

Characteristics of Phenotypes of Local Goat Quantitative Properties in East Kolaka Regency, Indonesia

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Abstract—Goats are a type of livestock that most people mostly keep to produce meat and milk to meet the protein needs of animal origin. Even local goats, such as *kacang* and *jawarandu* goats in East Kolaka Regency are used as a source of community income, especially education costs. This study aims to determine the quantitative characteristics of local goats in the East Kolaka Regency, carried out in three sub-districts: Ladongi District, Lambandia District, and Uluiwoi District, from January to April 2021. The research sample was 496 male and female local goats grouped by age < 1 year to > 3 years to determine quantitative characteristics in the form of bodyweight, chest circumference, shoulder height, and body length. Data and information were tabulated and analyzed descriptively, and a T-test was performed. The results of T-test analysis for body weights of *kacang* and *jawarandu* goats in the age group showed significant differences ($P < 0.05$) in both aged 6-12 months, 13-24 months, 25-36 months and >36 months, including chest circumference, shoulder height, and body length, while the diversity of head sizes of *kacang* and *jawarandu* goats including head length, head width, ear length, and ear width there was no significant difference ($P > 0, 05$) between the head length of male and female goats aged 6-12 months, 13-24 months, 25-36 months and >36 months. So, it can be concluded that between *kacang* and *jawarandu* goats, there are differences in quantitative characteristics.

Keywords—Local goat; quantitative nature; East Kolaka.

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I. INTRODUCTION

Cattle *kacang* and *jawarandu* goats are producers of meat sources of protein other than cows, sheep, and poultry and are spread in Indonesia [1]. It has market opportunities for its main community sources of income as small breeders [2],[3]. The maintenance of livestock in Indonesia is still simple with traditional maintenance systems [4],[5] although easy climate [6],[7], embassy goats are used as a side business or savings because the marketing of production is relatively easy. Local goats in Indonesia vary, generally dominated by *kacang* and *jawarandu* goats.

The *kacang* goat and the *jawarandu* goat have different qualitative properties depending on the type of male. However, it has advantages that can be combined to produce offspring with a better display of production than its elders. The result of a crossbreeding of *kacang* goats and *etawa* crossbreed goats is a *jawarandu* goat, commonly called *bligon* goat, that has prolific reproductive properties and displays superior performances compared to its two elders.

The advantages of local goats are that they can survive with low-quality feed, climate area, resistance to diseases and parasites [8],[9], and are a source of seedlings in genetic quality improvement [10]. This makes local goats a genetic resource for the development and genetic improvement of the goat nation nationally but maintains its purity and sustainability.

The livestock of *kacang* goats and *jawarandu* goats are raised in the community of East Kolaka Regency and have adapted to the environment and have had distinctive characteristics even though livestock are traditionally maintained. Thus, there is likely to be genetic mixing between local goats and other types of goats. Raising cattle of *kacang* goats and *jawarandu* is dominated by people's farms with simple skills, traditional technology [12], limited quality, and labor from the ranching family itself [13]. The nature of quantity in cattle goat of *kacang* and *jawarandu* is in the form of bodyweight, shoulder height, body length, chest circumference, head length, head width, ear length, and ear width. However, the quantitative nature cannot be directly

indexed but can be known by weighing and measuring that affect the quantitative nature of local goats.

Studies on the reproductive properties of *kacang* goats and *jawarandu* goats have been conducted [14]. But the study that discusses the quantitative nature of *kacang* and *jawarandu* goats has not been produced much like the quantity properties of *kacang* and *jawarandu* goat. For this reason, this study aims to conduct a quantitative study of the quantitative properties of *kacang* and *jawarandu* goats based on the appearance of body weight, shoulder height, body length, chest circumference, head length, head width, ear length, and ear width.

II. MATERIALS AND METHOD

The study was conducted from January to April 2021 in Ladongi, Lambandia, and Uluiwoi Districts of East Kolaka Regency, Southeast Sulawesi Province. Determination of location by purposive sampling on the consideration that the three sub-districts have the largest population of *kacang* and *jawarandu* goats. The population is the entire livestock of *kacang* and *jawarandu* goats with a study sample of 497 goats tails (Table 1) based on ages 6-12 months, 13-24 months, 25-36 months, and >36 months.

TABLE I
STUDY SAMPLE OF *KACANG* GOATS AND *JAWARANDU* GOATS

Age	<i>Kacang</i> Goat		<i>Jawarandu</i> Goat	
	Male (Tail)	Female (Tail)	Male (Tail)	Female (Tail)
6-12 Months	22	36	45	72
13-24 Months	12	42	17	95
25-36 Months	7	20	7	49
>36 Months	7	11	10	44
Total	48	109	79	260

The age of *kacang* goats and *jawarandu* goats is found by the change of incisive dentist and is classified based on age and type of livestock with the help of tools in the form of scales, measuring tapes, measuring sticks, writing stationery, and cameras. The data was collected in this study using primary data obtained at the time of direct observation of weighing and measuring the livestock of *kacang* goats and *jawarandu* goats with the help of writing instruments. The variables measured in the study were the quantitative nature of body weight obtained by weighing, shoulder height, body length, chest circumference, head length, head width, ear length, and ear width. Furthermore, the results of field observations were tabulated and analyzed descriptively for a T-test using SPSS 22. The research flow chart is presented in Figure 1.

