Determination of Growth and Survival Rates of Saanen kid in UniSZA Dairy Goat Farm

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ABSTRAK

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Berat badan hidup merupakan salah satu parameter dalam mengevaluasi produksi susu dan daging hewan ternak. Berat badan hidup menjadi indikator utama untuk meningkatkan karakteristik produksi. Studi ini dilakukan untuk mengukur kinerja pertumbuhan berdasarkan dua faktor; perbedaan jenis kelamin dan jumlah anak dalam satu kandungan serta mengamati tingkat kelangsungan hidup antara kedua faktor tersebut selama periode pengambilan sampel. Data dari 22 anak kambing Saanen dicatat selama 6 minggu. Hasil penelitian menunjukkan anak jantan memiliki berat badan hidup yang lebih tinggi daripada anak betina (P>0,05), dengan perbedaan 3,3% dalam persentase kenaikan berat badan hidup selama 6 minggu pengambilan sampel. Pertambahan berat badan 0,68 kg/hari dan 0,48 kg/hari untuk anak kambing betina. Studi ini juga menunjukkan anak kembar memiliki berat badan hidup rata-rata lebih tinggi daripada anak tunggal (P>0,05). Ukuran rata-rata anak kambing Saanen yang lahir tunggal berbeda secara tidak signifikan dengan yang lahir kembar (P>0,05). Anak kambing Saanen yang lahir kembar menunjukkan peningkatan berat badan hidup sebesar 9,9% dalam 6 minggu dibandingkan dengan anak tunggal. Kadar kelangsungan hidup adalah 86,4%, dengan anak tunggal melaporkan semua kematian. Kelangsungan hidup anak sebelum disapih dalam penelitian in tidak dipengaruhi oleh jenis kelamin atau jumlah anak dalam satu kandungan, tetapi dipengaruhi oleh usia induk. Faktor lain seperti kekurangan pakan harus diperhatikan karena akan memengaruhi produksi hewan secara keseluruhan. Data yang dikumpulkan selama penelitian ini berpotensi sebagai acuan penilaian nilai pemuliaan yang lebih akurat, serta perbaikan dalam pemberian pakan dan pengelolaan.

Kata Kunci: Anak Kambing, Pertumbuhan, Saanen, Daya Tahan Hidup

ABSTRACT

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Live weight is one of the parameters for evaluating milk and meat production of livestock. Live weight is an important indicator for improving production traits. The present study was conducted to measure growth performances based on two factors; sex differences and litter size and observation of survival between these factors during the sample period. Data from 22 Saanen kid were recorded for 6 weeks. Results showed that male kid had higher live weight than female kid (P>0.05), with a difference of 3.3% in the percentage of live weight gained over 6 weeks of sampling. This resulted in a body gain of 0.68 kg/day for male kid and 0.48 kg/day for female kid. The current study also showed that twin kid had a higher average live weight than single kid (P>0.05). The average size of single-born Saanen kid was not significantly different from twin-born Saanen goat kid (P>0.05). Twin-born Saanen kid gained 9.9% more live weight in 6 weeks than singleton- born. Survival was 86.4%, with all deaths attributable to singleton-born kid. In this study, preweaning kid survival was not affected by sex or litter size, but was affected by maternal age. Other factors such as pellet deficiency should be considered as they affect the overall production of the animals. The data collected in this study could potentially lead to more accurate evaluation of breeding value, and improvements in feeding and management.

Key Words: Goat Kid, Growth, Saanen, Survival Rates

INTRODUCTION

In Malaysia, the dairy goat industry is a relatively small component of the overall livestock sector, and there is no locally bred dairy goat. Instead, imported dairy goat breeds such as British Alpine, Saanen, and Toggenburg are used for milk production (Mohsin et al. 2019). In particular, the Saanen breed is known for its high milk production and adaptability to new environments, which has prompted the Malaysian government to import large number of Saanen goats. This trend is driven by the increasing popularity of goat

milk consumption in Malaysia, due to its health benefits, therapeutic properties, and adherence to Islamic religious values (Nasir et al. 2018). However, goat milk production is still low, largely due to its management by smallholder farmers and the absence of modern technology to improve livestock productivity (Shahudin et al. 2018).

