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CERTAIN FACTORS AFFECTING FERTILITY PERCENT IN SOME LOCAL BREEDS OF CHICKENS

LAILA M.A.G., M.A. ABD-EL-GALIL, T.H. MAHMOUD

Animal Production Research Institute, Agricultural Research Centre, Dokki, Giza, Egypt .

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Abstract

This study was carried out to study some factors affecting egg fertility in some local breeds of chickens (Gimmizah, Bandara and El-Salam). Three sex ratios for each breed were used (1 male for 10, 15 and 20 females). Hatches of January and February represented cold season, and hatches of April and May represented hot season .

Cocks used in this study were examined for semen quality (motility and live sperm percentage).

The results obtained were as follows :

1. There was significant effect ($P<0.01$) of breeds, sex ratio and month on fertility percent.
2. The highest fertility percentage was recorded for El-Salam breed (94.22%), followed by Gimmizah (92.12%) and Bandara (91.26%).
3. Sex ratio was found to have a significant effect ($P<0.01$) on egg fertility, where 1 male for 10 females was the best sex ratio in this study, followed by 1 male for 15 and 20 females.
4. Significant differences ($P<0.01$) were found between months, where fertility percent for hatches of January was the highest (95.17%), followed by hatches of February, April and May (93.47, 90.95 and 90.22%, respectively).
5. El-Salam cocks were the best in both semen motility and live sperm percent (6.33 and 92.33%), followed by Gimmizah (5.66 and 91.56%) and Bandara (5.66 and 90.00%). This in term agreed in the fertility percent obtained for the three breeds in the same order.
6. The interaction between sex ratio and months was significant ($P<0.05$), while, it was not significant between either breed by sex ratio or breed by month.
7. Positive phenotypic correlation was found between motility and live spermatozoa percentage, and between both of these two characters and fertility.

INTRODUCTION

The reproductive efficiency of the fowl is determined by the number of eggs laid and the percentage of chicks hatched. The problem of obtaining a high percentage of fertile eggs is of economic importance in poultry production, because incubated infertile-eggs have a reduced value as food and require additional incubator space and labour, so, they present a considerable economic loss .

There are many factors influencing fertility involving both male and female in domestic fowl. Many investigators recorded breed differences in egg fertility (Balat 1990 and Hassan 1991), sex ratio (Boa-Amponsen 1985) and seasonal effect (Balat 1990, Darwish *et al.* 1990 and Abd-El-Galil 1993).

On the other hand, semen quality was found to have significant correlation with fertility percentage (Kamar *et al.* 1984 and Radwan 1991). Highly significant correlations were observed between motility and live sperm percentage (Kamar and Badreldin 1959, and Radwan 1991), and between motility and fertility (Kamar *et al.* 1984). So, the quality of semen measured as a percentage of live spermatozoa and motility determines cock's fertilizing ability to a high extent.

Therefore, this experiment was designed to study the effect of breed, sex ratio, seasonal variations and semen quality as factors affecting percentage in incubated eggs.

MATERIALS AND METHODS

This experiment was carried out in Sids Poultry Research Station, Animal Production Research Institute, Ministry of Agriculture, during the period from January to May 1995 to study the effect of :

- Breed, through three local breeds of chickens, i.e. Gimmizah, Bandara and El-Salam.
- Sex ratio, through six ratios used for each breed (one male for 10,15 and 20 females).
- Environmental temperature, where, birds which produced eggs during April and May hatches were exposed to higher ambient temperature when compared with those eggs laid during January and February hatches.

A total of 135 females and 9 males from each breed at 40 weeks of age was used. Hens of each breed were divided into 9 groups (three replicates X three sex ratios). So, the total number of the experimental units was 27 units (3 breeds X 3 sex ratios X three replicates = 27 units).

Hens of each group were housed in pens of 2 X 2 meters, and maintained under the same nutritional and manageable conditions. All hens were subjected to natural day light during the experimental period and were fed layer diet having about 16% protein and M.E. 2754 (Kcal /Kg).

During months of January, February, April and May, eggs from each pen were collected for one week per month and incubated in a Pettersime incubator. On the 18th day of incubation period, the eggs were candled, and the infertile eggs were removed. Then, fertility percent was estimated .

At the end of the experiment, males were trained for collection of semen. Samples of the collected semen were examined to determine sperm motility and live sperm percentage. Mass motility was scored to scheme of classification described by Kamar (1960). Viability of spermatozoa and semen quality were evaluated by determining their normal physical characteristics. Immediately after collection of semen, a freshly ejaculated semen was diluted by sodium citrate extend, stained by 10% eosin and 5% vital, for estimating the percentage of live spermatozoa.

Environmental temperature during the experiment was recorded using maximum and minimum thermometer, and the average monthly temperature was recorded.

Statistical analysis:

Complete Random Design was used in the experiment with the following statistical model (Harvey 1987) :

$$Yijk1 = U + Bi + Tj + Mk + (BT)ij + (BM)\,ik + (TM)\,ik + (TM)jk + Eijk1.$$

Where :

Yijk1 = observed value of the concerned trait .

