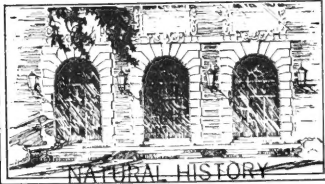




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The Literature of Arthropods Associated with Soybeans  
IV. A BIBLIOGRAPHY OF THE  
VELVETBEAN CATERPILLAR

*Anticarsia gemmatalis* Hübner  
(Lepidoptera: Noctuidae)

B. J. Ford    J. R. Strayer  
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Biological Notes No. 92

ILLINOIS NATURAL HISTORY SURVEY  
Urbana, Illinois—February, 1975

STATE OF ILLINOIS  
Department of Registration and Education  
Natural History Survey Division

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This paper is a contribution of the Illinois Soybean Entomology Team with support from the Illinois Natural History Survey, the University of Illinois International Soybean Program (INTSOY), the University of Illinois Departments of Entomology and Horticulture, the Illinois Agricultural Experiment Station and the U.S. Department of Agriculture through the regional project S-74, the U.S. Agency for International Development, and National Science Foundation and Environmental Protection Agency grant GB-34718, Soybean Sub-project.

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## The Literature of Arthropods Associated with Soybeans

### IV. A BIBLIOGRAPHY OF THE VELVETBEAN CATERPILLAR

#### *Anticarsia gemmatilis* Hübner (Lepidoptera: Noctuidae)

*Anticarsia gemmatilis* Hübner (1816) (Lepidoptera, Noctuidae) is an insect that has become a major concern to persons involved in the production of soybeans (*Glycine max* (L.) Merrill) in the Western Hemisphere. The larva of this species is commonly called the velvetbean caterpillar by researchers in the U.S.A. because it so seriously defoliated the velvetbean (*Stizolobium deeringianum* Bort) in the early 1900's (Chittenden 1905). Velvetbean caterpillar is now the common name for *A. gemmatilis* accepted by the Entomological Society of America.<sup>1</sup> Agricultural researchers in Mexico use a close Spanish equivalent for the common name, *gusano terciopelo*,<sup>2</sup> and Brazilian entomologists frequently refer to the species as *lagarta da soja*.

Until recently, the specific name was erroneously spelled "*gemmatilis*" by many authors. The error apparently traces back to Smith's (1893) misspelling. There are several synonyms in the literature partly because the maculation and coloration of the adults are extremely variable. Persons interested in the synonyms should consult Druce (1900) and Schaus (1940).

*A. gemmatilis* is primarily a foliage feeder on the Leguminosae. Guyton (1940) and English (1946) both described outbreaks of the caterpillars damaging peanuts (*Arachis hypogaea* L.) in Alabama. For Puerto Rico, Wolcott (1923, 1933, 1936, 1948, 1955) referred to the association of *A. gemmatilis* with soybean, peanut, alfalfa (*Medicago sativa* L.), sword bean (*Canavalia gladiata* DC.), bush bean (*Phaseolus vulgaris* var. *humilis* Alef.), lima bean (*P. limensis* Macf.), cowpea (*Vigna sinensis* Savi), and the gallito tree or Australian cork-wood tree (*Agati grandiflora* Desv.). Telford & Childers (1947) studied *A. gemmatilis* in relation to tropical kudzu (*Pueraria phaseo-*

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*lides* (Roxb.) Benth.) and kudzu (*P. lobata* (Willd.) Ohwi). Hinds & Osterberger (1931) reported cotton (*Gossypium*) as a host, but this seems to be the only nonleguminous host recorded for *A. gemmatilis* in the United States. Wheat (*Triticum*) was reported to be damaged by the species in Peru (Wille 1939).

Because the acreage and economic value of soybeans has increased substantially in subtropical and tropical areas during the last decade, it is not surprising that the species is now recognized as a major soybean pest. Outbreaks of the species on soybeans extend beyond the subtropics as far north as Maryland, Delaware, and Tennessee, U.S.A. These records were obtained from the U.S. Department of Agriculture Cooperative Economic Insect Report, Volumes 1-23 for 1951-1973. Soybean defoliation caused by *A. gemmatilis* in the U.S.A. is most serious in the southeastern and Gulf Coast states. The velvetbean caterpillar was first reported as a soybean pest in Florida and South Carolina by Nickels (1926). He estimated that in 1925 losses in South Carolina exceeded \$500,000. Douglas (1930) reported the same insect defoliating soybeans in Texas. Hinds & Osterberger (1931) reported the velvetbean caterpillar as a pest in Louisiana, but did not believe it to be a limiting factor in soybean production. Strayer (1973) determined that soybean defoliation by *A. gemmatilis* was limiting production in Florida and reported the estimated cost of control was \$1.2 million yearly from 1970 to 1973.

