MYXOMYCETES OF MEXICO III*

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MYXOMYCETES DE MEXICO III

RESUMEN

Se registraron siete especies de Myxomycetes nuevas para México, cuatro nuevas para la zona Neotropical. Se da énfasis a los Myxomycetes cortícolas (50-500 µm) que por lo general no se observan en el campo, sino en el laboratorio usando la técnica de la cámara húmeda. Se incluye una lista de todos los Myxomycetes (164 especies) conocidos en México y registrados en la literatura.

SUMMARY

Seven species of Myxomycetes new to Mexico are reported, of which four are new to the Neotropics. Emphasis was placed on those very small corticolous Myxomycetes (50-500 µm) which are usually not observed in the field, but rather in the laboratory by using the moist-chamber technique. Included is a list of all the Mexican Myxomycetes (164 species), which have been reported in previous literature.

INTRODUCTION

Many of the smaller Mexican Myxomycetes have been found in moist-chamber, such as those found in our study of the Myxomycetes developing on Mexican tree bark in this method (Keller and Braun, 1977). Seven more species new to Mexico have been observed while using the moist-chamber technique, and four of these collections (*Licea castanea* G. Lister, *L. kleistobolous* Martin, *Comatricha fimbriata* G. Lister et Cran, and *Colloderma robustum* Meylan) are also new to the Neotropics. The moist-chamber technique used is that of Gilbert and Martin (1933) and has been described in Spanish (Braun *et al.*, 1979).

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All species mentioned in this paper that have developed in moist-chambers are marked (MC) after the collection numbers.

SPECIES STUDIED

NEW RECORDS

Licea kleistobolous Martin, Mycologia 34: 702. 1942.

Distrito Federal: Mexico City, Chapultepec Park, from bark of living *Taxodium mucronatum,* in moist chamber. Collected July 23, 1977, wetted September 18, 1977, harvested December 24, 1977 (KLB 653, 656, 657) (MC). Figs. 1-2. This specimen agrees with Martin and Alexopoulos (1969), and is a first report for the Neotropics.

Licea operculata (Wingate) Martin, Mycologia 34: 702. 1942.

Veracruz: Xalapa, Garden at INIREB, bark of living oak tree *(Quercus xalapensis).* Collected October 17, 1983, wetted November 21, 1983, harvested November 28, 1983 (KLB 655) (MC). Fig. 3. The urnshaped sporangia with iridescent membranous lids are the external morphological characteristics that mark this species.

Licea castanea G. Lister, Jour. Bot. 49: 61. 1911.

Yucatan: Kabah, near archeological site bark of living tree (unidentified). Collected December 24, 1974, wetted January 29, 1975, harvested March 24, 1975 (KLB 556, 557, 559, 560) (MC). Fig. 4. First reported by Keller and Braun (1977) as *Licea* sp. This is the first report for the Neotropics.

Echinostelium elachiston Alexop., Mycologia 50: 52. 1958.

Yucatan: Uxmal, near archeological site, on bark of living red cedar (*Juniperus comitana).* Collected December 24, 1974, wetted January, 3, 1975, harvested January 16, 1975 (HWK 1395) (MC). Fig. 5

Enerthenema papillatum (Pers.) Rost., Mon. App. 28. 1876.

Distrito Federal: Mexico City, Chapultepec Park, bark from living tree (unidentified). Collected August 17, 1975, wetted December 22, 1975, harvested July 24, 1976 (HWK 2017) (MC). This specimen is unusual because the apical disc is not very prominent. The capillitium does not originate entirely from the apical disc, but extends a short distance down the columella. Lister (1925) points out that "If young sporangia are disturbed while developing the capillitium often varies considerably from the normal character, and the threads... spring from all parts of the columella... all conditions between this and the normal form ocurr in the same group of sporangia".

Colloderma robustum Meylan, Bull. Soc. Vaud. Sci. Nat. 58: 83. 1933.

