Comparative Study on Productive and Reproductive Performances of Indigenous, Red Chittagong Cattle, and Crossbred Cattle in Bangladesh

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This comparative study was conducted to investigate present productive and reproductive performances of Red Chittagong Cattle (RCC), indigenous and crossbred cattle in Bangladesh. Productive and reproductive traits are important to justify the performances of cattle breed and influence farmers’ decision-making process. The survey was conducted in 14 Upazilas of 9 districts and data was analyzed using SPSS 20 software. The least-square mean of lactation lengths, lactation milk yields and daily milk yields of three groups were found statistically significant \((p<0.01)\) within groups. These three productive traits were higher for crossbred cow \((231.64\pm3.19\) days, \(2016.76\pm40.11\) litres, \(8.62\pm0.15\) litres) respectively. The reproductive traits age at puberty, age at first calving, post-partum heat periods and calving intervals of indigenous, RCC and crossbred cows were also found statistically significant \((p<0.01)\). These reproductive traits were lower for RCC \((27.28\pm7.44\) and \(38.15\pm7.66\) months, \(59.37\pm28.77\) day and \(12.18\pm1.65\) months) respectively. However, services per conception rate were lower for indigenous \((1.29\pm0.57)\) cow. From the findings, productive traits were found better in crossbred on the other hand the reproductive traits were found better in RCC cows. The improvement of productive traits of RCC may represents it as a promising cattle breed in the context of Bangladesh.

Keywords: Conception rate, Genotype, Breeding, Lactation length, Milk yield, Red Chittagong Cattle

INTRODUCTION

Bangladesh is a predominantly agricultural country most of the population engaged in agricultural activities and rearing livestock. The contribution of livestock to GDP in FY 2018-2019 was 1.47% (DLS, 2020). In Bangladesh, some indigenous cattle types reared by most of the farmer are Munshiganj, Pabna, RCC, North Bengal grey etc. Presently through crossbreeding up-gradation is going on and contributing to upgrade productive traits. The productivity of meat and milk of indigenous cattle breeds were remained low. The best performance record of cattle breed necessary to accurate estimation of productive and reproductive traits in the dairy cattle such as age at puberty, age at first calving, post-partum heat period, service per conception, calving intervals, lactation length, lactation yield and milk yield (Sarder et al., 2007). It is an important factor to maintain the right genotype in the right environment for the expression of full genetic potentiality (Haque et al., 2011).
The daily animal protein requirements contribute to rural income growth, employment generation, women empowerment and livelihoods improvements (Bhuiyan et al., 2017). Previously (Hossain et al., 2018), (Nath et al., 2016), (Hasanuzzaman et al., 2012), (Habib et al., 2010), (Azizunnesa et al, 2010) and (Mostari et al., 2007) works on productive and reproductive performance of RCC. However, (Mamun et al., 2012), (Rokonuzzaman et al., 2009), (Alam et al., 2008), (Uddin et al., 2008), (Miazi et al., 2007) and (Sarder et al., 2007) work on productive traits of crossbred and indigenous cattle. Comparative study of RCC with other indigenous cattle and crossbred cattle were not studied. Considering the aforementioned circumstances, the present study was conducted to compare productive and reproductive performances of indigenous, RCC and crossbred cattle in Bangladesh which will contribute to a sustainable improvement of indigenous cattle breeds like RCC cattle.

**APPROACH AND METHODOLOGY**

**Selection of Study Areas**

The collection of data concerning current productive and reproductive traits of indigenous, Red Chittagong Cattle (RCC) and crossbred cattle 14 Upazilas of 9 districts (Table 1) in Bangladesh were selected purposively. A total of 719 sample farmers were surveyed to collect data to fulfill the scope and objectives of the study using a simple random sampling technique.

**Development of Interview Schedule**

The interview schedule was developed rationally, objective-based and a logical sequence was analyzable to present data scientifically. Then the interview schedule was pre-tested and after necessary correction, the final interview schedule was developed.

