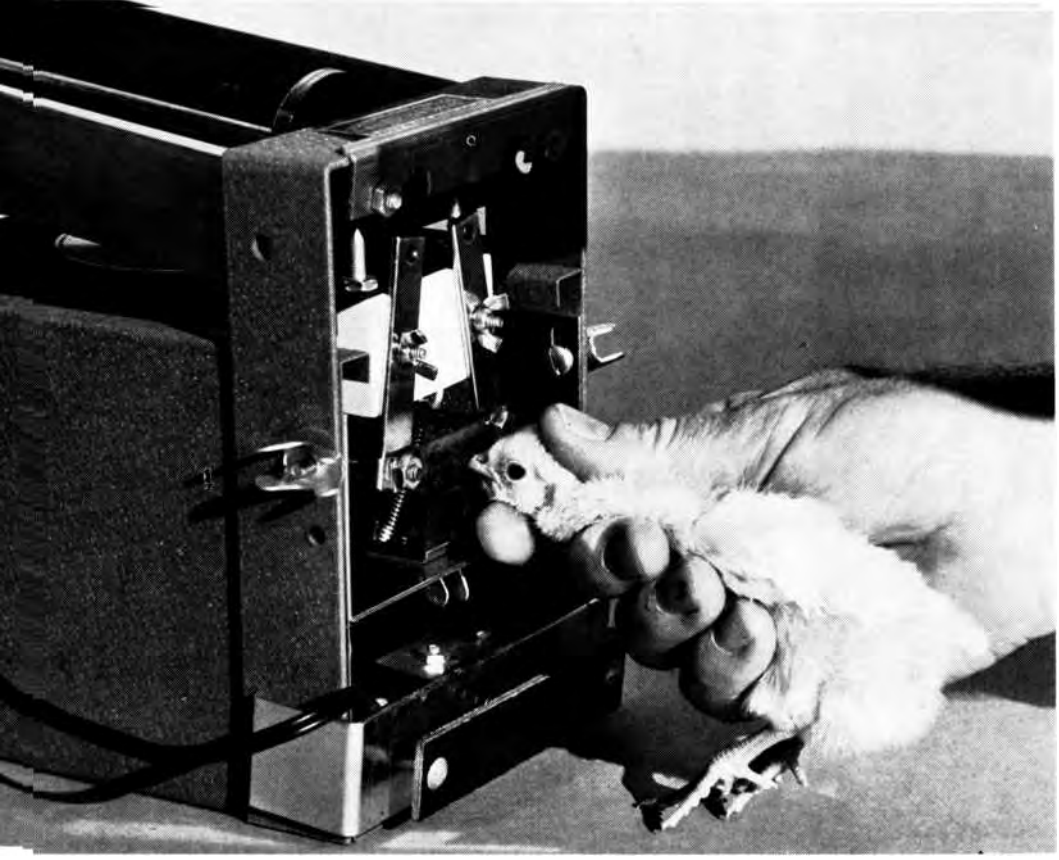


Precision debeaking machine shown controls the amount of beak removed by a guide plate with a $^{10}/_{64}$-inch hole. Machine also regulates cauterization period.

CONCLUSIONS

1. Precision debeaking with control over amount of beak removed and with timed cauterization at seven days of age increased egg production by 4.7% over debeaking at 12 weeks of age with or without precision.
2. Egg production per bird with three birds to a cage was 4.9% greater than with four birds per cage.
3. Mortality for four birds per cage was 6.1% higher than for three birds per cage.

Other advantages of early precision debeaking, in addition to increased egg production, include:

1. Chicks are easier to handle, making debeaking three times as fast, thereby reducing labor costs.
2. Unskilled labor can be used.
3. Debeaking remains accurate even though operator may tire.
4. Culls resulting from poor judgment or error during debeaking are eliminated.
5. Less food is wasted during rearing.
6. Cannibalism is reduced during rearing.

Effects of DEBEAKING *and* CAGE DENSITY *on egg production*

E. L. BRAMHALL
T. M. LITTLE

CANNIBALISM IS one of the reactions of hens to the crowding of cage living. Debeaking at 12 to 17 weeks of age has provided a practical control of cannibalism in the past. The results of this trial show that early precision debeaking not only controlled cannibalism but also increased egg production, as compared with later debeaking.

Early precision debeaking means that two-thirds of the beak is removed at seven days of age with a debeaking device that controls the amount of beak removed and the cauterization time (see photo). This is in contrast with the standard method of removing two-thirds of the upper beak at 12 to 17 weeks without precise control over amount of beak removed or time of cauterization. The appearance of a seven-day-old chick and a mature hen that have been debeaked by this new method are shown in photos.

