EFFECT OF NATURAL MATING AND FREQUENCY OF ARTIFICIAL INSEMINATION ON FERTILITY AND HATCHABILITY PARAMETERS OF KUTTANAD DUCK (*Anas platyrhynchos domesticus*) EGGS

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ABSTRACT

An experiment was conducted at University Poultry Farm, Mannuthy, Thrissur to compare the efficiency of artificial insemination and natural mating in ducks. The ducks under study were grouped into three treatments; T_1, T_2 and T_3 with five replicates of six ducks each. In T_1, the birds were allowed to breed by natural mating. In T_2 and T_3, ducks were housed in cages and inseminated once in five days and seven days, respectively, in the morning hours. The eggs collected were incubated separately and the percentage of early embryonic mortality, dead germs and dead in shell were calculated. The early embryonic mortality did not show any significant difference between natural mating and artificial insemination. The fertility per cent was found to be significantly higher in T_2 (Insemination once in 5 days) when compared with T_1 (natural mating) and T_3 (Insemination once in 7 days). The hatchability per cent on total eggs set was significantly higher in T_2 and was significantly lower in T_3. No significant difference was observed in the hatchability per cent on fertile eggs set. The results on fertility and hatchability indicate that artificial insemination at five days interval is more advantageous for fertile egg production in ducks.

Keywords: Ducks, insemination, fertility, hatchability

INTRODUCTION

Artificial insemination (AI) is a technique that involves collection of semen from the male, its evaluation, processing and finally deposition of semen within the female's reproductive tract. This helps in utilizing the superior males effectively and can be used as a tool to reduce inbreeding. The number of drakes required for breeding can also be reduced by employing artificial insemination. Besides these, artificial insemination technology helps to save cost of breeding pen, trap nests and labour and also helps to collect highly accurate breeding data. AI is the only method of mating in interspecific hybridization, especially for mule ducks production by crossing Muscovy drakes with common ducks. AI technique will facilitate rearing ducks in cages for breeding purpose and

also for selection programmes. Though Artificial Insemination is common in chicken, it is not widely practised in ducks. Semen collection and AI in ducks are gaining momentum as ducks are now reared in cages for breeding purpose and also for selection programmes. The semen quality characteristics of Kuttanad ducks have been documented by Cyriac *et al.* (2013). However, information regarding the fertility rate after AI technique in Kuttanad ducks is scanty. Hence, this study was designed with the objective of comparing the efficiency of Artificial Insemination with natural mating, so that the information on the fertility rate will facilitate the validation and application of AI in Kuttanad ducks.

MATERIALS AND METHODS

The efficiency of AI was evaluated utilising 90 ducks and 15 drakes at University Poultry Farm, Mannuthy, Thrissur. These ducks were grouped into 3 treatments; T_1, T_2 and T_3 with five replicates of six ducks each. In T_1, the birds were allowed to breed by natural mating. In T_2 and T_3, ducks were housed in cages and inseminated once in five days and seven days, respectively, in the morning hours. The semen collection and AI were done between 7am and 10am. The feathers around the vent region were clipped before semen collection in order to avoid contamination. The drakes were trained once a week for about three months before the experimental period. The training involved handling and attempting to ejaculate the drakes.

Semen Collection and Dilution

The method of semen collection followed was the massage procedure outlined by Lake and Stewart (1978) with the following modifications. The drake was kept on a table and was held in position by one assistant. The glass funnel, used for collecting semen was held in between the fingers of the technician's hand used for massaging the abdomen. The opposite hand gently stroked the back toward the tail ending with the thumb and forefinger on each side of the cloaca. The cloacal region was gently pressed to extrude the phallus. It was found preferable to collect the semen before complete extrusion of phallus (Plate 1). On complete extrusion of phallus, semen was lost as it flowed down the spiral shaped phallus. Care was taken to minimize contamination with uric acid waste. Semen samples were evaluated macroscopically for colour, consistency and other contaminants. Semen was diluted with Phosphate Buffered Saline (PBS) in 1: 1 ratio and kept at room temperature.

Artificial Insemination

The ducks were inseminated immediately after the dilution of semen. The duck was held upside down with the bird's abdominal region against the body of the holder. The abdominal region of the duck was gently pressed with the left hand and simultaneously with the right hand the cloaca was everted. The insemination equipment consisted of a capillary tube attached to a syringe with the help of a rubber tube. Semen in the inseminating tube was placed as far as possible in the exposed oviduct opening seen at the left side of the intestinal opening. As the semen was injected, the pressure around the cloacal region was gradually released till it returned to its normal position (Plate 2).

The eggs collected from naturally mated and inseminated groups were identified dam-wise and date-wise. They were incubated

separately in forced draft incubators and the number of fertile eggs, early embryonic mortality, dead germs, dead in shell and the number of chicks hatched in each treatment were recorded for six hatches. The percentage of early embryonic mortality, dead germs and dead in shell were calculated. The fertility percentage and hatchability percentage based on total eggs and fertile eggs set were calculated and analysed statistically as per Snedecor and Cochran (1994) using SPSS version 20.0.

RESULTS AND DISCUSSION

The results of the experiment done for comparing the efficiency of natural mating (T_1), Artificial Insemination once in 5 days (T_2) and Artificial Insemination once in 7 days (T_3) are presented in Table 1. The graphical representation is given in Fig. 1.

The early embryonic mortality per cent did not show any significant difference among the three treatments. The per cent dead germs was significantly ($p<0.05$) higher in T_2 and was significantly lower in T_3. The per cent dead germs in T_1 was comparable to that of T_2 and T_3. Significant difference ($p<0.05$) was also observed in the percentage of dead in shell.

The fertility per cent was found to be 61.34, 89.10 and 60.69, respectively in T_1, T_2 and T_3 and it was significantly higher ($p<0.05$) in T_2 when compared with T_1 and T_3. The hatchability per cent on total eggs set was significantly higher ($p<0.05$) in T_2 (42.46) and was significantly lower in T_3 (27.93). The hatchability per cent on total eggs set in T_1 (33.25) was comparable to that of T_2 and T_3. No significant difference was observed in the hatchability per cent on fertile eggs set.

The early embryonic mortality reported by Stunden (1996) and Sellier *et al.* (2005) after artificial insemination in Mallard ducks and Harikrishnan (2013) after natural mating in Kuttanad ducks was higher than the present findings. George (1977) and Harikrishnan (2013) recorded a higher percentage of dead germs and dead in shell in Kuttanad ducks under natural mating. The dead in shell percentage reported by Stunden (1996) with single insemination per week were also found to be higher.

The fertility per cent observed in the present study was lower than the findings of George (1977) in Kuttanad ducks, Pingel (1999) in Pekin and Muscovy, Stunden (1996), Ksiazkiewicz (2002) in Mini and Polish Pekin ducks, Harikrishnan (2013) in Kuttanad ducks, Giri *et al.* (2014) in Khaki Campbell ducks and Nahak *et al.* (2015) in Pekin ducks under natural mating. However, the fertility percent observed by Pingel (1999) in Mulard ducks (60 per cent) and Sellier *et al.* (2005) in common ducks (54.2 to 61.2 per cent) after 2 to 10 days of insemination agrees with that of the present study (61.34 per cent). For one collection per week, a higher fertility per cent was observed by Ghonim *et al.* (2009) and Sellier *et al.* (2005). Contrary to the present findings, George (1977), Cheng *et al.* (2002), Ksiazkiewicz (2002), Harikrishnan (2013) and Giri *et al.* (2014) observed higher values for hatchability percentage on total and fertile eggs set.

As opined by Ksiazkiewicz (2002), the variations of results observed in the present study from the findings of other authors might be due to breed differences, variations in systems of flock management,

collection and storage of eggs and incubation technique. But, from the present study, it could be concluded that Artificial Insemination at five days interval could be employed in Kuttanad ducks for collection of fertile eggs.

Table 1. Effect of natural mating and frequency of artificial insemination on fertility and hatchability parameters of Kuttanad duck eggs (per cent)

Parameters	T_1 (Natural mating)	T_2 (AI once in 5 days)	T_3 (AI once in 7 days)
No. of eggs set	1203	619	815
Early embryonic mortality (%)	4.76 ± 0.86	2.63 ± 0.66	4.12 ± 3.83
Dead germs (%)	17.76^{ab} ± 2.15	23.10^{a} ± 2.39	14.18^{b} ± 1.68
Dead in shell (%)	6.26^{c} ± 0.96	22.21^{a} ± 2.76	14.47^{b} ± 1.53
Fertility (%)	61.34^{b} ± 4.96	89.10^{a} ± 2.52	60.69^{b} ± 3.31
Hatchability on total eggs set (%)	33.25^{ab} ± 3.36	42.46^{a} ± 3.11	27.93^{b} ± 3.04
Hatchability on fertile eggs set (%)	50.87 ± 3.83	47.47 ± 3.69	43.90 ± 3.66

Means bearing non-identical superscripts in the rows differ significantly ($p<0.05$)

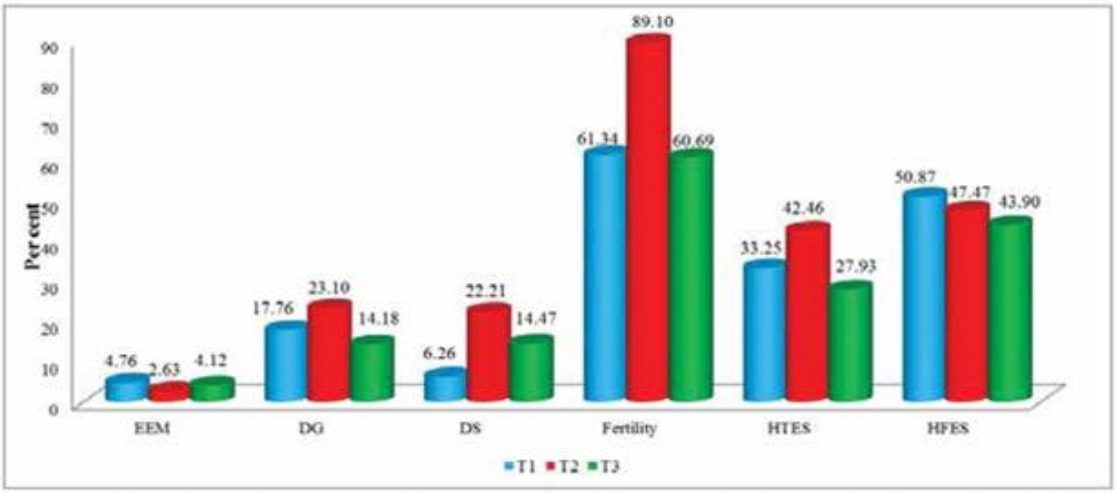

Fig. 1. Effect of natural mating and frequency of artificial insemination on fertility and hatchability parameters of Kuttanad duck eggs

(EEM - Early embryonic mortality, DG - Dead Germs, DS - Dead in Shell, HTES - Hatchability on Total Eggs Set, HFES - Hatchability on Fertile Eggs Set)

Plate 1. Semen Collection

Plate 2. Artificial Insemination

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