**Estimation of Sample Size for Household Survey**

The estimation of sample size is determined by budget, time, manpower and the number of samples available, etc. Consequently, for the present study sample size was fixed as 50 for each of the areas but a total of 719 samples (Table 1) were covered for collecting the necessary data. Both quantitative and qualitative forms of data were collected with face to face interview and on-farm visit.

**Data Input, Processing and Analysis**

After collecting the data were imputed in MS Access as per output tables. After intensive processing and synthesizing data were analyzed using appropriate econometric model and descriptive statistics with SPSS 20 software.

**Traits Considered for the Study**

The productive traits considered for the study were lactation length, lactation milk yield, daily average milk yield and the reproductive traits were age at puberty, age at first calving, post-partum heat period (PPHP), number of service/conception and calving interval.

**Lactation Length**

The lactation length of the cow is the milk-producing period after calving in one lactation known as lactation length.

**Total lactation Milk Yield**

The lactation milk yield is defined as the daily yield from 60 days before calving to 60 days before the next calving, to account for additional milk yield before calving and differences in calving interval.

**Daily Average Milk Yield**

The daily average milk yield is defined as milk production for over 24 hours. Milking twice a day is a common practice in many countries. In that case, it is the sum of the yields over 2 milkings.

**Age at Puberty**

Puberty is a period at which sexually organs are functionally developed and animals become able to release the gametes. A cow maturing at an early age will also calve at an early age and produces more milk in her lifetime. Delayed sexual maturity has a profound effect on the economics of dairy farm.

**Age at First Calving**

The age at first calving may be defined as the time of first giving birth of a newborn.

**Post-Partum Heat Period (PPHP)**

Post-partum heat period was calculated as the interval between parturition to the next heat that was observed after a certain period of parturition. That period is measured in days.

**Number of Service/Conception**

This is defined as the average number of services or insemination required per conception.
The calving intervals were recorded on the basis on the interval between the dates of one calving to the date of next calving and measured in days.

RESULTS AND DISCUSSIONS

Dairy Traits of Different Cattle Genotypes

Lactation Length

The milk production performance of different cattle genotypes shown in Table 2. The differences within the lactation length of different genotypes were found statistically significant (p<0.01). The least-square mean of lactation length (days) of three genotypes were found higher in crossbred cows (231.64±3.91) followed by RCC (204±4.70) and lower in indigenous cows (186±2.05). Azizunnesa et al. (2010) reported lactation length 238.8±30.60 days which is higher than the present findings. Khan et al. (2000) studied lactation length of RCC and found 222.85 days under farm condition. Almost similar result found by an earlier study (Hossain et al., 2018) and the value was 205.72±3.24 days.

Lactation Milk Yield

The lactation milk yield of indigenous, RCC, and crossbred was also noted as statistically significant (p<0.01). The lactation milk yield of the crossbred cow was higher (2016.76±40.11 litres) than indigenous (420.16±25.75 litres) and RCC (572.48±59.13 litres). Mostari (2007) found it was 526.81±29.32 litres in case of RCC which is lower than the present study. Hossain and Routledge (1982) reported that lactation yield of local cows was 213.0 kg under village condition which was quite lower than the present study. This is because breed up-gradation may occur.

Daily Average Milk Yield

The daily average milk yield of three genotype groups was also assessed statistically significant (p<0.01). In the case of crossbred cow, daily average milk yield was higher (8.62±0.15 litres) followed by RCC (2.77±0.22 litres) and in indigenous (2.26±0.10 litres) cows. However, daily average milk yield of RCC was per day which is close to an earlier study (Azizunnesa et al., 2010) who found it was 2.10±0.63 kg per day. Alam et al. (2008) reported that in indigenous crossbred cow it was 1.7±0.6 and 6.3±1.20 respectively which is lower than the current finding because breed up-gradation and management improvement may occur.

