EFFECTS OF SOME ENVIRONMENTAL SOURCES OF VARIATION ON BIRTH WEIGHT IN NILI-RAVI BUFFALO CALVES

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ABSTRACT

The present study was conducted to determine the effects of some environmental sources of variation on birth weight in Nili-Ravi buffalo calves born at Livestock Development Research Center Raroo Muzaffarabad over a period of 18 years. The data consisted of 416 calves born during the study period. Year of calf, sex of calf, birth season and parity were the main sources of variation on birth weight. The statistical analysis was carried out by using SAS statistical package program. The mean birth weight was 36.1±3.23 kg with a coefficient of variation of 8.62%. The birth weight ranged from 19 to 45 kg. The effects of calf sex, parity and birth season and birth year on birth weight were significant ($P<0.01$). Male calves were heavier (39.3±3.75 kg) as compared to female calves (33.2±3.21 kg). Birth weight of calves born during spring season had the highest value. The highest birth weight was recorded in 7^{th} parity, while the lowest birth weight was recorded in first parity. Heavier dams produced heavier calves, and as body weight of the dam at calving increased with age of the dam at calving, the birth weight of calves born also increased. This study indicates that environment is a very important source of variation for birth weight. The improvement and control in birth weight is possible by taking into account the environmental sources of variation while executing a breeding plan for Nili-Ravi buffaloes.

Keywords: *Bubalus bubalis*, buffaloes, environmental effects, birth weight, Nili-Ravi buffalo, Muzaffarabad Azad Kashmir, non-genetic effects

INTRODUCTION

Birth weight is the first observable polygenic character of animal, and it can be considered as the first phenotypic expression of individual's genotype and the difference of their subsequent growth (Yadav *et al*., 2001). It has been observed that birth weight of buffaloes are influenced by many environmental factors, for example sex of calf (Zaman *et al*., 2007; Hossein-Zadeh *et al*., 2012), maternal age (Thiruvenkadan *et al*., 2009), birth season (Ahmad *et al*., 2002; Hossein-Zadeh *et al*., 2012). These factors may suppress the animal's true genetic potential for growth (Thevarnanoharan *et al*., 2001). In the last five decades there has been a very high attraction in rearing of Nili-Ravi buffaloes in Azad Kashmir, as

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it has gained importance due to its versatile nature of acclimatizing itself to harsh environment of state. Nili-Ravi being a native of plains of Punjab, has performed exceedingly well in the hilly region; however, there has been scanty research work on different aspects and parameters of the buffaloes in the state. This research is therefore designed to evaluate birth weight and different environmental sources of variation on birth weight.

MATERIALS AND METHODS

In present study data regarding birth weight of 416 Nili-Ravi buffalo calves were collected from Livestock Development Research Center Raroo Muzaffarabad. The records were spread over a period of 18 years. The data consisted of animal's identification, date of birth, sire and dam tag number and birth weight and sex of the calf. It is a usual practice to record birth weight of new born calves within 5 to 10 h of birth. The data of Nili Ravi buffalo calves were checked for unrealistic entries and out liers. Records outside a range of 3 standard deviations from the phenotypic mean were removed. The animals were raised under intensive housing system. Covered sheds with open enclosures were provided. The animals were stall-fed. The seasonal fodders such as: Maize, Sorghum, Mott grass etc. in a chopped form were fed to the animals. Water sprinkling and fans were used to beat the heat in summer, while during winter nights when mercury touches zero the animals are confined to sheds with provision of some electric heaters. After birth, calves were fed colostrums for the first three days to increase their immunity against diseases. Vaccination and de-worming is a routine practice at the center.

The data on birth weight was analyzed to estimate the magnitude of environmental sources of variation. The environmental factors included year of birth (YB), season of birth (SB), sex of calf (cx) and parity (Par). The seasons of birth were designated as follows: Winter (December to January); Spring (February to March); Hot Dry (April to May); Hot Humid (July to September) and Autumn (October to November). The statistical model assumed for the evaluation of environmental factors on growth traits was therefore as follow:

$$Yijklm = \mu + YBi + SBj + cxk + Parl + eijklm,$$

Where: μ = population mean,

eijklm = the random error associated with each observation. The influence of various environmental factors on different growth traits of Nili Ravi buffalo calves was calculated by analysis of variance technique using Statistical Analysis System (SAS, 2004) software.

RESULTS AND DISCUSSION

The least squares means and standard errors of mean for birth weight are given in Table 1. The least squares means for birth weight was 36.1±3.23 kg with a coefficient of variation as 8.62%. The estimates were in line with findings of Ahmad *et al.* (2002), who reported mean birth weight of birth 36.3±3.23 kg in Nili-Ravi buffalo calves from Punjab, Pakistan: however present estimates were higher than mean literature values (Nawale *et al*., 1997). A higher birth weight (38.2±0.2 kg) as compared to present study was reported by Usmani *et al*., 1987 in Nili-Ravi. Akhtar *et al.* (2012) reported that least squares means for birth weight in Nili-Ravi buffaloes was 35.86±4.30 kg. All the sources of variation had a

significant effect (P<0.01) on the trait.

