii* [(2.3-) 2.5-6.0 mm long].

Key to the *Andropogon gerardii* complex and *A. hondurensis*

1. First glume flat to slightly concave, intercarinal veins present in center of the glume; anthers of sessile spikelet 1.0-1.2 mm long; sessile spikelet 5.0-5.3 mm long; endemic to Central America (Belize, Honduras, and Costa Rica)............... ....*A. hondurensis*
1. First glume distinctly grooved, intercarinal veins absent in the center of the glume (the groove); anthers of sessile spikelet (2.3-)2.5-6.0 mm long; sessile spikelet 5-12 mm long; found in México, United States and Canada............................2
   2. Second (upper) lemma awnless or with a straight, untwisted awn to 11 mm long. ....*A. gerardii* subsp. *hallii*
   2. Second (upper) lemma awned with a basally tightly twisted and once geniculate awn, awn (7.5)10.0-25.0 mm long..3
      3. Rhizomes usually absent, but if present then short, and the rhizome internodes 2 mm or less in length; pubescence on internodes and pedicels in inflorescence sparse to dense, white or sometimes yellow, pubescence 1.5-4.2 mm long.................................*A. gerardii* subsp. *gerardii*
      3. Rhizomes present, internodes more than 2 mm in length; pubescence on internodes and pedicels in inflorescence dense, yellow, pubescence 3-6 mm long...................................*A. gerardii* subsp. × *chrysocomus*

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NOMENCLATURAL COMBINATIONS IN *DIGITARIA* (POACEAE: PANICEAE)

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ABSTRACT

While writing the treatment of *Digitaria* for *The Manual of North American Grasses* the following nomenclatural combinations became necessary: ***Digitaria filiformis*** (L.) G. Köler var. ***dolichophylla*** (J. Henrard) *comb. et stat. nov.*; and ***Digitaria filiformis*** (L.) G. Köler var. ***laeviglumis*** (M. Fernald) *comb. et stat. nov.* A more in-depth discussion will be provided in the treatment of *Digitaria*.

KEY WORDS: *Digitaria, Digitaria filiformis, Digitaria dolichophylla, Digitaria laeviglumis*, nomenclature, Poaceae

Digitaria filiformis (L.) G. Köler var. ***dolichophylla*** (J. Henrard) J. Wipff *comb. et stat. nov.* BASIONYM: *Digitaria dolichophylla* J. Henrard, Blumea 1:94. 1934. TYPUS: UNITED STATES. Florida: Dade County; Buena Vista, 5 Dec 1903, *A.A. Eaton 459* (HOLOTYPE: L; Isotype: US).

This variety is found in moist pine barrens and open areas in southern Florida, Cuba, and Puerto Rico. As Henrard (1950) reported, the characters of the spikelets are not sufficiently different from *Digitaria filiformis*, but differs from the latter species in it's distinctive vegetative characteristics. The plants are glabrous, leaves mostly 1 mm or less wide, and growing in dense tufts. These morphological differences coupled with its geographical distribution warrant its recognition at the varietal level.

Digitaria filiformis (L.) G. Köler var. ***laeviglumis*** (M. Fernald) J. Wipff, *comb. et stat. nov.* BASIONYM: *Digitaria laeviglumis* M. Fernald, Rhodora 22:102. 1920. TYPUS: UNITED STATES. New Hampshire: Hillsborough County; Manchester, rare, 11 Sept 1901, *F.W. Batchelder* (HOLOTYPE: G!).

Similar to *Digitaria filiformis* var. *filiformis* except for the glabrous spikelets, and being endemic to the sands of New England (Fernald 1920).

Key to the varieties of *Digitaria filiformis*

1. Spikelets glabrous; endemic to sands of New England.................................
   ....*D. filiformis* var. *laeviglumis*
1. Spikelets pubescent; found in the eastern 1/2 of United States, West Indies, México, and Central America.
   2. Plants basally papillose hirsute; cauline leaves more than 1 mm wide; found in the eastern 1/2 of the United States, West Indies, México, and Central America.........................*D. filiformis* var. *filiformis* (including *D. villosa*)
   2. Plants glabrous; cauline leaves 1 mm or less wide; found in southern Florida, Cuba, and Puerto Rico............................*D. filiformis* var. *dolichophylla*

A more in-depth discussion of the above taxa will be provided in the forthcoming *The Manual of North American Grasses.*

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I am grateful to W.E. Fox, III (TAES) and Stanley D. Jones (BRCH) for reviewing this manuscript. I would also like to thank J.F. Veldkamp (L) for providing information regarding the type of *Digitaria dolichophylla* and Emily Wood (G) for granting a loan of *D. laeviglumis.*

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A NEW SPECIES OF *MINASIA* FROM THE SERRA DO CABRAL, MINAS GERAIS, BRAZIL (VERNONIEAE; ASTERACEAE)

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ABSTRACT

A new species of *Minasia* from Serra do Cabral differs from congeners by the pedunculate and sometimes solitary heads.

KEY WORDS: Asteraceae, Vernonieae, *Minasia*, Minas Gerais, Brazil

At the time of the description of the genus *Minasia* (Robinson 1992), three species were recognized, *M. alpestris* (Gardn.) H. Rob., *M. pereirae* H. Rob., and *M. scapigera* H. Rob. One additional species, *M. splettiae* H. Rob., has been described more recently (Robinson 1995). The study of the then available material indicated that further collecting of *Minasia* was needed. Among those encouraged to make more collections was Gert Hatschbach of Museu Botánico Municipal de Curitiba. Two new specimens of *Minasia* are included in the most recent set of Asteraceae sent for determination by Hatschbach. More collections are still needed, but observations on a described species and description of a further new species are given at this time.

One of the new specimens sent by Hatschbach: Serra do Cabral, início da subida (Mun. Joaquim Felício) Minas Gerais, 14 IV 1996, *G. Hatschbach 64718, A. Schinini, & J.M. Silva* (MBM,US); has the totally setuliferous achene and general inflorescence form of *Minasia pereirae*, but has more slender, narrowly pointed leaves. The specimen seems to match a photo of a Glaziou collection, *Glaziou 19546* (C), verified by Baker as *Vernonia alpestris*, but is not that species. The exact species placement awaits a more complete representation of *M. pereirae*.

The second collection is the basis of the following new species.

Minasia cabralensis H. Rob., *spec. nov.* TYPE: BRAZIL. Minas Gerais: Mun. Várzea da Palma, Serra do Cabral, Agro-industrial Serra do Cabral, 16 IV 1996, *G. Hatschbach 64904, A. Schinini, & J.M. Silva* (HOLOTYPE: MBM; Isotype: US).

Plantae herbaceae rosulatae perennes. Folia base late et dense imbricata supra basem leniter angustiore; laminae lineares 10-16 cm longae 4-7 mm latae apicae anguste acutae in sicco carinatae utrinque cinereae in pilis T-formibus dense obtectae. Inflorescentiae pauce vel non ramosae; pedunculis 1-35 cm longis, bracteolis linearibus 0.8-0.5 cm longis. Capitula 13-15 mm alta; involucra late infundibularia, bracteis 45-50 in seriebus 5-6 ovatis vel oblongo-lanceolatis 2-9 mm longis ca. 1.5 mm latis apice acutis extus inferne glabris superne leniter albo-tomentosis. Flores 20-25 in capitulo; corollae pallide lavandulae ca. 11 mm longae, tubis ca. 4.5 mm longis glabris, faucibus ca. 2 mm longis, lobis lineari-lanceolatis, ca. 4.5 mm longis ca. 0.8 mm latis, distaliter tomentellis et glanduliferis; thecae antherarum ca. 3.5 mm longae base non caudatae; appendices antherarum ca. 1 mm longae. Achaenia ca. 3 mm longa inferne longe dense setulifera superne glabra; setae pappi ca. 7 mm longae plerumque albae base rubro-tinctae, seriebus pappi exterioribus ca. 0.8 mm longis. Grana pollinis in diametro ca. 50 µm tricolporata echinata non lophata.

Minasia cabralensis, with its pedunculate and sometimes solitary heads, represents a broadening of the concept of the genus. Other described species all have heads sessile in pairs or larger groups. The leaves are slender, but they are less rigid than those of *M. splettiae*. The achenes have the setuliferous base and glabrous distal half of the type seen in *M. alpestris* and *M. scapigera*. The anthers of the new species have narrowly ovate apical appendages to 1 mm long as in most other members of the genus, not lanceolate and ca. 1.5 mm long as in *M. alpestris*.

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VASCULAR FLORA AND ECOLOGICAL SURVEY OF AN OLD-GROWTH FOREST REMNANT IN THE OZARK HILLS OF SOUTHERN ILLINOIS

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ABSTRACT

The vascular flora of Weaver's Woods, a 7.2 ha old-growth forest remnant, was studied during the 1995 growing season. A total of 215 species and subspecific taxa in 77 families and 155 genera were identified, of which 24 (11.2%) were non-native to the site. The predominant photosynthetic pathway was C_3 (96.3%), and only eight taxa possessed the C_4 pathway. The dominant growth form was perennial (78.0%), with most taxa being woody or herbaceous. The most common lifeforms were hemicryptophytes (76 taxa/35.3%) and phanaerophytes (62 taxa/28.8%). Four habitats were identified, with species richness being highest in dry-mesic upland forest and lowest in forest edge. Non-native taxa were most common along intermittent streams in mesic upland forest and along the forest edge. Abundance ratings confirmed that most taxa (80.9%) were infrequently encountered, which may be related to an increase in mesophytic species (increased shade) and limited habitat for shade intolerant plant species.

