EVALUATION OF UREA DILUTION FOR ESTIMATING CARCASS COMPOSITION OF FAT TAILED AWASSI SHEEP

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Summary

Thirty Awassi ram lambs were used to evaluate urea space (US) as an estimator of carcass composition. Urea space was measured 12 min following the infusion of 20% urea (130 mg urea/kg live weight (LW)). Lambs were slaughtered after urea dilution and weights of the full and emptied gastrointestinal tract and carcasses were taken. After chilling overnight, the left side of each carcass was physically dissected into bone, fat and lean. US/LW was related to percentages of carcass fat (PCF) and carcass lean(PCL) by the equations 21.6 - 0.03US (r^2= 0.90 $p<0.01$) and 46.9 + 0.07US (r^2= 0.76 $p<0.01$), resp. Negative correlations were obtained between US/LW or empty body weight (EBW) and each of tail fat,total fat percentage and PCF (-0.50, -0.48; -0.49,-0.48; -0.31 and -0,31). Positive correlation (+0.49) was estimated between PCL and US/LW. It is concluded that urea space measurement may be used as a practical estimator of carcass composition in fat tailed sheep.

Introduction

Accurate estimation of in vivo body composition is of great importance in research concerning factors that affect composition of gain. Several dilution techniques,e.g., tritium oxide, deterium oxide and urea have been developed to predict body composition in vivo . Such techniques were based on the relationship between total or empty body water and body composition (SHEBAITE,1977). Urea was shown to be a suitable substance for use as a tracer for estimating body composition. Urea is inexpensive, show a rapid distribution throughout the body water and is easily measured in blood and is not selectively stored. Several reports(KOCK and PRESTON (1979), HAMMOND et al(1984), RULE et al (1986) and BARTLE et al (1987)) have evaluated the urea dilution procedure as a predictor of body composition in cattle. Results of these studies indicated that this technique is potentially suitable in beef steers. In sheep, BARTLE et al (1988) indicated that urea dilution was related to body composition in lambs and that the proportion of variation in body composition accounted for by urea space was not satisfactory. The purpose of this study was to further evaluate the urea dilution technique as an estimator of body composition in fat tailed sheep.

Materials and Methods

Thirty Awassi ram lambs born during winter-1988 at the Animal Experimental Station Farm,College of Agriculture-Abu-Ghraib,Baghdad were used in this study. Lambs weighed on average 36.07 $\pm$ 3.6 kg at 6 months of age. They were fed individualy a concentrate diet containing 30% barley, 10% wheat, 43% wheat bran, 5% ground corn, 9% soy bean meal and 3% supplement . The day before slaughter, lambs were fasted ,weighed and urea dilution was determined following the technique described by PRESTON and KOCK (1973). A solution containing 20% urea dissolved in 0.9% saline (130 mg urea/kg live weight) was infused through a jugular vein catheter over 1 min period. The catheter was flushed with approximately 3 ml of saline afterurea infusion. Blood samples were obtained immediately before urea infusion and 12 min after infusion time. Blood was centrifuged at 3000 x g for 10 min and plasma was collected and stored at -20 c° until analyzed for urea N (FAWCETT and SCOTT , 1960). Urea space ,volume (liters) was calculated as a percentage of live weight (LW) and empty body weight (EBW) following the

formula described below :-

Urea space (%) = Volume infused ^{a} x concentration of solution ^{b} ÷ live weight or empty body weight in kg ÷ PUN ^{c}

a = volume of urea infused (ml) b = concentration of urea solution infused (mg urea - N / 100 ml)

c = difference in plasma urea nitrogen (PUN) taken from blood samples prior to and 12 min after infusion (mg urea - N / 100 ml). Carcasses were dressed according to commercial practice followed in Iraq . The weights of full digestive tract and its contents were determined to facilitate the calculation of a empty body weight. Thereafter, carcasses were chilled at 2-3 c° for 24h. after chilling, all carcasses were weighed, jointed into whole sale cuts, namely, neck,shoulder,rack,loins,legs,foreshank,breast,flank and fat tail. The left side of the whole carcasses was then physically disected into bone,fat and lean. The weights of caul,ruffle,kidney and pelvic fat were recorded. Correlation coefficents between carcass compositions (variables) and each of US/LW and US/EBW were estimated , prediction equations to predict PCL , PCF, tail fat percentage and chilled carcass weight from both US/LW and US/EBW were constructed . F-test was utilized to test the regression model of each given trial for significant variation .

Results and Discussion

The mean $\bar{+}$ SD of live weight,empty body weight,chilled carcass weight,urea space , fat tail and percentages of carcass fat, carcass lean are presented in table 1. The correlation coefficients of 0.49 and 0.48 were estimated between PCL and US/LW and US/EBW, respectively. These estimates were high and significant($p < 0.05$). However, a negative correlation estimates between PCF and US/LW or US/EBW were observed (- 0.31 and - 0.31). Negative correlation coefficients were obtained between US/LW or EBW and each of tail fat and total fat percentage (-0.50, -0.48 ; -0.49 ,-0.48). In consistent with these findings , BARTLE et al (1985) found that US was related negatively to percentage carcass fat in finishing lambs . Also later, BARTLE et al (1988) indicated that urea dilution was related to body composition in lambs. He reported that US was related negatively to percentage empty fat . Simillarly in beef cattle, BARTLE et al (1987) reported that urea space related positively to lean body percentage . This is supported by the findings of HELLER et al (1984) who found that skeletal muscle contained 86% of the blood urea concentration within 15 min after urea infusion.Prediction equations relating US/LW or EBW to carcass composition and chilled carcass weight are shown in table 2. These equations, given the best estimator of the studied variables based on US/LW or US/EBW can be very dependable in sheep. Regressions of PCF ,PCL ,total fat percentage on US/LW or EBW were significant ($p < 0.01$), which indicate that US/LW or EBW are very good indicator of PCF ,PCL and total fat percentage. Determination of fitting equations (R^2) were high and in the range of 0.76 - 0.99 . Results of analysis of residuals for regressions that used US expressed as a percentage of LW were similar in kind to those of US expressed as a percentage of EBW.

In conclusion, urea dilution appears to be a good estimator of in vivo carcass composition in fat tailed sheep.

Table 1 :- Mean ± SD for the studied traits

Trait	Mean ± SD
Live weight (kg)	36.07 ± 3.6
Empty body weight (kg)	31.8 ± 3.6
Carcass lean percentage	51.4 ± 3.4
Carcass fat percentage	19.5 ± 2.5
Tail fat	1.94 ± 0.4
Total fat percentage	32.8 ± 3.9
Chilled carcass weight	15.9 ± 1.8

Table 2 :- Constants (Intercepts) and Regression coefficients of prediction different traits using US/LW or EBW

Trait	US/LW		US/EBW		r^2
	constant ± SE	Regress. ± SE	constant ± SE	Regress ± SE	
PCL	47.1 ± 1.6	0.07 ± 0.02	46.9 ± 1.7	0.07 ± 0.03	0.76
PCF	21.5 ± 1.3	-0.03 ± 0.02	21.6 ± 1.4	-0.03 ± 0.02	0.90
Tail fat	2.5 ± 0.2	-0.01 ± 0.004	2.6 ± 0.26	-0.01 ± 0.005	0.77
Total fat percentage	37.6 ± 1.8	-0.08 ± 0.03	37.9 ± 1.9	-0.08 ± 0.02	0.77
Chilled carcass weight	17.07 ±0.9	-0.02 ± 0.01	17.2 ± 1.6	-0.02 ± 0.01	0.94

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