The Saanen dairy goat breed is named after its place of origin, the Saanen Valley in Switzerland (Silva et al. 2006). They have a rapid development process, gradually widening from the chest to the back. The Saanen breed is one of the large-framed dairy goat breeds that can reach withers heights of up to 80 cm and a full-grown live weights of up to 55 kg (Akdağ et al. 2011). In Malaysia, Saanen dairy goats are one of the most common dairy breeds, alongside other breeds such as Anglo Nubian and Jamnapari, which are recognized as dual-purpose goats.

There are two types of goat farming in Malaysia. Commercial farmers produce on a large-scale,while local and small farmers keep goats for meat and milk production as a source of income (Ibrahim and Jalil 2022). Goat farming can be profitable if animal management is focused on improving production traits, such as milk yield, growth rate, litter size, and reducing the mortality rates of kid and young adults. Live weight is a critical factor in determining potential milk production and traits of livestock, especially those with economic values (Khandoker et al. 2018; Moroz and Samorukov 2020). In additionbody size and live weight are two major factors that can be used to evaluate goat growth performance and are critical indicators for improving goat production (Kari et al. 2019; Fonseca et al. 2021).

Production qualities can be influenced by a combination of genetic and environmental factors, such as management practices, climate, nutrition, and health (McManus et al. 2008; Joy et al. 2020; Cheng et al. 2022). Recent research found that litter size, birth weight, and survival rates in kids and goat were significantly affected (Assan 2020; Habtegiorgis et al. 2022). In Malaysia, tropical conditions, including high temperatures and humidity, and fluctuating feed supply and quality posechallenges, and fluctuating in ruminant production (Khandoker et al. 2018).

During the weaning period, live weight is a critical trait for animal welfare, profitability, and production (Al-Dawood et al. 2020). However, pre-weaning kid mortality remains a major challenge for breeders, with kid' mortality being an important factor affecting goat production (Tesema et al. 2017). To achieve high market weight for goat kid, one approach is to improve their growth performance and survival rate by increasing their growth potential, which can be achieved through selection and improvement of environmental conditions (McManus et al. 2008; Tajonar et al. 2022).

The current study showed that Saanen goat production can be maximised by improving growth development and survival rate of weaned kid, which can have a a significant impact on the profitability of the goat industry. In addition, using weaned kid as breeding stock can improve overall quality and milk production.These results highlight the importance of focusing on growth performance, litter size, and survivability of weaned kid to ensure profitability in the goat industry. Moreover, the rapid growth during the pre-weaning period can reduce rearing costs and ultimately increase farmer profits. . Therefore, the knowledge and data obtained in this study can be used to increase the production of Saanen goats and ultimately improve the economic viability of the goat industry. The growth curve analysis presented in this study can have significant implications for the breeding, feeding, and management practices in the goat industry. Specifically, the knowledge gained from this analysis may allow for more accurate evaluation of breeding value, and information on more effective feeding and management strategies.

MATERIALS AND METHODS

Ethics approval

The UniSZA Animal and Plant Research Ethics Committee (UAPREC) approved the sampling method and experimental procedures in this study (Reference number: UAPREC/007/032).

Animal management

The present study was conducted at the UniSZA Dairy Goat Farm, Besut, Terengganu, from March to April 2022 in an intensive housing system. A total of 22 Saanen kid (15 females and 7 males) were selected based on their date of birth between March 9 and 15, 2022 and were 4-5 days old (0 weeks) at the beginning of the study. The kid were marked for identification according to their dam, and the experiment did not change the standard management and milking procedures for Saanen kid before weaning.All animals received colostrum directly from their dams up to seven days and were fed a standard diet consisting of pellets equal to 3% of their body weight in in the morning and fresh Brachiaria humidicola ad libitum in the afternoon, with free access to water until the end of sampling period. The live weight of each kid was recorded weekly for six weeks using a bucket to restrain any movement. Measurementswere taken and documented twice weekly, along with other information on feeding and age of the dam.The survival rate of each kid was observed weekly and statistically analyzed

using the recorded data. These results may help to accurately assess breeding value and improved feeding and management of Saanen goat kid.

