



Evaluation of Some Morphological Defects in Spermatozoa of Cocks

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ABSTRACT

The aim of this research was to prove the principal morphological sperm defects in Gramapriya hybrid cocks in Gujarat. In this experiment, six Gramapriya hybrid cocks were used. Semen was collected by abdominal massage method, two times a week during the 10 weeks period. A total 114 neat semen samples were examined morphologically, mean abnormal sperms and it types were evaluated. A total abnormal spermatozoa count of 6.58 ± 0.22 percent was determined. Tail defects were the leading defects at 4.54 ± 0.22 percent. Mid-piece of 1.21 ± 0.08 percent and head defects of 0.82 ± 0.08 percent were the next most prevalent. Acrosome defects were not included in present study. The sperm defects were correlated highly significant, positive with pH of semen (+ 431) and negative with mass (-0.563) and individual (-0.251) motility of spermatozoa. In conclusion, we observed that the most common morphological defects were tail due to very long which leads a reduction in sperm motility.

Keywords: Gramapriya hybrid cock, morphological, spermatozoa and defect

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INTRODUCTION

The function of male to produce semen, and in case of natural mating, to copulate and ejaculate the semen into the everted cloaca of the hen. Sperm of birds is long, cylindrical and tapered at both the ends. The spermatozoa are about $0.5 \mu\text{m}$ at their widest point and approximately $100 \mu\text{m}$ in length [5]. The fertility of cocks were evaluated through the macro and microscopic examination of semen produced by testes which located in the centre of the body cavity and, therefore, spermatogenesis proceeds at the internal body cavity temperature at 41°C in birds, as opposed to the scrotal temperature of $24\text{-}26^\circ\text{f}$ in mammals [5]. Spermatozoa are produced continuously by mitotic division to yield subsequent generations of spermatogonia and spermatocytes which enter the first meiotic division. After approximately 6 days, the second meiotic division has been completed during the next 7 to 8 days, during which morphology of mature spermatozoa is acquired. Acrosome and mid-piece defects are the most sensitive regions of poultry spermatozoa [10, 15] and also the connection between the head and mid-piece is very susceptible to damage by external factors [4] which leads to increase total morphological abnormal count into semen. It is recommended to be one of the most essential qualitative characteristics [8] and utilized for predicting the fertilizing ability of spermatozoa [9]. Therefore, the present work was conducted primarily to evaluate the some morphological sperm defects in dual-purpose Gramapriya hybrid cock semen.

MATERIALS AND METHODS

Six commercial dual purposed Gramapriya hybrid cocks, aged 38 weeks reared individually in California layer cages with providing *ad libitum* layer mash feed and water at Poultry Demonstration Unit, College of Veterinary Science & Animal Husbandry, S.D.A.U., Sardarkrushinagar. No additional light was supplied throughout the study. The environmental temperature was ranged between 8.7 to 35.2°f and relative humidity varied between 18.6 to 87.6% .

A total 114 neat semen samples were collected by abdominal massage method, two times in a week during morning between 8:30 to 9:30 a.m.. Smears were prepared and stained with eosin-nigrosin

differential staining method as described by Singh *et al.*, [12] and seen under oil immersion lens (100 X) in the simple light microscope. A total 300 sperms were counted, the proportion of total morphologically defected sperms including different types were classified according to Alkan *et al.*, [1] as follow except acrosomal defect,

a) Head defects:

1. 90° bent
2. 180° bent
3. Head detachment
4. Knotted head
5. Larger head (macrocephalic)
6. Smaller head (microcephalic) and
7. Head swelling

b) Midpiece defects:

1. Mid-piece bending
2. Mid-piece detachment
3. Mid-piece swelling
4. Mid-piece thickening
5. Mid-piece partial detachment
6. Knotting at head- midpiece border and
7. Mid-piece vacuolization

c) Tail defects:

1. 90° bent tail
2. 180° bent tail
3. Tail knotting
4. Tail detachment and
5. Curled tail

The data generated were analyzed statistically mean plus or minus the standard error and correlation coefficient with other physical attributes of semen according to Snedecor and Cochran, [13].

RESULTS AND DISCUSSIONS

The artificial inseminations in hens are recommended in late afternoon session due to cocks are shows their desire to mate late in the afternoons [6]. But, in this research, the ejaculates were collected from cocks in the morning hours. The proportion of morphologically abnormal spermatozoa in a semen sample is directly determining the fertilizing capacity. Although, cocks with high semen producing capacity are often very less and they affected with several factors to its seminal characteristics; age, season, environment, poor nutrition, unfavourable climatic conditions, and poor management besides individual factors which directly affect seminal morphology [1, 2].

