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Abstract

This study was carried out at the National Sheep Research Station in Elhuda, Sudan to investigate the situation of female sheep conditions while in gestation and to consult some aspects associated to pregnancy parameters and others on live weight were collected, processed and statistically tested in addition to variability consideration. Thus, live weight changes its variability and some relationships for certain reproductive traits in the Shugor and Dubasi subtypes of Sudanese Desert sheep ewes were studied from mating events to the immediate postpartum date. The overall live weight changes during this period resulted in an increase of 22.8 and 27.6% in the live weight of either of these two ewe groups ,respectively, but with an overall greater in live weight variability within the Shugor as contrasted with that within their contemporary Dubasi ewe group (11.33vs 8.27%, CV), having periodic mean value which ranges from 10.70 -13.5% CV and 7.2 – 8.5% CV, respectively, for the Shugor and Dubasi ewe groups. The combined contribution of the foetal lamb weights, foetal placenta fluids weights composed 20.0% for the Shugor and 17.9% for the Dubasi of the breeding (mating) live weight of each while the weight of the lamb at birth and that of the associated placenta had mean values of 11.1 ±0.06% and 1.23 ± 0.06, respectively, of the Shugor pre-partum ewe live weight but the corresponding mean proportional values in the Dubasi group were 9.48 ± 0.49% and 1.20 ±0.08 % .The regression of gestation length, post-partum ewe live weight and lamb birth weight had mean values of + 0.37 , + 0.71 and 0.002 as related to the breeding (mating) ewe live weight of the Shugor whereas the corresponding regression values in the Dubasi ewes were +0.03 ,+ 0.67 and + 0.03. None of these contrasting parameter values was significantly different in the two subtype groups. Similarly, the regression values of the placenta weight on the lamb birth weight were not significantly different, respecttively, - 0.02 and + 0.032 in the Shugor and Dubasi ewe groups. It is concluded that live weights variations in breeding females should be made manageable to their least possible to allow for more solid data, on the female and its offspring, as this is conductive to performance development.

Keywords: *Live weight; variability; traits; relationship; breeding/mating; pre-partum; post-partum placenta subtypes.*

1. Introduction

The sheep of the Sudan was extensively described by McLeroy (1961). Sheep, as well as other livestock, is vulnerable to short and/or long term-changes (±) in live weight arising from single or multiple effects that may intervene with their normal physiology. Type and extent of intervention is of great concern as to secure that the alteration is restorable. Sulieman et al. (1990), for instance, reported that the average seasonal and long-term live weight changes in adult breeding Shugor, Dubasi and Watish sheep, over the period 1979 – 1984, was around 2.4 kilogram throughout the year, excluding two months pre-partum and one-month post-partum ewes. The ewes in the former state had an average live weight of 41.5 kilograms, whereas those on the immediate post-partum had an average live weight of 39.5 kilograms. Such alterations have vital reflections on the reproductive performance of the sheep.

In the breeding (mating) ewes, such changes may arise and are complicated by the development of the conceptus, whereby, and by fourth to the sixth week of gestation (Robinson,1974) the differentiation of the embryo into its major components is completed. The foetal complex hence makes rapid growth and towards the end of pregnancy, the growth of the foetus overrides that of the placenta which, practically, begins to degenerate and decrease in size. On the other hand, Robinson et al. (1977) stated that the foetal fluids increase more slowly than the foetus and its membranes during most of the gestation period, but they tend, by lambing time, to add up at a more increased rate. The present study was executed with the intension of disclosing the pattern of live weight fluctuations and the associated trends of certain pregnancy components, exhibited by the adult breeding Shugor and Dubasi ewes from mating to lambing because these are considered viable concerns to a successful reproductive performance in the flock.

2. Materials and Methods

2.1. Experimental Animals and Management

Female Shugor (SH) and Dubasi (DU) sheep from a breeding flock of216 were studied during gestation in the National Sheep Research Station at El Huda town. These flocks were subsequently described by Sulieman et al. (1978), Sulieman and Essawi (1984a), El Karim and Owen (1987) and Sulieman et al. (1990) and they make the original flocks availing in the Station for scientific research. They were routinely housed and managed to receive pen-catering in addition to grazing agricultural by-products, rain-fed grasses, fodder crops and with an offer of concentrate supplement under especial circumstances.

2.2. Data and measurements

Data collected comprised those for the live weight, in kilograms (Kg), of ewes at mating, immediate pre-partum, immediate post-partum and fortnightly between mating and shortly before lambing (pre-partum). Additionally, lamb birth weight and the placenta weight were also recorded. Every individual weight was taken twice and the average of the two weighing procedures was recorded for the parameter in question. The ewes were weighed early in the morning, as was programed, before sending them to graze. The placenta was weighed, free of any traces of superficial fluids or soils, as well as was for the lamb.