Statistical analysis

In this study, the growth performance and litter size of Saanen kid were subjected to statistical analysis using the T-test. Specifically, the T-test was used to examine the mean values of live weight ± standard error (SE) and mean live weight of litter size±SE, with statistical significance set at $P<0.05$. In additionthe relationship between sexr and litter size was examined using correlation and linear regression analysis. The linear regression model was used to develop the optimal equation for estimatinglive weight based on a regression line.

At the endof the study period, the survival rate (%) of the kid was determined by dividing the total number of live kid by the original number of kid at the beginning of the study. The resulting quotient was then multiplied by 100 to obtain the percent survival rate survivability, this method described by Al-Dawood et al. (2020).

RESULTS AND DISCUSSION

Growth influenced by sex

The objective of the current study was to determine the sexes and live weight of Saanen goat kid during the period before weaning, which is a crucial developmental stage for the growth and survival of these animals. During a six-week experimental period, the live weights of Saanen aanen kidlings, regardless of sex, was closely monitored and recorded to analyze their growth patterns. The inclusion of both male and female Saanen kidlets in the study provided a comprehensive understanding of potential sex differences in growth performance.This information may prove very valuable in the context of livestock management and has the potential to provide information on breeding practices, nutritional requirements, and general herd management strategies.

Figure 1 shows the results of the analysis of the average live weight of of Saanen kidlings before weaning by sex (female and male). The graph shows a consistent upward trend ($P>0.05$) in the live weight of male kidlets compared to female. The present study aligns with the previous study, indicating that there is no significant difference in the weaning of Saanen kidlets(Teke et al. 2009). In the second week the average live weight of female Saanen kid was higher than that of male Saanen kid. However, from the 4th week onwards, the graph shows a significant increase in the live weight of the male Saanen kid in contrast to that of their female counterparts. These findings contribute to a comprehensive understanding of the growth performance of Saanen goat kid, which is of critical for the development of optimal livestock management strategies.

Analysis of the average live weight of pre- weaned Saanen kid at the sixth week of sampling showed that male pre-weaned Saanen kid had the highest average live weight of 6.40±2.85 kg. These result indicate the body weight of pre-weaned male Saanen kid increased consistently from the first week to the sixth week of sampling, indicating good growth performance.

