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Determination of reproductive parameters of sows at rural areas of Bangladesh

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ABSTRACT

The aim of this study was to determine the reproductive parameters of sows in selected area of Bangladesh. A total of 51 sows from 21 farms were selected for this study. The data on reproductive parameters were collected from the owners by interviewing with pretested questionnaire. We found that the age at puberty, estrus cycle length, estrus duration, interval between farrowing and onset of estrus and gestation length were 254.5±34.4 and 21.2±1.2 days, 34.2±13.2 h, 51.8±10.9 and 114.3±0.9 days, respectively. The number of required services for each pregnancy in native sows was 1.4 ±0.6, and the first service pregnancy rate using natural mating was 63.8%. Moreover, the number of piglets born per sow was 7.6±3.4. The highest piglet production (10.6±3.1) was in parity 5 and the lowest (4.1±0.6) was in parity 1. Estrus was detected in 34.1% sows on the basis of observing standing reflex when boar mounted. In conclusion, reproductive parameters in native sows of Bangladesh need to be improved for ensuring satisfactory reproductive performances.

Keywords

Sows, reproduction, fertility, Estrus cycle

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INTRODUCTION

The pig is considered as a highly prolific species having high ovulation rate, and if mated at the right moment, there is high probability of pregnancy in sows. (Peltoniemi et al., 2007). It is a highly productive animal compared with other farm animals (Anderson, 1974). However the most of the people in Bangladesh are Muslim religion. Therefore the pork is not popular in this country. But the environmental condition is suitable for pig reproduction. It is very prospective to export the pork to others country.

Reproductive performance of the sow herd is the key factor, if not the major factor, in controlling the efficiency of swine production (Hodson, 1980; Rekwot et al., 2001) and considered economically important to the swine industry (Day, 1974). It is measured primarily by the number of living pigs at birth or by the total farrowing or weaning weight of pigs produced by the dam within one year. Low levels of reproductive performance may not only result in low profit per sow, but will also limit attempts to improve the herd genetically (Rekwot et al., 2001).

There are several measures of reproductive performance including farrowing rate and litter size at birth and fertility index. Other parameters used include, pounds of pork/sow/yr and non - productive sow days (Van der leek and Becker, 1993). The goal of reproductive performance is to have 2.0 L per female annually with an average of 8.0 pigs per litter at weaning, that is, a total of 16 pigs weaned per year for each female maintained in the herd (Day, 1974).

Government has formulated "Poverty reduction strategy papers" (PRSP) to alleviate poverty. Accordingly, all national level policy planning has taken a sharp turn towards pro-poor approach reducing 50% poverty level by 2015 as indicated

by the Millennium Development Goals (MDG) (United Nations, 2000).

In Bangladesh, there live about 3.5-5.5 million Dalits who exist far below the poverty line with extremely limited access to health services, education and employment (International Dalit Soliderity Network). About 31% of the people of Bangladesh are poor (Bangladesh Economic Census, 2011) and more than 60% Dalits have trapped them in poverty (Higgett, 2009). Though, Bangladesh is an agricultural country, these people are not engaged in agriculture. They cultivate only swine traditionally. In different cultural and social occasions, they slaughter boar for consumption. Besides, swine is the only protein source of them. Swine farming has an important role on their livelihood. Some of them have initiated farming in semi-ranging system. But, they rare swine traditionally without applying any technology. If they begin swine farming using modern technology, it will contribute to their economy as well as to the GDP of Bangladesh.

It is imperative to know the reproductive parameters of the existing swine breed in Bangladesh. Therefore, it seems rationale to determine the reproductive parameters of sows resulting in increased productivity and decreased poverty in Bangladesh. Although there is large population of pig at rural areas, few reports exist on the reproductive performance of smallholder piggeries at rural areas. Therefore, the objective of the present study was to determine the common reproductive parameters of local sows in selected area of Bangladesh.

MATERIALS AND METHODS

Selection of the study area: Two villages and two wards of Sadar upazila of Thakurgaon district namely- Gobidonagar, Khochabari, Fakirpara and Nischintopur were selected for the study. The data of indigenous sows were collected from the mentioned area. A large number of Dalits live there. Most of them work as sweepers. Rising of indigenous sows were the main source of their livelihood.

