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308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorijps@gmail.com

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Comparing the Natural Mating with Artificial Insemination (A.I) at Mazandran Native Hen

H. Khazaei Koohpar, H. Sayyahzadeh and Z. Ansari Pirsaraei
Department of Animal Science, Sari Agricultural Sciences and Natural Resources University, Sari, Iran

Abstract: At the present study, a comparison was done between the natural mating and the A.I. in Mazandran native hen. 100 females and 10 males were randomly selected from the native hen flock, one male was determined per each ten females. First the natural mating was done between the flock. Each female's egg was determined using trap nest and each individual female and males chicken's number was counted at the end of the test. The male were removed from the boxes for insemination and then the males were ready for collecting the semen. The abdominal rubbing of the males were done by using the Burous method and the resulting semen were immediately diluted using the low fat milk and 0.1cc of semen was inseminated to each female and the insemination was reported after each six days. The egg collecting stage and the stages following the same as the natural mating. The results of the statistical analysis showed that there is no significant difference between the fertility and hatchability traits of these two models ($p>0.36$). Yet the A.I. helped to mate the males and females having no mating will and thus the hatchability percentage increased. On the other hand, the male's keeping cost decreased.

Key words: Hatchability, generating females, Artificial Insemination, natural mating

INTRODUCTION

Since in each country maintaining of the gene sources either herbal or animal sources is considered as maintaining of its national capital and as keeping native hen requires the least keeping and food supplies and gets its food needs by pasturing and food reminders and it can also be helpful for supplying part of the protein needs and creating job opportunities in rural areas. Livestock offers assistance, ministry of Jihad Sazandegi attempted to the native hen revival program in 12 points of the country in 1984. Of important problems of this national program, are slow growing, producing a few eggs, the high percentage of the broodiness of flock, light-weight body and their late maturing age comparing with industrial breeds. On the other hand, the native hen has the following advantages, including the approximately high quality of the egg, the thicker eggshell, the better and more optimal taste and flavor, higher percentage meat, resistance to heat and cold and some diseases above all, their growing and keeping require high cost and modern and expensive facilities and equipments (Makarechian, 2002).

On the other hand, producing and developing of the one -day improved chicken, considering the low fertility and the hatchability percentage of the flock, in order to increasing the native hen population and finally increasing the meat and egg production, forced the Mazandran (Liu *et al*., 2008). Poultry science university researchers to study on using of the A.I. method among the native flock to increasing the production of the fertilized egg. Dr. Zohari stated the advantages and disadvantages of the A.I. are that we can efficiently expand the fertility power of the typical males by A.I. breeding and also we can collect semen from old males having ultimately genetic and breed value and fertilize a lot of hen with them. One of the problems solved by A.I. technique is creating crossing possibilities between the birds and different breeds having no mating ability naturally. Also, we can use A.I. in heavy-weight breeds like Cornish and Sussex, in turkey breeds, Bronze breed that the male has no mating ability due to it s heavy weight and fertility percentage is very low and consequently getting a lot of eggs.

MATERIALS AND METHODS

This plan is based on the comparing between the natural mating and A.I. in native hen of the Mazandran. It was randomly chosen 100 females and 10 males among the mother flock to investigate their fertility performance and hatchability. First, the males and females were kept separately for two weeks, to make the less eggs semen and then one male was put in each box per ten females. One week after the male putting in each pan, the eggs were collected for hatchability, so that each female's foot was marked and after putting eggs on the trap nest, they were removed by the worker from the nest and the male and female and the box's number and the egg's weight were written on the eggs and they were transferred to the egg storing saloon. Due to the hot weather, the eggs were transferred to the

Corresponding Author: H. Sayyahzadeh, Department of Animal Science, Sari Agricultural Sciences and Natural Resources University, Sari, Iran

storing saloon two to three times a day. Fresh water and seed were available for the poultry, too. The saloon had natural light during the ten days collecting the eggs of each hen marked by a certain color by a marker, so their counting and identifying during the candling was done more easily. The eggs were candled in 18 days. At the end of the day 21 each chicken parents were determined based on the plaque on each net and the chickens were counted. At the end of the natural mating period, namely after 10 days of recording, the males were removed from each box and they were kept individually. To make the less eggs semen for inseminating and the male were ready for collecting semen.

