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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.

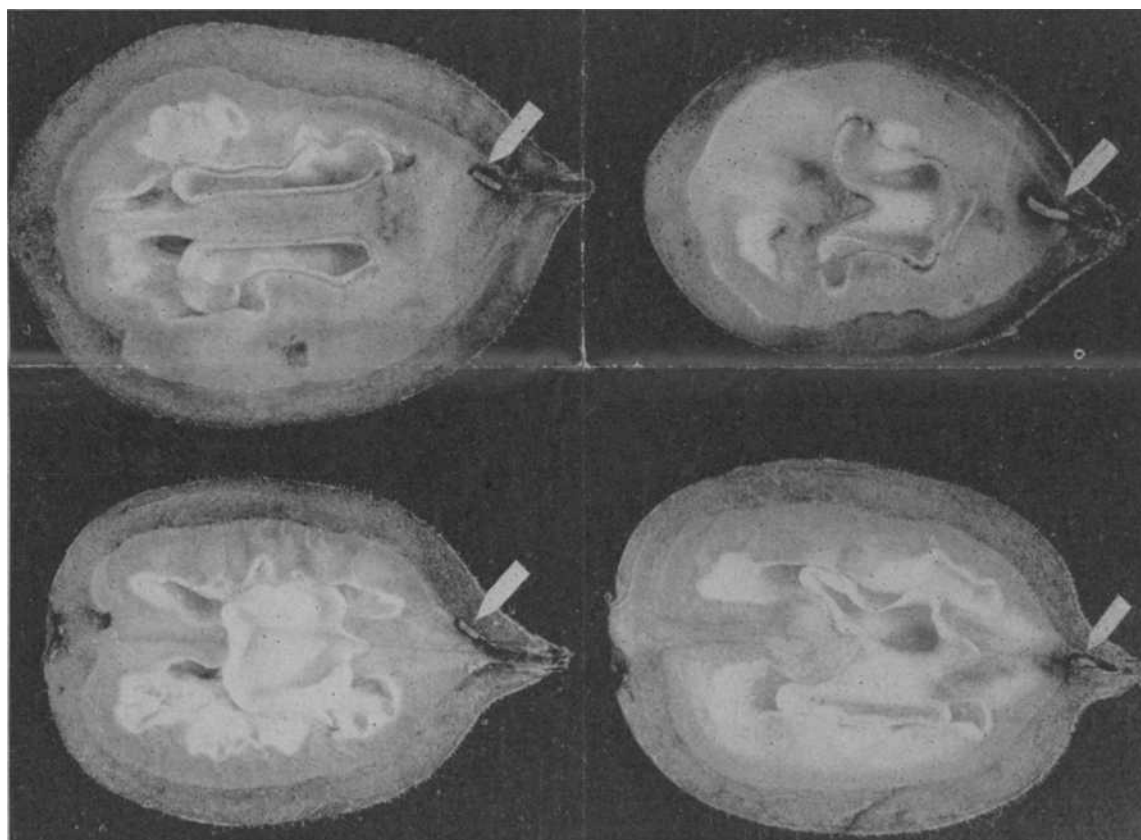
In southern California investigations on the control of this pest have been conducted by members of the entomological staff at the Citrus Experiment Station, Riverside, while in central California the study has been carried out by members of the entomological staff at Berkeley.

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

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



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

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.

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

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 oranges 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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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).....1/3 gallon.

Order of mixing: Standard lead arsenate and safener slurred added to tank when 1/2 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 1/2 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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Studies On Plasma Fractions From Domestic Livestock May Lead To Animal Disease Control

H. S. Cameron

Investigations of the effectiveness of plasma fractions obtained from the blood of domestic animals, in combatting certain infectious diseases of livestock are the logical extension of similar studies on human plasma during the war period.

The vast supply of blood from domestic food-producing animals available for fractionation or separation into its components, probably contains neutralizing substances formed by exposure to various antigens, the substances which when entering the blood or other cells stimulate the production of an antibody which in turn opposes the action of the toxin or other disease producing agent responsible for its formation.

The blood from which the fractions, used in these studies, were obtained, represented a pooled sample from about 400 hogs or cattle at a Chicago packing house. The blood was collected without regard to post-mortem or ante-mortem examination.

