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PHENOTYPIC CHARACTERISTICS OF INDIVIDUAL BULL USED FOR ARTIFICIAL INSEMINATION (AI) PROGRAMME IN BANGLADESH

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Abstract

The purpose of the present study was to estimate the effect of phenotypic characteristics on the performances of bulls at three AI centres/stations (CCBSDF, Savar, RDCIF, Rajabarihat and District AI centres, Rajshahi). A total 71 bulls were studied for phenotypic parameters, viz., body weight, body condition score, scrotal circumference (SC), libido score and time required between two ejaculates during 1993 to 2002. The information on the phenotypic parameters was obtained by interviewing the semen collectors in respective AI centers, reading the AI bull resister as well as examining and observing the bull during semen collection. The bulls were classified according to genetic composition viz., Group I: 100% Friesian, Group II: 100% Sahiwal, Group III: 75% Friesian? 25% Local, Group IV: 50% Sahiwa l?50% Friesian, Group V: 50% Friesian ? 50% Local and Group VI: 100% Local. In general, the average body weight, body condition score, scrotal circumference (SC), libido score and time required between two ejaculates were 572 ? 124 kg, 3.2 ? 0.5 (Score:1-5), 36.3 ? 1.9cm, 3.3 ? 0.6 (Score:1-5) and 7.1 ? 2.3 minutes, respectively. Individual bull had significant effect on phenotypic characteristics in six genetic groups. The overall better performance of phenotypic parameter was observed in bull Id #: 0065 for Friesian breed, 163 for 100% Sahiwal breed, 7811 for 75% Friesian ?25% Local, 5156 for 50% Sahiwal?50% Friesian, 8224 for 50% Friesian ? 50% Local and 40248 for 100% Local breed. Therefore, phenotypic characteristics has clearly influenced on bull performances of Artificial Insemination (AI) programme in Bangladesh.

Key words: Phenotypic characteristics, Individual bull and AI.

Introduction

Phenotypic characteristics refer to the observable or measurable differences among the individuals within a population for a particular trait (Lasley 1978). This is the raw material with which the animal breeder must work. If there were no variations among individuals there would be no need to select or cull animals for breeding purposes. Causes of phenotypic variation in farm animals are the heredity, environment and the interaction between heredity and environment. The body weight and scrotal circumference (SC) are two important parameters in assessing the reproductive efficiency of a male and both are positively correlated in young bulls (Ahmad *et al*. 1989) and in bulls over 18 months of age (Carter *el al*. 1980). Determination of SC is an essential aspect for breeding soundness examination and has a great value on indication of puberty, total sperm production, semen quality, pathological conditions of the testes, as well as on the sub fertility or infertility of a bull (Lunstra *et al*. 1978; Ahmad *et al*. 1989, Ott 1991). More importantly, SC is highly inheritable (Ott 1991) and is related to age of puberty in daughter and half-sib heifers along with their subsequent fertility and productivity (Brinks *et al*. 1978). In many studies, testicular measurements have been evaluated and relation to some seminal parameters, usually sperm number, sperm concentration and sperm motility also have been studied (Gipson *et al*. 1985, Ruttle *et al*. 1982). Many studies show that young bulls

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with small scrotal circumference have significantly lower fertility than bulls with large scrotal circumference. In general, Zebu cattle are considered to have lower reproductive efficiency than European cattle (Chenoweth 1981). Silva-Mena *et al*. (2000) reported that a libido and serving capacity test is useful for estimating the mating potential of Zebu bulls, though less sexually active than European males and can exhibit intense sexual activity over a short period with pregnancy rates comparable to those of *Bos taurus* bulls. These reports on these parameters are not available for different breeds of bulls used for AI in Bangladesh. Hence, the present investigation was carried out in order to study the influence of individual bull on body weight, condition score, SC, libido score and time lapses between two ejaculates.

Materials and Methods

The study was conducted at Central Cattle Breeding Station and Dairy Farm (CCBSDF), Savar, Dhaka, Rajshahi Diary and Cattle Improvement Farm (RDCIF), Rajabarihat and District Artificial Insemination Centre (DAIC) Rajshahi during the period from January, 1993 to December, 2002. Seventy one (71) bulls were selected from three AI centres for the present study as presented in Table-1, 2 and 3. All the bulls were directly or indirectly engaged for AI at different AI Sub-centres or points under the District AI centre, Rajshahi. The bulls were divided into 6 group according to their genetic composition such as: Group I: 100% Friesian (F), Group II: 100% Sahiwal (SL), Group III: 75% Friesian? 25% Local (L? F? F), Group IV: 50% Sahiwal? 50% Friesian (SL? F), Group V: 50% Friesian ? 50% Local (L? F) and Group VI: 100% Local (L).

Guidelines for final selection of bull to be used for AI

Selection of AI bulls was based on dam's performance and individual performance. The following information was considered for final selection of a bull use in artificial insemination.

Lactation of dam and grand mother, type and components of dam and sire, type and components of grand father, disease resistance of sire and dam, age at first calving of dam, calving interval of dam, lactation period of dam, age at maturity of dam.