Distrito Federal: Mexico City (GWM 90250) (MC). This species was

discussed in Braun and Keller (1976). Listed there as a possible new species. Fig. 6. This is a first report for the Neotropics.

Comatricha fimbriata G. Lister et Cran, Jour. Bot. 55:122. 1917.

Veracruz: Xalapa, Garden at INIREB, bark of living sweet gum tree *(Liquidambar macrophylla).* Collected October 17, 1983, wetted November 21, 1983, harvested November 28, 1983 (KLB 671) (MC). This specimen agrees with the general description given in Martin and Alexopoulos (1969). This species is also a first report for the Neotropics.

SPECIES PREVIOUSLY KNOWN IN MEXICO

Two other Myxomycetes have developed on Mexican tree bark in moist chamber during this study and although not new to Mexico, these species may be considered quite rare in Mexican collections. They are *Cribraria microcarpa* (Schrad.) Per., Veracruz, Xalapa, Jardín Botánico, INIREB, bark of living *Quercus leiophylla.* Collected November 17, 1983, wetted March 10, 1984, harvested April 12, 1984 (KLB 658) (MC). *Clastoderma debaryanum* Blytt, Quintana Roo, km 6 carretera Puerto Morelos, bark of living tree (unidentified). Collected Jan. 28, 1984, wetted June 16, 1984, re-wetted August 1, 1984, harvested August 29, 1984 (KLB 665) (MC).

THE KNOWN SPECIES OF MYXOMYCETES IN MEXICO

In table I is a list of all the Mexican Myxomycetes that have been recorded in the literature, based on López *et al.* (1981b). Those species new to Mexico are marked with an asterisk. Each species (except those new to Mexico) is followed by a list of numbers (in parentheses) which correspond to the numbered publications listed in Table II.

DISTRIBUTION OF THE SPECIES

In table III is the distribution of the Myxomycetes in Mexico, showing the predicted groups and those actually collected. The numbers are based on the taxonomic scheme of Martin *et al.* (1983), and the numbers in parentheses indicate the actual frequency of the groups, as reported for Mexico in the literature. Two families and 15 genera have not been collected in Mexico, and the 164 species collected to date represent approximately 35% of the species known from North America. Only the number of species actually collected and recorded in the literature has been shown here, although it is probably safe to assume that the total number of species for North America could be estimated at about 450. The two families (Elaeomyxaceae and Schenellaceae) are monogeneric, and have only

recently been given "family" status (Martin *et al.*, 1983). The 15 genera not collected as yet in Mexico, are shown more specifically in Table IV.

When the genera in Table IV are examined more closely, it is obvious why most of them have not been found. Ten of the 15 genera listed (66%) are monospecific, and each of these, with exception of 2, are also listed as minute (less than a mm in one or more dimension). Eleven of the 15 genera (73%) are listed as minute. There are two species of *Schenella,* but each are known only from the type material. *Erionema* is not minute, but has never been collected in the Western Hemisphere (Martin *et al.,* 1983). *Brefeldia* and *Amaurochaete* are quite large and probably will be found as more field collections are made. Since many of these genera are quite small, it seems rather likely that they will not be found in the field, but in the laboratory, through the use of the moist-chamber technique.

A study of the literature shows that collections of the Myxomycetes have been made in only 19 of the 31 States of Mexico (58%). The three States most heavily collected are Veracruz, Nuevo León, and Guerrero, and with no collections at all reported from the following: Aguascalientes, Baja California Norte, Baja California Sur, Campeche, Coahuila, Durango, Guanajuato, Nayarit, Querétaro, Sinaloa, Tamaulipas and Zacatecas. Since nearly two-thirds of the Myxomycetes known to science have not been collected in Mexico, it is obvious that much field work remains to be done.

