Effect of Time of Insemination on the Fertility and Hatchability Rates of Anak 2000 Broiler Breeder Hens

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DOI: 10.5455/japa.20160201120446

Online version is available on: www.grjournals.com
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Abstract

The present study was conducted to determine the effect of time of insemination on the fertility and hatchability rates of Anak 2000 broiler breeder hens. Fifty hens used for the study were divided into groups A and B and inseminated at 9:00 hours and 17:00 hours, respectively, with pooled semen collected from Anak 2000 broiler breeder cocks for six weeks. Fertile eggs were collected two days after the first insemination, and subsequently on daily basis throughout the six weeks period. Collected eggs were stored at a temperature of 16°C for seven days before incubation. The mean fertility rates for Groups A and B hens (65.51 ± 2.17 % versus 66.53 ± 2.18 %) showed no significant difference (P > 0.05). Similarly, the mean hatchability rates for Groups A and B hens (65.46 ± 4.34 % versus 72.37 ± 2.10 %) showed no significant difference (P > 0.05). Correlation analysis between fertility and hatchability rates within each group showed positive relationship for group A hens (r = 0.48, P > 0.05) and group B hens (r = 0.75, P > 0.05). This study suggests that artificial insemination at 09:00 hours and 17:00 hours could give similar results.

Keywords: Anak 2000 broiler breeders, fertility, hatchability, artificial insemination.
Introduction

Maximum production of day old chicks is one of the major aims of poultry breeders. One of the ways to achieve this aim is to improve the fertility and hatchability rates of breeder hens. Studies have shown that artificial insemination in avian species has relative advantages when compared to natural mating (Surai and Wishart, 1996; Penfold et al., 2000; Brillard, 2003). These advantages of artificial insemination include increased number of settable eggs, and better overall fertility and hatchability (Brillard, 2003). Timing of artificial insemination in commercial poultry breeding enterprise is of great importance for optimum success of artificial insemination (Obidi et al., 2008). Some authors have recommended that insemination should not be done around the time of oviposition for optimum insemination results (Brillard and Bakst, 1990; Brillard, 2003). Obidi et al., (2008) reported significantly better results for artificial insemination done at morning hours (10:00) than for that done in the afternoon hours (15:00). The present study was designed to determine fertility and hatchability rates following artificial insemination at 9:00 hour and 17:00 hour, respectively in Anak 2000 broiler breeder hens.

Materials and Methods

A total of 50 Anak 2000 broiler breeder hens aged 30 weeks were divided into two treatment groups: A and B, each made up of 25 hens and used for the study. The hens were housed according to their groups in deep litter pens containing nesting boxes, fed with standard NAPRI breeders’ mash containing 17% crude protein. Water was provided ad libitum. The weights of the hens were 3.07± 0.068 kg and 3.12 ± 0.058 kg for Group A and Group B respectively. The hens were each artificially inseminated with 0.05 ml of pooled semen collected from adult Anak 2000 broiler breeder cocks in a tuberculine syringe. Group A and group B hens were inseminated at 9:00 hour and at 17:00 hour, respectively for a period of six weeks. This was followed subsequently by fertility studies. Three persons were involved in the restraint, abdominal massage and insemination of the hen. One person held the hen with its feet at approximately right angle to its body, while the second person conducted the abdominal massage and the third person conducted the insemination. Abdominal massage on the hen was carried out as described by Bakst and Cecil (1983). The belly and the back feathers of the hen were stroked posteriorly in two or more firm movements accompanied by cloacal strokes, this served to elicit a partial eversion of the cloaca which was subsequently assisted using a controlled pressure to achieve eversion of the vagina. The tuberculine syringe containing 0.05 ml of pooled semen from the cocks was inserted into the vagina, and the semen released intravaginally as the vagina started to relax (Lake, 1978; Obidi et al., 2008). Insemination within each group was completed within 20 - 30 minutes of semen collection. Artificial insemination was carried out once weekly for a period of six weeks.

Fertility Studies

Fertile eggs were collected two days after the first insemination in each group, and on daily basis subsequently during the six-week period. A total of 804 fertile eggs comprising 375 eggs from group A hens 429 eggs from group B hens were collected and used for the study.

