

Insemination Techniques and Timing found important factors in turkey fertility studies on a commercial farm

W. F. ROONEY · F. X. OGASAWARA · D. C. FEREBEE

When a fertility problem arises, results of these studies suggest that it is most important to carefully examine insemination procedures. Introducing semen into the oviduct to a depth of a half inch did not lower candling reports in 1964-65; however, very shallow insemination, as in the 1963-64 experiment, resulted in lower candling reports. Weekly insemination gave far better candling reports during the second half of each year's experiments, especially in the 1963-64 season. Growers may find it more profitable to inseminate weekly during the second half of the breeder season. Weekly insemination may be the answer to fertility problems in some flocks. Candling reports with diluted semen were found to be as good as those with undiluted semen in these tests.

THE PRODUCTION of hatching eggs is an important seasonal activity of the turkey industry in California. Growers maintain one-fourth of the breeding turkeys of the United States and export to many other parts of the country in addition to supplying eggs for the state's large industry. To avoid costly adjustments, hatching eggs must show a reasonably high percentage of live embryos at seven to ten days incubation. This percentage is called a candling report and eggs are often sold with a guarantee of 75%.

Candling reports

Acceptable candling reports result from successful and repeated natural mating or artificial insemination, but are dependent upon the inherited level of fertility and hatchability for the strain.

Other factors influencing the candling report are: seasonal declines in fertility and hatchability; the length of time eggs are held prior to setting; holding conditions for the eggs; and incubator management.

With the heavy strains of turkeys popular in California, most turkey hatching egg producers rely on artificial insemination alone or in combination with natural mating, rather than only on natural mating.

The present commercial practice is to inseminate hens every two weeks because the sperm are stored in the oviduct (see microscopic photo) and can fertilize successive eggs. Although biweekly insemination generally results in satisfactory candling reports, there are numerous instances of low candling reports for eggs produced on commercial farms. Usually

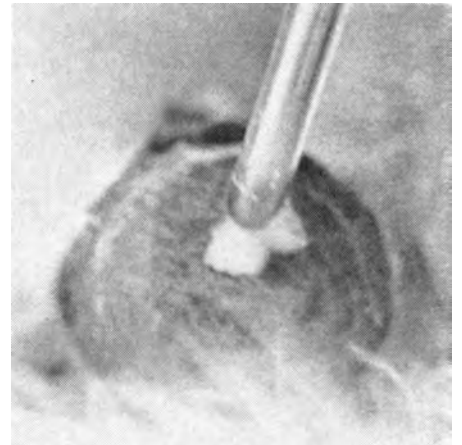
when this has occurred as early in the breeding season as February and March, it has been impossible to raise the candling reports following such declines. The cause of these low candling reports has been obscure, but investigations (on one farm) of the possibility that an unidentified disease agent might be responsible led to improved candling reports and also gave valuable information on the effects of weekly insemination, of depth of insemination, of supplemental use of antibiotics, and of the use of diluted semen.

1963-64 experiments

Candling reports in an apparently healthy flock of 3,000 large white turkey hens had declined from a high of 85.5% in November, 1963, to 48% in March, 1964. For experimental study, 200 laying hens were removed from the flock in



Insemination is commonly used to improve fertility in heavy strains of turkeys. The two men in photo above are using a plastic tube technique to inseminate a turkey hen.



Very shallow insemination, as shown above, was tested in the 1963-64 study. Semen has been placed against the wall of the oviduct while it was in an everted position. Results suggest that deeper insemination will give higher fertility.

Candling reports remained at an improved level for all groups, reaching a peak of 92.4% in group D, on weekly insemination, by the fourth week. Candling reports for groups A, B, and C during weeks 2 to 5, inclusive, were not statistically different in this test, showing that the combination of antibiotics with biweekly insemination gave no better results than insemination alone. On the other hand, the weekly-inseminated group had significantly higher candling reports.

After the possibility that washed plastic tubes might be the cause of low candling reports was proven not true, very

March and randomly distributed into four groups of 50 hens each (groups A, B, C, and D). Groups A, B, and C were inseminated every two weeks, as is the custom under commercial conditions, while group D was inseminated weekly. Hens in group A were given antibiotics intravaginally a week prior to insemination, each hen receiving 1 ml of a buffered solution containing 25 mg of dihydrostreptomycin sulfate and 10,000 units of potassium penicillin. (In an earlier project, this antibiotic treatment resulted in some success in maintaining or im-

proving fertility in turkey hens in one flock.) Hens in group B were given subcutaneous injections of Terramycin (150 mg) in the neck. (Reports of another previous study showed that when hens were routinely injected with Terramycin, fertility was maintained throughout the breeding season, as compared with untreated hens whose fertility dropped considerably as the season progressed.)