Management of bulls

All the bulls were kept under identical conditions of management, feeding (seasonal fodder) and watering. The bulls were housed individually in pens with sufficient cross ventilation and protection against summer heat and in an open space for sunbathing in winter. The management system at 3 (three) AI centres was more or less same.

Table 1. Identification of Breeding bulls with breed, date of birth, parent's history, and semen types of Deep Frozen Semen Production Laboratory, at Rajshahi Dairy and Cattle Improvement Farm (RDCIF), Rajabarihat.

Bull ID	Breed	Date of birth	Blood line			Semen type
			Sire	Dam	Dam's milk yield /lactation (Li)	
D013	L?F?F	12.4.96	F-18	L?F	-	Frozen
D025	L?F?F	9.8.96	F-26	L?F	-	Frozen
D042	L?F?F	13.9.95	F-17	L?F	-	Frozen
427	SL?SL	10.5.94	SL67396	SL-(Pak)	L_4 -1150/293	Frozen
7679	L?F	19.5.95	F-Toro	L-6229	L_3 -873/306	Frozen
7707	L?F?F	9.12.94	F.SP-Sultan	L?F-2185	L_6 -2890/447	Frozen
8224	L?F	10.11.95	F-longharn	L-2747	L_5 -628/269	Frozen

L= Local, F= Friesian and SL = Sahiwal, H= Holstein, $L_{1, 2, 3, ...}$ =Lactation status.

Table 2. Identification of Breeding bulls with breed, date of birth, parent's history, and semen types of District AI centre, Rajshahi.

Bull ID	Breed	Date of birth	Blood line			Semen type
			Sire	Dam	Dam's milk production /lactation (Liters)	
D019	L?F?F	12.10.96	F-17	L?F	-	Chilled
163	SL?SL	17.8.91	SL-S-7	SL-108	L_1 -47.6/41	Chilled
487	SL?SL	20.12.95	SL-Elders	SL-91	L_3 -1446/305	Chilled
2320	L?F?SL	15.10.86	SL-9594	L?F-324	-	Chilled
3103	L?F?F?F	13.10.87	NK	L?F?F-9761	-	Chilled
3331	L?F	19.1.88	F-Fergey	L-1657	L_2 -729/288	Chilled
3456	L?F	10.4.88	F-Fergey	L-1662	L_1 -1070/341	Chilled
4025	L?F	31.12.88	F-Fergey	L-2702	L_1 -860/397	Chilled
4414	$L?F_2$	6.8.89	F-Edo	L?F-1881	1045/178	Chilled
5848	L?F?F?F	16.2.92	F-SP Chief	L?F?F-819	L_2 -2285/328	Chilled
7744	SL?F	11.1.95	F-Toro	SL-201	L_2 -484/152	Chilled
7953	L?F	19.5.95	F-longharn	SL-219	L_1 -565/198	Chilled
8330	L?F	24.2.96	F-Plamar	L-5365	-	Chilled
8643	SL?F	28.9.91	F-Nordost	SL-2517	-	Chilled

L= Local, F= Friesian, SL = Sahiwal, H= Holstein, $L_{1, 2, 3, ...}$ =Lactation status

Table 3. Identification of AI bulls with breed, date of birth, parent's history and types of semen at Central Artificial Insemination Laboratory , CCBSDF, Savar, Dhaka.

Bull ID	Breed	Date of birth	Blood line			Semen type
			Sire	Dam	Dam's milk yield / lactation(Li)	
0008	F	25.1.90	Developer	SP-435	L_4 -1697.3/188	Frozen
0017	F	13.2.90	Hannover H.(Twin)	SP-429	L_1 -1048.1/197	Frozen
0019	F	26.2.90	Hannover H. (Twin)	SP-430	L_1 -1764.8/156	Frozen
0026	F	6.4.90	-	SP-466	L_1 -1679/180	Frozen
0054	F	11.4.94	F.P.S-Sultan	F-342	L_2 -1552.8/361	Frozen
0057	F	7.5.94	F.P.S-Sultan	SP-492	L_1 -4255.3/346	Frozen
0058	F	26.5.94	F.P.S-Sultan	F-346	L_4 -3395/364	Frozen
0060	F	11.10.94	F.P.S-Sultan	F-363	L_5 -1820/256	Frozen
0064	F	22.12.94	F.P.S-Sultan	SP-436	L_2 -7199/742	Frozen
0065	F	22.8.95	F.P.S-Sultan	SP-474	L_3 -1446/263	Frozen
0067	F	5.7.95	F.P.S-Sultan	SP-416	L_1 -2293/303	Frozen
D010	L?F?F	10.10.96	F-19	L?F	-	Frozen
D056	L?F?F	20.4.96	F-43	L?F	-	Frozen
DT-63	Local	1.9.96	-	-	-	Frozen

(Contd.) Table 3. Identification of AI bulls with breed, date of birth, parent's history and types of semen at Central Artificial Insemination Laboratory , CCBSDF, Savar, Dhaka.