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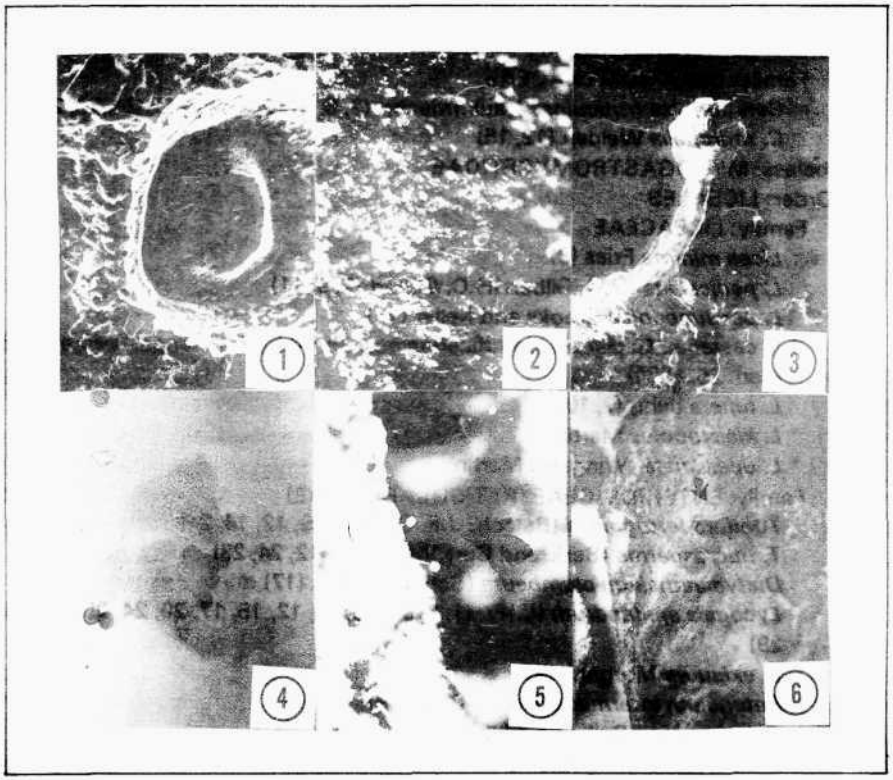

Figs. 1-6.-1-2: *Licea kleistobolus,* 1: SEM 1000X, note scattered tubercles on operculum, 2: Idem, 20X, *in situ.* 3: *Licea operculata,* SEM 500X. 4: *Licea castanea,* 200X, spores and fragment of cartilaginous wall with sutures. 5: *Echinostelium elachiston,* 40X, *in situ.* 6: *Colloderma robustum,* 20X, *in situ.*

TABLE I

THE KNOWN SPECIES OF MYXOMYCETES OF MEXICO *

Class: MYXOMYCETES
Subclass: CERATIOMYXOMYCETIDAE
Order: CERATIOMYXALES
Family: CERATIOMYXACEAE
Ceratiomyxa fruticulosa (Müll.)Macbr. (3, 5, 9, 10, 12, 15, 17, 24, 27, 28)
C. morchella Welden (12, 15)
Subclass: MYXOGASTROMYCETIDAE
Order: LICEALES
Family: LICEACEAE
Licea minima Fries (9)
L. pedicellata (H.C. Gilbert)H.C. Gilbert (7, 9, 11)
L. pseudoconica Brooks and Keller (11)
* *L. castanea* G. Lister - Identification confirmed by Nannenga-Bremekamp (Jan. 25, 1984)
L. tenera Jahn (7, 10)
* *L. kleistobolus* Martin
* *L. operculata* (Wingate) Martin
Family: ENTERIDIACEAE (RETICULARIACEAE)
Tubifera ferruginosa (Batsch) J.F. Gmel. (5, 9, 12, 14, 24)
T. microsperma (Berk. and Curt.)Martin (9, 12, 24, 28)
Dictydiaethalium plumbeum (Schum.) Rost. (17)
Lycogala epidendrum (L.)Fr. (1, 3, 5, 8, 9, 10, 12, 15, 17, 20, 24, 25, 27, 28, 29)
L. exiguum Morgan (17)
Enteridium intermedia Nann.-Brem. (9)
E. lycoperdon Bull. (10. 17, 22, 24)
E. splendens Morgan (17)
Family: CRIBRARIACEAE
Cribraria argillaceae (Pers.)Pers. (9)
C. aurantiaca Schrad. (28)
C. intricata Schrad. (28)
C. languescens Rex (14, 15, 28)
C. laxa Hagelst. 15, 28)
C. martinii Nann.-Brem. (12)
C. microcarpa (Schrd.) Pers. (18)

