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**Original Research Article**

# Gross and Morphometrical Studies on the Kidney of Marwari Sheep (*Ovis aries*)

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**A B S T R A C T**

A study conducted on the kidneys of *Marwari* sheep of either sex between the ages of 1-2 years. The morphological studies was done on the kidneys of 24 sheep and revealed that right kidney was slightly longer than the left and there was no significant difference observed between the weight, width, thickness, circumference and volume of right and left kidneys. Both the kidneys were bean shaped smooth and reddish brown in color. The renal crest or common papilla formed by the fusion of six to twelve pyramids.

## Introduction

~~Ashwagandha [*Withania somnifera* (L.) Dunal] is an important medicinal plant of India belonging to Solanaceae. A native of Mediterranean region in North Africa, it is also found in Madhya Pradesh, Punjab, Himachal Pradesh, Western Uttar Pradesh and Himalayas.~~

~~It is cultivated in an area of about 4000 ha in India (Farooqui and Sreeramu, 2001). In Madhya Pradesh, it is cultivated in Neemuch, Chhindwara, Mandsaur, Seoni, Katni, Shahdol, Dewas, Dindori, Hoshangabad and Jabalpur districts. Roots are excellent for preparing medicines. Diseased leaves exhibited decrease in sugars (20%) and chlorophyll (26.5%) whereas; increase was noticed for proline (25%), free amino acids (3%) and proteins (74.3%).~~

~~The leaf blight of Ashwagandha caused by *A. alternata* revealed that a little information is available more particularly on disease prediction module in Madhya Pradesh leading to its management. Therefore, an attempt was being made for its management through fungicides, organic manure and biofertilzers.~~

## Materials and Methods

The present study was conducted on 17 to 22 kg body weight bearing fifty apparently healthy adult Marwari sheep (*Ovis aries*) of either sex, 7-12 months old age. The livers were procured from the freshly slaughtered animals at Municipal slaughter house, Bikaner. The measurment for various physical parameters like weight, length,

width, thickness and volume were carried out. Weight was taken with the help of physical balance, volume was measured by water displacement method, length, width and thickness were measured by measuring scale and Vernier callipers (Fig.1).

## Results and Discussion

### Gross examination

In the present investigation the kidneys were retroperitoneal and situated against the dorsal body wall. The right kidney was positioned between the 12$^{th}$ thoracic and the 2$^{nd}$ lumbar transverse process and the left kidney was positioned below the transverse process of first three lumbar vertebrae. Similar findings were also reported by Akers and Denbow (2008**)** in sheep**.** However Sisson and Grossman (1956) described that the kidney of sheep resembled to that of ox in position except that right one was usually little further back and lies under first three lumbar transverse processes. The cranial end of the right kidney was lodged in the renal impression of liver and was connected with the caudate lobe of liver by caudate ligament.

### Shape and colour

The kidneys were bean-shaped and reddish brown in colour. Both the kidneys were smooth externally without any superficial lobulation. Similar findings were reported by May (1955), Raghavan (1964), Getty (1977), Al Asadi (2006) and Akers and Denbow (2008**)** for sheep, Konig and Liebich (2006) and Dyce *et al* (2010) in domestic animals, Smuts and Benzuidenhout (1987) and Halder *et al* (2002 a) in spotted deer. Arnautovic *et al* (2007) found that there was a great similarity between surfaces, extremities, margins, lobes, color, shape and fat tissues in the kidney of sheep and dog.

The kidney was seen to be consisting of outer dark brown cortex and inner dull brown medulla (Fig.2) as mentioned by Chugh and Dhingra (1981) in buffalo, Smuts and Benzuidenhout (1987) in camel, Zade, *et al* (2007) in panther, Gaykee, *et al* (2008) in sambhar and Konig and Liebich (2006) and Dyce *et al* (2010) in domestic animals. The hilus was in the middle of the medial border. There was a renal crest or common papilla formed by the fusion of six to twelve pyramids. However May (1955) and Sission and Grossman (1956) described that the renal crest or common papilla of sheep is formed by the fusion of 12-16 pyramids.

### Gross Measurements

The weight, length, width, thickness, circumference and volume of right and left kidneys were recorded in 24 sheep (Table 1). The weight of right kidney ranged from 26.08 to 55.3 grams with an average of 40.18±1.42 grams. The weight of left kidney ranged from 24.85 to 52.7 grams with an average of 38.67±38.67 grams.

