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Ouelbi Kerroubia Hamid

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Fertility in female turkeys : how to manage it ?

K. K. KRUEGER

Cuddy Farms, Inc. P.O. Box 247, Marshville, NC 28103, USA

Abstract

Fertility patterns in commercial breeder turkey hen flocks were studied by accessing the database of a large commercial breeder in the U.S. Variation in fertility between farms and flocks was studied. Fertility curves in hen flocks were examined with respect to flock age, male management system, strain, fertility level and cycle of production. Data suggests that fertility problems must be treated on a flock by flock basis and that management must first determine the level of true fertility and early embryonic mortality before appropriate and effective action can be taken.

Introduction

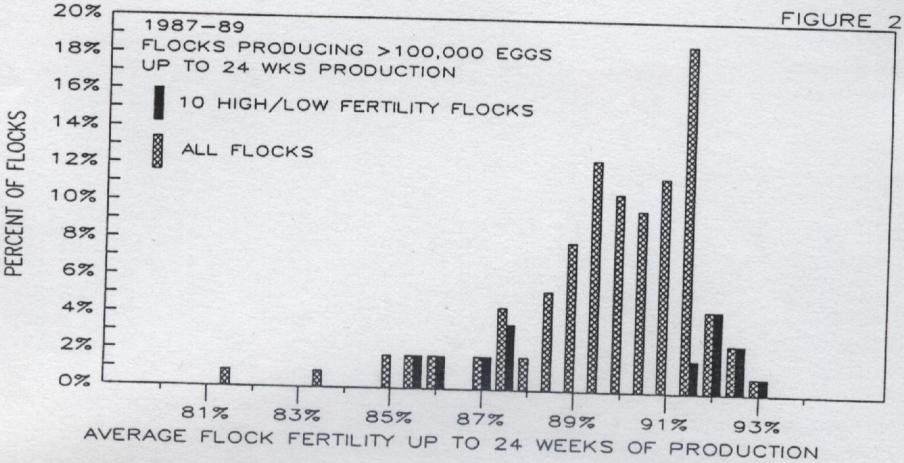
Maintaining reproductive performance in commercial flocks of Large White strain turkeys has become increasingly difficult over the last several years as primary breeders have concentrated heavily on genetic improvements in growth, feed conversion and meat yield. As a result, the average mature weight of parent stock turkey breeder hens has increased over 20% in the last five years alone. Breeder hens on ad libitum feeding regimes are now capable of attaining average flock weights in excess of 12 kg at 30 weeks of age. Growth rate of male line breeder toms has also continued to increase steadily and average flock weights in excess of 22 kg at 30 weeks of age are not uncommon. The increased growth potential in commercial slaughter turkeys has been a bonanza for the commercial grow out operations. It has, however, resulted in a noticeable decline in the number of poults produced per breeder hen housed. This loss in performance can be attributed primarily to reduced numbers of eggs per hen housed and reduced fertility.

The fertility information presented here was obtained from a large commercial breeder's computer data base and speculates how current technology might be used to improve fertility in turkey breeder hen flocks. Fertility, however, is somewhat of an ambiguous term when used in commercial poultry production. Unless otherwise stated, "fertility" will be used in this report to describe the number, or percentage of eggs, with live embryos after seven days of incubation. The term "true fertility" will be used to describe fertility determined by breaking eggs out and macroscopically examining the germ disc for embryonic development.

Artificial insemination practices

A confounding problem when surveying fertility in a large commercial company is that a variety of insemination practices are usually employed. Unless otherwise noted, no attempt has been made to determine how differences in insemination frequency, sperm cell dosage, tom management or other husbandry factors may affect fertility from farm to farm and flock to flock. Most flocks surveyed in this study were on the following insemination schedule: two inseminations performed at two to four day intervals beginning 14 to 17 days after lighting the hens for egg production, followed by weekly inseminations thereafter. Some flocks may have been inseminated on a biweekly few as 2,000 hens housed in a single barn on a farm. The distribution of average flock fertility appears to conform to the criteria of the normal distribution with some skewing towards the lower values.

FIGURE 2.