Age at Puberty

The reproductive performances of the different genotypes of cattle are shown in Table 3. It was found that the age at puberty among the three genotypes cattle was also statistically significant (p<0.01). The age at puberty was higher for crossbred cattle (33.69±5.36 months) and lower for RCC (27.28±7.44 months) which indicate the better performance of RCC. A similar result was found by earlier research conducted (Habib et al., 2010) who found it was 28.75±1.26 months in case of RCC cattle.

Age at First Calving

From the study, it was also noted that the age at first calving of indigenous, RCC, and crossbred were found statistically significant (p<0.01) within groups. It was higher for crossbred cow (45.08±5.61 months) followed by indigenous (44.45±8.50 months) and lower for RCC cow (38.15±7.66 months). In this case, RCC has better performance than the indigenous and crossbred cow. Previously, Hasanuzzan (2012) found 42±1.8 months for RCC which was higher than the present study may be indicating that the up-gradation of breed may occur.

Post-Partum Heat Period (PPHP)

The post-partum heat period (PPHP) of all three genotypic groups were found statistically significant (p<0.01). The findings denoted that it was very high for crossbred cow (102.86±51.79 days) followed by indigenous cow (88.46±56.94 days) and very low for RCC cow (59.37±28.77 days). Notably, RCC cow was fur better performer in this reproductive trait than the indigenous and crossbred cow.

Number of Service per Conception

The number of service per conception was found also statistically significant (p<0.01). Comparatively, it was higher for crossbred cow (2.39±0.82) followed by RCC (1.32±0.40) and lower for indigenous cow (1.29±0.57). Miazi (2007) reported it was 1.37±011 and 1.32±0.13 for crossbred and indigenous cattle and significantly lower in case of crossbred cow but current findings show the higher result, the service per conception trait for crossbred may be decreased. Several factors which might have influenced for the variation of service per conception such as the quality and quantity of semen, improper detection of heat, failure to inseminate at appropriate time, the level of fertility which might be influenced by the age of bull and cow, season of the year, diseases and other environmental factors.

Reproductive Performance of Different Cattle Genotypes
Calving Interval

The mean calving interval of indigenous, RCC, and crossbred was noted statistically significant (p<0.01). In this reproducive trait again RCC was shows best performance (12.18±1.65 months) among three groups. In the case of indigenous and crossbred, it was 12.66±1.73 and 14.17±2.32 months respectively. Nath (2016) reported that the mean calving interval of RCC was 13.05±0.60 months which were slightly higher than the present study because the performance of RCC may be improved.

CONCLUSION

The reproductive performances of indigenous and RCC were found more suitable than the crossbred cow. It is preferable to rear indigenous and RCC breeds due to lower time needed to age at puberty, age at first calving, calving interval conception rate, each year calving. But production performance both indigenous and RCC of milk found lower than the crossbred cow. For the improvement of indigenous and RCC production emphasis should be given by the government, cooperative sector for semen availability, quality feed, proper monitoring, need-based training, financial help, etc. Making an inventory (both hard and soft copy) of pure RCC available in the country by registering each animal; developing genetic evaluation system and production of pure and good bulls every year is important. The regular supply of meritorious bull semen to cattle breeding service providers of the country for upgrading indigenous and RCC cows as well as pure breeding should be expanded. Nucleus bull station at different places should be established. Ensuring the best quality RCC and indigenous semen supply to rural poor farmer further up-gradation may be ensured. It may help RCC to be a prominent and sustainable breed in Bangladesh. Consequently, income of rural poor farmer may increase which may contribute livelihood improvement of rural people sustainably.