A detailed life history of *A. gemmatilis* was published by Watson (1916). Greene, et al. (1973) have further observed feeding of the caterpillar, and mating and oviposition of the moths. Eggs are most often laid singly. There are six to seven larval instars during the normal 3- to 4-week developmental period. The larva consumes 98 percent of its total food during the third through the last stage.

*A. gemmatilis* is regarded as a tropical to subtropical species. Apparently it does not overwinter in temperate regions. It is presently believed that the species survives winter no farther north than central Florida in the U.S.A. except during very mild winters and that economic outbreaks of the pest are primarily limited to Florida and neighboring states in late summer. However, as stated above, areas farther north have experienced outbreaks. Moths have been reported as far north in North America as Ontario, Canada (Watson 1916) and Wisconsin (Smith 1893). The

1. Entomological Society of America, Committee on Common Names of Insects, 1970. C. C. Blickenstaff, chairman. Common names of insects approved by the Entomological Society of America. [Published by the Entomological Society of America.] 36 p.

2. Peña-M. R. and J. A. Sifuentes. 1972. Lista de nombres científicos y comunes de plagas agrícolas en México, 1972. Agricultura Técnica en México 3: 132-144.

This paper is published by authority of the State of Illinois, IRS Ch. 127, Par. 58.12. B. J. Ford is a Research Assistant at the Illinois Natural History Survey. Dr. J. R. Strayer is an Associate Professor, and J. Reid is a Graduate Assistant, in the Department of Entomology and Nematology, University of Florida. Dr. G. L. Godfrey is an Assistant Professor and International Programs Coordinator of Agricultural Entomology, University of Illinois, and an Assistant Entomologist at the Illinois Natural History Survey.

western distributional limits in North America are not clearly documented. According to Pacheco (1970), velvetbean caterpillars occur in Valle del Yaqui, Sonora, Mexico. Dr. J. G. Franclemont, Cornell University, collected the moths of *A. gemmatilis* in Madera Canyon, Santa Rita Mountains in southern Arizona (personal communication to G. L. Godfrey). The species is widespread in South America and the West Indies. There are soybean association records as far south as the Argentine provinces of Corrientes and Misiones (Rizzo 1972), Cordoba, and Tucuman, with occasional records near the city of Buenos Aires (Rizzo, personal communication to G. L. Godfrey).

This bibliography on *A. gemmatilis* is the fourth in a series contributing to the knowledge of the biology and control of arthropods on soybeans to assist in improved protection and production of this crop. The philosophy and scope of this bibliography is similar to that in the preceding bibliographies of the series. The references are not solely restricted to *A. gemmatilis* on soybeans. Many of the listed references pertain to the occurrence of *A. gemmatilis* on other leguminous crops, and to control measures, laboratory investigations, and systematics.

The titles in the present list were obtained primarily from standard reference sources and cross references. The literature search was concluded on December 31, 1973. The bibliography is as complete as possible with no deliberate screening except as noted below. References to reports in the USDA *Cooperative Economic Insect Report*, USDA *Insect Pest Survey Bulletin*, and Canadian *Insect Pest Review* were

not included because their indexes are very complete. Interested researchers are urged to consult them for additional information. A few references have not been specifically searched, due to the inability of the authors to locate them. They are designated with the symbol #.

The references are listed alphabetically by author, numbered consecutively, and tabulated by subject and period of publication (see reference table following the numbered entries), a decade being the smallest period considered. A reference can appear more than once in the subject index. This procedure was adopted to make cross referencing for the index as complete as possible.

Title abbreviations of the periodicals cited in this publication are listed along with spelled-out titles at the end of the paper.

SIRIC (Soybean Insect Research and Information Center, Illinois Natural History Survey and University of Illinois at Urbana-Champaign) has developed a series of computer programs which make possible more detailed searches of the literature according to subject matter. All citations in this bibliography are stored on tape, and can be retrieved through a series of key words which define categories considerably more refined than those listed in the table which follows the numbered references. The computerized information system greatly increases the usefulness of the printed bibliographies, and the two together are an important part of the effort of the Illinois Soybean Entomology Team to search out, compile, and organize for ready access the ever-increasing information on soybean entomology for the benefit of all professionals working in this area.