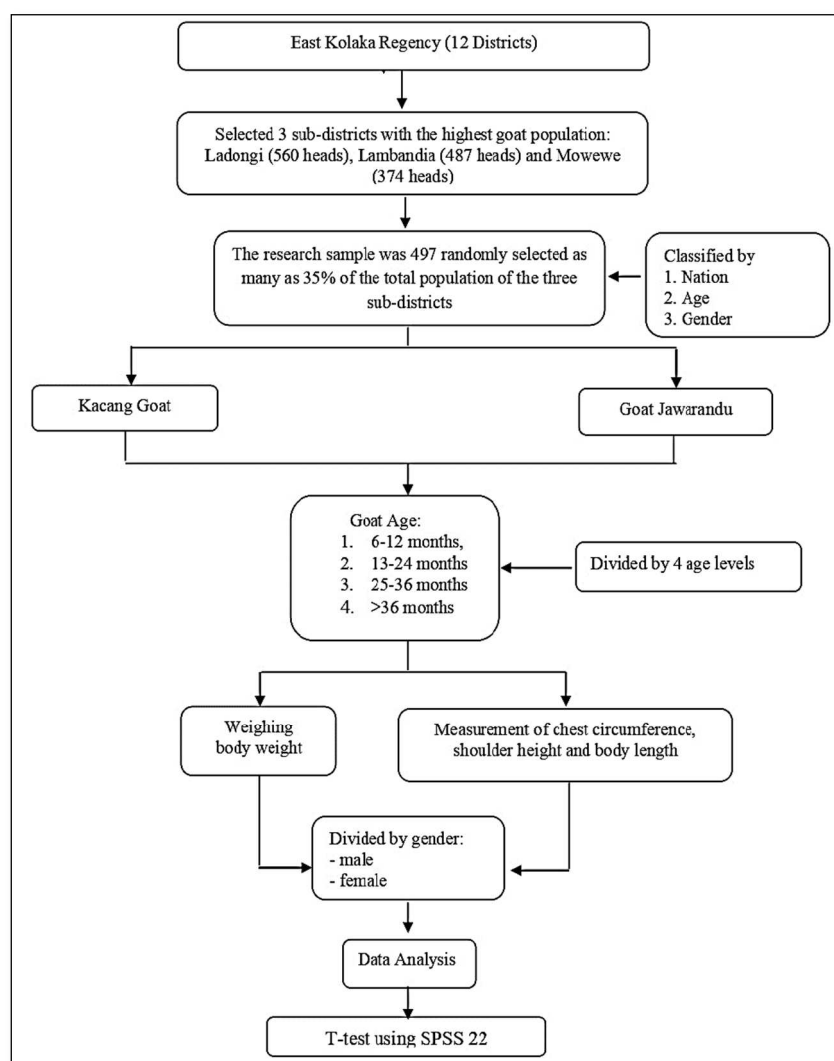


Fig. 1 Research Flowchart

III. RESULTS AND DISCUSSION

Quantitative properties cannot be grouped directly, but rather the way of weighing or measuring using measuring instruments and written with numbers. The phenotype display of the quantitative nature of goat body size reflects the growth and becomes a special feature of livestock.

A. Body Weight of Kacang Goats and Jawarandu Goats

The results of the T-test analysis for the bodyweight of *kacang* goats in the age group of 25-36 months showed there was a significant difference ($P < 0.05$) between the body weights of male and female *kacang* goats in the age group of 6-12 months, 13-24 months and >36 months there was no significant difference ($P > 0.05$) between male and female *kacang* body weights (Table 2).

TABLE II
AVERAGE BODY SIZE OF *KACANG* GOATS

Age (Month)	Quantitative Properties	<i>Kacang</i> Goats							
		Male				Female			
		n (Tail)	\bar{X}	SD	CoD	n (Tail)	\bar{X}	SD	CoD
6-12 Month	BW (kg)	n= 22	8,93±1,08	(5,69%)		n= 36	17,74±1,03	(5,83%)	
	CS (cm)		53,95 ^a ±1,87	(3,47%)			52,48 ^b ±4,00	(7,62%)	
	SH (cm)		52,10±2,72	(5,22%)			54,85±3,29	(6,00%)	
	BL (cm)			52,36 ^a ±3,37	(6,44%)		52,92 ^b ±4,65	(8,79%)	
13-24 Month	BW (kg)	n= 12	20,69±0,83	(7,69%)		n= 42	19,29±0,68	(3,54%)	
	CS (cm)		60,07±2,25	(7,23%)			56,20±2,00	(3,55%)	
	SH (cm)		56,10±2,32	(7,95%)			60,34±3,14	(5,20%)	
	BL (cm)		53,24±1,68	(6,11%)			59,70 ^b ±3,99	(6,68%)	
25-36 Month	BW (kg)	n= 7	23,25 ^a ±0,45	(3,80%)		n= 20	21,28 ^b ±1,35	(6,32%)	
	CS (cm)		63,83±2,79	(8,38%)			62,08±3,60	(5,80%)	
	SH (cm)		56,39±1,87	(6,43%)			56,41±3,77	(6,68%)	
	BL (cm)		62,89±1,45	(4,52%)			57,93 ^b ±2,88	(4,97%)	
>36 Month	BW (kg)	n= 7	23,22±0,67	(4,70%)		n= 11	21,42±1,06	(4,95%)	
	CS (cm)		65,89±2,11	(6,20%)			62,21±3,56	(5,73%)	
	SH (cm)		60,06±2,34	(7,51%)			59,45±1,77	(2,98%)	
	BL (cm)		62,39±2,72	(5,71%)			60,86±2,76	(4,54%)	

