

## Back Fat Layer Measurements by Ultrasonography in Camels - A Tool for Measuring the General Health Status

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### Abstract

Since 1950's ultrasound has been used extensively for measurements in different parts of the body, but the early techniques were very labor-intensive and slow. In 1970, the technology has been improved by the introduction of scanogram and SVC scanner. Recently by using new generations of the portable equipment that are originally designed for medical purposes, the real-time ultrasonic scanning (RTUS) has offered the potential to produce accurate and quick measurements at lower cost. The applications were described in livestock industry of North America. The computed tomography was proposed as the standard method for quantifying abdominal adiposity since 1990. There has been substantial variability in the relative accuracy while measuring the back-fat thickness by ultrasound so require a well-trained examiner and specific equipment. Ultrasonography is a very simple and reliable technique for measuring visceral and subcutaneous fat. In addition to this, ultrasonography is a quick and non-invasive technique having very good reproducibility rates with intra-examination variation less than 1% and lower costs than computed tomography scans. It is very first time in Pakistan, the back-fat layer measurement was measured by ultrasonography in camel herd where slaughtering can't be performed in breeding stock. This paper will be a useful addition in the field of camel science.

**Keywords:** Camel; Ultrasonography; Back Fat Layer; Desert; Pastoral

### Introduction

Camels in Pakistan are very well adapted to their native environment and can sustain life in hot and harsh deserts [1]. The dromedary camel is a best source of milk and meat especially for those areas where production performance of other animals is adversely affected by the harsh environmental conditions [2-4]. This is due to its unique physiological characteristics that enable to tolerate higher temperatures, solar radiations, water scarcity, poor vegetation, and rough topography [5-7].

Ultrasonography is a very simple and reliable technique for measuring visceral and subcutaneous fat by showing a very strong correlation with both these adiposities when measured with a

computed tomography scan [8,9]. As it allows the individual visualization of intra-abdominal (visceral) and subcutaneous fat so expected to be the most specific and reliable method [10]. proposed the ultrasonographic usage for the measurement of visceral adiposity for the first time as an alternative to computed tomography. According to [11] there has been substantial variability in the relative accuracy while measuring the back-fat thickness by ultrasound so require a well-trained examiner and specific equipment.

### Ultrasonography in camels

[12] proposed the most reliable technique of ultrasonographic measurement of thickness of fat tissues. Aloka (SSD-900 by Tokyo, Japan) a linear array probe was used to perform ultrasonographic

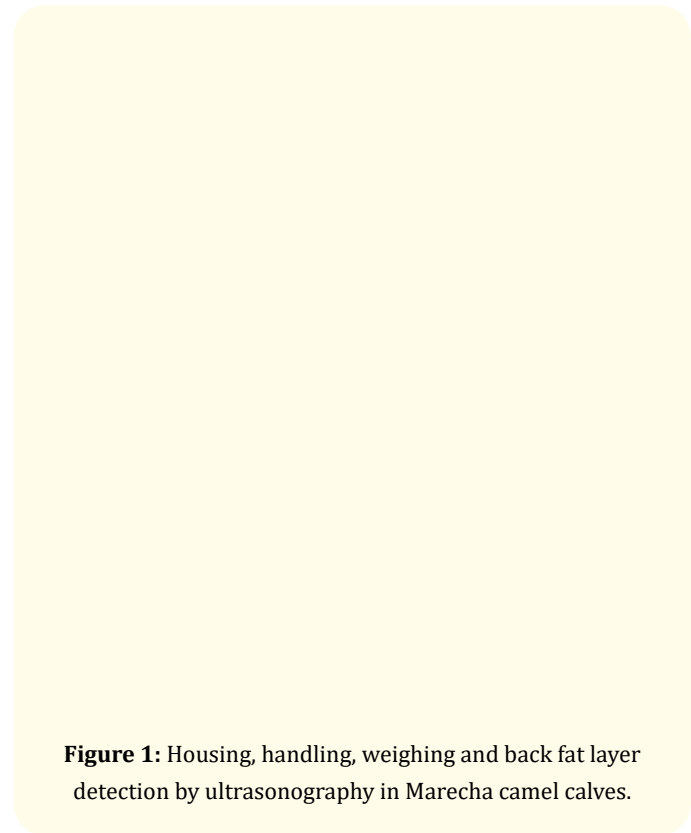
measurements in spine position. On the upper median abdomen, it was kept perpendicular to the skin and parallel to the skin in the midpoint between the xiphoid appendix and navel along the alba-line about the liver surface, longitudinal scan was done. Subcutaneous fat thickness and area in both the longitudinal and transverse views were measured on the xiphoumbilical line.