KEY WORDS: Illinois, floristics, life-forms, photosynthetic pathways

INTRODUCTION

Old-growth mesic upland forests are rare in the central hardwood region (Parker 1989). It is estimated that less than 1% of the original forest in this region remains as old-growth, and the majority of these forests are small (< 15 ha), isolated, and within fragmented landscapes (Parker, *et al.* 1985; Parker 1989). It is well-documented that upland forests dominated by oak-hickory are declining in the region from poor regeneration and are being replaced by *Acer saccharum* Marsh. and *Fagus grandifolia* Ehrh. (Boggess & Bailey 1964; Weaver & Ashby 1971; Schmelz, *et al.* 1974; Barton & Schmelz 1987; Shotola, *et al.* 1992; Franklin, *et al.* 1993). The decline of oak-hickory forests is thought to be caused by a combination of climatic change and removal of anthropogenic and natural disturbances (Parker 1989).

Weaver's Woods, one of the best documented old-growth forests in the Midwest, provides an excellent opportunity to add to our knowledge of the old-growth condition (Weaver & Ashby 1971; Shotola, *et al.* 1992). An extensive data set on woody and herbaceous vegetation at Weaver's Woods has been accumulated since 1956, but no one has undertaken a study of the complete vascular flora. Therefore, the objectives of this study were, following guidelines in Palmer, *et al.* (1995), to survey the vascular flora of Weaver's Woods, delineate habitat types, and describe the flora in terms of growth forms, life forms, and photosynthetic pathways.

STUDY AREA

Weaver's Woods is a privately owned 7.2 ha forest located approximately 8 km south of Jonesboro, Illinois (Figure 1). The study site is located within the Southern Section of the Ozark Division, a driftless region of dissected topography that is the eastern extent of the Salem Plateau (Schwegman, *et al.* 1973). Braun (1950) included the Illinois Ozarks as part of the Hill Section of the Western Mesophytic Forest. Moist ravines and sheltered slopes are favorable for mixed mesophytic vegetation, while oak-hickory forests develop on drier uplands (Braun 1950).

Climate in southern Illinois is continental with warm summers and mild winters. Thornthwaite (1948) considered the climate to be humid mesothermal with little to no water deficit in any season and a potential annual evapotranspiration of 76.2 cm. Average yearly precipitation at Anna, approximately 9 km north of the study site, is 117 cm. Precipitation is evenly distributed throughout the year, though extended periods of drought can occur during the summer months. The mean January temperature is 2°C while the mean July temperature is 26°C at Anna. The average number of frost-free days is 206, extending from 7 April to 30 October (Miles, *et al.* 1979).

Upland soils at Weaver's Woods consist primarily of Alford silt loam, approximately 81% of the study area. Alford silt loam is a well-drained, high available water-holding capacity typic hapludalf formed from deep loessal deposits. Other upland soils of minor importance comprise approximately 5% of the study area and are found on the steepest slopes. Ravine bottoms comprise approximately 15% of the study area and are composed of Elsah cherty silt loam and Haymond silt loam (typic udifluvents), which are moderately to well-drained soils (Weaver & Ashby 1971; Miles, *et al.* 1979; Shotola, *et al.* 1992).

Weaver's Woods, owned by the Weaver family since the 1820's, has remained free from fire and grazing for over 100 years (Weaver & Ashby 1971; Shotola, *et al.* 1992). Selective tree removal occurred between 1871 and 1950, with approximately 100 trees removed from the stand in various size-classes. Among the species removed were *Carya ovata* (Mill.) K. Koch for firewood, *Quercus alba* L., *Q. velutina* Lam., *Q. rubra* L., *Liriodendron tulipifera* L., and *Magnolia acuminata* L. for construction and stave bolts. This forest has been surrounded by farmland since the early 1900's and has experienced gullying along intermittent stream channels and windstorm damage (Weaver & Ashby 1971; Shotola, *et al.* 1992). A timber harvest occurred in November 1995, primarily due to an increase of *Acer saccharum* and *Fagus grandifolia* in the understory and the mortality of many oak and hickory overstory trees. Future management of this forest will include re-planting of oaks and hickories, removal of the *Acer* and *Fagus* understory, and construction of water bars to control erosion.

METHODS

Thirty trips were made to Weaver's Woods from 1 April to 15 November 1995 to collect voucher specimens, accumulate abundance and habitat information for each taxon, and delineate habitats. The entire forest was systematically searched approximately once each week during the growing season with special attention given to areas with high species richness. Voucher specimens were deposited at the Illinois Natural History Survey Herbarium (ILLS). Identifications, along with criteria for native and non-native taxa designation and plant duration, were made using Fernald (1950), Radford, *et al.* (1968), Mohlenbrock (1986), Gleason & Cronquist (1991), and Smith (1994). Nomenclature follows Mohlenbrock (1986).

Photosynthetic pathway (C_3/C_4) for each taxon collected at Weaver's Woods was determined using Downtown (1975), Raghavendra & Das (1978), Waller & Lewis (1979), Ueno, *et al.* (1989), and Baskin, *et al.* (1995) (Table 1). Plant duration (annual/perennial) was determined from taxonomic sources listed above. Annual designation also included those taxa (e.g., *Lactuca*) that have a biennial life cycle. Graminoids included Cyperaceae, Juncaceae, and Poaceae. Forb included non-woody and non-graminoid flowering plants. Woody plants included trees, shrubs, and lianas, while ferns and fern allies were listed as pteridophytes. Woody plants and pteridophytes were assumed to have C_3 photosynthetic pathways (Baskin, *et al.* 1995).

Plant life form (Raunkiaer 1934) was determined for each taxon using information in Ennis (1928), MacDonald (1937), Oosting (1942), Hansen (1952), Gibson (1961), and Baskin, *et al.* (1995).

Abundance ratings (Appendix 1) were defined to give a relative quantification to field observations and were modified from Murrell & Wofford (1987), Lortie, *et al.* (1991), Looney, *et al.* (1993), and Joyner & Chester (1994). Abundance rating refers to abundance of a taxon within habitats where it is known to occur. When a taxon occurs in more than one habitat, the first listed habitat (optimum) was used to calculate species richness by habitat type (Table 2). Abundance rating were: 1) abundant, species dominant in listed habitat(s); 2) frequent, species co-dominant or in large numbers in listed habitat(s); 3) occasional, species in moderate numbers in listed habitat(s); 4) infrequent, species in small numbers or few individuals in listed habitat(s); and 5) rare, species known from only one individual, a few individuals in a restricted habitat, or from one population.

Habitats for dry-mesic and mesic upland forest were designated using the system of White & Madany (1978). Canopy gap and forest edge habitats, not recognized by

White & Madany (1978), were recognized in this study based upon floristic composition and canopy structure.

RESULTS AND DISCUSSION

Based upon 230 collections made during this study, the known vascular flora of Weaver's Woods consisted of 215 species and subspecific taxa in 77 families and 155 genera. No state threatened or endangered taxa were identified. Twenty-four taxa (11.2%) were non-native to the study site (Table 3). Families with greatest representation by individual taxa were Asteraceae (25 taxa), Poaceae (19), Cyperaceae (10), Liliaceae (7), Rosaceae (7), Fabaceae (6), and Juglandaceae (6). The largest genus was *Carex* (10 taxa), followed by *Carya* (5), *Polygonum, Quercus*, and *Smilax* (4 taxa each). Genera with three taxa included *Acer, Botrychium, Desmodium, Dichanthelium, Elymus, Galium*, and *Ranunculus*.

Weaver's Woods was dominated by C_3 perennial forbs (71 taxa/33.2%), C_3 woody plants (64/29.8%), and C_3 annual forbs (41/19.2%). There were 112 forb taxa (52.1%), 64 woody taxa (29.8%), 30 graminoid taxa (14.0%), and 9 pteridophytes (4.2%) (Table 1). The totals of 64 woody and 151 herbaceous taxa were well above the criteria established for mesic old-growth forests in the central hardwood region (Parker 1989). Of forb and graminoid taxa, 47 (33.1%) were annual and 95 (66.9%) were perennial. Of the 47 annual taxa, six (12.3%) were considered to be biennial: *Campanula americana* L., *Cirsium discolor* (Muhl.) Spreng., *Hackelia virginiana* (L.) I.M. Johnston, *Lactuca canadensis* L., *L. floridana* (L.) Gaertn., and *Verbascum thapsus* L. The predominant photosynthetic pathway for all vascular taxa was C_3 (96.2%). Only eight taxa (3.8%), all in the Poaceae, were considered to have the C_4 photosynthetic pathway (Table 1). These eight taxa were confined to canopy gaps with high solar insolation and temperature. Several studies from the eastern United States in granitic and limestone outcrops (Philips 1982; Baskin, *et al*, 1995), and bottomland forests and swamps (Basinger, *et al.* 1996) also indicate that the C_3 photosynthetic pathway was most common.