After 20 days making ready the males semen were collected based on the Burous method. In this method, we took a male and rub its back and under abdomen slowly and lightly and open and close its cloaca several times. A funnel-shaped pipe was used for collecting the sperms. As the native male's semen volume was low, only five females had the inseminating ability in each collecting semen stage. The semen quality was investigated in each collecting semen. We entered 0.1cc semen by tuberculin syringe and a thin plastic pipe into the ovary canal. This was repeated for each hen each six days, which we took semen of each male three times a day and it was inseminated to five females .The semen was diluted by a low-fat milk immediately after the collecting semen and then the insemination was done. One week after the insemination, females having semen were collected and the parents and the box number were recorded on the eggs and were transferred to the egg storing salon as the natural mating. After 10 days collecting of the fertility eggs by a special color for each hen by a marker, the eggs were token to the setter set and the candling was done at the eighteenth day and finally each male and female's chickens were counted at the end of the day 21 (Table 1).

Table 1: Descriptive statistics of observations

Chick number	Female	Male	Model
442	96	10	Natural mating
153	72	8	A.I

As a note, females and males were weighed at first and end of every two methods (Table 2). In this stage, collecting the semen was also done in the ten males randomly chosen and it was inseminated to 100 females and then the fertility and hatchability traits were counted. These traits in the generations having a natural mating were also compared. In this case the statistical model, is as following:

$$y_{ijk} = \mu + R_i + H_j(R_i) + M_k + b_1X_1 + b_2X_2 + b_3X_3 + e_{ijk}$$

Y_{ijk}: Observation related to the fertility and hatchability
μ: The population mean
R_i: Male effect.
$H_j(R_i)$: Effect of nested female in the male
M_k: Method mating effect (natural, artificial)
X_1: Average weight effects of the eggs of each hen.
X_2: Female weight change effect
X_3: Male weight change effect
b_1, b_2 and b_3: Regression coefficients due to each effects
e_{ij}: Random error

The natural mating and insemination data were entered in the Excel and they were edited and finally these two models (the natural mating and the insemination) were analyzed by the SAS* soft ware.

RESULTS AND DISCUSSION

Comparing results of the A.I. and the natural mating showed that there were no significant difference between the hatchability traits of these two mating methods ($p>0.36$), but, as the fertility and hatchability percentage reported in native females are very low, so we can markedly promote the flock fertility using A.I. An important problem facing mother hen growers, is the mother flock's high weight causing reduced fertility percentage. The results show that the flock weights are low to cause a negative disorder on the flock fertility percentage and rate. Although, taking more advantages of A.I. requires more investigations. An experienced A.I. technician requiring high cost and additional work is the A.I's disadvantage. While, natural mating needs no means, additional work or specialist, but the most accurate research way to exact identifying the fertility power and the sex power of the flock members is using A.I. method (Zohari, 1995). Because, a successful A.I. can repay in part additional costs, omitting the flock additional males and selling them and thus saving cost. In our study this saving costs has saved 18% of the costs. It is necessary to perform and estimate this plan in a big flock.

Number of the eggs and the hatchability percentage were showed in Fig. 1-4 in two models, number of the eggs were different in two models, but the hatchability percentage were almost the same in the A.I. It worth's note that the productivity traits are of low inheritability and high flexibility rate. This high flexibility makes the successful changes possible by choosing. Weather, food, management and especially the animals breed affect greatly the productivity (Edriss and Mostajeran, 2004). As the performance period was short, so it was impossible to investigate the problem, but in this program considering the productivity performance study for 6 native flock's sequential generation, we also confirmed the low semen heritability and hatchability of the native flock studied by other researchers. Along with this (Makarechian, 2002), it was showed that due to the low heritability rate ($h^2 = 0.025$) of these two traits, a little genetic progress was gained during several generation choosing in the native flock, studying the semen quality showed that the native males semen have relatively fine mobility and 80% of the sperms received were of wave mobility, also, they had live and active spermatozoa of above 92% concentration (Table 3). As these 10 males play an important role in

Table 2: Comparison of means in A.I and natural mating

	Average egg number (±SD)	Hatchability percent model (±SD)	Average body weight (±SD)
Artificial insemination	65±0.18	65.4±2	2125±45.35
Natural mating	67±0.57	65.4±2	1957±26.46

Table 3: Comparison of semen in under testing males

TD (Minute)	AS (%)	LS (%)	SC (milliard per ml)	Mobility of sperm	Volume of semen (ml)	Male	Dam	Sire
4.00	5.1	3.99	3.7	1.1	0.93	21031	1914	474
3.63	1	99	3	1.2	0.5	21043	313	849
2.53	0.9	5.98	2.8	1.9	0.6	21050	1672	849
4.04	2.1	99.7	2.5	1	0.6	21096	313	849
1.53	7.0	99.3	3.4	2	0.8	21120	2184	990
1.04	9.0	99.1	3.3	1.6	0.85	21141	1617	990
3.03	8.0	99.2	3.3	1.5	0.9	21144	1721	751
2.03	4.0	99.6	3.5	1.7	0.75	21258	2184	990
3.53	5.0	99.5	3.6	2	0.9	21407	1182	956
-	-	-	-	-	-	21081	18	956