* The numbers are those of the papers of table II. Those species with an * are new records to Mexico.

Cont. Table 1

C. violacea Rex (9, 10, 11, 17)
Dictydium cancellatum (Batsch) Macbr. (3, 9, 10, 14, 15, 17, 24, 28)
Order: ECHINOSTELIALES
Family: ECHINOSTELIACEAE
Echinostelium arboreum Keller and Broks (9, 11)
E. minutum de Bary (7, 9, 10, 11, 17)
* *E. elachiston* Alexop.
Family: CLASTODERMATACEAE
Barbeyella minutissima Meylan (22, 24)
Clastoderma debaryanum Blytt (10, 28)
Order: TRICHIALES
Family: DIANEMACEAE
Calomyxa metallica (Berk.) Nieuwl. (11)
Dianema sp. (11) (to be named at a later date)
Family: TRICHIACEAE
Perichaena chrysosperma (Currey) A. Lister (3, 9, 10, 11, 28)
P. depressa Libert (9, 10, 11, 18)
P. vermicularis (Schw.) Rost. (18)
Calonema luteolum Kowalski (9, 11)
Arcirya cinerea (Bull.) Pers. (2, 3, 9, 10, 12, 15, 20, 24, 28)
A. denudata (L.) Wettst. (1, 3, 9, 10, 12, 17, 27, 28)
A. incarnata (Pers.) Pers. (10, 15, 25, 28)
A. ferruginea Sauter (11)
A. globosa Schw. (22)
A. insignis Kalchbr. and Cooke (9, 15, 20)
A. magna Rex (12, 14)
A. nutans (Bull.) Grev. (9, 10, 12, 15, 20)
A. leiocarpa (Cooke) Martin and Alexop. (9)
Matatrichia vesparium (Batsch) Nann.-Brem (1, 9, 10, 15, 17, 20)
Hemitrichia calyculata (Speg.) Farr (2, 5, 10, 12, 15, 17, 24, 28)
H. clavata (Pers.) Rost. (1, 10)
H. intorta (A. Lister) A. Lister (11)
H. karstenii (Rost.) A. Lister (9)
H. montana (Morgan) Macbr. (18)
H. serpula (Scop.) Rost. (1, 2, 9, 10, 15, 17, 18, 20, 28)
Trichia botrytis (J.F. Gmel.) Pers. (9, 15)
T. decipiens (Pers.) Macbr. (1, 2, 9, 10, 17)
T. favoginea (Batsch) Pers. (1, 2, 9, 10, 15, 17, 20, 24)
T. lutescens (A. Lister) A. Lister (7, 10)

