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Association of breed characteristics with milk production in Murrah buffaloes

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ABSTRACT

The study was conducted to establish relationship between some breed characteristics of Murrah buffaloes such as horn pattern, head, face, colour of skin coat, tail switch, udder and teat conformation, skin thickness and temperament with milk production. Observation on 245 lactating buffaloes from institute and 150 from field were recorded. These buffaloes were grouped into different categories based on level of variation in the morphological characters of each animal. The data were statistically analysed and relationship of each character with milk yield was examined. The results indicated that coat colour, head and face, tail switch, shape of udder and teats and skin thickness were associated with milk production. The lactation milk yield produced by buffaloes having jet black colour was significantly higher (2195±34 kg) than buffaloes with dark tan colour (1863±30 kg). The lactation milk yield of buffaloes possessing flat head was significantly higher than buffaloes with bulging head (2069±25 *vs* 1686±98 kg). No difference in milk yield was observed between buffaloes having different shape of horn or face. Significantly higher milk yield was obtained in buffaloes having long and deep udders with higher rear attachment than those having short and shallow udders with low rear attachment. The milk yield was higher for cylindrical shaped (2204±28 kg) as compared to bottle (1927±43 kg) or funnel (1507±41 kg) shaped teats. Milk production of docile buffaloes was significantly higher (2120±27 kg) than those of nervous (1829±49 kg) and aggressive buffaloes (1743±147 kg). The milk yield was also significantly higher in buffaloes having thin skin (2184±38 kg) than medium (1973±35 kg) and thick skinned buffaloes (1848±47 kg).

Key words: Breed characters, Buffaloes, Milk production

India has over 98 million heads of buffaloes, which is approximately 57% of total world buffalo population contributing 50 million tons of milk, which accounts for 55% of total milk production (92 million tons) in India (FAO 2005). The breeding tract of Murrah buffaloes stretches around the southern part of Haryana state comprising districts of Rohtak, Jind, Hisar and Bhiwani, the Union Territory of Delhi, and some parts of the western Uttar Pradesh. Due to high milk yield potential as well as of high milk fat % the Murrah buffaloes are in great demand all over the world. This breed is also being used for grading up of local non-descript buffaloes. Murrah buffaloes are jet black but dark tan animals are also commonly found. This animal is large in size with long and deep body. Horns are short and tightly curled in a spiral form. Head of females is usually short, fine and clear cut. Tail is black, long reaching below the hock up to fetlock and in some animals ending in a white switch. The skin is thin, soft and pliable with very little hair on the body in adult animals. Udder is capacious extending from hind legs to just behind naval flap with prominent milk-veins. Teats are long and placed uniformly wide apart. Rear teats are generally longer than the fore teats (Sethi 2004).

Characteristics of Murrah breed such as horn shape and size, colour of coat, body size, tail switch, shape size, attachment and placement of udder and teats, skin thickness, and temperament are considered to be associated with milk production (Mondal and Pandey 1995, Bhuiyan *et al.* 2004, Andrade and Garcia 2005). It is generally observed that there is no consensus amongst scientists, field veterinarians and farmers regarding the extent of deviation in important physical characteristics of Murrah breed. Therefore, it was considered imperative to undertake this study so that information on important physical characters for Murrah breed and the expected relationship with milk yield can be established.

MATERIALS AND METHODS

The observations on breed characteristic, viz. horn shape, colour of coat, tail switch, shape and attachment of udder and teats, skin thickness, and temperament were recorded from 245 lactating buffaloes at the Central Institute for Research on Buffaloes, Hisar, in 2005. Similar data were also collected from 150 field buffaloes, 30 each from 5

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adopted villages under field progeny testing programme of the institute with random sampling procedure. A visual appraisal was made to evaluate the type of horn, head and face, colour of coat and switch of the tail. The length, depth and attachment of the udder were defined as suggested by Davis (1962). Further information on the teat shape in 3 categories, i.e. cylindrical, bottle and funnel shaped and tip of the teat as round or pointed was collected. Skin thickness was measured at the side of the neck of buffalo by a fold of the skin between jaws of vernier callipers. Half of that reading was taken as the actual thickness of the skin. The temperament of buffaloes was observed visually and

