

# Sexual Behavior and Semen Production of Madura Bulls

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**Abstract**—Madura cattle are Indonesian native germplasm which has a high productivity. Madura bulls used for artificial insemination programs must be superior bulls with a high libido and semen production. The libido can be seen through the sexual behavior of the bulls before semen collection. The purpose of this study was to determine the relationship between sexual behavior and semen production in Madura bulls. This research was conducted on February 20 until April 25, 2018, at the Laboratory of Singosari National Artificial Insemination Center, Malang. The materials used were 4 Madura bulls aged at 8 to 11 years. The parameters observed were sexual behavior (libido duration and ejaculation duration) and semen production (total spermatozoa and total motile spermatozoa). The method used was observational in a randomized block design. The results showed that the individual bulls had no significant differences ( $P > 0.05$ ) on libido duration and ejaculation duration, but had a highly significant difference ( $P < 0.01$ ) on total spermatozoa and total motile spermatozoa. The highest libido duration was observed in the Kanwa bull with an average of  $2.45 \pm 3.41$  minutes. Meanwhile, the highest ejaculation, total spermatozoa, and total motile spermatozoa were found in the Pasean bull with an average of  $7.17 \pm 1.60$  minutes,  $7,374.2 \pm 1,888.05$  million/ejaculate, and  $5,133.52 \pm 1,359.65$  million/ejaculate, respectively. It could be concluded that there are no differences in sexual behavior among individual Madura bulls, however, there are differences in spermatozoa production. In addition, the sexual behavior stimulation could increase spermatozoa production.

**Keywords**— Artificial insemination, sexual behavior, spermatozoa production, Madura cattle.

## I. INTRODUCTION

This Madura cattle is one of the original Indonesian beef cattle which has good reproductive performance. Madura cattle population decreases from year to year so it must be maintained to prevent extinction. The efforts that can be made to increase Madura cattle population including the selection of superior bulls, then spreading the bulls and frozen semen to the areas with lack of the bulls.

Artificial insemination is an effort to insert semen into the reproductive tract of female animals which are lust with the help of inseminators in order to achieve the pregnancy [1]. Artificial insemination provides an opportunity for superior bulls to distribute their offspring maximally. If compared to natural mating, it will be limited to increase the livestock population, because each ejaculation can only marry a female, thereby reducing the reproductive ability of the bulls with superior genetic traits.

The superior bulls can produce semen continuously and optimally with good quality and quantity if the bulls are fertile and have optimal reproductive performance, especially during

semen collection and semen quality evaluation. The good method of semen production begins with the process of the bulls approaching the cows or teaser, kissing the outer genital organs, then followed by trying to mount without being accompanied by copulation [2].

The sexual behavior parameters according to Herwijanti [3] including thrust power, pinch power, jumping power, number of false mounting, libido duration, ejaculation duration, and erection quality. The factors influencing semen production are the testicular diameter, age, environment (temperature and radiation), nutrition, mating frequency, and social factors (dominance or competition) [4]. Sexual activity affects the semen production and quality, the more frequent sexual activity, the total spermatozoa production will increase but the volume per ejaculation will decrease [5]. The purpose of this study was to evaluate the sexual behavior and semen production of Madura bulls.

## II. MATERIALS AND METHODS

### A. Location of Study

This study was carried out at Singosari National Artificial Insemination Center, Malang. This site is situated at 800 to 1200 m above sea level with the tropical climate in nature. The average temperature ranged from 16 to 22°C, the average relative humidity is 70 to 90%, and the average precipitation is 2.233 mm/year.

### B. Animals and Study Design

A total of 4 Madura bulls, aged at 8 to 11 years, were used in this study. The body weight of the bulls was ranged from 400 to 500 kg. The method used was observational study by monitoring the sexual behavior of 4 Madura bulls which was replicated 10 times. The sexual behavior assessment including libido duration and ejaculation duration.

### C. Semen Collection and Evaluation

Besides sexual behavior, this study also observed the semen production of Madura bulls. The semen collection was done once a week using the artificial vagina. The apparatus used was the artificial vagina, collection vial, protector jacket, corn, black cover cloth, thermometer, and flip cage. While the materials used were a teaser, ky jelly, warm water, and tissue. Immediately after collection, the semen was then evaluated for total spermatozoa and total motile spermatozoa per ejaculate according to Ax *et al.* [6] and Susilawati [7]. The total spermatozoa were calculated by volume x concentration, while total motile spermatozoa were calculated by volume x

concentration x individual motility. The apparatus used was a microscope, ose, cover glass, object glass, socorex pipette, litmus paper, spectrophotometer, and a cool top, while the material used was the semen of Madura bulls.

D. Statistical Analysis

Data were analyzed descriptively and using analysis of variance in a randomized block design. If a significant difference appeared, the data were further tested using Duncan multiple range test.

III. RESULTS AND DISCUSSION

Sexual behavior is the process of flirtation of the bulls approaching the cows or teasers, kissing the outer genital organs, then followed by trying to mount without being accompanied by copulation. Sexual behavior arises and can be observed during pre-copulation, copulation, and post-copulation. Copulation patterns in cattle include flirtation, erection, mounting that takes place during pre-copulation, and ejaculation during copulation [8].

A. Libido Duration

The results showed that there was no significant difference ( $P>0.05$ ) of libido duration among individual Madura bulls (Table 1). The highest libido duration was found in the Kanwa bull with the average of  $2.45\pm3.41$  minutes, while the lowest libido duration was found in the Lombang bull with the average of  $1.08\pm0.80$  minutes. No significant difference of libido duration among individual bull maybe due to the similar condition around the bulls and similar handling officer of the bulls. This result was in accordance with Susilawati [7], who found that the breed, age, scrotal circumference, adaptability, and environmental situation during semen collection, as well the skill of officer could affect the quality and quantity of ejaculated semen.

