

Mortality Pattern of Nili-Ravi Buffaloes under Organised Herd in India

K.S. Das^{*1}, S.S. Paul², G. Singh¹ and J.K. Singh¹

¹Central Institute for Research on Buffaloes, Regional Station- Bir Dosanjh, Nabha, Patiala, Punjab 147 201, India

²Central Institute for Research on Buffaloes, Sirsa Road, Hisar, Haryana 125001, India

Abstract: The objective of the study was to find out the mortality pattern of Nili-Ravi buffaloes under organised herd in tropical climate. An investigation was carried out on post mortem findings of 318 Nili-Ravi buffaloes maintained at Central Institute for Research on Buffaloes, Regional Station-Bir Dosanjh, Nabha, Patiala, Punjab over a period of 16 years (1994-95 to 2009-10). Each year was divided into three seasons i.e. hot-dry (March-June), hot-humid (July-October) and cold (November to February). Sex of animals was divided into male and female group. The age of animals were grouped into eight categories viz. up-to 30 days (d), 31-60 d, 61-90 d, 91-180 d, 181-365 d, 366-1095 d, 1096-3650 d and more than 3651 d. The causes of mortality, based on post-mortem findings, were classified into twelve classes e.g. major respiratory diseases (MARD), minor respiratory diseases (MIRD), major digestive disorders (MADD), minor digestive disorders (MIDD), cardiovascular diseases (CVD), parasitic diseases (PAD), infectious diseases (ID), musculoskeletal diseases (MSD), urogenital/reproductive diseases (UGD/RD), neurological disorders (ND), nutritional/metabolic/production diseases (NMD) and miscellaneous disorders (MD). Majority of the buffaloes died in the months of July to October. About two third of the buffalo deaths occurred before one year of their age. MARD followed by MAAD and CVD were the predominant causes of buffalo death under organised herd. This information will be beneficial in reducing buffalo mortality through adopting proper herd health programme of organized buffalo herd.

Keywords: Buffalo, Mortality, Nili-Ravi, Organized herd.

INTRODUCTION

Nili-Ravi breed is one of the superior buffalo breeds in India in terms of their production and reproduction potential. The western part of Punjab state viz. Amritsar, Gurdaspur, Tarn Tarn and Ferozpur district is considered as the home tract of this breed. The numbers of pure Nili-Ravi buffaloes are declining at a faster rate in their home tract in India [1]. The Regional Station of Central Institute for Research on Buffaloes at Bir Dosanjh, Nabha, Punjab was established during the year 1987 to conserve and improve this fine breed. This is the only organized pure Nili-Ravi buffalo herd in India.

Mortality pattern of any organised dairy farm indicates the herd health status and efficiency of routine animal management. Moreover, climatic variations round the year, age and sex of animals, and kind of diseases are also important factors in animal mortality. However, to reduce the overall mortality of the herd, a number of management steps like proper feeding, housing, vaccination etc. are generally undertaken well in advance. Often, there is considerable loss due to the seasonal and routine changes in management, which could be avoided by

adopting standard management practices and avoiding unnecessary as well as abrupt changes in the routine management activities [2]. Many researchers [3-5] reported the buffalo calf mortality under commercial dairy farm. An epidemiological survey report on buffalo mortality are available at different state livestock Farms in India [6]. However, references in the literature regarding the mortality pattern of organised buffalo herd are very limited. Therefore, the present investigation was undertaken to find out the mortality pattern of Nili-Ravi buffaloes under organised dairy herd maintained at Central Institute for Research on buffaloes, Nabha, Punjab.

MATERIALS AND METHODS

Location of the Study

The present study was conducted at the Central Institute for Research on Buffaloes, Regional Station-Bir Dosanjh, Nabha (latitude, 30° 22'28"N and 76° 8'54"E), Patiala, Punjab, India. The elevation of the area is about 250 m above sea level. The average annual rainfall is around 700 mm. The minimum and maximum temperatures range from 1° in winter to 47°C in summer.

