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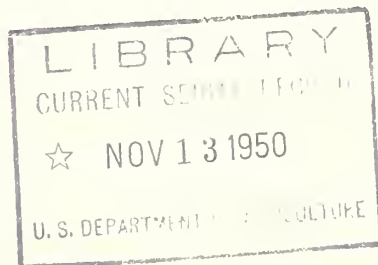
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C A C A O

A Bibliography on the Plant and Its Culture  
and Primary Processing of the Bean

Compiled by  
Roberta C. Watrous  
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## PREFACE

The demand for cacao products has greatly increased during the twentieth century. At the same time diseases and pests have threatened one after another of the cacao-producing areas of the world. It has therefore become essential to reexamine every factor which might have a bearing on the problem of maintaining and increasing production, whether by improvement of methods, by seeking remedies for specific ills, or by finding areas suitable for new plantings. In addition to experiments and research conducted by governmental and private agencies in the various cacao-growing countries, broad programs of research under cooperative sponsorship were undertaken as early as 1930 at the Imperial College of Tropical Agriculture, Trinidad, and more recently at the West African Cacao Research Institute, Tafo, Gold Coast, and the Inter-American Institute of Agricultural Sciences, Turrialba, Costa Rica.

This bibliography is intended to serve students, research workers, and others concerned with the problems involved in growing healthy and productive cacao trees and in processing the beans to meet the standards set by manufacturers of cocoa and chocolate. It includes, in addition to general material on the culture of cacao in various parts of the world and certain special aspects of culture, references on the botany and pathology of the plant, its insect and other enemies, and both practical and scientific aspects of the primary processing of the cacao bean. It does not include material dealing chiefly with the processing and sale of cacao products outside the country of origin, or items of interest primarily to the historian. With only a few exceptions the bibliography is limited to holdings of the U. S. Department of Agriculture Library and published during the period 1920 to 1949. Call numbers following the citations are those of the Library.

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## PRINCIPAL SOURCES CONSULTED

### CATALOGS:

U. S. Department of Agriculture Card Catalog, including Plant Science and Plant Pathology Catalogs.

### BIBLIOGRAPHICAL AND ABSTRACT JOURNALS:

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Tropical Agriculture, 1924-1949.

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A Bibliography on the Plant and Its Culture  
and Primary Processing of the Bean

## GENERAL

1. BARRETT, O. W. The tropical crops, a popular treatment of the practice of agriculture in tropical regions, with discussion of cropping systems and methods of growing the leading products. New York, Macmillan, 1928. 445 p., illus. 38 B27

Chapter 5 deals with cacao.

2. BOIS, D. Les plantes alimentaires chez tous les peuples et à travers les ages. Histoire, utilisation, culture. Vol. IV, Les plantes à boissons. Paris, Lechevalier, 1937. 600 p., illus. Ref. 452.8 B63

Cacao et chocolat, p. 402-437, treats of botany, culture and enemies, harvesting the beans and preparing them for market, and trade and consumption statistics.

3. BYWATERS, H. W. Modern methods of cocoa and chocolate manufacture. Philadelphia, Blakiston, 1930. 316 p., illus. 68.3 B99

Partial contents: Sect. 1, The raw material: Ch. 1, The production of cacao beans; Ch. 2, The inner structure and chemical composition of the cacao bean; Ch. 3, Commercial cacao beans and the countries from which they come; Ch. 4, The storage of cacao beans; Ch. 5, The quality of the cacao beans.

4. LE CACAO dans les colonies françaises. Rev. Internat. des Prod. Colon. 7:331-351, illus. Nov. 1932. 286.8 R326

Contents: 1, En Afrique Occidentale Française; 2, Dans les territoires africains sous mandat; 3, A Madagascar; 4, Le cacao en A. E. F. [Afrique Equatoriale Française]; 5, Martinique, Guadeloupe, Hébrides.

5. CHARLES-LAUREUR, J. Le Cacao. Internat. Cong. Trop. and Subtrop. Agr., Compt. Rend. (1931) 6(2):324-338. 1932. 26 In86

World production and consumption.

6. CIFERRI, R. La futura economia agrario-coloniale Europea. Rass. Econ. Dell'Africa Ital. 29:383-404. June 1941. 261 C71

Section on cacao, p. 392-396, reviews production and consumption statistics, especially 1933-37.

7. COCOA, CHOCOLATE AND CONFECTIONERY ALLIANCE, LTD. Report of the Cocoa Conference held at Grosvenor House, London, 30th August-1st September 1949. London, 1949. 115 p. 68.39 In82

In addition to papers listed by author and title elsewhere in this bibliography, includes various untitled addresses and discussions at meeting sessions.

U.S.D.A. Library has also report of conference held in 1947, 64 p. Subjects discussed were: Aims of plant-breeding, preparation, quality and breeding of cocoa; Research work at West African Cocoa Research Institute and Imperial College of Tropical Agriculture, Trinidad; Disease control and rehabilitation.

8. COCOA RESEARCH CONFERENCE, 1945. Report and proceedings. 168 p. London, Colonial Office, 1945. 68.39 C64

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9. CONFERENCE OF WEST AFRICAN AGRICULTURAL OFFICERS, 2, GOLD COAST, 1929. Proceedings. Gold Coast Dept. Agr. B. 19, 106 p. 1930. 26 G56B

Includes discussions, findings, and reports concerning cacao.

10. CONGRÈS INTERNATIONAL DES FABRICANTS DE CHOCOLAT ET DE CACAO, ANTWERP, 1930. Congrès international des fabricants de chocolat et de cacao, Anvers 1930 (du 8 au 11 septembre). Bruxelles, 1930. 68.39 C76

Consists of preparatory volume and official report.

11. DAVIES, S. H. Cocoa cultivation in the British tropical colonies. Roy. Soc. Arts J. 72:158-168. Jan. 25, 1924. 501 L847J

12. FAUCHÈRE, A. Guide pratique d'agriculture tropicale. II. Les grandes cultures. Paris, Challamel, 1922. 468 p., illus. (Bibliothèque d'Agriculture Coloniale). 38 F27

Le cacaoyer, p. 95-189.

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13. FINCKE, H. Handbuch der kakaoerzeugnisse; ihre geschichte, rohstoffe, herstellung, beschaffenheit, zusammensetzung, anwendung, wirkung, gesetzliche regelung und zählberichte, dargestellt für gewerbe, handel und wissenschaft. Berlin, Springer, 1936. 568 p., illus. Ref. Libr. Cong.

Die Rohstoffe der Kakaoerzeugnisse; A, Der Kakao, p. 30-100, discusses species and varieties of cacao, the anatomy of the bean, cultivation, diseases and pests, harvesting and preparation of the bean, and the cacao industry and trade.

14. FROST, B. Indians to Spaniards to us, the story of the triple play by which we obtained chocolate. Crown 33(12):9-11, 29, illus. Dec. 1944. 389.8 C88

15. HALL, C. J. J. VAN. Cacao. Ed. 2. London, Macmillan, 1932. 514 p., illus. 68.3 H14

Contents: Ch. 1, Historical; Ch. 2, Home country; geographical distribution of the cultivated plant; climatic conditions; Ch. 3, The chemistry of cacao and cacao soils; Ch. 4, The botanical characteristics; Ch. 5, Varieties of cacao; Ch. 6, The cultivation of cacao; Ch. 7, Selection; Ch. 8, Fermentation, washing, and drying; Ch. 9, Diseases and enemies; Ch. 10, Cacao-growing countries; Ch. 11, Some characteristics of the marketable bean.

16. HART, J. H. Cacao, a manual on the cultivation and curing of cacao. London, Duckworth, 1911. 323 p., illus. 68.3 H25C

Based largely on conditions in Trinidad.

17. HARTENBOWER, A. C. Apuntes sobre el cultivo y explotación del cacao. Hacienda 21:298-300, illus. Oct. 1926. 6 H11

18. HARVEY, M. A. R. Cacao, the chocolate tree. Pan Amer. Union. Commod. Com. Ser. 18, 15 p., illus. 1942. 150.9 C732

19. HERNANDEZ MARTIN, D. El cacao. Frutos 2(13):4-5; (14):4-5; (15):7-8; (16):4-5, illus. July-Dec. 1944. 80 F9472

20. INTER-AMERICAN ECONOMIC AND SOCIAL COUNCIL. Documentary material on cacao. Washington, Pan American Union, 1947. 2 v. 68.3 In8

Papers dealing with conditions in various cacao-growing countries and related subjects will be found in the various sections of this bibliography.