Life forms of the 214 taxa identified from Weaver's Woods were as follows: hemicryptophytes (76 taxa/35.3%), phanaerophytes (62/28.8%), therophytes (41/19.1%), cryptophytes (35/16.3%), and chamaephytes (1/0.5%). Six biennial taxa and two perennial *Rubus* taxa were considered as hemicryptophytes, although they were considered as annual and woody taxa respectively, in plant duration. Studies in the eastern United States from localized granite and limestone outcrops (Philips 1982; Baskin, *et al.* 1995), regional areas (Oosting 1942), and statewide floras (MacDonald 1937; Hansen 1952; Gibson 1961) all note that the most prevalent life form is the hemicryptophyte.

Although habitats at Weaver's Woods were dominated by woody vegetation, the proportion of herbaceous growth forms within each habitat did vary. C_3 perennial forbs, C_3 perennial graminoids, and pteridophytes were frequent components of dry-mesic forest. C_3 annual forbs were frequent along intermittent streams and alluvial terraces in mesic upland forest, while C_3 annual forbs and C_4 graminoids were frequent in canopy gaps and along the forest edge (Table 1).

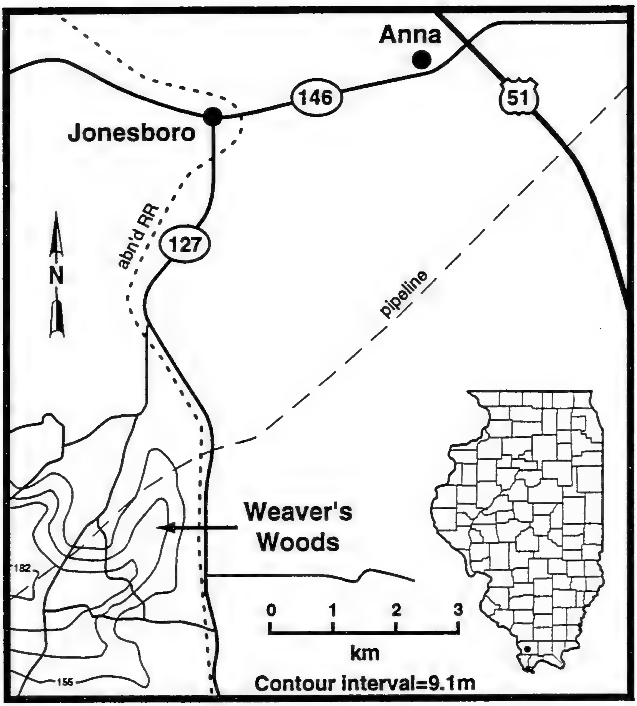

Figure 1. Location of Weaver's Woods, approximately 9 km south of Anna, Union County, Illinois.

Table 1. Distribution of growth forms and plant duration at Weaver's Woods, Union County, Illinois, 1995 survey (Annual includes those taxa with biennial duration).

GROWTH FORM	ANNUAL	PERENNIAL
C_3 GRAMINOID	0	22
C_4 GRAMINOID	6	2
C_3 FORB	41	71
C_3 WOODY		64
C_3 PTERIDOPHYTE		9
TOTAL	47	168

Table 2. Species richness per habitat type at Weaver's Woods, Union County, Illinois, 1995 survey.

RELATIVE ABUNDANCE	HABITAT TYPE				
	DRY-MESIC FOREST	MESIC FOREST	CANOPY GAP	FOREST EDGE	TOTAL
ABUNDANT	6	1	0	0	7(0)
FREQUENT	29	4	1	0	34(0)
OCCASIONAL	18	1	3	2	24(2)
INFREQUENT	32	21	4	10	67(8)
RARE	25	35	13	10	83(14)
TOTALS	110(1)	62(10)	21(4)	22(9)	215(24)

Table 3. Summary of the vascular flora of Weaver's Woods, Union County, Illinois, 1995 survey.

	FAMILIES	GENERA	SPECIES AND LESSER TAXA		
			NATIVE	NON-NATIVE	TOTAL
PTERIDOPHYTA	4	7	9	0	9
CONIFEROPHYTA	1	1	1	0	1
ANTHOPHYTA					
A. MONOCOTYLEDONEAE	10	28	41	8	49
B. DICOTYLEDONEAE	62	119	140	16	156
TOTALS	77	155	191	24	215

Species richness was highest in dry-mesic (110 taxa/51.2%) and mesic upland forest (62/28.8%) habitats and lowest in forest edge (22/10.2%) and canopy gap (21/9.8%) habitats (Table 2). The high species richness values for dry-mesic and mesic upland forest were most likely a function of the area of these habitats, since they occupy approximately 81% and 15% of the site, respectively. Species richness of non-native taxa was highest in mesic forest, primarily in rocky, intermittent stream beds (10 taxa/4.7%), and forest edge (9/4.2%) habitat types, and lowest in the dry-mesic forest (1/0.5%) habitat (Table 2).

Abundance ratings indicate that only seven taxa (3.3%) were abundant and 34 taxa (15.8%) were frequent within their respective habitat optima at Weaver's Woods (Table 2). The majority of taxa (80.9%) were occasional (11.2%), infrequent (31.2%), or rare (38.6%) in abundance within their habitat optimum (Table 2). This may be due to fragmentation (edge effect) and increased canopy shade from *Acer saccharum, Asimina triloba* (L.) Dunal, and *Fagus grandifolia* during the growing season which limit habitat and growth of shade intolerant plant species (Shotola, *et al.* 1992). Future study will examine response of the vascular flora to tree harvesting, in particular the potential increase and/or spread of non-native taxa, and changes in the life-form and photosynthetic pathway composition.

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APPENDIX 1

The vascular flora of Weaver's Woods is arranged alphabetically by family, genus, and species. Taxa that are non-native to the study site are preceded by an asterisk (*). After the binomial and authority, a list of habitat types (1 = dry-mesic forest, 2 = mesic forest, 3 = canopy gap, 4 = forest edge) where the taxon occurred most often is given first, followed by an abundance statement (A = abundant, F = frequent, O = occasional, I = infrequent, R = rare), collection number of the first author, life form (Ph = phanaerophyte, H = hemicryptophyte, Cr = cryptophyte, Th = therophyte, Ch = chamaephyte), and photosynthetic pathway.

ACERACEAE

Acer negundo L. 2; R; 10316; Ph; C_3
Acer rubrum L. 2, 1; R; 10317; Ph; C_3
Acer saccharum Marsh. 1, 2, 3, 4; A; 9654; Ph; C_3

ADIANTACEAE

Adiantum pedatum L. 1; R; 9518; Cr; C_3

ANACARDIACEAE

Rhus glabra L. 3; I; 9889; Ph; C_3
Toxicodendron radicans (L.) Kuntze 1, 4, 2, 3; A; 9900; Ph; C_3

ANNONACEAE

Asimina triloba (L.) Dunal 1, 2, 3, 4; A; 10362A; Ph; C_3

APIACEAE

Chaerophyllum procumbens (L.) Crantz 2; I; 9507; Th; C_3
Cryptotaenia canadensis (L.) DC. 1, 2; F; 9645, 9861; H; C_3
Osmorhiza longistylis (Torr.) DC. 1, 2; F; 9515; H; C_3
Sanicula canadensis L. 1, 2; F; 9644, 9860; H; C_3

AQUIFOLIACEAE

Ilex decidua Walt. 1; R; 10255; Ph; C_3

ARACEAE

Arisaema dracontium (L.) Schott 1, 2; O; 9509; Cr; C_3
Arisaema triphyllum (L.) Schott 1, 2; F; 9519; Cr; C_3

ARALIACEAE

Aralia spinosa L. 1, 4; I; 10249; Ph; C_3
Panax quinquefolius L. 1, 2; O; 9514; Cr; C_3

ARISTOLOCHIACEAE

Aristolochia serpentaria L. 1; I; 10241; Cr; C_3

ASCLEPIADACEAE

Cynanchum laeve (Michx.) Pers. 4, 3; R; 10307; Cr; C_3
Matelea gonocarpa (Walt.) Shinners 1; R; 10360; H; C_3

ASPLENIACEAE

Asplenium platyneuron (L.) Oakes 1; I; 9481; H; C_3
Cystopteris protrusa (Weatherby) Blasd. 1; O; 10361; Cr; C_3
Polystichum acrostichoides (Michx.) Schott 1, 2; I; 9497; H; C_3

ASTERACEAE

Ambrosia artemisiifolia L. 2, 3; R; 10294; Th; C_3
Ambrosia trifida L. 4, 2, 3, 1; I; 10240; Th; C_3
Aster lateriflorus (L.) Britt. 2, 4; I; 10331; H; C_3
Aster simplex Willd. 2; R; 10362; H; C_3
Bidens bipinnata L. 3; R; 10242; Th; C_3
Bidens frondosa L. 3; R; 10333; Th; C_3
Cirsium discolor (Muhl.) Spreng. 3, 4; R; 10296; H; C_3
Conyza canadensis (L.) Cronq. 3, 4; R; 10246; Th; C_3
Elephantopus carolinianus Raeusch. 3, 4; R; 10239; H; C_3
Erechtites hieracifolia (L.) Raf. 3, 2, 1; O; 10247; Th; C_3
Erigeron annuus (L.) Pers. 2, 1; I; 9668; Th; C_3
Erigeron philadelphicus L. 2, 3; I; 9492; H; C_3
Eupatorium rugosum Houtt. 1, 4, 3, 2; F; 10363; H; C_3
Eupatorium serotinum Michx. 3, 4; I; 10250; H; C_3
Gnaphalium purpureum L. 2; R; 10345; Th; C_3
Helianthus divaricatus L. 4; R; 10251; Cr; C_3
Lactuca canadensis L. 1, 4; R; 10295; H; C_3
Lactuca floridana (L.) Gaertn. 1, 3, 4; I; 10252; H; C_3
Prenanthes altissima L. var. *cinnamomea* Fern. 1; I; 10327; H; C_3
Senecio glabellus Poir. 2; I; 9491; Th; C_3
Solidago caesia L. 1, 2; R; 10329; H; C_3