Experimental Animals

Post mortem findings of 318 pure Nili-Ravi buffaloes, maintained at Central Institute for Research on Buffaloes, Regional Station-Bir Dosanjh, Nabha,

*Address corresponding to this author at the Central Institute for Research on Buffaloes, Regional Station- Bir Dosanjh, Nabha, Patiala, Punjab 147 201, India; Tel: +91 1765 263164; Fax: +91 1765 263167; E-mail: kalyanipm@gmail.com

Patiala, Punjab over a period of sixteen years (1994-95 to 2009-10), were analysed to investigate the mortality pattern of pure breed Nili-Ravi buffaloes under organised herd of tropical climate. The institute is maintaining the elite herd of pure Nili-Ravi buffaloes for research, standardization of management packages for the benefit of researchers, dairy farmers to improve and conserve this native germplasm. Young calves are allowed to stay with their mother for 3 days for colostrums feeding. Then, calves are allowed to suckle their mother before milking for two times in a day. Animals are managed in groups according to their age under loose housing system. Standard routine management practices related to housing, feeding, watering and milking were followed in the farm. Vaccination for Haemorrhagic Septicaemia (HS), Foot and Mouth Disease (FMD) and Brucellosis were practiced routinely. Both internal and external parasites were controlled through using deworming drugs at regular intervals. Post mortem examination of dead animals was done to ascertain the cause of mortality.

Data Collection

The data on yearly mortality pertaining to the sixteen years 1994-95 to 2009-10 was collected. Each year was divided into three seasons i.e. hot-dry (March-June), hot-humid (July-October) and cold (November to February). Sex of animals was divided into male and female group. The age of animals were grouped into eight categories viz. up-to 30 days (d), 31-60 d, 61-90 d, 91-180 d, 181-365 d, 366-1095 d, 1096-3650d and more than 3651 d. However, as a matter of policy of the centre, those male calves were retained in the farm after completion of full lactation of their mother only when they came under selection for future use in the set. Similarly, buffaloes, completed first lactation, were culled when they were not represented the true to their breed. Due to this, there was difference in their numbers in respect of mortality when compared according to sex and particular age. The causes of mortality based on post-mortem findings were classified into twelve major classes e.g. major respiratory diseases (MARD) including pneumonia, bronchopneumonia, pneumo-enteritis, acute respiratory failure/infection, pulmonary emphysema and chronic suppurative bronchopneumonia; minor respiratory diseases (MIRD) including gangrenous pneumonia, gangrenous rhinitis, lung abscess, rupture of diaphragm and lung congestion; major digestive disorders (MADD) including enteritis, gastroenteritis and stomatitis; minor digestive disorders (MIDD) including jaundice, peritonitis, hepatitis, traumatic

reticulo-peritonitis and intestinal obstruction; cardiovascular diseases (CVD) including cardiac failure, deposition of fat in heart, myocarditis, haemorrhagic shock and pericarditis; parasitic diseases (PAD) including ascariasis, trypanosomiasis etc.; infectious diseases (ID) including foot and mouth disease, brucellosis, leptospirosis, septicaemia, colibacillosis etc.; musculoskeletal diseases (MSD) like osteoarthritis; urogenital/reproductive diseases (UGD/RD) including premature birth, prepartum and postpartum prolapsed of vagina, uterus, bladder; neurological disorders (ND); nutritional/metabolic/production diseases (NMD) including bloat/tympany, acidosis, weakness; miscellaneous disorders (MD) including trauma, snake bite, multiple hairball in rumen, electrocution, accidental death and unknown reasons.

Data Analysis

The numbers of dead animals under different season, sex, age, disease and year were recorded. The mortality rate as per total herd strength in each year was calculated considering the total animals died to total herd strength of that particular year. Considering total number of dead animals, the per cent mortality rate were also calculated under different seasons, age, sex, disease and year using standard statistical procedure. Kaplan-Meier Survival Analysis (KMSA) was done to find out the cumulative probability of survivability at 1 to 5000 days of age of Nili-Ravi buffaloes during the study period by using SPSS [7].