Description: BW (Body Weight), CS (Chest size), SH (Shoulder Height), BL (Body length), SD (Standard deviation), CoD (Coefficient of diversity), \bar{X} (Average), n(Number of samples)^{ab} Superscripts that are different on the same line show a noticeable difference ($P < 0.05$)

There was no significant difference in T-test analysis for the bodyweight of *jawarandu* goats in each age group ($P > 0.05$). The average bodyweight of the highest male goats is found at the age of >36 months, which is 23.22±0.67 kg, and in goats, the female goats are 21.42±1.06 kg, while the highest weight of male *jawarandu* goats is found at the age of >36

months 27.17±1.47 kg and female *jawarandu* goats 26.77±1.65 kg (Table 3). The bodyweight of *kacang* and *jawarandu* goats tends to increase with the age of livestock and tends to slow down when the cattle are adults. The increase in body weight indicates that the cattle are growing.

TABLE III
AVERAGE BODY SIZE OF *JAWARANDU* GOATS

Age Month	Quantitative Properties	<i>Jawarandu</i> Goats							
		Male				Female			
		n (Tail)	\bar{X}	SD	CoD	n (Tail)	\bar{X}	SD	CoD
6-12 Month	BW (kg)	n= 45	20,52±2,14	(10,41%)		n= 72	20,27±1,88	(9,26%)	
	CS (cm)		58,56±5,06	(8,64%)			59,59±5,44	(9,14%)	
	SH (cm)		55,01±4,07	(7,40%)			54,56±4,00	(7,32%)	
	BL (cm)		54,49±3,81	(6,99%)			53,83±3,92	(7,29%)	
13-24 Month	BW (kg)	n= 17	23,65±1,37	(5,79%)		n= 95	23,75±1,68	(7,07%)	
	CS (cm)		70,58±2,41	(3,41%)			69,53±4,66	(6,70%)	
	SH (cm)		65,30±4,36	(6,68%)			63,48±5,26	(8,29%)	
	BL (cm)		62,62±3,71	(5,93%)			64,44 ^b ±5,00	(7,76%)	
25-36 Month	BW (kg)	n= 7	26,25±1,01	(3,85%)		n= 49	25,25±1,64	(6,48%)	
	CS (cm)		74,28±2,16	(2,91%)			72,36±4,21	(5,82%)	
	SH (cm)		64,11±3,60	(5,61%)			65,17±4,18	(6,41%)	
	BL (cm)		64,78±2,66	(4,10%)			67,12±2,82	(4,20%)	
>36 Month	BW (kg)	n= 10	27,17±1,47	(5,42%)		n= 44	26,77±1,65	(6,16%)	
	CS (cm)		77,37±1,40	(1,81%)			76,67±3,75	(4,90%)	
	SH (cm)		67,83±4,38	(6,45%)			65,03±4,60	(7,08%)	
	BL (cm)		68,17±3,69	(5,41%)			66,77±3,91	(5,86%)	

Description: BW (Body Weight), CS (Chest size), SH (Shoulder Height), BL (Body length), SD (Standard deviation), CoD (Coefficient of diversity), \bar{X} (Average), n(Number of samples)^{ab} Superscripts that are different on the same line show a noticeable difference ($P < 0.05$)

The study's results showed that body weight gain peaked at the age of >36 months, indicating that the goat had reached an adult body. Growth will increase until puberty and begin to slow down in the adult period of the body. *Kacang* goat body

weight experienced rapid growth until 24 months, after which growth was slower. The growth pattern of male *kacang* goats tends to increase, and 94.8% of body weight growth is influenced by age.

Genetic and environmental factors influence weight gain. Genetic factors determine the ability of production [15], [16], [17]. Environment to support livestock production according to their abilities [18], [19]. Environmental factors include feed, housing, maintenance, disease, and climate. Genetics and the environment have an important role because even though livestock has superior genetics, their production will not be optimal without the support of good maintenance and feeding.

Research conducted previously in West Muna Regency found the highest male *kacang* body weight at the age of >2 years in Wadaga District of 25.00±2.83 kg, Kusambi District 24.86±6.20 kg, Sawaregadi District 22.29±2.82 kg. The highest average body weight of female *kacang* goats aged >2 years was found in Sawerigadi District 21.83±3.07 kg, Wadaga District 21.45±3.01 kg, and Kusambi District 21.25±4.49 kg. The highest average body weight of male and female *kacang* goats in the transmigration area was found at the age of > 24 months, namely 19.2±2.3 kg and 18.7±2.7kg, respectively. Meanwhile, the highest average body weight of male and female *Kacang* goats in non-transmigration areas was found at the age of >24 months, namely 17.3±2.2 kg and 17.3±2.2 kg, respectively.