DT-65	Local	2.11.96	-	-	-	Frozen
BL-120	Local	1.6.97	-	-	-	Frozen
180	SL?SL	15.5.92	SL-S-11	SL-2597	L_4-1972/227	Frozen
186	SL	29.8.92	SL-S-7	SL-2589	L_4-1612/302	Frozen
313	SL	24.1.93	SL(Pakistan)	SL-218	L_1-325/30	Frozen
419	SL	9.4.94	SL-67396	SL-208	L_1-1536/254	Frozen
431	SL?SL	6.7.94	SL-67396	SL-2589	L_2-767/120	Frozen
499	SL?SL	18.4.96	SL-Elders	SL-305	-	Frozen
524	SL?SL	21.4.96	SL-67396	SL-74	-	Frozen
536	SL?SL	19.11.97	SL-122	SL-314	L_1-576/227	Frozen
2304	L?F	4.10.86	F-Sepel	L-1617	L_5-3995/289	Frozen
3498	L?F?F	2.5.88	F-din Fergey	L?F 1879	L_4-481/212	Frozen
3502	SL?F?F	4.5.88	F-Fergey	SL?F-6250	L_2-2157/296	Frozen
3612	$(L?F)_2$	1.7.88	L?F-229	-	-	Frozen
3645	SL?F	19.7.88	F—Fergey	SL-2682	L_1-925/239	Frozen
3670	SL?F	5.8.88	F-Fergey	SL-2640	L_2-410/300	Frozen
4813	$L?F_2$	29.9.90	L?F-8552	L?F-7353	L_7-1610/308	Frozen
4866	L?F	18.4.90	F-bimbo	L-4089	L_1-571/285	Frozen
4930	L?F? (SL?F)	6.4.90	SL?F-6730	L?F-7236	L_5-1200/326	Frozen
5156	SL?H?F?SL?F	29.11.90	SL?F-3552	SL?H?F-5655	L_3-1791/320	Frozen
6087	L?F?F?F	28.4.92	-	L?F?F-3656	-	Frozen
6104	SL?F	3.5.92	Spring-Chief	SL-2555	L_3-299/100	Frozen
6138	$(L?F)_2$	9.5.92	LF-3010	LxF-2204	L_2–1918.2/301	Frozen
6768	L?H?F?F	11.4.93	F.S.P-Chief	L?H?F-7549	L_1-2230/384	Frozen
6816	SL?F?F	12.5.93	F-26951	SL?F-3528	-	Frozen
7680	L?H?F?F?F	27.11.94	F-Toro	L?H?F?F?F	L_2-3724/415	Frozen
7811	L?H?F?L?F?F?F	28.2.95	F.PS-Sultan	L?F?L?F?F?F	L_1-169/30	Frozen
7832	L?F	12.3.95	F.H-5682	L-9208	L_1-480/230	Frozen
9911	SL?F?F	3.7.83	F-231	SL?SL-7832	L_1-1111/364	Frozen
40248	Local	8.3.97	-	-	-	Frozen
40253	Local	5.4.98	-	-	-	Frozen
40261	Local	8.12.97	-	-	-	Frozen
40268	Local	15.1.97	-	-	-	Frozen
40270	Local	7.2.97	-	-	-	Frozen
40271	Local	8.1.97	-	-	-	Frozen
40275	Local	7.10.96	-	-	-	Frozen

L= Local, F= Friesian and SL = Sahiwal H= Holstein and $L_{1, 2, 3, ...}$ =Lactation status

Phenotypic Characteristics of Bull Studied

Body weight: The body weight of each bull was recorded monthly using large weighbridge at CCBSDF, Savar, Dhaka. The body weights of bulls were calculated according to the Shaeffer's formula adopted by McNitt (1983) at RDCIF, Rajabarihat and DAI centre, Rajshahi.

$$\text{Body weight (kg.)} = \frac{\{Length\,(\text{inch}) \times \text{Girth}^2\,(\text{inch})\}}{300 \times 2.2}$$

Body condition: In order to record the health condition the lumber vertebral processes of the bulls were used as landmark. The body conditions of the bulls were recorded at one-month interval during study period. The body condition of the bulls was scored into 1 to 5 scale (Nicholson and Butterworth 1986).

1.0= Marked emaciated.

1.5= Transverse process projects prominently, neural spines appear sharply.

2.0= Individual dorsal spines are pointed to the touch and hips, pins, tail-head and ribs are prominent.

2.5= Ribs, hips and pins are clearly visible, little fat covered dorsal spines are barely visible, muscle mass between the hooks and pins are slightly concave.

3.0= Ribs are usually visible, little fat covered dorsal spines are barely visible.

3.5= Animals are smooth and well covered, dorsal spines can not be seen but easily felt.

4.0= Animals are smooth and well covered but fat deposits are not marked.
Dorsal spines are felt with firm pressure but feel rounded rather than sharp.

4.5= Fat cover in critical areas can be easily seen and felt. Transverse process can be seen or felt.

5.0= Heavy deposits of fats are clearly visible on tail-head, brisket and cod.

