**Research Article**

# MORPHOMETRY OF THE FEMALE REPRODUCTIVE ORGANS OF THE MURRAH CROSS BUFFALOES IN CHITWAN, NEPAL

**B. Devkota[1]* and A.K. Singh[2]**

[1] Agriculture and Forestry University, Rampur, Chitwan, Nepal

[2]Institute of Agriculture and Animal Science, Tribhuvan University, Chitwan, Nepal

## ABSTRACT

The study was conducted to understand the normal morphometry of reproductive organs of Nepalese Murrah cross buffaloes. Reproductive organs of mature buffaloes (n=41) were collected from local slaughter house and normal samples (n=35) were used to determine the normal morphometry. Three diamentional measurements of the ovaries, structures within the ovaries, such as corpus luteum (CL) and follicles (F) and lengths and diameters of the cervix, uterine body and uterine horns were measured by using standard measurement techniques. Ovaries were categorized into 4 types on the basis of the presence or absence of one or both functional structures of CL and F $\geq$ 0.8 cm. The size of the reproductive organs of these buffaloes was almost similar with, or little smaller, to that reported for other breeds. The largest CL length and follicular diameter was 1.8 and 1.4 cm, respectively. There were significant correlations ($r \geq 0.56$, $p<0.001$) among the lengths, breadths, thickness and volumes of the ovaries. The overall size of the ovary was related to the presence or absence of CL and F$\geq$0.8 cm. The information documented in this study can be valuable while dealing with the clinical reproductive disorders, performing rectal examination, using transrectal ultrasonography and applying reproductive technologies in Nepalese buffaloes.

**Key words**: buffalo, reproductive organs

## INTRODUCTION

Buffaloes are the indispensable livestock resource of Nepal. There are more than 5.2 million buffaloes in Nepal, among which 1.37 million are milking buffaloes. This single species alone contributes >70 % to country's total milk pool and 60% to country's meat production (Government of Nepal, 2013).

It is known that buffaloes have a compromised reproductive performances associated with delayed age of puberty and first calving, prolonged calving interval, poor expressions of estrus signs, prolonged postpartum anestrus and seasonal anestrus (Nanda et al., 2003; Barile, 2005; Madan & Prakash, 2006; El-Wishy, 2007; Sah & Nakao, 2010; Devkota et al., 2012). These problems are related to disorders in reproductive physiology or anatomy (Rao & Sreemannarayana, 1983; Bondurant, 1999; Iqbal et a., 1991; Lohdi et al., 1999; Usmani et al., 2001; Ghanem et al., 2002; Azawi et al., 2007; Azawi, 2008). In order to understand the various disorders in reproductive organs such as metritis, endometritis, pyometra, mucometra, hydrosalpinx, cervicitis, vaginitis, anestrus due to inactive ovary and cystic ovarian, it is important to know the normal morphology and function of reproductive organs. Moreover, it is valuable to establish a reference morphometry of

* Corresponding author: bhuminand@gmail.com, bdevkota@afu.edu.np

reproductive organs for dealing the clinical reproductive problems, performing rectal examination, using transrectal ultrasonography and applying reproductive technologies.

The morphometry of the reproductive organs of buffaloes has been studied in other countries (Damodara, 1958; Ahmad et al., 1987; Al-Fahd et al., 2004; Kumar *et al.,* 2004; Gupta *et al.,* 2004; Carvalho *et al.* 2010), where the buffalo breeds are different than that of Nepal. In Nepal, the northern mountain region is the habitat of indigenous Lime and Parkote breeds, and the southern plain has Indian Murrah or its crosses. Several southern valleys, such as Chitwan, has buffalo population whose phenotypes are closer to Indian Murrah, and probably are the various blood level crosses between the indigenous and Indian Murrah breed. A little or no information is documented so far about the normal biometry of reproductive organs of these buffaloes. The objective of the present study, therefore, was to understand the basic morphometry of the reproductive organs of Murrah cross buffaloes bred in Chitwan, Nepal.

## MATERIALS AND METHODS

This study was conducted in the Institute of Agriculture and Animal Science, Chitwan, Nepal. Reproductive organs of mature buffaloes (n=41) were collected from the local slaughter house, transported in normal saline and measured for morphometry within 5 hours. Out of 41 samples, 35 were recorded as normal, 2 as uterine abnormalities (UA) and 4 as pregnant, and only normal samples were used to determine the normal morphometry. All ovaries (n=19) bearing corpus luteum (CL) from normal (n=14), pregnant (n=4) and UA (n=1) were used to study the nature of CL. Lengths more than 7 cm were measured by graduated tape and the shorter lengths and diameters were measured with the help of vernier caliper. The volume of ovary, and CL and follicle ($F \geq 0.8$ cm) after extirpation were measured by water displacement method using graduated cylinders. The diameters of the cervix and uterine body were measured at the mid points and uterine horns were measured just above the base of external bifurcation. The lengths of the cervix, uterine body and uterine horns were determined as the distances between the external to the internal os, the internal os to the internal bifurcation of the uterine horns and from the internal bifurcation of the uterine horns to the origin of the oviduct, respectively, after dissection. The distance between the internal and external bifurcation of the uterine horns were also measured after dissection. The length, breadth and thickness of the ovary were the distance from the anterior pole to the posterior pole, hilus to the free border and between the medial and the lateral surfaces, respectively. Ovaries were categorized into 4 types on the basis of the presence or absence of one or both functional structures such as CL and $F \geq 0.8$ cm. The data were expressed as mean ± standard deviation (SD). Statistical analysis was carried out by using JMP 5.1 (SAS, Japan) software. The relationships among the length, breadth, thickness and volume of the ovaries as well as morphometrical values of the cervix, uterine body and uterine horns were determined by multivariate analysis, and probability values of $P<0.05$ were considered significant.