Insemination

Both before and during the study reported here, hens were inseminated with approximately $\frac{1}{32}$ ml of undiluted semen by plastic tubes and without supplemental natural mating. Standard insemination procedure for the study was to release semen only after the everted oviduct returned to its normal position and with the plastic tube inserted about 2 inches.

Results are shown in table 1. Records for each week began the second day following insemination, with week 1 showing that, prior to the experiment, candling reports had ranged from 43.1% to 51.7%. Following the first insemination (week 2), percentages ranged from 78.6% in group A to 85.1% in group C, the control group, on the customary biweekly insemination. Thus, it was evident that the poor results obtained previously were due to poor insemination practices.

CALIFORNIA AGRICULTURE

Progress Reports of Agricultural Research, published monthly by the University of California Division of Agricultural Sciences.

William W. Paul *Manager*
Agricultural Publications
Jerry Lester..... *Editor*
Chispa Olsen *Assistant Editor*
California Agriculture

Articles published herein may be republished or reprinted provided no advertisement for a commercial product is implied or imprinted. Please credit: University of California Division of Agricultural Sciences.

California Agriculture will be sent free upon request addressed to: Editor, California Agriculture, 207 University Hall, 2200 University Avenue, Berkeley, California 94720

To simplify the information in California Agriculture it is sometimes necessary to use trade names of products or equipment. No endorsement of named products is intended nor is criticism implied of similar products which are not mentioned.

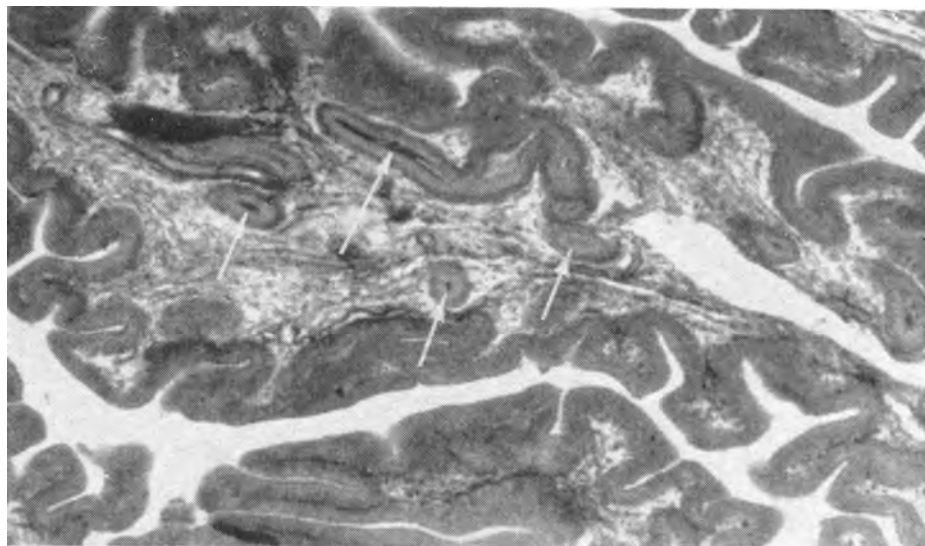


shallow insemination (still on a biweekly schedule) was tested on groups A and B. For very shallow insemination, semen was deposited by plastic tubes on the side wall of the everted oviduct with little or no insertion and the semen released while the oviduct was still everted (see detail photo). Candling reports dropped to a much lower level with shallow insemination (weeks 6 through 9). The difference in candling reports between shallow insemination and the control group was not statistically significant, probably because of the sequence followed in the experiment and the short duration of the shallow insemination test.

Groups C and D remained on their respective treatments throughout the study. Whereas candling reports for group D decreased very little, those for the control group C, on biweekly insemination, declined substantially, from 71.3% to 59.9% during the late breeder season. Turkeys on weekly insemination maintained high candling reports late in the breeder season, which is normally the period during which such excellent results are most difficult to obtain.

