Research Article

Effect of Non-genetic Factors on Culling and Mortality Rate in Murrah Buffalo Males

Pushp Raj Shivahre, Ashok Kumar Gupta, Achun Panmei, Mukesh Bhakat, Atish Kumar Chakravarty, Vijay Kumar, Shakti Kant Dash, Manvendra Singh

Dairy Cattle Breeding Division, National Dairy Research Institute, Karnal, Haryana, India _ 132001.

Abstract | Sixteen years data (1997-2012) comprising of records on 1029 Murrah buffalo males born in NDRI herd were analysed to study culling and mortality rates. Data were classified into four periods viz., P-1 (1997-2000), P-2 (2001-2004), P-3 (2005-2008), P-4 (2009-2012) and four seasons of birth viz., S-1 (Dec-Mar), S-2 (Apr-Jun), S-3 (Jul-Sep), S-4 (Oct-Nov); to study the disposal pattern of different age groups of buffalo male calves. Mortality rates in different age groups of 0-1, 1-2, 2-3, 3-6, 6-18, 18-36, 36-60 and above 60 months were 17.49, 5.99, 3.34, 5.42, 6.35, 2.59, 2.81 and 1.96 percent, respectively and corresponding culling rates for the age groups were 6.32, 9.95, 9.86, 14.69, 25.60, 39.81, 39.89 and 34.31 percent; respectively. Mortality rate was higher in young age groups (0-1 months, 1-2 months) whereas, culling rate was higher in six months and above age group. Overall disposal rate in eight age groups were 23.81, 15.94, 13.20, 20.10, 31.95, 42.39, 42.70 and 36.27 percent respectively. Effect of season and period of birth was statistically significant ($p<0.01$) for overall disposal rate in age groups of 0-1, 1-2, 2-3, 3-6. Higher overall disposal rate in male calves born in Dec-Mar and Jul-Sep could be due to higher mortality which could be attributed to exposure to inclement cold weather conditions in the former and parasitic infection in the latter season.

Keywords | Age groups, Culling rate, Disposal rate, Mortality rate, Murrah males, Period of birth, Season of birth

Editor | Kuldeep Dhama, Indian Veterinary Research Institute, Uttar Pradesh, India.
Received | September 03, 2014; **Revised** | November 06, 2014; **Accepted** | November 07, 2014; **Published** | December 05, 2014
***Correspondence** | Pushp Raj Shivahre, National Dairy Research Institute, Karnal (Haryana) India; **Email:** drpr06@gmail.com
Citation | Shivahre PR, Gupta AK, Panmei A, Bhakat M, Chakravarty AK, Kumar V, Dash SK, Singh M (2014). Effect of non-genetic factors on culling and mortality rate in Murrah buffalo males. Adv. Anim. Vet. Sci. 2(12): 657-661.
DOI | http://dx.doi.org/10.14737/journal.aavs/2014/2.12.657.661
ISSN (Online) | 2307-8316; **ISSN (Print)** | 2309-3331

INTRODUCTION

India with 59.5 million atons of milk is the world's topmost buffalo milk producer (FAO, 2009), which is reflecting the importance of buffalo in dairy industry of India due to its genetic potential of production and adaptability to cater to the huge demand of our country. Sire as well as dam contributes equally to the inheritance of polygenic characters such as milk production but during selection more emphasis is given to sire than dam due to more genetic contribution and higher intensity of selection that can be realized in males and hence a greater impact can be achieved on herd performance. Involuntary culling has negative effects on farm economy; farmers should therefore strive for less involuntary culling to allow more voluntary culling (Weigel et al., 2003). Under progeny testing programme, males born from elite buffaloes

inseminated with semen of proven bulls are therefore, raised for frozen semen production for subsequent inclusion in test mating. However, prior to reaching frozen semen production, a number of high genetic merit males are disposed of due to various reasons. Hence, knowledge of disposal pattern is very helpful in accurate planning and successful execution of genetic improvement programme. Therefore, there is a need to evaluate the disposal rate to assess the relevance of their use as monitoring criteria in herd-health schemes.

MATERIAL AND METHODS

Records on 1029 Murrah buffalo males born during the period 1997-2012, at NDRI, Karnal, were collected from Dairy Cattle Breeding Division, Livestock Research Centre and Artificial Breeding Research Centre. The data were analysed to study mortality rate and culling rate of different age groups of buffalo males. Data were classified into four periods *viz.,* P-1 (1997-2000), P-2 (2001-2004), P-3 (2005-2008), P-4 (2009-2012) and four seasons *viz.,* winter, summer, rainy and autumn i.e. S-1 (Dec-Mar), S-2 (Apr-Jun), S-3 (Jul-Sep), S-4 (Oct-Nov), respectively.

