THE EFFECT OF CANDLING ON THE HATCHABILITY OF EGGS FROM BROILER BREEDER HENS

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Primary Audience: Owners and General Managers of Chick Hatcheries, Embryology Specialists, Consultants, Researchers

SUMMARY

In many commercial hatcheries candling is maintained as a routine operation, assuming that the removal of "clear" eggs at transfer can improve hatchability and chick quality. However, in the published literature, few data exist to support the benefits of this routine. A series of experiments was conducted to evaluate the influence of candling on hatchability and chick quality. Eggs from breeder flocks at seven different ages were used.

Candling did not alter average hatchability when calculations were based on total number of eggs set (84.53 vs. 84.07%, respectively, for candled and control eggs), as well as on the number of eggs with live embryos at 18 days of incubation (95.65 vs. 95.89%, respectively, for candled and control eggs). There were no significant differences observed due to flock age.

Average chick quality was slightly improved by candling when culls were expressed as a percentage of total settable eggs (0.84 vs. 0.97% of culls). For flocks 63 weeks of age, a positive effect was also observed (0.93 vs. 1.49% of culls).

Key words: Broiler breeder hens, candling, chick quality, hatchability
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DESCRIPTION OF PROBLEM

In many commercial hatcheries, chicken hatching eggs are candled on the 18th or 19th day of incubation, when incubated eggs are transferred from setters to hatchers, to remove "clear" eggs (infertiles and early dead germs).

Candling is thought by many to be advisable under most conditions, because "clears" can put a strain on the air flow within the hatcher [1] and, as clears do not produce metabolic heat, they can also create temperature variations inside the machine; both effects can adversely affect hatchability and chick quality. However, few data exist to support this theory. Candling is costly, whether using hand or automatic egg candlers, and usually there is no market for clear eggs. Elimination of candling

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at transfer could result in significant economic savings in broiler chickens production.

The trials described in this paper were conducted in cooperation with a commercial hatchery to investigate the benefits or detriments of candling hatching eggs of broiler parent flocks; sufficient numbers of eggs were used to allow small differences in hatchability to be detected.

Materials and Methods

Fourteen experiments were carried out from May to August 1992, each using eggs from one flock of Cobb 500 broiler breeder hens from one source, the supply farm. The flocks were reared and kept during lay under standard management conditions [2].

A total of 537,600 hatching eggs were utilized from flocks of seven different ages (33, 38, 43, 48, 53, 58, and 63 weeks of age). The treatments included candled or noncandled (control) × seven flock ages, and were compared over two hatchers (Machines 1 and 2).

Each treatment combination was represented by 38,400 eggs in each hatch; eggs were assigned at random into two equal groups, candled or control.

Eggs were collected daily over a 4-day period. Upon collection, they were culled to remove the dirty, or misshapen eggs, then randomized daily into two groups of 4,800 eggs each (capacity of one setter trolley), fumigated, and stored at 18°C and 75% relative humidity. Each group contained a total of 19,200 eggs placed into four setter trolleys and placed in one side of the same incubator. Eggs were set on the day following the fourth day of collection in an electronically-controlled, single-stage incubator (Petersime 576). All eggs were fumigated in the incubator on the day of setting. Both groups were incubated in the same setter and the trolleys of which one were placed on a similar position around the central fan. Conventional temperature and humidity conditions were used.

On day 18 of incubation, all eggs from Group 1 (19,200 eggs) were transferred to hatching baskets and placed in a Petersime 192 hatcher, maintained at conventional temperature and humidity conditions. The eggs from Group 2 were candled to identify and remove those classified as infertiles and containing early dead embryos; eggs with apparently living embryos were then transferred to another identical hatcher for three days. All eggs were desinfected with formalin immediately after transfer to either hatcher. In both groups chicks were taken off 21 days and 12 hours post incubation.

From each group 24 hatcher trays were analyzed (six trays from each trolley), positioned at the same places in the trolley to avoid position effects (corresponding to 3,600 eggs set). Observations of the number of saleable chicks hatched, culls, and unhatched eggs were made on each tray at hatching. Saleable chicks were used for calculating hatchability based on corresponding number of eggs set. Culls were nonviable chicks for marketing, and were used as a basis for estimating the quality of chickens. Total observations made in all the experiments carried out in the present study correspond to 100,800 eggs set.

In order to calculate hatchability as a percentage of eggs with living embryos at 18th day of incubation, eggs that failed to hatch were broken out and examined macroscopically. Unhatched eggs were assigned to one of two categories: 1) infertiles, rots, and deaths up to 18 days, and 2) deaths after 18 days. For each group, control and candled, unhatched eggs from two hatcher trays of each trolley were broken out and examined, a total correspond-

TABLE 1. Effect of machine on hatchability and cull of settable eggs and eggs with live embryos at 18 days of incubation[A]

MACHINE	SETTABLE EGGS (%)[B]		EGGS WITH LIVE EMBRYOS (%)[C]	
	Hatch	Culls	Hatch	Culls
1	84.13	0.88	95.76	1.12
2	84.44	0.93	95.77	1.08

[A]Each mean is the average of seven ages of broiler breeder flocks.

[B]Each value represents a mean of 50,400 eggs set.

[C]Each value represents a mean of 4,800 eggs set.

ing to 1,200 eggs set. Total examinations made in all experiments carried out in the present study include unhatched eggs from 33,600 eggs set. All data were subjected to statistical analyses [3] to determine significance.