Scrotal circumference (SC): Measurements of scrotal circumference (in centimeter) were made fortnightly at the area of the largest diameter of the scrotum using a cloth tape as described by Ott (1991). The testes were pulled firmly into the lower part of the scrotum by encircling its base with the hand and pulling down on the testes. The scrotal tape was formed into a loop and slipped over the scrotum and pulled up snugly around the greatest diameter of the scrotal contents. The thumbs and fingers were located on the side of the scrotum rather than between the testes to prevent separation of the testes and inaccurate measurement (Figure 1).

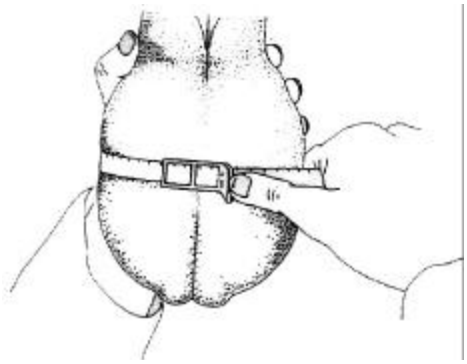

Figure 1. Correct methods for measurement of scrotal circumference

Libido of AI bulls: The libido of each bull were recorded at the time of semen collection by assigning a numerical value as described by Singh and Pangawkar (1989), with slight modifications. A libido score was given every 2.5 minutes until service to the artificial vagina was achieved.

1 = Little interest in mounting, despite sniffing at the rear end of mount and perhaps vague mounting attempts.

2 = Mounting after obvious repeated hesitation with weak clasping and seeking.

3 =Comparatively quick mounting without obvious eagerness. Satisfactory holding and seeking.

4 = Quick mounting with bulls attention focused on the mount with very good holding and seeking.

5 = Uncontrolled eager mounting with very good holding and intensive seeking.

Two ejaculates were collected from each bull and the time required between two ejaculates was noted for each bull with stopwatch. The time lapse between two ejaculate was measured in minutes (m).

Statistical analysis

The results are presented as Mean?SD for body weight, body condition score, scrotal circumference, libido score and time required between two ejaculates of 71 bulls among 6 genetic groups of bull. Data were analyzed applying GLM (General Linear Model for factorial experiments) using SPSS (10.1) computer software package (Anonymous 1996). Duncan's New Multiple Range Test was done to make specific treatment comparison for values that were found significant by F-Test according to procedure outlined by Steel and Torrie (1980).

Results and Discussion

The present investigation was undertaken to evaluate the effect of individual bull on phenotypic characteristics of 71 bulls of three AI centers/stations used for AI programme in Bangladesh. The Mean?SD for body weight, body condition, scrotal circumference, libido and time required between two ejaculates were 572?124 kg, 3.2?0.5 (score:1-5), 36.3?1.9 cm, 3.3?0.6 (score:1-5) and 7.1?2.3 minutes respectively among the six genetic groups of 71 bulls. In the present study, all the bull examined was found to have satisfactory soundness in respect to their body weight, body condition score, scrotal circumference (SC), libido score and time required between two ejaculates.

Individual bulls

The Mean?SD for body weight, body condition, scrotal circumference and time required between two ejaculates of 11 Friesian bulls are presented in Table 4. The average body weight ranged from 629 to 853 kg differences were significant. The highest body condition score (4.0?0.0) was found in bull Id #: 0026, 0057 and 0019 and lowest (3.00?0.0) in bull Id #: 0019. The significant highest SC (39.0?0.6 cm) was found in bull Id #: 0067. The libido was highest in bull Id #: 0067 than the bull Id #:0026 (4.6?0.3 vs. 2.7?1.2, score: 1-5; $p<0.05$). The longer time period (6.7?0.7 minutes) was required to complete a second ejaculate in bull Id #: 0026 and shorter time period in bull Id #:0067 (3.8?1.2 minutes).

Table 4. The mean age, body weight, body condition score, scrotal circumference, libido and time required between two ejaculates of Friesian bulls used for AI programme in Bangladesh.

Bull ID	Phenotypic Parameters				
	Body weight (kg)	Body condition score(1-5 scale)	Scrotal circumference (cm)	Libido score (1-5 scale)	Time required between 2 ejaculates (min)
0008	853?26 [a] n=22	3.5?0.0 [d] n=51	38.1?0.5 [d] n=51	3.5?0.2 [d] n=51	6.3?1.4 [a] n=35
0017	802?50[ab] n=22	3.7?0.3 [c] n=53	39.0?0.6 [a] n=53	3.4?0.2 [d] n=53	6.4?1.0 [a] n=47
0019	819?123[ab] n=29	3.0?0.0 [d] n=50	37.6?0.3 [f] n=50	3.4?0.2 [d] n=50	6.4?0.6 [a] n=47
0026	777?48 [bc] n=19	4.0?0.0 [a] n=51	38.0?0.4[de] n=51	2.7?0.2 [e] n=51	6.7?0.7 [a] n=40
0054	656?25 [e] n=23	3.5?0.0 [d] n=51	37.5?0.3 [f] n=51	3.7?0.1 [c] n=51	4.8?0.7 [bc] n=73
0057	665?38 [e] n=17	4.0?0.0 [a] n=57	38.5?0.3 [c] n=57	3.5?0.2 [d] n=57	5.3?0.9 [b] n=57
0058	649?51 [de] n=22	3.9?0.1[ab] n=77	37.9?0.4 [e] n=77	3.9?0.2 [bc] n=77	4.3?1.2 [cd] n=70
0060	745?41[cd] n=19	4.0?0.0 [a] n=77	38.9?0.4[ab] n=77	3.8?0.2 [bc] n=77	5.2?1.4 [bc] n=72
0064	640?52 [e] n=19	3.9?0.1 [b] n=50	37.0?0.2 [g] n=77	3.9?0.2 [bc] n=50	4.8?1.3 [bc] n=49
0065	761?66 [bc] n=17	4.0?0.0 [a] n=50	38.7?0.4[bc] n=50	4.0?0.3 [b] n=50	5.2?1.7 [bc] n=47
0067	629?46 [e] n=23	3.5?0.0 [d] n=59	37.0?0.2 [g] n=59	4.6?0.3 [a] n=59	3.8?1.2 [d] n=55
Total	734?97 n=232	3.7?0.3 n=626	38.0?0.7 n=626	3.7?0.5 n=626	5.3?1.5 n=550