RESULTS AND DISCUSSION

The season, sex and age-wise mortality pattern of Nili-Ravi buffaloes under different years were presented in Table 1. The overall mortality rate as per yearly herd strength was noted to be 4.67 per cent. The highest mortality rate (10.21%) was recorded during 1995-96 followed by 1997-98 and 1996-97. The mortality rate was much lower in 2005-06 and 2009-2010 (2.3 vs. 2.6%). The trend of mortality rate was almost similar (varied from 2.3 to 5.0%) in other years. The high mortality rate in 1995-96 might be due to the sudden outbreak of haemorrhagic septicaemia disease. Considering the season, maximum (44%) overall mortality was recorded in rainy season i.e. during July to October which might be due to the hot and humid weather of the region. Again, about 35 per cent overall mortality was noted during November to February. The severe cold stress might be responsible for that. The result also showed that March to June had lowest

Table 1: Season, Sex, Age and Disease-Wise Mortality Pattern under Different Years in Nili Ravi Buffaloes

Parameters		Number of mortality in different years																Total
		1994-1995	1995-1996	1996-1997	1997-1998	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	
Season	Mar. – Jun.	7	3	6	10	6	3	3	4	5	5	3	1	4	1	3	2	66 (21)
	Jul.-Oct.	4	28	10	8	6	4	6	10	3	6	10	4	17	5	14	5	140 (44)
	Nov.-Feb.	2	3	9	12	8	6	5	5	7	8	9	6	5	13	9	5	112 (35)
Sex	Male	8	13	11	13	8	3	5	9	7	6	9	4	10	6	8	4	124 (61)
	Female	5	21	14	17	12	10	9	10	8	13	13	7	16	13	18	8	194 (39)
Age (days)	0-30	1	1	5	5	2	2	3	2	-	3	1	1	9	5	6	4	50 (16)
	31-60	2	-	3	5	1	4	3	5	2	9	5	-	1	3	4	-	47 (15)
	61-90	5	2	2	6	2	-	2	1	2	1	1	2	1	-	5	2	34 (11)
	91-180	1	7	5	5	8	1	3	3	5	2	3	3	-	2	3	-	51 (16)
	181-365	2	8	1	1	1	1	1	-	1	1	4	1	4	2	4	1	33 (10)
	366-1095	1	3	-	2	1	-	2	1	-	2	6	1	1	1	1	2	24 (08)
	1096-3650	-	10	7	5	3	3	-	6	3	1	1	3	9	6	3	2	62 (19)
	>3651	1	3	2	1	2	2	-	1	2	-	1	-	1	-	-	1	17 (05)
Diseases	MARD	2	5	8	10	6	5	2	3	6	6	5	5	7	12	8	3	93 (29)
	MIRD	-	1	1	-	-	-	-	1	3	1	-	-	-	-	-	2	09 (03)
	MADD	4	2	1	1	3	1	3	6	2	6	-	-	4	1	5	2	41 (13)
	MIDD	-	1	-	3	-	-	-	-	1	-	1	-	3	-	1	1	11 (3.5)
	CVD	3	8	7	4	4	-	2	2	1	1	2	2	3	-	1	1	41 (13)
	PAD	-	-	-	-	1	-	-	1	-	-	-	-	-	-	2	-	04 (1.2)
	ID	1	14	1	3	-	2	-	-	-	1	2	2	4	-	2	1	33 (10)
	MSD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	01 (0.3)
	UGD/RD	1	-	2	3	-	1	-	1	-	1	1	-	2	-	-	-	12 (04)
	ND	-	-	-	-	1	-	-	1	-	-	3	-	1	-	-	1	07 (02)
	NMD	2	3	4	1	4	-	2	3	2	-	2	2	-	3	1	-	29 (09)
MD	-	-	1	5	1	4	5	1	-	3	6	-	2	3	5	1	37 (12)	
Total number of dead animals		13 (4.09)	34 (10.69)	25 (7.86)	30 (9.43)	20 (6.29)	13 (4.09)	14 (4.40)	19 (5.98)	15 (4.72)	19 (5.97)	22 (6.92)	11 (3.46)	26 (8.18)	19 (5.97)	26 (8.18)	12 (3.77)	318 (100)
Total herd strength		353	333	356	407	409	406	423	398	447	471	442	480	482	482	464	461	6814
Mortality rate as per total herd strength		3.68	10.21	7.02	7.37	4.89	3.20	3.31	4.77	3.36	4.03	4.98	2.29	5.39	3.94	5.60	2.60	4.67

