Preliminary Studies on the Fowl Semen Dilution and Effect to the Egg Fertility

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Introduction

Poultry farming is considered as a principle component in livestock sector in Sri Lanka which provides commercial income and considerable contribution to national GDP. The poultry industry depends on the breeding materials obtained from poultry breeding centers and private companies which are few in the country. Presently, natural breeding is practiced as breeding method to produced day old broiler chicks which is costly and needs large number of male birds. Introduction of Artificial Insemination (AI) programmers for broiler breeder farms will be a suitable alternative for natural breeding. Though AI is practiced in some of the poultry breeding centers using undiluted semen, poultry semen dilution is a novel area to Sri Lanka (Niroshan, 2003). Since fowl semen is very thick, highly concentrate and less volume secretion, semen diluent can be used to increase the semen volume which facilitates the efficient utilization of poultry semen (Mcgvern, 2002). Therefore, present study was conducted to develop suitable poultry semen diluent and to compare the efficiency of different breeding methods in poultry.

Methodology

This study was carried out at Karandagolla NLDB farm and Laboratory analysis was carried out at AI center in Kundesale. Semen samples were collected from 46 weeks old male birds separately and the volume of the semen were measured using a pipette, spermatozoa concentration and semen mortality were evaluated by heamocytometer method (WHO, 1999) and Microscopic test observation (Arthur *et al*., 1989) respectively as semen quality parameters. Ringers' solution was selected as the semen diluent (Solution 1) and the second solution was modified by adding carbon source (Fructose) to Tabatabeai *et al*. (2009) *as* energy source (Solution 2) and semen dilution was done in 1:1 ration of semen and diluent. After preparation of semen diluents, pH level was measured and spermatozoa concentration and semen mortality and motility were evaluated. Out of two solutions, best solution was selected and used for the semen dilution in the breeding trial.

Three (03) different breeding methods as which natural breeding, artificial insemination (without semen dilution- WOD) and artificial insemination with semen dilution were practiced for breeding stock of same breed, age and physiological conditions. Females were age separated ensuring that they are free from semen. Artificial insemination program continued after three days interval and egg collection was done daily. Eggs were incubated after collecting and the fertility on day 18 and after hatching was determined. Hatchability percentage was estimated separately in all breeding methods. Data were analyzed using MINITAB 16 software.

Results and Discussion

The fowl semen mortality percentage was significantly higher in Ringer's solution than modified Ringer's Solution (Figure 1). Tough pH level of diluted semen of modified Ringers solution was 8.2 which are at the upper limit of the tolerable pH of spermatozoa (Bongonoff and Schaffner, 1954). Fructose, mainly used as an energy source for fowl semen may have a higher effect than the semen pH in reducing sperm mortality percentage in modified Ringers solution. Further the motility of the sperms is significantly higher in modified Ringer's solution diluted

semen sample than the Ringer's solution diluted semen ($p<0.05$). Out of the tested two solutions, modified Ringer's solution was used for the semen dilution in the breeding trial.

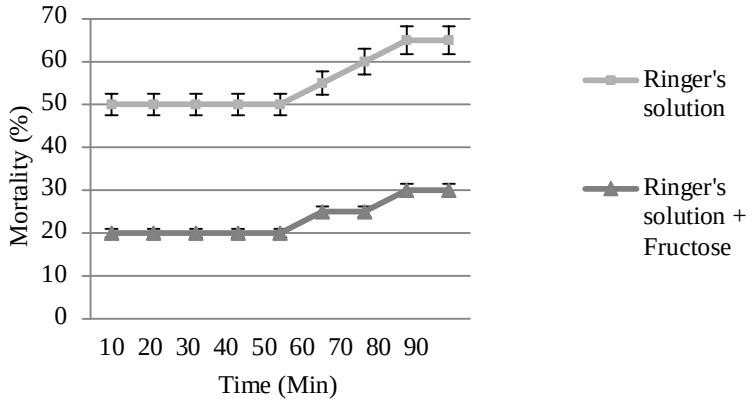

Figure 1. Variation of semen mortality in two solutions used for poultry semen dilution

The fertile eggs percentage of the artificial insemination with undiluted semen and artificial insemination with diluted semen are significantly higher than the fertile eggs from natural breeding ($p<0.05$).

However, AI program without dilution exhibits the highest Fertility than diluted semen used treatment (Figure 2). This is due to the high spermatozoa concentration (312×10^{8} sperm/mL) present in the undiluted semen compared to the average sperm concentration present in the diluted semen (15.6×10^{8} sperm/mL).

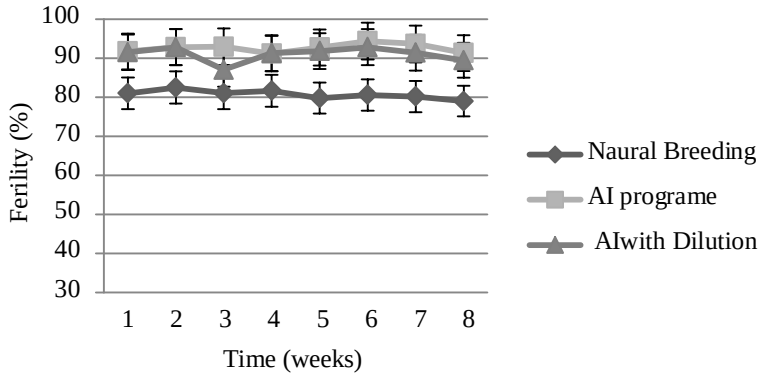

Figure 2. Variation of Fertile eggs percentage with different breeding techniques

During first three weeks of trial there was no significant difference in hatchability between the treatments ($p>0.05$) (Figure 3). However, during latter part of the trial (5-8 weeks), hatchability percentages of the artificial insemination with undiluted semen and diluted semen showed significantly higher percentage than the eggs of natural breeding ($p<0.05$).

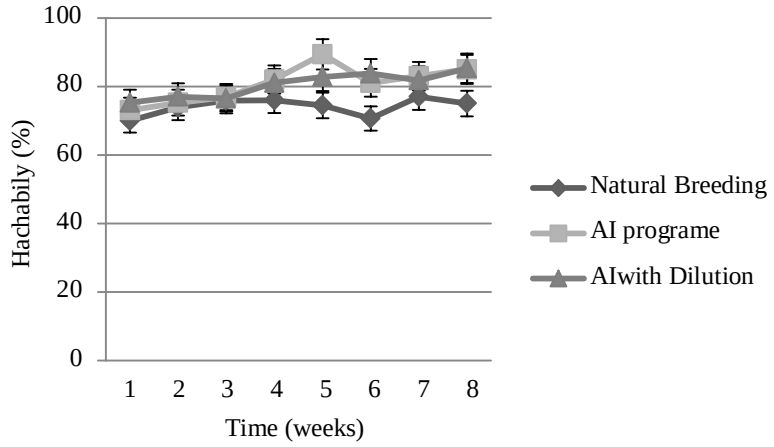

Figure 3. Hatchability percentage of chicken eggs with different breeding techniques

Conclusions

According to the study, higher percentage of egg fertility and hatchability was obtained from the artificial program with or without semen dilution. Since there is no significant difference of hatchability and fertility in these two treatments, diluted semen can utilize the available spermatozoa efficiently. Therefore, artificial insemination using modified Ringer's solution diluted semen can be considered as the best method of breeding in poultry.

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