The eggs collected were carefully marked according to groups and transported to the Hatchery Unit of the National Animal Production Research Institute (NAPRI), Shika, Ahmadu Bello University Zaria, Nigeria for fertility and hatchability studies. The eggs were stored at 160°C for a maximum of seven days and then incubated in a Buckeye® incubator (Lopen Group, Mill Lane Lopen, South Pertheron Someset, TA 13 5JS, England) at 37.6°C according to the method of Tona et al., (2003). Fertility and hatchability were determined following candling at day 18 of incubation and at hatching on day 21, respectively.

Fertility rate was calculated using the formula:

Fertility rate = Number of fertile eggs × 100%
              Number of incubated eggs

Where, the number of incubated eggs is the same as the number of eggs set as described by Abubakar and Oni (2002) and Brillard (2003).

Hatchability rate was calculated as follows:
Hatchability rate = \frac{\text{Number of hatched eggs}}{\text{Number of incubated eggs}} \times 100\%

Where, the number of incubated eggs is the number of fertile eggs incubated in the hatcher as described by Abubakar and Oni (2002) and Brillard, (2003).

**Statistical Analysis**

The effect of time of insemination on fertility and hatchability rates was determined by comparing the rates for the treatment groups A and B using the independent t-test assuming equal variances. Correlation analysis was used to determine the relationship between fertility and hatchability rates within each of the groups. Values at \( P < 0.05 \) were considered to be statistically significant. All the results were analyzed using GraphPad Prism version 5.00 for Windows, GraphPad Software, San Diego California USA, www.graphpad.com.

**Results**

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The least square mean values for the fertility rates and hatchability rates of Group A and B hens are shown in Table 1.

Correlations among Fertility Rates and Hatchability Rates of Group A and Group B Anak 2000 Broiler Breeder Hens

The correlation coefficient values for fertility rates and hatchability rates of Group A and Group B Anak 2000 broiler breeder hens (Table 2) showed positive but statistically insignificant relationship between fertility rate and hatchability rate within the two groups.

**Discussion**

The age of the broiler breeder hens used for this study may have contributed to the relatively low values obtained in the fertility and hatchability rates. Roque and Soares (1994) observed a variation in the fertility of broiler breeder hens with differences in age. They reported that hatchability increased with increase in age. Older birds laid eggs with better shell quality that enabled them act as thicker barrier to bacterial penetration and a resultant high fertility while the younger birds laid eggs with lower egg shell quality resulting in poor fertility. Roque and Soares (1994) further explained that eggs with lower egg shell quality have been shown to create opportunity for improper water balance and inadequate gaseous exchange. These lead to early embryonic mortality and a resultant lower hatchability. Similarly, the fertility rates of 82.1±1.0%, 85.0±2.3%, 76.0±3.2% and 78.3±2.5% obtained in 48 weeks old Shika brown breeder hens by Obidi et al., (2008) were higher than those
obtained in Anak 2000 broiler breeders in this study. This could be attributed to the difference in age and breeds of the hens. The fertility and hatchability rates obtained in this study for Groups A and B inseminated at 09:00 hours and 17:00 hours, respectively showed no statistical difference. This is similar to the finding of Obidi et al., (2008) who reported higher fertility and hatchability rates with morning inseminations in Shika Brown breeder hens, and those of Cooper (1964) and Leslie et al., (1966) who reported maximum fertility in turkey breeders and quails respectively following evening insemination. Obidi et al., (2008) reported higher fertility and hatchability rates with morning inseminations in Shika Brown breeder hens which were attributed to higher sperm quality recorded in the morning hours. Earlier works by Cooper (1964) and Leslie et al., (1966) in turkey breeders and quails respectively reported maximum fertility following evening insemination. They were of the opinion that insemination in the evening hours after oviposition time resulted in better results. These findings could explain the similarities in the fertility and hatchability rates observed in the present study.

The positive correlation between fertility and hatchability rates within each group of hens obtained in this study agrees with the results of earlier workers (Cooper and Rowell, 1958; McDaniel et al., 1981; McIntyre et al., 1986).

Conclusion

Fertility and hatchability rates following artificial insemination at 09:00 hours and 17:00 hours gave similar results. Observations from the present study showed that the use of broiler breeder hens at about 30 weeks of age for breeding purposes could give low fertility results. Such practice in any broiler breeding enterprise would therefore not be profitable.

Acknowledgement

The author wishes to acknowledge the Staff of National Animal Production Research Institute, Zaria for their assistance during the course of this research.

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