21. INTERNATIONAL COCOA CONFERENCE, LONDON, 1946. Conférence Internationale du Cacao. Londres, 1, 2 et 4 octobre 1946. Compte rendu officiel. Bruxelles, Office International du Cacao et du Chocolat, 1946? 155 p. 68.39 In82

Session on research into prevention of disease, selection of types, replanting and other matters connected with cultivation includes papers by L. E. Campbell (p. 88-89), Sir H. Tempany (p. 89-93), J. West (p. 93-96), D. H. Urquhart (p. 96-98), A. G. Beattie (p. 98-103), and R. E. D. Baker (p. 103-105).

Section on survey of world cocoa areas with particular reference to extension includes papers by J. Cadbury (p. 127-132) and Sir H. Tempany (p. 132-134).

22. JOHNSTON, J. R. El cultivo del cacao. Off. Internat. du Cacao et Choc. B. Off. 1:439-457. Dec. 1931. 68.38 Of2

Summaries in French, English, German, and Italian. Culture, diseases and pests, and preparation for market.

Reprinted in part in Asoc. Venezolana de Prod. Cacao. B. 1(4):1-10, Apr. 1936. 68.38 As5

23. KLOPSTOCK, F. Kakao; wandlungen in der erzeugung und der verwendung des kakaos nach dem weltkreis. Leipzig, Bibliographisches Institut, 1937. 138 p. Ref. (Wandlungen in der Weltwirtschaft, hft. 12). 281.368 K69

Section on culture includes discussions of plantation culture in Brazil and elsewhere, problems of plantation culture, culture by natives in the Gold Coast and other parts of tropical Africa, and problems and dangers of native culture.

24. KNAPP, A. W. The cocoa and chocolate industry: the tree; the bean; the beverage. Ed. 2, rev. and enl. London, Pitman, 1930. 188 p., illus. Ref. 68.3 K72C
25. KNAPP, A. W. Cocoa and chocolate, their history from plantation to consumer. London, Chapman and Hall, 1920. 210 p., illus. Ref. 68.3 K72
26. LANDAVERDE, A. Diez cultivos tropicales. México, D. F., Trucco, 1941. 227 p., illus. 38 L23 Ch. 2, El cacaoero, p. 33-65.
27. LECOQ, R. Cacao, poudres de cacao et farines composées alimentaires avec et sans cacao. Paris, Vigot, 1926. 180 p., illus. Ref. 68.3 L49  
Partial contents: I, Description et cultures du cacao; II, Récolte du cacao; III, Sortes commerciales du cacao; IV, Caractères physiques, anatomiques et chimiques de la fève de cacao; V, Conservation, nettoyage et sélection des fèves de cacao.
28. MACLAREN, W. A. Rubber, tea & cacao, with special sections on coffee, spices and tobacco. 334 p., illus. Ref. London, Benn, 1924. (The resources of the Empire Ser., v. 5). 256 F31  
Section 2, Tea, Cacao and Coffee, includes several chapters on the cacao-growing industry of the Empire, including surveys of the industry in three geographic areas and a discussion of the position and prospects of the British cacao-growing industry.
29. MANETTI, C. Il cacao, pianta dell'avvenire. Rass. Econ. dell'Africa Ital. 30:131-138. Mar. 1942. 261 C71  
Consumption, geographic distribution, cultivation, and processing.
30. MERDIAN, B. Chocolate grows on trees. Agr. in the Americas 2:143-147, illus. Ref. Aug. 1942. 1 F752A  
History, production in Latin America, and outlook for world trade.
31. MERDIAN, B. C. World cacao production and trade. Foreign Agr. 5:33-60, illus. Feb. 1941. 1.9 Ec7For  
Includes brief survey of situation in each of the principal producing and importing countries.
32. MIDDLE AMERICA INFORMATION BUR. Middle America and cocoa. New York, 1947? 7 p., illus. 68.3 M58  
A brief review of history, cultivation, processing, and trade, with special reference to tropical America.
33. MORALES, M. O. Cultivo racional del cacao. Agr. Trop. 5(9):11-15, illus. Sept. 1949. 26 Ag8  
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34. MURRILL, W. A. Where chocolate comes from. How the cacao bean is grown and made into cocoa powder and chocolate. Sci. Amer. 122:626, illus. June 5, 1920. 470 Sci25
35. OBANDO, N. Cultivo del cacao. Bogotá, Ministerio de agricultura y comercio, 1935. 52 p., illus. Ref. 68.3 Ob1  
Includes selection of varieties, planting, culture, harvesting, insects, and diseases.  
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36. OLIVIER, L. Le cacao en fèves aux pays de production. Etudes et observations sur la production, la préparation, l'emballage et l'expédition du cacao en fèves. Cong. Internat. des Fabric. de Chocolat et de Cacao 1:127-132. 1930. 68.39 C76  
Notes on culture and preparation apply chiefly to West Africa.
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Brief summary of the situation relating to cacao culture and trade in each of the producing countries.
38. PRUDHOMME, E. Le cacao dans les colonies françaises. Agron. Colon. 18:321-326, 359-363; 19:1-8. Nov. 1929-Jan. 1930. 26 Ag812  
World production, consumption, and French Colonial production; chiefly statistical.
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42. SCHWARZ, L. J. Cacao situation; a general statement. In Inter-American Economic and Social Council. Documentary material on cacao, pt. I, p. 2-8. Ref. Washington, Pan American Union, 1947. 68.3 In8  
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Situation and outlook as reported to conference of chocolate and cocoa interests at London, Sept. 14-16, 1948.
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Reviews reasons for decline in cocoa production and steps to be taken to improve the situation.
45. SPRECHER VON BERNEGG, A. Kakao und kola. Stuttgart, F. Enke, 1934. 264 p., illus. Ref. (His Tropische und subtropische weltwirtschaftspflanzen, pt. 3, v. 1) 452.8 Sp7  
Pt. 1, Der Kakaobaum, includes chapters on history, botany, cultural factors, harvesting, processing, costs and returns, chemical composition, products, world production and economic importance.
46. STAHEL, G. Aantekeningen over cacao. Surinam. Landbouwproefsta. Med. 11, 19 p. 1947. Ref. 102.5 D95  
Topics discussed include cacao soils, the root system of "koffiemama" [Erythrina sp.], humus and crown structure, and dieback.
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48. TEMPANY, H. A. The threatened future of cocoa. World Crops 1:10-14. Sept. 1949. 281.8 W892  
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49. TISSOT, P. Améliorations récentes apportées à la culture du cacao et à la préparation du cacao dans le monde. Rev. de Bot. Appl. et d'Agr. Trop. 15:103-115. Ref. Feb. 1935. 26 R323  
Discusses choice of variety, ecological needs, fertilizers, planting, improvements in preparation methods, and the world cacao situation.
50. WHITMORE, H. B. World cacao-bean production and trade. U. S. Off. Foreign Agr. Relat. Foreign Agr. Rpt. 29, 27 p. Aug. 1948. 1.943 F763  
Includes brief summary of situation in each of the cacao-growing countries.
51. WHYMPER, R. Cocoa and chocolate, their chemistry and manufacture. Ed. 2. London, Churchill, 1921. 568 p., illus. Ref. 68.3 W62  
Contents: Pt. 1, History, botany, and agriculture of cacao; Pt. 2, Manufacture of chocolates and cocoa powders; Pt. 3, Chemistry of cacao.
52. WILSON, O. The tree that gives the chocolate. Nature Mag. 8:177-179, illus. Sept. 1926. 409.6 N214
53. WOHLFARTH, O. Der einfluss der natürlichen verhältnisse auf den kakaobau. Tropenpflanzer 27:145-157. Ref. Nov./Dec. 1924. 26 T75  
Discusses proximity to the sea, shape of the cacao tree, pruning, protection from sun and wind, interplanting, pests, soil, and yields.
54. WOHLFARTH, O. F. W. Die natürlichen grundlagen des kakaobaues. Leipzig. U. Phil. Facul. Jahrb. 1923:176-178. 275.9 L532  
Abstract of dissertation.  
Climatic requirements, varieties, water and light requirements, yields.
55. WOODHOUSE, C. H. World supply and demand from the commercial standpoint. In Cocoa, Chocolate and Confectionery Alliance. Report of the Cocoa Conference, 1949, p. 2-8. London, 1949. 68.39 In82  
Includes notes on factors affecting production in various areas.



