The Effects of Sperm Number and Insemination Interval on the Fertility and Hatchability of Sentul Hens

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Abstract. Sexually mature Indonesian native hens (Sentul hens) were housed singly in laying cages and artificially inseminated with combination of three different levels of diluted pooled semen (50 million sperm/0.05 ml; 100 million sperm/0.1 ml; and 150 million sperm/0.15 ml) and at either of three different intervals (every 3, 6 and 9 days). The results show that the sperm number and Insemination intervals had no significant interaction (P>0.05) on % fertility and hatchability. The best fertility around 90 %; P<0.05 was obtained by inseminating interval 6 days with sperm number 100 million/ 0.1 ml of diluted semen.

Keywords: sperm number, insemination interval, fertility, hatchability, sentul hens

Introduction

Artificial insemination has been applied routinely by commercial turkey hatching eggs producers for many years. But now AI has already done in commercial chicken especially in big chicken companies to produce fertile hatching eggs. Tabatabaei [1] and Brillard and McDaniel [2] reported that the maximum fertility of eggs was achieved with the use of 100 and 200 million spermatozoa, respectively. Kim et al. [3] and Sexton [4] which used sperm concentration of 50 – 100 million showing adequacy for good fertility in chickens and turkeys. RAE Pym [5] reported that insemination twice a week gave higher fertility than those of insemination once a week. However Brillard and Daniel [2] reported that dose of about 125 million spermatozoa weekly Inseminated gave highest fertility in broiler chickens.

Sentul chicken is a native local chicken in Ciamis, West Java Indonesia that has the potential to meet the needs of eggs and meat in Indonesia. The present study was undertaken to determine the amount of spermatozoa and interval of insemination that would provide the highest fertility and hatchability for possible use by farmers of Sentul hatching eggs.

2. Methodology

This research was conducted using experimental methods. The design used was a completely randomized design of 3 x 3 factorial patterns. As a treatment, the combination of spermatozoa concentrations consisting of k1 = 50 million, k2 = 100 million, and k3 = 150 million spermatozoa, while the second factor ib interval consisted of f1 = 3 days, f2 = once every six days, and f3 = once every day.

The research material used 135 sentul chickens aged 8 months. Each unit of experiment consisted of 5 females, and each of the treatment was replicated three times. The variables measured are egg fertility and egg hatchability.

3. Result and Discussion

The data for both amount of spermatozoa and Interval of insemination are presented in **Table 3** and **Table 4**.

Table 3. Fertility and Hatchability result in various of sperm concentration (%)

Variable	Amount of Spermatozoa at each Insemination		
	50 million	100 million	150 million
Fertility	76.36±18.17 [a]	90.01±4.34 [b]	83.32±10.77 [ab]
Hatchability	62.48±16.69 [a]	58.50±12.50 [a]	61.06±15.43[a]

Table 4. Fertility and Hatchability result in various of interval of insemination (%)

Variable	Insemination Interval (d)		
	Three days	Six days	Nine days
Fertility	86.55±11.47 [ab]	90.22±3.66 [b]	73.09±16.15 [a]
Hatchability	59.14±11.94 [a]	62.63±12.65 [a]	60.27±19.30 [a]

The results of the analysis showed that the interaction between the amount of sperm and the insemination interval had no significant effect (P>0.05) on the fertility and and hatchability. Amount of sperm, and Insemination intervals were also not significantly affected (P>0.05) on fertility and hatchability, while the treatment of spermatozoa amount had a significant effect (P<0.05), and the Interval of Insemination had a very significant effect (P<0.01) on the fertility.

Fertility of eggs

In assessing fertility levels using the number of spermatozoa per Insemination is very important. In this study the level of the fertility is largely determined by the number of spermatozoa inseminated. This problem is important in this study which was designed to measure the effect of the number of spermatozoa on the level of egg fertility.