The rates of animal disposed from the herd due to season and period of birth were calculated by proportion using descriptive statistics. To study the differences in disposal rate, Chi-square value was calculated (Snedecor and Cochran, 1968).

RESULTS AND DISCUSSION

Overall disposal, mortality and culling rates of different age group of Murrah buffalo males are presented in **table 1**. Overall disposal rate of males from 0-1, 1-2, 2-3, 3-6, 6-18, 1.5 mo-3 yrs, 3 yrs-5 yrs and >5 yrs age group were 23.81, 15.94, 13.20, 20.10, 31.95, 42.39, 42.70 and 36.27 percent, respectively. Whereas mortality rates were 17.49, 5.99, 3.34, 5.42, 6.35, 2.59, 2.81, 1.96 and culling rate 6.32, 9.95, 9.86, 14.69, 25.60, 39.81, 39.89, 39.31 & 34.31 percent, respectively. In younger age groups overall disposal was mainly due to mortality while in older age groups overall disposal was due to culling. According to Afzal et al. (1983) the mortality in buffalo calves was found to be 39.8% which is comparatively higher than our finding. Pradhan and Panda (1994) also reported that high mortality in Murrah buffalo calves occurred mainly during 0-3 months of age. Effect of season of birth was highly significant (P<0.01) on overall disposal up to 6 months age group whereas period of birth was highly significant (P<0.01) for 1-2, 2-3 6-18 month age groups and significant (P<0.05) for 0-1, 3-6 month age groups. Pandey et al. (2012) found that effect of season, period and sire was highly significant (P<0.01) on mortality rate, while for culling season effect was significant. Highest disposal rate in 18 mo-3 yrs and 3-5 years age groups was found because during this age animal comes into semen donation stage so more of disposal due to reproductive problems like libido problem, semen freezability. Disposal due to surplus was observed in these age groups which might be due to more number of bulls available than the requirement of the farm. At NDRI herd Chauhan (2007) conducted a study on Karan Fries males and found that important cause of disposal for male calves below 1.5 years of age was mortality and in case of above 1.5 years of age group, culling due to poor growth and poor semen quality were the main reasons. Based on 15 yrs data Mukhopadhyay et al. (2010) reported that subfertility problem is one of the major causes of disposal of breeding bulls which was almost one-third to half of the reserved stock disposed due to sub-optimal reproduction efficiency and poor libido was one of the important cause of subfertility among the Murrah buffalo males.

Effect of season and period of birth on overall disposal, mortality and culling are presented in **table 2**. In case of males born in winter (S1: Dec-Mar) culling was highest in 18 mo-3 yrs age group i.e. 48.24% followed by >5 yrs (32.14%), 3-5 yrs (30.95%), 6-18 mo (29.77%), 2-3 mo (12.23%), 1-2 mo (10.41%), 3-6 mo (8.97%) and 1-2 mo (6.75%) while mortality was highest in 0-1 mo age group i.e. 22.19% followed by 3-6 mo (7.05%), 6-18 mo (5.34%), 2-3 mo (4.79%), 1-2 mo (4.52%), >5 yrs (3.57%), 3-5 yrs (2.35%) and 18mo-3yrs (2.34%). In S2 (Apr-Jun) culling was highest in 3-5 yrs age group i.e. 37.50% while mortality was highest in 0-1 mo age group i.e. 16.30% whereas minimum culling and mortality was recorded in 0-1 mo (0.00%) and >5 yrs (0.00%). In S3 minimum culling and mortality was in 3-6 mo (2.76%) and >5 yrs (0.00%) while maximum culling and mortality was found in >5 yrs (47.06%) and 0-1 month age group (14.40%). In S4 there was no culling in 0-1, 1-2 and 2-3 month age groups while maximum (40.0%) animals culled of 3-5 yrs age group whereas mortality was highest in 0-1 mo (17.01%) and minimum mortality in 3-5 yrs age group. S3 showed highest culling rate (27.80%) followed by S1 (19.0%), S4

