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LISTING AND DESCRIPTION OF AVOCADO PROJECTS AT UNIVERSITY OF CALIFORNIA CITRUS EXPERIMENT STATION

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Most aspects of the production of the avocado crop and certain aspects of post harvest handling ate under investigation at this Station. Upon request, a listing and brief description of objectives of each project concerning avocados has been prepared. In certain instances the project relates solely to avocados, while in others, avocados are included logically with citrus and/or other crops. In several instances there is work of a preliminary nature, concerning avocados, that has not been formalized into a project, and it is listed as Miscellaneous Research. There is, in addition however, a substantial amount of work in progress under general projects in most departments that is not listed but which relates to avocados. Space does not permit a summarization of the research results on each project.

About 30 academic staff members are concerned directly with research on avocados. Only the academic staff members are listed under the personnel for each project. In addition, there are about 30 highly competent technicians associated with the academic staff members in this research. In certain instances, academic staff members and technicians devote their entire time to avocado work. It is estimated that the equivalent of 10 academic staff members and 10 technicians are devoting their time fully to research on avocados.

A listing of the projects concerning avocados at this Station follows.

Project 1458	Avocado Rootstock Experiments
Personnel:	F. F. Halma and W. B. Storey
Object:	To determine the effects of rootstock varieties on productivity, economic longevity, fruit size, and fruit maturity season of commercially important scion varieties.

Project 1131	Avocado Breeding
Personnel:	W. B. Storey, and B. O. Bergh.
Object:	To develop, by plant breeding methods, high quality varieties (1) which will be adapted to the various climatic zones in the avocado growing region of southern California, (2) which will produce good crops annually, with a minimal tendency toward alternate bearing,

and (3) which will mature earlier or later in the crop season, thereby extending the marketing season at both ends.

Project 1434 An Orchard Trial of Avocado Varieties

Personnel: W. B. Storey

Object: To appraise performance of the 70 varieties in the planting at the Station and to determine which varieties are best suited to growing in the interior climatic zone designated Area 8 by the Avocado Variety Committee of the California Avocado Society. Note: The appraisal of variety performance in all areas also is in progress.

Project 1163A Responses of Subtropical Trees and Shrubs to Pruning

Personnel: P. W. Moore, O. C. Taylor and E. M. Nauer

Object: Pruning of avocado trees to maintain tree size in close planted orchards as compared to orchard thinning (tree removal) and no pruning or orchard thinning. Also, to determine response to pruning of different avocado varieties having different growth habits. Note: - This is a joint project with S. A. Cameron and R. W. Hodgson of U. C.L.A., in which C.E.S. is largely responsible for field work on avocados and citrus.

Project 1630 Field Studies on Macro-and Micronutrient Nutrition and Fertilization of Avocado

Personnel: T. W. Embleton, W. W. Jones, F. T. Bingham, and C. K. Labanauskas

Object: To determine the magnitude of the influences that nitrogen, potassium, phosphorus, minor elements, and soil amendments have on production, quality, and maturity of avocados.

Project 1632 Macronutrient Sprays in Relation to Growth and Productivity of Citrus and Avocados

Personnel: W. W. Jones, T. W. Embleton, L. R. Jeppson, and F. T. Bingham

Object: To determine if macronutrients (nitrogen, phosphorus, and potassium), applied as sprays, can be used satisfactorily on citrus and avocados in lieu of soil applications of these same nutrients, or in conjunction with soil applications.

Project 1694 Basic Mineral Nutrition of Avocado Trees

Personnel: F. T. Bingham, T. *W.* Embleton, and C. K. Labanauskas.

Object: To study nutritional requirements of the avocado with special reference to determining (1) the full range of visual symptoms associated with mineral deficiencies and excesses, (2) the tissue composition associated with deficiencies and excesses, and (3) the effects of variable nutrition on fruit yields, quality, rate of maturity, and size. Note: Sand and also water culture experiments conducted in the glasshouse and out-of-doors.

Project 1408 Soil-Moisture-Plant Relations of Avocado Trees

Personnel: M. R. Huberty and S. J. Richards

Object: To study the soil-moisture requirements of avocado trees in order that more adequate recommendations may be made for irrigation, drainage, and soil type suitable for avocado production. In cooperation with the Department of Plant Pathology, to study the soil and water relations which influence the occurrence and severity of root rot on avocado trees.

Project 1546 Soil Physical Condition in Relation to Irrigation

Personnel: M. R. Huberty, S. J. Richards, and L. H. Stolzy

Object: To develop and improve techniques for characterizing soil physical properties; to evaluate the role of the variables which influence the distribution and utilization of water in soil; and to evaluate the effects of soil management practices on soil physical conditions, using existing methods. Note: These investigations relate as directly to avocados as to any other crop. Avocado plants will be used in the experiments.

Project 1475 The Physiology of weed Control

Personnel: B. E. Day

Object: To secure information on the physiology of weeds in southern California and to apply these findings to the development of control measures. Note: Work is in progress in avocado plantings.

Project 1701 The Biochemistry of Maturation in Avocado Fruit.

Personnel: R. C. Bean

Object: To develop products for treatment of fruit or plant which will control maturation, ripening, and storage in such a way as to obtain high quality fruit at a desirable time for marketing and to attempt to find

methods by which the effects of an exposure of fruit to adverse conditions may be minimized.

Project 944 Diseases of Avocado and Minor Subtropical Fruits

Personnel: G. A. Zentmyer, L. J. Klotz, and F. T. Bingham

Object: To find the causes, the influencing factors, and control measures for the diseases affecting avocado trees and other subtropical trees in southern California; to investigate the effect of fertilizers, soil amendments, and various soil management practices on the incidence of root rot and other diseases of avocado.