The results of the T-test analysis showed that for the chest circumference of *kacang* goats in each age group, there was one group aged 6-12 months. There was a significant difference ($P < 0.05$) between the chest circumference of male and female *kacang* goats, while in three age groups 13-24 months, 25-36 months, and >36 months, there was no significant difference ($P > 0.05$) between the chest circumference of male and female *kacang* goats. T-test analysis for the chest circumference of *jawarandu* goats in each age group showed no significant difference ($P > 0.05$).

The average chest circumference of the highest male *kacang* goat was at age >36 months 65.89±2.11 cm, and the chest circumference of female *kacang* goat was 62.21±3.56 cm, while the male *Jawarandu* goat was 77.37±1.40 cm and female 77.37±1.40 cm. In the age group, 6-12 months to >36 months, the chest circumference of male and female *kacang* goats tended to increase. The growth of the chest circumference is dominated by the growth of the ribs and the meat tissue attached to the bone. Meanwhile, from the age of 25-36 months until the age of >36 months, the growth of the ribs tends to be slow and reaches its maximum limit. The growth of the size of the chest circumference was followed by the growth of muscle tissue and flesh, so in the age group >36 months, the increase in chest circumference was caused by the growth of muscle tissue and meat, which began to increase. *Jawarandu* goats aged 6-12 months and 13-24 months, chest circumference growth was dominated by the growth of ribs and meat tissue attached to the bones.

Changes influence the increase in the size of the chest circumference in bone size, in this case, the chest ribs, and changes in the size or accumulation of meat fat in the body (muscle tissue) [20], [21], [22]. In growing cattle, weight gain will increase so that the animal has good muscle tone, directly affects body conformation, and is understood to increase the size of the chest circumference. Changes will follow the increase in the size of the chest circumference in the size of the width and length of the skin (skin area). It leads to bodyweights, the size of the weight and area of the skin will also be different. Growth has fast and slow stages, the last

stage occurs when the animal is not yet sexually mature, and the slow stage occurs when the body is mature.

The results of the t-test analysis showed that the shoulder height of *kacang* and *jawarandu* goats for each age group did not have a significant difference ($P > 0.05$) between the shoulder heights of male and female goats. The highest mean shoulder height of male *kacang* goats was found at the age of >36 months or 60.06±2.34 cm and female *kacang* goats 59.45±1.77 cm while the male *jawarandu* goats were 67.83±4.38 cm and females 65, 03±4.60 cm. The shoulder height of the research results in the age group of 6-12 months to the age of 13-24 months tends to increase while the age of 13-24 months to 25-36 months is relatively constant, while for *jawarandu* goats, shoulder height tends to increase with age. From 25-36 months to the age of >36 months, muscle tissue plays a role in growth. The bone grows continuously with a relatively slow rate of growth and relatively faster muscle growth [23], so the muscle-to-bone ratio increases during growth [24].

The constituent of the front foot is associated with shoulder height, experiencing initial growth compared to other components. Bones experience the fastest growth according to their function to support the body. Before puberty, bones grow continuously to achieve optimal growth at 10 months, then relatively constant at >10 months.

The results of the T-test analysis showed that there was a significant difference ($P < 0.05$) between the body length of the *kacang* goats in the three age groups of 6-12 months, 13-24 months, and 25-36 months ($P < 0.05$). At the age of >36 months, there was no significant difference ($P > 0.05$). The results of the T-test analysis for the body length of the *jawarandu* goats at the age of 13-24 months showed there was a significant difference ($P < 0.05$) between the body lengths of the male and female *jawarandu* goats, while in the other three age groups 6-12 months, 25-36 months and >36 months there was no significant difference ($P > 0.05$) between male and female *jawarandu* goats.

The highest average body length of the *kacang* goat was found at the age of >36 months 62.39±2.72 cm. The female *kacang* goat was 60.86±2.76 cm, while the male *jawarandu* goat was 68.17±3.69 cm, and the female was 66.77 ±3.91cm. Age group 6-12 months and age 13-24 months body length experienced bone growth, while at the age of 25-36 months and age >36 months. Bone growth began to slow down or relatively the same, while the body length of the *jawarandu* goat. By increasing age, it will experience rapid growth and stops when the cattle have matured.

Body length in goats, even at the same age, does not necessarily give the same increase in length because this is determined by bone development [25], [26]. Body length describes the development of the spine, which consists of the spine, lumbar spine, and collarbone [27],[28]. Rapid growth occurs in the period from birth to weaning and puberty, but after puberty to adulthood, the growth rate begins to decline and will continue to decline into adulthood.

B. Variation in Head Size of Kacang Goats and Jawarandu Goats

The average size of the head of male and female goats from the age range of 6-12 months to >36 months, including head length, head width, ear length, and ear width, increases with

the increasing age of livestock. Based on the T-test analysis, it can be seen that for the head length of the *kacang* and *jawarandu* goats in each age group there was no significant difference ($P>0.05$) between the head lengths of male and female goats. The highest mean head length of male *kacang* goats was found at age >36 months 19.11 ± 0.67 cm and female *kacang* goats 19.14 ± 0.73 cm and the highest average head length of male *jawarandu* goats were found at age >36 months

21.70 ± 0.61 cm and female *jawarandu* goat 21.08 ± 0.67 cm. This is in accordance with our research in North Buton Regency that the head length of local goats in Kabila District is 14.84 ± 1.63 cm, Botupingge District is 14.29 ± 0.96 cm, and Bonepantai District is 13.25 ± 1.12 cm. and head size of local goats in South Lasalimu District, namely the length of the male head 14.04 ± 1.32 cm and the female 14.83 ± 1.07 cm.

TABLE IV
MEAN HEAD SIZE OF *KACANG* GOATS IN EAST KOLAKA REGENCY

Age Month	Quantitative Properties	<i>Kacang</i> Goats							
		Male				Female			
		n (Tail)	\bar{X}	SD	CoD	n (Tail)	\bar{X}	SD	CoD
6-12 Month	HL (cm)	n= 22	14,46±1,23	(8,51%)	n= 36	15,21±0,95	(6,27%)		
	HW (cm)		8,94±0,68	(7,60%)		8,73±0,76	(8,75%)		
	EL (cm)		12,13±0,72	(5,91%)		12,19±0,74	(6,10%)		
	EW (cm)		7,85±0,91	(11,55%)		7,67±1,00	(13,00%)		
13-24 Month	HL (cm)	n= 12	17,59±1,32	(7,50%)	n= 42	17,72±1,08	(6,07%)		
	HW (cm)		10,86±0,85	(7,80%)		11,10±0,76	(6,85%)		
	EL (cm)		14,63±1,14	(7,81%)		10,19±1,03	(10,08%)		
	EW (cm)		8,59±0,57	(6,64%)		8,71±0,62	(7,15%)		
25-36 Month	HL (cm)	n= 7	18,94±0,90	(4,75%)	n= 20	18,51±0,60	(3,24%)		
	HW (cm)		11,56±0,67	(5,77%)		11,72±0,50	(4,27%)		
	EL (cm)		15,33±0,81	(5,26%)		15,54±0,55	(3,54%)		
	EW (cm)		9,44±0,67	(7,06%)		9,14±0,64	(6,97%)		
>36 Month	HL (cm)	n= 7	19,11±0,67	(3,49%)	n= 11	19,14±0,73	(3,80%)		
	HW (cm)		11,89±0,67	(5,61%)		11,62±0,60	(5,16%)		
	EL (cm)		15,44±0,67	(4,32%)		15,48±0,65	(4,20%)		
	EW (cm)		9,56±0,67	(6,98%)		9,57±0,64	(6,65%)		

Description: HL (Head Length), HW (Head Width), EL (Ear Length), EW (Ear Width), SD (Standard Deviation), CoD (Coefficient of diversity), \bar{X} (Average), n (Number of Samples), ^{ab} Superscripts that are different on the same line show a noticeable difference ($P<0.05$)

The size of the head length of *kacang* and *jawarandu* goats in the location of the study tends to increase with the age of livestock. Afterbirth, the head and legs develop early, while the body, especially the back, develops slowly and is the last growing part of reaching adult size. Relatively rapid bone growth occurs in the bones of the head. Growth is a coordinated accretion of body structure that occurs until the

individual becomes an adult. The goat's body undergoes rapid growth, after which the growth runs more slowly. Growth will decrease when livestock has reached a turning point when the bean goat is an adult. Growth will run well depending on supporting factors such as the environment, genetics, and maintenance procedures.

TABLE V
AVERAGE SIZE OF *JAWARANDU* GOAT HEAD IN EAST KOLAKA REGENCY

Age Month	Quantitative Properties	<i>Jawarandu</i> Goat							
		Male				Female			
		n= (Tail)	\bar{X}	SD	CoD	n= (Tail)	\bar{X}	SD	CoD
6-12 Month	HL (cm)	n= 45	15,31±1,04	(6,79%)	n= 72	5,19±1,18	(7,74%)		
	HW (cm)		8,78±0,77	(8,73%)		8,93±0,81	(9,10%)		
	EL (cm)		12,39±0,89	(6,67%)		12,43±0,87	(6,97%)		
	EW (cm)		7,23±1,21	(16,70%)		7,19±1,13	(15,71%)		
13-24 Month	HL (cm)	n= 17	17,72±0,78	(4,38%)	n= 95	17,92±1,13	(6,30%)		
	HW (cm)		11,42±0,68	(5,99%)		11,21±0,83	(7,40%)		
	EL (cm)		14,83±0,95	(6,38%)		15,22 ^b ±1,18	(7,73%)		
	EW (cm)		8,68±0,50	(5,76%)		8,58±0,74	(8,62%)		
25-36 Month	HL (cm)	n= 7	19,44±1,13	(5,83%)	n= 49	20,09±0,83	(4,13%)		
	HW (cm)		11,56±0,67	(5,77%)		11,76±0,64	(5,47%)		
	EL (cm)		17,56±1,13	(6,46%)		18,12±0,87	(4,78%)		
	EW (cm)		8,78±0,67	(7,60%)		9,03±0,65	(7,16%)		
>36 Month	HL (cm)	n= 10	21,70±0,61	(2,83%)	n= 44	21,08±0,67	(3,18%)		
	HW (cm)		11,77±0,58	(4,93%)		11,78±0,46	(3,88%)		
	EL (cm)		18,40±1,21	(6,58%)		18,29±1,17	(6,40%)		
	EW (cm)		9,70±0,61	(6,32%)		9,67±0,43	(4,48%)		

Description: HL (Head Length), HW (Head Width), EL (Ear Length), EW (Ear Width), SD (Standard Deviation), CoD (Coefficient of diversity), \bar{X} (Average), n (Number of Samples), ^{ab} Superscripts that are different on the same line show a noticeable difference ($P<0.05$)

T-test analysis found that for the width of the head of *kacang* and *jawarandu* goats in each age group there was no significant difference ($P>0.05$) between the width of the head

of male and female goats. The highest mean head width of the male *kacang* goats at age >36 months was 11.89 ± 0.67 cm and the female *kacang* goats 11.62 ± 0.60 and the highest average

head width of the male *jawarandu* goats were found at the age of >36 months 11.77±0.58 cm and female *jawarandu* goat 11.78±0.46 cm. The results of the study were that the head width of the *kacang* goats tended to increase in the age group of 6-12 months to 13-24 months and was relatively constant at the age of 13-24 months until the age of >36 months, while the head width of the *jawarandu* goats at the study site was relatively constant at the age of 6-12, and months to 13-24 months and tends to increase at the age of 25-36 months.

Relatively fast bone growth occurs in the bones of the head, thighs, forelegs, and hind legs. Relatively moderate bone growth occurs in the bones of the chest and shoulder cavities, while relatively slow bone growth occurs in the lumbar spine, chest, and hips and is in the process of growing livestock. In goats, skeletal growth is prioritized, and meat growth and fat accumulation occur.

Analysis of the T-test can be seen that for the length of the ears of *kacang* goats in each age group, there is no significant difference ($P > 0.05$) while for *jawarandu* goats in the age group of 13-24 months there is a significant difference ($P < 0.05$). while for the other three age groups, there was no significant difference ($P > 0.05$) between the ear lengths of male and female goats. The highest mean ear length of male *kacang* goats was found at the age of >36 months 15.44±0.67 cm and female *kacang* goats 15.48±0.65 cm.

The average ear length of the female *kacang* goat is 4 cm. This can happen due to the genetic diversity of the *kacang* goat individuals in a population. This characteristic variation arises because individuals have different genes. The highest mean ear length of the male *jawarandu* goat was found at the age of >36 months, 18.40±1.21 cm, and the female *jawarandu* goat 18.29±1.17 cm.

The ear length of male and female *Jawarandu* goats at the study site tended to increase with the increasing age of livestock. The diversity of characteristics of several quantitative traits found in *Jawarandu* goats is caused by two factors: the diversity caused by the environment and the diversity caused by inherited or genetic traits. Goat gene responses to environmental factors are usually seen in the appearance of the phenotype of the goat in question. The gene's nature will determine the character's potential, while the environment will determine to what extent the potential limit is. The genetic condition of goats can be said to be relatively more stable than the state of the phenotype, which often changes in line with environmental conditions or maintenance.

Based on the T-test analysis, it can be seen that for the ear widths of the *kacang* and *jawarandu* goats in each age group there was no significant difference ($P > 0.05$) between the ear widths of male and female goats. The average ear width of the highest male *kacang* goats was found at the age of >36 months 9.56±0.67 cm. Female *kacang* goats were 9.57±0.64 cm. The average ear width of the highest male *jawarandu* goat was found at the age of >36 months 9.70±0.61 cm and the female *jawarandu* goat 9.69±0.45 cm.

The size of the ear width of goats in the age group of 6-12 months and 13-24 months tends to increase, while in the age group of 25-36 months to >36 months the growth is relatively constant. Goat growth is an increase in the shape and weight of building tissues, such as tendons, brain bones, heart, and all body tissues (except fat tissue) as well as other body organs.

This growth can also be interpreted as pure growth, namely the addition of protein and mineral substances.

IV. CONCLUSION

The average quantitative traits of *kacang* goats in male goats ranged from <1 year to >3 years which included body weight, chest circumference, shoulder height, and body length, respectively, ranging from 18.93±1.08 - 23.22± 0.67kg, 53.95±1.87- 65.89±2.11 cm, 52.10±2.72 - 60.06±2.34 cm, and 52.36±3.37-60.86± 2.76 cm. While the female goats are 17.74±1.03-21.42±1.06 kg, 52.48±4.00-62.21±3.56 cm, 54.85±3.29-59, 45±1.77 cm, and 52.92±4.65-60.86±2.76 cm. The average quantitative traits of *jawarandu* goats in male goats ranged from <1 year to >3 years which included body weight, chest circumference, shoulder height, and body length, respectively, ranging from 20.52±2.14-27.17± 1.47 kg, 58.56±5.06-77.37±1.40 cm, 55.01±4.07-67.83±4.38 cm and 54.49±3.81-68.17 ±3.69 cm. Meanwhile, female goats were 20.27±1.88 - 26.77±1.65 kg, 59.59±5.44 76.67±3.75 cm, 54.56±4.00-65, 03±4.60 cm and 53.83±3.92-66.77±3.91 cm.