Scale 5 was the best and 1 was the worst. n= Number of observation, The values are Mean?SD, a,b,c,d,e,f, g Mean?SD with different superscript letters in the same column differs significantly with each others (P<0.001).

The Mean?SD for body weight, body condition, scrotal circumference, libido and time required between two ejaculates of 100% Sahiwal bulls are shown in Table 5. The average body weight, body condition, scrotal circumference, libido and time required between two ejaculates were 743?39, 3.2?0.4 (score:1-5), 35.46?0.9 cm, 2.47?0.6 (score:1-5) and 9.28?1.5 minutes respectively. The body weight and body condition varied from 429?5 to 515 kg and 2.2?0.3 to 4.0?0.0 respectively, differences were significant. The SC were significantly greater in bull Id #: 180 than the bull Id #: 536 (36.3?0.2 vs. 33.6?0.6 cm;). The significant highest in libido score (3.6?0.4) was found in bull Id #: 524 and lowest (1.8?0.2) in bull ID #: 180. The shorter time period (7.7?1.0 minutes) required completing a second ejaculate for bull ID #: 186.

The Mean?SD for body weight, body condition, scrotal circumference, libido and time required between two ejaculates of 75% F×25% L bulls are shown in Table 6. The body weight, body condition, SC, libido and time required between two ejaculates varied from 438?21 to 711?26 kg, 2.5?0.0 to 4.0?0.0 (score:1-5), 32.9?0.07 to 39.2?0.2 cm, 2.4?0.2 to 4.1?0.3 (score:1-5) and 3.6?1.1 to 7.4?0.7 min. respectively, differences were significant.

The Mean?SD for body weight, body condition, scrotal circumference, libido and time required between two ejaculates of 50% SL×50% F bulls are presented in Table 7. The mean body weight, body condition, SC, libido and time required between two ejaculates were 618?77 kg, 3.5?0.3 (scale:1-5), 37.3?1.1cm, 3.1?0.6(scale:1-5) and 8.3?1.8 minutes respectively. The body weight, body condition score, SC and libido varied from 511 to 675 kg, 3.0?0.0 to 4.0?0.0, 35.4?0.4 to 39.1?0.2 cm, 2.1?0.1 to 3.9?0.3 and 5.9?0.8 to 11.0?0.8 min respectively.

Table 5. The mean age, body weight, body condition score, scrotal circumference, libido and time required between two ejaculates of Shaiwal bulls used for AI programme in Bangladesh.

Bull ID	Phenotypic Parameters				
	Body weight (kg)	Body condition score (1-5 scale)	Scrotal circumference (cm)	Libido score (1-5 scale)	Time required between 2 ejaculates (min)
163	515?35 [a] n=24	3.0?0.0 [d] n=109	36.0?0.2 [ab] n=109	2.7?0.5 [c] =109	8.4?0.5 [ab] n=5
180	485?33[abc] n=22	2.2?0.3 [e] n=51	36.3?0.2 [a] n=51	1.8?0.2 [e] n=51	10.3?1.4 [a] n=36
186	504?42[ab] n=26	3.5?0.0 [b] n=44	34.7?0.3 [f] n=44	1.9?0.1 [e] n=44	7.7?1.0 [b] n=21
313	443?11 [de] n=20	4.0?0.0 [a] n=55	36.2?0.2[a] n=55	2.8?0.2 [bc] n=55	9.8?1.2 [a] n=40
419	463?21 [cd] n=21	3.0?0.0 [d] n=55	35.8?0.3[cd] n=55	2.9?0.2 [bc] n=55	9.1?1.3[ab] n=43
427	459?26 [cde] =16	3.5?0.0 [b] n=50	34.2?0.1 [g] n=50	3.4?0.3 [a] n=50	8.4?1.2 [ab] n=22
431	472?28 [bcd] n=19	3.5?0.0[b] n=56	35.2?0.5 [e] n=56	3.0?0.2 [b] n=56	9.0?1.2 [ab] n=40
487	504?23[ab] n=15	3.1?0.2 [c] n=49	36.0?0.0[bc] n=49	2.4?0.3 [d] n=49	9.0?2.2 [ab] n=32
499	429?5 [e] n=15	3.5?0.0 [b] n=48	35.3?0.6 [e] n=48	2.0?0.3 [e] n=48	10.1?1.3 [a] n=43
524	448?13 [de] n=17	3.5?0.0 [b] n=52	35.7?0.1[d] n=52	3.6?0.4 [a] n=52	8.6?1.4 [ab] n=47
536	444?32 [de] n=16	3.0?0.0 [d] n=51	33.6?0.6 [h] n=51	3.1?0.3 [b] n=51	9.6?1.4 [ab] n=28
Total	473?39 n=211	3.2?0.4 n=620	35.46?0.9 n=620	2.74?0.6 n=620	9.28?1.5 n=327