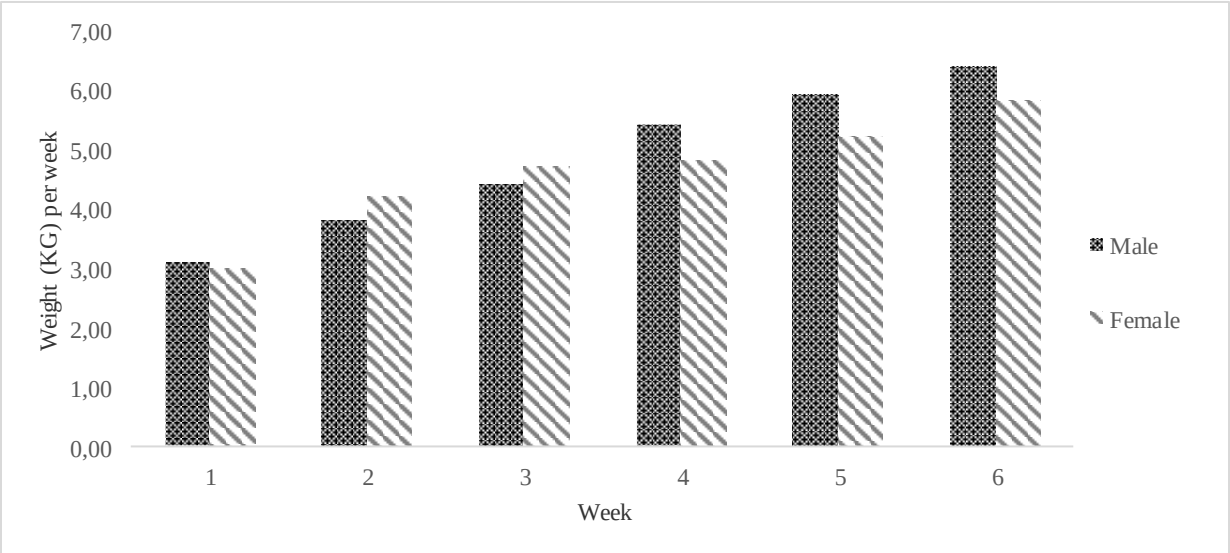


Figure1. Average live weight of Saanen goat kid before weaning, by sex

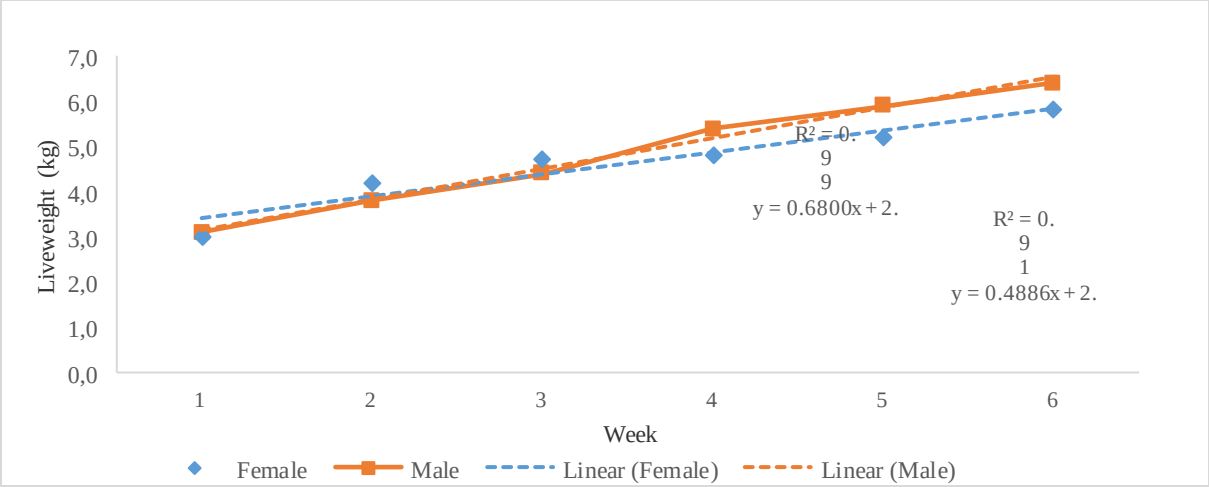
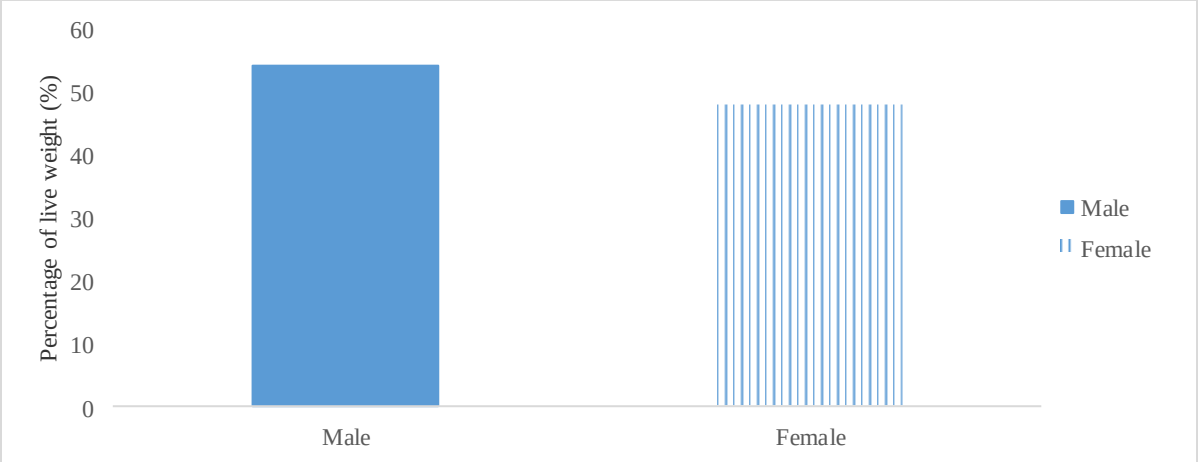


