# Supplemental Feeding of Honey Bees

BOB SHEESLEY • BERNARD PODUSKA

for the many other crops which benefit from honey bee pollination in this state. If these crops are to be grown profitably, growers, agricultural chemical applicators, and beekeepers must work together to supply and protect honey bees.

### Pollination capability

Information has been needed concerning the possibilities of increasing bee populations and of determining the relative pollination capabilities of bee colonies of different strengths in each crop. An experiment was conducted recently in Fresno County to answer the following four questions: 1. Is it possible to stimulate the queen bee to lay eggs by feeding drivert sugar mixed with 1% shattered natural pollen? 2. What is the effect on bee populations and on the amount of pollen collected by colonies fed supplement foods before natural pollen is available? 3. How does the number of bees plus the total area of open and capped brood in a colony affect the amount of pollen collected by the colony? 4. When should bee colonies be graded for their potential pollination capabilities if bee numbers and brood area are used as rating criteria?

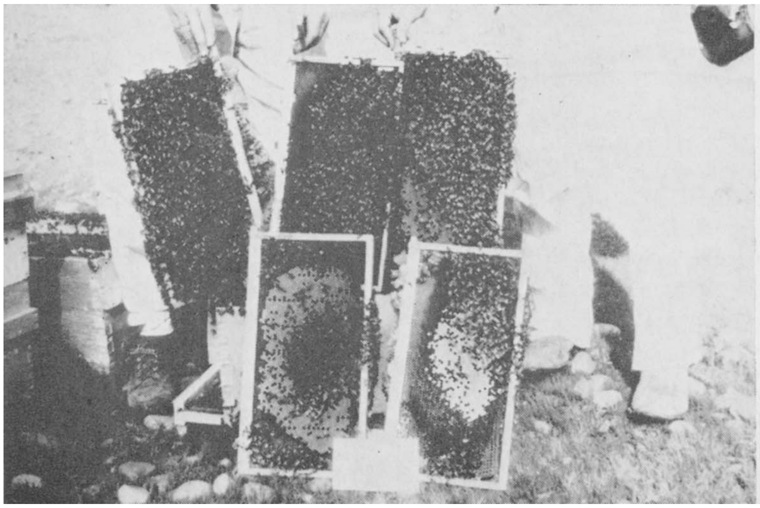
Results reported here are from this single experiment conducted under one set of conditions. However, the consistency of results suggests they are valid for this set of conditions.

The study involved sixty colonies of bees divided into five treatments of twelve colonies each. Each treatment consisted of four strong colonies, four of medium strength, and four weaker colonies. Original strength ratings were based on the size of the bee cluster on January 3, prior to the availability of natural pollen in the area. There was virtually no brood in any of the colonies at this time, and all colonies were clustered. The colonies were further assigned to four equal replications to eliminate pollination differences due to the effect of physical location in the almond orchard during pollination.

The five treatments used in the experiment were as follows :

1. A control treatment receiving no supplemental food.
2. One-lb feedings of drivert sugar with 1% pollen on January 3 and again on January 5 (totaling 2 lbs of food).
3. The same (drivert sugar with 1% pollen feedings) as treatment 2—plus 1 lb of a substitute food consisting of 17.4% brewers yeast, 52.1% soy flour, and 30.5% sugar. These were mixed with water to a heavy paste consistency and fed on January 8. On February 29 (during almond pollination) an additional 1¾ lbs of drivert sugar with 1% pollen was fed.
4. The same drivert sugar with 1% pollen feedings as in treatment 2—plus a supplement food consisting of 5.3% natural pollen, 65.7% soy flour, and 29% sugar. These were mixed with water to a heavy paste consistency. One pound of this substitute food was fed January 8. A second 1-lb feeding was fed February 2 to those colonies which had cleaned up the first feeding.
5. The same drivert sugar with 1% pollen feedings as in treatment 2—plus 1 lb of substitute food consisting of 5.3% natural pollen, 65.7% cotton seed meal dust and 29% sugar. These were mixed with water to a heavy paste consistency and fed on January 8.

All sixty colonies were also rated for strength on three dates during the experiment. These ratings were based on measurements of the total square inches of open and capped brood. The first date was January 16, four days after natural pollen became available in the area. The second rating was on February 14 just prior to moving the colonies into the almond orchard for pollination. The third rating was after almond pollination on March 15. Only colonies with an actively laying queen were included in the results. Queen vigor did not become a serious



This colony measured 1,120 square inches of brood 42 days after feeding drivert sugar with 1% pollen.

Pollen was collected during three two-day periods with a one day rest period between collections.

problem in any of the treatments during the experiment.

In answer to the first question listed for this experiment, the amounts of brood area (square inches) measured on three dates are summarized in table 1. Visual observations January 8, five days after feeding drivert sugar with 1% pollen, indicated that the control treatment colonies had not broken their bee clusters. Bees in all treatments which had received the drivert sugar with 1% pollen had broken their clusters and were actively moving within the colonies.