Cont. Table 1

T. scabra Rost. (11)
T. varia (Pers.) Pers. (9, 10)
T. verrucosa Berk. (1, 2, 4, 7, 9, 10)
Order: PHYSARALES
Family: PHYSARACEAE
Willkommlangea reticulata (Alb. and Schw.) Rost. (17)
Leocarpus fragilis (Dicks.) Rost. (10, 22, 24)
Physarella oblonga (Berk. and Curt.) Morgan (3, 9, 10, 11, 15, 28)
Badhamia affinis Rost. (3, 9, 10, 24)
B. capsulifera (Bull.) Berk. (10)
B. gracilis (Macbr.) Macbr. (9)
B. macrocarpa (Ces.) Rost. (5, 18)
** *B. obovata* (Peck) Smith (18, 24)
B. panicea (Fries) Rost. (5)
B. papaveraceae (Berk and Rav.) (17)
B. utricularis (Bull.) Berk. (9)
Fuligo cinerea (Schw.) Morgan (9, 10)
F. intermedia Macbr. (17)
F. megaspora Sturgis (17)
F. septica (L.) Wiggers (1, 9, 10, 12, 14, 17, 24, 27, 28, 29)
Craterium aureum (Schum.) Rost. (9, 22)
C. leucocephalum (Pers.) Ditmar (3, 5, 10, 11, 17, 22)
C. minutum (Leers) Fr. (10)
Physarum bitectum G. Lister (11)
P. bivalve Pers. (22)
P. bogoriense Racib. (9, 10, 17)
P. cinereum (Batsch) Pers. (9, 10, 15, 17, 20)
P. compressum Alb. and Schw. (9, 10, 11, 15, 20)
P. citrinum Schum. (9)
P. didermoides (Pers.) Rost. (17, 24)
P. flavicomum Berk. (16, 27)
P. galbeum Wingate (28)
P. globuliferum (Bull.) Pers. (2, 3, 9, 10, 14)
P. leucophaeum Fr. (7, 10, 17)
P. melleum (Berk. and Br.) Massee (7, 9, 15, 17, 20)
P. mutabile (Rost.) G. Lister (9)
P. nicaraguense Macbr. (3, 9, 10)

** Reported as *Craterium obovatum* Peck in Guzmán and Villarreal (1984) (24)

Cont. Table 1

P. nutans Pers. (7, 8, 9, 10)
P. oblatum Macbr. (3, 9, 10)
P. penetrale Rex (9)
P. pezizoideum (Jungh.) Pav. et Lag. (15, 20)
P. polycephalum Schw. (15, 20)
P. pulcherripes Peck (15, 18)
P. pusillum (Berk. et Curt.) G. Lister (9, 10, 17, 18, 21)
P. roseum Berk. et Br. (18)
P. serpula Pers. (22)
P. stellatum (Massee) Martin (3, 9, 10, 28)
P. sulphureum Alb. et Schw. (3, 9, 10)
P. tenerum Rex (3, 9, 10)
P. tropicale Macbr. (2, 7, 10)
P. vernum Somm. (7, 9, 10, 26)
P. virescens Ditmar (9, 27)
P. viride (Bull.) Pers. (9, 17, 28)

Family: DIDYMIACEAE

Diachea bulbillosa (Berk. et Br.) A. Lister (15)
D. leucopodia (Bull.) Rost. (10, 15, 17)
D. radiata G. Lister and Petch (15, 20)
Physarina echinospora Thind et Manocha (6, 7, 9, 10)
Diderma asteroides (A. et G. Lister) G. Lister (17)
D. crustaceum Peck (9, 18)
D. chondrioderma (de Barry et Rost.) G. Lister (11)
D. deplanatum Fr. (28)
D. effusum (Schw.) Morgan (3, 9, 10)
D. hemisphaericum (Bull.) Hornem (3, 9, 10, 11, 12, 15, 17, 20)
D. niveum (Rost.) Macbr. (9)
D. spumaroides (Fr.) Fr. (9)
D. testaceum (Schrad.) Pers. (9)
Mucilago crustacea Wiggers (9, 17)
Didymium anellus Morgan (9)
D. clavus (Alb. and Schw.) Rab. (3, 9, 10, 11)
D. crustaceum Fr. (10)
D. difforme (Pers.) S.F. Gray (9, 11)
D. iridis (Ditmar) Fr. (9, 10, 17, 22, 24)
D. leoninum Berk. et Br. (22)
D. megalosporum Berk. et Curt. (7, 10)
D. melanospermum (Pers.) Macbr. (11, 18)

