

UNIVERSITY OF CALIFORNIA BERKELEY

Botanical Garden Quarterly



Friends of the Botanical Garden

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Pest control in the botanical garden

By Anton Christ, Manager

More than 700 persons jammed into the Sacramento Community Center for a conference on the issue of the use of pesticides a few weeks ago. There are indeed some conflicts between the farmers who feel they need the synthetic pest killers and the ecologists and health experts who feel that these chemicals are often dangerous and not always necessary.

Dr. Paul Erhlich, a population biologist from Stanford University, expressed his disgust with the makers of pesticides by stating "The petrochemical industry is of about the intellectual and moral level of the people who sell heroin to high school kids." Although I would not take this extreme a position, as man-

ager of the botanical garden I have encouraged a policy of minimal pesticide usage.

Although commercial sources of plants are under pressure to produce perfect plants since customers refuse to buy flawed specimens, we in the botanical garden do not concern ourselves with a few damaged leaves. Our specimens may not be "perfect" but they look natural and we accept them as they are.

The discovery and manufacture of hundreds of new fungicides, insecticides, nemacides and other materials and practices have greatly improved the means of pest control. But surprisingly, for a garden this size and with the great variety of different plant materials from

all over the world, we use very few chemicals. Over the years it has been our policy to use as few pesticides as possible. Not that we do not have any pests — we certainly do — but as long as the pest does not interfere with the normal development of the plant we choose to ignore it.

One recurring pest is the California oak moth (*Phryganidia californica*) which attacks the coast live oak trees (*Quercus agrifolia*) in the garden about every seven years. The trees are stripped of their leaves by small caterpillars of the California oak moth which then descend to the ground on long silken threads. In the soil they will pupate and later the small brownish-white moths will emerge.

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Pesticides from plants

By Laurianne L. Hannan, Educational Coordinator

With alarming reports continually surfacing about the dangers of synthetic pesticides (the organophosphates and chlorinated hydrocarbons) and their persistence in the environment, many people have turned their attention to the ancient tradition of using plant extracts as pesticides. These so-called "botanical" pesticides are not completely safe either (particularly nicotine from tobacco) but they do break down readily into relatively benign natural components.

In contrast, synthetic chemicals tend to linger in the environment and become stored in both plant and animal tissue. In fact, measurable amounts of these pesticides have been found in the fat of fish far out in the ocean as well as in the tissue

of Eskimos isolated from areas of pesticide usage.

Although over 1,200 plants are listed by the U.S. Department of Agriculture as having some insecticidal properties, only a few have been commercially exploited. Five of the most commonly used and most effective natural organic insecticides are pyrethrum, rotenone, ryania, sabadilla and nicotine.

Pyrethrum

The pesticide pyrethrum comes from the dried flower heads of *Chrysanthemum cinerariifolium* (formerly classified as *Pyrethrum roseum*). A member of the sunflower family, this plant is known as Dalmatia and Dalmatian insect flower as well as pyrethrum daisy. Pyrethrum

daisy is a bushy perennial herb which can grow up to three feet high. The bright green leaves are finely divided and are covered on the undersurfaces by thick silvery hairs. Perched on the end of a long stem, each solitary daisylike flower cluster is made up of white "petals" (ray flowers) and a yellow "center" (disc flowers).

It has been purported that pyrethrum may have been used as an insecticide nearly 2000 years ago in China. Before World War I, most pyrethrum daisy was grown in its native Yugoslavia (in the region of Dalmatia). Then Japan increased production of the plant, and now many countries, including the U.S. cultivate it.

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Organic pesticides

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The active insecticidal ingredients in the pyrethrum daisy are the pyrethrins which are valued for their "stunning" effect. When one sees pyrethrum listed as one of the agents in an insecticide, it is the chemical which paralyzes the pest. The other insecticidal agents then go to work to kill the insect. Pyrethrum is commonly used in insect sprays, and since it breaks down rapidly in sunlight or strong artificial light, it has been designated as one of the safest insecticides for use on food plants.

Rotenone

The pesticide rotenone is extracted from the roots of several different plants and then used as a dust for crops and ornamentals. Rotenone is only moderately toxic to mammals but is high toxic to fish and has been used to destroy fish as well as insect pests. The rotenone chemicals were first identified in derris or tuba root (*Derris elliptica*) in 1902 and later in Lancepod (*Lonchocarpus spp.*), and Hoary Pea (*Tephrosia vogelii*). All three of these genera are in the Pea family (Leguminosae).

Derris is a large climbing plant whose branches are covered with dense brown hairs. The flower clusters can grow up to one foot long and the petals are bright red. Although cultivated throughout the tropics, this plant is native to India and Malaysia. Lancepod, native to South America, is noted for its showy flowers which range in color from white to violet. Hoary Pea is a shrub covered with a dense coat of tawny hairs. The flowers occur in dense clusters and are violet-purple. This plant is native to tropical Africa.