Management of sows: The sows were managed extensively or traditionally. In extensively managed small hold farms, most sows were under grazing freely daily. All sows had free access to drinking water. There was no restriction of sucking by piglets. Weaning is occurred naturally in these sows. Boars and sows were kept together and natural mating occurred among them. They were kept in open houses made by bamboo. Floor of some houses was made of concrete and some were made of sand. Most of the houses of swine were not clean and the site of housing was not clean also. The houses of sows were located near the drain or garbage. Farmers are not careful of the general health condition of swine. No deworming and vaccination were in practice there. By day, sows were kept free and they took food from here and there. At night, they were kept in houses. Sows were fed with rice husk, rice polish, rice gruel and waste product of hotels.

Collection of data: Data were collected during September 2011 to April 2012 by direct interview. Information given by owners of sows was recorded on pre-tested questionnaire for analysis.

Preparation of the schedule: The questionnaire was prepared according to the objective of the investigation and was designed in a simple way so that the farmers can understand easily. The questionnaire included questions to collect following information. age at puberty of sows, estrus cycle length of sows, estrus period of sows, prominent estrus signs of sows, gestation period of sows, number of piglets born per sow, parity of sows, interval between farrowing and onset of estrus, number of services required for each pregnancy.

Statistical analysis: The collected data were entered into the Excel datasheet and descriptive statistics were performed. The values for age at puberty, estrus cycle length, estrus period, prominent estrus signs, gestation length, and number of piglets born per sow, interval between farrowing and onset of estrus, number of services for each pregnancy were expressed as mean ± standard deviation.

RESULTS AND DISCUSSION

The mean age at puberty, estrus duration and interval between farrowing and onset of estrus of indigenous sows is presented in **Table 1**. The mean age at puberty of indigenous sows was 254.5 ± 34.4 days. The minimum age at puberty was 209 days and the maximum age at puberty of indigenous sows was 360 days.

The mean estrus duration of indigenous sows was 34.2±13.2 h. The lowest duration was found 15 h and the highest was 70 h. The mean interval between farrowing and onset of estrus in indigenous sows was 51.8±10.9 days. The lowest interval between

Table 1: The mean age at puberty, estrus duration and interval between farrowing and onset of estrus in indigenous sows.

Parameters	Mean ± SD	Minimum	Maximum
Age at puberty (days)	254.5±34.4 (n=30)	209	360
Estrus duration (hours)	34.2±13.2 (n=44)	15	70
Interval between farrowing and onset of estrus (days)	51.8±10.9 (n=30)	37	77

farrowing and onset of estrus was 37 days and the highest interval between farrowing and onset of estrus was 77 days.

The estrus cycle length in indigenous sows is presented in **Table 2**. The range of the estrus cycle length was from 19 to 24 days. The mean estrus cycle length was 21.2±1.2 days. Estrus cycle length of 24 days was found in the lowest proportion of sows (2.9%) and estrus cycle length of 19 days was fond in the highest proportion of sows (42.9%).

Table 2: Estrus cycle length of indigenous sows.

Estrus Cycle Length (days)	No. (%) of sows	Mean ± SD (days)
19	1 (2.9)	21.2 ± 1.2
20	10 (28.5)	
21	15 (42.9)	
22	5 (14.3).	
23	3 (8.6)	
24	1 (2.9)	
Total	35 (100)	

The gestation length of indigenous sows is presented in **Table 3**. The gestation length in sows ranged from 113 to 116 days. The mean gestation length was 114.3±0.9 days. The lowest proportion of sows (12.9%) had the gestation period of 116 days and the highest proportion of sows (41.9%) had the gestation length of 114 days.

The number of piglets delivered by individual sows is presented in **Table 4**. The number of piglets furrowed by indigenous sows ranged from 3 to 14. The mean number of piglets delivered was 7.6±3.4. The lowest number of piglet production was 4.1±0.6 in parity 1 and the highest number of piglet production was 10.6±3.1 in parity 5. The minimum number of piglet production was 3 in parity 1 and the maximum number of piglet production was 14 in parity 5.

Table 3: Gestation length of indigenous sows.

Gestation length (days)	No. of sows (%)	Mean±SD (days)
113	7 (22.6)	114.3±0.9
114	13 (41.9)	
115	7 (22.6)	
116	4 (12.9)	
Total	31 (100)	

Table 4: Number of piglets delivered in different parities of sows.