Figures in the parentheses indicate the per cent mortality rate.

overall mortality rate i.e. 21 per cent. The weather of March and April in the farm region was generally comfortable to animals. Although the environment temperature was highest during May and June, overall mortality was lowest those months because of adoption of proper heat stress management strategies in the farm and minimum chance of growing microorganisms in the shed due to continuous exposure of sun rays in the shed floors. However, throughout sixteen years the season showed almost similar trend. Season had also shown no effect on buffalo calf mortality [4]. In Surti buffaloes, the report [5] of the effect of season on calf mortality depicted that winter months had highest (38.29%) death rate than during other seasons and there was positive association between season and diseases, with lowest deaths during summer.

The Table 1 depicted that the overall female mortality was higher (61%) compared to male (39%). The similar trend of high mortality was observed throughout sixteen years. In fact, as per matter of policy of the centre, those male calves were retained in the farm after completion of full lactation (either 305 days or cessation of lactation whichever was earlier) of their mother only when they came under selection for future use in the set. Otherwise, surplus males were sold. As a result, the overall male mortality rate might be lower. In another study report envisaged that the male calf mortality was 50.66 per cent while it was 49.33 per cent in female calves [4]. They pointed out that in their study area both male and female calves

were equally cared because calves in early age were usually required to stimulate milk let down and after weaning the preference was given to female as future herd replacement while male calves were usually sold out for beef purpose. However, the sex had no effect on the rate of mortality in young calves [3-4]. An epidemiological study [6] on buffalo mortality at 28 livestock farms of 14 states of India indicated that the death rates in males were comparatively higher in all age group except adults.

As per age was concerned, about 68 per cent mortality occurred within one year of age. Out of which 16, 15, 11, 16 and 10 per cent animals died between 0-30, 31-60, 61-90, 91-180, 181-365 days of age, respectively. The result envisaged that rate was comparatively more (19%) in 1096-3650 days age group than other groups which might be due to the death of more number of animals of this age group because of outbreak of disease in the farm during 1995-96. The group also had maximum number of animals out of total herd. It was also noted that maximum death of 0-30 days age group was during 2006-07 whereas the respective deaths of 31-60, 61-90, 91-180, 181-365 days age groups were during 2003-04, 1997-98, 1998-99 and 1995-96. The death was lowest in buffaloes of more than 3651 days which was probably due to the sale/auction of old age buffaloes. Kaplan-Meier curve showing cumulative probability of survivability at 1 to 5000 days of age of Nili-Ravi buffaloes during the study period (Figure 1).

