

THE FIFTIETH ANNIVERSARY OF THE CITRUS EXPERIMENT STATION

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Many avocado growers were among the hundreds of visitors who toured the University of California's Citrus Experiment Station, attended the symposium, and participated otherwise in activities on February 14, 1957 celebrating the 50th anniversary of the Station's establishment at Riverside. They saw and heard how a small laboratory established in 1907 on the slopes of Mt. Rubidoux has developed into a world-renowned center of research in subtropical horticulture, conducting investigations on most of the crops grown in the southern portion of this state.

It was only two years after the Station was moved in 1917 to its present site at the foot of Box Springs Mountains that the first avocado plantings were made. While there had been a limited amount of work in progress on avocados since the early 1920's, the continual increase in avocado plantings and the increasing importance of production problems warranted greatly expanded research efforts at this Station, particularly during the past decade. Presently, most aspects of the production of the avocado crop and certain aspects of post-harvest handling are under investigation in the reasonably well-rounded research program. There are 22 formal research projects and 10 exploratory or miscellaneous items of research in progress on avocados involving 30 academic staff members and 30 highly competent technicians, some from each of the 9 research departments.

These projects were listed and described briefly in the Avocado Society Yearbook of 1956. The research program includes: biological control of avocado pests and certain aspects of chemical control including fumigation of fruits for fruit fly infestation (for use if fruit fly should become established); avocado diseases with especial emphasis on *Phytophthora* root rot; plant nematodes; fertilization, including basic studies of mineral nutrition as well as field studies with the major and minor elements; irrigation; salinity; varieties; rootstocks; breeding; biochemistry of maturation (ripening), pruning; growth regulators; weed control; and the effect of smog.

Some of the significant accomplishments in avocado work at the Station will be mentioned briefly below.

The avocado planting on the Station grounds in 1919 was one of the first experimental plantings of avocados and it provided a great deal of information on varieties under consideration at that time. Also it was a valuable experimental area and it provided a source of seeds for various purposes.

There has been active participation by staff members in meetings of the California Avocado Society and they have provided considerable amounts of material for

publication in the Annual Yearbook of the Society. This activity dates back to the first meeting in 1915 of the then California Avocado Association when Director H. J. Webber, Professor W. T. Horne, and Dr. I. J. Condit were on the program. Dr. Webber was a charter member of the Association and its president in 1916. Six of this Station's staff members have received the Society's award of Honor: H. J. Webber, W. T. Horne, M. B. Rounds, I. J. Condit, A. R. C. Haas, and G. A. Zentmyer.

The establishment of the present variety orchard in 1943 by M. B. Rounds and its subsequent development by M. M. Winslow and Dr. W. B. Storey, has provided valuable information on many new varieties, demonstrated that interior areas are suitable for avocado growing, provided information on fruit quality in relation to environment, and served as a source for budwood for many purposes.

Most of the information on avocado diseases has been developed by staff members of this Station. The avocado disease project was first headed by Professor W. T. Horne and later by Dr. G. A. Zentmyer. Other staff members have made significant contributions. Professor Horne's Experiment Station Bulletin No. 585 entitled "Avocado Diseases in California" published in 1934 presents outstanding research information on diseases of fruit, roots, trunks, and branches. The virus nature of sunblotch was established and its spread by budwood and occasionally by root grafting was demonstrated by Professor Horne and Dr. E. R. Parker. Subsequently, Dr. J. M. Wallace demonstrated sunblotch transmission in avocado seed. The cause and methods of control of *Dothiorella* fruit rot were established by Professors Horne and Fawcett. Of great significance is Dr. Zentmyer's excellent work on the soil fungus ***Phytophthora cinnamomi*** in which he demonstrated that this fungus is the causal organism of the very serious avocado root rot disease. He developed information on the life cycle of the fungus, spore stages, response of the fungus to temperature, pH, nutrition, certain suggested control measures using soil fumigants and other fungicides, the role of irrigation and drying of the soil (in cooperation with Dr. S. J. Richards and others), means of spread of the disease, crops to replant in diseased areas, role of organic matter, and other factors in disease development, as well as other hosts of the fungus. Dr. Zentmyer conducted extensive exploration in the native home of the avocado in Latin America for rootstocks that might be resistant to the fungus. A total of approximately 150 collections of avocados and related plants representing 15 species of ***Persea*** and representatives of a number of other related genera have resulted from the three explorations in Latin America. Several of these collections have been found to be highly resistant to the disease. Some of them are graft-compatible with the commercial avocado while others that are not graft-compatible will serve as a valuable source of breeding material. Tests of many local varieties of avocado have resulted in the discovery that certain selections of the Duke have considerable resistance to the *Phytophthora* root rot fungus. During these explorations in Latin America, Dr. Zentmyer has obtained valuable information on other important avocado diseases which are not present in the United States. Another contribution by Dr. Zentmyer was the discovery that the soil fungus, ***Verticillium albo-atrum***, is the cause of "collapse" of avocado and the demonstration of factors influencing development of the disease and its control.

Insecticide research by Professor H. J. Quayle and others in the earlier period resulted in control measures for latania scale, brown mite, greenhouse thrips, omnivorous

looper, and the amorbia leafroller. Subsequently, excellent work by Dr. C. A. Fleschner and others developed information leading toward a program of biological control of insect and mite pests of avocado.