56. ZELLER, T. Kakao. Hamburg, W. Bangert, 1925. 165 p., illus. Ref. (Bangerts ausland-bücherei, nr. 25. Reihe: Wohltmann-bücher, bd. 1) 68.3 Z3

Contents: I, Botanisches; II, Der anbau; III, Die aufbereitung des erntegutes; IV, Das produkt; V, Weltproduktion und weltverbrauch; VI, Literatur.

57. ZIPPERER, P. Die schokoladen-fabrikation. Ein monographie der kakaofrucht und ihrer verwertung. Ed. 4. Berlin, Krayn, 1924. 338 p., illus. Ref. 68.3 Z6

H. Schaeffer and dipl.-ing. Schröder, editors. Contents: I, Der kakaobaum; II, Fabrikation der kakao-erzeugnisse; III, Zusatzstoffe zu den schokoladen; IV, Untersuchung und beurteilung von kakaopräparaten.

#### North America

##### Mexico

58. MEXICO. DEPT. DE ESTUDIOS ECONOMICOS. El cacao. Producción, industrialización y comercio. México, 1934. 77 p. Libr. Cong.

Ch. 1 includes detailed statistics of production in Mexico.

59. MEXICO. DIRECCION DE ECONOMIA RURAL. El cacao. Mex. Dir. de Econ. Rural. Bol. Mens. 190:152-171, illus. Mar. 1942. 254.5 Ag83

Includes data on Mexican production, Brazilian specifications for cacao, world production and consumption, Mexican consumption, domestic and foreign trade, and prospects for Mexican cacao.

60. MEXICO. SECRETARIA DE AGRICULTURA Y GANADERIA. Informe de labores . . . del 1 de Septiembre de 1945 al 31 de Agosto de 1946. Mexico, 1946. 2 v., illus. 8 M5711

Includes (v. 1, p. 366-400) account of plans for the Estación Central de Investigación y Propagación del Cacao, Cacaotán, Chiapas, with production records of more than 200 selected trees in the region of Chiapas. "Resume del Informe" for 1948/49 includes work of Instituto de Investigaciones Agrícolas in propagating promising cacao clones. Some earlier reports mention cacao culture and production.

#### Central America

61. ALMENGOR A., A. El cultivo del cacao en Suchitepéquez. Guatemala Sec. de Agr. Rev. Agr. 16:150-154, illus. Sept. 1939. 8 G934

Handbook for Guatemala.

Issued also in separate form, 1940. 68.3 AL6

62. ALTON, R. A. Report on a visit to Jamaica, Costa Rica and Trinidad. Brit. Guiana. Bd. Agr. J. 18:2-19. Jan. 1925. 9.6 B772J

Includes brief account of cacao cultivation in Costa Rica by United Fruit Company.

63. COSTA RICA. CENTRO NACIONAL DE AGRICULTURA. Informe anual, 1939. San José, 1940. 119 p. 102 C822

Informe del Departamento de Fitopatología y Sanidad Vegetal, by R. Méndez C., includes data on diseases of cacao.

Earlier reports are similar. Informe anual for 1934 lists four insects found on cacao.

Later reports not available for examination.

64. GOMEZ RUEDA, C. Instrucciones para el cultivo del cacao. Rev. de Agr. Trop. [Salvador] 12:163-164. 1939. 8 R326

Brief instructions on various points of culture and sanitation.

65. HERNANDEZ, M. G. Le Cacao, ses qualités et l'importance de son rendement. Off. Internatl. du Cacao et du Chocolat. B. Off. 5(10):423-426. Oct. 1935. Libr. Cong.

Cacao cultivation in El Salvador.

Summaries in English, German, Spanish, and Italian.

66. HOLDRIDGE, L. R. Report on visit to the main cacao area in Guatemala. Cacao Inform. B. 2(3):1-3. Mar. 1950. 68.38 C11

67. KEITHAN, E. F. Cacao in Costa Rica. Econ. Geog. 16:79-86, illus. Jan. 1940. 278.8 Ec7

Abridged in Trop. Agr. 18:203-205. Oct. 1941. 26 T754

68. MANGEL N., R. Cultivo y beneficio del cacao. C. N. A. Rev. del Centro Natl. de Agr. (Costa Rica) 1:90-95, 144-147, 169-171, 206-213. May-Oct. 1936. 8 C62

General instructions for Costa Rica.

69. SAMAYOA MENDEZ, O. El cacao y su cultivo. Guatemala. Sec. de Agr. Rev. Agr. 17:325-338. Sept. 1940. 8 G934

Account of cacao culture in Guatemala, including various methods of propagating from seed.

70. STAHEL, G. De herleving der cacao-cultuur. Paramaribo? Departement Landbouwproefstation, Surinam, 1947. 12 p. 68.3 St1H

Outlook for improved production through clones imported from Trinidad for propagation and distribution.

71. TROYO CH., A. Algunos datos acerca del cacao. Rev. de Agr. [Costa Rica] 15:318, 320-323. July 1943. 8 Es1

72. U. S. INSTITUTE OF INTER-AMERICAN AFFAIRS. FOOD SUPPLY DIV. Abaca, cacao, and the African oil palm in Costa Rica; a special report. [By Vance Rogers.] Washington, 1947. 48 p., illus. 173.3 In83 Ab

Section on cacao based chiefly on conditions on United Fruit Company plantations.

#### West Indies

73. CRADWICK, W. Cocoa. Jamaica Agr. Soc. J. 25:52-57. Feb. 1921. 8 J223

Lecture delivered at course for agricultural instructors.

74. DOMINICA. DEPT. OF AGRICULTURE. Report, 1946. Roseau, 1947. 30 p. 102 W523

Includes brief notes on cacao selection and propagation. Earlier reports occasionally mention cacao.

75. DRAKE, A. Cultivo del cacao. Rev. de Agr. [Cuba] 12:44-45. Jan. 1931. 8 Ag88Re

76. JAMAICA. DEPT. OF AGRICULTURE. Annual report for the year ended 31st March, 1948. Kingston, 1950. 23 p. 8 J227A

Reports (p. 10) propagation work and laying out of cultural experiments at Orange River Agricultural Station.

Some earlier reports give similar administrative information.

77. LEGRAND, J. F. Plantas útiles de Puerto Rico. El cacao. Rev. de Agr. de Puerto Rico 6(5):7-16, illus. May 1921. 8 R325

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302. GIBBERD, A. V. Experiments in the regeneration of cacao farms in the Agege district. *West African Agr. Conf. 3. Papers 1 (Nigeria):*47-56. 1938. 27 W52
303. LEWIN, C. J. The improvement of quality. *Cocoa in Nigeria. Trop. Agr. [Trinidad]* 2:205. Sept. 1925. 26 T754  
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304. NIGERIA. AGRICULTURAL DEPT. Annual report . . . for the year 1948. Lagos, 1949. 75 p. 24 N563  
Includes brief reports of Nigerian Cocoa Survey (p. 33-37), and other administrative and experimental work dealing with cacao. 1947 report includes data on improvement of quality through grading. 1946 includes tables showing size of beans from 6 selected clones and seasonal variation in bean weight (p. 28). Earlier reports contain similar material.
305. SCHWARZ, L. J. Cocoa in Nigeria. In *Inter-American Economic and Social Council. Documentary material on cacao*, pt. I, p. 139-147. Washington, Pan American Union, 1947. 68.3 In8
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308. WEST AFRICAN CACAO RESEARCH INSTITUTE. Report on a visit to the Eastern Provinces of Nigeria and Southern Cameroons. By J. West. Tafo, Gold Coast, West African Cacao Res. Inst., 1947. 14 p., illus. Ref. 68.3 T12

History of cultivation, the existing native industry, and possibilities for improvement.