Hog Cholera

Because in this group of hogs many would have been exposed to virus through vaccination, passive immunization against hog cholera was suggested.

Ten cholera-susceptible crossbred pigs, averaging 35 pounds apiece, were used as subjects in the tests.

Injections were made subcutaneously. Temperatures were taken daily, and autopsies were conducted on the pigs that died.

Results of the experiment showed that 35 pound pigs were protected from two cubic centimeters of virus by four cubic centimeters of plasma fraction 11 (gamma globulin).

Brucellosis

Specific antibodies for *Brucella*, the cause of contagious abortion in cattle and swine, were concentrated in fraction 11 of both swine and

cattle plasma.

Passive immunization—swine alone—has not been successfully used in brucellosis of cattle or swine. Whether or not the concentrated antibody can be effective will be determined by animal experimentation.

Staphylococcus

Several strains of *Staphylococcus aureus*—a form of mastitis-producing organism—were tested for toxin production.

Three of the strains showed marked toxicity, two a slight amount and four none at 1:10 dilution.

In testing for antitoxin the same procedure was followed, but with the addition of the plasma fraction.

Antitoxin was clearly demonstrated in the bovine gamma globulin fraction and to a lesser degree in the corresponding porcine fraction. It was absent in other fractions.

Conclusion

The use of plasma fractions in therapy, and passive immunization leading to modification, at least, of an outbreak of disease, would appear as a distinct possibility.

Probably the greatest application of the fractions will be found in those classes of livestock, such as chickens, turkeys, and rabbits, where extensive domestication is relatively recent, large numbers are concentrated in small areas, and mortality from infectious disease constitutes the greatest single hindrance to economical production.

An application may also lie in the field of pork production, wherein it has been stated that 40 per cent of pigs farrowed fail to reach market.

Intensive investigations exploring the field are warranted.

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White Or Yellow—Butterfat Has Approximately Equal Value In Vitamin A Potency

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our principal dairy breeds. In order to meet this requirement, the mixed herd and the crossing of breeds have reached alarming proportions in the market milk areas.

In one important dairy county in California, it has been estimated that 90 per cent of the dairy herds are a mixture of the high and low fat breeds.

When two Guernseys are mated, it is reasonably certain that the female offsprings will produce milk yellow in color and testing about 5 per cent fat and 9.5 per cent solids-not-fat.

The mating of Holsteins would probably result in an individual capable of producing twice as much milk, but with less color at a lower test in both fat and solids-not-fat, than that of the Guernsey.

Indiscriminate Cross-Breeding

When breeds are crossed indiscriminately and the offspring retained for breeding purposes, much that has been gained through generations of selective breeding is lost. There is an entirely new combination of characters in the offspring, so that there is no way of predicting what the results will be. Usually, in the first generation, there is a rather high proportion of exceptionally good animals, but the second and third generations yield many mediocre and worthless individuals.

When the crossing of breed results in lowering production, either the margin of profit to the dairy farmer is reduced, or the consumer must pay more for milk.

Butterfat and Economy Related

That there is a direct relation between the amount of butterfat produced and economy of production is shown by the figures recently released by the Bureau of Dairying of the United States Department of Agriculture.

In a survey in the 1944 cow testing

association records, it was found that as butterfat production was multiplied by 5, the cost of feed was doubled, and the profit above feed cost was multiplied by 22. That is, for a group of cows producing 100 pounds of fat yearly, the average feed cost was \$47 with a return of \$8 above the cost of feed.

At the same time, for the group whose average yearly production was 500 pounds, the feed cost was \$90 and the income over feed cost was \$178 per cow.

The Channel Island breeds produce a pound of butterfat with greater economy than does the average Holstein; yet the Holstein, because of the greater volume of milk produced, is more economical in the production of solids-not-fat than is the average Jersey or Guernsey.

Possible Solution

The solution of the problem does not lie in the crossing of breeds with the probable lowering of production and loss of economy. Nor does it lie in the inefficient procedure involved in maintaining two separate breeds on the average dairy ranch. The wisdom of attempting to develop a new breed to meet our present market demand is to be seriously questioned.

The problem can be solved only through the efforts of a unified dairy industry directed towards the utilization of our present breeds of dairy cattle in the efficient production of the kind of milk the public wants.

Consumer education concerning the special nutritive qualities of milk should be encouraged. It might even become necessary to establish, in areas where the high fat breeds predominate, enough herds of lower testing breeds to make possible the blending of milk for market demand.