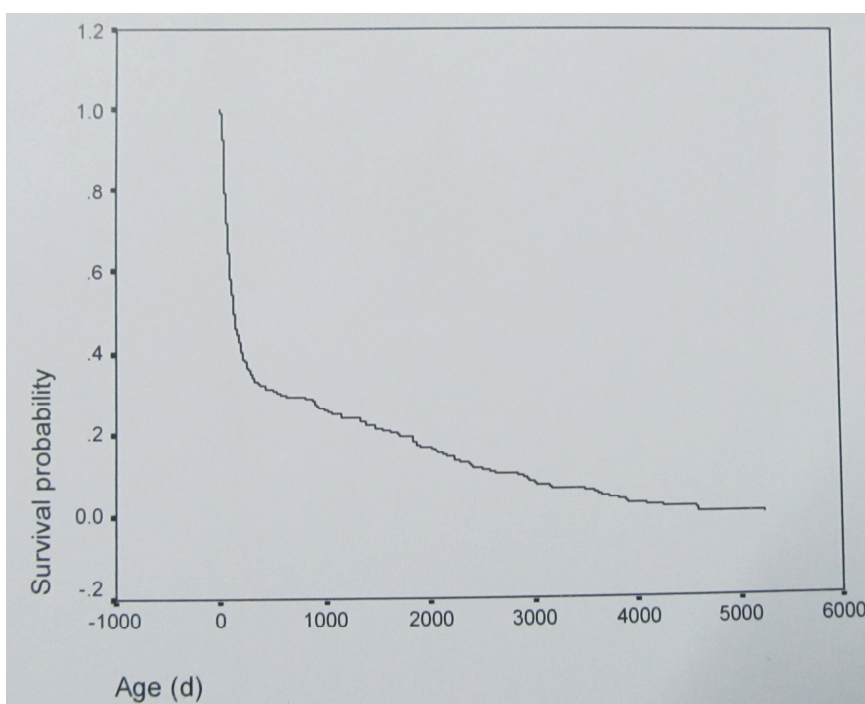


Figure 1: Kaplan-Meier curve showing cumulative probability of survivability at 1 to 5000 days of age of buffaloes.

Mortality of buffaloes at different age due to various diseases are also depicted in Figures 2-7. Mortality of buffalo calves was higher during the first three months of age, while it was lower at the age group of three months and above [4]. They also noted that statistically the mortality rate was influenced by age ($0 < 0.05$) of the calves. But, age from 3-6 months and above had no effect on calf mortality. Similar reports of high mortality rate in first month were also put forth by in Surti (33%) buffaloes [8] and in Murrah (36.8%) buffaloes [9]. The

mortality was 27.03 per cent in calves, 7.49 per cent in young stocks, 5.13 per cent in adults and crude death rate was 9.28 per cent [6]. He also envisaged that the mortality rate in calves was 3.6 times more as compared to the young stocks whereas the adults had 32 per cent less mortality.

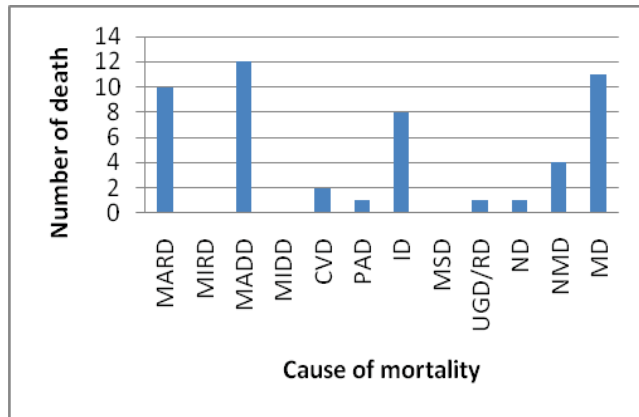


Figure 2: Mortality up to 30 days of age.

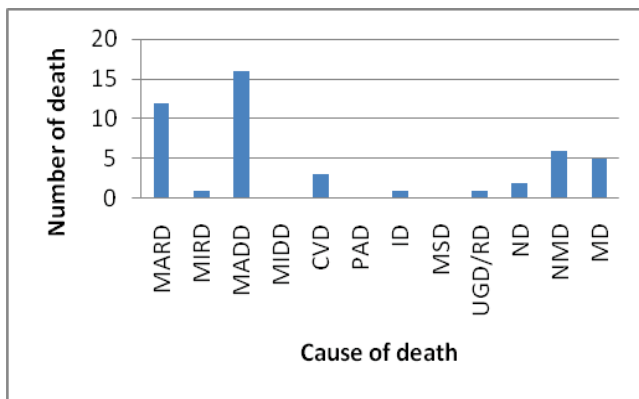


Figure 3: Mortality from 31 to 60 days of age.