Scale 5 was the best and 1 was the worst. n= Number of observation, The values are Mean?SD, a,b,c,d,e,f,g, h Mean?SD with different superscript letters in the same column differs significantly with each others (P<0.001).

Table 6. The mean age, body weight, body condition score, scrotal circumference (SC), libido score and time lapse between two (2) ejaculate of ?75% Friesian-?25%Local (75%F-25%L) cross-bred bulls used for AI programme in Bangladesh.

Bull ID	**Phenotypic Parameters**				
	Body weight (kg)	Body condition score (1-5 scale)	Scrotal circumference (cm)	Libido score (1-5 scale)	Time required between 2 ejaculates (min)
D010	452?24[f] n=19	3.2?0.2 [c] n=51	35.0?0.7 [d] n=51	2.4?0.2 [e] n=51	6.9?0.7 [ab] n=40
D013	438?21[f] n=12	2.5?0.0[d] n=28	32.9?0.7 [f] n=28	3.4?0.3 [d] n=28	5.7?1.2 [cd] n=18
D019	493?71 [ef] n=20	2.2?0.2 [d] n=63	33.9?0.6[e] n=63	3.9?0.1 [ab] n=63	4.5?0.9[cd] n=12
D025	610?91[bcd] n=28	3.0?0.3 [c] n=62	36.1?0.3 [c] n=62	3.7?0.2[c] n=62	4.8?2.1[cd] n=22
D042	598?66 [bcd] n=20	3.5?0.0 [b] n=66	39.1?0.5[a] n=66	3.7?0.2 [c] n=66	4.7?1.8 [cd] n=15
D056	489?51[ef] n=17	3.0?0.0 [c] n=51	34.7?0.6[e] n=51	3.8?0.0 [bc] n=51	4.7?0.7 [cd] n=39
3103	581?47 [cd] n=17	3.5?0.0 [b] n=67	35.9?0.2 [c] n=67	4.1?0.3 [a] n=63	3.7?1.2 [d] n=10
3498	656?25 [ab] n=18	3.5?0.0[b] n=62	39.2?0.2 [a] n=62	3.2?0.3 [d] n=62	7.4?1.2 [a] n=51
5848	623?34[bc] n=12	3.1?0.2 [c] n=54	38?0.3 [b] n=54	3.7?0.2 [c] n=54	5.2?1.5 [c] n=14
6087	654?47 [ab] n=22	3.0?0.0 [b] n=55	36.7?0.9 [c] n=55	3.8?0.1 [bc] n=55	5.4?1.1[c] n=53
6768	639?21 [bc] n=20	3.3?0.2 [c] n=64	37.8?0.2 [b] n=64	3.3?0.3 [d] n=64	5.8?1.4[bc] n=61
7680	549?41[de] n=16	3.5?0.0 [b] n=51	35.3?0.3[d] n=51	3.8?0.1[bc] n=51	4.8?1.3 [c] n=49
7707	608?53 [bcd] n=20	4.0?0.0 [a] n=60	35.6?0.2 [d] n=60	3.8?0.2 [bc] n=60	4.8?1.0 [cd] n=46
7811	711?26 [a] n=15	4.0?0.0 [a] n=50	37.6?0.3 [b] n=50	3.9?0.1[ab] n=50	3.6?1.1[d] n=34
Total	582?92 n=256	3.2?0.4 n=784	36.4?1.8 n=784	3.6?0.4 n=784	5.4?1.6 n=464

Scale 5 was the best and 1 was the worst. n= Number of observation, The values are Mean?SD, a,b,c,d,e,f Mean?SD with different superscript letters in the same column differs significantly with each others (P<0.001).

Table 7. The mean age, body weight, body condition score, scrotal circumference (SC), libido score and time lapse between two (2) ejaculate of ?50% Sahiwal-?50%Friesian (50%SL-50%F) cross bulls used for AI programme in Bangladesh.