The morphological defects of cocks sperms of the present study are presented in table 1. The mean percentage of abnormal spermatozoa (6.58 ± 0.22 %) obtained was similar to that reported by Tuncer *et al.* [16] in Denizli, Bah *et al.* [3] in local cocks of Nigeria, Tuncer *et al.* [17] in Gerze and Tabatabaei *et al.* [14] in Indigenous broiler roosters cocks. Contrary to present findings some workers reported higher abnormal spermatozoa count in Ebro [2] and in Ross-308 roosters [14]. The reports of lower abnormal sperm were also found RIR and WLH [12, 7] and Denizli [16] cocks. This difference can be attributed to the breed of cock used, live-weight, season, environmental temperature and humidity, ration size and semen collection techniques [1, 16]. Short term or freezing of cock semen also enhances the total number of morphologically abnormal spermatozoa than initial ejaculates because of cold water shock made during operations [2].

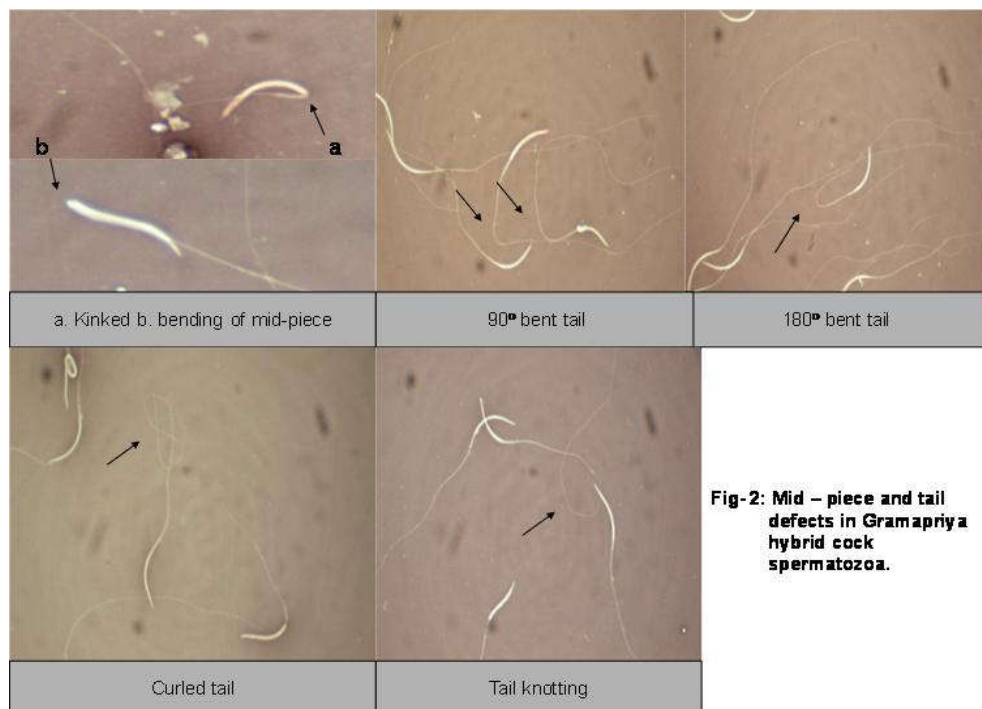
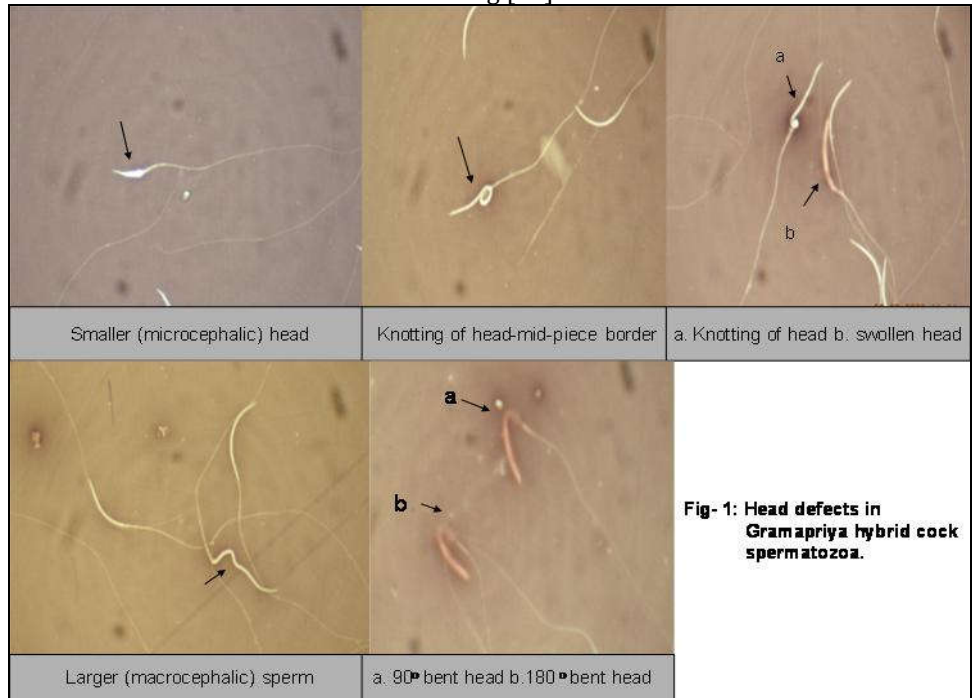
Table 1: Morphological defect in neat semen of Gramapriya hybrid cock (n=114)