Cont. Table 1

D. minus (A. Lister) Morgan (9)
D. nigripes (Link) Fr. (3, 9, 10, 18)
D. squamulosum (Alb. and Schw.) Fr. (3, 9, 10)
D. vaccinum (Dor. and Mont.) Buchet (17, 18)
Lepidoderma tigrinum (Schrad.) Rost. (17)

Subclass: STEMONITOMYCETIDAE
Order: STEMONITALES
Family: STEMONITACEAE

Colloderma sp. (probably *C. pustulatum* Macbr.) (8)
* *C. robustum* Meylan (9, 10, 22). Listed in Braun et Keller (1976) as a new species. Now identified as *C. robustum* Meylan. This is a first report for the Neotropics.
* *Enerthenema papillatum* (Pers.) Rost.
*** *Stemonitis axifera* (Bull.) Macbr. (9, 10, 14, 15, 24, 26)
**** *S. pallida* Wingate (3, 9, 10, 15, 28)
S. confluens Cooke and Ellis (18)
S. flavogenita Jahn (12, 27, 28)
S. fusca Roth (8, 9, 10, 15, 17, 27, 28)
S. herbatica Peck (10)
S. smithii Macbr. (1, 9, 28)
S. splendens Rost. (3, 9, 10, 12, 15)
S. trechispora (Berk.) Macbr. (3, 9, 10, 28)
S. virginiensis Rex (9)
Macbrideola cornea (G. Lister et Cran) Alexop. (9, 11)
M. decapillata H.C. Gilbert (11)
Lamproderma arcyrionema Rost. (2, 9, 10, 28)
L. arcyrioides (Sommerf.) Rost. (18)
L. echinulatum (Berk.) Rost. (9)
L. scintillans (Berk. et Br.) Morgan (17)
Comatricha elegans (Racib.) G. Lister (9, 10)
C. longipila Nann.-Brem. (18)
C. longa Peck (3, 9, 10, 12)
C. nigra (Pers.) Schroet (17)
C. pulchella (C. Bab.) Rost. (1, 9, 10, 15)
C. tenerrima (M.A. Curt.) G. Lister (9)
***** *C. typhoides* (Bull.) Rost. (1, 3, 9, 10, 15, 17, 20, 27, 28)
C. subcaespitosa Peck (9)
* *C. fimbriata* G. Lister et Cran

*** Reported as *S. axifera* var. *smithii* (Macbr.) Hagelst. by Farr, 1976 (10)
**** Reported as *S. carolinensis* Macbr. by Farr, 1976 (10)
***** Reported as *C. typhoides* var. *similis* G. Lister by Farr, 1976 (10)

TABLE II

LIST OF PAPERS ON THE MYXOMYCETES OF MEXICO

1. Macbride and Smith (1896)*
2. Macbride (1922)
3. Emoto (1933)
4. Hagelstein (1944)
5. Welden and Lemke (1961)
6. Alexopoulos and Blackwell (1968)
7. Martin and Alexopoulos (1969)
8. Guzmán (1972)
9. Braun and Keller (1976)
10. Farr (1976)
11. Keller and Braun (1977)
12. Welden and Guzmán (1978)
13. Braun, Keller and Braun (1979)
14. Welden, Dávalos and Guzmán (1979)
15. López, Sosa and Villarreal (1979)
16. Pérez-Silva (1979)
17. Gómez-Sánchez and Castillo (1981)
18. López, Villarreal and Sosa (1981a)
19. López, Villarreal and Sosa (1981b)
20. López, Sosa and Villarreal (1981)
21. Guzmán and Guzmán-Dávalos (1981)
22. Villarreal (1983)
23. Martin, Alexopoulos and Farr (1983)
24. Guzmán and Villarreal (1984)
25. Chacón and Guzmán (1984)
26. Guzmán and Varela (1979)
27. Martínez-Alfaro, Pérez Silva and Aguirre Acosta (1983)
28. Guzmán (1983)
29. Mapes, Guzmán and Caballero (1981)

* The numbers are those showed in Table I

TABLE III

Distribution list of the Myxomycetes of Mexico, showing the predicted groups and those actually collected (in parentheses).