In tracking the carcass merit and composition ultrasound used to be a substitute for serial slaughter. To project future cutability grades ultrasound measures can be used as back-fat thickness increases at continuous definite rates [13]. Ultrasound is very sensitive to detect subtle changes in fat thickness over time and can be used to check live animal changes in absolute fat thickness so might be used as an alternate to slaughter in research studies. In trials where back fat thickness of live animals must be reported, if careful in sonification and echo graphic interpretation is done, that could be accepted as equivalent to a carcass measure. Thickness of the subcutaneous fat layer was measured on the right side of the animal between the 12<sup>th</sup> and 13<sup>th</sup> rib over the longissimus muscle. In sonification was done with an Aloka (210 B-mode ultrasound system) which was equipped with a 5-MHz, 56-mm scanning width, and linear array trans-rectal transducer (UST-5813-5). On the monitor of this instrument the image portrayal was of same size as the animal dimensions. The couplant used was mineral oil, cattle were not clipped, and no stand-off pad was used. Usually, the next day cattle were re-measured with the previous measures concealed. To allow the biological increase in the fat thickness between two readings regression analysis was equally applied to adjust the mean value of the first reading to that of second. Several elements in the measurement protocol were seemed to reduce errors in the back-fat estimates by ultrasonography [14].

Ultrasonic scanning is very effective in carcass measurements prediction in animals. Fat depths can be measured very accurately as on the carcass and rump fat depths were about 85% of scanning measurements [15]. According to [16] sternal recumbency is the most suitable position to perform ultrasonographic examination and the technique is non-invasive having the advantage that it could be applied on sitting non-tranquilized camels. A greater correlation between carcass measurements and ultrasonography was obtained by some researchers at 3<sup>rd</sup> and 4<sup>th</sup> lumbar vertebrae [17,18]. While the most common site is 12<sup>th</sup> and 13<sup>th</sup> rib to evaluate the transverse fat and lion muscle depth in lambs as reported by [19]. To predict lean mass and fat yield the total tissue depth is

a measurement included in carcass grading systems over the 12<sup>th</sup> rib at 11 cm apart from the midline of carcass in Australia [20], Canada [21] and New Zealand [22]. Ultrasonic measurements are more accurate tool for evaluation of fat and total tissue depths in animals and when only the fat depth assessment is required then the site between 12th and 13th ribs seemed to be more appropriate for this measurement [23].

In very recent study [24], performed ultrasonographical procedures in Marecha camel calves and documented that sternal recumbency is the most suitable position to perform ultrasonographical examination. They measured the back-fat layer by ultrasonography in feedlot calves of breeding stock and found back fat layer measurement above 4 mm in all animals and further confirmed the results by relating with body condition scores.



**Figure 1:** Housing, handling, weighing and back fat layer detection by ultrasonography in Marecha camel calves.

## Conclusion

Ultrasonography has offered the potential to produce accurate and quick measurement at lower cost. In tracking the carcass

merit, ultrasonography used to be a substitute for serial slaughtering. It is a very simple and reliable technique for subcutaneous fat measurement. Rump fat depths can be measured very accurately by ultrasonography. Sternal recumbency is the most suitable position to perform ultrasonographical examination; technique is non-invasive and could be applied on non-tranquilized camels.

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### Data Availability Statement

All relevant data are within the paper and supplementary materials.

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### Competing Interests

There is no competing interest.

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