| | Total Morphological defects | Head defects | Mid-piece defects | Tail defects |
|----------------------|-----------------------------|-----------------|-------------------|-----------------|
| Mean \pm S. E. (%) | 6.58 \pm 0.22 | 0.82 \pm 0.08 | 1.21 \pm 0.08 | 4.54 \pm 0.26 |
| Range (%) | 3.18 to 10.71 | 0.0 - 2.4 | 0.0 - 3.06 | 1.8 - 10.71 |

Total head defects were 0.82 ± 0.08 percent and observed head defect types were knotted, swollen, macrocephalic, microcephalic, 90° bent, 180° bent and detached head in the present study (figure 1). The percentage of head abnormalities obtained in present results was nearer to that reported by Sevinc *et al.* [11] in White Leghorn and New Hampshire cocks, Alkan *et al.* [1] in American Bronze turkeys. Controversial report of higher head abnormalities was in Denizli [16], in Gerze cocks [17] and in Indigenous and Ross roosters. The bending and knotting of the head of cock spermatozoa which is never

found in mammals sperm due to spherical in shape. According to Tsukunaga [15] stated that poultry sperms could swell in seminal plasma after ejaculation and it was very difficult to determine the abnormal swelling of the head region.

In the present study, the mean value of mid-piece defects was second most common defects after the tail defects at 1.21 ± 0.08 percent. The most commonly mid-piece defects were bending and kinked midpiece in Gramapriya hybrid cock semen (Figure 2). The percentage of mid-piece abnormalities obtained was nearer to that reported by Tabatabaei *et al.* [14] in Indigenous and Ross roosters. The higher mid-piece abnormalities were reported in Leghorn and New Hampshire [11] cocks, in American Bronze turkeys [1], in Denizli [16] and in Gerze cocks [17]. The mid-piece defects were higher than that of the head due to it is most sensitive regions of poultry spermatozoa [10] and also a connection between the head and mid-piece of cock sperm is very sensitive to external factors [4]. The higher prevalence of bending and kinking of midpiece abnormalities was due to the sensitivity of this region, as it deteriorates quicker than other regions and the tail's movements cause bending [18].



Tail defects were highest at 4.54 ± 0.22 percent, and the most frequent types were bending and knotting of the tail (figure 2). Also found the coiling of tail around the head as tail defects in the present study which not classified by Alkan *et al.*, [1] in Turkey. The percentage of tail abnormalities supported the finding reported by Tabatabaei *et al.*, [14] in Indigenous roosters. However the lower tail defects were reported in WLH and New Hampshire [11], in American Bronze turkeys [1] and in Ross roosters [14]. The very low tail abnormality was also recorded in Denizli [16] and in Gerze [17] cocks. The results of tail defects were variable to above studies in poultry sperm because of it is secondarily occurring mechanical defects as well as it is very thin, long and vigorous motility after ejaculation [11, 15].

In the present study, total morphological defects were found to be highly significant, negatively correlated with mass motility and individual motility and positively correlated with seminal pH (Table 2). It is close agreement with Kundu and Panda [7] and Bah *et al.* [3] who found highly significant and negative correlation of abnormal spermatozoa count with live spermatozoa and mass motility while highly significant and positively correlated with pH. The seminal pH is further moves towards alkaline as the semen with higher numbers of defected spermatozoa. The present correlation supports the statement of Alkan *et al.* [1] that the morphological defects affect the fertility more than the motility.

Table- 2: Correlation matrix of physical attributes with total morphological defects of cock semen (n= 114)

| Physical attributes | Total Morphological defects |
|-----------------------------|-----------------------------|
| Volume | 0.096 |
| Colour and appearance | -0.096 |
| pH | 0.431** |
| Mass Motility | -0.563** |
| Individual motility | -0.251** |
| Spermatozoa count | -0.088 |
| Total spermatozoa count | 0.067 |
| Live spermatozoa count | 0.032 |
| Total Morphological defects | 1 |

** Highly significant (P <0.01)

* Significant (P <0.05)

This is the first study which proved some morphological characteristics of Gramapriya hybrid cocks, so we couldn't compare the data same breed cocks that compared data on another breed of cocks and Turkey. The tail defects were highest occurring morphological defects, followed by mid-piece and head defects, it depends on morphological characteristics of cock sperms and susceptibility of different parts of sperms to various factors.

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