## RESULTS AND DISCUSSION

The measurements of the cervix, uterine body and uterine horns are shown in Table 1. The lengths and diameters of the cervix and uterine horns observed in the present study are almost similar

with, or little smaller than, the previously reported lengths and diameters by Ahmad *et al.* (1987), Al-Fahd et al. (2004), Kumar *et al.(*2004), Gupta *et al.(*2004) and Carvalho *et al. (*2010) for other buffalo breeds. However, the discrepancy was observed on the length of the uterine body. The reason may be that we measured separately the lengths between the internal os of the cervix and the internal bifurcation of the uterine horns as the uterine body length (1.4±0.4 cm), and between the internal and external bifurcation of the uterine horns as distance between two bifurcation points (5.4±1.3 cm). If we combine these two lengths, our measurements are also closer to these reports. We observed that the actual internal length of the uterine body in the buffalo is almost negligible or very short and this knowledge is important during artificial insemination (AI) or embryo transfer (ET) in the buffalo. Significant correlations ($r \geq 0.55$, $P<0.05$) were observed between the two bifurcation points and the cervical, uterine body and uterine horn lengths.

**Table 1. The measurements (mean±SD) of the cervix, uterine body and uterine horns of 35 mature Murrah cross buffaloes in Chitwan, Nepal.**

| Parameters | Length (cm) | Diameter (cm) |
|---|---|---|
| Cervix | 5.9±0.9 | 2.5±0.6 |
| Uterine body | 1.4±0.4 | 2.7±0.7 |
| Left uterine horn | 24.6±8.2 | 2.1±0.5 |
| Right uterine horn | 25.7±8.1 | 2.1±0.6 |

**Table 2. The measurements (mean±SD) of the ovaries with (+) or without (-) CL and F≥0.8 cm in 35 mature Murrah cross buffaloes in Chitwan, Nepal**.

| Types of ovaries (n=70) | Length (cm) | Breadth (cm) | Thickness (cm) | Volume (cc) |
|---|---|---|---|---|
| $CL^{(-)}$, $F\geq0.8\ cm^{(-)}$(n=46) | 1.83±0.31 | 1.15±0.22 | 1.21±0.17 | 1.83±0.83 |
| $CL^{(-)}$, $F\geq0.8\ cm^{(+)}$(n=10) | 2.07±0.31 | 1.22±0.20 | 1.29±0.21 | 2.26±1.03 |
| $CL^{(+)}$, $F\geq0.8\ cm^{(-)}$(n=7) | 2.17±0.22 | 1.59±0.32 | 1.57±0.15 | 3.54±1.19 |
| $CL^{(+)}$, $F\geq0.8\ cm^{(+)}$(n=7) | 2.50±0.25 | 1.49±0.17 | 1.65±0.30 | 4.14±1.59 |

The measurements of the ovaries are shown in Table 2. Some differences were observed between the present biometry and the previous reports by Damodara *et al.,* (1958), Ahmad *et al.* (1987), Gupta *et al.,* (2004), Kumar *et al.* (2004) and Carvalho *et al.,* (2010). In general, the dimensions observed in this study revealed somewhat smaller ovaries and the reason may be due to breed difference or the methods adopted while measuring them, since the ovaries in the present studies were strictly measured after excising the extraneous bursa. Moreover, in contrast to the earlier studies, we grouped all the ovaries on the basis of the presence or absence of one or both functional structures such as CL and F≥0.8 cm and categorized them into four types as indicated in Table 2. Such categorical data can serve as a reference while understanding the ovarian dynamics prior to, or during estrus synchronization, AI, ET and follicular aspiration. The nature of CL observed

was as maroon colored in appearance, embedded (74%, n= 14) or protruded (26%, n=5) and with centrum (11%, n= 2) or without centrum (89%, n= 17). The maximum length and volume of CL, and diameter and volume of follicle were 1.80 cm and 2.25 cc, and 1.4 cm and 1.3 cc, respectively. There were significant correlations ($r \geq 0.56$, $P<0.001$) among the lengths, breadths, thickness and volumes of the ovaries. The overall size of the ovary was related to the presence or absence of CL and F≥0.8 cm.

In the present study, we were unable to specify the age, parity and body weight of buffaloes. However, it was confirmed that all were mature buffaloes. This is the first precise report on important morphometry of the female reproductive organs of buffaloes present in Chitwan, Nepal. The information documented here can be valuable as a future reference while dealing with the clinical reproductive disorders, performing rectal examination, using transrectal ultrasonography and applying reproductive technologies in the similar types of buffaloes in Nepal.

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