Table 1. Frequency of buffaloes with regard to their phenotypic characters

Breed characters	Farm		Field		Overall	
	Freq	%	Freq	%	Freq	%
Horn pattern						
Short tightly curled	132	53.88	57	38.00	189	47.85
Medium loosely curled	101	41.22	73	48..67	174	44.05
Large open/drooping	12	4.90	20	13.33	32	8.10
Coat colour						
Jet black	133	54.29	87	58.00	220	55.69
Dark tan	112	45.71	55	36.67	167	42.28
Brown	-	-	8	5.33	8	2.02
Head type						
Flat	231	94.29	146	97.33	377	95.44
Bulging	14	5.71	4	2.67	18	4.56
Face type						
Short	201	82.04	86	57.33	287	72.66
Long	32	13.06	48	32.00	80	20.25
Heavy	12	4.90	16	10.67	28	7.09
Tail and tail switch						
Black tail black switch	141	57.56	31	20.67	172	43.54
Black tail white switch	57	23.26	51	34.00	108	27.35
White tail white switch	47	19.18	68	45.33	115	29.11
Udder shape (front)						
Long	138	56.33	80	53.33	218	55.18
Short	107	43.67	70	46.67	177	44.82
Udder shape (rear)						
Long	147	60.00	68	45.33	215	54.43
Short	98	40.00	82	54.67	180	45.57
Depth						
Long	72	29.39	40	26.67	112	28.35
Short	173	70.61	110	73.33	283	71.65
Rear attachment						
High	174	71.02	86	57.33	260	65.83
Low	71	28.98	64	42.67	135	34.17
Teat shape						
Cylindrical	134	54.69	117	78.00	251	63.55
Bottle/pear	75	30.62	21	14.00	96	24.30
Funnel	36	14.69	12	8.00	48	12.15
Teat tips						
Round	161	65.72	109	72.67	270	68.35
Pointed	84	34.28	41	27.33	125	31.65
Skin thickness						
Thin (<6.0 mm)	114	46.53	67	44.67	181	45.83
Medium (6.0–7.5 mm)	98	40.00	59	27.33	157	39.74
Thick (>7.5 mm)	33	13.47	24	16.00	57	14.43
Temperament						
Docile	187	76.33	116	77.33	303	76.72
Nervous	56	22.87	34	22.67	90	22.78
Aggressive	2	0..80	-	-	2	0.50

classified as docile, nervous and aggressive as suggested by Dash *et al.* (1976). The animals were grouped into different categories based on the level of variation in characters of each animal. In field, animals' peak yield was recorded and lactation yield was predicted using the method of Anil Kumar (2000). Analysis of data was done to find out the relationship between different breed characters and milk yield as per method described by Snedecor and Cochran (1980) for one-way classification of data.

RESULTS AND DISCUSSION

All the buffaloes were categorized on the basis of their phenotypic characters and results are presented in Table 1. It is apparent from the data that more than half of the buffaloes of farm had short tightly curled horns, whereas in field, majority of buffaloes with medium loosely curled horns were encountered. The overall data indicated that majority of buffaloes were having either short tightly curled (48%) or medium loosely curled horns (44%). The study also revealed that more than half of the buffaloes (56%) had jet black colour and short face (73%), whereas more than 95% buffaloes were having flat head. Majority of buffaloes (44%) had black tail and black switch. Kushwaha *et al.* (2004) also noticed deviation in the horn pattern in Bhadawari buffaloes and reported that 20% of buffaloes had curved and twisted horns. They also observed that 65% buffaloes were having copper colour skin while 35% had blackish skin. Shrikhande *et al.* (1996) reported that majority of Nagpuri buffaloes had a bulging forehead, black body and white switch of the tail. Patel and Ulmek (2002) observed long curved backward, upward and usually twisted outward horns, black to brown body coat colour in Pandharpuri buffaloes. They also revealed that 3/4th Pandharpuri buffaloes were having white and 1/4th had black coloured tail switch. In the present study more than half of the buffaloes in farm as well as field had long udder from front and rear, while two-third buffaloes had high rear udder attachment. However, deep udder was found in only 28% buffaloes. The studies further revealed that majority of buffaloes were having cylindrical teats with round tips. Sonawane *et al.* (2002) also found large sized fore and rear udders, cylindrical teats and rounded teat tips in majority of Murrah buffaloes. During the study it was also observed that more than 45% buffaloes in both the categories were having thin skin and more than 3/4th of buffaloes were of docile temperament.