Approximately 95% of the flocks surveyed fell within a range of only 5.5 percentage points (87.5%-93.0%) and over 75% of the flocks fell within a range of only three percentage points (89%-92%). Knowing the wide variation in external factors (season, environment, husbandry, genetics, insemination techniques, nutrition etc.) that may effect fertility, it is surprising that flock to flock variation in fertility is rather low. To further examine how flock to flock fertility may differ, a sample of the 10 flocks with high fertility and 10 flocks with the low fertility were extracted from the "normal" tails of the distribution as shown in Figure 2.

FIGURE 3.

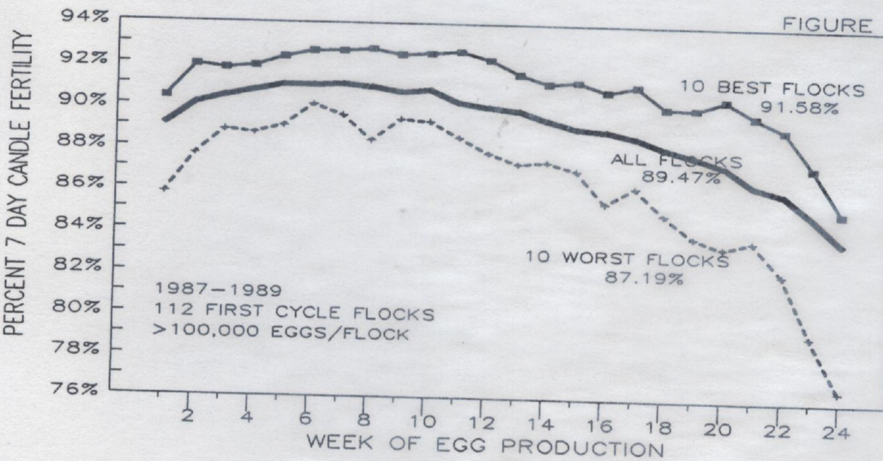


Figure 3 presents the average fertility by weeks of production for the high (91.58%), low (87.19%) and average (89.47%) flocks sampled. Regardless of the group (high, low, or average) there appears to be a generalized shape to the fertility curve.

The data accumulated in Figure 3 suggests that in high, low and average fertility flocks that maximum fertility is not obtained until about the sixth or seventh week of lay. On the average fertility is rather stable until about 12 to 15 weeks of lay at which time it begins to decrease at the rate of about 0.5% per week. Initial fertility in low fertility flocks is about 5 percentage points lower than initial fertility observed in high fertility flocks. However, as in high fertility flocks, maximum fertility in low fertility flocks was not reached until about the sixth week of egg production. In low fertility flocks fertility after 12 weeks of age decreased at an average of about one percentage point per week or about double the rate of decline experienced in the high fertility flocks.

Effect of male management system on fertility

The advent of short term semen preservation systems has encouraged the development and use of the stag farm concept in the U.S. commercial turkey breeding industry. Within the data base queried for this report hen flocks were segregated based on whether semen used for artificial inseminations was obtained from males located on the hen farm or produced on a remotely located stag farm.

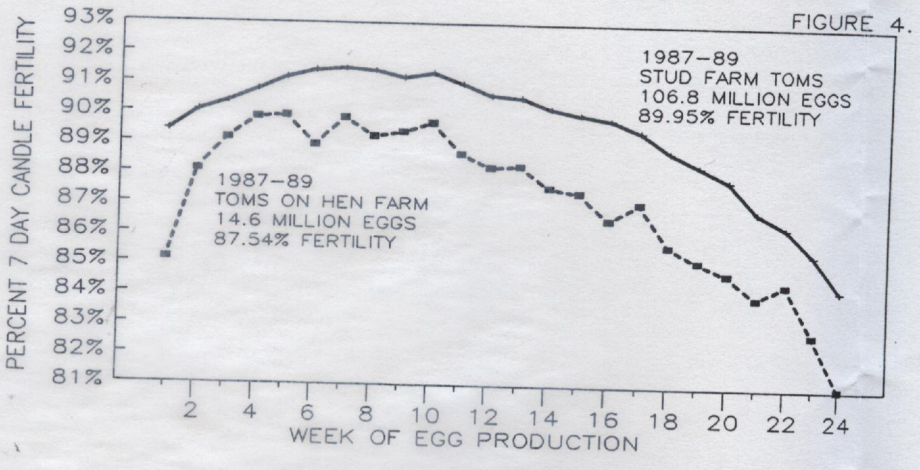


Figure 4 presents the average weekly fertility for flocks based on source of semen. Average fertility in hen flocks inseminated with semen from stag farm toms was 89.95% as compared to 87.54% for flocks inseminated with semen from males housed on the same farm. Shapes of the fertility curves are almost identical between the two groups with the exception that initial and peak fertility is much lower in flocks with males housed on the hen farms.