Parity	Piglets (Mean±SD)	Minimum	Maximum
1 (n=6)	4.1 ± 0 .6	3	5
2 (n=4)	5.0 ± 0.8	4	6
3 (n=4)	6.3 ± 1.2	5	7
4 (n=3)	8.6 ± 2.5	6	11
5 (n=5)	10.6 ± 3.1	8	14
6 (n=3)	10.6 ± 2.1	9	13
7 (n=3)	10.3 ± 2.5	8	13
8 (n=4)	10.0 ± 2.0	8	12
9 (n=3)	9.6 ± 2.1	8	12
Total=35	Mean=7.6±3.4		

Table 5: Number of services required for each pregnancy in sows

No. of services for each pregnancy	No. of sows (%)	Mean ± SD
1	23 (63.8)	1.4 ± 0.6
2	11 (30.5)	
3	2 (5.5)	
Total	36 (100)	

Table 6: Prominent estrus signs observed in sows.

Prominent estrus signs	No. of sows (%)
Standing when boar mounted	15 (34.1)
Genital discharge	10 (22.7)
Swollen vulva	11 (30.5)
Pacing and grunting	8 (18.2)
Total	44 (100)

The number of natural services required for each pregnancy of indigenous sows is presented in **Table 5**. It was observed that the mean number of services required for each pregnancy of indigenous sows was 1.4±0.6. The lowest proportion of sows (5.5%) required 3 services for pregnancy and the highest proportion of sows (63.8%) required one service for pregnancy.

The prominent estrus signs observed in indigenous sows are presented in **Table 6**. The physical and behaviuoral sings in sows during estrus was almost common to all sows. The lowest proportion of sows (18.2%) was detected in estrus by observing pacing and grunting of sows and the highest proportion of sows

(34.1%) was detected in estrus by observing standing when boar mounted.

The study was conducted to assess the reproductive parameters of indigenous sows in selected area of Bangladesh. For this purpose a survey work was conducted because it is thought to be more advantageous than other data collection methods (Hughes, 1982). Since the farmers do not keep proper records of their operation, in this study like other survey works, information from individual farmers was collected.

The average age at puberty of indigenous sows was 254.5±34.4 days. Similarly, the age at puberty in European Large White gilts was 8 months (Bon et al., 1979). The age at puberty of present study is a little bit higher than that of a previous study where the age at puberty was 204.1±28.0 days (Tummaruk et al., 2003). Similarly, occurrence of puberty between 5 and 8 months of age has been documented in European breeds (Christenson and Ford, 1979; Hughes, 1982). Moreover, Sterning et al. (1998) reported that the mean age at puberty of gilts was 206 days. Further, Camous et al. (1985) found that ages at puberty at different photoperiods were 193.4, 175.6 and 177.1 days, respectively. Contrasting to the present and previous findings, occurrence of puberty at the age of 3 months has been reported in Chinese Meishan breed elsewhere (Cheng, 1983). The variations at the age of puberty among different studies may be due to variations in breeds of swine, feeding practices and agro-climatic conditions among studies.

In the present study, the mean duration of estrus in indigenous sows was 34.2±13.2 h and it ranged from 15 to 70 h. Similarly, Singleton and Diekman (1984) reported that duration of estrus or heat is variable which may last only 12 h in gilts or up to 60 h or more in sows. The variation in duration of estrus among studies may be due to variation in breed of sows and agro-climatic conditions among studies. Since the actual time of the onset of estrus is rarely known, it is recommended that a female receives at least two mating during estrus. This helps ensuring that sperm are present at an optimum time relative to ovulation for fertilization to occur.

The mean estrus cycle length in indigenous sows of the present study was 21.2±1.2 days and the range of estrus cycle length varied from 19 to 24 days. The finding of the present study is consistent with previous study where the mean estrus cycle length was 21 days and it ranged from 18 to 24 days.

In the present study, the mean interval between farrowing and onset of oestrus in indigenous sows was 51.8±10.9 days and it ranged from 37 to 77 days. Adshell (1946) stated that sows do not usually come into heat during lactation. Sows generally lack of cyclic ovarian activity during the lactation period (Melampy et al., 1966; Crighton and Lamming, 1969). An experiment was conducted in confinement during 1997 to 1999 using 174 large white × landrace sows by Knox and Zas (2001). In that study, after weaning, the average percentage of sows returning to estrus within 8 days of weaning was 86.2. There are reports that a small percentage of sow exhibits anovulatory oestrus about 1 to 5 days postpartum (Warnick et al., 1950; Heitman and Cole, 1956). If oestrus occurs after the first week postpartum, ovulation usually also occurs. Normally, plasma progesterone remains at very low concentrations (less than 1 ng/mL) until late lactation or after weaning when estrus and ovulation occur (Ash and Heap, 1975; Aherne et al., 1976; Parvizi et al., 1976). Nevertheless, in the present study no weaning practice is done resulting in having long interval between farrowing and onset of estrus in indigenous sows. This emphasizes the importance of weaning of piglets for shortening of postpartum period. In the present study, the highest proportion of estrus detection was performed by standing of sows when boar mounted. This result supports the result of Sterning et al. (1998) who found that the 77.7% (351 out of 452) sows showed standing reflex at estrus period.