	ORDER	FAMILY	GENUS	SPECIES
CERATIOMYXOMYCETIDAE	1 (1)	1 (1)	1 (1)	(2)
	CERATIOMYXALES			
MYXOGASTROMYCETIDAE	LICEALES	3 (3)	9 (7)	(24)
	ECHINOSTELIALES	2 (2)	3 (3)	(5)
	TRICHIALES	2 (2)	13 (8)	(29)
	PHYSARALES	3 (2)	16 (13)	(75)
STEMONITOMYCETIDAE	1 (1)			
	STEMONITALES	2 (1)	11 (6)	(29)
	(6 (6)	13 (11)	53 (38)	(164)

TABLE IV

LIST OF GENERA OF MYXOMYCETES NOT YET COLLECTED IN MEXICO

Listerella (MS, M)
Lindbladia (MS, M)
Minikatella (MS, M)
Prototrichia (MS, M)
Oligonema (M)
Arcyodes (MS, M)
Cornuvia (MS, M)
Elaeomyxa (M)
Protophysarum (MS, M)
Erionema (MS)
Schenella
Brefeldia (MS)
Amaurochaete
Leptoderma (MS, M)
Diachaeopsis (M)

MS monoespecific
M minute (less than 1 mm in one or more dimension).

LITERATURE CITED

Alexopoulos, C.J. and M.M. Blackwell, 1968. Taxonomic studies in the Myxomycetes II. *Physarina. J. Elisha Mitchell Soc. 84:*48-51.

Braun, K.L. and H.W. Keller, 1976. Myxomycetes of Mexico I. *Mycotaxon 3:* 297-317.

Braun, K.L., H.W. Keller and J.R. Braun, 1979. Cultivo e identificación de los Myxomycetes. *Bol. Soc. Mex. Mic. 13:*205-209.

Chacón, S. and G. Guzmán, 1984. Nuevas observaciones sobre los hongos, líquenes y mixomicetos de Chiapas (México). *Bol. Soc. Mex. Mic. 19:* 245-251.

Emoto, Y., 1933. Myxomyceten aus Mexiko. *Shocub. Zasshi (Bot. Mag.) Tokyo 47 (554):*132-135.

Farr, M.L., 1976. *Myxomycetes. In:* Flora Neotropica No. 16. Cramer, New York.

Gilbert, H.C. and G.W. Martin, 1933. Myxomycetes found on the bark of living trees. *In:* Papers on Iowa Fungi IV. *Stud. Nat. Hist. Iowa University 15:*3-8.

Gómez-Sánchez, A. and J. Castillo, 1981. Estudio sobre los Myxomycetes del Estado de Nuevo León. *Bol. Soc. Mex. Mic. 15:*199-233.

Guzmán, G., 1972. Algunos macromicetos, líquenes y mixomicetos importantes de la zona del Volcán Popocatépetl. *In:* Guías Botánicas de excursiones en México. I Congreso Latinoamericano de Botánica, Soc. Bot. Mex., *Mexico City, pp.* 17-44.

Guzmán, G., 1983. Los hongos de la Península de Yucatán, II. Nuevas exploraciones y adiciones micológicas. *Biotica 8:*71-100.

Guzmán, G. and L. Guzmán-Dávalos, 1981. Nuevos datos sobre el Myxomycete *Physarum pusillum* en México. *Bol. Soc. Mex. Mic. 16:*105-107.

Guzmán, G. and L. Varela, 1979. Hongos del Herbario de W.B. COOKE (E.U.A.) depositados en ENCB y discusiones sobre su distribución en México. *Bol. Soc. Mex. Mic. 13:*63-73.