Solidago canadensis L. 4, 3; I; 10291; H; C_3
**Taraxacum officinale* Weber 2; R; 10364; H; C_3
Vernonia gigantea (Walt.) Trel. 2, 4; R; 10305; H; C_3
Xanthium strumarium L. var. *canadensis* (Mill.) Torr. & Gray 3, 4; R; 10330; Th; C_3

BALSAMINACEAE

Impatiens capensis Meerb. 2, 1, 3; F; 9862; Th; C_3

BERBERIDACEAE

Podophyllum peltatum L. 1; A; 9864; Cr; C_3

BIGNONIACEAE

Campsis radicans (L.) Seem. 4, 1; R; 9897; Ph; C_3

BORAGINACEAE

Cynoglossum virginianum L. 1, 2; I; 9479; H; C_3
Hackelia virginiana (L.) I.M. Johnston 1, 3; O; 10238; H; C_3
Myosotis macrosperma Engelm. 2; R; 10365; Th; C_3

BRASSICACEAE

**Cardamine hirsuta* L. 2, 1, 3; I; 9489; Th; C_3
Dentaria laciniata Muhl. 1, 2; F; 9484; Cr; C_3
**Thlaspi arvense* L. 2; R; 9493; Th; C_3

CAESALPINIACEAE

Cercis canadensis L. 1, 4; R; 10341; Ph; C_3
Gleditsia triacanthos L. 2, 4, 3; I; 9867; Ph; C_3

CALLITRICHACEAE

Callitriche terrestris Raf. 2; R; 10366; Th; C_3

CAMPANULACEAE

Campanula americana L. 2, 1; I; 10236; H; C_3
Lobelia inflata L. 1, 2; I; 9881, 10292; Th; C_3
Lobelia siphilitica L. 2; I; 10230; H; C_3

CAPRIFOLIACEAE

**Lonicera japonica* Thunb. 4, 2, 1; O; 9871; Ph; C_3
**Lonicera maackii* (Rupr.) Maxim. 4, 3,1; I; 9659; Ph; C_3
Sambucus canadensis L. 1, 3, 2; F; 9868; Ph; C_3
Viburnum rufidulum Raf. 1; I; 9508; Ph; C_3

CARYOPHYLLACEAE

**Stellaria media* (L.) Vill. 2; I; 10342; Th; C_3

CELASTRACEAE

Celastrus scandens L. 4, 1; I; 9500; Ph; C_3
Euonymus atropurpurea Jacq 1, 2, 4; F; 9504, 10248; Ph; C_3
**Euonymus fortunei* (Turcz.) Hand.-Mazz. 4, 1; I; 9503; Ph; C_3

CHENOPODIACEAE

Chenopodium album L. 1, 3, 4; I; 10318, 10337; Th; C_3

COMMELINACEAE

**Commelina communis* L. 2; R; 9888; Th; C_3

CONVOLVULACEAE

**Ipomoea hederacea* (L.) Jacq. 4, 3; R; 10323; Th; C_3

CORNACEAE

Cornus drummondii C.A. Mey. 1, 4; I; 9873; Ph; C_3
Cornus florida L. 1, 4; I; 9896; Ph; C_3

CORYLACEAE

Carpinus caroliniana Walt. 1, 2; I; 9872; Ph; C_3
Ostrya virginiana (Mill.) K. Koch 1, 2; O; 10299; Ph; C_3

CUPRESSACEAE

Juniperus virginiana L. 1; R; 9648; Ph; C_3

CYPERACEAE

Carex amphibola Steud. 1, 2; F; 9473, 9513; H; C_3
Carex artitecta Mack. 1; I; 9501; H; C_3
Carex blanda Dewey 1, 2; F; 9506; H; C_3
Carex cephalophora Willd. 1; R; 9477; H; C_3
Carex digitalis Willd. 1; I; 9494; H; C_3
Carex hirsutella Mack. 1, 4; R; 9874; Cr; C_3
Carex hirtifolia Mack. 1; R; 9512; Cr; C_3
Carex jamesii Schwein. 1, 2; F; 9496; H; C_3
Carex laxiflora Lam. 1; R; 9476, 9529; H; C_3
Carex rosea Willd. 1, 2; R; 9498, 9524; H; C_3

DIOSCOREACEAE

Dioscorea quaternata (Walt.) J.F. Gmelin 1, 2, 4; I; 9520; Cr; C_3

EBENACEAE

Diospyros virginiana L. 1, 4, 3, 2; I; 10293; Ph; C_3

ELAEAGNACEAE

**Elaeagnus umbellata* Thunb. 4; R; 9895; Ph; C_3

EUPHORBIACEAE

Acalypha rhomboidea Raf. 3, 2; R; 10244; Th; C_3
Acalypha virginica L. 3, 1; I; 10243, 10382; Th; C_3

FABACEAE

Amphicarpa bracteata (L.) Fern. 1, 2; I; 9878, 10301; Th; C_3
Desmodium canescens (L.) DC. 4; R; 10319; H; C_3
Desmodium glabellum (Michx.) DC. 1, 4; R; 10302, 10335; H; C_3
Desmodium paniculatum (L.) DC. 1, 4; R; 10320; H; C_3
**Robinia pseudo-acacia* L. 4, 1; I; 10328; Ph; C_3

**Trifolium repens* L. 2; R; 10367; H; C_3

FAGACEAE

Fagus grandifolia Ehrh. var. *caroliniana* (Loud.) Fern. & Rehd. 1, 2; F; 9649; Ph; C_3
Quercus alba L. 1, 2, 4; F; 9639; Ph; C_3
Quercus prinoides Willd. var. *acuminata* (Michx.) Gl. 2, 1; R; 9658; Ph; C_3
Quercus rubra L. 1, 4; F; 9647; Ph; C_3
Quercus velutina Lam. 1, 4; F; 9646; Ph; C_3

FUMARIACEAE

Corydalis flavula (Raf.) DC. 1, 3, 2; F; 9475; Th; C_3

HAMAMELIDACEAE

Liquidambar styraciflua L. 2, 1, 3, 4; I; 9667; Ph; C_3

HYDRANGEACEAE

Hydrangea arborescens L. 1, 2; R; 9876; Ph; C_3

HYPERICACEAE

Hypericum punctatum Lam. 1; R; 10322B; H; C_3

IRIDACEAE

Sisyrinchium angustifolium Mill. 2; R; 9886; H; C_3

JUGLANDACEAE

Carya cordiformis (Wang.) K. Koch 1, 2; I; 9663; Ph; C_3
Carya glabra (Mill.) Sweet 1, 2, 4; F; 9655; Ph; C_3
Carya ovalis (Wang.) Sarg. 1, 2, 4; F; 9656; Ph; C_3
Carya ovata (Mill.) K. Koch 1, 2, 4; F; 9641; Ph; C_3
Carya tomentosa (Poir.) Nutt. 1, 4; R; 10257; Ph; C_3
Juglans nigra L. 1, 2, 4; I; 9653; Ph; C_3

JUNCACEAE

Juncus tenuis Willd. 2, 1; I; 9885; H; C_3

LAMIACEAE

**Perilla frutescens* (L.) Britt. 2, 3; O; 10325; Th; C_3
Prunella vulgaris L. var. *elongata* Benth. 2; I; 10231; H; C_3
Teucrium canadense L. var. *virginicum* (L.) Eat. 4; I; 9866; H; C_3

LAURACEAE

Sassafras albidum (Nutt.) Nees 1, 4, 3, 2; O; 9643; Ph; C_3

LILIACEAE

Allium canadense L. 2; R; 9480; Cr; C_3
**Allium vineale* L. 1, 4; R; 9522; Cr; C_3
**Ornithogalum umbellatum* L. 4, 1; I; 10368; Cr; C_3
Polygonatum biflorum (Walt.) Ell. 1; R; 9517; Cr; C_3
Smilacina racemosa (L.) Desf. 1, 2; I; 9516; Cr; C_3
Trillium recurvatum Beck 1; F; 9488; Cr; C_3
Uvularia grandiflora Sm. 1; I; 9526; Cr; C_3

MAGNOLIACEAE

Liriodendron tulipifera L. 4, 1, 3; O; 9642; Ph; C_3
Magnolia acuminata L. 1, 2; I; 9499; Ph; C_3

MENISPERMACEAE

Cocculus carolinus (L.) DC. 1; R; 10369; Ph; C_3
Menispermum canadense L. 1, 4, 2; O; 9521; Ph; C_3