2.3. Statistical Analysis

This operation was executed by analysis of variance, t- test and simple regression, as was described by Little and Hills (1978), using Texas Instruments Programmable Calculator (TI58). The mean values of parameters in the SH and DU were thus prepared with their standard errors (±). Mean proportional values, ±standard errors, for the weights of lambs and placentas, at birth, were derived based on the immediate pre-partum ewe live weight. The fortnightly measured live weights in each ewe group (16 of SH and 31 of DU) were plotted along 8 fortnights, together with the immediate pre- and immediate post-partum ewe live weights. These live weights appear in Figure 1 with coefficient of variations (CV %) to reflect the variability of each of these live weights along the course of the events under investigation. These coefficients were t-tested to assess their variation between the two ewe groups.

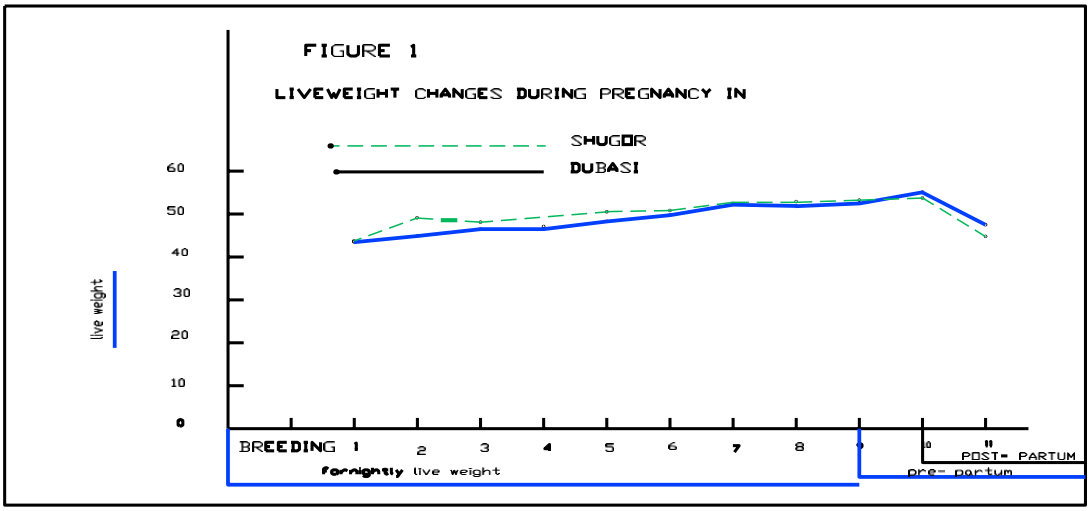

Figure (1): Live weight changes during pregnancy in mature Shugor and Dubasi ewes.

Figures 2, 3 and 4 represent the linear regression of the immediate post-partum ewe live weight, gestation length and lamb birth weight, respectively, on the ewe breeding (mating) live weight. Also, the regression of the placenta on the lamb birth weight was shown in figure 5. Tables 1 and 2 were prepared to depict mean values of some of the parameters considered.

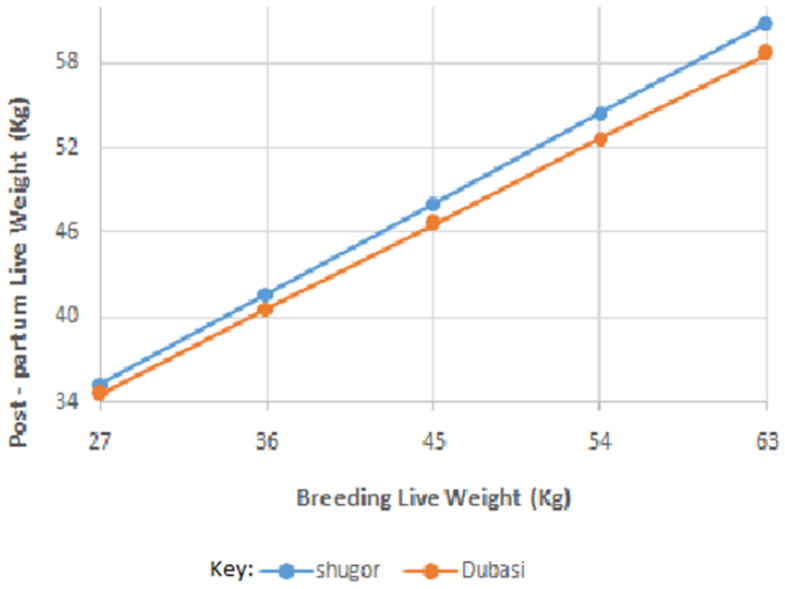

Figure (2): Linear regression of post – partum live weight on breeding live weight in Shugor and Dubasi ewes .