Table 1: Disposal rate of different age group of Murrah males

Age group	No. available	Culling rate	Mortality rate	Disposed rate
0-1mo	1029	65(6.32)	180(17.49)	245(23.81)
1-2mo	784	78(9.95)	47(5.99)	125(15.94)
2-3mo	659	65(9.86)	22(3.34)	87(13.20)
3-6mo	572	84(14.69)	31(5.42)	115(20.10)
6-18mo	457	117(25.60)	29(6.35)	146(31.95)
18mo-3yrs	309	123(39.81)	8(2.59)	131(42.39)
3-5yrs	178	71(39.89)	5(2.81)	76(42.70)
>5 yrs	102	35(34.31)	2(1.96)	37(36.27)

Figure in parentheses indicate percentage

(11.61%) and S2 (8.0%) while highest mortality rate was found in S1 (11.40) followed by S3 (10.68%), S4 (6.43%) and S2 (5.07%). Aglave et al. (2010) conducted a study on cross bred cattle and reported that highest mortality was observed in summer (9.28%) followed by monsoon (7.43%) and winter (5.08%). Babcock et al. (2013) reported that there was higher risk of disposal (culling and mortality) of animal arriving in March to September than animal arriving during November to February.

Maximum culling was recorded in >5 yrs age group in P1 (1997-2000) and P2 (2001-2004) i.e. 94.12% and 92.86% because the bull produced required number of semen doses at this age group. In P1 (1997-2000) minimum culling was recorded in 2-3 mo age group (8.18%) and minimum mortality in 18 mo-3yrs (1.89%) while maximum culling and mortality was found in >5 yrs (94.12%) and 0-1 (17.82%) respectively. In P2 (2001-2004) minimum culling and mortality was recorded in 0-1 mo (9.38%) and 3-5 yrs (0.00%) whereas maximum mortality was observed in 0-1 mo age group (10.55%). In P3 and P4, >5 yrs age group was not considered because most of the animals could not reach this age group during the data collection period. In P3 (2005-2008) maximum culling and mortality were reported in 3-5 yrs (70.21%) and 0-1 mo (13.49%) age group whereas minimum culling and mortality were found in 0-1 mo (6.35%). In P4 maximum culling and mortality was observed in 6-18 mo and 0-1 mo age group i.e. 15.15% and 28.46% while minimum culling and mortality estimated in 0-1 mo (0.41%) and 2-3 mo (4.97%) age groups. Overall disposal revealed a decreasing trend as per period advanced. The results indicated that management practices over the time were improved. Highest culling was recorded in P-2 (22.15%) while maximum mortality was found in P-4 (11.84%).

Effect of season and period was found to be statistically significant ($P<0.01$) for overall disposal rate in age groups of 0-1, 1-2, 2-3, 3-6 months. Higher overall disposal rate in age groups up to 2 months of age was observed for first and last periods which could be primarily due to higher mortality rates during those periods. For the age groups of 3-6 and 6-18 months, overall disposal rate was lower in last period which could be due to decline in culling rates over the years. Higher overall disposal rate in male calves born in Dec-Mar and Jul-Sep could be due to higher mortality which could be attributed to exposure to inclement cold weather conditions in winter season and parasitic infection in the latter season. So managemental intervention is important in winter months like bedding should be dry and soft, make some arrangement for prevention of direct cold air. Taraphder et al. (2011) conducted study over a period of 16 years from 1985 to 2000 at NDRI, Karnal, Haryana and found that total disposal rate in adult buffaloes was 26.10 percent (culling 20.77 percent and mortality 5.33 percent) in Murrah. Voluntary and involuntary culling rates were 5.38 percent and 15.39 percent, respectively. Ravi et al. (2005) conducted study over 36 year data from 1969-2005 and found that 28.40 percent animal disposed due to death and 2.75 percent animals disposed due to culling.

The result of the study indicated that mortality rate was higher in young age group (up to 6 months), whereas culling rate was higher in older age group (above 18 months). Higher overall disposal rate in male calves born in Dec-Mar may be due to higher mortality due to inclement cold weather whereas high

Table 2: Effect of season and periods of birth on disposal rate of Murrah buffalo males

