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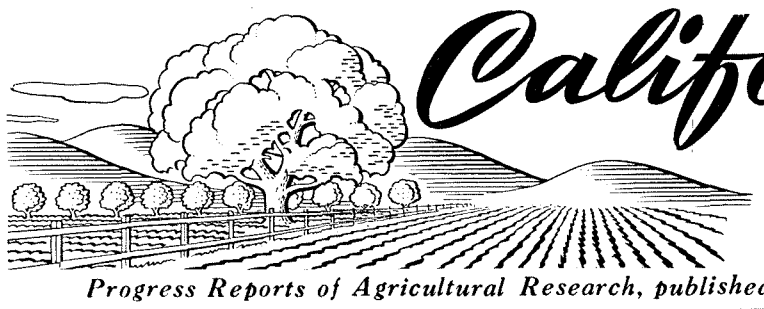

California AGRICULTURE

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Processing Milk Powders For Their Particular Uses

Helge Shipstead

The first successful milk drying process was the atmospheric double drum dryer.

The advantage of this dryer is its simplicity and low cost of investment. No precondensing is required. The roller powder has a very cooked flavor and the colloidal property of the milk proteins are greatly reduced. The nutritive value, however, is largely preserved and this type of powder is well suited for bread making.

The spray drying process became commercially successful after the introduction of precondensing the fluid milk. Whole milk powder made from precondensed milk has a much better keeping quality than that made from fluid milk. The particles of the precondensed whole milk are larger and heavier and present a much smaller surface of exposure to the air.

Keeping Quality Improved

Elimination of copper and iron contamination resulted in a great improvement in keeping quality. In spite of this, and other improvements, it was not possible to keep whole milk powder at room temperature for more than three to six months without development of a tallowy flavor. It was evident that this flavor was caused by oxidation of the butterfat contained in the whole milk powder.

Plotting the flavor score of the powder against the amount of oxygen absorbed revealed the critical level of oxygen absorption to be around 5 cc per pound of powder. This meant it would be necessary to remove the air from the can of whole milk powder to reduce the total remaining free oxygen to below 5 cc.

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Vitamin A Content Similar In Yellow Or White Butterfat

W. A. Regan

A conclusion drawn in error some thirty years ago misled the milk consuming public, and the dairymen followed suit.

Carotene was found to be the pigment that gave milk its golden yellow color. Later it was discovered that carotene, derived from plants, was the precursor of vitamin A.

The conclusion was drawn that yellow milk was distinctly superior to white milk in its vitamin A potency.

Dairymen with high producing Holstein herds and unable to purchase Guernsey females because of their scarcity and high price, resorted to cross-breeding, placing Guernsey bulls at the head of their herd. Other dairymen, finding it difficult to maintain two breeds on the same ranch, adopted the easy way out and resorted to cross-breeding.

More recently it was shown that the white butterfat of the Holstein was approximately the same vitamin A value as the yellow fat of the Guernsey, when the cows are on the same feed. The Holstein converts the carotene into vitamin A.

Market Demand Complicates Production

The situation is further aggravated by the demand for market milk of a fat content not typical of

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Investigations On The Control Of Codling Moth On The Payne Walnut In Central California

A. E. Michelbacher and W. W. Middlekauff

The codling moth, **Carpocapsa pomonella,** occurs throughout California and is one of the most important pests of walnuts.

In southern California investigations on the control of this pest have been conducted by members of the entomological staff at the Citrus Experiment Station, Riverside, while in central California the study has been carried out by members of the entomological staff at Berkeley.

The information contained in this report covers only the work done by the Berkeley station and is applicable to central California conditions. The investigations were started in 1941 and have been conducted principally at Linden on the Payne variety of walnut.

Timing Spray Applications

A study of the habits of the codling moth in relation to the timing of spray applications was undertaken.

Moth flights have been determined through the utilization of bait pans for trapping the adults. Records for the years 1943 to 1945 inclusive show that there are two broods of moths that must be considered. The first occurs in late April or early May and the second in July.