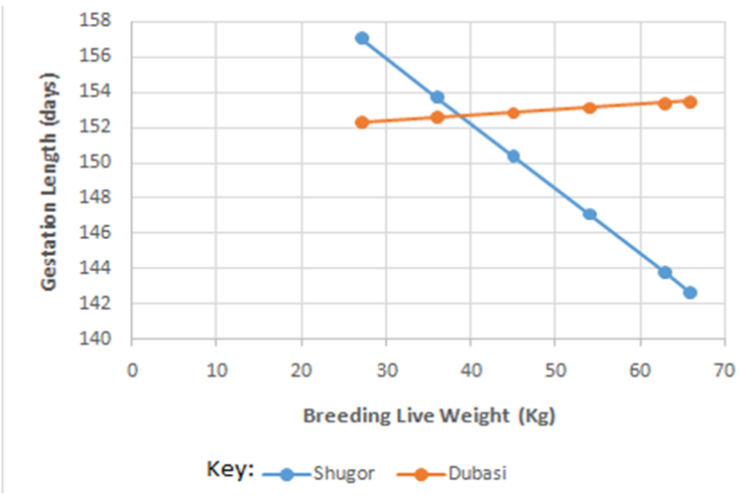

Figure (3): Linear regression of gestation length on Breeding live weight in Shugor and Dubasi ewes.

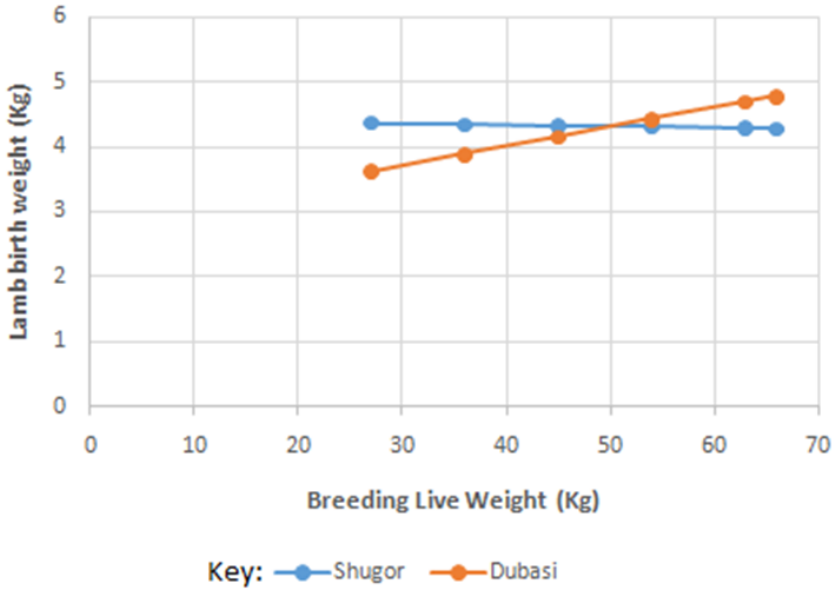

Figure (4): Linear regression of lamb birth weight on breeding ewe live weight in Shugor and Dubasi ewes.

3. Results and Discussion

The results obtained relate to those of live weights at mating, and lambing (Table 1) and those fortnightly measured, from breeding to lambing, are plotted in Figure 1. The two sub-types sheep had non-significantly different live weights measured at breeding (mating) or at the immediate post-partum (lambing). These live weights are 43.3±0.57 and 42.9±0.61 Kg at mating and 46.8±0.61 and 45.2±0.73 Kg at the post-partum, for the Shugor and Dubasi, respectively, (Table 1).