Bull ID	Phenotypic Parameters				
	Body weight (kg)	Body condition score (1-5 scale)	Scrotal ircumference (cm)	Libido score (1-5 scale)	Time required between 2 ejaculates (min)
2320	666?78[a] n=26	3.8?0.2 [b] n=63	37.4?1.2 [cd] n=63	2.9?0.2 [e] n=63	8.3?1.5[cd] n=20
3502	545?44[cd] n=18	3.0?0.0 [d] n=54	37.8?0.4 [c] n=54	2.4?0.3 [g] n=54	11.0?0.8 [a] n=48
3645	594?76 [bc] n=23	3.5?0.0 [c] n=54	37.5?0.3[cd] n=54	2.2?0.2 [h] n=54	8.3?0.9[bcd] n=52
3670	665?39[a] n=19	4.0?0.0[a] n=51	36.5?0.2 [e] n=53	2.1?0.1[h] n=53	8.6?0.8[bcd] n=42
4930	634?14 [ab] n=15	4.0?0.0 [a] n=51	37.8?0.3[c] n=51	3.4?0.1 [cd] n=51	8.8?1.0 [bc] n=48
5156	653?15 [ab] n=14	3.5?0.0 [c] n=50	39.1?0.2 [a] n=50	3.5?0.3 [bc] n=50	5.9?0.8 [e] n=50
6104	675?31[a] n=13	3.5?0.0 [c] n=22	35.6?0.4 [f] n=22	2.7?0.4 [f] n=22	9.5?0.8 [b] n=20
6816	674?50 [a] n=17	3.0?0.0[d] n=59	36.7?0.4 [e] n=59	3.8?0.2 [a] n=54	7.5?1.4 [d] n=52
7744	561?34[cd] n=19	3.5?0.0 [c] n=64	35.4?0.4 [f] n=64	3.2?0.2 [d] n=64	8.9?2.3 [bc] n=12
8643	642?16 [cd] n=15	3.5?0.0 [c] n=52	38.3?0.2 [b] n=52	3.6?0.1 [b] n=52	9.0?1.1 [bc] n=17
9911	511?86 [d] n=19	3.0?0.0 [d] n=50	37.2?0.4 [d] n=50	3.9?0.3 [a] n=50	7.5?2.0 [d] n=38
Total	618?77 n=198	3.5?0.3 n=572	37.3?1.1 n=572	3.1?0.6 n=572	8.3?1.8 n=399

Scale 5 was the best and 1 was the worst. n= Number of observation, The values are Mean?SD, a,b,c,d,e,f Mean?SD with different superscript letters in the same column differs significantly with each others (P<0.001).

The Mean ?SD for body weight, body condition, SC, libido and time required between two ejaculates of 50% Friesianx50% Local bulls are presented in Table 8. The body weight, body condition and SC varied from 451?24 kg to 638?43 kg, 2.5?0.0 to 4.5?0.0 (score: 1-5) and 32.6?0.6 to 39.0?0.5 cm respectively, differenced were significant.

The mean?SD for the body weight, body condition, SC, libido and time required between two ejaculates of 100% Local bulls are shown in Table 9.

The body weight and body condition varied from 354?27 to 437?23 kg, 2.5?0.0 to 3.0?0.0 respectively, difference were significant. The SC of 10 local bulls varied from 31.0?0.0 to 35.1?0.3 with a mean 34.0?1.2 cm, which was found significantly lowest (31.0?0.0 cm) in bull Id #: 40270 and highest in bull Id #: 40248 (35.1?0.3 cm). The highest libido score was recorded (2.8?0.1) in bull Id #: 40253 and lowest (2.4?0.2) in bull ID #:40275. The significantly highest time required (12.0?0. 0 minutes) in bull Id #: 40270 and lowest (9.3?1.0 minutes) in bull Id #: 40271. Variation of phenotypic characteristics among six genetic groups may be due to following factors such as breed characteristics, nutritional, managemental, number of observation, season and as well as different AI centres /stations where different management maintained.

Table 8. The mean age, body weight, body condition score, scrotal circumference (SC), libido score and time lapse between two (2) ejaculate of 50% Friesian-50%Local (50%F-50%L) cross-bred bulls used for AI programme in Bangladesh.