We thank Dr. John G. Franclemont, Department of Entomology, Cornell University, for his advice and consultations that facilitated the completion of this bibliography. The final editing by O. F. Glissendor and the cover design by Lloyd LeMere are much appreciated. Joe Ann Auble and Raymond Kotel contributed greatly by typing the manuscript.

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## PERIODICAL ABBREVIATIONS

- Abh. Senckenberg. Naturforsch. Ges.—Abhandlungen der Senckenbergischen naturforschenden Gesellschaft.
- Agr. News (Barbados)—The Agricultural News (Barbados).
- Agr. Pecuar.—Agricultura e Pecuaria (Rio de Janeiro).
- Agron. Trop. (Maracay)—Agronomia Tropical (Maracay).
- Ala. Agr. Exp. Sta. Annu. Rep.—Alabama Agricultural Experiment Station Annual Report.
- Ala. Agr. Exp. Sta. Leaf.—Alabama Agricultural Experiment Station Leaflet.
- Ala. Agr. Exp. Sta. Progr. Rep. Ser.—Alabama Agricultural Experiment Station Progress Report Series.
- Ala. Polytech. Inst. Grad. Sch. Bull.—Alabama Polytechnic Institute, Graduate School Bulletin.
- An. Reun. Fitosanit. Brasil—Anais da Reuniao Fitosanitaristas do Brasil.
- An. Soc. Espan. Hist. Natur.—Anales de la Sociedad Espanola de Historia Natural.
- Annu. Rev. Entomol.—Annual Review of Entomology.
- Arch. Inst. Biol. (São Paulo)—Archivos do Instituto Biologico (São Paulo).
- Ark. Agr. Exp. Sta. Ext. Serv. Circ.—Arkansas Agricultural Experiment Station Extension Service Circular.
- Ark. Agr. Exp. Sta. Rep. Ser.—Arkansas Agricultural Experiment Station Report Series.
- Auburn Univ. Coop. Ext. Serv. Circ.—Auburn University Cooperative Extension Service Circular.
- Barbados Dep. Agr. Rep.—Report on the Department of Agriculture, Barbados.
- Better Homes Gard.—Better Homes and Gardens.
- Biol. Cent.-Amer.—Biologia Centrali-Americana.
- Bol. Campo (Rio de Janeiro)—Boletim do Campo (Rio de Janeiro).
- Bol. Didatico Esc. Super. Agr.—"Luiz de Queiroz" Univ. São Paulo—Boletim Didatico, Escola Superior de Agricultura "Luiz de Queiroz" Universidade de São Paulo.
- Boll. Lab. Entomol. Agr. "Filippo Silvestri"—Bollettino del Laboratorio di Entomologia Agraria "Filippo Silvestri."
- Bull. Amer. Mus. Natur. Hist.—Bulletin of the American Museum of Natural History.
- Bull. Brooklyn Entomol. Soc.—Bulletin of the Brooklyn Entomological Society.
- Bull. Buffalo Soc. Natur. Sci.—Bulletin of the Buffalo Society of Natural Sciences.
- Bull. Entomol. Res.—Bulletin of Entomological Research.
- Bull. U.S. Nat. Mus.—Bulletin of the United States National Museum.
- Bur. Farmer—Bureau Farmer (Louisiana Edition).
- Can. Entomol.—Canadian Entomologist.
- Caribbean Res. Coun., Crop Inq. Ser.—Caribbean Research Council, Crop Inquiry Series.
- Citrus Ind.—Citrus Industry.
- Clemson Agr. Coll. Ext. Serv. Circ.—Clemson Agricultural College Extension Service Circular.
- Clemson Agr. Coll. Ext. Serv. Inform. Card—Clemson Agricultural College Extension Service Information Card.
- Clemson Univ. Agr. Ext. Serv. Circ.—Clemson University Agricultural Extension Service Circular.
- Clemson Univ. Agr. Res.—Clemson University Agricultural Research.
- Cornell Univ. Agr. Exp. Sta. Mem.—Cornell University Agricultural Experiment Station Memoir.
- Correio Agro-Pecuar. (São Paulo)—Correio Agro-Pecuario (São Paulo).
- CorrespBl. Zool.-Miner. Ver. Regensburg—Correspondenz-Blatt des Zoologisch-Mineralogischen Vereins in Regensburg.