U = the overall mean for the concerned trait.

Bi = the effect of the i th breed.

Tj = the effect of the jth treatment (sex ratio).

Mk = the effect of the Kth month.

(BT)ij = the effect of interaction of ith breed in jth treatment.

(BM)ik = the effect of interaction of ith breed in Kth month.

(TM)jk = the effect of interaction of jth treatment in Kth month.

Eijk1 = a residual element random deviation of the 1 th trait.

Before analysis, data taken as percentage were transformed using arcsine transformation according to Snedecor and Cochran (1977). After analysis, measures were re-transformed to the original scale.

RESULTS AND DISCUSSION

Effect of breed :

The mean of fertility percentages for the three studied breeds within each sex ratio are listed in Table 1.

It could be observed that, El-Salam breed showed a higher fertility percentage (94.22%) than the other two breeds while, there was no-significant differences between Gimmizah and Banara breeds, (92.12 and 91.26%, respectiverly).

The results obtained herein agreed with those reported by Kalita *et al.* (1985), Mohapatra *et al.* (1986) and Balat (1990),where they detected significant differences between different breeds in fertility percentage.

Gernerally, the fertility percentages recorded in this study were lower than those recorded by Abd-El-Galil (1993) for Gimmizah and Bandara (92.6 and 92.6%), while, they were higher than those reported for El-Salam (83.4%) by Balat (1990).

Sex ratio :

As shown in Table 1, there were highly significant differences ($P<0.01$) between the three sex ratios used in this study. The highest fertility percentage (94.02%) was recorded for the first sex ratio (1 male for 10 females), then, the fertility percentage decreased by the higher sex ratio used (1 male for 15 or 20 fe-

Table 1. Mean and standard deviation for egg fertility % for the different treatments.

Average egg fertility $\bar{X}$ + S.D.																
Months:	Jan.			Feb.			Apr.			May			Total & Ave			Overall Mean
Amb. Temp.	5-15°C			8-15°C			13-26°C			16-34°C						
M : F	1:10	1:15	1:20	1:10	1:15	1:20	1:10	1:15	1:20	1:10	1:15	1:20	1:10	1:15	1:20	
Breeds:																
El-Salam:																
$\bar{X}$	98.36	94.50	93.08	97.06	94.80	94.97	90.19	95.00	93.82	91.10	92.30	90.94	95.10	94.70	93.28	94.22
± S.D.	0.15	1.85	1.90	0.10	2.85	0.95	6.09	1.75	0.85	3.00	2.82	5.72	4.75	2.57	4.03	3.86
Gimmizah:																
$\bar{X}$	97.80	96.50	94.60	93.90	92.50	91.00	94.32	83.62	88.90	88.95	88.21	89.84	94.15	90.80	91.22	92.12
± S.D.	0.10	0.12	0.10	1.45	0.10	0.10	0.90	3.32	3.70	5.13	2.87	2.14	4.86	5.06	2.85	4.51
Bandara :																
$\bar{X}$	95.10	91.00	93.24	94.70	87.50	91.94	90.57	88.83	90.24	89.90	91.22	89.27	92.75	89.70	91.23	91.26
± S.D.	2.20	1.05	0.06	0.19	0.50	1.35	2.20	0.47	1.91	8.18	2.47	3.73	5.77	2.18	2.95	4.04
Total	97.24	94.20	93.65	95.55	91.85	92.74	92.04	89.75	91.10	90.98	90.03	90.03	94.02	91.67	91.94	92.58
& Ave.	1.94	2.64	1.21	1.86	3.45	1.97	3.83	5.28	3.11	5.59	3.10	3.92	3.71	3.28	3.62	3.65
Overall $\bar{X}$	95.17			93.47			90.95			90.22			92.58			92.58
Mean ± S.D.	2.52			2.92			4.12			4.18			3.65			3.65

males) (91.67 and 91.94%, respectively) .

These results, however, could not held true with birds of small body, where, Boa-Amponsen (1985) reported that sex ratio had non-significant effect on fertility percentages, when he used either one male for 6,8,10 or 12 Leghorn females, or one male for 8, 10, 12 or 15 Dekalb females .

Although the interaction between breed and sex ratio was non-significant, there was significant interaction ($P<0.05$) between sex ratio and months. This interaction could be explained on light of breed differences in mature body weight for the three studied breeds (Table 2).

Table 2. Body weight at 12 week old for both males and females studied withing each breed.

	El-Salam		Gimmizah		Bandara	
	M	F	M	F	M	F
X	901.76	730.59	908.82	636.11	1028.57	848.00
±	327.84	150.31	152.31	105.80	148.99	113.34

Effect of month :

Results obtained in this study showed that, fertility percentages were higher in hatch of January, then, it decreased gradually in February, April and May (95.17, 93.47, 90.95 and 90.22%, respectively) (Table 1). Decreased fertility percentages may be due to the increase of the environmental temperature through these different months (Table 1).

These results agreed with those reported by Balat (1990) and Darwish *et al.* (1990), where they found that the fertility percentages were higher in winter than in the other seasons. Saeid and Al-Soudi (1975) detected seasonal differences in semen quality, and also, in fertility percentages.

There were non-significant interaction between breed and months, while, the interaction was significant ($P<0.05$) between sex ratio and months.

Semen quality characteristics :

Table 3 shows the semen quality traits (motility and live sperm percentages)

for the three studied breeds.

These results showed that, the highest score in semen quality traits was recorded for El-Salam males. This could partially explain the results recoded for fertility percentage for the studied breeds. There was positive phenotypic correlation (r = 0.741) between motility and live spermatozoa, (r = 0.500, 0.902 and 0.896 for El-Salam, Gimmizah and Bandara, respectively).

Table 3. Motility and Live sperms percentage for semen and the correlation (Phi) between them for the three studied breeds .

Breed	Traits		
	Motility X ± S.D	Live Sperms % X ± S.D.	Phi
El-Salam	6.33±0.58	92.33±3.01	0.500
Gimmizah	5.66±0.58	91.56±2.83	0.902
Bandara	5.66±0.58	90.00±2.00	0.866
Total & Aver.	5.89±0.60	91.60±2.75	0.741

Also, a positive phenotypic correlation was found between egg fertility and semen characteristics (Table 4). The values obtained for the correlation between fertility and motility were 0.863, 0.896 amd 0.876, and between fertility and live spermatozoa percentage were 0.869, 0.874 and 0.959 for the three breeds, respectively. So, the cock's fertilizing ability could be determined, to a great extent, by testing the semen quality for either the motility or live spermatozoa percentage.

These results agreed well with the finding reported by Kamar *et al.* (1984), where, they found significant positive correlation between motility and fertility.

Table 4. Correlation (Phi) between egg fertility and certain semen characteristics for the studied breeds.

Breed	El-Salam Phi	Gimmizah Phi	Bandara Phi
Semen characteristics :			
Motility	0.863	0.896	0.867
Live sperms %	0.869	0.874	0.959

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بعض العوامل التى تؤثر فى نسبة الاخصاب فى بعض سلالات الدواجن المحلية

ليلى محمد أحمد جوهر، محمد عبد العزيز عبد الجليل ، طه حسين محمود

معهد بحوث الأنتاج الحيوانى - مركز البحوث الزراعية - الدقى - جيزة - مصر .

أجريت هذه التجربة لدراسة بعض العوامل التى تؤثر فى نسبة الاخصاب فى بعض سلالات الدواجن المحلية (الجميزة - البندرة - السلام)، وقد أستخدم فيها ثلاث نسب جنسية لكل سلالة (ذكر واحد لكل ١٠ - ١٥ - ٢٠ أنثى)، وأعتبرت تفريخات شهرى يناير وفبراير ممثلة لشهور السنة الباردة وتفريخات شهرى ابريل ومايو ممثلة لشهور السنة الحارة، وقد أختبرت الديوك المستخدمة لصفات السائل المنوى (حركة الحيوانات المنوية والنسبة المئوية للحيوانات المنوية الحية). وقد أمكن الحصول على النتائج الأتية :

١- كان هناك تأثير معنوى لكل من السلالة والنسبة الجنسية والشهور على النسبة المئوية للاخصاب.

٢- كانت أعلى نسبة إخصاب فى سلالة السلام (٩٤,٢٢٪) تليها الجميزة ٩٢,١٢٪) ثم البندرة (٩١,٣٦٪).

٣- كان للنسبة الجنسية تأثير معنوى على نسبة الإخصاب ،حيث أعطت نسبة ذكر واحد لكل ١٠ اناث أفضل نتائج تليها نسبة ذكر واحد لكل من ١٥ ، أو ٢٠ أنثى.

٤- وجدت اختلافات معنوية بين الشهور فى نسبة الاخصاب، حيث أعطت تفريخات شهر يناير أعلى نسبة اخصاب (٩٥,١٧٪) يليها تفريخات شهر فبراير ثم إبريل ومايو (٩٣,٤٧ ، ٩٠,٩٥ ، ٩٠,٢٢٪ على التوالى).

٥- كانت ديوك السلام هى الأفضل فى صفتى الحركة والنسبة المئوية للحيوانات المنوية الحية (٦,٣٢ ، ٩٢,٣٣ ٪) تليها ديوك الجميزة (٥,٦٦ ، ٩١,٥٦٪) ثم ديوك البندرة (٥,٦٦ ، ٩٠,٠٠٪) وهذه النتائج بدورها تتفق مع نسبة الإخصاب لهذه السلالات وبنفس الترتيب.

٦- كان التداخل بين النسبة الجنسية والشهور معنويا بينما كان غير معنوى بين كل من السلالة والنسبة الجنسية وبين السلالة وشهور التفريخ.

٧- وجد ارتباط موجب بين الحركة والنسبة المئوية للحيوانات المنوية الحية وبين كل من هاتين الصفتين والنسبة المئوية للإخصاب.