MORACEAE

**Morus alba* L. 4; R; 9904; Ph; C_3
Morus rubra L. 2, 1, 4, 3; F; 9482; Ph; C_3

NYSSACEAE

Nyssa sylvatica Marsh. 1, 4, 2, 3; O; 9666; Ph; C_3

OLEACEAE

Fraxinus americana L. 1, 4, 2, 3; F; 9661; Ph; C_3

ONAGRACEAE

Circaea lutetiana Aschers. & Magnus subsp. *canadensis* (L.) Aschers. & Magnus 1, 3, 2; F; 9859; Cr; C_3

OPHIOGLOSSACEAE

Botrychium dissectum Spreng. var. *dissectum* 2; R; 10304; Cr; C_3
Botrychium dissectum Spreng. var. *obliquum* (Muhl.) Clute 2, 1; I; 10235; Cr; C_3
Botrychium virginianum (L.) Sw. 1, 2; I; 9485; Cr; C_3
Ophioglossum vulgatum L. var. *pycnostichum* Fern. 2; R; 9486; Cr; C_3

ORCHIDACEAE

Aplectrum hyemale (Willd.) Nutt. 1, 2; F; 9528; Cr; C_3
Corallorhiza wisteriana Conrad 1; R; 9474; Cr; C_3
Tipularia discolor (Pursh) Nutt. 2; R; 9527; Cr; C_3

OXALIDACEAE

Oxalis stricta L. 1, 2; I; 9875; H; C_3

PASSIFLORACEAE

Passiflora lutea L. var. *glabriflora* Fern. 3, 1, 4; I; 9523, 9893; H; C_3

PHRYMACEAE

Phryma leptostachya L. 1, 2, 3; F; 9863; H; C_3

PHYTOLACCACEAE

Phytolacca americana L. 3, 1, 4, 2; F; 9870; Cr; C_3

PLANTAGINACEAE

Plantago rugelii Dcne. 2; R; 9879, 10381; H; C_3

PLATANACEAE

Platanus occidentalis L. 2, 4; I; 9650; Ph; C_3

POACEAE

Agrostis perennans (Walt.) Tuckerm. 2, 1; R; 10245, 10343; H; C_3
Bromus pubescens Muhl. 1; R; 10370; H; C_3
Dichanthelium acuminatum (Sw.) Gould & Clark var. *fasciculatum* (Torr.) Freckm. 2; R; 10297; H; C_3
Dichanthelium boscii (Poir.) Gould & Clark 2; R; 9877; H; C_3
Dichanthelium clandestinum (L.) Gould 2; I; 10324; H; C_3
**Digitaria ischaemum* (Schreb.) Muhl. 2; R; 10339; Th; C_4
**Digitaria sanguinalis* (L.) Scop. 3; R; 10322; Th; C_4
Echinochloa muricata (Beauv.) Fern. 2; R; 10338; Th; C_4
Elymus hystrix L. 2; R; 9884; H; C_3
Elymus villosus Muhl. 2; R; 9665; H; C_3
Elymus virginicus L. 1, 2, 4; O; 9887; H; C_3
Leersia virginica Willd. 2, 1, 3; F; 10232; H; C_3
Muhlenbergia sobolifera (Muhl.) Trin. 2; R; 10371; H; C_4
Panicum dichotomiflorum L. 2; R; 10340; Th; C_4
Poa sylvestris Gray 1, 4; R; 10372; H; C_3
**Setaria faberi* Herrm. 3; R; 10254; Th; C_4
**Setaria viridis* (L.) Beauv. var. *major* (Gaudin) Pospichal. 3; R; 10334; Th; C_4
**Sorghum halepense* (L.) Pers. 3, 4; R; 10373; Cr; C_4
Sphenopholis obtusata (Michx.) Scribn. 1; R; 9478; H; C_3

POLEMONIACEAE

Phlox divaricata L. subsp. *laphamii* (Wood) Wherry 1, 2; O; 9505; Ch; C_3

POLYGONACEAE

**Polygonum cespitosum* Blume var. *longisetum* (DeBruyn) Stewart 2; I; 10298; Th; C_3
Polygonum punctatum Ell. 2, 3; I; 9903, 10336; Th; C_3
Polygonum scandens L. 1, 3, 4; O; 10326; H; C_3
Polygonum virginianum L. 1, 2, 3; F; 10237; H; C_3

PORTULACACEAE

Claytonia virginica L. 1, 2; F; 10374; Cr; C_3

PRIMULACEAE

Samolus valerandii L. 2; R; 10303; H; C_3

RANUNCULACEAE

Clematis virginiana L. 3; R; 10321; H; C_3
Hydrastis canadensis L. 1, 2; O; 9664; Cr; C_3
Ranunculus abortivus L. 2; R; 9495; H; C_3
Ranunculus micranthus Nutt. 2; R; 9487; H; C_3
Ranunculus recurvatus Poir. 1, 2; I; 9525; H; C_3

ROSACEAE

Agrimonia parviflora Ait. 2; R; 10300; H; C_3
Agrimonia rostellata Wallr. 1, 2; I; 9898; H; C_3
Geum canadense Jacq. 1, 2, 4; F; 9883; H; C_3
Prunus serotina Ehrh. 1, 4, 3, 2; F; 9652; Ph; C_3

Rosa multiflora Thunb. 4, 2; I; 9894; Ph; C_3
Rubus allegheniensis Porter 4; I; 10375; H; C_3
Rubus occidentalis L. 4; R; 10376; H; C_3

RUBIACEAE

Galium aparine L. 1, 3, 2, 4; F; 10377; Th; C_3
Galium circaezans Michx. 1, 2; O; 9640; H; C_3
Galium triflorum Michx. 1, 2; O; 9882; H; C_3

SCROPHULARIACEAE

Gratiola neglecta Torr. 2; R; 10378; Th; C_3
Scrophularia marilandica L. 1, 3, 4; I; 10233; H; C_3
**Verbascum thapsus* L. 2; R; 10344; H; C_3
Veronica peregrina L. 2; R; 9490; Th; C_3

SMILACACEAE

Smilax glauca Walt. 1, 3; I; 9483; Ph; C_3
Smilax hispida Muhl. 1, 3, 2, 4; O; 9502, 10380; Ph; C_3
Smilax pulverulenta Michx. 1; R; 9472; H; C_3
Smilax rotundifolia L. 1, 3, 4; O; 9892; Ph; C_3

SOLANACEAE

Physalis heterophylla Nees 3; R; 9869; Cr; C_3
Physalis pruinosa L. 3; O; 10253; Th; C_3
Solanum ptycanthum Dunal 3, 1; O; 10256; Th; C_3

THELYPTERIDACEAE

Phegopteris hexagonoptera (Michx.) Fee 1, 2; I; 9510; Cr; C_3

ULMACEAE

Celtis laevigata Willd. 2, 1, 3, 4; I; 9657; Ph; C_3
Celtis occidentalis L. 1, 2, 3, 4; I; 9651; Ph; C_3
Ulmus americana L. 2, 1, 3; I; 9662; Ph; C_3
Ulmus rubra Muhl. 1, 2, 3, 4; A; 9902; Ph; C_3

URTICACEAE

Boehmeria cylindrica (L.) Sw. 2, 1, 3; I; 9880; Cr; C_3
Parietaria pensylvanica Muhl. 1, 2, 3; I; 9511; Th; C_3
Pilea pumila (L.) Gray 2, 3, 1; A; 10234; Th; C_3

VERBENACEAE

Verbena urticifolia L. 4; R; 9899; H; C_3

VIOLACEAE

Viola sororia Willd. 2, 1, 3; F; 10379; H; C_3

VITACEAE

Ampelopsis cordata Michx. 4; R; 10306; Ph; C_3
Parthenocissus quinquefolia (L.) Planchon 1, 4, 3, 2; A; 9901; Ph; C_3
Vitis aestivalis Michx. 1, 3, 4, 2; O; 9891; Ph; C_3
Vitis vulpina L. 1, 3, 4, 2; O; 9890; Ph; C_3

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SYNOPTICAL STUDY OF *RHUS VIRENS* (ANACARDIACEAE) AND CLOSELY RELATED TAXA

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ABSTRACT

A taxonomic study of *Rhus virens* and closely related taxa is rendered. Previous workers have lumped or variously split this complex, which includes *R. virens, R. choriophylla, R. andrieuxii, R. pachyrrhachis*, and *R. schiedeana*. I have reduced *R. choriophylla* to varietal rank under *R. virens*; additionally, a southern element of the latter from Puebla and Oaxaca is proposed as a new taxon, ***R. virens*** var. ***australis*** B.L. Turner, *var. nov.* *Rhus pachyrrhachis* and *R. schiedeana* are maintained, but populational elements of the latter from northeastern México have been segregated as ***R. tamaulipana*** B.L. Turner, *spec. nov.* The morphological relationships of these various taxa are briefly touched upon, including a key for identification purposes and figures showing their distribution.

KEY WORDS: Anacardiaceae, *Rhus*, México, U.S.A.

Attempts to provide accurate names for members of the *Rhus virens* A. Gray complex in Texas and closely adjacent México provided impetus for the present paper. *Rhus virens* is an abundant shrub in southern Texas and throughout much of northern México, easily recognized by its shrubby habit and relatively thick evergreen imparipinnate leaves. Barkley (1937) treated the species as belonging to the sect. *Pseudoschmaltzia, Rhus virens* being its type. His treatment of this section, which included twelve species, was based upon relatively few specimens and little or no field work. The contribution here includes five species of this section: *R. virens, R. choriophylla* Woot. & Standl., *R. andrieuxii* Engler *ex* DC., *R. pachyrrhachis* Hemsl., and *R. schiedeana* Schlecht. Numerous specimens of these taxa assembled since Barkley's treatment, especially at LL, TEX, now permit a more refined treatment of this complex.