The length of right kidney ranged from 6.7 to 4.1 cm. with an average of 5.83±0.102 cm. The length of left kidney ranged from 6.3 to 4.54 cm with an average of 5.66±0.073 cm.

The average width, thickness, circumference and volume of the right kidney was 3.39± 0.108cm, 2.71± 0.057 cm, 9.89 ±0.082 cm, 41.08±1.19 ml respectively. Similarly the average width, thickness, circumference and volume of the left kidney were 3.37±0.107 cm, 2.69 ±0.051cm, 9.66±0.76 cm, 39.66±1.05 ml respectively. However the difference between the length, width, thickness, circumference and volume of right and left kidneys was non-significant.

**Table.1** Statistical details of different variable for weight, length, width, thickness, circumference and volume of right and left kidneys

| | Body weight (kg) | Kidney weight (gm) | | Kidney length (cm) | | Kidney Width (cm) | | Kidney thickness (cm) | | kidney circumference (cm) | | Kidney volume (ml) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | R | L | R | L | R | L | R | L | R | L | R | L |
| **Mean± SE** | 23.92± 2.78 | 40.18± 1.42 | 38.67± 1.24 | 5.83±. 102 | 5.66±0 .073 | 3.39±0 .108 | 3.37±. 107 | 2.71±0 .057 | 2.69±0 .051 | 9.89±0 .82 | 9.66±0 .76 | 41.08± 1.19 | 39.66± 1.05 |
| **S.D.** | 7.70 | 6.95 | 6.07 | 0.5 | 0.36 | 0.531 | 0.512 | 0.279 | 0.254 | 4.04 | 3.72 | 5.83 | 5.15 |
| **C.V.** | 32.19 | 17.29 | 15.69 | 8.57 | 6.36 | 15.66 | 15.19 | 10.29 | 9.44 | 40.84 | 30.50 | 14.19 | 12.98 |

**Fig.1** Photograph showing measuring length of the kidney.

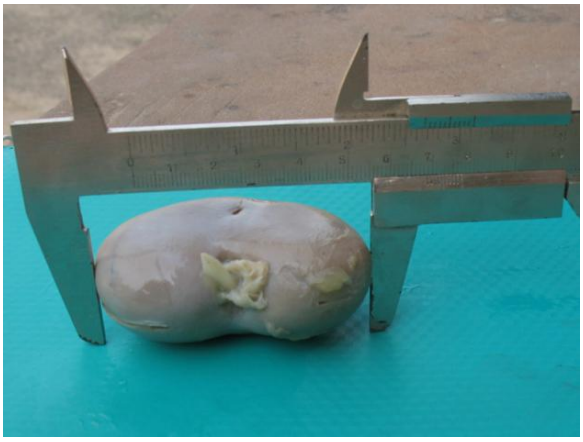
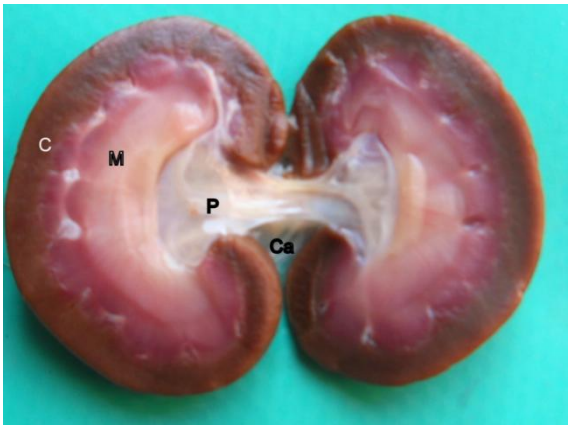


**Fig.2** Photograph Bisected kidney of sheep showing (P) Renal Pelvis or Hilus, (C) Cortex, (M) Medulla, (Ca) Capsule




In the present study the average weight, length, width, thickness and volume of right kidney are slightly higher than left kidney. These findings were opposite to the findings of Ladukar *et al* (2006) in 15-year-old black bear and were similar to those of Getty (1977) in horse and Halder *et al* (2002 a) in spotted deer. May (1955) and Sission and Grossman (1956) described in sheep that the average weight was about 4 ounces Its length is about 3 inches (7.5 cm), width is about 2 inches (5 cm) and thinned a little more than 1 inch (3 cm); however these values were lesser in the present study.

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