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Study of correlation between different morphometric traits in Kanni goats

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Abstract
The present study was undertaken to study the correlation between body weight and different morphometric traits in Kanni goats. Data was collected from forty (40) Kanni goats of both sexes on different age groups. The goats were classified into three groups based on the permanent incisor's teeth *viz.*, one year (first permanent incisor), two years (two permanent incisors), and three-years age groups (three permanent incisors). Scientific management practices like feeding, vaccination, deworming and other practices were followed. The different morphometric traits such as body length, chest girth, paunch girth, height at withers, rump height, tail length, neck circumference, head length, and rump length were recorded. During one year of age group, only bodyweight had a highly positive correlation with body length (r=0.777). In the two-year age group, body weight had a high correlation with chest girth (r=0.776). Correspondingly, at three years of age group, the body weight had a highly significant correlation with body length was (r=0.811), chest girth (0.920), height at withers (0.890), rump height (0.910), tail length (0.850), neck circumference (0.815). This indicates that there is exists a strong linear correlation between body weight with body length, chest girth, height at withers, rump height, tail length. This study will help the farmers to know the relationship between body weight with other body morphometric traits in Kanni goats and these traits were used to improve the body weight so that they can select the elite animals for a future breeding program.

Keywords: Body weight, body length, chest girth, correlation, Kanni goats

Introduction
India is home to 148.88 million numbers of goat population. It has been increased to 0.85% as compared to the previous year (Anonymous, 2019) [6]. Goat produces meat, milk, wool, manure, and fibres it plays a very significant role in the rural economy and other backward class people to enhance their livelihoods to climb their poverty ladder as well as asset growth. Goat meat is contributing about 14% of the total annual meat production. The breeding tract of Kanni goats is mainly found southern part of Tamil Nadu, especially in Sattur and Sivakasi taluks of Virudnagar district; Kovilpatti, and Vilattikulam taluks of Tuticorin district; Sankarankovil taluk of Tirunelveli district. This breed is also called Kanni Adu and Varikan Adu. These goats have white strips on either side of the face extending from the base of the horn to the corner of muzzle and white lines on the edge of ears. The majority of the animals have a white patch or lines on either side of the neck. The different morphometric traits are used to assess several characteristics and will give significant evidence for the growth of the animals (Pesmen and Yardimci, 2008) [16]. In addition, various morphometric traits are important sources in terms of reflecting the breed standards (Riva *et al.,* 2002) [17] and are also important in giving information about the morphological structure and development ability of the animals.

The most common morphometric traits in goats are body weight, body length, body depth, head length, head depth, ear length, height at withers, width at withers, rump height, heart girth, neck circumference, tail length, and width. Among, these morphometric traits, body weight plays a vital role in determining economically important traits in farm animals. Estimating the body weight using body measurements is practical, faster, easier, and cheaper in the rural areas where the sources are insufficient for the breeder (Nsoso *et al*., 2003). Generally, the correlation was significantly highly reported between body weight and heart girth in small ruminants. Therefore, Atta and El khidir, (2004) [17] reported that body weight can be measured using different morphometric traits

However, many literatures are available on body weight and other body morphometric traits such as body length, chest girth, paunch girth, height at withers, rump height, tail length, neck

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circumference, head length, and rump length. The aim of the present investigation was undertaken to study the correlation between different morphometric traits. This study will help the farmers to know the relationship between body weight with other body morphometric traits in Kanni goats and these traits were used to improve the body weight so that they can select the elite animals for future breeding programs.

Materials and Methods
Location of Study: The study was carried out at Livestock Farm Complex, Veterinary College and Research Institute, Tirunelveli, TANUVAS, Tamil Nadu. The temperature recorded in this area ranged from 95°F and 77°F respectively.

Ethical Approval: The present study does not involve any intervention of collection of blood or the tissues from the animals under the study.

Experimental animals and Data collection
In the present study, the data comprised of forty (40) Kanni goats of both sexes on different age groups. Based on the permanent incisor's teeth goats were classified into three categories viz., one year (first permanent incisor), two years (two permanent incisors), and three-years age groups (three permanent incisors). The experimental animals were subjected to the traditional management system, which allows them to graze and feed on communal land during the day and returns them to the shed. The scientific management practices such as feeding, vaccination, deworming and other routine practices were followed.