- Entomol. Ber. (Amsterdam)—Entomologische Berichten (Amsterdam).
- Entomol. News—Entomological News.
- Entomol. Rec. J. Var.—The Entomologist's Record & Journal of Variation.
- Environ. Entomol.—Environmental Entomology.
- Ext. Serv. Rev.—Extension Service Review.
- Farm Quart.—Farm Quarterly.
- Farm Tech.—Farm Technology.
- Fln. M. Lillo Univ. Nac. Tucuman Misc.—Fundacion M. Lillo, Universidad Nacional de Tucuman, Argentina, Miscelanea.
- FlR (São Paulo)—Fertilizantes, Inseticidas e Racoes (São Paulo).
- Fla. Agr. Exp. Sta. Annu. Rep.—Florida Agricultural Experiment Station Annual Report.
- Fla. Agr. Exp. Sta. Bull.—Florida Agricultural Experiment Station Bulletin.
- Fla. Agr. Exp. Sta. Press Bull.—Florida Agricultural Experiment Station Press Bulletin.
- Fla. Coop. Ext. Serv. Plant Prot. Pointers Ext. Entomol. Mimeo.—Florida Cooperative Extension Service, Plant Protection Pointers, Extension Entomology Mimeograph.
- Fla. Dep. Agr. Bien. Rep.—Florida Department of Agriculture Biennial Report.
- Fla. Dep. Agr. Bull. (n.s.)—Florida Department of Agriculture Bulletin, New Series.
- Fla. Dep. Agr. Quart. Bull.—Florida Department of Agriculture Quarterly Bulletin.
- Fla. Entomol.—Florida Entomologist.
- Fla. Grower—The Florida Grower.
- Fla. State Plant Bd. Quart. Bull.—Florida State Plant Board Quarterly Bulletin.
- Ga. Agr. Exp. Stas. Mimeo Ser.—Georgia Agricultural Experiment Stations Mimeo Series.
- Ga. Coastal Plain Exp. Sta. Bull.—Georgia Coastal Plain Experiment Station Bulletin.
- Ga. Coastal Plain Exp. Sta. Mimeo. Pap.—Georgia Coastal Plain Experiment Station Mimeograph Paper.
- Ga. Exp. Sta. Annu. Rep.—Georgia Experiment Station Annual Report.
- Ga. Exp. Sta. Press Bull.—Georgia Experiment Station Press Bulletin.
- Highlights Agr. Res.—Highlights of Agricultural Research.
- J. Agr. Univ. P. R.—Journal of Agriculture of the University of Puerto Rico.
- J. Amer. Soc. Agron.—Journal of the American Society of Agronomy.
- J. Dep. Agr. P. R.—Journal of the Department of Agriculture of Porto Rico.
- J. Econ. Entomol.—Journal of Economic Entomology.
- J. N. Y. Entomol. Soc.—Journal of the New York Entomological Society.
- La. Agr. Exp. Sta. Annu. Rep.—Louisiana Agricultural Experiment Station Annual Report.
- La. Agr. Exp. Sta. Bull.—Louisiana Agricultural Experiment Station Bulletin.
- La. Coop. Ext. Serv. Publ.—Louisiana Cooperative Extension Service Publication.
- La Molina Estac. Exp. Agr. Informe—La Molina, Peru Estacion Experimental Agricola Informe.
- La Molina Estac. Exp. Agr. Mem.—La Molina, Peru, Estacion Experimental Agricola Memoria.
- Mem. S. Calif. Acad. Sci.—Memoirs of the Southern California Academy of Sciences.
- Mem. Soc. Nac. Agr. Lima—Memoria de la Sociedad Nacional Agraria, Lima.
- Mex. Inst. Nac. Invest. Agr. SAG. Circ. CIANO—Mexico Instituto Nacional de Investigaciones Agricolas, Secretarias de Agricultura y Ganaderia, Centro de Investigaciones Agricolas del Noroeste Circular.
- Minas Gerais Brasil Dep. Prod. Veg. Bol. Agr.—Minas Gerais, Brasil, Departamento de Produção Vegetal, Boletim de Agricultura.
- Min. Agr. (Rio de Janeiro) S.I.A.—Ministério da Agricultura (Rio de Janeiro), Serviço de Informação Agrícola.
- Miss. Farm Res.—Mississippi Farm Research.
- Miss. State Univ. Coop. Ext. Serv. Inform. Sheet—Mississippi