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Study Of Evolution Aided By Research On Genus *Crepis*

E. B. Babcock

New knowledge about evolution which came to light during the investigations of a 25-year research program in the general field of plant genetics has a definite value in practical agricultural plant breeding.

The chief aim of this research was to discover new facts about the evolution of plants—how new species originate in nature—and how the younger members of a group of closely related species come to differ from the older species of the genus.

Outline of Study Plan

The aim of the research program was accomplished by the following lines of work:

(1) Analyzing the comparative features of the 196 different species which comprise the classification—genus *Crepis*—herbs of the Chicory Tribe of the Sunflower Family.

Only one of the 196 species of *Crepis* has become a common garden flower, the Red Hawkbeard. All the others are wild species, some of them being weeds, but a few kinds are used locally as fodder.

As a group, *Crepis* is closely related to the genus *Lactuca* which contains the lettuce plant, and to the genus *Taraxacum* which includes the common dandelion and its wild relatives.

Crepis species exhibit great diversity in their life processes, since the various kinds are peculiarly adapted to extremely different environments, such as swamps, deserts, meadows, seashores, and alpine peaks.

(2) Bringing together at Berkeley, living plants of 113 of these species, from North America, Asia, Europe, and Africa, and subjecting them to microscopic study and experimental breeding.

(3) Synthesizing or fitting together, all the available evidence in working out the evolutionary history of this group of related species.

Important Factors in Evolution

Three general conditions and three vital processes have been important in the evolution of the 196 species from a few original ones.

The first condition is secular—the time element. The genus *Crepis* originated 20 to 30 million years ago. Although many *Crepis* species are perennial, all of them produce new seed progeny each year. Hence there have been 20 to 30 million generations of *Crepis* since the group originated.

The second condition is environmental change, of which there are three important groups: (1) the cooling and drying of the climate in the late Miocene and Pliocene epochs; (2) the processes of mountain building which opened new migration routes for some species and erected barriers for others; and (3) the effects of glaciers, including the extreme vacillation in climatic temperatures and moistures.

The third condition is isolation, which may be accomplished in two ways: (1) the natural migration of species—mostly through seed distribution by the wind—which may result eventually in the isolation of populations, the migration being either from one altitude to another or from one place to another in the same altitude; (2) the isolation between groups of individuals within any one species by means of genetic changes taking place within the plants themselves. This second method of isolation depends upon the first vital process.

The first vital process involves the sexual isolation of different parts of the same population by the creation of an internal mechanism which is capable of becoming more and more complicated and effective as time goes on.

The second vital process is the gradual building up of differences between isolated populations. In *Crepis* this has been accomplished largely by means of minor gene mutations. The recurrence of gene mutations is potentially able to create endless changes in the form and function of the plant and its parts.

The third vital process is adaptation to environmental changes which

Production Problems Of Rabbit Growers Subject Of Cooperative Research At Davis And Fontana

T. J. Hage

Disease-free herds and better management practices for commercial rabbitries form the goal of a research program now under way.

The United States Rabbit Experiment Station at Fontana and the University of California are cooperating in the research program.

One experimental herd of rabbits is maintained at Davis where danger of contamination of the research herd from outside herds is comparatively small.

A second experimental herd is kept at Fontana in San Bernardino County which with Los Angeles County

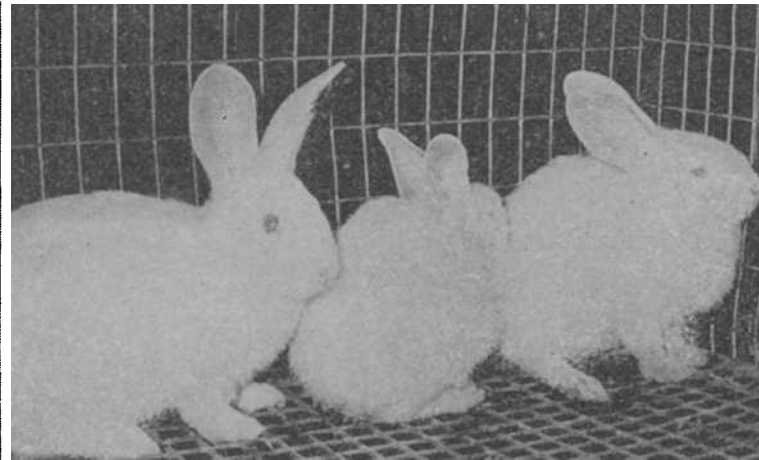
The stock for the disease-free herd at Fontana was picked from the experimental herd there.