#### São Tomé and Príncipe

309. BELLEFROID, V. DE. Note sur la culture du cacao à l'île de San Thomé. B. Agr. du Congo Belge 11:67-73. Mar./June 1920. 24 K83

310. CAMARA, M. DE S. DA, and COUTINHO, D. M. DE F. P. O presente e o futuro das plantações em S. Tomé relatório dos trabalhos efectuados na propriedade de "Água Ize." Lisbon. Inst. Super. de Agron. An. 2: 138-196. 1925. 105.7 L682

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Includes chapters on various types of diseases, insects and other pests, and methods of disease prevention and treatment.

312. SCHWARZ, L. J. Cocoa in São Tomé and Príncipe. U. S. Bur. Foreign and Dom. Com. Trade Prom. Ser. 138, 27 p., illus. 1932. 157.54 T67

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313. URICH, F. W. San Thomé cacao industry. Trop. Agr. [Trinidad] 5:275-278, illus. Nov. 1928. 26 T754

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314. ZUZARTE CORTESAO, A. F. Culture du cacaoyer (la crise agricole actuelle de la colonie portugaise de S. Tomé e Príncipe). Lisbonne, Ministère des Colonies, 1921. 132 p. 68.3 Z8

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315. BORNEO (BRITISH NORTH). DIRECTOR OF AGRICULTURE. Annual report for 1938. Sandakan, 1939. 16 p. 22.5 B64

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Report for 1946 includes brief notes on diseases of cacao, p. D8-D9. Earlier reports occasionally mention cacao.

318. CHEESMAN, E. E. Rapport sur les possibilités de culture du cacaoyer en Malaisie, à Sarawak et dans le Nord Bornéo, 1948. Agron. Trop. 3:639-640. Nov./Dec. 1948. 26 Ag86

Resume of conclusions of his Report . . . (item 319).

319. CHEESMAN, E. E. Report on potentialities for the cultivation of cocoa in Malaya, Sarawak, and North Borneo. Malayan Agr. J. 31:222-250. Oct. 1948. 22.5 F312

Consists of the sections relevant to the Federation of Malaya of the report under the above title (item 318).

Contents: Pt. 2, Summary of conclusions; Pt. 3, Malaya; Pt. 6, The supply of planting material.

"Implementation of the recommendations of the Cheesman report [extracts]," by A. E. S. McIntosh, p. 247-250.

320. CHEESMAN, E. E. Report on the potentialities for the cultivation of cocoa in Malaya, Sarawak, and North Borneo. Gt. Brit. Colon. Off. Colon. 230, 44 p. 1948. 68.3 C41

Includes evaluation of both natural and economic factors bearing on suitability of each country for cacao culture, and a discussion of possible supplies of planting material. Appendix B consists of reports on diseases and insects associated with cacao in Malaya, by A. Thompson, A. Johnston, and H. T. Pagden.

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Suggestions for improvement and modernization of plantations.

322. DUARTE, C. Note sur les cacaos de Timor. B. Agr. du Congo Belge 21:985-987. Sept. 1930. 24 K83

Brief history of cacao culture in Timor, and characteristics of the types of cacao grown there.

323. FFRENCH-MULLEN, M. D. Summary of a preliminary survey of existing cacao in the Northern District, Fiji. Fiji. Dept. Agr. Agr. J. 15:8-9. Mar. 1944. 25 F47Ag

Survey of plantings surviving from plantings made between 1900 and 1912 and abandoned since 1912.

324. GILLET, D. Réport to Cadbury Bros. Ltd., Bournville, on the suitability for cocoa growing of the Territories of Malaya, Sarawak, and British North Borneo. Dec. 1947-Mar. 1948. [n. p., 1948?] 24 p., illus., maps. 68.3 G41

Considers climate, topography, soils, and population of each area with respect to suitability for cacao growing. Appendix gives average monthly rainfall in Sarawak, 7 stations in North Borneo, and 53 stations in Malaya.

325. JACK, H. W. Cocoa. Fiji Dept. Agr. Agr. J. 8:45-46. 1936. 25 F47Ag

Possibilities for cacao culture in Fiji.

326. RIECK, M. Mahr criollo. More criollo. In Gordian. Essays on Cacao, Cocoa, and Choc., p. 180-182. Hamburg, 1925. 68.8 G65A

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Reprinted from Gordian, no. 690.

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327. TAMMES, P. M. L. Mogelijkheden voor de cacao-cultuur in Oost-Indonesië. Tijdschr. v. Econ. en Sociale Geog. 40:144-145. July 15, 1949. 280.8 T44

Need for new cacao-producing areas, beginnings and plans for the culture in Celebes, Malacca, and British North Borneo.

#### Malaya

328. FAULKNER, O. T., and MILSUM, J. N. Cacao, an introductory note. Malayan Agr. J. 26:20-26, illus. Ref. Jan. 1938. 22.5 F312

Preliminary report of a small-scale trial at the Central Experiment Station, Serdang, F. M. S.

329. FEDERATED MALAY STATES. DEPT. OF AGRICULTURE. Annual report, 1948. Kuala Lumpur, 1949. 79 p. 22.5 F31R

Includes reports of various divisions on steps taken to carry out recommendations made by Professor Cheesman for establishing cacao as a crop. Notes on insect pests, p. 45; diseases, p. 52-53.

Some earlier reports contain brief reports on work with cacao at Central Experiment Station, Serdang.

330. GRAY, H. F. W. Cocoa—a revenue producing cover under rubber. Planter 25:109-115. Apr. 1949. 78.8 P69

Suggestions for its establishment in Malaya as a companion crop for rubber.

331. HARTLEY, C. W. S. Investigations into the growing of cocoa in Malaya. Malayan Agr. J. 32:59-69, illus. Apr. 1949. 22.5 F312

Account of Department of Agriculture experiments and establishment of trial blocks on estates.

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332. STEWART, A. Cocoa experiment. Planter 25:276-279. Sept. 1949. 78.8 P69

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334. COOLHAAS, C. Zijn er mogelijkheden voor het planten van andere gewassen den de thans in Oost-Java gecultiveerde? *Bergcultures* 15:1252-1259. Sept. 13, 1941. 22.5 B45

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335. EBES, K. De mogelijkheden voor de cacao-cultuur in Indonesië. *Bergcultures* 18:233-237. Ref. June 16, 1949. 22.5 B45

Possibilities for cacao culture in Indonesia, with special reference to Java.

See also Item 337.

336. GIESBERGER, G. Cacao-cultuur op Sumatra's oostkust. *Bergcultures* 18:479, 481, 483, 485. Nov. 16, 1949. 22.5 B45

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Comments on article of same title by Ebes (Item 335). Supplementary note by Ebes on p. 283.

338. HAAN, J. T. DE. Korte gegevens betreffende de cacao-cultuur. *Arch. v. Koffiecult. Nederland-Indië*. 7:1-74. Dec. 1933. 68.28 Ar2

Discusses culture, selection, preparation, diseases, and pests.

339. HALL, C. J. J. VAN. De herleving van de cacao-cultuur in Ned.-Indië en de invoer van cacao-varieteiten uit andere landen. *Amsterdam Kolon. Inst., Afd. Handelsmuseum. Ber.* 58, 9 p. 1931. 503 Am82B

The revival of cacao culture in the Netherlands Indies and the importation of cacao varieties from other lands.

340. KINDT, L. Beschouwingen over cacao. *Bergcultures* 7:106-107. Jan. 28, 1933. 22.5 B45

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341. MACGILLAVRY, D. Dertig jaar cacao-cultuur. *Bergcultures* 7:742-747. July 1, 1933. 22.5 B45

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342. OCHSE, J. J. The cacao industry of Java and Surinam. *Cacao Inform. B.* 1(8):1-2. June 1948. 68.38 C11

343. PAERELS, J. J. Overzicht over de voornaamste ziekten en plagen van den cacao-boom op Java. *Tijdschr. over Plantenziekten* 30:51-61. 1924. 464.8 T44

A survey of diseases and pests of cacao in Java, grouped according to the part of the plant affected.