- State University Cooperative Extension Service Information Sheet.
- Mo. Agr. Exp. Sta. Res. Bull.—Missouri Agricultural Experiment Station Research Bulletin.
- Monserrat Bot. Sta. Rep.—Monserrat. Report on the Botanic Station.
- N. Amer. Entomol.—North American Entomologist.
- N. C. Agr. Exp. Sta. Annu. Rep.—North Carolina Agricultural Experiment Station Annual Report.
- N. C. State Univ. Agr. Ext. Serv. Insect Notes, Grains & Soybeans Note—North Carolina State University Agricultural Extension Service Insect Notes, Grains and Soybeans Note.
- Okla. Agr. Exp. Sta. Bien. Rep.—Oklahoma Agricultural Experiment Station Biennial Report.
- Okla. Agr. Exp. Sta. Mimeo. Circ.—Oklahoma Agricultural Experiment Station Mimeographed Circular.
- Okla. Agr. Exp. Sta. Rep.—Oklahoma Agricultural Experiment Station Report.
- P. R. Agr. Exp. Sta. Bull.—Puerto Rico Agricultural Experiment Station Bulletin.
- P. R. Fed. Exp. Sta. (Mayaguez) Circ.—Puerto Rico Federal Experiment Station (Mayaguez) Circular.
- P. R. Fed. Exp. Sta. (Mayaguez) Rep.—Report of the Federal Experiment Station in Puerto Rico (Mayaguez).
- Pointe-a-Pitre Guadeloupe Sta. Agr. Rapp.—Pointe-a-Pitre, Guadeloupe, Station Agronomique Rapport.
- Proc. Assoc. S. Agr. Workers—Proceedings of the Association of Southern Agricultural Workers.
- Proc. Cotton States Br. Amer. Assoc. Econ. Entomol.—Proceedings of the Cotton States Branch, American Association of Economic Entomologists.
- Proc. La. Acad. Sci.—Proceedings of the Louisiana Academy of Sciences.
- Proc. N. Cent. Br. Entomol. Soc. Amer.—Proceedings of the North Central Branch, Entomological Society of America.
- Proc. Soil Crop Sci. Soc. Fla.—Proceedings of the Soil and Crop Science Society of Florida.
- Proc. Tall Timbers Conf. Ecol. Anim. Contr. Habitat Manage.—Proceedings of the Tall Timbers Conference on Ecological Animal Control by Habitat Management.
- Proc. 10th Int. Congr. Entomol. (Montreal)—Proceedings of the Tenth International Congress of Entomology (Montreal).
- Proc. Zool. Soc. London—Proceedings of the Zoological Society of London.
- Res. Farming (N. C. Agr. Exp. Sta.)—Research and Farming (North Carolina Agricultural Experiment Station).
- Rev. Comerc. Trabajo (Cuba)—Revista de Agricultura, Comercio y Trabajo (Cuba).
- Rev. Agr. P. R.—Revista de Agricultura de Puerto Rico.
- Rev. Asoc. Ing. Agron.—Revista de la Asociación de Ingenieros Agronomos.
- Rev. Ceres.—Revista Ceres.
- Rev. Chilena Entomol.—Revista Chilena de Entomología.
- Rev. Entomol. (Rio de Janeiro)—Revista de Entomología (Rio de Janeiro).
- Rev. Fac. Agron. Univ. Repub. Uruguay—Revista de la Facultad de Agronomía, Universidad de la República, Uruguay.
- Rev. Fac. Agron. Vet. Univ. Rio Grande do Sul—Revista de Faculdade de Agronomia e Veterinária da Universidade do Rio Grande do Sul, Brasil.
- Rev. Fitotec. Latinoamer.—Revista Fitotecnia Latinoamericana.
- Rev. Ind. Agr. Tucuman—Revista Industrial y Agrícola de Tucuman.
- Rev. Inst. Bolsa Cereales—Revista Institucional de la Bolsa de Cereales.
- Rev. Peru. Entomol.—Revista Peruana de Entomología.
- Rice J.—Rice Journal.
- Santiago de las Vegas Cuba Estac. Exp. Agron. Circ.—Santiago de las Vegas, Cuba, Estacion Experimental Agronomica Circular.