The dramatic difference in initial fertility between flocks inseminated with semen from males on the hen farm as opposed to stag farm males is somewhat puzzling. In most instances males housed on hen farms are producing very high quality and quantities of semen at the onset of the hens' egg production cycle and as a result, initial inseminations of 400 to 600 million sperm cells per insemination are quite common. Initial inseminations in flocks with semen derived from stag farm toms are usually controlled at 200 to 300 million sperm cells per insemination. The earlier and more rapid decline in fertility in flocks inseminated with semen from stag farms is, however, understandable and quite predictable. Males housed on hen farms are usually not subjected to body weight control. They achieve maximum body weight at about 40 to 45 weeks of age which is followed shortly thereafter by molting, a gradual and progressive loss in body weight and a noticeable reduction in semen quality and quantity. The onset of this reduced fecundity in males housed on hen farms coincides closely with the rapid decline in fertility of hen flocks beginning at about 12 weeks of egg production. Data presented in Figure 4 suggests there must also be a strong hen component to the decline in fertility experienced in hen flocks after 12 weeks as it cannot be completely eliminated by using higher quality and quantities of semen from males housed on stag farms.

<u>Strain effects on fertility</u>

Strain differences in fertility have been observed in the commercial turkey breeding industry for many years. The data base examined for this report contained information on only two strains of Large White turkey breeders which will be referred to as Strain A and Strain B.

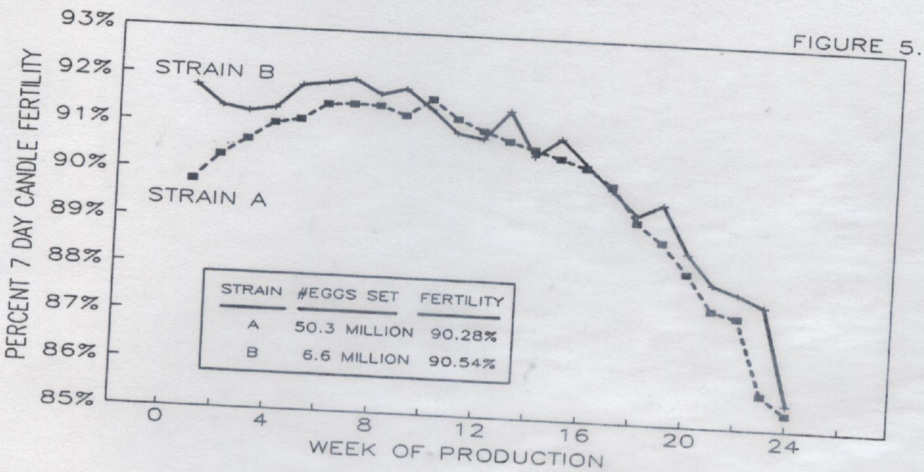
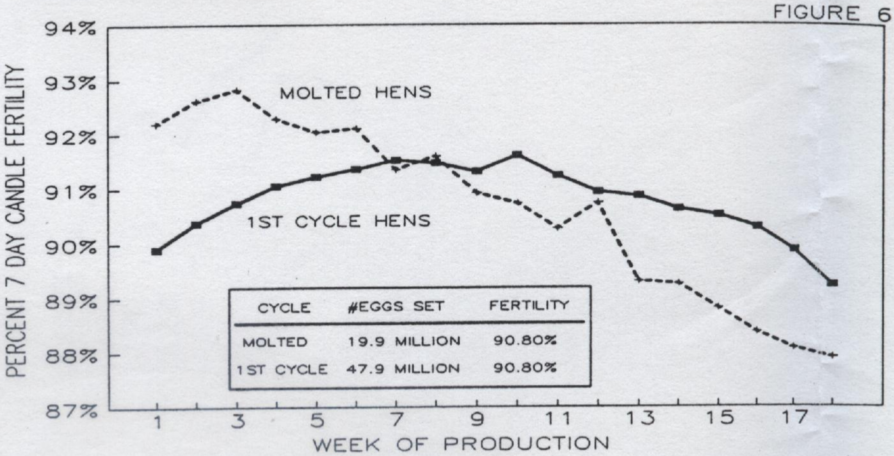