Statistical analysis
The statistical data package for social science (SPSS, version 21) was used to analyse the data at 5% level of significance. The correlation between body weight with different body measurements were calculated by Pearson correlations method.

Results and Discussion
Correlation between body weight and different body morphometric traits
The correlation between body weight and other body morphometric traits such as body length, chest girth, paunch girth, height at withers, rump height, tail length, neck circumference, head length, and rump length are presented in Table 1, 2, and 3 respectively. In the present study at one year of age group (one pair of permanent incisors) body weight had a positive correlation with body length (r=0.777), chest girth (0.301), paunch girth (0.528), height at withers (0.670), rump height (0.603), tail length (0.657), neck circumference (0.463), head length (0.475) and rump length (0.510) respectively. The body weight had a significantly ($P<0.05$) positive correlation with body length (r=0.777). However, the highest correlation was observed between body length & paunch girth, rump length and neck circumference were (r= 0.701) and (0.835) respectively. There is no negative correlation was observed between body weight with other body measurements during this period.

In two-year age group (two pair of permanent incisors) the correlation between body weight with body length (r=0.453), chest girth (0.776), paunch girth (0.694), height at withers (0.624), rump height (0.616), tail length (0.460), neck circumference (0.463), head length (0.475) and rump length (0.605) respectively. All the linear body measurements were showed a positive correlation with body weight. However, the

chest girth had a significantly ($P<0.05$) positive correlation with body weight (r=0.776). The highest correlation was observed between height at withers & chest girth, rump height, and height at withers were (r= 0.721) and (0.780) respectively. Correspondingly, three-year age group (three pair of permanent incisors) correlation between body weight with body length was (r=0.811), chest girth (0.920), paunch girth (0.353), height at withers (0.890), rump height (0.910), tail length (0.850), neck circumference (0.815), head length (0.562) and rump length (0.620) respectively. Among these nine body measurements, rump height (0.910) had the highest correction coefficients than other traits whereas, paunch girth (0.353) had the very lowest correction coefficients. During 3-4 years of age groups, paunch girth was found to be not significant with height at withers and head length with the values of (-0.059) and (-0.348) respectively.

The findings of the present study were comparable with an earlier finding of Mathapo *et al*. (2021) studied that body weight had a highly significant positive correlation with body length (r=0.727) in boar goats. This positive correlation ($P<0.05$) between body weight and other body morphometric traits was agreement with Melesse *et al*. (2013) reported that body weight had high correlation with body length and chest girth in sheep. Abdallah *et al*. (2019) reported the highest and positive correlation ($P<0.01$) between body weight and neck circumference (0.997) for the males and of paunch girth (0.978) for female goats. Many researchers like Mukharjee *et al*. (1981), Singh and Mishra 2004; Abdel- Mageed and Ghanem (2013) [3], and Abd-Allah *et al*., 2019 was revealed that higher significant correlation between body weight with chest girth in Shami, Brown Bengal goats, grey Bengal and Barbari goats. The correlation coefficients between the body weight and other morphometric traits were ranged as heart girth, body length, chest depth, and withers height with the values of 0.95, 0.86, 0.77, and 0.55 respectively in Sannan goats (Pesmen and Yardimci, 2008) [16].

The highest correlation was observed between body weight with heart grith(r=0.76) which can be used as an indirect selection criterion in the absence of weighing scale (Khan *et al*., 2006). A high correlation (0.82) was observed between body length and height at withers (Adhiant *et al*., 2020) [4]. Positive correlation of similar magnitude with body weight and body linear measurements have been reported Mubende and small east African goat breeds in Uganda (Jimmy *et al*., 2010) [12], central high land, and Woyto-Guji goat breeds of Ethiopia (Zergaw *et al*., 2017) [20]. Similar findings were also revealed by Thiruvenkadan (2005) [19] in Kanni goats, Malabari goats (Alex *et al*., 2010) [5], Cam *et al*., 2010; Attapady black goats (Raja *et al*., 2015), and maefur goats (Berhe, 2017) while a contrast study was reported by Celik (2019) [11]; Hoseini *et al*., 2012; and Lavvaf *et al*., 2012 [23]. Karna *et al*., 2020 revealed that body length, height at withers and chest girth had highly significant ($P<0.001$) moderate to high correlation with body weight was observed.