Observations of brood stages in all treatments indicated that the queen bees of the control colonies started laying eggs January 11, the day natural pollen became available in the area. The queens in all other treatments started laying eggs January 3, the day they received the drivert sugar with 1% pollen. This eight-day jump in egg-laying activity accounts for the differences in brood area between the control colonies and all other treatments measured January 16.

To compare specific strength ratings with the pollination ability of colonies, pollen was collected during almond pollination. Three two-day periods of collection were used, with a one-day rest period between collection periods. The pollen-trapping dates were 2/29–3/1, 3/3–3/4 and 3/6–3/7. The effect of the foods used on the amount of pollen collected by the bees in each treatment group is listed in table 2. Treatment 3 is not included in table 2. The trapped pollen could not be separated from the drivert sugar which was used to feed treatment 3 on February 29. Observations indicated that colonies in treatment 3 collected less pollen than those of any other treatment.

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141

TABLE 1. BROOD AREA COMPARISON

| Treatment | Rating dates 1/16 | 2/14 | 3/15 |
|---|---|---|---|
| | Per cent of control | | |
| Control | 100 | 100 | 100 |
| 2 | 362 | 130 | 122 |
| 3 | 421 | 116 | 98 |
| 4 | 457 | 124 | 108 |
| 5 | 388 | 116 | 104 |

TABLE 2.
TOTAL POLLEN COLLECTED FROM TREATMENTS

| Treatment | Pollen collected |
|---|---|
| | Per cent of control |
| Control | 100 |
| 2 | 144 |
| 4 | 91 |
| 5 | 80 |

TABLE 3. POLLEN COLLECTED FROM COLONIES OF DIFFERENT STRENGTHS

| Strength rating | January 3 | February 14* | March 15* |
|---|---|---|---|
| | Pollen rated per cent of "A's" | | |
| A | 100% | 100% | 100% |
| B | 62% | 55% | 61% |
| C | 55% | 17% | 29% |

* Average square inches of brood area:

| | 2/14 | 3/15 |
|---|---|---|
| A's = | 885 | 1.749 |
| B's = | 656 | 1,392 |
| C's = | 332 | 762 |

These results indicate that the supplemental foods fed January 8, after feeding drivert sugar with 1% pollen January 3, are related to the reduction in pollen collection. Possibly the bees stored and used these supplement foods in lieu of gathering more natural pollen to meet their colony needs. No attempt was made to measure the amounts of supplemental foods stored during this experiment.

The colonies which received only 2 lbs of drivert sugar with 1% pollen collected 44% more pollen than the control colonies.

Letter grades were given each colony after each of the rating dates to help answer the third and fourth questions listed for the experiment. The strongest 20 colonies were rated as "A's," the 20 colonies of medium strength were "B's," and the weakest 20 colonies were graded "C." Table 3 shows the relative amounts of pollen collected from all colonies compared with their original January 3 strength rating, which was two months before pollination. This table also lists a comparison of the pollen collection results with the February 14 rating, which was made two weeks before pollination and the March 15 rating, which was made two weeks after the pollen was collected. The average weight of pollen collected is expressed in table 3 as a percentage of the pollen collected by the "A" strength colonies.

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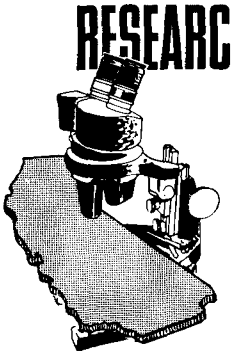
# RESEARCH PREVIEWS



A continuing program of research in many aspects of agriculture is carried on at University campuses, field stations, leased areas, and many temporary plots loaned by cooperating landowners throughout the state. Listed below are some of the projects currently under way, but on which no formal progress reports can yet be made.

## QUEEN BEE BREEDING

Experiments by apiculturists at Davis indicate that it may be possible to control the breeding of queen bees by strategic placement of hives containing desirable drones within the area used by the queen during her mating flight. This could become an important factor in the genetic improvement of bees.

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## NATURAL INSULATION

Biochemists at Riverside have developed a way to measure the heat- and cold-conducting properties of citrus leaves. Experimenting with four varieties, it was found that citrus leaves themselves provide much better insulation against extreme heat and extreme cold than had been believed—information that may prove valuable in future studies on frost protection.

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## STEAM-PRESSURED GRAIN

Trials by animal scientists at Davis have shown that cattle fed milo grain processed under steam pressure made more efficient gains than those fed the untreated grain. The same treatments had no significant effects on the utilization of barley. Why this is so will be the subject of further studies.

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## LIME STORAGE

Biochemists at Riverside are studying the compositional changes that take place in lime fruits stored over different time periods, at different temperatures, with different surface treatments, in an attempt to determine the best conditions for keeping the fruits.

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## TURKEY PACKING MACHINERY

A semi-mechanized line for packing dressed turkeys is in the design stage at the Department of Food Science and Technology, U.C., Davis. The packing line may result in a 15 per cent reduction in the labor required to prepare the birds for weighing, placing them in plastic bags, marking the weight on the bags, and sealing them.