Figure 5 presents the average weekly fertility curves for first cycle breeder hens from these two strains through 24 weeks of lay. Over the entire production period, average fertility for strain A and B was 90.28% and 90.54%, respectively. The major difference between the fertility curves for the two strains appeared to be in the first three weeks of the production cycle where strain B was superior. Random examination of eggs from strain A candled as "clears" reveals that the difference in 7 day candle fertility between the two strains is due to an increase in early embryonic mortality in strain A. Routine breakout of eggs candled as clears has shown that true fertility between the two strains is almost identical during the first five weeks of lay.

Fertility in force molted breeder hens

Force molting of turkey breeder hens for a second cycle of egg production is an effective management tool and is widely practiced in the U.S. Figure 6 presents a comparison between fertility curves in first cycle and force molted breeder hens through 18 weeks of production.

FIGURE 6.



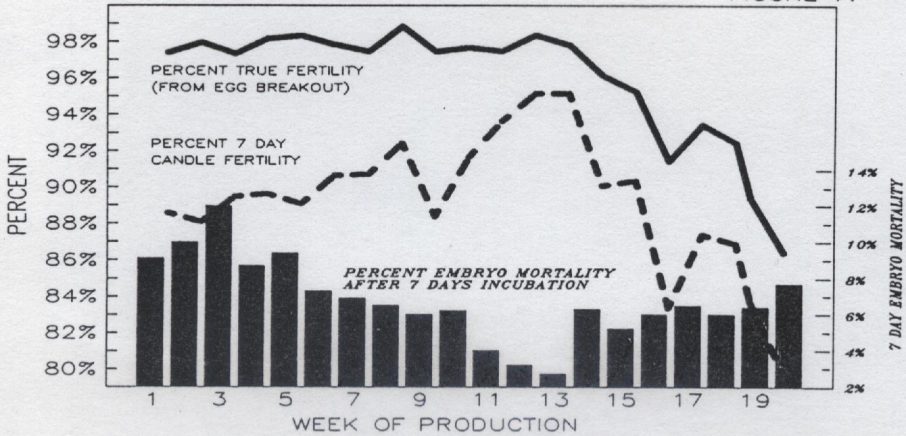
Fertility through 18 weeks of production averaged 90.8% for both first cycle and force molted hens. However, the fertility curves for force molted breeders and first cycle breeders are very different. Fertility for the first several weeks of production in force molted breeders averaged about 2 percentage points higher than in first cycle breeders. Almost a straight line decline in fertility in force molted breeders was observed, and by the seventh week of production, fertility dropped below that of the first cycle breeders. It is speculated that the higher seven day candle fertility in force molted breeders is due to reduced early embryonic mortality as compared to first cycle breeders. Conversely, the poorer late season fertility in force molted breeders is probably due to excessive early embryonic mortality. Routine breakouts at hatch time tend to confirm this. Average egg size in force molted breeders after 10 weeks of lay often exceeds 100 grams. This is usually accompanied by poor shell quality and problems with incubation equipment and egg handling which may aggravate the early embryonic mortality problem. Controlling egg size in force molted breeders would probably improve performance considerably.

True fertility versus candle fertility

When fertility problems arise in commercial turkey breeder flocks the initial response is usually to increase the sperm cell dosage or insemination frequency. Past field experience has shown that in many cases this often does little to improve the situation or produces at best only a brief improvement. The first step when investigating an apparent fertility problem should always be to macroscopically examine eggs candled as "clears" to determine the true fertility and the amount of early embryonic mortality. Only by determining whether the problem is one of true fertility or excessive early embryonic mortality can appropriate action be taken to correct the problem.

Figure 7 presents the true fertility, seven day candle fertility and early embryonic mortality results obtained from a single flock of Large White commercial turkey breeders being monitored as part of a field experiment.

FIGURE 7.



Weekly egg sets were made from this flock and after seven days of incubation 10%-15% of the eggs (1000 to 1500 eggs per set) were candled for fertility readings. All eggs candled as "clear" were broken open and observed for true fertility and early embryonic mortality.