344. ROEPKE, W. Cacao. Ed. 2. Haarlem, Tjeenk Willink, 1922. 160 p., illus. (Dekker, J., ed. *Onze Kolon. Landb.* 11) 38 D36

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347. WYNSCHENK DOM, C. A. Enkele korte mededeelingen betreffende de cacao-cultuur. *Bergcultures* 13:178-179. Feb. 11, 1939. 22.5 B45

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353. GALANG, F. G. Cultural directions for cacao (*Theobroma cacao*). P. I. Dept. Agr. & Nat. Resources. Bur. Agr. C. 125, 7 p. Sept. 15, 1921. 25 P54C

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355. PAGUIRIGAN, D. Outlines of Philippine crops. *Agr.-Com.-Indus. Life* 11(8):26-27, 38. Aug. 1949. 25 Ag8

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371. NICHOLAS, H., and BECKETT, W. H. Mulching trial with cacao on Kumasi and Asuansi Experiment Stations. Gold Coast Dept. Agr. B. 16:141-146. 1929. 24 G56B

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379. ALAMO, F. DE P. Acerca de la oportunidad de practicar le poda del cacaotero. Asoc. Venezolana de Prod. de Cacao. B. 1(4):20-23. Apr. 1936. 68.38 As5

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Principles of pruning for tree shaping and instruments to be used.

382. HARTLEY, C. Wondbescherming bij cacao. Indische Culturen (Teysmannia) 10:740-745. Ref. Dec. 15, 1925. 26 In2

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## THE CACAO PLANT

## Taxonomy and Varieties

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## Hemiptera

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1009. MAYNÉ, R., and GHESQUIÈRE, J. Hémiptères nuisibles aux végétaux du Congo Belge. Ann. de Gembleux 40:1-41, illus. Jan. 1934. 13 G28  
Index refers to 66 species attacking cacao.
1010. NICOL, J. M. The present position of research on capsid pests of cacao in West Africa. Cacao Res. Conf. Rpt. & Proc. 1945:111-113. Ref. 1945. 68.39 C64
1011. SQUIRE, F. A. On the economic importance of the Capsidae in the Guinean Region. Rev. de Ent. 18:219-247. Ref. Aug. 1947. 421 R326  
Deals chiefly with five species attacking cacao: Sahlbergella singularis, Bryocoropsis laticollis, Distantiella theobroma, Helopeltis bergrothi, and Odoniella reuteri. Discusses distribution, nature of damage, bionomics, seasonal fluctuations, resistance factors, alternative host plants, natural enemies, and possible control measures.

## Helopeltis

1012. BETREM, J. G. Derrispoeder als middel ter bestrijding van de Helopeltis in de cacaoocultuur. Bergcultures 14:134-154. Feb. 3, 1940. 22.5 B45  
Reports large-scale field experiments in use of derris powder against Helopeltis attacking cacao in Java.
1013. BETREM, J. G. Kort verslag van een proef over bestrijding van Helopeltis in cacao door middel van verstuiven van derrispoeder. Bergcultures 12:1790-1796, illus. Dec. 24, 1938. 22.5 B45
1014. BETREM, J. G., and OSTENDORF, F. W. Resultaten van Helopeltis-vangproef MJ 373 over de periode Januari 1935 tot en met November 1936. Bergcultures 11:835-840. June 5, 1937. 22.5 B45  
Helopeltis-catching tests at Geta cacao plantation.
1015. BETREM, J. G., and OSTENDORF, F. W. Twee Helopeltis-vangproeven bij cacao op de onderneming Geta. Bergcultures 10:1456-1459. Ref. Nov. 21, 1936. 22.5 B45  
Helopeltis-catching tests.
1016. BETREM, J. G. Verdere gegevens omtrent de bestrijding van de Helopeltis door middel van derrispoeder. Bergcultures 15:238-249. Mar. 1, 1941. 22.5 B45  
Use of derris against Helopeltis on cacao in Java.
1017. GIESBERGER, G. Bestrijding van Helopeltis bij cacao met loodarsenaat. Arch. v. Koffiecult. Nederland. Indië 14:100-102. Jan. 1940. 68.28 Ar2  
Use of lead arsenate to control Helopeltis on cacao.
1018. GIESBERGER, G. Eenige waarnemingen over de aantasting van cacao door Helopeltis. Arch. v. Koffiecult. Nederland. Indië 14:44-99. Jan. 1940. 68.28 Ar2  
Notes on Helopeltis attacking cacao.
1019. JONG, J. K. DE. Helopeltis in cacaotuin. Bergcultures 8:658-667. July 14, 1934. 22.5 B45
1020. JONG, J. K. DE. Helopeltis in de cacao. Bergcultures 6:523-528. May 21, 1932. 22.5 B45
1021. LEVERT, P. Eenige gegevens over Helopeltis-aantasting bij cacao. Bergcultures 13:1290-1300. Sept. 16, 1939. 22.5 B45  
Discusses influence of black ants (Dolichoderus bituberculatus) and lice, influence of Plagioteles longipes, and influence of sap composition on the extent of Helopeltis infestation.
1022. LEVERT, P. H. Het mier-luis-complex bij cacao en verdere gegevens over Helopeltis-aantasting. Arch. v. Koffiecult. Nederland. Indië 14:1-43. Ref. Jan. 1940. 68.28 Ar2  
Discusses the ant-mealybug complex in cacao plantings and control of Helopeltis.

1023. MENZEL, R. Over de in Helopeltis parasiteerende sluipwesp. Thee 5:115-120, illus. Dec. 1924. 68.18 T34  
A species of Euphorus found on Helopeltis on tea and cacao in Java.
1024. MENZEL, R. Over spinnen- en sluipwespen-cocons en een parasiet der cacao-Helopeltis. Thee 5:72-75, illus. Sept. 1924. 68.18 T34  
Includes notes on a parasite of Helopeltis, probably of the genus Euphorus.
1025. MEYER, A. H. Derrisbestuiving ter bestrijding van Helopeltis. Bergcultures 13:1487. Oct. 21, 1939. 22.5 B45
1026. MEYER, A. H. Het Helopeltisvraagstuk in de cacao. Bergcultures 11:622-635. May 1, 1937. 22.5 B45  
Discussion of 16 questions dealing with the Helopeltis problem in Java.
1027. MEYER, A. H. Twee Helopeltis-vangproeven op de onderneming Getas. Bergcultures 11:150-151. Jan. 30, 1937. 22.5 B45  
Helopeltis-catching tests on the Geta Estate.
1028. MILLER, N. C. E. A new Malayan species of Helopeltis (Rhynchota, Capsidae). B. Ent. Res. 30:343-344, illus. Nov. 1939. 421 B87  
Helopeltis theobromae, n. sp., on cacao and plants of Bixa orellana growing nearby in the Federated Malay States.
1029. MOHR, J. C. VAN DE M. Au sujet du rôle de certaines fourmis dans les plantations coloniales. B. Agr. du Congo Belge 18:97-106, illus. Mar. 1927. 24 K83  
Includes account of use of black ants, Dolichoderus bituberculatus, in control of Helopeltis on cacao in Java.
1030. PEELLEN, J. R. C. Enkele nabetrachtingen over het ter vergadering der Plantersvereniging Semarang-Kedoe behandelde agendapunt: "Bestrijding van Helopeltis in cacao." Bergcultures 11:878-886. June 12, 1937. 22.5 B45  
Discusses trapping and other control methods.
1031. UPHOF, J. C. T. El hemiptero Helopeltis del cacahual y las hormigas que lo ahuyentan. Hacienda 39:11, illus. Jan. 1944. 6 H11  
Natural control of Helopeltis antonii by Dolichoderus bituberculatus, and dependence of the latter on Pseudococcus crotonis, in Java cocoa plantations.