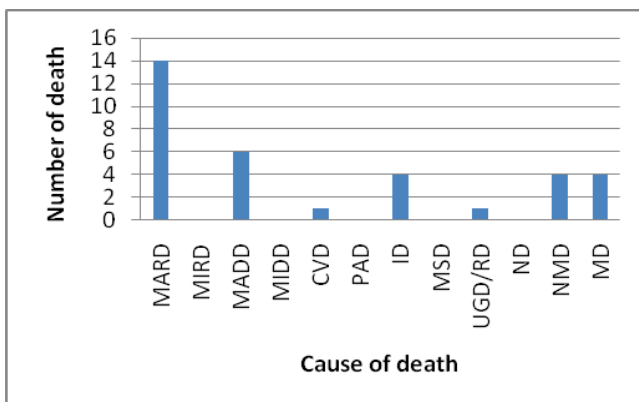


Figure 4: Mortality from 61 to 90 days of age.

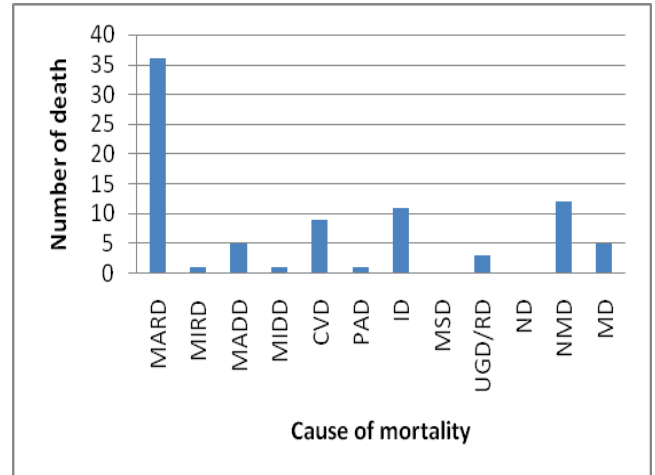


Figure 5: Mortality from 91 to 365 days of age.

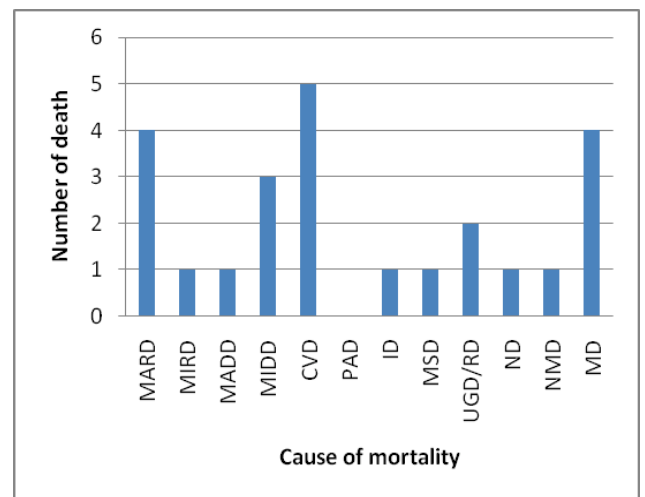


Figure 6: Mortality from 1 to 3 years of age.