The following key will distinguish among the *Rhus virens* phalanx, and brief comments upon their relationships and synonymies follow.

KEY TO *RHUS VIRENS* AND VERY CLOSELY RELATED TAXA

1. Terminal leaflets (excluding petiolules) of larger leaves mostly (3-)4-7 cm long; Hidalgo, Querétaro, Veracruz, Guerrero, Chiapas, and Guatemala.................. .... 1. *R. schiedeana*
1. Terminal leaflets (excluding petiolules) of larger leaves mostly 3-4 cm long; Sonora and closely adjacent U.S.A., eastwards to Tamaulipas and southern Texas, southwards along the Sierra Madre Oriental to Oaxaca, México.
   2. Vestiture of stems and leaves composed of spreading hairs about 0.5 mm high; mostly Gulf slopes of Sierra Madre Oriental (Tamaulipas, San Luis Potosí, and Querétaro)...2. *R. pachyrrhachis*
   2. Vestiture of stems and leaves essentially absent or composed of short appressed or spreading hairs 0.25 mm high or less.
      3. Larger leaves with mostly 11-13 leaflets; pubescence of minute arcuate, upwardly appressed, hairs; southern Nuevo León, Tamaulipas, San Luis Potosí?, and Hidalgo...3. *R. tamaulipana*
      3. Larger leaves with mostly 3-9 leaflets; pubescence variable or nearly absent, but not as described in the above..........................4. *R. virens*
         4. Vestiture of stems and leaves composed of spreading short hairs mostly ca. 0.2 mm high; Texas, New Mexico, and north central México........ ....4a. var. *virens*
         4. Vestiture of stems and leaves essentially absent or much shorter than 0.2 mm high; widespread.
            5. Larger leaves with lateral leaflets mostly 2-3 cm long; southern México (Puebla, Oaxaca). .... 4c. var. *australis*
            5. Larger leaves with lateral leaflets mostly 3-4 cm long; north central México. .... 4b. var. *choriophylla*

1. *RHUS SCHIEDEANA* Schlecht., Linnaea 16:480. 1842.

Two sheets are cited in the protologue for this taxon, both apparently from the state of Hidalgo: *Schiede s.n.*, "Barranca de Santa Maria inter San Jose del Oro et Ixmiquilpan"; and *C. Ehrenberg s.n.*, "Ad Reglam a sept. ad Nov." A lectotype needs to be selected from among these, but the very complete description leaves little doubt as to the application of the name concerned.

My concept of this taxon is about the same as that of Barkley (1937), both of us placing emphasis on the large terminal leaflets which serve to distinguish it from the smaller leafleted, largely allopatric, *Rhus pachyrrhachis*. These two taxa have similar vestitures (long spreading hairs ca. 0.5 mm high) and relatively large leaflets, which serve to distinguish them from *R. virens* and *R. tamaulipana*.

David Young (by annotation) has designated at least one collection of *Rhus schiedeana* from Querétaro, México (*Johnston 6135a* [TEX]) as a possible hybrid or hybrid derivative from *R. pachyrrhachis*, but I think the plant concerned is fairly typical *R. schiediana*. As indicated in Figures 1 and 2, the two taxa probably occur in close proximity in this region and the occasional hybrid (if not introgressant) is to be expected.

I have examined and annotated 42 or more sheets (LL, TEX) of *Rhus schiedeana* and these have served in my construction of Figure 1. The isolated collection from the state of Guerrero was annotated by Young (TEX) as a distinct subspecies of *R. schiedeana*, but this is not obvious to me from the single collection concerned.

2. *RHUS PACHYRRHACHIS* Hemsl., Biol. Centr. Amer. Bot. 1:218. 1880. TYPE: MEXICO. San Luis Potosí: 22° northern latitude, 6000-8000 ft., 1878-1879, *Parry & Palmer 125* (HOLOTYPE: K; Isotypes: F,GH,MO,PH, according to Barkley, 1937).

My concept of this taxon is about the same as that of Barkley (1937) and, as perceived through annotation (LL, TEX), that of Young. As noted in the above account of *Rhus schiedeana*, *R. pachyrrhachis* is closely related to the latter and perhaps hybridizes with it upon occasion. The two are readily distinguished, for the most part, by leaflet size, as noted in my key.

Young annotated at least a few sheets of *Rhus pachyrrhachis* as possible hybrids or hybrid derivatives from *R. virens* (e.g., *Taylor 71, 121* [TEX], both from near Nuevo León, Mpio. Galeana, Hacienda Pablillo), but I take these to be but forms of fairly typical *R. pachyrrhachis* having somewhat smaller leaves.

A single sterile collection from Coahuila (*Villareal 3158* [TEX]) differs significantly from the numerous other collections examined and mapped (Figure 2) in possessing an attractive markedly purplish vestiture on its new-growth foliage. The population from which this plant was obtained deserves closer scrutiny, at least for its potential as a xeriscape plant in the desert regions of Texas and México.

3. *RHUS TAMAULIPANA* B.L. Turner, *spec. nov.* TYPE: MEXICO. Tamaulipas: "8 mi S of Palmillas" along the Cd. Victoria—San Luis Potosí highway, "ravine bottom on E side of highway," 20 Jul 1985, *S. Ginsbarg 132* (with A. Whittemore). (HOLOTYPE: TEX!).

Similis *R. virenti* Lindh. *ex* A. Gray sed foliis majoribus pluribusque, 9-11 (vice 5-7), folioliis apicaliter acutis, et indumento pilorum minute appressorum.

Shrubs 1-2 m. high. Stems 3-8 mm across, when young the vestiture densely pubescent with mostly upturned or appressed hairs 0.2 mm high or less. Larger leaves 11-14 cm long; lateral leaflets, mostly 5-6 pairs, ovate to lanceolate, 2.5-3.5(-4.0) cm long, 1.0-1.7 cm wide, glabrous above and below except for a sparse pubescence along the margins and midrib, the apices decidedly acute. Inflorescences axillary, about 1/2 as long as the subtending leaves, their branches minutely appressed-pubescent, stiffly ascending at first but divergent with age. Bracts broadly ovate, 0.5-1.0 mm long. Calyces glabrous, scarious, ca. 1.5 mm high. Petals 5, white, ca. 2.5 mm long, 1.2-1.4 mm wide. Stamens ca. 1.4 mm long, the anthers ca. 0.5 mm long. Fruits globose, white to rose-colored, 6-7 mm across, evenly pubescent throughout with spreading hairs ca. 0.5 mm long, below these a surface layer of minute ovoid sessile glands.

ADDITIONAL SPECIMENS EXAMINED: MEXICO. Nuevo León: Mpio. Zaragoza, Cerro La Peña, NE exposure, 2600-2700 m, 3 Jul 1988, *Patterson 5817*. Tamaulipas: 1 km S of Carabanchel, 5800-5900 ft, 30 Jul 1965, *Gilbert 89* (TEX); Mpio. Villa de Casas, Sierra Tamaulipas, 900 m, 22 Sep 1965, *Martínez F-1960* (TEX); Gomez Farías, Rancho del Cielo, 22 Jul 1968, *Richardson 736* (TEX); same locality, 25 Jul 1968, *Richardson 819* (TEX); 29 Aug 1968, *Richardson 850* (TEX); 26 Nov 1968, *Richardson 1045* (TEX); Rancho del Cielo, 4 Nov 1964, *Webster 104* (TEX).

Barkley (1937; and by annotation) included material of this taxon in his broad concept of *Rhus andrieuxii* Engler *ex* DC., as noted in my discussion under *R. virens*. Young, to judge from annotations, referred four of the above-cited sheets in his concept of an as-yet undescribed subspecies of *Rhus virens*.

Rhus tamaulipana, as indicated in the diagnosis, differs markedly from *R. virens* (all varieties) in having larger, more apically acute leaves with more numerous leaflets (4-5 pairs of laterals, vs. 2-3[-4] pairs). Additionally, the vestiture is composed of fine minutely appressed hairs. No intergrades between *R. tamaulipana* and *R. virens* were encountered in this study, the former occurring on the more mesic eastern slopes of the Sierra Madre Oriental, the latter more to the interior in more xeric sites.

4. *RHUS VIRENS* Lindh. *ex* A. Gray

My study of this very common species suggests that three morphological varieties make up the taxon, as indicated in my key. Two of these, var. *virens* and var. *choriophylla*, are essentially allopatric and intergrade, at least over parts of their distribution as shown in Figure 3. I treat these as belonging to the subsp. *virens* -- the additional morphogeographical element, var. *australis*, is relatively well-marked and because of its isolated geographical position, is treated as a monotypic subspecies.

4a. *RHUS VIRENS* Lindh. *ex* A. Gray var. *VIRENS*

Rhus virens Lindh. *ex* A. Gray, Bost. J. Nat. Hist. 6:159. 1850. TYPE: A. Gray in the protologue of *R. virens* cites a number of collections; the manuscript name was based upon several Lindheimer collections from the vicinity of New Braunfels, Comal Co., Texas. From among these a lectotype must be selected.