## Sahlbergella

1032. BOX, H. E. The cacao pest situation in West Africa and the Cameroons, with special reference to Sahlbergella singularis Hagl. and S. theobroma Dist. (Hemiptera: Capsidae). Report upon a visit to French Togo, Dahomey, Nigeria and the Cameroons during the dry season, December, 1943 to March, 1944. West African Cacao Res. Inst. Tech. B. 1, 69 p. Ref. May 1944. 68.39 T12  
Abstract in Rev. Appl. Ent. 33:195-196. 1945.
1033. \*BOX, H. E. The Sahlbergella menace to Gold Coast cocoa. West African Cacao Res. Inst. Memo. 9, 8 p. 1944.  
Abstract in Rev. Appl. Ent., Ser. A, 32:287. Aug. 1944. 421 R325  
Reviewed in B. Agr. du Congo Belge 37:205-208. Mar. 1946. 24 K83
1034. BREDO, H. J. Contribution à l'étude de Sahlbergella singularis Hagl. B. Agr. du Congo Belge 22:81-98, illus. Ref. Mar. 1931. 24 K83  
Biology and control measures.
1035. COTTERELL, G. S. Life history and habits, etc., of Sahlbergella singularis Hagl. and Sahlbergella theobroma Dist. Gold Coast Dept. Agr. B. 7:40-43, illus. 1924. 24 G24B  
Abstract of Bulletin 3, Preliminary study of the life-history and habits of Sahlbergella singularis Hagl. and Sahlbergella theobroma Dist.
1036. COTTERELL, G. S. A new parasite of Sahlbergella singularis Hagl. Gold Coast Dept. Agr. B. 7:44-46, illus. 1927. 24 G56B  
Euphorus sahlbergellae Wilkinson.
1037. COTTERELL, G. S. The occurrence of Sahlbergella spp. and other pests of cacao in Fernando Póo, San Thomé and the Belgian Congo. Gold Coast Dept. Agr. B. 20:162-171. Ref. 24 G56B
1038. COTTERELL, G. S. Preliminary study of the life-history and habits of Sahlbergella singularis Hagl. and Sahlbergella theobroma Dist., attacking cocoa on the Gold Coast, with suggested control measures. Gold Coast Dept. Agr. B. 3, 26 p., illus. June 1926. 24 G56B

\*Not examined.

1039. COTTERELL, G. S. Report on the occurrence of Sahlbergella spp. and other insect pests of cacao in Fernando Póo, San Thomé and the Belgian Congo. Gold Coast. Dept. Agr. B. 22:112-145, illus. Ref. 1930. 24 G56B

Includes rainfall tables for Fernando Póo, San Thomé, and Belgian Congo.

1040. FOURNEAU, L. Le Sahlbergella du cacaoyer a la Côte d'Ivoire. Rev. de Bot. Appl. et d'Agr. Colon. 8: 509-510. July 1928. 26 R323

Sahlbergella singularis.

1041. POSNETTE, A. F. Resistance of Theobroma cacao to Sahlbergella spp. on the Gold Coast. B. Ent. Res. 34:159-162. Ref. June 1943. 421 B87

Under experimental conditions neither Sahlbergella theobroma nor Sahlbergella singularis exercised any constant choice between shoots from young and old trees.

1042. WILKINSON, D. S. On two new parasites from West Africa bred from the cacao barksapper (Sahlbergella). B. Ent. Res. 17:309-311, illus. Mar. 1927. 421 B87

Euphorus sahlbergellae, n. sp., and Mesochorus melanothorax, n. sp.

#### Homoptera

1043. BALACHOWSKY, A. Contribution à l'étude de la faune du Congo Belge. Diapines nuisibles au caféier et au cacaoyer. Rev. de Path. Veg. et d'Ent. Agr. de France 16:141-145, illus. Ref. Apr./May 1929. 464.9 S01

Describes Aspidiotus gracilis sp. nov., found on cacao leaves.

1044. BALLOU, H. A. Mealy-bug on cacao. Agr. News [Barbadoes] 21:74. Mar. 4, 1922. 8 W525A

Reports collection of Pseudococcus citri, P. P. bromeliae, and Philephedra broadwayi on cacao in Grenada.

1045. CAMPOS R., F. Algo sobre las pestes reinantes del cacao. Guayaquil, Ecuador. Col. Nac. Vicente Rocafuerte. Rev. 14(46/47):79-90. 1932. 516 G93

Discusses and names Ormenis albigyna, n. sp., supposed carrier of witches broom disease, and considers briefly other insects injurious to cacao.

1046. HAMBLETON, E. J. Studies of hypogeic mealybugs. Rev. de Ent. 17:1-77, illus. Aug. 1946. 421 R326

Includes descriptions of the following new species found on roots of Theobroma cacao: Morrisonella globocula, from Trinidad, M. theobromae, from Ecuador, and Ripersiella ornata, from Trinidad.

1047. PICKLES, A. Scale insects of cocoa. Agr. Soc. Trinidad & Tobago. Proc. 41:579-584. Sept. 1941. 8 T73

Howardia biclavus and Asterolecanium pustulans.

1048. SEABRA, A. F. DE. Description d'un psyllidae ravageur des feuilles et des jeunes fruits des cacaoyers. Soc. Portug. des Sci. Nat. Mém., Ser. Zool. 2:97-100, illus. 1922. 506 S01M

Not identified.

1049. SEABRA, A. F. DE. Note sur l'habitat de l'Aspidiotus articulatus a S. Thomé. Soc. Portug. des Sci. Nat. Mém., Ser. Zool., 2:116-118. 1922. 506 S01M

On cacao and other cultivated plants.

1050. SILVA, P. Mais um Membracideo nocivo ao cacaueiro. Bahia Rur. 6(62):7, illus. Ref. Jan. 1939. 9.2 B142

Hoplophora porosa, Wlk. (Hoplophorion pertusa, Germ.)

1051. SILVA, P. Sobre a espécie de Phrictus (Hom., Fulgoridae), atacando o cacaueiro na Bafa. Rev. de Ent. 16:267-268. Aug. 1945. 421 R326

Phrictus diadema, not Phrictus quinquepartitus.

1052. STRICKLAND, A. H. Coccids attacking cacao (Theobroma cacao, L.), in West Africa, with descriptions of five new species. B. Ent. Res. 38:497-523, illus. Ref. Dec. 1947. 421 B87

Coccidel la spelaea, Tylococcus westwoodi, Formicococcus tafoensis, Farinococcus loranthi, Newsteadia wacri, n. spp.

1053. VAYSSIÈRE, P. Trois nouveaux Stictococcus (Hem. Coccidae). Soc. Ent. France. B. 40:282-287, illus. Dec. 26, 1935. 420 F84B

Includes Stictococcus aliberti, n. sp., from cacao in French Togoland.

1054. WILLIAMS, C. B. A frogopper damaging cacao in Panama. B. Ent. Res. 13:271-274, illus. Jan. 1923. 421 B87

Clastoptera theobromae, Williams, sp. n

1055. CARTER, W. Insect notes from South America with special reference to Pseudococcus brevipennis and mealybug wilt [of pineapple]. J. Econ. Ent. 42:761-766. Oct. 1949. 421 J822

Includes report on test of effect of mealybugs on cacao plants in an area free of virus disease.

1056. HALL, W. J. The identity of a mealybug vector of "swollen shoot" virus disease of cacao in West Africa. B. Ent. Res. 36:305-313, illus. Nov. 1945. 421 B87

Compares Pseudococcus exitiabilis and Pseudococcus njalensis.

1057. LAING, F. A new injurious mealy-bug from the Gold Coast. B. Ent. Res. 35:91-93, illus. Apr. 1944. 421 B87

Pseudococcus exitiabilis, n. sp., is reported as one of the vectors of swollen-shoot virus disease of cacao.

1058. NICOL, J., OWEN, H., and STRICKLAND, A. H. Biological control of the mealybug vectors of swollen shoot virus of cacao. Nature [London] 165:490. Mar. 25, 1950. 472 N21

Experiments using Aspergillus spp. against Pseudococcus under laboratory conditions.

1059. POSNETTE, A. F., and STRICKLAND, A. H. Parasitism of the mealybug vectors of swollen-shoot of cacao. Nature [London] 163:105-106. Ref. Jan. 15, 1949. 472 N21

Pseudococcus njalensis attacked by Anagyrus spp.

1060. RISBEC, J. Les parasites des Pseudococcus du cacaoyer, vecteurs du swollen shoot en Côte d'Ivoire. Agron. Trop. 4:578-581. Nov./Dec. 1949. 26 Ag86

Leptomastix longipennis, Anagyrus subproximus, Achrysoptophagus aegyptiacus, Coccophoctonus abengourou n. sp., and Thysanus sp.

1061. SQUIRE, F. A. Entomological aspects of 'swollen shoot' of cacao. Nature [London] 162:743. Nov. 6, 1948. 472 N21

Suggests biological methods to control Pseudococcus species believed to be transmitters of the virus.

#### Hymenoptera

1062. BONDAR, G. A formiga caçarema nos cacauais. Bahia Rur. 1:346-348, illus. July 1934. 9.2 B142

Azteca chartifex.

1063. BONDAR, G. A formiga de enxerto, praga dos cacaues na Bahia. Campo [Rio de Janeiro] 1(3):50-52, illus. Mar. 1930. 9.2 C15

Damage by nests of Azteca chartifex and epiphitic plants associated with these nests on limbs and trunks of cacao trees.