Figure 2. Regression plot of live weight grouped by sex



Fiure 3. Percentage of live weight gain of Saanen goat kid grouped bu sex before weaning during the six weeks

Similarly, female Saanen kid had the highest mean live weight of 5.80±2.48 kg pre-weaning at the sixth week of sampling, indicating a consistent increase in body weight from week one to week six and growth performance.. No significant difference (P>0.05) were observed between male and female Saanen kid. This current study are in the aggrement with the previous study where no significant sifference has been recorded in weaning Saanen goat kidlets (Teke et al. 2009). However, during in the second and third weeks of sampling, the mean live weight of pre-weaning female Saanen kid before weaning was higher than the mean live weight of male Saanen goats before weaning in the same week.

Data collected during live weight monitoring were then used to determine the sex of the Saanen kidlets and analyze their growth patterns. It is expected that the result of this research will increase knowledge of the factors affecting the growth and development of Saanen kidlings before weaning.

In the present study, the regression curve and the equation for live weight as a function of sex were shown in Figure 2.The male Saanen kid had a higher coefficient of determination (R^2) value of 0.9900 compared to the female Saanen kid, which had a value of 0.9144. The tightly clustered distribution of data points with no outliers resulted in a linear regression line for both male and female kid. The high R-value indicates a positive correlation between live weight and sex. The regression line for sex showed that male Saanen kid had a daily weight gain of 0.68 kg/day, while female Saanen kid had a daily weight gain of 0.48 kg/day. This information is useful in predicting the live weight of Saanen goat kid based on their sex. At the end of a six-week growth experiment, the proportion of live weight gain in male and female Saanen goat kid was determined.

Figure 3 showed the percentage of live weight gain of Saanen goat kid before weaning during the six weeks of the study. The data show that male Saanen kid had a

higher percentage of live weight gain compared to their female counterparts, with a difference of 3.3%. However, statistical analysis showed that there was no significant difference (P>0.05) between male and female Saanen kidlets in terms of the percentage of live weight gained over the six-week period.

Growth influenced by litter size

The second factor under consideration pertained to ascertaining the impact of litter size on the growth and survival rates of Saanen goat kid. During the sampling period, the study recorded 16 individual kid (n=16) and three sets of twin kid (n=6). The recorded goat kid underwent weight measurement and the incidence of kid' mortality was documented between the first and the sixth week of life.

Figure 4 shows the mean body weight of Saanen goat kid before weaning in different litter sizes over a six-week sampling period. The observed trend for single pre-weaning kid shows a gradual increase in body weight from the first week of life up to the sixth week. Conversely, pre-weaning twin kid demonstrate a notably accelerated rate of body weight gain throughout the six-week sampling period, characterized by a rapid weight gain during six weeks period of study.

At week 6, the single-born Saanen kid reached their maximum average live weight of 5.60±2.86 kg. Thus, the variations in body weight over the six-week sampling period indicate differences in growth performance. Conversely, the mean live weight of twin-born Saanen kid remained comparable over the six weeks of sampling, with no significant variation detected (P>0.05). The highest mean live weight of the twin-born Saanen infants was recorded at week 6 at 7.10±0.58 kg. 7.10±0.58 kg. Discrepancies in body weight during the six-week period, therefore, indicatedifferent growth rates in the twin-born kid.