REFERENCES

- [1] A. Pratiwi *et al.*, "Angiotensin-converting enzyme inhibitor activity of peptides derived from Kacang goat skin collagen through thermolysis hydrolysis," *Vet. World*, vol. 14, no. 1, pp. 161-167, 2021, DOI: 10.14202/vetworld.2021.161-167.
- [2] T. R. Hakim *et al.*, "Extraction of Collagen from the Skin of Kacang Goat and Production of Its Hydrolysate as an Inhibitor of Angiotensin-Converting Enzyme," *Trop. Anim. Sci. J.*, vol. 44, no. 2, pp. 222-228, Jun. 2021. DOI: 10.5398/tasj.2021.44.2.222.
- [3] W. Widjiati, Z. Faizah, N. Darsini, V. F. Hendrawan, E. M. Luqman, and S. B. Sumitro, "Increased Profile Fertilization and the Process of Cleavage of Kacang Goat In Vitro Fertilization Using Intracytoplasmic Sperm Injection," *Adv. Anim. Vet. Sci.*, vol. 8, no. 8, pp. 868-872, 2020. DOI: 10.17582/journal.aavs/2020/8.8.868.872.
- [4] W. Widjiati *et al.*, "Identification of Caspase 3 Intensity in Kacang Goat Oocyte Post Vitrification using Confocal Laser Scanning Microscopy," *Adv. Anim. Vet. Sci.*, vol. 8, no. 12, pp. 1362-1366, 2020. DOI: 10.17582/journal.aavs/2020/8.12.1362.1366.
- [5] I. Widiyono, S. Sarmin, and Y. Yanuartono, "Influence of body condition score on the metabolic and reproductive status of adult female Kacang goats," *J. Appl. Anim. Res.*, vol. 48, no. 1, pp. 201-206, Jan. 2020. DOI: 10.1080/09712119.2020.1764361.
- [6] P. K. Tahuk and G. F. Bira, "Carcass and meat characteristics of male Kacang goat fattened by complete silage," *Vet. World*, vol. 13, no. 4, pp. 706-715, 2020. DOI: 10.14202/vetworld.2020.706-715.
- [7] R. Razali *et al.*, "Chemical Quality of Longissimus Muscles of Kacang Goat After Supplemented With A Combination of Palm Kernel Meal and Powdered Katuk Leaf," *E3S Web Conf.*, vol. 151, 2020. DOI: 10.1051/e3sconf/202015101030.
- [8] B. Panjaitan *et al.*, "Comparison of Estrous Performance and Progesterone Level of Kacang Goats Induced by PGF2 α Versus Ovsynch Protocol," *E3S Web Conf.*, vol. 151, 2020. DOI: 10.1051/e3sconf/202015101045.
- [9] D. Febrina *et al.*, "Digestibility of Nutrient and Performance of Kacang Goats which are Given Fermented Oil Palm Fronds Extract," *Adv. Anim. Vet. Sci.*, vol. 9, no. 3, pp. 422-428, 2020. DOI: 10.17582/journal.aavs/2021/9.3.422.428.
- [10] D. Depison, W. Putra, G. Gushairiyanto, Y. Alwi, and H. Suryani, "Morphometric characterization of Kacang goats raised in lowland and highland areas of Jambi Province, Indonesia," *J. Adv. Vet. Anim. Res.*, vol. 7, no. 4, pp. 734-743, 2020. DOI: 10.5455/javar.2020.g475.
- [11] D. A. Lestari, S. Sutopo, and E. Kurnianto, "Amino acid diversity based on cytochrome b gene in Kacang and Ettawa Grade goats," *J. Indones. Trop. Anim. Agric.*, vol. 42, no. 3, Art. no. 3, pp. 135-146, Aug. 2017. DOI: 10.14710/jitaa.42.3.135-146.
- [12] W. Rina *et al.*, "Optimization of acid-soluble collagen extraction from Indonesian local kacang goatskin and Physico-chemical properties characterization," *Chem. Eng. Trans.*, vol. 63, pp. 703-708, 2018. DOI: 10.3303/CET1863118.

