Defoliation of Hydrangea

chemical defoliation of hydrangea plants obtained rapidly and without injury to flower buds by prestorage treatment

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Flower buds of the common hydrangea —*Hydrangea hortensis*—are initiated during summer or early fall, but a cold period of 6–8 weeks is required to condition the buds for subsequent flowering.

The conditioning cold period can be given the plants by subjecting them to temperatures of 33°F to 40°F in refrigerated dark storage or by storing them outdoors under straw in a cool location.

If hydrangea plants are stored with leaves on them, the leaves will abscise over a long period of time. The dead leaves develop a mold—*Botrytis* sp.—which will infect the flower buds.

Defoliation of hydrangea plants before storage with ethylene gas given off by ripe apples has been used by pot plant growers in areas where apples are abundant. Some growers allow frosts to defoliate the plants but frosts can be too severe sometimes and cause plant injury or so slight that defoliation is incomplete.

Experiments to find a chemical defoliant which would be rapid in action but not destroy the flower bud—for the next year's forcing—were started in 1952. However, materials tried prior to 1956—sodium azide, phenyl mercury chloride, amino triazole, calcium cyanamide, and some others—were rejected on the basis of incomplete defoliation and undesirable aftereffects on the plants.

In 1956, tests were made with three of the most promising defoliants: Vapam, Folex, and zinc chloride. Vapam is a 31% solution of sodium methyl dithiocarbamate and was used in aqueous solutions at the rate of 2.5 ml/liter—milliliter per liter—3.75 ml/liter and 5.0 ml/liter. Folex is an emulsion containing 75% tributyl phosphorotrithiote and was used at the rate of 10 ml/liter, 15 ml/liter and 20 ml/liter. A 4% zinc chloride solution was used.

Mean Leaf Defoliation of Hamburg and Europa Hydrangeas with Various Concentrations of Chemical Defoliants

Treatments	Leaf abscission	
	In 8 days %	In 15 days %
2.5 ml/liter Vapam	100.00	100.00
3.75 ml/liter Vapam	98.43	99.41
5.0 ml/liter Vapam	99.11	100.00
10.0 ml/liter Folex	95.71	97.57
15.0 ml/liter Folex	99.34	99.34
20.0 ml/liter Folex	95.23	99.13
4% Zinc Chloride	64.18	76.74
Control	6.26	13.29

One half pint of the diluted Vapam solutions was applied to one square foot of soil, which vaporized into 10 cubic feet of air space. The plants were kept in the vapors from 4 p.m., December 17, to 8 a.m. December 18, 1956. Folex and zinc chloride were sprayed on the plants until they were thoroughly wet. Five plants of Hamburg and three of Europa were used per treatment. Counts of leaf drop were made eight days after treatment and again at 15 days after treatment. The plants remained outdoors from December 19, 1956, until January 2, 1957, when they were placed in a greenhouse with a maintained night temperature of 60°F. The plants were forced in the greenhouse, to observe whether any detrimental aftereffects developed due to the defoliants.

Leaf abscission on the Vapam treated plants was evident within 48 hours. The Folex treated plants began showing effects after 72 hours. After eight days both the Vapam and Folex treatments—all concentrations—caused practically complete leaf drop. Plants treated with zinc chloride abscised approximately two thirds of their leaves. The control plants were less than 7% defoliated. In 15 days the leaf defoliation of the zinc chloride treated plants increased to 76.7% and the control plants abscised 13.3% of their leaves.

The manner of defoliation effected by Vapam and Folex was particularly desirable. None of the foliage burned to any noticeable extent. About a day prior to leaf fall the leaves wilted somewhat indicating a moisture deficit. Then they dropped with what appeared to be a fairly normal abscission layer. This layer was quite dry with the Vapam, but remained moist for a day or so on the plants treated with Folex. A second good feature effected by both chemicals was that the young unfolding and expanding leaves dropped as readily as the mature leaves. Often young leaves are resistant to drop and must be hand defoliated. There was no visible injury to green twigs or tight buds.

The plants used in this experiment had well developed buds at the time of treatment and had sufficient cold to bring the buds to forcing stage. Shoots on which terminal buds were still tightly enclosed by terminal leaves at time of treatment, showed no bud or leaf injury from the treatments.

Some injury to the most advanced shoots appeared upon forcing. Variety Europa showed slight injury at all concentrations of Vapam but Hamburg showed only slight injury at the highest concentration.

Plants of both varieties treated with Folex—at the highest concentration—showed the same type of injury, expressed as reduced leaf size, and a slight silvering of some leaves much like smog damage. In addition, the plants treated with Vapam showing injury—particu-

Concluded on page 15

CANNING FRUIT

Continued from preceding page

other hand, more of the mechanically harvested peaches showed injury after canning than was evident at the time of harvest. A high percentage of the peach halves showing injury had only marks in the flesh which were not apparent except upon careful examination.

In canning, each peach and pear was cut into halves. In fruit that was damaged in harvest, usually one good half remained. Some of the blemishes were removed in the peeling process and in addition, U. S. Choice grade permits 10% of the halves in each can to include blemishes. In both the peaches and the pears, a further salvage could have been realized if the blemished fruit had been trimmed and used in fruit cocktail, nectar or sliced fruit.

A tree structure that would have few limbs to interfere with fruit fall would be the first requirement if fruit is to be harvested onto a catching frame. Such a tree may be possible.