The minimum number of spermatozoa 50-100 million per Insemination per week is needed to achieve maximum fertility with fresh semen without diluents [3,6,7,12,]. The results of this study using Ringre lactate diluents (1:4) can be seen in **Table 3.** The fertility using 50 million spermatozoa per Inseminaation produced a low fertility level (76.36%, P<0.05) compared to the fertility level of inseminated chicken groups with 100 million spermatozoa per insemination (90.22%; P<0.01).

For the number of spermatozoa 150 million also produced a lower fertility level compared to the fertility inseminated with 100 spermatozoa (90.01 vs 83.32, P> 0.05). This result is similar to the results of a study by Saleh et al. [7] and Tabatabaei [1], which states that the optimum dose or number of spermatozoa for Insemination is around 100 million, and almost the same as the results of Brillard and Daniel [2], the optimum dose of about 125 million spermatozoa inseminated weekly in broiler chickens. It can be concluded that the number of spermatozoa 100 million per Insemination produces the best fertility compared to the those of Interval of 3 and 9 days.

Data on fertility and hatchability of sentul hens inseminated with different Insemination intervals are presented in **Table 3.** The fertility data ranged from 73.09 - 90.22%. The lowest was achieved by sentul chickens inseminated with a nine-day Iinsemination intervals, 73.09% (P<0.05) when compared with the fertility value with Insemination intervals every 6 days, 90.22%, while the next low was

achieved by a group of chickens inseminated with insemination interval of three days, 86.55%, P>0.05 when compared with the results of the fertility interval of 9 days (73.09%). This result is in accordance with the results of the research conducted by Brillard and Daniel, the optimum interval of Insemination is every week. It can be concluded that the interval of Insemination of six days produces the best fertility compared to those of the intervals of three and nine days.

Hatchability

From **Table 3**, it can be seen that the hatchability of the three sperm number have almost the same values ranging from 58.5 - 62.48% for hatchability (P> 0.05). The results of hatchability are lower than the results of the study of Mugiyono et al. [13] and Hidayat and Asmarasari [8] which stated the hatchability of sentul chickens ranged from 77 - 85%.

Hatchability is influenced by many factors, such as environmental factors and hatch management. There are many factors that cause fertile eggs to fail to hatch, including:lethal genes, insufficient nutrients in the egg and associated with not suitable for embryonic development.

From livestock factors that affect hatchability include: strain, health, nutrition and age. There was no difference between the three sperm number treatments (50, 100 and 150 million of sperm), because indeed the sperm number did not play a direct role in hatchability. Sperm number play a role to determine the power level of egg fertility [7]. **Table 3** insemination sperm number affects the fertility level (P<0.05) and good Insemination sperm number which is 100 million. Average value of hatchability with Insemination interval treatment every three, six and nine days ranges from 59.14 - 62.63%, P> 0.05.

The results of hatchability is lower than the results of the study of Mugiyono et al. [8]; Hidayat and Asmarasari [9] which stated the hatchability of sentul chickens ranged from 77 to 85%. Many factors determine the success of hatchability. These include: health of livestock, feed, strain, age of chickens and management of livestock can cause hatchability that varies greatly. Another factor is the environment around the cage before the eggs are hatched. The collection of eggs, storage, and handling must be optimum to maintain the survival of the embryo before and during incubation. After setting in the incubator, temperature, turning egg , humidity, ventilation in incubator room, sanitation, and hatchery management in general are very decisive factors for embryo life and hatchability

The absence of influence from the intervals of insemination on the hatchability of sentul chicken eggs showed that theinterval of insemination was closely related to semen production which would have a direct effect on egg fertility. Factors that influence the hatchability of the egg affect the hatchability: storage period, incubation position, not storage position, as described above [10,11].

In conclusion there is no significant interaction between sperm number and insemination intervals on the fertility and hatchability, and best fertility results of around 90% were achieved using insemination interval 6 days with sperm number 100 million/ 0.1 ml of diluted semen. These results suggest that this protocol can be used as a guideline for inseminators to inseminate chickens using diluted fresh semen.

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