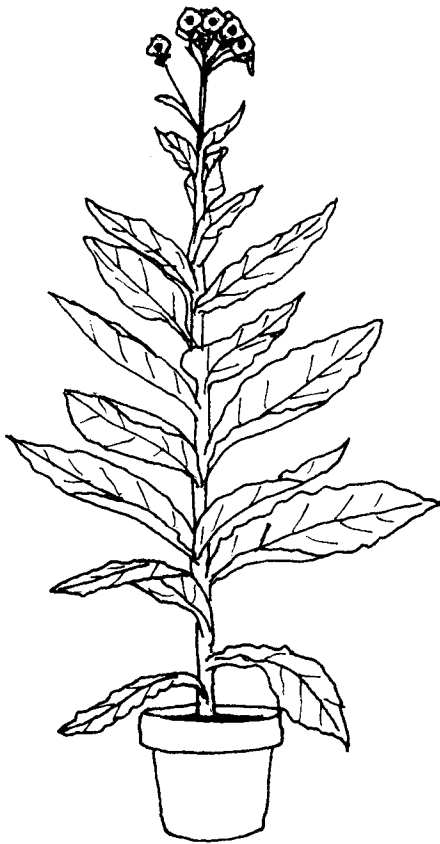
Ryania and sabadilla

Two other natural organic insecticides of interest are ryania and sabadilla. Ryania comes from *Ryania speciosa*, a shrub native to the island of Trinidad. The insecticide is extracted from the stems and roots of the plant, and works by making the insects sick and lethargic rather than killing them. Thus, it does not reduce population densities, but provides crop protection since the sickly insects have reduced appetites.

Sabadilla comes from *Schoenocaulon officinale*, a South American and Mexican plant of the lily family. A dust made from its seeds has served as an insecticide since the 16th century and is especially effective in killing lice. Sabadilla has low toxicity for mammals.

Nicotine

Nicotine comes from the waste leaves of the tobacco plant (*Nicotiana tabacum*) which is in the nightshade family (Solanaceae). As an insecticide it is generally used as nicotine sulfate and is most commonly applied as a fumigant. Tobacco is a stout annual herb which can grow up to six feet tall. The broad leaves may be a foot or more long, and the stem is covered with sticky hairs. The flowers are borne in a large open cluster and range in color from greenish-red to pink. Tobacco was native to tropical America but is now widely cultivated. Nicotine is extremely toxic to soft-bodied insects and must be used carefully because it is also highly toxic to humans and other animals. If used in home gardens or on crops, it destroys beneficial insects, earthworms, and other essential soil organisms along with the pests.



Nicotine, from the tobacco plant is used as a pesticide.

illustration by Laurianne Hannan

Pest control in the garden

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Outside the garden in the surrounding Strawberry Canyon area, trees are seldom killed by the moths. However, in the garden where we water more, oak root fungus (*Armillariella mellea*) occurs and the combination of the two have killed four of our coast live oak trees.

According to Dr. David Regnery of Stanford University, a virus disease always present in populations of this moth — but usually affecting only a few individuals — spreads to others over the years. Finally, when the insect population reaches a peak, contacts between caterpillars result in an epidemic. As a result, the numbers of emergent moths are drastically reduced and take several years to build up again. Until recently this outbreak of oak moth caterpillars controlled itself. But now (probably due to the change in the weather), one attack tends to follow another. In 1970 Dr. Dud-

ley E. Pinnock, Insect Pathologist at UC Berkeley advised us to control the moth with a bacterium (*Bacillus thuringensis*). It is an insect pathogen, a microorganism that causes disease in an insect. The bacterium is cultured commercially. It is harmless to humans, domestic animals, wildlife and beneficial insects — and above all it works. Generally, we seldom or never have to use pesticides on the outdoor plantings in the botanical garden. There might be scale on Rhododendrons which we spray against once in awhile. We also spray for tent caterpillars and a few other insects but on very rare occasions.

But in the greenhouses where the conditions are almost ideal for insects and other pests, we do have to interfere on a regular basis. Pesticides are used to control white flies (the more persistent ones), mites, woolly aphids, etc..

However, in the tropical greenhouse we have been able to avoid pesticides by using biological control. Judith Van der Naillen (with advice from Arthur Slater of Environmental Health and Safety, and from staff members of the Department of Biological Control) is doing a fine job controlling plant pests with their natural enemies.

Finally, when we employ synthetic herbicides to check weeds in the garden, we use only the "selective" types which kill certain kinds of plants but do not significantly injure others. We also use preemergent herbicides in the outside areas. For example, the weeding in the Cactus Area is done mostly with pre-emergent weed killers. We avoid non-selective herbicides since these kill nearly all plants in the sprayed areas and make replanting almost impossible for a year or longer.

A BOOK OF HENRY EVANS PRINTS

BOTANICAL PRINTS. Henry Evans. 64 pages plus 65 plates. © 1977 W.H. Freeman and Company, San Francisco. \$25.00.