TD = Time of discoloration (Minute); AS = Abnormal Spermatozoids (%); LS = Live Spermatozoids (%); SC = Semen Concentration (milliard per ml)

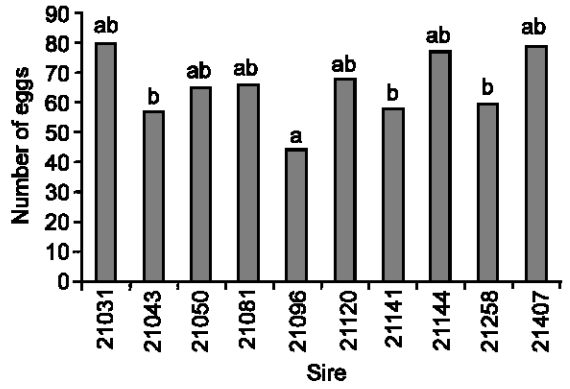

Fig. 1: Number of egg production (N.M.; Natural mating). Dissimilar alphabets show level of significant comparison of mean

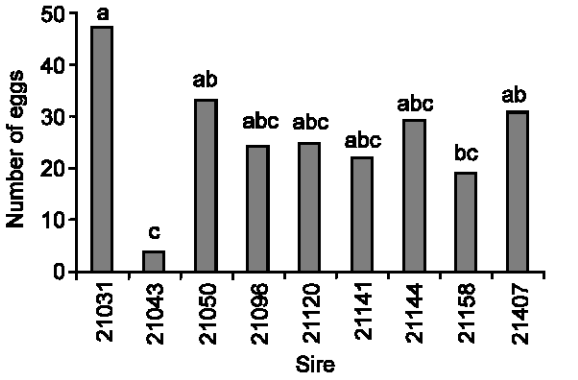

Fig. 3: Number of egg production (A.I.). Dissimilar alphabets show level of significant comparison of mean

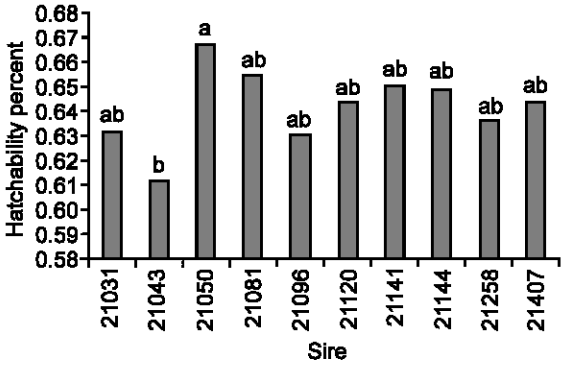

Fig. 2: Hatchability percentage (N.M). Dissimilar alphabets show level of significant comparison of mean

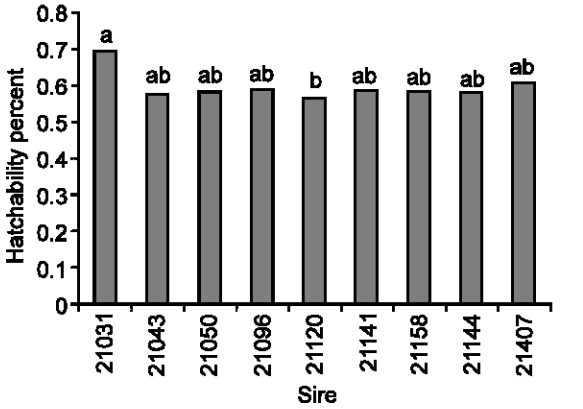

Fig. 4: Hatchability percent (A.I). Dissimilar alphabets show level of significant comparison of mean

both natural mating and A.I., they had identical performance in comparatively studying the two productivity systems. In this program, how ever, we had no comparing between the native and improved hen, but based on other researcher's, studies, all of the improved poultry breeds have better semen quality than the native ones.

Zahraddeen *et al.* (2005) showed that in each ejaculation, the jump frequency, the live spermatozoid and the sperm concentration and amount was significantly higher in the improved ducks than the native ones. Also they found that the sperm concentration is affected significantly by the ejaculation frequency (Zahraddeen *et al*., 2005).