1064. BONDAR, G. A formiga saúva, praga dos cacaues. Correio Agr. 8:29-32. Feb. 1930. 9.2 C812

Atta cephalotes.

1065. CALLAN, E. M. A note on Phanuropsis semiflaviventris Girault (Hym., Scelionidae), an egg-parasite of cacao stink-bugs [Mecistorhinus spp.]. Roy. Ent. Soc., London. Proc. Ser. A:Gen. Ent. 19:48-49. June 22, 1944. 420 L84Pa

In Trinidad.

1066. PLANK, H. K. La hormiga arriera [Atta spp.], los medios para combatirla en las huertas de cacao del Ecuador. Asoc. de Agr. del Ecuador B. 1(3):37-45. May 1921. 9.5 As5B

Translated from English by E. Molestina O.

1067. SILVA, P. A "formiga de enxerto" [Azteca paraensis var. bondari]. Inst. de Cacau da Bahia. B. de Divulgação 1, 21 p., illus. 1945. 63.39 In7

Includes control methods on cacao.

1068. SILVA, P., and BARBOSA, M. DA R. O Instituto de Cacau e o combate á formiga de enxerto [Azteca paraensis bondari]. Bahia Rur. 16(7):24-26, 23. July 1948. 9.2 B142

1069. URICH, F. W. Ants in relation to agriculture. Agr. Soc. Trinidad & Tobago. Proc. 23:227-235. June 1923. 8 T73

Cacao fields, p. 231-233.

#### Isoptera

1070. PATTERSON, W. H. Notes on termites in the Gold Coast. Gold Coast Dept. Agr. B. 7:35-39. 1927. 24 G56B

Termites attacking cacao, p. 37.

1071. SEABRA, A. F. DE. Quelques observations sur le *Neotermes gestri* F. Silv. et le *Microcerotermes parvus theobromae* Desn. Soc. Portug. des Sci. Nat. Mém., Sér. Zool., 2:24-28, illus. 1922. 506 SolM  
Termites attacking cacao in Sao Thomé.
1072. SEABRA, A. F. DE. Les termites des plantations de cacaoyers. Étude agricole. Soc. Portug. des Sci. Nat. Mém., Sér. Zool., 2:78-87, illus. 1922. 506 SolM

## Lepidoptera

1073. BONDAR, G. Larve des fruits du cacao, *Marmara izortha* Meyr. Off. Internatl. du Cacao et Choc. B. Off. 7:353-355. Nov. 1937. 68.38 Of2  
French and English.
1074. BONDAR, G. Lepidopteros nocivos ao cacaueiro no Estado da Bahia. *Correio Agr.* 2:260-265, illus. Sept. 1924. 9.2 C812  
*Melanchroia mecinana*; *Sylepta prorogata*; *Callicore meridionales*; *Myelosis duplipunctella*, and several unidentified species.
1075. BONDAR, G. Traça das frutas de cacau, *Marmara izortha* Meyr. Campo [Rio de Janeiro] 8(90): 11-12, illus. June 1937. 9.2 C15
1076. HEURN, W. C. VAN. Waarnemingen betreffende een parasiet van het cacao-motje. *Ent. Ber.* 6:26-27. Nov. 1921. 420 N38B  
*Acrocercops cramerella* parasitized by an Ichneumonid of the genus *Mesostenus*.
1077. NOYES, W. M. Moth pests in cocoa and confectionery. *B. Ent. Res.* 21:77-121. Ref. Mar. 1930. 421 B87  
Discusses the moths concerned, various recommended methods of control, tests of methods, and recommendations.
1078. OTANES, F. Q. Notes on a cacao pod borer moth *Acrocercops cramerella* Snell. *Philippine J. Agr.* 7:419-424, illus. Fourth quarter 1936. 25 P543  
Includes suggestions for control.
1079. SILVA, P. Novo registro e o primeiro hospedeiro de *Promasiopoda pinguoides* T. T. (Diptera, Exoristidae) no Brasil. *Rev. de Ent.* 15:153-161, illus. Ref. Aug. 1944. 421 R326  
Host is caterpillar of *Arsenura armida*, a new potential pest of cacao.
1080. SILVA, P., and HEINRICH, C. *Stenomoma decora* Zeller (Lep. Stenomatidae), uma nova praga potencial do cacaueiro na Bafa, Brazil. *Rev. de Ent.* 17:361-374, illus. Ref. Dec. 1946. 421 R326  
English summary.  
On cacao and kapok (*Ceiba pentandra*).

## Ephestia

1081. BONDAR, G. "Controle biológico da traça de cacau [*Ephestia cautella*] pelo *Microbracon hebetor*," por Pedroto Silva, 1947. *Chacaras e Quintais* 77:208. Feb. 15, 1948. 9.2 C34  
Comments on the bulletin mentioned in title (item 1094).
1082. BUXTON, D. A. J. Cocoa moth (*Ephestia elutella*). *Cocoa Res. Conf. Rpt. & Proc.* 1945:156-157. 1945. 68.39 C64
1083. CHABOUSSOU, F. Contribution à l'étude d'*Ephestia elutella* Hübner. *Rev. de Zool. Agr. et Appl.* 36:20-32, 36-48, 81-90, 100-109, 154-158, 184-190, illus. Ref. Feb.-Dec. 1937. 410.9 So12
1084. CIFERRI, R. Una explicación biológica de la práctica del "pintado" del cacao. *Agr.* 3(1/2):37-40. Jan./Apr. 1948. 9.95 Ag83  
Claying of cacao beans as preventive of *Ephestia infestation*, and possibility of employing inert dusts for protection of stored beans.
1085. DEHUT, M. V. Produits susceptibles d'être employés dans la lutte contre la mite du cacao. Off. Internatl. des Fabric. de Choc. et de Cacao. B. Off. 3:111-117. Mar. 1933. 68.38 Of2  
Summaries in English, German, Spanish, and Italian. Chiefly on the use of fumigants in warehouses.
1086. FERNANDO, M. The sources of *Ephestia infestation* of stored cacao in Ceylon. *Trop. Agr.* [Ceylon] 92:141-155. Ref. Mar. 1939. 26 T751
1087. FROGGATT, J. L. *Ephestia cautella* Wlk. moth pest of stored cocoa beans and copra. *New Guinea Agr. Gaz.* 3(2):23. Dec. 1937. 23 N453  
Infestation of cacao beans attributed to storing near copra.

1088. GOLDING, F. D. Two new methods of trapping the cacao moth (*Ephestia cautella*). *B. Ent. Res.* 32:123-132. Ref. Aug. 1941. 421 B87  
For use in warehouses.
1089. JOINT COMMITTEE ON CACAO INFESTATION. Report. Off. Internatl. des Fabric. de Choc. et Cacao. B. Off. 2:319-326. July 1932. 68.38 Of2  
Joint committee of Manufacturing Confectioners' Alliance and Cocoa Association of London.  
Report on sources of infestation in cacao beans, with special reference to *Ephestia elutella*, and preventive measures.
1090. KNAPP, A. W. The cacao moth. Off. Internatl. des Fabric. de Choc. et Cacao. B. Off. 2:375-380. Oct. 1932. 68.28 Of2  
Summaries in French, German, Spanish, Italian, and Portuguese.  
Discusses the desirability of fumigation of cacao warehouses to combat *Ephestia elutella*.
1091. NICOL, J. M. *Ephestia elutella* and *E. cautella* infesting cacao. *Gt. Brit. Imp. Inst. B.* 33:171-174. Ref. July 1935. 26 G79  
Identification of species in stored cacao.
1092. NICOL, J. M. Insect infestation of cacao beans in the producing countries, with a note on the extent to which *Ephestia elutella* Hub. and *E. cautella* Wlk. establish themselves in warehouses and factories in Great Britain. *Gt. Brit. Imp. Inst. B.* 39:17-25. Ref. Jan./Mar. 1941. 26 G79
1093. RANK, J. Die cacao-motte (*Ephestia elutella*). Off. Internatl. des Fabric. de Choc. et Cacao. B. Off. 3: 285-287. June 1933. 68.38 Of2  
Summaries in French, English, Spanish, and Italian. Suggestions for control of cacao moth in warehouses.
1094. SILVA, P. Controle biológico da "traça do cacau" [*Ephestia cautella*] pelo *Microbracon hebetor* (Say). *Inst. de Cacao da Bahia. B. Téc.* 7, 39 p., illus. 1947. 68.39 B14B  
English summary, p. 30-31.  
For comments on this bulletin by G. Bondar, see item 1081.
1095. SILVA, P. Esclarecendo comentários sobre o *Microbracon hebetor* (Say) e a "traça do cacau" [*Ephestia cautella*]. *Bahia Rur.* 16(8):31. Aug. 1948. 9.2 B142  
Reply to comments by G. Bondar on the preceding item.
1096. VAYSSIERE, P. Quelques conseils pour lutter efficacement contre la pyrale du cacao (*Ephestia elutella* Hbn). Off. Internatl. des Fabric. de Choc. et Cacao. B. Off. 4:401-408. Nov. 1934. 68.38 Of2  
Summaries in English, German, Spanish, and Italian.
1097. WADSWORTH, R. V. Cacao beans and *Ephestia elutella*. *Trop. Agr.* [Trinidad] 10:97-100. Apr. 1933. 26 T754  
Reports studies on effects of type of bean and of various processing and storage factors on susceptibility to insect attack.