Results and Discussion

MACHINES

There were no differences between machines in terms of hatchability of total set eggs, hatchability of eggs with live embryos at 18th day of incubation, and culls (Table 1). These findings suggest that there is no variation due to utilizing several breeder flocks of the same strain and several machines of the same type. Consequently, data for the different machines were combined for presentation of results concerning the effect of candling (Table 2).

HATCHABILITY

Candling did not significantly ($P > .05$) affect averaged hatchability (Table 2), expressed as a percentage of all eggs set for incubation (84.53 vs. 84.07%, respectively, for candled and control eggs), or as a percentage of eggs with live embryos at 18 days of incubation (95.65 vs. 95.89%, respectively, for candled and control eggs). The interaction, candling × age of breeder flocks, was not significant for hatchability (Table 2).

These results do not agree fully with traditional opinion of hatchery managers that candling is especially advisable when eggs of old flocks are set. In fact, a general decline in fertility and an increase of early dead germs and "rots" with hen age, could suggest that candling is more advisable when eggs of old flocks are set.

TABLE 2. Effect of candling on total hatchability, hatchability of eggs with live embryos at 18 days of incubation, and culls

BREEDER AGE (BA) (weeks)	TREATMENT (T)	HATCHABILITY (%)		CULLS (%)	
		Settable Eggs[A]	Eggs with Live Embryos[B]	Settable Eggs[A]	Eggs with Live Embryos[B]
33	CONTROL	91.21	97.54	0.42	0.36
	CANDLED	90.95	98.07	0.43	0.45
38	CONTROL	89.22	96.82	0.67	0.63
	CANDLED	89.91	96.54	0.69	0.81
43	CONTROL	86.07	95.16	1.33	1.29
	CANDLED	87.25	95.45	1.06	1.10
48	CONTROL	87.57	96.61	0.89	0.96
	CANDLED	87.96	96.75	1.05	0.74
53	CONTROL	82.49	95.42	1.01	1.33
	CANDLED	83.43	94.77	1.19	1.70
58	CONTROL	79.89	95.18	1.03	1.30
	CANDLED	81.39	96.28	0.83	0.74
63	CONTROL	71.82	92.81	1.49[a]	2.33
	CANDLED	71.73	93.47	0.93[b]	1.73
AVERAGE	CONTROL	84.07	95.89	0.97[a]	1.17
	CANDLED	84.53	95.65	0.84[b]	1.04
INTERACTION T × BA		NS	NS	*	NS

[A]Each value represents mean of 7,200 eggs set.

[B]Each value represents mean of 2,400 eggs set.

[a,b]Means within a column with different superscripts differ significantly ($P < .05$).

*Interaction significant at $P < .05$

Sauver [4] advises candling at 18th day of incubation in order to avoid poor air quality of hatchers and to allow better monitoring of the operation. In addition, Coleman [1] considers that old machines were designed neither for total live heat from 100% fertile eggs nor for 70% live embryos, because both situations put a strain on the air supply within old machines.

Present results concerning the effect of candling on hatchability do not agree completely with traditional opinion about the benefits of candling. Rather, they suggest that modern machines are better designed than older ones, and so it is easier to control the temperature in the egg mass and the air composition within the hatcher.

CHICK QUALITY

Culls (i.e., chick quality) were significantly lower ($P < .05$) for settable eggs that were candled (0.84%) versus those that were not candled (0.97%). This small effect observed on averaged results was not significant when culls were calculated as percentage of eggs with live embryos at 18th day of incubation (1.04 vs. 1.17%), which was based on fewer eggs.

The positive effect of candling on chick quality was significant for settable eggs of breeder flocks 63 weeks of age (0.93 and 1.49% culls, respectively for candled and control eggs). This finding was attributed to: 1) lower fertility, consequently more infertile eggs within the hatcher that can create major temperature and air composition variations; 2) poorer shell quality that has been reported to be concomitant with aging [5, 6, 7] and associated with higher early embryonic mortality and lower hatchability [8, 9, 10]; and 3) increased incidence of rots in eggs of older flocks and so the removal of those rots would decrease contamination and improve chick quality. For eggs from younger flocks, the effect of candling on chick quality was very small, not significant, and not consistent with increasing age.

The observation that candling improves chick quality of older hens could explain the general thought that clears must be removed at transfer. However, in the present study the difference observed was statistically significant but small, and under most conditions its economic benefits may be lower than the cost of candling in a commercial hatchery.

Conclusions and Applications

1. Candling did not result in a significant difference in average hatchability, calculated as percentage of all eggs set, as well as hatch of eggs with live embryos at 18th day of incubation, when compared to control eggs.
2. Hatchability of eggs from broiler breeder flocks from 33 through 63 weeks of age was not affected by candling.
3. A significant but small decrease in percentage of culls was observed in total candled settable eggs versus total control eggs (0.84 vs. 0.97%, respectively). A significant difference was also observed with settable eggs from hens 63 weeksk of age (0.93 vs. 1.49%, respectively, for candled and control eggs).
4. In the published literature few data exist concerning the effects of candling, and it seems worthy of additional investigation. For the moment, candling effects on hatchability and chick quality should be checked for each type of hatcher and for each hatchery, namely when old machines are being utilized. Experience will dictate the benefits or detriments of candling hatching eggs of broiler breeder flocks for each particular situation.

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