Influence of some typical breed characters on lactation milk yield in farm and field animals was examined and is depicted in Table 2. The farm buffaloes with short tightly curled horns produced significantly more milk than the buffaloes having large open or drooping horns. In field animals the lactation milk yield with short tightly curled horns was also significantly higher than medium loosely curled horns. In pooled data, however, no significant difference in milk yield with type of horns was observed. The milk produced in lactation by buffaloes having jet black colour was significantly higher than buffaloes with dark tan colour

Table 2. Influence of some phenotypic characters on lactation milk yield

Physical characters	Lactation milk yield					
	Farm		Field		Overall	
	n	Mean ± SE	n	Mean ± SE	n	Mean ± SE
Type of horns						
Short tightly curled	132	$2006^{a} \pm 37$	57	$2315^{a} \pm 69$	189	2099 ± 35
Medium loosely curled	101	1961 ± 44	73	$2100^{b} \pm 61$	174	2020 ± 36
Large open/Drooping	12	$1722^{b} \pm 127$	20	2082 ± 121	32	1947 ± 94
Coat colour						
Jet black	133	$2082^{a} \pm 39$	87	$2368^{a} \pm 56$	220	$2195^{a} \pm 34$
Dark tan	112	$1844^{b} \pm 35$	55	$1901^{b} \pm 55$	167	$1863^{b} \pm 30$
Brown	–	–	8	2047 ± 193	8	2047 ± 193
Type of head						
Flat	231	$1988^{a} \pm 28$	146	$2198^{a} \pm 43$	377	$2069^{a} \pm 25$
Bulging	14	$1741^{b} \pm 100$	4	$1496^{b} \pm 226$	18	$1686^{b} \pm 98$
Type of face						
Short	201	2005 ± 30	86	$2292^{a} \pm 57$	287	$2091^{a} \pm 28$
Long	32	1850 ± 76	48	$2114^{a} \pm 73$	80	$2009^{a} \pm 55$
Heavy	12	1771 ± 101	16	$1771^{b} \pm 101$	28	$1771^{b} \pm 71$
Colour of tail and tail switch						
Black tail black switch	141	$2088^{a} \pm 37$	31	$2387^{a} \pm 88$	172	$2142^{a} \pm 35$
Black tail white switch	57	$1835^{b} \pm 54$	51	2216 ± 81	108	$2015^{b} \pm 51$
White tail white switch	47	$1799^{b} \pm 51$	68	$2057^{b} \pm 59$	115	$1951^{b} \pm 42$

Means bearing different superscripts differ significantly ($P<0.05$).

Table 3. Influence of various features indicative of size and shape of udder and teats on lactation milk yield

Features	Lactation milk yield					
	Farm		Field		Overall	
	n	Mean ± SE	n	Mean ± SE	n	Mean ± SE
Udder shape (Front)						
Long	138	2164[a] ± 34	80	2412[a] ± 57	218	2255[a] ± 31
Short	107	1727[b] ± 33	70	1914[b] ± 50	177	1801[b] ± 29
Udder shape (Rear)						
Long	147	2157[a] ± 32	68	2418[a] ± 63	215	2240[a] ± 31
Short	98	1698[b] ± 34	82	1982[b] ± 51	180	1827[b] ± 32
Depth of udder						
Deep	72	2378[a] ± 43	40	2600[a] ± 83	112	2457[a] ± 42
Shallow	173	1805[b] ± 26	110	2026[b] ± 42	283	1891[b] ± 24
Rear attachment of udder						
High	174	2108[a] ± 30	86	2335[a] ± 55	260	2183[a] ± 28
Low	71	1644[b] ± 40	64	1970[b] ± 60	135	1799[b] ± 38
Teat shape						
Cylindrical	134	2149[a] ± 34	117	2266[a] ± 45	251	2204[a] ± 28
Bottle/Pear	75	1880[b] ± 42	21	2098[a]± 119	96	1927[b] ± 43
Funnel	36	1516[c] ± 42	12	1481[b]± 108	48	1507[c] ± 41
Teat tips						
Round	161	2053[a] ± 33	109	2207 ± 52	270	2115[a] ± 29
Pointed	84	1821[b] ± 36	41	2106 ± 78	125	1915[b] ± 42

Means bearing different superscripts differ significantly ($P<0.05$).

when the data were pooled for farm and field buffaloes. The lactation milk yield of buffaloes possessing flat head was significantly higher than buffaloes with bulging head. In farm, no difference in milk yield was observed between buffaloes having different types of face. However, field buffaloes with heavy face produced less milk as compared to buffaloes with short or long face. The study further indicated that in pooled data regarding colour of tail and tail switch, the milk yield was significantly higher in buffaloes having black tail black switch than black tail white switch or white tail white switch.