Season/ Age		0-1 mo	1-2 mo	2-3 mo	3-6 mo	6-18 mo	18mo-3yrs	3-5yrs	>5yrs	Overall disposed
	Av. Anim.	1029	784	659	572	457	309	178	102	**964**
S1 (Dec-Mar)	Av. Anim.	311	221	188	156	131	85	42	28	
	Culling	21 (6.75)	23 (10.41)	23 (12.23)	14 (8.97)	39(29.77)	41 (48.24)	13(30.95)	9 (32.14)	183 (19.00)
	Mortality	69 (22.19)	10 (4.52)	9 (4.79)	11 (7.05)	7 (5.34)	2 (2.35)	1 (2.38)	1 (3.57)	110 (11.40)
	Overall	90 (28.94)	33 (14.93)	32 (17.02)	25 (16.03)	46 (35.11)	43 (50.59)	14(33.33)	10(35.71)	293 (30.40)
S2 (Apr-Jun)	Av. Anim.	135	113	105	91	53	36	24	13	
	Culling	0 (0.00)	1 (0.88)	12 (11.43)	32 (35.16)	9 (16.98)	10 (27.78)	9 (37.50)	4(30.77)	77 (8.00)
	Mortality	22 (16.30)	7 (6.19)	2 (1.90)	6 (6.59)	8 (15.09)	2 (5.56)	2 (8.33)	0 (0.00)	49 (5.07)
	Overall	22 (16.30)	8 (7.08)	14 (13.33)	38 (41.76)	17 (32.08)	12 (33.33)	11(45.83)	4 (30.77)	126 (13.07)
S3 (Jul-Sep)	Av. Anim.	389	289	218	181	167	116	67	34	
	Culling	44 (11.31)	54 (18.69)	30 (13.76)	5 (2.76)	42 (25.15)	46 (39.66)	31(46.27)	16(47.06)	268 (27.80)
	Mortality	56 (14.40)	17 (5.88)	7 (3.21)	9 (4.97)	9 (5.39)	3 (2.59)	2(2.99)	0 (0.00)	103 (10.68)
	Overall	100(25.7)	71 (24.57)	37 (16.69)	14 (7.73)	51 (30.54)	49 (42.24)	33(49.25)	16(47.06)	371 (38.48)
S4 (Oct-Nov)	Av. Anim.	194	161	148	144	106	72	45	27	
	Culling	0 (0.00)	0 (0.00)	0 (0.00)	33 (22.92)	29 (27.36)	26 (36.11)	18(40.00)	6 (22.22)	112 (11.61)
	Mortality	33 (17.01)	13 (8.07)	4 (2.70)	5 (3.47)	5 (4.72)	1 (1.39)	0 (0.00)	1 (3.70)	62 (6.43)
	Overall	33 (17.01)	13 (8.07)	4 (2.70)	38 (26.39)	34 (32.08)	27 (37.50)	18(40.00)	7 (25.93)	174 (18.04)
$\chi 2$ value overall		14.4**	30.3**	20.1**	49.0**	0.7	4.3	2.9	3.1	
Periods										**912**
P1 (1997-2000)	Av. Anim.	275	202	159	139	109	83	40	17	
	Culling	24 (8.73)	24 (11.88)	13 (8.18)	19 (13.67)	19 (17.43)	38 (45.78)	18(45.00)	16(94.12)	171 (18.75)
	Mortality	49 (17.82)	19 (9.41)	7 (4.40)	11 (7.91)	7 (6.42)	5 (1.89)	5 (12.50)	1 (5.88)	104 (11.40)
	Overall	73 (26.55)	43 (21.29)	20 (12.58)	30 (21.58)	26 (23.84)	43 (51.81)	23(57.50)	17(100.0)	275 (30.15)
P2 (2001-2004)	Av. Anim.	256	205	166	132	100	53	30	14	
	Culling	24 (9.38)	29 (14.15)	32(19.28)	25 (18.94)	41 (41.00)	22 (41.51)	16(53.33)	13(92.86)	202 (22.15)
	Mortality	27 (10.55)	10 (4.88)	2 (1.20)	7 (5.30)	6 (6.00)	1 (1.89)	0 (0.00)	1 (7.14)	54 (5.92)
	Overall	51 (19.92)	39 (19.02)	34 (20.48)	32 (24.24)	47 (47.00)	23 (43.40)	16(53.33)	14(100.0)	256 (28.07)
P3 (2005-2008)	Av. Anim.	252	202	173	151	116	70	47	14	
	Culling	16 (6.35)	23 (11.39)	17 (9.83)	31 (20.53)	39 (33.62)	23 (32.86)	33(70.21)	-	182 (19.96)
	Mortality	34 (13.49)	6(2.97)	5(2.89)	4(2.65)	7(6.03)	0(0.00)	0 (0.00)	-	56 (6.14)
	Overall	50 (19.84)	29 (14.36)	22 (12.72)	35 (23.18)	46 (39.66)	23 (32.86)	33(70.21)	-	238 (26.10)
P4 (2009-2012)	Av. Anim.	246	175	161	150	132	103	61	57	
	Culling	1 (0.41)	2(1.14)	3 (1.86)	9 (6.00)	20 (15.15)	-	-	-	35 (3.83)
	Mortality	70 (28.46)	12(6.86)	8(4.97)	9(6.00)	9 (6.82)	-	-	-	108 (11.84)
	Overall	71 (28.86)	14 (8.00)	11 (6.83)	18 (12.00)	29 (21.97)	-	-	-	143 (15.67)
Overall		245 (23.81)	125 (15.94)	87 (13.20)	115 (20.10)	146(31.9)	131(42.39)	76(42.70)	37(36.27)	
$\chi 2$ value overall		8.9*	14.4**	13.5**	8.6*	22.7**	5.6	2.3	0	