In the present study, the effect of sex on birth weight was determined to be statistically significant (P<0.01). Male calves were heavier (39.3±3.75 kg) as compared to female calves (33.2±3.21 kg). Male calves were 6.1 kg heavier than female calves at birth. The results were in accordance with (Kul *et al*., 2018; Hossein-Zadeh *et al*., 2012; Sahin and Ulutas, 2013; Zaman *et al*., 2007; Ahmad *et al*., 2002; Naqvi *et al*., 1999), who reported birth weight of the male calves were higher as compared to female calves. The results of present study were not in line with findings of Yadav *et al*., 2004, who reported that the effect of sex on birth weight was non-significant. In our study we came to conclusion that sex of calf was an important parameter for birth weight.

The means for birth weight of the calves born during different seasons varied significantly. Kul *et al*., 2018; Ahmad *et al*., 2002 also reported a significant effect of season of birth on birth weight in Anatolian and Nili-Ravi buffaloes from Turkey and Pakistan, respectively. Ahmad *et al*., 2002 reported that spring born calves were higher in weight as compared to calves born during other seasons. The results of Ahmad *et al*., 2002 were corresponding to the present study. In present study the birth weight of the calves born during hot season was lowest (35.2 kg) while the birth weight of the calves born during spring was highest (37.8 kg); followed by birth weight of the calves born during winter, hot-humid and autumn. The results of present study that spring born calves had the highest birth weight reflects the availability of plentiful best quality fodder during late winter and early spring months, while calves born during autumn season were having lowest birth weight which reflects the shortage of good quality fodder during the late summer and autumn months.

Parity of the dam also showed significant effect on the birth weight. The birth weight was smallest (34.2 kg) for first parity buffaloes, while it was highest (38.8 kg) for those buffalo calves born from 7th parity buffaloes. The present results were in partial agreement with Rao and Rao (1996); Thevamanoharan *et al*. (2001); Ahmad *et al*. (2002). Rao and Rao (1996) reported that in Murrah buffaloes birth weight was significantly lower in the first parity calves than that of the later parity calves. In present study heavier dams at calving produced heavier calves, and body weight of dams at calving increased with age at calving. Weight of the dam at calving had more pronounced effect on birth weight as compared to age of the dam at calving; the results were in agreement with Usmani *et al*., 1987.

The effect of year of calving on birth weight was statistically significant (P<0.01) in present study. These findings were in agreement with the findings of Ahmad *et al*., 2002; Akhtar, 2012, who reported a significant effect of year of season on birth weight in Nili-Ravi buffaloes in Punjab, Pakistan. The buffalo calves born during 1990 were lighter in weight (35.2±0.19 kg), while those born during 2001 were heavier (38.9±0.34 kg). There was a gradual increase in birth weight from 1990 to 2001, which is probably due to effect of parity. We have observed that as parity increased the weight of new born calves also increased and calves born during the 7th parity were the heaviest. It was observed that in 2001 the maximum number of buffaloes in 7th parity were present in the herd, resulting in heavier calves during that year.

CONCLUSION

The present research revealed that

Table 1. Least squares means and standard errors of mean for birth weight in Nili-Ravi buffalo calves.

Year of birth	Variables						
	Mean±SE	Overall Mean±SE	Level of significance	Variables	Mean±SE	Overall Mean±SE	Level of significance
				Sex of calves			
1990	35.2±0.19	36.1±3.23	**	Male	39.3±0.35	36.1±3.23	**
1991	35.4±0.17	-	-	Female	33.2±0.31	-	-
1992	36.1±0.25	-	-	**Season of birth**		-	**
1993	36.6±0.33	-	-	Winter	36.8±0.21	36.1±3.23	-
1994	36.8±0.25	-	-	Spring	37.8±0.44	-	-
1995	36.9±0.26	-	-	Dry Hot	35.2±0.33	-	-
1996	37.3±0.18	-	**	Hot Humid	35.6±0.26	-	-
1997	37.6±0.15	-	-	Autumn	36.3±0.27	-	**
1998	37.9±0.32	-	-			-	-
1999	38.2±0.21	-	-	**Parity**		36.1±3.23	-
2000	38.5±0.25	-	-	1	34.2±0.26	-	-
2001	38.9±0.34	-	-	2	34.9±0.23	-	-
2002	37.4±0.43	-	-	3	35.7±0.18	-	-
2003	37.8±0.17	-	-	4	36.5±0.27	-	-
2004	36.9±0.10	-	-	5	37.3±0.13	-	-
2005	36.8±0.21	-	-	6	38.2±0.33	-	-
2006	35.8±0.27	-	-	7	38.8±0.42	-	-
2007	36.7±0.20	-	-	8	38.6±0.44	-	-

environmental like sex of calf, parity, year and season of calving were very important sources of variation for birth weight of Nili-Ravi buffalo calves. It was concluded the effects of non-genetic factors should be given due consideration while formulating any breeding plan and birth weight can be controlled by controlling environmental sources of variation.

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