Table (1): Some Parameters of Breeding mature Shugor and Dubasi Sub-types of Sudan Desert Sheep Ewes

Sheep group	Shugor			Dubasi		
Parameters			**% of Pre-partum weight			% of Pre-Partum weight
	N	$\bar{X}$ ±SE	$\bar{X}$ ±SE	N	$\bar{X}$ ±SE	$\bar{X}$ ± SE
Mating live weight, Kg	115	43.3±0.57		101	42.9 ± 0.61	
*Fortnightly live weight variability, CV%	11	11.33±1.08		11	8.72 ± 0.82	
Gestation length, days	60	151.3 ± 2.25		96	152.8 ± 0.36	
Post-partum live weight, Kg	115	46.8± 0.61		101	45.2 ± 0.73	
Lamb birth weight, Kg	92	4.32± 0.09	11.1 ± 0.56	96	4.09 ± 0.09	9.48 ± 0.49
Placenta weight, Kg	31	0.60 ± 0.03	1.23 ± 0.06	26	0.74 ± 0.12	1.20 ± 0.08

±se = Standard error
CV% = Coefficient of Variation, Percent
$\bar{X}$ = Mean value of parameter in question
SE= Mean Standard error
*Fortnightly live weight variability = Fortnightly gestational ewe live weight variability measured in terms of percent coefficient of variation (CV).
**% of Pre-partum weight = values indicate percent proportions of the parameter out of pre-partum ewe weight.

N = Number of the animals

Breeding and post-partum live weights vary under different conditions as, for example, body maturity, management and breed. In this respect, Sulieman et al. (1990) reported that, on average, breeding mature SH and DU ewes' live weight was, on a long-term respect, 41.6 Kg, in which case ewes in the region of two months pre-partum and one month post-partum were exempted, whereas the immediate post-partum live weight was 39.5 Kg. However, they indicated that, on annual basis, fluctuations in live weight throughout the year were of the order of 2.4 Kg in either of the SH or DU, observing that in the present study, the overall average change in live weight during gestation was found to be 22.8% and 27.6% of the breeding live

weight in the SH and DU, respectively. The contribution of the resulting pregnancy products' weight, alone, amounted to 20% and 18% of the breeding live weight in either of the two ewe groups, respectively.

Plotting the periodic (fortnightly) live weights in Figure 1 demonstrates the pattern of alterations of these live weights during pregnancy. The mean values of the coefficient of variations (CV%) of these weights variability levels range as: 10.70 – 13.5% and 7.20- 8.50 % having an over average value of 11.33 ± 1.08 % and 8.72 ± 0.82 %, respectively for Shugor and Dubasi sub-types. The latter was found on an average of 11.33±1.08 % and 8.72±0.82% in the two sub-types, respectively, indicating more conformity in live weight in the DU than in the SH ewes during pregnancy.

Coop (1962) noted that an increase of 5 Kg in live weight during gestation was associated with an increase of 6% in lambing rate, measured in terms of ewe actually lambed in Merino and Romeny ewes. Also Mukasa-Mugerwa et al. (1994) observed that ewes which gave birth to twins were significantly heavier and had an improved body condition score (BCS), in contrast to those single bearing ewes (26.5±0.7 Kg and 2.8±0.1, BCSvs 22.3±0.3 Kg and 2.4±0.1, BCS). They indicated that this was consistent with the steady increase in twinning rate with rising live weight at mating from zero to weaning at ≤15 Kg to 31.3% to weaning, at 30 Kg or more. Likewise, Luginbuhl and Poore indicated that, in goats, an offer of rising level of feed supplement was provided to raise their breeding live weight and improve their reproductive performance. However, Molle et al. (1997) reported that ewe live weight changes during gestation were not affected by nutritional facilitation and that ewes in the most favorable nutritional offer could only maintain their live weight while their body condition tended to stay within the 2.7 – 2.9 scores range. But El Hag et al. (2007) reporting on the Sudan Desert, Hamari sub-type; 3-8 years old, observed that ewes with an overall average 41.2 Kg breeding live weight tended to end up with 39.33, 42.12, 41.94 and 44.39 Kg as lambing weights and sizably negative weight changes within -2.49, and -1.96 Kg for a control and a flushed ewe groups. On the other hand, Idris et al. (2010ab) observed that condition scores in breeding female Hamari sub-type of Sudanese Desert sheep were increasing in response to feed supplementation during mating and that alterations in ewe body live weight in ewes more than three years in age were not experienced before the fourth week post-partum.

For gestation length in the present study, Table 1 depicts a period of 151.3±2.25 and 152.8±0.36 days for the SH and DU, respectively, with bigger variation within the former group, but the two mean values were not significantly different. But Sulieman and Essawi (1984a) observed that the Sudanese Desert sheep subtype Shugor had significantly longer gestational period (154.14±3.8 days) than either of their contemporaries Dubasi (152.7±3.8 days) or Watish (152.8±3.0 days). These authors also found that there was a tendency towards a negative correlation between gestation length and birth weight in the order of -0.659, -0.003 and -0.092, respectively in these three sub-types, which was significant only for the Shugor. However, moderately lower gestation periods of 149.0±2.0 and 149.0±8 days were shown for Menz ewes by Mukasa-Mugerwa and Lahlu-Kassi (1995), but an existence of more variation in this period's length was shown in the data of Hassan and Talukder (2011) as: 152.8±3.8, 145.0±4.1 and 146.6±5.4 days, in different regional native sheep in Bangladesh.