In order to protect the walnut crop from the first brood it is necessary to apply a spray in early May, at a time when the developing walnuts are still very small.

Basic lead arsenate used at the rate of 4 pounds to the 100 gallons of water has been the standard insecticide used. In order to obtain satisfactory control with this material a second spray is necessary.

Investigations have shown that this second treatment can be applied with good results any time from the latter part of May until about the middle of June.

If the early spray is neglected, observations have shown that under conditions of severe attack, 25 per cent or more of the walnut crop may be infested before the end of May. This well illustrates the importance of applying an early spray in those areas where the codling moth is a major pest.

First brood caterpillars mostly enter the nuts at the blossom end, and the great majority of these nuts are not involved in the harvested crop because they either drop from or dry up on the trees well in advance of harvest. Nevertheless, these wormy nuts represent a direct loss to the grower.

Second brood caterpillars mostly enter the nuts at the side and stem end. Where sprays are thoroughly applied and the two spray program is followed, wormy drops as well as caterpillar infestation in the harvested crop is not likely to be serious.

Standard Lead Arsenate Spray

Standard lead arsenate is more effective against the codling moth than is basic lead arsenate.

There is danger, however, of standard lead arsenate causing tree injury. In order to avoid this hazard it has been used in combination with a commercial basic zinc sulfate safener that contains 50 per cent zinc expressed as metallic. This combination has been used at Linden for the past five years without any trace of tree injury. The control obtained has been excellent.

A single, thoroughly applied, spray during the first week in May has resulted in successful control for the entire season. The control has been about as good as that which has been obtained with the two spray basic lead arsenate program.

A second standard lead arsenate spray improves the control but it is doubtful whether the results justify the added expense.

In 1946 a number of growers in the Linden area applied the standard lead arsenate treatment to at least a portion of their planting. No injury whatever was reported and the program will be further tested on a commercial scale in 1947. However, unrestricted recommendations for substituting standard lead arsenate for basic lead arsenate must wait until the treatment has been further subjected to the test of time. Under no conditions should it be used in the coastal regions until investigations that will be undertaken in 1947 show that it can be applied safely.

The composition of the standard lead arsenate spray per 100 gallons of water is as follows:

Standard lead arsenate.....3 lbs.
Commercial safener (basic zinc sulfate containing 50 per cent zinc expressed as metallic) 1 lb.
Medium summer oil emulsion (83 per cent oil).....⅓ gallon.

Order of mixing: Standard lead arsenate and safener slurried added to tank when ½ full followed by the oil. A wetting agent can be used, but if so, the manufacturer's recommendations should be followed carefully.

New Insecticides

Extensive investigations have been conducted with DDT, DDD and other new insecticides.

DDT at dosages of ½ and 1 pound of actual material per 100 gallons of spray have resulted in phenomenal control of the codling moth. However, the treatments have resulted in destructive mite populations. Also, there has been a serious increase in the frosted scale population where