Project 944A Avocado Sun-Blotch Disease

Personnel: J. M. Wallace, P. R. Desjardins, and G. A. Zentmyer

Object: Investigation of seed and bud transmission of sun-blotch virus, including methods of inactivating the virus in both seeds and buds.

Project 1524 Soil Fungicides for Subtropical Horticultural Crops

Personnel: G. A. Zentmyer, J. B. Kendrick, Jr., L. J. Klotz, T. A. DeWolfe, and J. T. Middleton

Object: To find fungicides that will be effective in controlling various soil-inhibiting plant pathogens which incite root diseases, either by treatment of soil before planting or after planting. Note: New fungicides are evaluated in the laboratory and glasshouse. Many materials have been tested against Phytophthora root rot of avocados.

Project 255B Armillaria Root Rot Studies

Personnel: E. F. Darley, G. A. Zentmyer, and P. A. Miller, (U.C.L.A.)

Object: To determine methods of control of the root disease caused by the fungus, *Armillaria mellea,* including resistant plants of citrus, avocados, and ornamental trees and shrubs, soil treatment with chemicals, and by biological means utilizing the soil fungus, *Trichoderma viride.*

Project 1495 Biological Control of Mites on Citrus, Avocado, Walnut, and Ornamentals

Personnel: C. A. Fleschner

Object: To develop methods of effectively controlling plant-feeding mites on

citrus, avocado, walnut, and ornamentals through the use of natural agencies. Note: An important section of this project relates to field studies on the effect of insecticides on the effectiveness of natural enemies, in which Walter Ebeling at U.C.L.A. is cooperating.

Project 1493 Biological Control of Red, Yellow, Purple, and other Diaspine Scales on Citrus, Avocado, Walnut, and Ornamentals

Personnel: P. H. DeBach

Object: Search for effective natural enemies of the armored scale insects in foreign countries, introduce them into California, and evaluate their effectiveness in control here. Note: The work on avocados has related principally to the latania scale. Natural enemies of unarmored scale insects and mealybugs on avocados are considered under other general projects not included in this list.

Project 1422A Fruit Fly Investigations: Study of the Influence of Sterilization Treatments for Fruit Flies on the Physiology, Handling, and Marketability of Avocado Fruits

Personnel: W. B. Sinclair and D. L. Lindgren

Object: To determine the influence of approved quarantine sterilization treatments for fruit flies on the marketability of all commercial varieties of avocados and to determine, for those varieties that will not tolerate the approved treatments, the maximum exposure that can be tolerated. As rapidly as promising new sterilization treatments for fruit flies are developed, their effects on the various varieties of avocados will be evaluated.

Project 1411 Bioclimatic Research on the Mexican Fruit Fly

Personnel: P. S. Messenger

Object: To determine the capacity of the Mexican fruit fly, *Anastrepha ludens* (Loew), to reproduce and perpetuate itself under the different climates of the various fruit-producing areas of California. Note: This work is in progress at Brownsville, Texas, in cooperation with the U. S. Department of Agriculture. Avocado is a host of the Mexican fruit fly.

Project 1576 Development and Utilization of Analytical Methods for Insecticides and Acaracides as Residue Methods and as Composition Methods

Personnel: F. A. Gunther, M. J. Kolbezen, and T. R. Fukuto

Object: To develop and evaluate chemical and physical properties of new

insecticides and acaricides in terms of possible utilization as specific, or at least useful, means for the quantitative determination of the major effective ingredients in the presence of plant and animal extractives. Note: This work relates to the residues of pesticidal chemicals on or within avocado fruits, as well as with all other crops on which these chemicals are used. In cooperation with Walter Ebeling at U.C.L.A.

Project 1618 Biology and Control of Nematodes Attacking Avocados

Personnel: S. A. Sher

Object: To determine the economic importance of nematodes to the production of avocados and to study the biology and control of those species found to be injurious.

Project 1633 Effect of Air Pollution upon Agricultural Crops, Methods for Reducing Plant Damage, and Identification of Air-borne Phytotoxicants.

Personnel: J. T. Middleton, R. F. Brewer, E. F. Darley, L. C. Erickson, J. B. Kendrick, Jr., S. J. Richards, O. C. Taylor, GW. Todd, and R. T. Wedding

Object: The effect of air pollutants, such as fluorides, hydrocarbons oxidants, and sulfur dioxide upon agricultural crops is being investigated for the purpose of assessing their phytotoxicity and influence upon water use, growth, and yield of economic plants. Methods for reducing plant damage are being studied. Note: Avocados are receiving major emphasis in these studies.

MISCELLANEOUS RESEARCH

Effect of plant growth regulators upon the set of avocado fruits. *H. Hield*

Field studies on the relation of total salts and chlorides to the nutrition of avocado trees. *F. T. Bingham*

Effect of various organic chemicals added to the soil upon growth of the fungus, *Trichoderma viride,* which is antagonistic to the development of the Phytophthora root rot fungus on avocado roots. *W. Moje* and J. *P Martin*

The absorption, injection, transport and accumulation of leaf applied C labelled 8-hydroxquinoline in the roots of avocado seedlings in relation to control of *phytophthora cinnamomi. F. M. Turrell* and *G, A. Zentmyer*,

Laboratory and field studies on the effectiveness of natural enemies in control of omnivorous looper and amorbia on avocados. *C. A. Fleschner*

Effectiveness ofgranulosis diseases in control of omnivorous looper on avocados. *J. M.*

Hall

Expansion of several aspects of our work on avocados will be possible soon, both at the new South Coast Field Station and at the Citrus Experiment Station, as additional facilities become available.