Rhus sempervirens Scheele, Linnaea 23:566. 1850. *Toxicodendron sempervirens* (Scheele) Kuntze, *Rev. Gen. Pl.* 152. 1891. *Schmaltzia virens* (Scheele) Small, *Fl. Southeast. U.S.* 729. 1903. TYPE: U.S.A. Texas: Comal Co., vicinity of New Braunfels, 1845, *F. von Roemer s.n.* (type material not located).

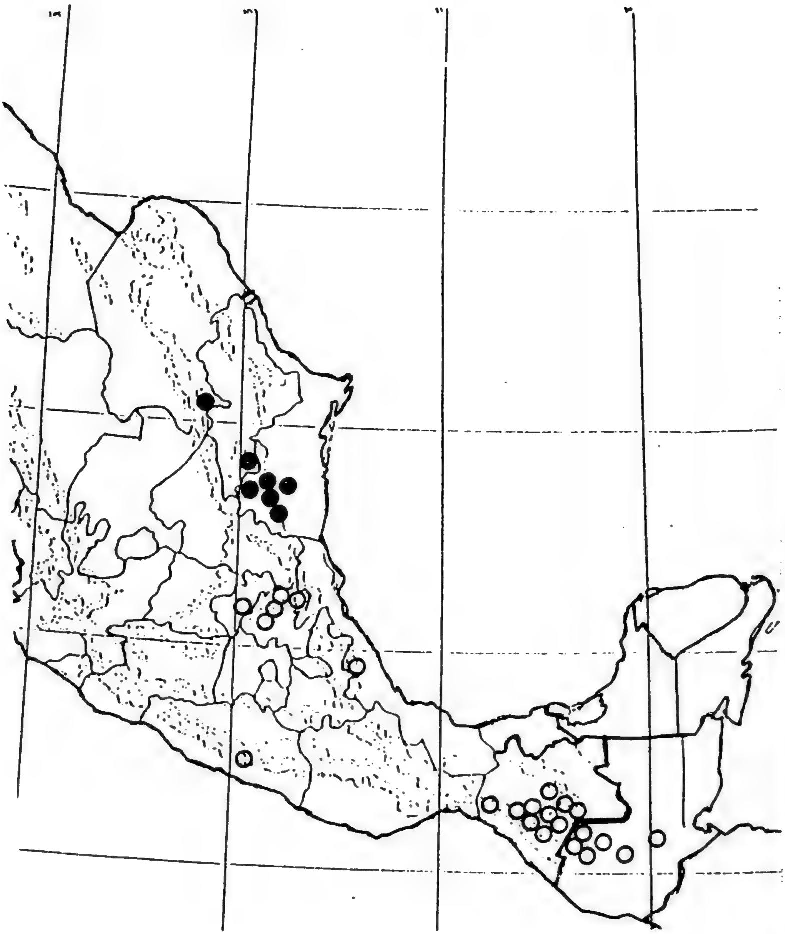

Figure 1. Distribution of *Rhus schiedeana* (open circles) and *R. tamaulipana* (closed circles).

Figure 2. Distribution of *Rhus pachyrrhachis* (open circles).

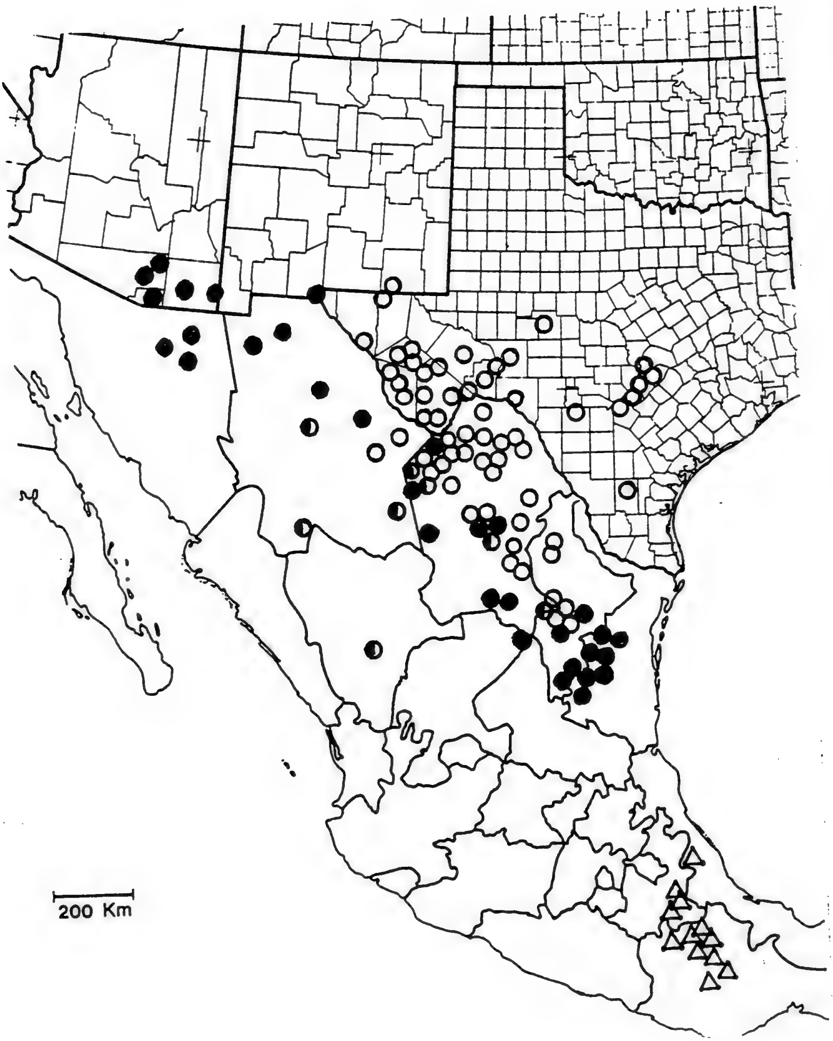

Figure 3. Distribution of *Rhus virens*: var. *virens* (open circles); var. *choriophylla* (closed circles); intermediates between the foregoing (half-closed circles); var. *australis* (triangles).

My concept of this taxon is about the same as that of Barkley (1937). Both *Rhus virens* and *R. sempervirens* are typified by material collected in the vicinity of New Braunfels, Texas, the former name having priority by a few months.

The var. *virens*, in my account, is largely distinguished by vestiture, this composed of spreading short-pilose hairs ca. 0.2 mm high. As shown in Figure 3, occasional intermediates between var. *virens* and var. *choriophylla* occur in north central México where their populations seemingly intergrade.

4b. ***RHUS VIRENS*** Lindh. *ex* A. Gray var. ***CHORIOPHYLLA*** (Woot. & Standl.) B.L. Turner, *var. nov.* Based upon *Rhus choriophylla* Woot. & Standl., Contr. U.S. Natl. Herb. 16:146. 1913. TYPE: U.S.A. New Mexico: Eddy Co. (?), SW corner of New Mexico in Guadalupe Canyon, 16 Aug 1892, *E.A. Mearns 699* (HOLOTYPE: US, not examined).

As indicated in Figure 3, this is a western phase of *Rhus virens*, largely distinguished by its near-glabrosity. Some workers have suggested that leaflet size and inflorescence position might serve to distinguish between the two varietal taxa (*e.g.*, Correll & Johnston 1970), but this is not evident to me after examination of 200 or more specimens from over a broad area.

Barkley (1937) also used pubescence to distinguish between these two taxa, noting var. *choriophylla* (which he treated as specifically distinct) to have leaflets glabrous or nearly so. Young, to judge from annotations (TEX), contemplated treating *R. choriophylla* as a subspecies of *R. virens*. His concept of subspecies is presumably the same as my varietal concept. I use the term subspecies to cluster varieties and/or to designate those varietal elements which are well differentiated and nearly at the species level.

4c. ***RHUS VIRENS*** Lindh. *ex* A. Gray var. ***AUSTRALIS*** B.L. Turner, *var. nov.* TYPE: MEXICO. Oaxaca: Mpio. de Tepelmeme, 1 km al O de El Rodeo, 2200 m, "Matorral esclerofilo . . .," 8 Jul 1986, *Abisai G. Mendosa et al. 2453* (HOLOTYPE: TEX).

Similis *R. virenti* Lindh. *ex* A. Gray subsp. *virens* sed folioliis parvioribus pluribusque plerumque 7-9 (vice 5-7), apicibus anguste obtusis aut acutis (vice late obtusorum aut rotundorum).

ADDITIONAL SPECIMENS EXAMINED: MEXICO. Puebla: *Tenorio L. 5137* (TEX); *Tenorio 7314* (TEX); *Valiente B. 783* (TEX); *Webster 20051* (TEX). Oaxaca: *Chazaro, et al. 7065* (TEX); *Rzedowski 19190* (TEX).

If treated at the species level, the name *Rhus andrieuxii* possibly applies to this taxon. The latter, as indicated in its protologue, is typified by several collections: *Andrieux 271*, presumably from the states of Puebla or Oaxaca; *Karwinsk s.n.*, without locality; and *Liebman s.n.*, collected at "Plantavillo." Clearly a lectotype from among these must be selected.

Rhus andrieuxii, in its protologue is described as having leaves with 5-7 leaflets, the leaflets 2-3 cm long, 1.5-2.5 cm wide. Barkley (1937), while accepting *R. andrieuxii* as a valid species, broadened the description of the species so as to include elements with more numerous leaflets (9-17), including material that I recognize here as *R. tamaulipana.* Standley (1923) accepted *R. andrieuxii* as distinct but describes the leaves as having 5 or 7 leaflets, as given in the type description.