Figure in parentheses indicate percentage; * $\chi 2(P<0.05)$, ** $\chi 2(P<0.01)$; Av. Anim. is availability of animals.

mortality in Jul-Sep may be due to parasitic infection. Intensive health care and management is required for young male buffalo calves especially in rainy season and winter months. It is very necessary to protect animals from hot, humid and cold inclement weather conditions.

ACKNOWLEDGEMENTS

The authors are thankful to Head DCB Division, Incharge Cattle Yard and Incharge ABRC for providing necessary information. The authors also thankful to the Director (NDRI) for financial assistance provided during the research work.

COMPETING INTERESTS

The authors declare that they have no competing interests.

REFERENCES

- Afzal M, Javid MH, Anjum AD (1983). Calf mortality: Season Pattern, age distribution and causes of calf Mortality. Pakistan. Vet. J. 3 (1): 30-33.
- Aglave PM, Adangale SB, Walkunde TR, Kale VA, Poul SP (2010). Effect of Genetic Factors on mortality in Cross-bred cattle Holdeo (HF X Deoni). Vet. World. 3(1): 32-33.
- Babcock AH, Cernicchiaro N, White BJ, Dubnicka SR, Thomson DU, Ives SE, Scott HM, Milliken GA, Renter DG (2013). A multivariable assessment quantifying effects of cohort-level factors associated with combined mortality and culling risk in cohorts of U.S. commercial feedlot cattle. Prev. Vet. Med. 108(1): 38-46.
- Chauhan I (2007). Influence of genetic and non-genetic factors on semen production in Karan Fries bulls. M.V.Sc. Thesis, National Dairy Research Institute. Karnal, Haryana, India.
- FAO (2009). FAO statistical database. www.fao.org.
- Mukhopadhyay CS, Gupta AK, Yadav BR, Khate K, Raina VS, Mohanty TK, Dubey PP (2010). Subfertility in Males: An Important Cause of Bull Disposal in Bovines. Asian-Aust. J. Anim. Sci. 23(4): 450-455.
- Pandey S, Singh CV, Barwal RS, Singh CB (2012). Factors Affecting Replacement Rate and its Components in Crossbred Cattle. Indian J. Dairy Sci. 65(3): 234-238.
- Pradhan B, Panda GM (1994). Calving pattern and mortality trends in Murrah buffalo calves in Orissa. Indian J. Anim. Prod. Health. 10(4): 143-146.
- Ravi P, Tomar AKS, Pandey HN, Joshi HC, Majumdar S, Bisht GS, Shukla M (2005). Use of disposal pattern in developing breeding strategies for crossbred cattle and Murrah buffaloes. Proceeding, VIII National conference on Animal Genetics and Breeding (Abstracts). IVRI, Izatnagar, Bareilly (UP).
- Snedecor GW, Cochran WG (1968). Statistical Methods. (Oxford and IBD Publishing Co., Calcutta).
- Taraphder S, Tomar SS, Gupta AK (2011). Studies on disposal pattern in an organized herd of Murrah buffalo. Online J. Vet. Res. 15(1): 68-75.
- Weigel KA, Palmer RW, Caraviello DZ (2003). Investigation of factors affecting voluntary and involuntary culling in expanding dairy herds in Wisconsin using survival analysis. J. Dairy Sci. 86(4):1482-1486.