Bull ID	Phenotypic Parameters				
	Body weight (kg)	Body condition score (1-5 scale)	Scrotal circumference (cm)	Libido score (1-5 scale)	Time required between 2 ejaculates (min)
2304	558?74[b] n=15	3.0?0.0[d] n=51	36.9?0.3 [c] n=51	2.8?0.3 [e] n=51	6.2?0.8 [cd] n=40
3331	511?27[cd] n=15	4.0?0.0[b] n=61	35.9?0.2 [de] n=61	3.6?0.3 [c] n=61	7.8?0.6 [a] n=21
3456	638?43[a] n=18	3.0?0.0 [d] n=57	38.4?0.1[b] n=57	3.4?0.2 [d] n=57	5.7?0.4[d] n=7
3612	500?51[cd] n=22	2.5?0.0 [f] n=51	35.7?0.1[f] n=51	3.2?0.2[d] n=51	6.9?1.1[abc] n=35
4025	495?94[cd] n=21	2.5?0.0 [b] n=48	35.9?0.5[de] n=48	3.5?0.2[d] n=48	6.2?1.1 [cd] n=34
4414	653?19[a] n=15	2.7?0.2[e] n=65	32.9?0.3[e] n=65	3.6?0.3[c] n=65	6.1?1.6 [cd] n=15
4813	637?18 [a] n=14	3.0?0.0[d] n=54	39.0?0.5 [a] n=54	3.4?0.2 [d] n=54	7.3?1.3 [ab] n=50
4866	652?12[a] n=50	4.5?0.0[a] n=53	38.2?0.1 [b] n=53	3.3?0.1 [d] n=53	6.6?1.2[bc] n=46
6138	518?47[cd] n=21	3.0?0.0 [d] n=60	37.0?0.3 [c] n=60	3.4?0.2 [d] n=60	6.8?1.0 [bc] n=57
7679	566?54 [b] n=18	3.6?0.2 [c] n=61	35.7?0.4 [ef] n=61	3.8?0.2 [b] n=61	6.8?1.0 [bc] n=15
7832	488?67 [d] n=17	2.5?0.0 [f] n=41	34.2?0.4[g] n=41	3.3?0.2[d] n=41	6.5?1.2 [bcd] n=30
7953	513?49 [cd] n=20	2.5?0.0 [g] n=62	32.7?1.2[i] n=62	2.8?0.3 [e] n=62	7.8?0.4[a] n=5
8224	534?100 [bc] n=22	3.0?0.1 [d] n=64	32.6?0.6 [i] n=64	4.4?0.3[a] n=64	3.4?0.7[e] n=15
8330	451?24[e] n=14	2.5?0.0[f] n=41	33.6?1.0 [h] n=41	3.7?0.1 [c] n=41	7.1?0.6[ab] n=8
Total	547?81 n=251	3.0?0.6 n=769	35.6?2.2 n=769	3.4?0.4 n=769	6.6?1.3 n=377

Scale 5 was the best and 1 was the worst. n= Number of observation, The values are Mean?SD, a,b,c,d,e,f, g,h, i Mean?SD with different superscript letters in the same column differs significantly with each others (P<0.001).

Table 9. The mean age, body weight, body condition score, scrotal circumference (SC), libido score and time lapse between two (2) ejaculate of 100% Local (100%L) bulls used for AI programme in Bangladesh.

Bull ID	Phenotypic Parameters				
	Body weight (kg)	Body condition score (1-5 scale)	Scrotal circumference (cm)	Libido score (1-5 scale)	Time required between 2 ejaculates (min)
DT-63	397?32 [ab] n=16	2.5?0.0 [b] n=29	33.8?0.1 [d] n=29	2.5?0.2 [bc] n=29	11.2?1.7 [ab] n=15
DT-65	432?34[ab] n=20	2.5?0.0 [b] n=53	34.4?0.6 [b] n=53	2.6?0.1 [ab] n=53	10.0?1.0 [ab] n=42
120	437?23[a] n=16	2.5?0.0 [b] n=43	34.2?0.4 [bcd] n=43	2.7?0.2[a] n=43	10.0?2.0 [ab] n=34
40248	436?43[ab] n=19	3.0?0.0 [a] n=65	35.1?0.3[a] n=65	2.6?0.1 [ab] n=65	10.5?1.0 [ab] n=56
40253	417?26[ab] n=13	2.5?0.0 [b] n=27	33.0?0.4[e] n=27	2.8?0.1[a] n=27	10.7?1.0[ab] n=9
40261	434?30[ab] n=18	2.5?0.0 [b] n=50	33.7?0.1 [d] n=50	2.7?0.1 [a] n=50	9.6?1.0 [ab] n=43
40268	428?28 [ab] n=12	3.0?0.0[a] n=26	34.4?0.5 [bc] n=26	2.7?0.1[a] n=26	11.1?0.9 [ab] n=13
40270	391?29[bc] n=9	2.5?0. [b] n=16	31.0?0.0[f] n=16	2.5?0.2 [bc] n=16	12.0?0.0 [a] n=2
40271	354?27[c] n=12	2.5?0.0 [b] n=24	31.2?1.0 [f] n=24	2.6?0.2 [ab] n=24	9.8?1.0 [ab] n=5
40275	426?17 [ab] n=7	2.5?0.0 [b] n=16	34.0?0.0 [cd] n=16	2.4?0.2[c] n=16	9.3?1.0 [b] n=14
Total	418?38 n=142	2.6?0.2 n=349	34.0?1.2 n=349	2.6?0.2 n=349	10.2?1.4 n=233

Scale 5 was the best and 1 was the worst. n= Number of observation, The values are Mean?SD, a,b,c,d,e,f Mean?SD with different superscript letters in the same column differs significantly with each others (P<0.001).

In conclusion, the best performance for phenotypic parameters was observed in bull Id #: 0065 for Friesian breed, 163 for 100% Sahiwal breed, 7811 for 75% Friesian ? 25% Local, 5156 for 50% Sahiwal? 50% Friesian, 8224 for 50% Friesian ? 50% Local and 40248 for 100% Local breed. Bull Id #: 0065, 163, 7811, 5156, 8224 and 40248 had good phenotypic performances as well as 100% Friesian breed had better phenotypic performances. Therefore, it can be concluded that the bulls used in AI programme in Bangladesh were affected by their phenotypic performances.

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