This book, the first devoted exclusively to the work of Bay Area artist Henry Evans, reproduces 33 full-color plates and 29 black and white plates of the artist's distinctive plant portraits. According to the foreword by Wilfred Blunt (who is the author of *The Art of Botanical Illustration*), Evans has "a unique and sensitive style."

Evans began his career selling antiquarian books in San Francisco, and later published under the imprint of the Peregrine Press. Gradually, however, he spent more and more time at printmaking, producing the familiar, stark linocut prints of California native plants and of various exotics. Several years ago I commented to Evans on his style, a word to which he objected, since (at least then) he claimed that he illustrated exactly what he saw and thus the idea of style was irrelevant.

The color blocks are printed in full-page size (nine by twelve inches), although the portrait of the white pine in his state-flower series occupies two fac-

ing pages. The black and white prints are smaller and generally occupy positions at the margins of the text. Evans seems to be particularly fond of California poppies and persimmons, or perhaps he is attracted to their vivid orange color. Examples of both plants are present here — but so are eggplants, violets, bitterroot, and shooting stars.

As Blunt states, Evans clearly possesses a sound botanical knowledge, an impeccable sense of design, and a complete sureness of touch. All his plants are identified by their common name, their Latin binomials, and their place of origin. The illustrations portray plants with a wide range of geographic origins, including Yalta, USSR (bamboo); Gray Summit, Missouri (violet); and the botanical garden in Strawberry Canyon (*Homeria, Calochortus*).

The book is beautifully edited, designed, and printed. Lest the reader be too dazzled by the brilliance of the plates, the accompanying text presents a series of brief paragraphs from Evan's notebook describing his artistic motivations and the techniques he uses.

Robert Ornduff, Director

Friends of the Botanical Garden
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FRIENDS OF THE BOTANICAL GARDEN NOTES

Logo Contest. Can you design a new logo to represent the University of California Berkeley Botanical Garden? The logo must be a simple black and white emblem with no shadings (halftones). Please submit all entries to: Editor, *Botanical Garden Quarterly*, University of California, Berkeley, 94720, by March 1, 1978. The grand prize for this contest will be the duplication of your creation on subsequent issues of the *Botanical Garden Quarterly*, and on other publications of the Friends of the Botanical Garden.

Officers elected. At a special meeting of the Friends of the Botanical Garden on January 10 the following officers were selected: Jerry Carlin, President (1978-80); Mary Lee Jefferds, Vice-President (1978-79); Nancy Wilson, Secretary (1978-79); and Gene Opton, Treasurer (1978-80). Also selected were the following Executive Board members: for 1978-79, Brent Berlin, Alan Dundes, Garrett Eckbo, Marvin Schmid; and for 1978-80, Michael Gerba, Pat Haynes, Jim Novosel, and Jean Vogt.

Information Center progress. According to Margaret Mitchell, President of the Docent Council, the construction of the docent and university financed information center at the garden should soon be underway. Jim Novosel, designer of the structure, anticipates that the building will be completed in April.

Funds for bench. At the recent January 10 board meeting the Friends/

BG donated \$1,500 for the construction of a bench to surround the new information center in the garden. Hopefully, this will be the first of many such projects supported by the Friends/BG to benefit the garden.

Thanks. The Friends of the Botanical Garden would like to extend their appreciation to Mrs. Dorothy Brown (secretary at the garden) who has many times taken on extra tasks for the benefit of the Friends/BG, and has proven to be of great assistance.

New office staff. Laura Hess recently joined the Friends/BG as secretary, and will be available at the Friends/BG office (the garden annex) Tuesdays and Thursdays noon to 4 p.m. Ms. Hess, a student of soil resource management at UC Berkeley, has already contributed considerably to the smooth-running of the Friends/BG.

Board meeting planned. A board meeting of the Friends/BG is scheduled for Monday, April 10, at noon in the garden meeting room. Other members of the Friends/BG who wish to participate are urged to attend.

Open house and plant sale. Watch for further notices of the botanical garden's "Open House," which is scheduled to coincide with the UC Charter Day celebration in April. Also, information on the docent-sponsored pre-plant sale on May 6 (restricted to members of Friends of the Botanical Garden) and the general plant sale on May 13 will be included in the next issue of the *Quarterly*.

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Please make checks payable to: Friends of the Botanical Garden

Join Friends of the Botanical Garden

You are invited to become a member of the Friends of the Botanical Garden. This organization was developed to provide assistance to the botanical garden in improving and extending the plant collection, enriching the education program, and meeting general capital requirements.

Members, in return, are offered spe-

cial programs on plants and gardening, a 25% discount on selected UC Press books (such as *California Spring Wildflowers* by Munz), preview privileges for the annual sale of unique plants from the garden, and a quarterly publication which covers topics of general interest to plant enthusiasts as well as news of the garden.

Student and Senior Citizen memberships are discounted to \$5. Standard dues are \$10 for an individual, \$15 for a family. The Friends of the Botanical Garden function as a support group under the auspices of the UC Berkeley Foundation, and dues and gifts are tax deductible.

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