DDT for External Parasites

A series of investigations produced the conclusion that control of external parasites, such as fleas, on rabbits can be gained successfully by the use of 10 per cent DDT in talc. The rabbits do not suffer any toxic effects from the dusting at that concentration.

Two methods of application were used:

(1) A dusting powder containing 10 per cent DDT in talc was applied



The rabbit on the left is normal; weight 3 pounds, usual stance, eyes bright, ear alert, and the fur smooth and clean. The center rabbit, a litter-mate of the first, has advanced enteritis; weight 2 pounds, characteristic position of arched back with feet drawn up under the body, eyes almost closed and lusterless, ears laid down and darker in color, fur rough, matted, and soiled with fecal matter. The rabbit on the right is a litter-mate of the other two; enteritis is less advanced than in the center animal.

is believed to lead the nation in the production of rabbits and rabbit products.

In 1946, Los Angeles County produced rabbits, meat, pelts, and fertilizer valued in excess of \$9,680,000.

The nearness of the Fontana herd to heavy producing rabbit centers increases the hazard of contagion. Control measures developed at Davis may be tested thoroughly at Fontana before they are recommended.

Disease-free Herds

To get a true picture of the cause and control of the various diseases of rabbits it was necessary to have some normal, healthy animals as a foundation herd.

Three bucks and five does, free of fleas or other external parasites and without symptoms of common diseases of rabbits, were obtained as the start of the experimental herd at Davis.

is accomplished through gene mutation and natural selection. One adaptation of the most profound significance in the evolution of *Crepis*, is the change in type of root from the shallow root system to the deep taproot. This made it possible for perennial plants to maintain themselves under drier conditions than the oldest species in the genus could endure.

Another adaptation of general importance is the development of tolerance to dry climates—the oldest *Crepis* species were moisture-loving perennials whereas some of the youngest species are short-lived desert annuals.

Foundation for Future Research

There are many unsolved problems in plant breeding to be studied, but the results of research on *Crepis* have laid a good foundation on which future research can be based.

No longer can the systematic study of plants and animals be restricted to the herbarium or museum and yield satisfying results. The organisms must be studied, if possible, in their native environments.

They must be brought into the experimental garden or laboratory for intensive study in order to throw all the light possible on their natural relationships.

In this way accurate classification becomes the indispensable foundation of both biology and agriculture.

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to the rabbits by shaking the dust from a quart size Mason jar with a perforated lid; and

(2) A generous amount of the DDT dust was placed in the bottom of a cellophane bag large enough to contain the body of a rabbit, leaving its head out of the bag. Tapping the outside of the bag under the dust, causes the powder to rise in a cloud to settle in the fur.

Investigations of Enteritis

"Mucoid enteritis"—a disease attacking the intestinal system of young rabbits—is responsible for a heavy mortality in the herds.

Charts kept during the past two years show the trend in mortality caused by enteritis in the 11-to-56 day old age groups.

The most accurate statistics are maintained on this age group because after they reach 56 days, a large proportion of commercially raised rabbits are sold for meat.

It is assumed that enteritis is infectious as it seems to be constantly present in a greater or less degree.

Sudden increases in the numbers of cases take place but no month is free from mortality in the herd. The low points on the chart for 1945, were the months of April and October. The same months were the high points on the 1946 chart.

By the time the rabbits had reached 41 days of age, one-third of the mortality had taken place. The next seven days accounted for the second one-third, with the greatest mortality at the rabbit age of 45 days.

The age distribution seems alike in both the high and the low months of mortality with a possible slight shift to younger ages in the low months as shown on the chart.

In the course of the study of enteritis, investigations have not as yet produced specific control measures which can be recommended for commercial use.

Research Program Continues

The ultimate goal of this cooperative research program is to obtain knowledge that will be helpful to the industry in reducing losses in the commercial herds.

Efforts are being made to develop definite and practicable measures that can be employed by rabbit producers in the prevention and control of diseases and for the improvement of management practices.

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