ACKNOWLEDGMENTS

I am grateful to Gayle Turner for the Latin diagnoses, and to her and Ted Delevoryas for reviewing the manuscript. Tom Wendt substantially improved the paper by various critical comments, although not agreeing with my synoptical study approach, feeling that a more intensive study of the entire sect. *Pseudoschmaltzia* complex is needed.

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Barkley, F. 1937. A monographic study of *Rhus* . . .. Ann. Missouri Bot. Gard. 24:265-499.

Standley, P.C. 1923. *Rhus* in *Trees and Shrubs of Mexico*. Contr. U.S. Natl. Herb. 23:665-671.

Phytologia (May 1996) 80(5):377-380.

BOOKS RECEIVED

Humus Chemistry Genesis, Composition, Reactions. Second edition. F.J. Stevenson. J.W. Wiley & Sons, Inc., 605 Third Avenue, New York, New York 10158. 1994. xvi. 496 pp. $79.95 ISBN 0-471-59474-1 (hardcover).

This book is an extremely detailed treatise on the chemistry of humus. An introductory chapter on organic matter in soils is followed by a chapter on extraction and fractionation techniques, and general chemical composition of soil organics. The next five chapters cover major classes of organic molecules in soil, followed by chapters discussing biochemistry and functional groups of soil organics. The book might well be expected to end with these discussions, but the next three chapters contain considerable detail on additional analytical methods (degradation, NMR, spectroscopy); three more chapters discuss colloidal, electrochemical, ion-exchange, properties of soils; and the final five chapters examine metal, clay, and pesticide complexes/reactions, and the role of organics in soil formation. It would seem that this book contains all the information that one would need to understand chemistry of humus.

McGraw-Hill Concise Encyclopedia of Science & Technology. Third edition. Sybil P. Parker (ed.). McGraw-Hill, Inc., Oxford University Press, 198 Madison Avenue, New York, New York 10016. 1996. xxxiv. 298 pp. $65.00 ISBN 0-19-577584-8 (hardcover).

Hundreds of contributors have worked with the 69 editors to produce this work. The current edition contains over 300 new entries since the second edition. The text of the 7900 entries is enhanced by drawings, tables, and photographs. In addition to the entries themselves, extensive appendices include information on measurement units and conversions, biographical listing, symbols and abbreviations, and biological classification.

New Uses for New Phylogenies. Paul H. Harvey, Andrew J. Leigh Brown, John Maynard Smith, & Sean Nee (eds.). Oxford University Press, 198 Madison Avenue, New York, New York 10016. 1996. xii. 349 pp. $35.00 ISBN 0-19-854984-9 (paper).

This book is not a how to of phylogenetic reconstruction. Its intent is to summarize how phylogenetic information (whatever its origin or method of development) can be used to facilitate research in other fields. Some of these other fields described in the book include phytogeopraphy, ecology, population genetics, evolutionary relationships, evolutionary concepts/mechanisms, conservation biology, and parasitology. While the basic principles of applying phylogenetic information to other disciplines may be the same regardless of the source of data, this book deals nearly exclusively with phylogenetic information gleaned from molecular studies. The twenty chapters were contributed by 41 authors.

Plant Membrane Biology. Ian M. Møller & Peter Brodelius (eds.). Proceedings of the Phytochemical Society of Europe 38, Oxford Science Publications, Clarendon Press, Oxford University Press, 198 Madison Avenue, New York, New York 10016. 1996. xv. 294 pp. $135.00 ISBN 0-19-857776-1 (hardcover).

An international array of 80 authors have complied an impressive compendium of 22 papers on plant membrane biology. These papers were presented at the symposium of The Phytochemical Society of Europe on 26-29 April 1994 at Lund, Sweden. The 22 chapters in this book were taken from among the 30 lectures and 32 posters presented at the conference by the 130 attendees. Major sections (3-6 papers each) cover the topics of signal transduction, biogenesis and turnover, redox processes, dynamics of membrane domains, and transport across membranes. The individual papers are typically rather detailed summaries of knowledge on particular topics rather than general summaries of the topics of the major sections. The book is a good summary of current research on biology of plant membranes.

Units, Symbols, and Terminology for Plant Physiology, A Reference for Presentation of Research Results in the Plant Sciences. Frank B. Salisbury (ed.). International Association for Plant Physiology, Oxford University Press, 198 Madison Avenue, New York, New York 10016. 1996. xiv. 234 pp. $29.95 ISBN 0-19-509445-X (paper).

This book is an indispensable reference for researchers preparing manuscripts and making presentations. The book is targeted for plant physiologists, but is useful well beyond plant physiology, many of the suggestions and techniques applicable to publications/presentations in any academic discipline. The most widely applicable sections are those on the International System of units, botanical nomenclature, statistics, and the appendices which contain suggestions on scientific writing and producing effective presentations. More closely associated with plant physiology, but potentially applicable to other fields are chapters on thermodynamics, solutions, water relations, electromagnetics, biochemistry, genetics, growth, movement, phenology, and transport. The final appendix provides guidelines for measuring and reporting environmental parameters for plant experiments in growth chambers.

Wild Flowers of Pakistan. Yasin J. Nasir & Rubina A. Rafiq. T.J. Roberts (ed.). Oxford University Press, 198 Madison Avenue, New York, New York 10016. 1996. xxxiv. 298 pp. $65.00 ISBN 0-19-577584-8 (hardcover).

This book provides an introduction to the flora of Pakistan. It combines certain aspects of both a flora, and a plant picture book. While it only includes approximately 650 of an estimated 5000 species in the flora of Pakistan, it also includes keys to included genera and species. However, there is no family key. Each generic listing includes the total number of species of the genus within Pakistan, followed by a key to those species included in the book. Each included species is briefly described, and accompanied by a color photograph. The photographs are typically excellent, providing the user with considerable information with which to identify a given plant. Limited synonymy is included with the species descriptions. Criteria used for selection of plants for inclusion include those plants that are widespread and common those plants that are particularly attractive, and a balance of geographic representation. In addition to the keys, descriptions, and photographs, the book includes a phytogeographic summary.

Annual Review of Phytopathology, Volume 32. R. James Cook (ed.). Annual Reviews, Inc., 4139 El Camino Way, Palo Alto, California 94306. 1994. Oxford University Press, 198 Madison Avenue, New York, New York 10016. 1996. xvi. 639 pp. $49.00 (U.S.A.); $54.00 (elsewhere) ISBN 0-8243-1332-1; ISSN 0066-4286 (hardcover).

This volume begins with several historical and biographical chapters outlining major events in phytopathological study, and pioneers in phytopathology. These are followed by sections on diagnosis and appraisal (chapters on ash yellows, dogwood anthracnose, and beech bark disease), fungal pathogens (*Erysiphe*, rusts), prokaryotic pathogens (Rhizoctonia, *Agrobacterium*, and *Erwinia*), nematodes, viral pathogens, cellular/organismic factors, molecular interactions, climate, chemical control, and biological control. The final chapter is a discussion of the role of plant clinics in disease diagnosis and education. The 30 papers were produced by a total of 63 authors. In addition to the text and bibliography for each contribution, many include black and white drawings and/or photographs, and a number of them include color illustrations.

Phytologia (May 1996) 80(5):381-382.

CORRECTIONS AND ADDITIONS

Volume 79, issue 5, pages 382-388, first page (382). Due to a printer error, the Chinese characters and addition of *Clematis minggangiana* were omitted from the text on page 382. Page 382 is reproduced with the appropriate Chinese characters and the corrected abstract on the page following this page.

NOTULAE DE RANUNCULACEIS SINENSIBUS (XX)

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ABSTRACT

Clematis minggangiana W.T. Wang, ***Delphinium pseudoyunnanense*** W.T. Wang & M.J. Warnock, ***D. kansuense*** W.T. Wang var. ***villosiusculum*** W.T. Wang & M.J. Warnock, and ***Thalictrum simaoense*** W.T. Wang & G. Zhu are described as new. New combinations are provided for ***Delphinium shawurense*** W.T. Wang var. ***pseudoaemulans*** (C.Y. Yang & B. Wang) W.T. Wang, ***D. delavayi*** Franch. var. ***baoshanense*** (W.T. Wang) W.T. Wang, ***D. umbrosum*** Hand.-Mazz. var. ***drepanocentrum*** (Bruhl) W.T. Wang & M.J. Warnock, ***Batrachium trichophyllum*** (Chaix *ex* Villars) Bosche var. ***jingpoense*** (G.Y. Chang *et al.*) W.T. Wang, and ***Ranunculus*** sect. ***Stenoglossa*** (W.T. Wang) W.T. Wang. These new taxa and new combinations are necessary to facilitate ongoing study of the Flora of China.

KEY WORDS: Ranunculaceae, *Batrachium, Clematis, Delphinium, Ranunculus, Thalictrum*, China, systematics, flora

The following new taxa and new combinations have been brought to light by ongoing work on the Flora of China.

Delphinium pseudoyunnanense W.T. Wang et M.J. Warnock, *spec. nov.* TYPE: CHINA. Yunnan (云南): Between Tengchong (腾冲) and Longling

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