REFERENCES


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Table 1: Number of households surveyed according to upazilas and districts

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>District</th>
<th>Upazila</th>
<th>Households surveyed</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chattagram</td>
<td>Anowara</td>
<td>60</td>
<td>6.67%</td>
<td>93.33%</td>
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<tr>
<td></td>
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<td>Banskhali</td>
<td>45</td>
<td>4.44%</td>
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<td></td>
<td></td>
<td>Chandanaish</td>
<td>44</td>
<td>25.00%</td>
<td>75.00%</td>
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<td></td>
<td></td>
<td>Hathazari</td>
<td>53</td>
<td>5.66%</td>
<td>94.34%</td>
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<tr>
<td></td>
<td></td>
<td>Patia</td>
<td>34</td>
<td>11.76%</td>
<td>88.24%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Satkania</td>
<td>57</td>
<td>-</td>
<td>100.00%</td>
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<tr>
<td>2</td>
<td>Sylhet</td>
<td>Jaintapur</td>
<td>51</td>
<td>41.18%</td>
<td>58.82%</td>
</tr>
<tr>
<td>3</td>
<td>Jeshore</td>
<td>Keshobpur</td>
<td>53</td>
<td>5.66%</td>
<td>94.34%</td>
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<tr>
<td>4</td>
<td>Mymensingh</td>
<td>Mymensingh</td>
<td>61</td>
<td>65.00%</td>
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<td>5</td>
<td>Banderban</td>
<td>Nikhongchari</td>
<td>52</td>
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<tr>
<td>6</td>
<td>Shariatpur</td>
<td>Noria</td>
<td>52</td>
<td>21.15%</td>
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<tr>
<td>7</td>
<td>Rajshahi</td>
<td>Godagari</td>
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<td>40.74%</td>
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<tr>
<td>8</td>
<td>Kurigram</td>
<td>Rajharat</td>
<td>50</td>
<td>40.00%</td>
<td>60.00%</td>
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<tr>
<td>9</td>
<td>Tangail</td>
<td>Sakhipur</td>
<td>53</td>
<td>1.89%</td>
<td>98.11%</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Grand Total</td>
<td>719</td>
<td>21.45%</td>
</tr>
</tbody>
</table>

Table 2: Dairy traits of different cattle genotypes

<table>
<thead>
<tr>
<th>Traits</th>
<th>Mean±SE</th>
<th>Indigenous (n=313)</th>
<th>RCC (n=64)</th>
<th>Crossbred (n=153)</th>
<th>Level of significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lactation length (day)</td>
<td>186.76±2.05</td>
<td>204.54±4.70</td>
<td>231.64±3.19</td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>Lactation milk yield (litres)</td>
<td>420.16±25.75</td>
<td>572.48±59.13</td>
<td>2016.76±40.11</td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>Daily average milk yield (litres)</td>
<td>2.26±0.10</td>
<td>2.77±0.22</td>
<td>8.62±0.15</td>
<td>***</td>
<td></td>
</tr>
</tbody>
</table>

(Significant at 1% level of significance ***=p<0.01)

Table 3: Reproductive traits of different cattle genotypes

<table>
<thead>
<tr>
<th>Traits</th>
<th>Mean±SD</th>
<th>Indigenous (n=288)</th>
<th>RCC(n=68)</th>
<th>Crossbred (n=154)</th>
<th>Level of significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at puberty (months)</td>
<td>33.31±8.03</td>
<td>27.28±7.44</td>
<td>33.69±5.36</td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>Age at first calving (months)</td>
<td>44.45±8.50</td>
<td>38.15±7.66</td>
<td>45.08±5.61</td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>Post-partum heat period (PPHP)</td>
<td>88.46±56.94</td>
<td>59.37±28.77</td>
<td>102.86±51.79</td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>Number of service/conception</td>
<td>1.29±0.57</td>
<td>1.32±0.49</td>
<td>2.39±0.82</td>
<td>***</td>
<td></td>
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<tr>
<td>Calving interval (months)</td>
<td>12.66±1.73</td>
<td>12.18±1.65</td>
<td>14.17±2.32</td>
<td>***</td>
<td></td>
</tr>
</tbody>
</table>

(Significant at 1% level of significance ***=p<0.01)