- [13] R. Adiwijanti, I. G. S. Budisatria, K. Kustantinah, R. Rusman, and E. Indarto, "Effects of rations containing formaldehyde-protected soybean meal on meat production in Kacang goats," *Vet. World*, vol. 12, no. 6, pp. 890–895, Jun. 2019. DOI: 10.14202/vetworld.2019.890-895.
- [14] T. Armansyah *et al.*, "Concentration and motility of spermatozoa and testosterone level of kacang goat after seminal vesicle extract administration," *Open Vet. J.*, vol. 8, no. 4, pp. 406-410, Oct. 2018, DOI: 10.4314/ovj.v8i4.9.
- [15] E. D. Kusumawati, S. Rahadi, S. Nurwathon, and D. L. Yulianti, "Quality of Post Thawing Spermatozoa of Etawa Crossbreeds (PE) at 37°C at different times," *J. Science And Technology. Trop.*, vol. 6, no. 2, pp. 246-250, May 2019, doi: 10.33772/jitro.v6i2.7152.
- [16] A. W. Yirsaw *et al.*, "Goat $\gamma\delta$ T cell subpopulations defined by WC1 expression, responses to pathogens and cytokine production," *Dev. Comp. Immunol.*, vol. 118, pp. 2411-2502, May 2021, DOI: 10.1016/j.dci.2020.103984.
- [17] C. H. Yang *et al.*, "Effects of melatonin administration to cashmere goats on cashmere production and hair follicle characteristics in two consecutive cashmere growth cycles," *Domest. Anim. Endocrinol.*, vol. 74, pp. 1-18, Jan 2021, doi: 10.1016/j.domaniend.2020.106534.
- [18] M. Hambakodu and L. S. Enawati, "Physical Quality of Goat Meat Young Male Kacang Given Field Grass and Three Levels of Concentrate," *J. Science And Technology. Trop.*, vol. 6, no. 1, pp. 57-61, Jan. 2019. doi: 10.33772/jitro.v6i1.5491.
- [19] A. A. El-Raghi, M. A. E. Hassan, I. T. El-Ratel, N. M. Hashem, and S. A. Abdelnour, "Sustainable Management of Voluntary Culling Risk in Primiparous Zaraibi Goats in Egypt: Roles of Season and Reproductive and Milk Production-Related Traits," *Animals*, vol. 11, no. 8, Art. pp. 1-12, Aug. 2021, DOI: 10.3390/ani11082342.
- [20] J. Simões *et al.*, "Review: Managing sheep and goats for sustainable high yield production," *Animal*, Vol. 30 pp. 1-12, Jul. 2021, DOI: 10.1016/j.animal.2021.100293.
- [21] F. D.-V. Galán, J. L. G. Guerrero, M. D. Pertiñez, L. A. Z. Garcés, P. R. Pérez-Cacho, and H. Galán-Soldevilla, "Calidad sensorial de la carne de cabritos lechales criados en sistemas de producción basados en pastoreo," *Rev. Mex. Cienc. Pecu.*, vol. 12, no. 1, pp. 306-317, Jun. 2021, doi: 10.22319/rmcp.v12i1.5454.
- [22] F. D. Sheikh, T. A. S. Ganai, A. M. Ganai, S. Alam, and S. Asmat, "Exploring genetic diversity in cashmere goats of Ladakh for enhancing production," *Small Rumin. Res.*, vol. 201, no. 6, pp. 1-11, Aug. 2021, doi: 10.1016/j.smallrumres.2021.106409.
- [23] A. A. Amayi, T. O. Okeno, M. G. Gicheha, and A. K. Kahi, "Breeding dairy goats for disease resistance is profitable in smallholder production systems," *Small Rumin. Res.*, vol. 197, no. 1 pp. 1-8, Apr. 2021, doi: 10.1016/j.smallrumres.2021.106337.
- [24] J. M. G. Souza-Fabjan, L. F. L. Correia, R. I. T. P. Batista, Y. Locatelli, V. J. F. Freitas, and P. Mermillod, "Reproductive Seasonality Affects In Vitro Embryo Production Outcomes in Adult Goats," *Animals*, vol. 11, no. 3, pp. 1-9, Mar. 2021. doi: 10.3390/ani11030873.
- [25] H. Hasma, E. Abustam, R. Malaka, M. I. Said, and R. Rifqi, "Effect of Age on Gelatin Quality of Goat Bones through Pretreatment of Acetic Acid (CH₃COOH)," *J. Science and Technology. Trop.*, vol. 8, no. 2, pp.85-90 Dec. 2020, doi: 10.20956/jitp.v8i2.9800.
- [26] A. D. Yantoro, W. Wardoyo, and R. K. Dewi, "Identification of Quantitative and Qualitative Characteristics of Local Sheep in Jotosanur Village, Tikung District, Lamongan Regency," *Int. J. Anim. Sci.*, vol. 3, no. 4, pp.124-128, Nov. 2020, doi: 10.30736/ijasc.v3i04.29.
- [27] N. Foeh, F. U. Datta, N. Ndaong, A. Detha, and R. Akal, "Effect of Feed on Physiological Status of Kacang Goat (*Capra aegragus hircus*) with Incentive Maintenance Patterns in Dry Land Areas," *J. Kaji. Vet.*, vol. 9, no. 1, pp. 8-12, Mar. 2021, doi: 10.35508/jkv.v9i1.3909.
- [28] G. K. Natalia, I. W. Batan, and I. K. Suatha, "Anatomical Characteristics and Size of the Hip Bone (Os Coxae) Bali Cattle," *Indones. Med. Veterinus*, vol. 10, no. 3, pp. 375–388, 2021, doi: DOI: 10.19087/imv.2021.10.3.375.