## Orthoptera

1098. BONDAR, G. Os insectos damnios. XXXI. O gafanhoto (locustideo) do cacaueiro. *Meronicidius intermedius*, Brunner. *Chacaras e Quintais*, 29:27-28, illus. Jan. 15, 1924. 9.2 C34

## Thysanoptera

1099. HOOD, J. D. A new Actinothrips (Thysanoptera) from Brazil. *Brooklyn Ent. Soc. B.* 23:147-150, illus. June 1928. 420 B79  
*Actinothrips bondari* sp. n. from dead cacao leaves at Bahia, Brazil.

## Selenothrips

1100. ADAMSON, A. M. Progress report on the introduction of a parasite of the cacao thrips from the Gold Coast to Trinidad. *B. W. I. Trop. Agr.* [Trinidad] 13:62-63. Mar. 1936. Ref. 26 T754  
*Dasyscaphus parvipennis*.
1101. BONDAR, G. Ferrugem do cacáo causada por *Selenothrips rubrocinctus*, Giard, (Heliothrips rubrocinctus, Giard). *Bahia Rur.* 1:427-428. Aug. 1934. 9.2 B142
1102. CALLAN, E. M. Natural enemies of the cacao thrips. *B. Ent. Res.* 34:313-321. Ref. Dec. 1943. 421 B87

Reviews previous records of natural enemies of the cacao thrips, *Selenothrips rubrocinctus*, discussing those occurring in Trinidad, with comment on the importance of natural enemies in control.

1103. CALLAN, E. M. Sex ratio affected by host plant. *Nature* [London] 152:162-163. Aug. 7, 1943. 472 N21  
Counts show that proportion of males of *Selenothrips rubrocinctus* is much higher on cashew than on cacao. Significance of phenomenon unknown.

1104. CALLAN, E. M. Thrips resistance in cacao. *Trop. Agr. [Trinidad]* 20:127-135. Ref. July 1943. 26 T754

*Selenothrips rubrocinctus*.

1105. COTTERELL, G. S. A new parasite of *Heliothrips rubrocincta*. *Gold Coast Dept. Agr. B.* 7:47-48, illus. 1927. 24 G24B

Parasite later identified as *Dasycaus parvipennis*.

1106. COTTERELL, G. S. The red banded cacao thrips, *Heliothrips rubrocinctus*, Giard. *Gold Coast Dept. Agr. B.* 13:94-99, illus. 1928. Ref. 24 G56B

1107. COTTERELL, G. S. Report on the collection and despatch to Trinidad of the parasite *Dasycaus parvipennis*. *Gold Coast Farmer* 4:172-174. Jan. 1936. 24 G563

For control of *Selenothrips rubrocinctus*.

1108. DARLING, H. S. The effect of light on the incidence of cacao thrips. *Trop. Agr. [Trinidad]* 19:151-162. Ref. Aug. 1942. 26 T754

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## Harvesting and Primary Processing

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1141. LILIENTHAL, O. A. VON. Pesquisas em torno da fermentação do cacau. *Bahia, Topografia naval*, 1939. 34 p., illus. 68.3 L62  
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1172. BIRCH, H. F. Changes in the nitrogenous components of *Forastero* cacao during fermentation. Proteins and protein-decomposition products. *Imp. Col. Trop. Agr. [Trinidad] Cacao Res. Ann. Rpt. (1940)*10:22-33. Ref. 1941. 68.39 C11

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1175. BUSSE, W. Die versuche und vorschläge von F. L. Stevens zur kakao-aufbereitung. *Tropenpflanzer* 29:406-409. Oct. 1926. 26 T75

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1179. FONSECA, J. PINHEIRO DA. Fermentação do cacão. *Brazil. Min. da Agr., Indus., e Com. B.* 18:789-805. June 1929. 9.2 Ag83

Includes table showing changes in composition of cacao beans caused by fermentation.

1180. FORSYTH, W. G. C. A method for studying the chemistry of cacao fermentation. *Nature [London]* 164: 25-26. Ref. July 2, 1949. 472 N21

Investigations using technique of chromatography.

1181. HARDY, F. The isoelectric theory. Its application to certain problems of crop products manufacture, and soil fertility. Pt. IV, 3. The fermentation of cacao. *Trop. Agr. [Trinidad]* 2:256-257. Nov. 1925. 26 T754

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1182. HOYNAK, S., POLANSKY, T. S., and STONE, R. W. Microbiological studies of cacao fermentation. *Food Res.* 6:471-479. Ref. Sept. 1941. 389.8 F7322

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1186. KNAPP, A. W., and WADSWORTH, R. V. The distribution of theobromine during the fermentation of cacao. *Soc. Chem. Indus. J. Trans.* 43:124T-126T. Ref. Apr. 25, 1926. 382 M31

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1190. LAYCOCK, T. An investigation of the causes of mouldiness of cured cacao. *Nigeria Agr. Dept. Ann. B.* 7:5-16, illus. Ref. Aug. 1, 1928. 24 N563B

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1191. LILIENFELD-TOAL, O. A. VON. Fortschritte und aufgaben der forschung auf dem gebiete der kakao-aufbereitung. *Off. Internatl. des Fabrik. de Choc. et Cacao. B. Off.* 2:437-443. Nov. 1932. 68.38 Of2

Reviews research on preparation of cacao.

Summaries in French, English, Spanish, Italian, and Portuguese.

1192. LILIENFELD-TOAL, O. A. VON. Über kakao-hefen, ein beitrug zur kenntnis der biologie der kakao-fermentation. *Tropenpflanzer* 30(2, sup.), 48 p., illus. Ref. Feb. 1927. 26 T75

Discusses literature and reviews methods used in different parts of the world, with studies on predominating yeast flora at different stages of fermentation.

1193. LITERATURE survey on cacao curing. *Cacao Inform. B.* 1(10):1-2. 1948. 68.38 C11

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1196. PORTÈRES, R. Amélioration des graines de cacao par la fermentation. *Agron. Colon.* 18:275-279. Sept. 1929. 26 Ag812

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1199. STANER, P. La fermentation du cacao. *Agr. et Élevage* 5:97-98. June 13, 1931. 26 Ag84

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Contents of II: 1, De biologie der cacaogisten (The biology of cacao yeasts), by A. Steinmann; 2, Cacao-bereiding volgens de methode van Stevens (The curing of cacao by the method of Stevens), by J. T. de Haan; 3, Enkele proeven om cacao te fermenteeren door toevoeging van ragi (The fermentation of cocoa by adding ragi), by J. T. de Haan.

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1202. STEINMANN, A. Over de cacao-fermentatie op Java. Bergcultures 1:1097-1109. Mar. 19, 1927. 22.5 B45
1203. STEVENS, F. L. Regarding the curing of cacao. Trinidad & Tobago. Dept. Agr. B. 21:27-35. 1925. 8 T732B  
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Reports experiments on cacao fermentation at University of Illinois.
1204. TISSOT, P. La fermentation du cacao. Rev. de Bot. Appl. et d'Agr. Trop. 16:264-276. Ref. Apr. 1936. 26 R323  
A review of published work.
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