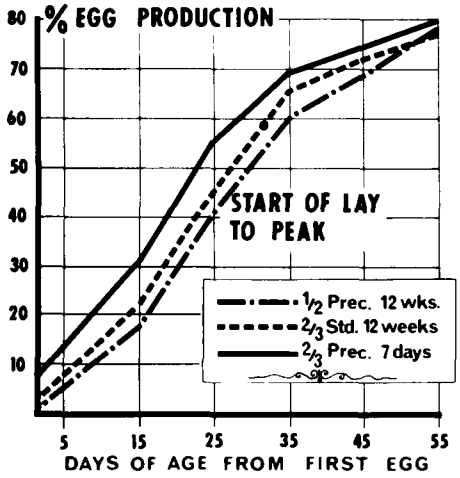
This experiment was set up to compare effects of method of debeaking, of number of birds per cage, as well as any interactions among these factors on egg production, mortality, and cannibalism. The three methods of debeaking included:

(1) Early precision—two-thirds of the beak removed from seven-day-old chicks, using a 10/64-inch hole and 2.5-second cauterization time; (2) Late precision—one-half of the beak removed from 12-week-old chicks with 21/64-inch hole and 2.5-second cauterization; and (3) Late non-precision—about two-thirds of upper beak removed from 12-week-old chicks, with a brief but untimed cauterization.

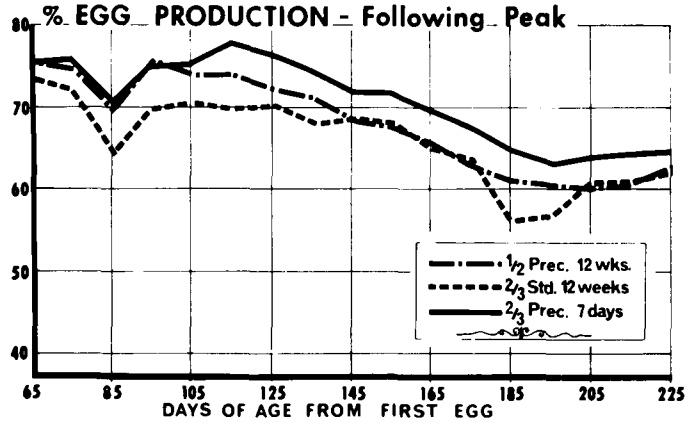
Cage population densities during the tests were: three birds per 12 × 18-inch cage, 72 sq inches per bird; and four birds per 12 × 18-inch cage, 54 sq inches per bird.

One entire house 50 ft long with two rows of back-to-back cages on each side of

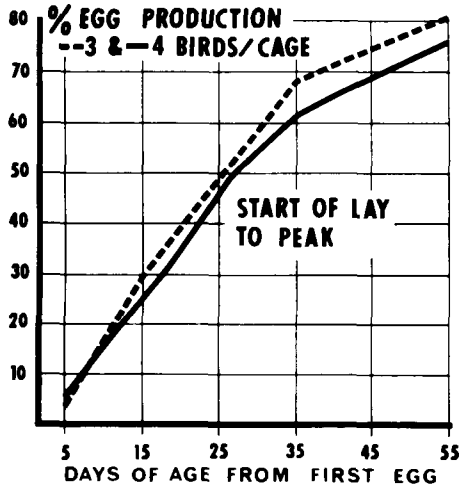
GRAPH 1



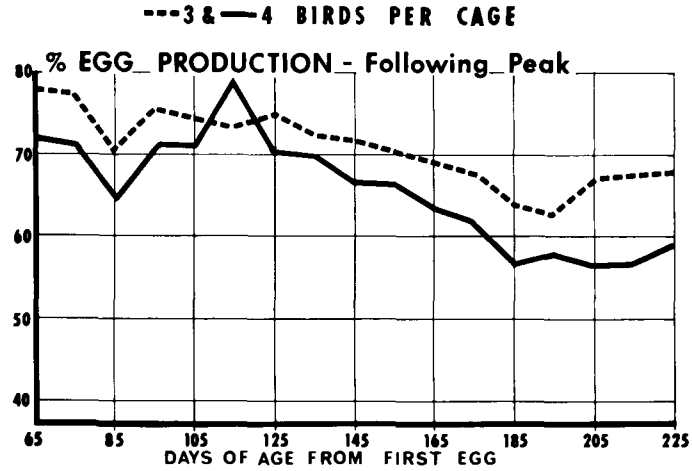
GRAPH 2



GRAPH 3



GRAPH 4



an aisle was used for the experiment. All cages were made of wire, uniform in construction, and placed back to back with center watering troughs and with feed troughs fastened to the front.