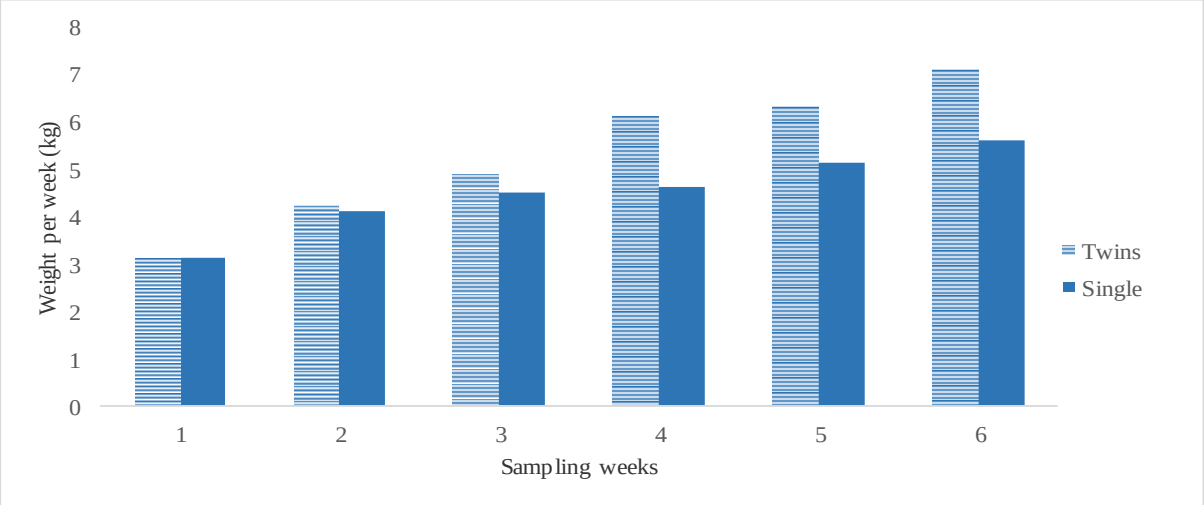


Figure 4. Average live weight of Saanen goat kid before weaning according to litter size (singles and twins)