These preliminary trials are encouraging enough to warrant further testing.

Concluded on page 14

MARKETING ORDERS

Continued from page 2

provisions. The term promotion includes advertising, trade and consumer education, the employment of fieldmen for retail point-of-sale displays, and similar activities. About 67% of the total expenditures for all activities under all California marketing programs is classified under promotion.

In terms of economics, sales promotion and advertising are carried on to influence consumer demand affecting the derived demands at the handler and producer levels. Consumer demand is generated by the interaction of consumer preferences, income, and prices. Advertising attempts to change the structure of the consumer's preferences thereby altering in certain directions his demand.

The intent of marketing program advertising is to supplement—not displace—private advertising. There is no evidence that sales promotion under marketing orders has caused a decrease in private advertising by individual firms. If sales promotion is carried on under the authority of a marketing order, every participant must contribute to the financial support of the advertising, in proportion to the volume he markets.

Objective and substantive results to support the effectiveness of advertising and promotion are extremely difficult to develop. The disentangling of short-run and long-run consequences, temporary and lasting results, single and cumulative reactions, and multiplier effects, raise tremendous analytical problems. Simple questions as to whether to advertise or how much should be spent on advertising are difficult to answer. But many producers and handlers believe it is necessary to advertise to expand, or even maintain, their market outlets.

The third major category of provisions is that of research. The commodity marketing programs do not have research staffs but utilize other organizations. Some orders utilize the research services of the state university, and some orders also purchase research services from private firms. At times they participate jointly with the government under provisions of or similar to the Federal Research and Marketing Act.

The research activities of marketing programs are economic in nature and often technological with economic implications. Technological research projects include, for example, improved processing methods for canned fruits, disease and pest control, improved varieties, development of new utilizations, improved equipment, and similar studies by technical departments and organizations.

Economic and statistical research ranges from the organization and development of data reporting systems to econometric analyses of the operation and effects of marketing programs. Of particular concern to those orders having a volume-regulation provision are the economic characteristics of the market demands facing the industry. Knowledge concerning price and income effects, for example, as well as measures of demand relationships among various products is necessary for a rational operation of the volume-regulation provisions. Some orders have at hand—or seek to acquire—such economic relationships.

To have current information on retail inventories, purchases, sales, and prices—the type of data not available in reports of federal or state agencies—some advisory boards contract with private marketing research agencies to obtain such information. Those orders are accumulating a fund of economic knowledge concerning consumer and trade behavior that exceeds in detail and scope that of other industries.

For purposes of planning marketing policy, several of the orders—cling peaches, Bartlett pears, and lemon products, for example—have helped to finance researches in objective preharvest sampling forecasts of the prospective supplies available for marketing. Reliable and timely forecasts of supplies are of particular concern to the orders utilizing volume-regulation provisions.

There are two major types of quantity control available under the volume-regulation provisions. One is intertemporal distribution of the harvested crop marketed within the season and a second is curtailment of the total crop to be harvested or marketed—or both—for the season as a whole. Intertemporal distribution within the season may have several economic objectives, the primary one being the approaching of maximum returns from the sale of the crop. Related objectives include dampening of the seasonal patterns of prices and sales. Curtailment of the total crop also has the primary objective of increasing returns from the sale of the crop. But in each case, the particular effects on prices and returns depend upon the nature of the relevant supply and demand functions, their price and income elasticities, their stability over time, and their sensitivity to developments in related products.

The problem of multiple products stems from the interaction of crops which are competing in demand or are produced and marketed in competing areas. Interregional and interproduct competition can not be ignored in the operation of volume control.

A marketing program which disregards the indirect—as well as the direct—economic effects on competitive products, or regions, is eventually likely to find its objectives frustrated and its long-run relative market position affected.

Marketing orders are effective only for certain types of problems under particular circumstances. They must be tailored to specific situations, and they require skillful management blended with appreciation of their short-run and long-run economic implications.

Of particular significance is volume regulation of seasonal total supply. If seasonal total demand facing growers is such that restricting the season's total volume brings increased total returns to growers, there is short-run inducement to practice such volume regulation, and it can be rationalized in acute situations. But continued restriction, resulting in grower returns being increased sufficiently and over a long enough period can lead to expansion of growers' productive capacity.

Although marketing orders may be used to control volume marketed, they are not effective in controlling volume produced. Growers are free to expand or contract their acreage or yield and thereby their volume. New growers also can enter the industry in response to anticipated relatively profitable operations. Such long-run flexibility in production counteracts, at least in part, the short-run effects on grower prices and returns from volume control through marketing orders. Thus, the administration of seasonal total supply regulations calls for use of the order so that its short-term applications do not bring about long-term effects which aggravate the situation the order was intended to alleviate.

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The above article is based on Giannini Foundation Report No. 196, Economic Objectives and Operations of California Agricultural Marketing Orders, *by the same author. Copies of the detailed report are available without cost.*

HYDRANGEA

Continued from page 12

larly in the 5 ml/liter treatment—were more prone to wilt during the heat of the day than other treatments. None of the plants treated at the two lower levels of Folex showed injury.

With all Vapam and Folex treatments the most immature buds—which most closely approached the stage of development when commercial growers would defoliate—forced normally with neither malformed buds or leaf injury. The plants were in peak of flowering between March 10 and April 1, 1957. All plants had good commercial quality.

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