Guzmán, G. and L. Villarreal, 1984. Estudios sobre los hongos, líquenes y mixomicetos del Cofre de Perote, Veracruz I. Introducción a la micoflora de la región. *Bol. Soc. Mex. Mic. 19:*107-120.

Hagelstein, R., 1944. The Mycetozoa of North America. 1-306, Mineola.

Keller, H.W. and K.L. Braun, 1977. Myxomycetes of Mexico II. *Bol. Soc. Mex. Mic. 11:*167-180.

Lister, A., 1925. *A monograph of the Mycetozoa* (ed. 3). Revised by G. Lister.

López, A., A. Sosa, and L. Villarreal, 1979. Estudios sobre los Myxomycetes del Estado de Veracruz I. *Bol. Soc. Mex. Mic. 13:*127-144.

López, A., A. Sosa and L. Villarreal, L., 1981. Estudios sobre los Myxomycetes del Estado de Veracruz II. *Biotica 6:*43-56.

López, A., L. Villarreal and A. Sosa, 1981a. Estudios sobre los Myxomycetes del Estado de Veracruz III. *Bol. Soc. Mex. Mic. 16:*77-94.

López, A., L. Villarreal and A. Sosa, 1981b. Estudios sobre los Myxomycetes del Estado de Veracruz V. Los Myxomycetes mexicanos registrados en la literatura. *Bol. Soc. Mex. Mic. 16:*95-104.

Macbride, T.H. and C.L. Smith, 1896. The Nicaraguan Myxomycetes. With notes on certain Mexican species. *Nat. Hist. Bull. State Univ. Iowa 4:*73-75.

Macbride, T.H., 1922. The North American Slime-Moulds (ed. 2). 1-299. Macmillan Co., New York.

Mapes, C., G. Guzmán and J. Caballero, 1981. Etnomicología purepecha. *El conocimiento y uso de los hongos en la Cuenca de Pátzcuaro, Michoacán.* Cuadernos de Etnobiología 2, Dir. Gral. Culturas Populares, Soc. Mex. Mic. and UNAM, Mexico city.

Martin, G.W. and C.J. Alexopoulos, 1969. The Myxomycetes. 1-560. Univ. of Iowa Press, Iowa City.

Martin, G.W., C.J. Alexopoulos and M.L. Farr, 1983. *The Genera of Myxomycetes.* University of Iowa Press, Iowa City.

Martínez-Alfaro, M., E. Pérez Silva and E. Aguirre-Acosta, 1983. Etnomicología y exploraciones micológicas en la Sierra norte de Puebla. *Bol. Soc. Mex. Mic. 18*:51-63.

Pérez-Silva, E., 1979. Primer registro del Myxomycete *Physarum flavicomum* en México. *Bol. Soc. Mex. Mic. 13:*239-242.

Villarreal, L., 1983. Algunas especies de Myxomycetes no registradas del Estado de Veracruz. *Bol. Soc. Mex. Mic. 18:*153-164.

Welden, A.L. and P.A. Lemke, 1961. Notas sobre algunos hongos mexicanos. *Bol. Soc. Bot. Mex. 26:*1-23.

Welden, A.L. and G. Guzmán, 1978. Lista preliminar de los hongos, líquenes y myxomycetes de las regiones de Uxpanapa, Coatzacoalcos, Los Tuxtlas, Papaloapan y Xalapa (parte de los Estados de Veracruz y Oaxaca). *Bol. Soc. Mex. Mic. 12:*59-102.

Welden, A.L., L. Dávalos and G. Guzmán, 1979. Segunda lista de hongos, líquenes y myxomycetes de las regiones de Uxpanapa, Coatzacoalcos, Los Tuxtlas, Papaloapan y Xalapa (México). *Bol. Soc. Mex. Mic. 13:*151-161.