- Santiago de las Vegas Cuba Estac. Exp. Agron. Informe—Santiago de las Vegas, Cuba, Estacion Experimental Agronomica Informe.
- Secr. Est. Neg. Agr. Ind. Comerc. S.I.P.A. (Ser. A)—Secretaria de Estado dos Negócios da Agricultura, Indústria e Comércio, Sección de Informações e Propaganda Agrícola (Serie A), Porto Alegre, Rio Grande do Sul, Brasil.
- Soil Sci. Soc. Amer. Proc.—Soil Science Society of America Proceedings.
- Solo Cent. Acad. "Luiz de Queiroz" Univ. São Paulo—Solo, Centro Academico "Luiz de Queiroz" Universidade de São Paulo, Brasil.
- Soybean Dig.—Soybean Digest.
- Sugar Bull.—The Sugar Bulletin.
- Tenn. Agr. Exp. Sta. Bull.—Tennessee Agricultural Experiment Station Bulletin.
- Tenn. Agr. Exp. Sta. Ext. Serv. Publ.—Tennessee Agricultural Experiment Station Extension Service Publication.
- Trans. Brit. Mycol. Soc.—Transactions of the British Mycological Society.
- Trans. Entomol. Soc. London—Transactions of the Entomological Society of London.
- Trop. Agr. (Trinidad)—Tropical Agriculture (Trinidad).
- Tucuman Estac. Exp. Agr. Publ. Misc.—Tucuman, Argentina, Estacion Experimental Agrícola Publicacion Miscelanea.
- U.S. Dep. Agr. Agr. Handb.—United States Department of Agriculture, Agriculture Handbook.
- U.S. Dep. Agr. Agr. Res. Serv. Rep. State Agr. Exp. Stas.—United States Department of Agriculture, Agricultural Research Service, Report on the State Agricultural Experiment Stations.
- U.S. Dep. Agr. Bur. Entomol. Bull.—United States Department of Agriculture, Bureau of Entomology Bulletin.
- U.S. Dep. Agr. Bur. Entomol. Plant Quar. E Ser.—United States Department of Agriculture, Bureau of Entomology and Plant Quarantine, E Series.
- U.S. Dep. Agr. Farmers Bull.—United States Department of Agriculture Farmers' Bulletin.
- U.S. Dep. Agr. Leaflet.—United States Department of Agriculture Leaflet.
- U.S. Dep. Agr. Off. Exp. Stas. Rep.—United States Department of Agriculture, Report of the Office of Experiment Stations.
- U.S. Dep. Agr. Rep. Chf. Bur. Entomol. Plant Quar.—United States Department of Agriculture, Report of the Chief of the Bureau of Entomology and Plant Quarantine.
- U.S. Dep. Agr. Tech. Bull.—United States Department of Agriculture Technical Bulletin.
- U.S. Dep. Agr. Yearb. Agr.—United States Department of Agriculture, Yearbook of Agriculture.
- Univ. Buenos Aires Fac. Agron. Vet. Publ. In.—Universidad de Buenos Aires Facultad de Agronomía y Veterinaria Publicacion Interna.
- Univ. Ga. Coop. Ext. Serv. Leaflet.—University of Georgia Cooperative Extension Service Leaflet.
- Uruguay Min. Agr. Gan. Centro Invest. Sanid. Veg. Publ. Tec. (Ser. Zool. Agr.)—Uruguay Ministerio de Agricultura y Ganadería, Centro de Investigaciones de Sanidad Vegetal, Publicacion tecnica (Serie Zoología y Agricultura).
- Va. Polytech. Inst. Agr. Ext. Serv. Circ.—Virginia Polytechnic Institute Agricultural Extension Service Circular.
- Va. Polytech. Inst. Agr. Ext. Div. Contr. Ser.—Virginia Polytechnic Institute Extension Division Contract Series.
- Verh. K. K. Zool.-Bot. Ges. Wien—Verhandlungen der kaiserlich-königlichen zoologisch-botanischen Gesellschaft in Wien.
- West Indian Bull.—West Indian Bulletin.
- West Indies Imp. Dep. Agr. Pamph. Ser.—Imperial Department of Agriculture for the West Indies, Pamphlet Series.