A high correlation was observed at three years of age group than other age groups. This indicated that there exists a strong linear relationship between body weight with other morphometric traits. This might be due to more or less similar environmental influences at different age groups. Since body measurements had a high correlation with body weight, this may be used as selection criteria, Bhattacharya *et al*. (1984) and Bose and Basu (1984) [10] also reported that selection based on body measurements should improve meat production in goats.

Table 1: Correlation between different morphometric traits (One pair of permanent incisors)

Traits	Body weight	Body length	Chest girth	Paunch girth	Height at withers	Rump height	Tail length	Neck circumference	Head length	Rump length
Body weight	1									
Body length	0.777*	1								
Chest girth	0.301	0.422	1							
Paunch girth	0.538	0.701*	0.447	1						
Height at withers	0.670	0.482	0.468	0.538	1					
Rump height	0.603	0.647	0.479	0.612	0.617	1				
Tail length	0.657	0.326	0.448	0.275	0.680	0.426	1			
Neck circumference	0.463	0.467	0.611	0.233	0.343	0.346	0.376	1		
Head length	0.457	0.408	0.294	0.444	0.556	0.388	0.319	0.123	1	
Rump length	0.510	0.540	0.688	0.367	0.297	0.414	0.395	0.835*	0.255	1

Correlations were significant at P≤0.05

Table 2: Correlation between different morphometric traits (Two pair of permanent incisors)

Traits	Body weight	Body length	Chest girth	Paunch girth	Height at withers	Rump height	Tail length	Neck circumference	Head length	Rump length
Body weight	1									
Body length	0.453	1								
Chest girth	0.776	0.340	1							
Paunch girth	0.544	0.452	0.471	1						
Height at withers	0.699	0.373	0.721	0.697	1					
Rump height	0.616	0.437	0.692	0.565	0.780	1				
Tail length	0.460	0.602	0.427	0.125	0.257	0.343	1			
Neck circumference	0.694	0.400	0.672	0.536	0.656	0.544	0.467	1		
Head length	0.624	0.429	0.653	0.436	0.748	0.773	0.414	0.644	1	
Rump length	0.605	0.274	0.576	0.354	0.584	0.684	0.391	0.616	0.401	1

Correlations were significant at P≤0.05

Table 3: Correlation between different morphometric traits (Three pair of permanent incisors)

Traits	Body weight	Body length	Chest girth	Paunch girth	Height at withers	Rump height	Tail length	Neck circumference	Head length	Rump length
Body weight	1									
Body length	0.811	1								
Chest girth	0.920	0.924	1							
Paunch girth	0.353	0.102	0.367	1						
Height at withers	0.890	0.870	0.800	-0.059	1					
Rump height	0.910	0.719	0.723	0.128	0.727	1				
Tail length	0.850	0.838	0.813	0.076	0.774	0.728	1			
Neck circumference	0.815	0.850	0.846	0.113	0.863	0.846	0.865	1		
Head length	0.562	0.522	0.477	-0.348	0.651	0.602	0.609	0.667	1	
Rump length	0.620	0.423	0.533	0.568	0.551	0.540	0.480	0.517	0.216	1

Correlations were significant at P≤0.05

Conclusion

The results of the present study indicated that there is a correlation between body weight with body morphometric traits in Kanni goats. During one year of age group, body weight had a highly positive correlation with body length (r=0.777). In the two-year age group, body weight had high correlation with chest girth (r=0.776). Correspondingly, at three years of age group, the body weight had a highly significant correlation with body length was (r=0.811), chest girth (0.920), height at withers (0.890), rump height (0.910), tail length (0.850), neck circumference (0.815). This indicates that there is exists a strong linear correlation between body weight with other morphometric traits. This study will help the farmers to know the relationship between body weight with other body morphometric traits in Kanni goats and these traits were used to improve the body weight so that they can select the elite animals for future breeding programs.

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