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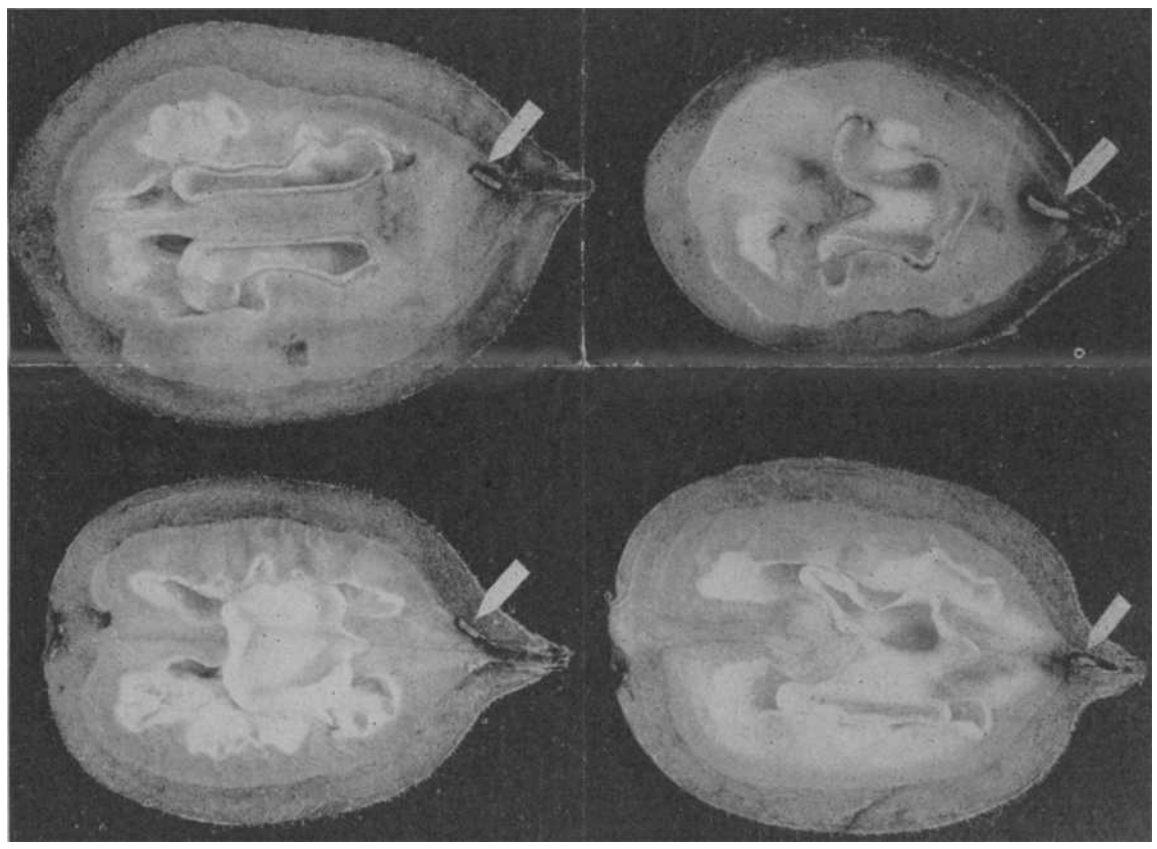

Walnuts cut through blossom end to reveal young codling moth caterpillar injury to developing nuts. The caterpillars are indicated by the white arrows.

Effects Of Plant Growth Regulators On Orange Drop

W. S. Stewart, L. J. Klotz, and H. Z. Hield

In citrus, fruit drop may be considered a continuous process from the time of flowering to fruit maturity.

Superimposed on this background of continuous fruit drop are three periods during which drop is most intense. These are fruit set, June drop, and preharvest drop.

Preharvest Drop Reduced

The first extensive experimental plots reported here, using water sprays of 2,4-D to reduce mature fruit drop in citrus were established in Valencia orange orchards in May, 1946.

Concentrations of 2,4-D tested, ranged from five pounds of 2,4-D in one million pounds of water, to 40 pounds per million. In these as in numerous subsequent tests, a reduction in drop of mature fruit was found even when the spray was applied two weeks after a heavy drop had been in progress.

In this respect the data are very consistent. The amount of reduction in fruit drop was variable, ranging from 28 to 78 per cent in eleven plots distributed throughout southern California.

This was to be expected, considering the variation in drop observed among individual orchards, and considering that some plots were harvested before severe drop from the nonsprayed trees occurred.

Similarly fruit drop reductions, ranging from 27 to 96 per cent were obtained in 23 plots of navel organges using 2,4-D sprays of 25 p.p.m. or less.

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New Vegetables For California Farms Result Of Research

Glen N. Davis

A number of varieties of vegetables have been developed in recent years, either individually or jointly by members of the University of California Agricultural Experiment Station and the United States Department of Agriculture. Some of the varieties mentioned here have been available for several years. Others are of more recent origin.