In the present study, the mean gestation length was 114.3 ± 0.9 days. Similarly, average gestation length of 114±2.0 has been reported elsewhere (Pitcher and Springer, 1997). Cole and Foxcroft (1982) also reported a gestation length of 114 days in domestic sows and 119 days in wild sows. In a study, the number of corpora lutea (CL) was adjusted to 4, 5, 6, 7 or 8 by unilateral ovariectomy at day 30 to 40 of gestation and it was observed that the number of CL or the level of progesterone and estrogen had no effect on the length of gestation. Moreover, there was an inverse relationship between litter size and length of gestation in sows.

In the present study, the mean number of piglet production was 7.6±3.4. Contrasting to the present finding, Zaleski et al. (1993) obtained 12.2 piglets per litter after evaluating 98 farrowings. Cole and Foxcroft (1982) also reported to have 12 piglets per litter in domestic sows and 5 piglets in wild sows. The variation between studies may be due to lower body weight and smaller size of the sows in present study compared to previous studies. In the present study, litter size increases gradually with the increasing

number of parity and the highest litter size was in parity 5. This result is consistent with the earlier study where litter size usually increased from first to second litter and again from second to third litter, but then plateaus until approximately the seventh or eighth litter (Hughes and Varley, 1980).

In the present study, it was observed that the mean number of services required for each pregnancy in indigenous sows was 1.4±0.6. The first service pregnancy rate was 63.8% in indigenous sows. Compared to the present study, higher pregnancy rate (71.9%) has been documented in swine received natural service in Illinoise, USA. A number of factors contribute to the success or failure of breeding in sows. Age, mode of insemination and the number of insemination attempts have been shown to affect rates of successful pregnancy in swine (Scofield and Penny, 1969; Wrathall, 1975; Flowers and Alhusen, 1992). Lee et al. (1997) examined the effect of birth litter sex ratio of sows and gilts on reproductive performance using a 13 years database of breeding and litter data. Gilts that failed to become pregnant on the first breeding attempt came from litters with significantly higher proportions of males than gilts that successfully conceived on the first breeding attempt. Overall, female swine were significantly more likely to exhibit lower rates of successful breeding during their first four breeding attempts if they had been born in a male-biased litter. A total of 2,696 mating attempts were included in an analysis and examination of the data revealed that young females of approximately 1.5 years or less in age were more likely to have an unsuccessful mating, whereas the oldest groups of sows were more likely to conceive (Lee et al., 1997). However, in the present study, I used very few numbers of sows for investigation and the age of sows and birth litter sex ratio was not exactly known due to lack of records.

It is likely that disease or disorder free sows should be conceived at first mating by fertile boars as multiple ovulations occur in them. However, a minimum of 4 embryos are needed for maintaining pregnancy in sows (Pitcher and Springer, 1997). Because, if fewer than 4 embryos are present in the uterus, luteolysis occurs probably due to insufficient estrogen production by trophoblasts to prevent release of prostaglandin (Pitcher and Springer, 1997). Even if pregnancy occurs in one horn of sows (as in segmental aplasia of oviduct), luteolysis occurs and the pregnancy is terminated (Pitcher and Springer, 1997). Moreover, a minimum level of progesterone required for maintaining pregnancy in sows is 6 ng/mL (Cole and Foxcroft, 1982).

CONCLUSION

For native sows of Bangladesh, it may be concluded that the age at puberty, estrus cycle length, estrus duration are 254.5±34.4 and 21.2±1.2 days, and 34.2±13.2 h, respectively. The interval between farrowing and onset of estrus is 51.8±10.9 days. The gestation length is 114.3±0.9 days. The number of required services for each pregnancy is 1.4 ± 0.6. The first service pregnancy rate using natural mating is 63.8%. The number of piglet born per sow is 7.6±3.4. Standing reflex at estrus was observed in 34.1% females.

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