Experimental design

The experimental design was a split-plot replicated five times. Debeaking methods were the main plots and densities were sub-plots. Four cages represented the experimental unit.

August-hatched, Stone-strain, white Leghorn pullets were used. In addition to the 420 birds required for the test, extra birds of each treatment combination were grown for replacements. Pullets were placed in the lay cages just after the 12-week debeaking.

There was no culling; dead birds and those near death were removed and replaced with healthy birds of the same lot. This kept the density of birds constant throughout the experiment.

Egg production and mortality records were started when the first egg was laid and kept daily thereafter for 229 days. Each cage had its own egg record attached permanently above the cage. The first egg was laid about the 20th week.

Data on egg-production rate were analyzed for two separate periods. The first period was from the first egg laid to peak production (60 days). The second period of 169 days went from peak production to the end of the trial. By processing the data in this manner the effect of debeaking on rates of early and late production was measured.

The data from peak production to the end of trial provided comparisons among debeaking methods and cage densities, and their interaction during the major production period.

Laying data

For the first (60-day) period (graph 1), birds debeaked at seven days of age laid 53.0% (100% = 1 egg per day) while the average of the other two methods was 46.1%. This difference was highly significant, but there was no significant difference between methods 2 and 3.

During the second period of 169 days (graph 2), the pullets debeaked at seven days laid 70.8% while the average of the other two methods was 66.7%. This difference was highly significant; the differ-

Seven-day-old chick after precision debeaking. This method of debeaking is permanent.

Mature hen debeaked by precision debeaking as a chick.

ence between methods 2 and 3 was not significant.

During the first period of 60 days, the average difference due to density was not significant, but production started to diverge near the end of the period (graph 3). During the last 169 days (graph 4), birds in the three-bird cages laid 70.9% while those in the four-bird cages laid 65.4%. This difference was highly significant.

There was no significant interaction between debeaking and density during either period. The production over the entire laying period for the six treatment combinations is summarized in the table.

EFFECTS OF DEBEAKING METHODS* AND CAGE DENSITY ON EGG PRODUCTION

Birds/Cage	(1) Early precision	(2) Late precision	(3) Late non-precision	Average
3	68.6%	64.9%	62.9%	65.4%
4	63.7%	58.9%	58.9%	60.5%
Av.	66.1%	61.9%	60.9%	

* See text for explanation.

There was a highly significant difference between densities in number of birds that died from causes other than cannibalism. The four-bird cages had a death rate of 11.7% while the three-bird cages showed only 5.6%. There was no significant difference related to debeaking method. The mortality from vent picking (cannibalism) showed no significant difference either due to cage density or method of debeaking. The percentage of pick-outs was low in all cases—about 5%.

Ervin L. Bramhall is Farm Advisor, Ventura County. Thomas M. Little is Extension Biometrician, University of California, Riverside.

SULFUR-COATED for controlled- of container-

TOKUJI FURUTA

R. H. SCIARONI · J. R. BREECE

CONTROLLED-RELEASE fertilizers have been used in the production of ornamental plants for a number of years. This slow release of elements from fertilizer particles has been achieved by one of three methods: (1) coating fertilizer particle with a membrane to regulate availability; (2) using minerals or compounds which are slightly soluble; and (3) using compounds which are slow to mineralize.

Coating

Coating particles or granules of urea with sulfur and a sealant results in the formation of a membrane that regulates the availability of nitrogen for plant growth. The rate of nitrogen availability is determined by the thickness of the coating. Several experiments were conducted during 1966 in nurseries throughout California to determine the value and use of sulfur-coated urea for the growth of ornamental plants. The results (with woody plants in containers) are reported here.

Sulfur-coated urea with various dissolution rates was used in two ornamental nurseries on container-grown woody plants. The rate of dissolution was determined by measuring the amount of substrate that would dissolve in water at 100° F in a 24-hour period, and was expressed as a percentage of the original weight. Fertilizers with dissolution rates of six, five, and one per cent were used. The dissolution rate is influenced by the thickness of the sulfur coating.

Controlled-release urea was incorporated into the soil mixture immediately before the small plants (liners) were planted. During the growing season, some of the plants in the experiments were given additional amounts of fertilizer.

Toxicity

Symptoms of toxicity due to overfertilization were evident in many of the urea incorporation treatments. Injury to plants of wax-leaf privet (*Ligustrum japonicum*) and dwarf Chinese holly (*Ilex cornuta* "Rotunda") occurred when sulfur-coated urea with a dissolution rate of six per cent was incorporated at 40 and 80 grams of nitrogen per cubic foot of soil mixture. Injury occurred to dwarf Chinese holly plants at rates of 20 grams of nitrogen. Injury was also noted on English laurel plants (*Prunus lauro-*

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141