Cantaloupes

Powdery Mildew Resistant No. 45 is resistant to form No. 1 of the powdery mildew but is not resistant to form No. 2 and can not be recommended as a resistant type.

Powdery Mildew Resistant No. 5 is resistant to both forms of the powdery mildew. Under good cultural conditions it has produced over 200 crates to the acre. Its high quality is reflected in refractometer readings of 13 to 14 per cent soluble solids—mostly sugars. It is not as early as some varieties nor is it completely immune from mildew. If the melons are not harvested at the first indication of the "slip" they tend to become overmature quickly.

Powdery Mildew Resistant No. 6 and No. 7. No. 6 is well netted and well shaped. It has a larger seed cavity than No. 5 and the flesh has less quality and flavor. No. 7 produces a small oblate melon and in comparison with No. 5 and No. 6 is somewhat later in maturity. The seed cavity and flesh are comparable to No. 6.

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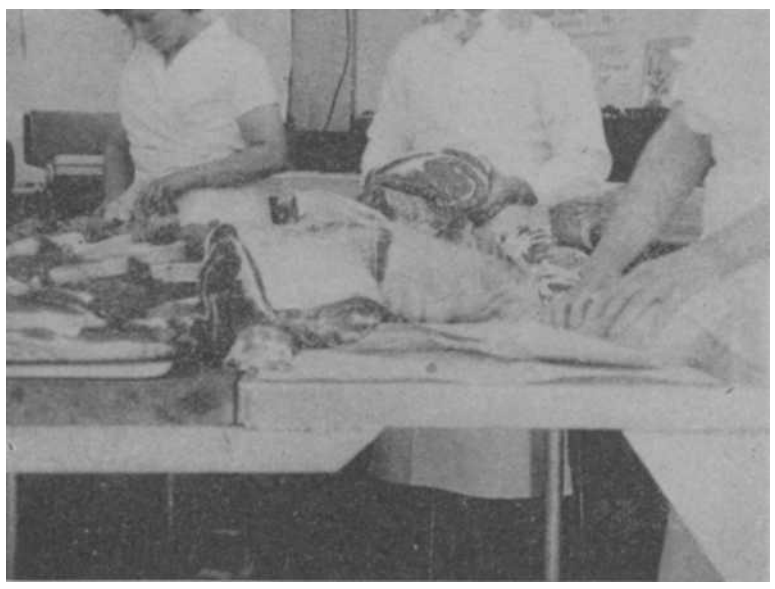
Pretreatment And Wrapping Of Frozen Pack Meats Studied For Effects On Storage Qualities

W. V. Creuss

It is well established that the storage temperature for frozen meats should be as nearly constant as possible. It should be 0 Deg. F or lower for longest storage life.

Meats properly aged—not overaged—and well wrapped should keep satisfactorily at a constant 0 Deg. F for the following periods:

1. Fresh beef, 12-14 months,
2. Fresh pork, 6-8 months,
3. Lamb and poultry, 8-10 months,
4. Seasoned sausage, 2-3 months,
5. Other ground meats—hamburger and lamburger, 4-6 months.



Beef properly aged and well wrapped should keep satisfactory at 0 Deg. F for 12 to 14 months. The choice and application of wrapping materials are important factors in the successful storage of frozen pack meats.

Recent experiments have dealt chiefly with various pretreatments of meats, various wrapping materials and various packages.

Cold Kippering

Lamb chops, beef steaks and pork chops were given a very brief cold-smoke treatment. The period of exposure was 30 minues. There was practically no drying of the meats. The surface became rather gray in color and there was no cooking effect. They were wrapped in plastic surfaced paper, or packed in plastic bags.

The smoked meats were very pleasing in aroma and flavor after frying or broiling—even after 17 months of storage at 0 Deg. F. The untreated meats used as checks had long since became rancid or stale or both.

Chicken similarly treated is very pleasing in aroma and flavor, but the experimental packing has not been stored long enough to ascertain the effects of kippering on keeping quality.

Theoretically, this treatment should be effective on poultry, fish, and meat.

