

RESEARCH

Department research projects are mainly directed toward the study and solution of environmental problems within the community.

A new project in this biennium is concerned with municipal wastewater and sludge management. Its ultimate goal is to set criteria for the use of effluent waters to irrigate horticultural plants as an alternative to dumping such waters into the ocean. The project involves the study of the relative toxicity of various metals found in effluent waters and the corollary study of the resistance of various ornamental plants to the toxic materials. Seventeen acres of land, known as San Jose Creek Test Station, at the junction of the Pomona and San Gabriel River Freeways, have been leased from the Sanitation District for future testing.

Air Pollution

Studies in this continuing research project show that a pollutant of the photochemical oxidant type may react with plant tissue when it enters the leaf and cause leaf injury yet be destroyed itself. A pollutant may also react with chemical substances on or in the leaves and be destroyed but yet cause no plant injury. In either instance, the plant is serving to cleanse the air of pollutants. Numerous studies of air cleansing by plants have been conducted to determine the most efficient species and to ascertain the conditions most conducive to air cleansing by plants.

The inheritance pattern of air pollution tolerance in plants is of considerable importance to the plant breeder who desires to develop tolerant varieties. Studies have shown that tolerance to ozone, peroxyacetylnitrate (PAN), and ambient photochemical oxidants in petunias is due to a small number of genes which act primarily in an additive manner but show some degree of dominance. The magnitude of the heritability estimate indicates that the breeder can readily select for tolerance in this species.

Fire Retardant Plant Project

Laboratory studies of plant flammability are continuing. Data show that moisture content and leaf thickness are important factors governing fuel ignition. The moisture retention capacity of a plant and not the moisture content appears to control fuel surface temperature during heating.

Pathology

Practical field control of Armillaria mellea (oak root rot fungus) with cycloheximide is an important consideration. Injection of adult oak trees was made at Huntington Library for the purpose of delimiting the ranges of concentration and application rate of cycloheximide. Concentrations at 100 ppm to 400 ppm of cycloheximide produced no visible injury to the tree. Leaf necrosis appeared at higher rates of injection, however, and new leaves and shoots sprouted in abundance within three weeks after application.

Plant Breeding

A selection program is underway with petunias to develop varieties more tolerant of photochemical oxidants.

A number of controlled pollinations were made among Cistus selections that show promise as low fuel types for use on green belts around hillside homes and as low maintenance cover for woodland sites. The goal is to develop a prostrate type with a good root system, high drought tolerance, resistance to insects and disease, and with desirable ornamental properties.

Callistemon interspecific crosses were made to provide a measure of species relationships as evidenced by their ability to cross and segregate for various traits. An understanding of the inheritance of various traits will in turn provide a better understanding of the possible parentage of a number of putative hybrids presently in the nursery trade.

Attempted crosses between yellow- and purple-flowered tabebuias is continuing in an effort to obtain trees with the desired features of both groups.

Plant Virus Program

The study of tobacco mosaic virus (TMV) on various ornamental plants has revealed a general acceptance of species of plants to TMV infection. Resistance among different plant species to virus infection can be correlated with virus replicating capacity. Monocotyledonous plants and ferns are shown to be capable of infection by this virus. Physiological studies on virus resistance by means of plant hormone application and light and dark treatment indicates a direct correlation

of virus resistance with metabolic mechanisms of the plant. Susceptible plants react differently to these treatments because of lack of resistant factors.

Herbarium

During the biennium, 1,326 individual collections totaling about 5,000 botanical specimens were acquired by the Herbarium. Of the collections, a total of 693 specimens were obtained from the Arnold Arboretum, Barnes Arboretum, Fairchild Tropical Garden, and the U.S. National Arboretum, through the specimen exchange program. Over 1,600 specimens have been mounted and incorporated into the Herbarium which presently contains over 10,000 mounted specimens. Over 2,000 exchange sheets were distributed and over 500 specimens were sent for referral to herbaria overseas.

Special research has been devoted to the following genera: Acacia, Eucalyptus, Grevillea, Melaleuca, and Kunzea. These studies were undertaken in the interest of elucidating the proper scientific classification of the species within these groups and the species in our living Arboretum collection.

The Herbarium has been active in a student work program and in a program conducted through Las Voluntarias involving volunteers assisting in the Herbarium, learning herbarium techniques, and how to identify and preserve plants.

Plant Records

The Plant Records Unit is responsible for the maintenance of identified and labeled plants, plant data, the seed collection and exchange program and the dissemination and collection of weather data.

During the biennium, 1,320 accessions were posted from botanical gardens, nurseries and individuals. Some of the outstanding additions to our introduction program came from the following sources:

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|---------------------------|----------------------------------------------------------------------------|
| Camellia japonica hybrids | - U.S. Department of Agriculture |
| Impatiens hybrids | - U.S. Department of Agriculture
(collected in the wilds of New Guinea) |
| Hoya species | - U.S. Department of Agriculture
(collected in the wilds of New Guinea) |
| Gladiolus species | - J. W. Loubser - South Africa |
| Palm species | - California Jungle Gardens (large collection) |
| Various genera | - Aritaki Arboretum, Japan |
| Various genera | - Canberra Botanic Gardens, Australia |
| Various genera | - Christchurch Botanic Gardens, New Zealand |
| Various genera | - Hong Kong Herbarium, Hong Kong |
| Various genera | - Hortus Botanicus, Bornova-Izmir, Turkey |
| Various genera | - Marimurtra Botanic Gardens, Spain |
| Various genera | - Monrovia Nursery and Select Nursery |
| Various genera | - United States National Arboretum, Washington, D.C. |

	<u>1971-72</u>	<u>1972-73</u>
Accessions	404	916
Seed Planted	403	554
Plants Moved to Permanent Field Locations	1,150	484
Identification Labels Made	4,446	4,126

Seed and Plant Exchange

In accordance with Arboretum policy, seed and plant materials were distributed on an exchange basis to various arboreta, botanic gardens, nurseries and individuals in the United States and around the world. Members of the California Arboretum Foundation, Inc., were given an allotted number of seed envelopes of easily germinated but highly ornamental plants that are not generally available to the public. Over 6,500 envelopes of diverse kinds of seed were distributed. Some of the foreign botanic gardens with whom we exchanged seed and plant material are: Hong Kong Herbarium; Christchurch Botanic Gardens, New Zealand; University of Ghana Botanic Gardens, Ghana; Salisbury Botanic Gardens, Rhodesia; Kyoto Takeda Herbal Garden, Japan; Taiwan Forest Research Institute, China; Universidad Austral, Valdivia, Chile; Jardin Botanique, Nantes, France; University of Pretoria Botanic Gardens, Pretoria, South Africa; etc. A particularly outstanding collection of twenty-one accessions of bougainvillea hybrids were sent to us by the United States Department of Agricultural Experiment Station, Glenn Dale, Maryland. Two other greatly climatically desired collections of seed were sent to us by Christchurch Botanic Gardens, New Zealand and from the Universidad Austral, Valdivia, Chile.



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