Information has been developed by Dr. W. B. Sinclair, Dr. D. L. Lindgren, and others on ethylene dibromide, methyl bromide, and other fumigants to be used for treatments of avocado fruits in case of establishment of fruit flies that infest' avocados, together with residue data of organic insecticides to avoid any toxic residues in the fruit resulting from insecticide treatment.

The preparation and publication of Dr. Condit's excellent "Bibliography of the Avocado" was an important contribution.

The work of Dr. Haas provided much valuable information on chemical composition of avocado tissues and of nutritional aspects of avocado culture.

The establishment of many field plots in various localities by Dr. W. W. Jones, Dr. T. W. Embleton, Dr. S. J. Richards, Dr. F. T. Bingham, and others has provided valuable information on irrigation, fertilization with micro- and macro- elements, diagnosis of injury from high chlorides and sulfates in irrigation water, and established maximum amounts of salts in irrigation water that avocados will tolerate.

The avocado breeding project was initiated by Dr. J. W. Lesley and conducted for several years by Dr. P. A. Peterson. Now it is the responsibility of Dr. B. O. Bergh. With a large number of progeny under test, active development of interspecific hybrids, and detailed information on flower development, a substantial amount of valuable information is already available.

The research needs of agriculture in this portion of the state have increased greatly and this has necessitated an expansion of the work of this Station and a broadening of the program to include investigations on most of the commercial crops grown here. This is a natural development, not only because of need but because the Citrus Experiment Station is an integral part of the Statewide Agricultural Experiment Station of the University of California. While about two-thirds of the present research program relates to citrus, the research efforts on avocados and other subtropical fruits as well as vegetable and field crops is increasing.

The present overall research program of the Citrus Experiment Station consists of 118 formal projects and 21 exploratory items, i.e., miscellaneous research. There are 10 departments which are listed below in alphabetical order with the name of the Chairman, and in three instances the resident Vice-Chairman, of each department: Biological Control, C. P. Clausen; Cultivations, F. M. Coray; Entomology, R. L. Metcalf; Horticulture, Walter Reuther; Irrigation and Soils, M. R. Huberty (Los Angeles), S. J. Richards, Vice-Chairman; Plant Biochemistry, W. B. Sinclair; Plant Nematology, D. J. Raski (Davis), S. A. Sher, Vice-Chairman; Plant Pathology, J. T. Middleton; Soils and Plant Nutrition, H. D. Chapman; Vegetable Crops, J. E. Knott (Davis), O. A. Lorenz, Vice-Chairman.

The Department of Cultivations is a service department that is responsible for all cultural operations on experimental plantings of the Station.

The research staff consists of 115 academic personnel assisted by 150 well-qualified

technicians. The Station's land and other facilities are reasonably adequate. Buildings and well-equipped laboratories, greenhouses with headhouses, lathhouses, and other relevant structures occupy about 40 acres of land. There is approximately 370 acres of irrigated experimental land and about 150 acres of land on which irrigation facilities have not been developed. Under present circumstances there is a fully adequate supply of irrigation water of high quality for the entire agricultural acreage.

About 13 acres of land are devoted at present to avocados and this acreage will increase in the near future. The avocado variety planting consists of over 70 varieties and the breeding program has produced over 1,000 hybrids from controlled pollination. The active breeding program is expected to produce many thousands of hybrids in the future, some of which will be planted on Station grounds, others at the South Coast Field Station, and with grower cooperators. Other avocado plantings on the Station are used for irrigation and fertility experiments, and for certain diseases and other investigations. There are many field plots on avocados in various localities in cooperation with growers in which variety, rootstock, fertility, salinity, irrigation, disease, insect, mite, and weed control experiments are in progress.

In addition to the land used at the Citrus Experiment Station for the extensive and varied research program there is field research in progress by staff members at the Imperial Valley Field Station, the Antelope Valley Field Station, the newly developed South Coast Field Station, and on land under lease in four localities. Also, an important part of the research program is conducted in cooperation with private growers. A total of well over 500 acres of citrus, avocados, dates, grapes, deciduous fruits, walnuts, and vegetable and field crops is used in cooperative grower experiments each year.

The California Avocado Society has always been very interested and most helpful in connection with the Station's research program on avocados. The Society has provided research funds in a number of instances and more recently to assist in the avocado root rot program and in basic studies on mineral nutrition. The Farm Bureau Avocado Sections in the several counties where avocados are grown likewise have been interested and helpful in connection with the Station's work as has the Avocado Research Advisory Committee which is appointed by the avocado industry.

Cooperation by a large number of individual avocado growers has been exceedingly helpful in the research program. Needless to say, the interest and assistance of all concerned has been very stimulating and it is greatly appreciated. In view of the fine attitude of growers and grower organizations and the excellent cooperation of the Agricultural Extension Service, good progress on the problems under investigation can be expected.

The William T. Horne Memorial Library is now located in the new Library Building on the Riverside campus. The Library Committee of the California Avocado Society and this Station aspire to add publications to the present collection as rapidly as possible. The following statement from that Committee's report at the Annual Meeting in June, 1955 is relevant: "Future efforts will be directed toward obtaining subject matter material, including publications and books, to be added to the present collection so that the William T. Horne Memorial Library will be the most complete collection of information on the avocado."

It is difficult to place a dollar value on the work of the Citrus Experiment Station, but in a joint resolution honoring the Station on its 50th Anniversary, the State Legislature estimated that operation of the Station has resulted in savings to the agricultural industry of this state of more than \$25,000,000 annually. It is expected that the necessarily expanding research program of this Station will continually increase the savings to the agricultural industries concerned.