Dipping Experiments

Samples were dipped in several anti-oxident solutions before freezing.

The technique used consisted in dipping the meats in the solution, draining, wrapping, freezing and storing.

Of the dips compared in these experiments the dilute—0.5-1 per cent—citric acid dip appeared to have the greatest practical value for use in locker plants. It aided materially in retarding staling and rancidification of the wrapped meats. Other tests indicate that a 0.5 per cent solution of the acid would be sufficient. It is inexpensive and readily available.

Wrapping Materials

A satisfactory wrapping material must be non-toxic and should: (1) be odorless and tasteless; (2) possess high wet strength so when it is wet with meat juices it will not soften and break easily; (3) not become brittle at 0 Deg. F; (4) be applied easily; (5) not be prohibitive in cost; (6) protect as nearly completely as possible against moisture vapor loss; (7) not adhere to the meat; (8) be heat sealable, although this is not necessary; (9) be grease proof; (10) be of good strength before freezing; and (11) be easily marked for identification.

In our experiments several wraps were compared, with interesting results.

Aluminum Foil

Aluminum foil proved superior to regular locker paper and to the cellophane laminated locker paper, when the meat was wrapped tightly so that most air pockets were excluded. It fits the contour of the meat and remains in position much better than does locker paper.

Results of our experiments agree with those recently reported by Dr. J. G. Woodroof in Georgia. There was much drying and staling of the meats wrapped in locker paper. There was considerable drying and some staling of odor and flavor when cellophane was the wrapper. Meats and chickens wrapped in aluminum foil were still in excellent condition with practically no drying or staling after being stored for one year at 0 Deg. F.

The total relative quality scores were; with the basis of aluminum wrapped chicken as 100; cellophane, 75; locker paper, 50.

Aluminum foil appears to greatly retard most of the drying and staling due in part to enzyme action and in part to oxidation, including rancidification.

Other Pliable Materials Compared

Various plastic film bags, laminated bags, two kinds of rubber bags, frozen food cartons with and without plastic bag liners, and pure aluminum foil bags—not laminated to paper—were compared as containers for hamburger, roast beef and lamb chops.

After 11 to 17 months storage meats in all of the plastic and plastic lined bags were in better condition than those wrapped in locker paper.

In general, rubber latex bags appeared to be the best of the bags used. Several plastic lined paper bags were superior to wrapping paper.

Tin Cans and Glass Jars

When hamburger, lamburger and roast beef were filled tightly into tin cans, with practically no air spaces, and the can sealed hermetically—air tight—after filling the meats kept extremely well.

They retained their fresh color, fresh flavor and fresh odor for 17 months in the formal experiments. Several cans of hamburger opened after more than 24 months storage were still in very good condition.

Similar results were obtained with ordinary Mason fruit jars. In this case it was necessary to fill with ground meat or meat pieces and water—to prevent air pockets—only to the shoulder of the jars to allow room for expansion on freezing.

A disadvantage of both jars and cans is the fact that they waste some space in the locker in comparison with meats wrapped in paper. If rectangular cans were used this fault would be eliminated.

W. V. Cruess is Professor of Food Technology and Biochemist in the Experiment Station.

Processing Milk Powders For Their Particular Uses

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per pound of powder in order to assure perfect keeping quality.

Study regarding evacuation of air from the can containing the whole milk powder showed that part of the oxygen was held very tightly by the powder. This part of the oxygen was occluded as air pockets inside each individual spray particle. Considerable time would be required for the diffusion of all the occluded oxygen from these pockets into the free space outside the particles from where it could be evacuated.

It was necessary to maintain the powder under a high vacuum or expose it to an atmosphere of nitrogen or carbon-dioxide for a certain length of time in order to remove the occluded oxygen. About half of the occluded oxygen could be removed in 24 hours and practically all of it would diffuse out in one week.

The practical conclusion from these tests was that a holding time of from 18 to 20 hours was required to bring the total remaining oxygen content of the can with whole milk powder below 5 cc. per pound of powder.