TABLE I. The average libido duration of Madura bulls (mean ± standard deviation).

Individual	Libido duration (minutes)
Adikara	1.16±1.57
Kanwa	2.45±3.41
Pasean	1.40±0.89
Lombang	1.08±0.80

The results showed that the average libido duration in this study was 112 seconds. In contrast, Herwijanti [3] reported that the libido duration of Madura cattle, Limousin cattle, Bali cattle, and Brahman cattle were  $21.47\pm33.13$ ,  $28.27\pm24.53$ ,  $60.87\pm35.47$ , and  $18.60\pm22.89$  seconds, respectively. This difference value may be due to several factors such as the environment and genetics. Susilawati [7] stated that the lack of energy in the feed will affect gonadotropin, which will cause a decrease in the body weight up to 25 to 30%, which in turn will reduce libido duration. Meanwhile, the energy requirement of Madura bulls observed in this study have been fulfilled so that the libido duration did not significantly differ between individual bulls. The factors which could affect libido are (1) if the male is mixed with females, the libido will be higher than individually strapped, (2) in essence, the livestock is bisexual, so the libido can be between fellow males,

depending on the habits, (3) the high temperature could reduce libido and (4) poor feeding quality and quantity could reduce libido as well if it exceeds the requirements [5].

B. Ejaculation Duration

The results showed that the ejaculation duration was not differed ( $P>0.05$ ) among individual Madura bulls (Table 2). The highest ejaculation duration was found in the Pasean bull with an average of  $7.17\pm1.60$  minutes, while the lowest value was found in the Adikara bull with an average of  $5.23\pm1.17$  minutes. The average ejaculation duration of Madura bulls in this study was  $395\pm2.17$  seconds. This result was in line with Herwijanti [3] who measured ejaculation duration in Madura bulls of Sapudi, Bluto, and Srunggi, which showed an average ejaculation duration of  $244.33\pm70.64$  seconds. This finding was not so different because still in one breed, namely Madura bulls. This is in accordance with Susilawati [7] who stated that each individual had their own preferences or habits. The location of the collection and place also affect whether the bulls are preferred or not in the semen collection process and could also affect the ejaculation duration.

TABLE II. The average ejaculation duration of Madura bulls (mean ± standard deviation).

Individual	Ejaculation duration (minutes)
Adikara	5.23±1.17
Kanwa	5.25±3.37
Pasean	7.17±1.60
Lombang	6.13±2.55

C. Total Spermatozoa

Total spermatozoa are calculated by multiplying the semen volume by the spermatozoa concentration [7]. The results showed that there was a highly significant difference ( $P<0.01$ ) on total spermatozoa among individual bulls (Table 3). Madura bull which has the highest total spermatozoa count was the Pasean bull with an average of  $7,374.20\pm1,888.05$  million/ejaculate, while the lowest one was the Adikara bull with an average of  $3,157.72\pm1098.77$  million/ejaculate. The longer the ejaculation time, the higher the total spermatozoa production. The most influential factor which affected this current result was the semen collection officer. The ejaculation duration depended on the decision of the officer who determined whether the male was ready or not in the semen collection process based on the penis erection. This result was in agreement with Fuerst *et al.* [9] and Walth *et al.* [10] who stated that the bulls handling officers had a significant effect on semen volume and total spermatozoa in each ejaculation. The semen collection officer had an influence on the semen volume in accordance with the field conditions, where the officers change according to their working hours.

TABLE III. The average total spermatozoa of Madura bulls (mean ± standard deviation).

Individual	Total spermatozoa (million/ejaculate)
Adikara	3,157.72±1,098.77 <sup>a</sup>
Kanwa	5,061.46±1,950.01 <sup>a</sup>
Pasean	7,374.20±1,888.05 <sup>ab</sup>
Lombang	6,571.88±2,480.47 <sup>bc</sup>

D. Total Motile Spermatozoa

The results showed that the individual bulls had a highly significant difference ( $P < 0.01$ ) on total motile spermatozoa (Table 4). The highest total motile spermatozoa were recorded in the Pasean bull with an average of  $5,133.52 \pm 1,359.65$  million/ejaculate, while the lowest one was recorded in the Adikara bull with an average of  $2,046.69 \pm 725.52$  million/ejaculate. In line with the result of total spermatozoa, the longer the ejaculation time, the higher the total motile spermatozoa production. This result may be due to the longer sexual stimulation could improve the semen quality. Johnson *et al.* [11] stated that several factors which influence the semen quality are the level of stimulation, the frequency of ejaculation, and feed quality. Yekti *et al.* [5] argue that the factors which cause differences in the total motile spermatozoa in individual livestock including genotype, testicular size correlates with the semen production, the greater the size of the testes, the more semen production, this is because more than 90% of the testicular contents are seminiferous tubules which are the place of spermatozoa production.

TABLE IV. The average total motile spermatozoa of Madura bulls (mean  $\pm$  standard deviation).

Individual	Total motile spermatozoa (million/ejaculate)
Adikara	$2,046.69 \pm 725.52^a$
Kanwa	$2,553.26 \pm 915.07^a$
Pasean	$5,133.52 \pm 1,359.65^{ab}$
Lombang	$4,217.77 \pm 1,484.71^b$

IV. CONCLUSION

The individuals Madura bulls have similar sexual behavior but produce different spermatozoa production. The longer the ejaculation time resulting in the higher total spermatozoa and total motile spermatozoa.

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