Lamb birth weight (Table 1) is not significantly different between the two ewe sub-types but its proportion (Table 1) in the pre-partum ewe live weight in the SH (11.1±0.56%) is bigger than that (9.48±0.49%) in the DU. While the placenta had smaller weight (0.6±0.03 Kg) in the SH (Table 1) compared to that (0.74±0.12 Kg) obtained for the DU (Table 1), it had about similar proportions (Table 1) relative to the ewe pre-partum live weight (1.23±0.06% vs 1.20±0.08%).

As for birth weight measures, those shown in (Table 1) are very similar to those previously reported in this area for some Desert Sheep, for instance, Sulieman and Essawi (1984b) who reported an average 3.96 and 4.04 Kg for the SH and DU, respectively for this parameter, but Sulieman et al. (1990) described an overall average of 3.29 Kg and individual birth weights of 3.62 and 3.47 Kg for the SH and DU and 3.17 Kg for a third sub-type (the Watish) in this consideration. Aside from breed variations, however, Mukasa-Mugerwa and Lahlu-Kassi (1995) indicated that ewe nutrition and gestation weight changes, influenced lamb birth weight which was reflected in lamb viability. In regard to the placenta weight, the information mentioned above (Table 1) demonstrates the difference which may exist when this information is further compared with other data that was obtained on smaller sized sheep, for instance, Mukasa-Mugerwa and Lahlu-Kassi (1995) who reported that the placenta in Menz sheep weighed 210±80 grams (about 10% of lamb birth weight) and that much of its growth was accomplished earlier in the gestation period. Also, Hassan and Talukder (2011) reported that the placenta, in three regional native Bangladesh sheep, weighed: 355.5±14.1, 335.9±15.5; and 331.0±18.6 grams, composing about 28, 25 and 22% of birth weight, respectively. The relevant data, in this respect, in our study, represents 14 and 18% for the SH and DU, respectively. Mukasa-Mugerwa and Lahlu-Kassi (1995) noted, further, that ewes gaining weight had heavier placenta weights and there was therefore positive relationship between placenta weight and number of placentomes and birth weight.

Table 2 (A=B): Relationship between Some Pregnancy Products in Shugor and Dubasi Sub-types

Ewe Group / Relationship	Shugor Rxy*	Dubasi Rxy*
A-breeding live weight with:		
Gestation length	+0.37	+0.03
Postpartum weight	+0.71	+0.67
Lamb birth weight	-0.002	+0.03
B- lamb birth weight with:		
Placenta weight	-0.02	+0.32

Rxy* = Coefficient of Regression.

In Table (2) the regression of gestation length, post-partum and birth weights on breeding ewe live weight, is shown in part (A), whereas the regression of the placenta on the lamb birth weight is presented in part (B) of the table. These relationships are further illustrated in the Figures: 2, 3, 4 and 5. For both A and B Table2 parts these mean values tended, in their strength, to be poor, moderate or relatively strong, with different positive or negative signs in the two ewe groups. Frank understanding of such relationships is considered of utmost importance so as to maintain a reasonably sound and productive course of events between breeding and lambing in a flock of sheep. Before reaching at a conclusion for the present relationship parameter performance, it should be strongly advocated that more trying, in this respect, is needed.

4. Conclusion

It is concluded that restoration of optimal management conditions, in a breeding flock of sheep, is of high priority to keep live weight and reproductive traits variations within their least possible levels. This may include per head catering of individual breeding individual breeding ewes to avoid unnecessary competition to available feed. Obtainable data could thus be more feasible for comparison to provide more valid information.

4.1. Recommendations

Live weight and reproduction are mark lands for the science of production in a flock of sheep, and therefore, it is the only way to look into these to explore and plan for targeted productivity development. Investigations patterns of live weight growth and probable trends of association relations of production parameters pave the way and setup tangible material towards better utilization of the sheep as an economic tool for national welfare. Since the local national research efforts on these lines are meager, it is strongly advocated and recommended that these landmarks will be brought forth for due scientific thinking and promotion of the sheep flocks productivity development since the sheep constitute the first priority, at least for the present time, to an actively revivable and survivable livestock economics.

4.2. Acknowledgement

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Concerning references in the present study: they are basic and relevant let aside the dearth of farm activities and systematic production lines to generate up-to-date local information.

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