One of the most important problems to make this gas-process a commercial success was that of obtaining perfectly air-tight cans.

When gas packing was first practiced about 25 per cent of the cans were leakers, which had to be repaired or discarded. By close cooperation with the can company through several years it was possible to reduce the leakers to two or three per cent.

Antioxidants

High heat treatment of the fluid milk before drying will produce antioxidants which protect the butterfat against oxidation. The powder invariably takes on a more or less cooked flavor and this seems to change into a stale flavor on storage.

If the whole milk powder is gas-packed, it isn't necessary to give the fluid milk any higher heat treatment than that required for good pasteurization and complete inactivation of that class of enzymes that speed up hydrolysis of fats. This can be accomplished by short time heating to 175 or 180 Deg. F.

In spite of adequate heat treatment of the fluid milk before drying and a perfect gas process of the powder, this will gradually become stale when stored at 100 Deg. F. for several months.

Addition of antioxidants to whole milk powder will protect the butterfat from oxidation for a considerable period of time without gas processing, but it will not prevent development of staleness.

Processing Skim Milk For Baking

The processing of skim milk for the production of non-fat dry milk solids depends largely upon what it is to be used for.

For bread making it is necessary to preheat the fluid skim milk to a fairly high temperature of about 190 Deg. F. with a holding time of about 10 minutes, both for roller and spray drying.

The commercial baker always wants a bread with large loaf volume. It is recognized that the use of non-fat milk solids made with inadequate heat treatment will result in a small loaf volume.

Bakers want to use a non-fat dry milk powder with a mixmum water-binding quality, but it is of even greater importance to him that the water-binding quality of the powder is uniform.

The water-binding quality of non-fat dry milk solids depends largely on the heat treatment of the condensed skim milk before drying. The effect of this heat treatment varies with the heat stability of the milk which again depends on the season. It also depends on the type of equipment available and the use of automatic heat control is of tremendous importance to obtain a uniform product from day to day.

The addition of non-fat dry milk solids to bread not only improves the flavor, texture and keeping quality of the bread but it also increases the nutritive value by adding valuable milk proteins and minerals, besides considerable quantities of thiamin and riboflavin.

Helge Shipstead is Research Associate in the Experiment Station, Davis.

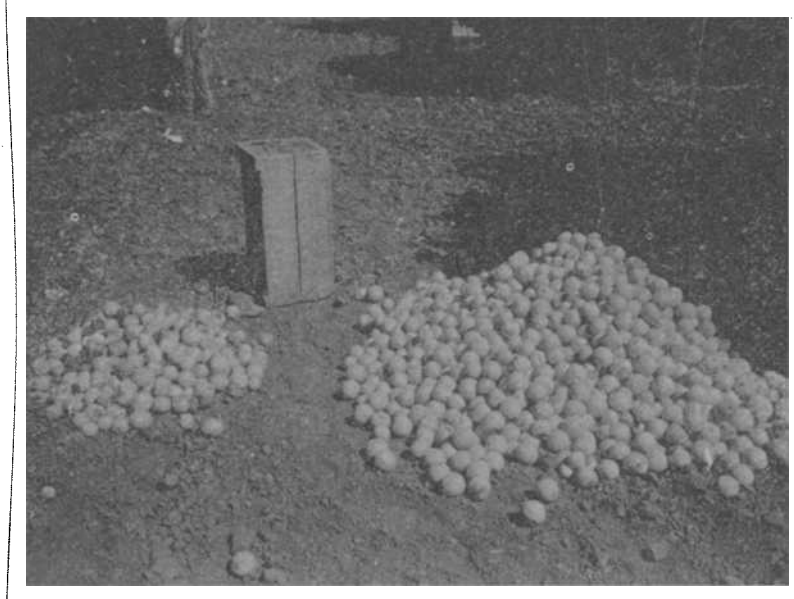
Resistance of Sweet Corn to ear worm is being studied in an attempt to develop a worm resistant strain.