1964-65 experiment

During this season there was an opportunity to continue the studies of turkey egg production on the same farm. Prior to egg production, Broad-Breasted Bronze hens were randomly grouped, 53 to a pen, in four groups, and managed as in the previous season, but for an 18-week lay period starting January 21, 1965. Groups 1, 2, and 3 were all inseminated biweekly while group 4 was inseminated weekly. Group 1 was the control group, group 2 was given $\frac{1}{16}$ ml of semen diluted 1:1 with 1% saline solution, and group 3 was inseminated with a plastic tube inserted $\frac{1}{2}$ inch into the everted oviduct (semen released with the oviduct



"Sperm nests" are seen in a microscopic view of the lower oviduct (uterovaginal junction). Sperm stored here will fertilize successive eggs, thereby accounting for prolonged fertility following artificial insemination or natural mating. "Sperm nests" are also located in the infundibulum, the uppermost region of the oviduct, but are less numerous there.

everted). Dosage was $\frac{1}{32}$ ml of undiluted semen except for group 2, and group 4 was inseminated weekly. Standard insemination procedure, as described for the 1963-64 experiment, was used for all groups except group 3.

Table 2 shows the candling reports for the 18-week experiment. Weekly insemination again produced the highest candling reports. Insemination at $\frac{1}{2}$ -inch depth gave better results than the control insemination, the difference being highly significant. Results with diluted semen, when compared with the control, showed no significant difference.

During the 18-week study, actual fertility (not candling reports) in the four groups averaged 85.2%, 87.4%, 87.5%,

and 93.4%, respectively. The least significant difference at the 5% level was 1.71%. Candling reports followed actual fertility levels and for the season averaged 8.5 to 10.1 percentage units lower than actual fertility.

W. F. Rooney, former Extension Poultry Specialist with the University of California Agricultural Extension Service, is now a Farm Advisor, San Bernardino County; F. X. Ogasawara is Assistant Professor, Poultry Department and Animal Physiology Department, University of California, Davis; and D. C. Ferebee, former Tulare County Farm Advisor, is now engaged in private employment in Italy.

TABLE 1. CANDLING REPORTS, 1963-64 SEASON

WEEK:	1	2	3	4	5	6	7	8	9
GROUP:									
A	51.7 ^a	*78.6	73.0 ^a	*70.8	75.1	*64.4 ^c	52.8	*53.8 ^c	40.6
B	43.1 ^b	*79.2	65.8 ^b	*78.0	72.6	*71.3 ^c	63.0	*64.5 ^c	48.7
C	48.1	*85.1	75.0	*78.8	71.9	*71.3	59.4	*64.8	59.9
D	49.5	*80.2	*86.2	*92.4	*88.3	*86.4	*83.6	*83.0	*84.0

* = Artificial insemination (A.I.) at time indicated: A, B, and C on biweekly A.I.; D on weekly.
^a = Pen.-strep. treatment of oviduct 1 week before A.I.
^b = Terramycin injection 1 week before A.I.
^c = Very shallow insemination, biweekly.

TABLE 2. CANDLING REPORTS, 1964-65 SEASON

DATES:	Jan. 21- Feb. 3	Feb. 4- Feb. 17	Feb. 18- Mar. 3	Mar. 4- Mar. 17	Mar. 18- Mar. 31	Apr. 1- Apr. 14	Apr. 15- Apr. 28	Apr. 29- May 12	May 13- May 26	Avg.	
Insemination procedure											
1 - Biweekly, control		89.6	87.0	84.0	80.2	79.3	77.5	71.7	50.0	57.2	75.2
2 - Biweekly, dilute		85.7	86.5	83.9	81.0	81.3	76.0	74.9	65.1	61.2	77.3
3 - Biweekly, $\frac{1}{2}$ inch		87.0	82.9	84.8	84.5	85.6	73.7	81.5	69.8	61.4	79.0
4 - Weekly		86.5	87.9	86.8	91.7	88.0	85.4	80.9	78.4	75.5	84.6
Average		87.2	86.1	84.9	84.4	83.5	78.1	77.2	65.8	63.8	79.0

SUBSCRIPTION RENEWAL CARD IN THIS ISSUE MUST BE RETURNED OR YOUR NAME WILL BE DROPPED FROM THE MAILING LIST FOR CALIFORNIA AGRICULTURE

U.S. SUBSCRIBERS must also include ZIP CODE with their address or the Post Office Dept. will collect first class postage with each issue delivered.