The study also included the influence of size and shape of udder and teats on lactation milk yield and results are given in Table 3. The milk yield of buffaloes both from farm and field decreased significantly as the length of the udder from front as well as rear decreases. The higher milk yield was obtained from long udder from front and rear than short udder shape from front and rear. This means that lactation milk yield was higher in buffaloes with udder that extended more forward and backward, i.e. more capacious udders are associated with higher yields. Hafeez and Naidu (1981) reported that milk yield was significantly related with udder width and length. Singh and Bhatnagar (1977) noticed that the width of the udder played more important role than the length of the udder in cattle whereas, on the contrary, the length of the udder in the buffaloes played an effective role in producing more milk. The milk yield was significantly higher in buffaloes having deep udder as compared to buffaloes having shallow udder. The results of the present study are supported by Bhuiyan *et al.* (2004) who indicated that size and depth of udder were very important conformation traits for milk production. Significant influence was also observed for rear attachment of the udder with milk yield. The milk yield of buffaloes with higher rear attachment of udder was 2183±28 kg and for low rear attachment it was 1799±38 kg. Hafeez and Naidu (1981) and Bharadwaj *et al.* (1991) also found positive and significant association of milk yield with depth and rear attachment of the udder. Milk yield was higher in buffaloes having cylindrical shaped teats as compared to bottle or funnel shaped teats; and buffaloes with round tips yielded significantly higher milk than those having pointed teat tips. On the contrary, Bharadwaj *et al.* (1991) found no difference in milk yield between teat shape and teat tips. However, Moore *et al.* (1981) found significantly higher milk yield in exotic cows with funnel shaped teats than in those with cylindrical teats.

A negative and significant influence between skin thickness and milk yield was observed (Table 4). Milk yield was higher in buffaloes having thin skin than medium and thick skinned buffaloes. Fineness of skin is a trait positively associated with good dairy type (Davis 1962). Similar findings were recorded by Bhatnagar and Kumar (1980). They suggested that animal with thin skin could dissipate more heat and thus be more efficient for production of milk in warm regions. In contrast, Desai and Sharma (1962) reported positive and significant correlation of skin thickness with milk yield in Hariana cattle, which of course is not a

Table 4. Influence of skin thickness on lactation milk yield

Skin thickness	Lactation milk yield					
	Farm		Field		Overall	
	n	Mean ± SE	n	Mean ± SE	n	Mean ± SE
Thin (<6.0 mm)	114	$2058^{a} \pm 44$	67	$2398^{a} \pm 64$	181	$2184^{a} \pm 38$
Medium (6.0–7.5 mm)	98	$1929^{b} \pm 42$	59	$2047^{b} \pm 62$	157	$1973^{b} \pm 35$
Thick (>7.5 mm)	33	$1815^{b} \pm 48$	24	$1894^{b} \pm 92$	57	$1848^{b} \pm 47$

Means bearing different superscripts differ significantly (P<0.05).

Table 5. Influence of temperament grade on lactation milk yield

Features	Lactation milk yield					
	Farm		Field		Overall	
	n	Mean ± SE	n	Mean ± SE	n	Mean ± SE
Docile	187	$2041^{a} \pm 30$	116	$2247^{a} \pm 49$	303	$2120^{a} \pm 27$
Nervous	56	$1756^{b} \pm 57$	34	$1949^{b} \pm 86$	90	$1829^{b} \pm 49$
Aggressive	2	$1743^{b} \pm 147$	–	–	2	$1743^{b} \pm 147$

Means bearing different superscripts differ significantly (P<0.05).

dairy type of animal. However, Manik *et al.* (1981) found no correlation of skin thickness with milk yield, whereas Muralidharan (2001) found lowest skin thickness during lactation period and highest during dry period in Murrah buffaloes.

Temperament is closely associated with the behaviour of the animals and denotes the general consistency with which the animals behave, their tendency to perform certain actions under certain situations. It is, therefore, the outcome of an interaction between heredity and the life history of the animal. Different breeds have different conformation and different temperaments (Nema *et al.* 1999). Normally a docile behaviour is considered a dairy type character associated with high milk yield (Davis 1962). In the present study Influence of temperament grade on lactation yield of Murrah buffaloes was examined and findings are presented in Table 5. It was found that milk production of docile buffaloes was significantly higher than those of nervous and aggressive buffaloes. Similar findings were reported by Gupta *et al.* (1985). Dash *et al.* (1976) found that an increase of 1 point in temperament score during milking was associated with decrease in milk yield @ 0.81 kg. In contrast, Bharadwaj *et al.* (1991) observed that aggressive buffaloes gave higher milk yield than nervous animals.

It can be inferred from the study that specific breed characters, viz. colour of coat, type of head and face, tail and tail switch influenced milk production significantly. It was also observed that buffaloes with udders that extend forward and backward more, deep, having high rear attachment and cylindrical shaped teats with round tips yielded more milk than buffaloes that deviate away from these ideal purebred buffaloes. Fine skinned buffaloes were high producers than those with thick skin. Docile buffaloes were also better milk yielders.

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