Plant Growth Regulators For Control Of Drop Of Valencias And Navels Subject Of Research

(Continued from page 1)

Analyses of the fruit harvested from trees sprayed with 2,4-D for preharvest drop control have shown no undesirable effects on the treatment. No data have been obtained on the storage qualities of this fruit.

In view of these data it appears that it will be possible to incorporate preharvest drop control into already established spray programs at only the additional cost of the plant growth regulator.



Preharvest drop from Valencia orange trees during the interval September 5 to October 12, 1946. RIGHT, 2,860 fruit from 20 non-sprayed trees. LEFT, 586 fruit from 20 trees sprayed September 5 with 25 p.p.m. 2,4-D, two weeks after initiation of the heavy drop.

Decreases from 50 to 65 per cent in preharvest drop of grapefruit were also obtained with water sprays of 2,4-D.

2,4-D In Combination

Preliminary tests have indicated that 2,4-D is compatible and effective when applied in combination with other commonly used spray chemicals such as zinc, manganese, or copper in copper bordeaux sprays.

Used in conjunction with oil sprays for pest control it reduced leaf drop as well as fruit drop. Other exploratory tests showed that preharvest drop reduction was obtained when 2,4-D sprays were applied either with a spray-duster or as a fog.

The cost of the 2,4-D in 20,000 gallons of an 8 p.p.m. spray is about $1.90. Under average conditions this would be sufficient to treat a 10 acre grove.

An 8 p.p.m. 2,4-D spray has been found to reduce preharvest drop 30 to 65 per cent with no apparent injury to either young or mature leaves but at present it is recommended for limited trial only.

Sprays containing between 8 p.p.m. and 25 p.p.m. generally gave a greater reduction but resulted in various degrees of curling or buckling of young "soft", expanding leaves. With continued growth there was a tendency for these leaves to regain their normal shape. In all cases, the subsequent flush of leaves were normal.

Curling of young leaves can be minimized when using high concentration 2,4-D sprays—above 8 p.p.m. —by spraying between growth flushes. These sprays have no visible effects on mature leaves.

Studies in Progress

Data now being obtained indicate that 2,4-D may be effective in reducing drop of Valencia oranges even when applied six months before the usual preharvest drop occurs. If this is confirmed it increases the feasibility of applying 2,4-D in conjunction with other spray treatments as well as applying it between flushes of leaf growth.

In view of the injurious effects of extremely high concentrations—75 p.p.m. or more—it is clear that, "If a little is good, more is better" woud be disastrous in the case of 2,4-D.

Considering the fact that 2,4-D achieved fame as a "plant-killer", is is unlikely that anyone will be temped to use more of this substance than is necessary to accomplish the job at hand.

W. S. Stewart is Assistant Plant Physiologist in the Experiment Station, Riverside.

L. J. Klotz is Professor of Plant Pathology and Plant Pathologist in the Experiment Station, Riverside.

H. Z. Hield is Laboratory Technician, Citrus Experiment Station, Riverside.

Investigations On Control Of Codling Moth On Walnuts

(Continued from page 1)

DDT has been applied, and the walnut aphid population has, on occasions, developed to destructive levels where the sprays have not been thoroughly and evenly applied.

Continued extensive investigations of DDT will be conducted in 1947, but to the present time no spray program involving DDT can be safely recommended.

An Insect Confused With Codling Moth

Over most of the Sacramento Valley and in other areas such as the Napa Valley the Catalina Cherry Moth, often confused with the codling moth, is the most serious pest attacking walnuts. Infestation by this pest does not occur until late in the growing season.

Spray programs that are directed against the codling moth will not control the Catalina Cherry Moth.

Damage by this pest can best be reduced by harvesting the walnut crop at the earliest possible date.

A. E. Michelbacher is Assistant Professor of Entomology and Assistant Entomologist in the Experiment Station.

W. W. Middlekauff is Assistant Professor of Entomology and Assistant Entomologist in the Experiment Station.

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HAROLD ELLIS.....Director, Agricultural Information

W. G. WILDE.....Editor

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