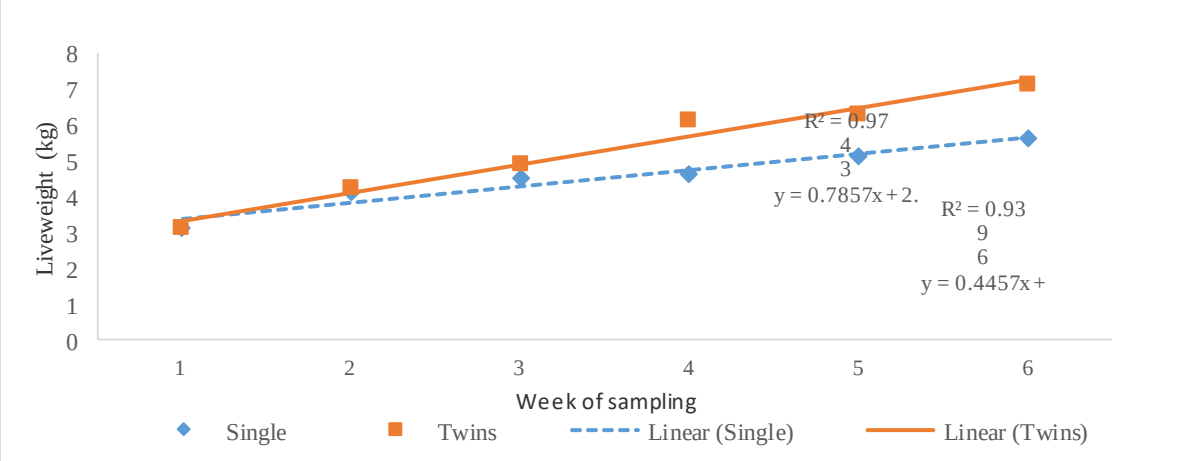


Figure 5. Regression curve of live weight on litter size

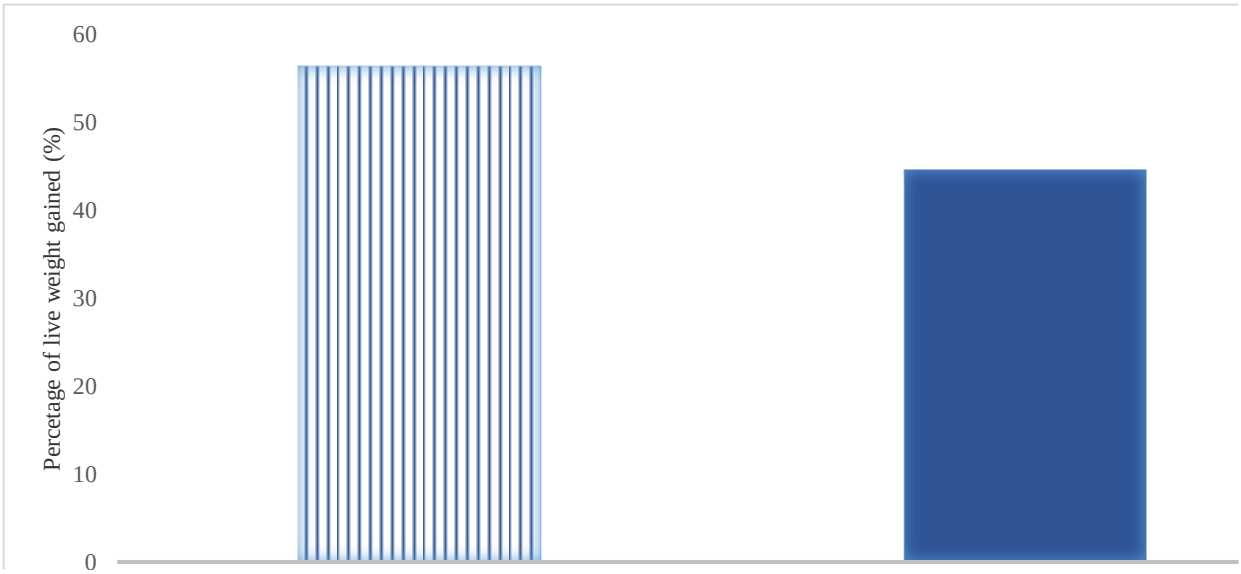


Figure 6. Percentage (%) live weight gained (litter size) over 6 weeks of sampling

After recording live weight, Saanen kidlings were evaluated for the effects of litter size on their growth patterns. The results of this study will improve our understanding of the factors affecting the growth and development of Saanen goat fawns in the pre-weaning period.

Figure 5 shows a regression plot of live weight against litter size that allows prediction of live weight using a linear line. The plot shows a dense clustering of data points with no significant outliers, resulting in a straight regression line for both single and twin kid. The R^2 value, which measures the goodness of fit of the regression line, was higher for twin kid (0.9743) than for single kid (0.9396), indicating a stronger correlation between live weight and litter size in the former. This means that twin kid gained 0.79 kg/day and single kid 0.45 kg/day during 6 weeks sampling period. The high R-value confirms a positive relationship between litter size and live weight, indicating that larger litter sizes contribute to better growth and development of Saanen goat kid in the pre-weaning period. At the completion of a six-week growth experiment, the percentage of live weight gained for twin and single-born Saanen goat kid was calculated.

Figure 6 shows that twin-born Saanen kid had a higher percentage of live weight gained over 6 weeks of sampling in compared to single-born goats, with an estimated difference of 9.9% This finding suggests that twins born prior to weaning Saanen kid in this specific farm had a greater rate of live weight gain than ingly born goats.The objective of the last analysis was to determine the survivaland mortality rate of Saanen goat kid. For this purpose, data on birth and death of Saanen goat fawns were collected over a period of six weeks. