

a greater quantity of food does not solve a problem if at the same time the population increase is such that its diet is maintained at an inadequate level. Food must be produced by a relatively small portion of the population, leaving the other part free to work in industry, transportation, education, public services, the arts and sciences. A balanced culture may result. When too large a portion of the population concerns itself with agriculture, in order to survive, the culture is unbalanced and an unprogressive culture may result.

PLANT DISEASE RECORDS AT ZAMORANO, HONDURAS, 1950-1952

ALBERT S. MULLER

THE RECORDS OF PLANT DISEASES which follow were made during two successive agricultural years, starting in May 1950, at the Pan American Agricultural School, located in the Río Yeguare Valley, Honduras, altitude 2600 feet.

At this institution a wide variety of crop plants is cultivated all during the year for food and ornamental purposes, for teaching value, or for obtaining information on adaptability in Central America or in localities of similar climate. It has been possible to make continuous observations on reaction to diseases of cultivated plants representing fifty genera.

Some of the records are of importance in that they show that the diseases involved are serious limiting factors in production in the area. Others are of importance for the moment, only because they add to the knowledge of the distribution of plant diseases in Central America. This preliminary survey shows great similarity with plant disease surveys made in El Salvador, Guatemala and Venezuela. Specimens are in the herbarium of the University of Florida.

1. ALLIUM SPP. During rainy periods garlic, leek and onions were damaged by *Alternaria porri* (Ell.) Saw.

2. AMARYLLIS SP. Some beds of Amaryllis were completely infected by mosaic.

3. APIUM GRAVEOLENS. During a rainy period large sections of celery rows rotted due to *Erwinia carotovora* (Jones) Holland.

4. *ARACHIS HYPOGAEA*. Peanut rust, caused by *Puccinia arachidis* Speg. reduced production, especially in the dry season. Leaf spot, due to *Mycosphaerella pinodes* (B. & Br.) Stone, was unimportant.

5. *BETA VULGARIS*. Beet leaf spot, *Cercospora beticola* Sacc. was severe during the wet season only.

6. *BRASSICA* SPP. Only the lower foliage of cabbage, broccoli and cauliflower was damaged by *Alternaria brassicae* (Berk.) Sacc.

7. *CAJANUS CAJAN*. Rust, *Uromyces dolicholi* Arth., caused such severe defoliation of pigeon pea that the seed crop poor. Leaf spot, due to *Cercospora cajani* P. Henn., was common but unimportant, being limited to lower leaves.

8. *CANNA* SP. Rust, *Puccinia cannae* P. Henn., was prevalent, the drying up of the foliage giving an undesirable aspect to the canna beds.

9. *CAPSICUM* SPP. Hot peppers, of several kinds, were severely stunted by mosaic, the incidence of infection often being very high. The variety of sweet pepper, Calwonder, was not appreciably damaged by mosaic, even in adjacent plantings. Old plants suffered defoliation from *Cercospora capsici* H. & W. in wet periods.

10. *CARICA PAPAYA*. Black spotting of older papaya foliage by *Pucciniopsis caricae* (Speg.) Earle was common but never serious. Young foliage was often damaged by *Oidium caricae* Noack. Spoilage of ripening picked fruit was caused by *Colletotrichum papayae* H. Henn.

11. *CITRULLUS VULGARIS*. During wet periods the foliage of maturing watermelon plants was always devastated by *Pseudoperonospora cubensis* (B. & C.) Rostow, and frequently many fruits were lost due to Pythium rot.

12. *CITRUS* SPP. Scab, due to *Sphaceloma fawcettii* (Jenkins) Bit. & Jenk., was found on lemons and limes. Gummosis, *Phytophthora parasitica* Dast., was common in the heavier soils, and more in evidence in the wet season.

13. *COFFEA ARABICA*. The only coffee disease seen in the region was leaf spot, caused by *Cercospora coffeicola* B. & C., showing up on trees exposed to excess sunlight.

14. *CUCUMIS SATIVUS*. Either powdery mildew, *Erysiphe cichoracearum* D. C., or downy mildew, *Pseudoperonospora cu-*

bensis (B. & C.) Rostow, or both of these together shortened the productive period of cucumbers in all plantings observed.

15. CUCURBITA SPP. Powdery mildew, *Erysiphe cichoracearum* D. C., was very severe on summer squashes, but no severe damage was found on any other kind of squash or pumpkin. Downy mildew, *Pseudoperonospora cubensis* (B. & C.) Rostow, appearing on older foliage did not seem to reduce production. Mosaic, when present, stunted plants severely, especially summer and acorn squashes.

16. DAUCUS CAROTA. Foliage blight of carrots, *Alternaria carotae* Ell. & Lang. was very severe in wet periods. Soft rot caused by *Sclerotium rolfsii* Sacc. was found in some plantings and soft rot, due to *Erwinia carotovora* (Jones) Holland in others.

17. DAHLIA SP. Foliage of mature plants became unsightly due to powdery mildew, *Oidium* sp.

18. DOLICHOS LABLAB. The foliage of this valuable green manure plant spotted badly in wet periods, when the plants were setting seed, due to *Cercospora cruenta* Sacc. The infection spread to pods and seeds.

19. EUCHLAENA MEXICANA. Rust, *Puccinia sorghi* Schw., was common on the foliage of this forage plant and also stripe, *Helminthosporium turcicum* Pass.

20. FICUS CARICA. Rust, *Cerotelium fici* (Cast.) Athur, was common on mature fig foliage.

21. FRAGARIA CHILOENSIS. During wet periods much of the fruit of the strawberry was lost by rot, *Botrytis cinerea* Pers. Leaf spot, *Ramularia fragariae* Sacc. was not of importance and not often seen.

22. GLADIOLUS SP. Gladiolus plants, exposed to prolonged wetness, rotted at the soil level due to *Rhizoctonia solani* Kuhn. Mosaic was found infrequently.

23. GOSSYPIUM SPP. Leaf blight, *Septocylindrium areola* (Atk.) B. & C., caused premature defoliation and leaf spot, *Alternaria gossypii* Auct. was common on lower foliage of maturing plants. Mosaic, stunting plants severely, affected only a small percentage of plants.

24. HOLCUS SORGHUM. Losses from smut, *Sphacelotheca sorghi* (Lk.) Clinton, varied from 10% to 80% in 10 varieties, interplanted with Bonita, Honey Drip, Martin, Plainsman and Schrock, which showed no smut. Head smut, *Sphacelotheca*

reiliana (Kuhn) Clinton affected the varieties Shallu, Atlas, Sourless, and Sumac, which were among those affected by common smut. Rust, *Puccinia purpurea* Cooke, reduced the value of sorghums for forage and stripe, *Helminthosporium turcicum* Pass. helped to dry out the foliage prematurely. Leaf spot, *Cercospora sorghi* Ell. & Ev. was severe on the variety Black Amber.

25. IMPATIENS BALSAMINA. Powdery mildew, *Oidium sp.*, caused premature defoliation of balsams.

26. IPOMOEA BATATAS. Some storage losses were found due to *Rhizopus nigricans* Ehren., but in the field no diseases were found except white rust, *Albugo ipomoeae-panduranae* (Sch.) Sw., which was unimportant.

27. JASMINUM OFFICINALE. Jasmine vines were partially defoliated by *Cercospora jasminicola* Chupp & Muller, during a prolonged wet spell.

28. LACTUCA SATIVA. Outer foliage of mature lettuce was sometimes spotted by *Septoria lactucae* Pass. and more often rendered unsightly by *Cercospora longissima* (Trav.) Sacc. without damage to the heads. Soft rot, *Erwinia caratovora* Jones) Holland, ruined many heads during wet periods.

29. LILIUM SPP. A number of kinds of lilies were stunted by mosaic and were lost.

30. LYCOPERSICON ESCULENTUM. Plantings of tomatoes, except in soils never previously growing tomatoes, were nearly all failures due to bacterial wilt, *Phytoplasma solanacearum* (Erw. Smith) Bergey et al. Some resistant lines are under study, selected from Marglobe, a variety which showed less foliage damage from *Phytophthora infestans* (Mont.) de B. than from *Alternaria solani* (E. & M.) J. & G. Some fruit rot caused by *Phytophthora* was seen, but the chief rotting organism in wet spells seems to be a *Pythium* species. Gray mold, *Cladosporium fulvum* Cooke, was a factor in drying up the foliage prematurely in a dry season planting and heavy infestations of the roots by *Heterodera marioni* (Cor.) Good. shortened the production period in some fields. A severe virus disease was sometimes present, reducing production.

31. MANGIFERA INDICA. Young foliage and small fruits were sometimes affected by powdery mildew, *Oidium mangiferae* Berth. and by anthracnose, *Colletotrichum gloeosporioides* Penz. Both caused dropping of large numbers of fruit in early

stages and the latter caused rotting of much fruit picked for ripening. Leaf spot, *Cercospora mangiferae* Koork. was unimportant, causing some leaf drop.

32. MANIHOT ESCULENTA. Leaf spot, *Cercospora henningsii* Allesch., was common on lower foliage, but no important diseases were observed.

33. MUSA SPP. Small banana plantings, partially shaded in mountain pockets, showed considerable sigatoka, *Cercospora musae* Zimm., but produced fruit enough to justify their existence. Plantains were not affected by diseases.

34. ORYZA SATIVA. Rice nearing maturity was attacked by two foliage diseases, one caused by *Cercospora Oryzae* Miy. and the other by *Helminthosporium oryzae* v. B.H. Neither caused serious crop reduction, but seed infection by the latter fungus was so widespread that no part of the crop could be set aside for seed.

35. PERSEA AMERICANA. Anthracnose, *Colletotrichum gloeosporioides* Penz., caused rotting of picked fruit kept for ripening and affected inflorescences and small fruits, causing considerable dropping. As reported by Zentmyer and Popenoe (Pl. Dis. Rptr. 35: 25, 1951) and observed by the writer, trees of many varieties in poorly drained, heavy clay soils die out in two or three years due to *Phytophthora cinnamoni* Rands, while trees in lighter soils continue to grow vigorously.

36. PETUNIA SP. Petunias in flower were defoliated by a leaf spot caused by *Cercospora Petuniae* Chupp & Muller.

37. PHASEOLUS SPP. Extremely poor bean crops were due principally to anthracnose, *Colletotrichum lindemuthianum* (S. & M.) C. & B., with rust *Uromyces phaseoli* var. *typica* Arthur, second in importance, followed by mosaic. In a heavily infected field of red beans, four out of every five pods were infected and valueless due to anthracnose. A field of Tendergreen showed half of the plants ruined by mosaic. A ring spot type of virus disease and a rugose mosaic disease were observed also. Two leaf spot diseases, one due to *Chaetoseptoria wellmani* Stev. and the other due to *Isariopsis griseola* Sacc. were common, but both were late appearing on maturing plants. Bean plants, in low wet places, rotted at the ground level and wilted due, in some cases, to *Sclerotium rolfsii* Sacc. and others to *Rhizoctonia solani* Kuhn.

38. PISUM SATIVUM. Foliage of maturing peas was covered with powdery mildew, *Erysiphe polygoni* D. C., usually, and leaf spot, *Mycosphaerella pinodes* (B. & Bl.) Stone, was common.

39. PRUNUS PERSICA. Mature foliage of peaches was usually affected by rust, *Transschelia pruni-spinosae* (Pers.) Dietel, stimulating defoliation, which does not seem to damage the trees. In a planting of 250 trees of 22 varieties and 162 seedlings at about 6000 feet, the varieties Luttichau and Taber were severely attacked by curl, *Taphrina deformans* (Fcl.) Tul. and four other varieties showed light infection. In a nearby planting of the same varieties, but at 2600 feet, no disease was found. A year later, the leaf curl disease had not spread. Fruit rot, *Sclerotinia cinerea* Schrot, was the cause of much loss in picked fruit. Scab, *Cladosporium carpophilum* Thum, was found in some fruit at the 6000 foot level which is cold and humid.

40. PUNICA GRANATUM. Leaf spot, *Cercospora punicae* Syd., was common on foliage and sometimes discolors maturing fruits.

41. RAPHANUS SATIVUS. White rust of radishes, *Albugo candida* Pers. ex Ktze. was common but unimportant.

42. ROSA SPP. Black spot, *Actinonema rosae* (Lib.) Tr. makes the bushes unsightly for most of the year, causing partial defoliation as well. Leaf spot, *Cercospora rosaeicola* Pass affects some varieties severely, especially wild stock during the wet season. Powdery mildew, *Oidium leucoconium* Desm. appeared severe at times.

43. RUBUS SPP. Two types of raspberries, red and black, were defoliated and retarded in growth by rust, *Gymnoconia interstitialis* (Schl.) Lag.

44. SESAMUM INDICUM. Sesame plants at maturity showed severe foliage blight caused by *Alternaria solani* (E. & M.) J. & Gr.

45. SOLANUM TUBEROSUM. Blight, caused by *Phytophthora infestans* (Mont.) de B., was extremely destructive in the spring plantings of potatoes, but unimportant in plantings whose growing period extended into the dry season towards the end of the year. Leaf spot, *Alternaria solani* (E. & M.) J. & Gr. was not of much consequence in early plantings but was so severe in late plantings as to cause premature defoliation and crop