Brun and Larzul (2003) studied the fertility and hatchability rate in ducks (especially in the pure and hybrid breeds with Muscovy) and they found that the heritability estimation have an average effect on the productivity. The heritability for productivity or hatchability is two times the pure in hybrid breeds. (Fertility 32% versus 15% and hatchability 36% versus 16%). The genetic coefficient of the hatched chicken was with fertility above the average level and reasonable (Brun and Larzul, 2003). In our studies, the fertility percentage during the flock A.I. was more than the natural mating, but it was not at the reasonable level. This is explainable as the insemination was more accurate and the fertility was more expected, but in the A.I., due to the flock permanent stress (for permanent collecting semen and permanent insemination of the mother flock), the fertilized zygotes related to the egg-making process, didn't lasted and a high percentage of the fertilized eggs by the insemination, didn't turn in to chickens (Table 1). But in the natural mating all of the stages were slow and were done without any stress.

Hammerstedt (1996), performing a plan about A.I. found that each male can have maximum 10 females mating and fertility ability in natural mating. While, at A.I., we can inseminate 100 females with one male's sperm and this makes the maximum using of the flock males possible (Hammerstedt, 1996). In our studies, as we worked on the native hen 's flock and the sperm amount was three times lower than the improved females in native males in each ejaculation and they got average 0.3 CC semen, we couldn't diluted it more than two times. So, we could only fertilize 5 females in each semen's collecting stage with so volume and each male fertilized 10 females weekly. These result doses not match Hammerstedt report. But in natural mating, one male was in each box with 10 females that had a favourable result and this result is similar to above reasults. Also, in the economic estimation, our study results is match with Brillard and De Reviers (1998). They showed that although the cost and effort are two times the natural mating in A.I. and it requires 10-20% more investment, but the hatchability cost reduces 10 percent, so, they concluded that this technique is of high value in heavy- weight breeds. On the other hand, in A.I. the male keeping cost is lower as one to three males are kept per each 100 females, but in natural mating 8-10 males are kept per each female. The insemination dose is 100-200 million spermatozoids and the insemination has been reported once a week. Our result in the native flock is very similar to this researchers except for that. We use one male per each maximum 20 females requiring more costs considering the sperm quality. We concluded that three factors play an important role in increasing the flock fertility: 1. Semen volume 2. Semen concentration 3. Live and active spermatozoids percentage. We estimated the correlation coefficient between the semen quality and the fertility power 0.948 percentages.

Liu *et al.* (2008), reported that the correlation coefficient is 0.985% in improved flock, he also reported that there is a high correlation between the sperm quality and estradiol and testosterone amount in the semen plasma (0.48 correlation coefficient) (Liu *et al*., 2008). We didn't study in this case.

Abplanalp (1982) by selecting 21 generations of the productive males found that there is a relatively good correlation between the sperm quality and the hatchability percentage of the males (0.18±0.02) (Abplanalp, 1982). Our studies show that this coefficient is quite negative using A.I. method while it is positive in the natural mating conditions. Statistics show the season and the weather conditions play an important role in the flock fertility power. As the researches were done from the middle of the spring the end of the summer, they had a negative role on the important fertility factor. Certainly, the environmental factor caused the low fertility percentage in our study, but as both treatments were compared in the same conditions, the results are relative and neglect able.

Chowdhury *et al.* (2004) of Bangladesh reported that season has been an efficient factor in the fertility power of the ducks. In this study, winter is the best time for the hatchability of the ducks (Chowdhury *et al*., 2004).

Taylor (2003) found that natural mating and A.I. with time limitations can affect the fertility power, so that Am and Pm inseminations are in both the natural mating 54.8%, 80.9% and the insemination 70% and 77% respectively. And they concluded that they had the highest fertility percentage in the afternoons. In our study there were no significant effects in this case (Taylor, 2003).

Suggestions:

- As the environmental factors play a determinant role on the economic traits of the native hens in order to gain the maximal genetic potential besides breeding researches, it is necessary to perform several food plans to identify and determine the real food needs of the native hens. This helps to estimate the real food cost of the native hen and to precede the industrialized trend of breeding of the native hens at its right direction.
- Due to the beneficial effects of insemination to keep less males in the herd to bear less breeding cost and to use less keeping place for them and

insemination all of the hens. It is recommended, this method to be reviewed in the poultry industry and a novel method to be invented to prevent stress among the herd. Insemination is better to be performed at the male's early maturity ages and namely to have a successful and easier insemination, the male should not already have mating experience before. In so doing, we can gain more sperms by making ready the male and this takes less time.

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