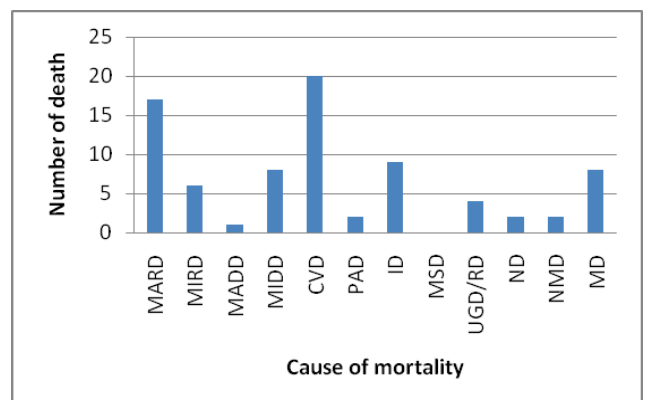


Figure 7: Mortality beyond 3 years of age.

The disease-wise mortality pattern of Nili-Ravi buffaloes are presented in Table 1. The investigation showed that majority of the buffaloes died due to different MARD (29%) followed by MAAD and CVD (13% each), MD (12%), and ID (10%). The table also clearly depicted that in most of the years MARD were the main causes of animal death in the farm except during 1995-96 where the maximum animal died in ID particularly due to the outbreak of haemorrhagic septicaemia. On the other hand, death of animals due to PAD, MSD and ND were minimum which might be due to the adopting of proper deworming programme, maintaining hygienic environment in the shed and feeding of balanced ration particularly use of minerals, vitamins in the concentrate feed. The buffalo calf mortality report [5] showed that there were 39.29 per cent death due to enteritis, 24.94 per cent due to pneumonia and 12.59 per cent due to pneumoenteritis. In another study, it was found that out of 1728 total deaths during four years period, 33.62 per cent were due to digestive disorders, 29.82 per cent due to respiratory diseases, and 17.48 per cent due to various specific diseases [6].

Considering the year-wise percent mortality rate, the present investigation showed that the maximum (11%) mortality of buffaloes occurred during 1995-96 followed by 9 per cent during 1997-98, 8 per cent each during 1996-97, 2006-07 and 2008-09. The per cent mortality rate was minimum (about 3%) during the year 2005-06. In most of the years under investigation, the per cent mortality rates of Nili-Ravi buffaloes varied between 4 to 7. The year-wise mortality rate of

buffaloes in another study [6] were also ranged from 6.5 -8.5 per cent with an average 7.5 per cent.

CONCLUSION

It can be concluded from above investigation that majority of the buffaloes died in the months of July to October. About two third of buffalo death occurred before reaching the age of one year. MARD followed by MAAD and CVD were the predominant causes of buffalo death under organised herd. This information will be beneficial in reducing buffalo mortality rate through adopting proper herd health programme of organized buffalo herd.

REFERENCES

- [1] Singh TP, Singh R, Singh G, Das KS, Deb SM. Performance of production. *Ind J Anim Sci* 2011; 81: 1231-8.
- [2] Prasad S. Mortality patterns. *Trop Anim Health Prod* 2004; 36: 645-54.
<http://dx.doi.org/10.1023/B:TROP.0000042855.58026.bd>
- [3] Khan A, Khan MZ. Epidemiological aspects. *P Vet J* 1995; 1: 163-8.
- [4] Khan ZU, Khan S, Ahmad N, Raziq A. Investigation on mortality. *J Ag Biol Sci* 2007; 2: 16-2.
- [5] Patil NA, Prasanna Kumar S, Mallikarjunappa S, Bhat ARS. Calf mortality. *Ind Vet J* 1992; 69: 1018-22.
- [6] Rathore BS. An epidemiological study. *Ind J Comp Micro Immun Infect Dis* 1998; 19: 43-9.
- [7] SPSS. Statistical Packages, Version 11.01, SPSS Inc., Illinois, USA 2001.
- [8] Patil NA, Mallikarjunappa S, PrasannaKumar S, Bhat ARS. Comparative study. *Ind J D Sci* 1991; 44: 526-8.
- [9] Pradhan B, Panda GM. Calving pattern. *Ind J Anim Prod Health* 1994; 10: 143-6.