Peak seven day candle fertility in this flock did not occur until the twelfth week of production. However, breakout results suggest that true fertility was near its maximum the first week of production and for the first twelve weeks averaged over 98%, varying less than two percentage points from week to week. The discrepancy between true fertility and candled fertility related closely to the amount of early embryonic mortality observed in the sampled eggs. Candled fertility in this flock decreased approximately two percentage points per week from 12 through 20 weeks of production. Breakout results showed that true fertility declined similarly. Early embryonic mortality from 12 to 20 weeks of production was observed to be at near normal levels for this stage of production. The patterns of true fertility and early embryonic mortality observed in this flock demonstrate that to take appropriate corrective measures management must have information on both true fertility and early embryonic mortality.

<u>Summary</u>

Computer data bases can easily store and manipulate tremendous amounts of information vital to making correct management decisions. Having rapid access to this information and the ability to carefully query it to answer "what if ?" type questions will be vital in managing fertility and other production parameters as commercial breeding companies increase in size. Information obtained on large data sets also point to areas where further research is needed to improve performance.

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FERTILITE FEMELLE CHEZ LA DINDE REPRODUCTRICE : COMMENT LA GERER ?

KENNETH K. KRUEGER

Cuddy Farms, Inc, P.O. Box 247, Nashville, NC 28103, USA.

Résumé

L'évolution de la fertilité de troupeaux commerciaux de dindes reproductrices a été étudiée à partir de données issues d'un important élevage situé aux Etats-Unis.

Les variations de fertilité entre fermes et troupeaux ont été étudiées en fonction de l'âge, du système d'utilisation des mâles, des niveaux de fertilité et du cycle de reproduction. Nos résultats indiquent que les problèmes de fertilité doivent être traités troupeau par troupeau et que les indications données par la gestion technique de chacun d'eux doivent en premier lieu déterminer le niveau de fertilité vraie ainsi que celui de la mortalité embryonnaire précoce avant qu'une action appropriée puisse être conduite.

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Influence of the male on the decline of fertility with age in broiler breeder flocks

P.M. HOCKING

*AFRC Institute of Animal Physiology and Genetics Research
Roslin, Midlothian EH25 9PS, Scotland*

Abstract

After 35 weeks of age, the male broiler breeder becomes less sexually active and produces fewer spermatozoa whilst bodyweight and the incidence of musculo-skeletal lesions increase. There is no evidence that males become obese. Dietary crude protein concentrations of 160 to 180 g crude protein (CP)/kg may be associated with reduced fertility compared with diets containing 100 to 120 g CP/kg. However, the main determinant of poor fertility is the physical size of the male which can be controlled by separate-sex feeding techniques. Consideration should be given to the welfare aspects of separate sex-feeding.

Introduction

Fertility in commercial flocks of broiler breeders peaks at 95 to 98% between 30 and 38 weeks of age and at the time of flock depletion may be as low as 70 to 80%. The reasons for this decline may be the result of male or female factors but this paper will be concerned entirely with the influence of the male. A review of recent research will be made followed by a summary of practical strategies to improve fertility in older flocks of broiler breeders.

Physiological changes with age

Concentration of testosterone in the plasma of male broiler breeders declines with age (Sexton *et al.* 1989a). Sexual activity falls linearly from 28 to 58 weeks of age (Duncan *et at.*, 1990) and is presumably related to changes in the level of testosterone. In caged birds semen production, concentration of spermatozoa and the proportion of males providing semen decline with age (Wilson *et el.* 1987 a, b; Hocking 1989; Sexton *et al.* 1989a). Nevertheless, at flock depletion virtually all breeding males have normal testicular function and are physiologically capable of fertilising a hen's ovum (Hocking and Duff 1989).

Musculo-skeletal lesions

Duff and Hocking (1986) described a large number of musculo-skeletal lesions in adult broiler breeder males. In excess of 90% of the birds examined had at least one lesion and it seemed reasonable to deduce that the fertility of affected males would be depressed. Subsequent analyses of data at the end-of-lay from three experiments failed to detect any important relationships between the occurrence of different lesions and fertility (Hocking and Duff, 1989). However severe musculo-skeletal lesions occurred in 75% of males culled for low fertility (about 45% of the total) in two experiments where bodyweight was not controlled.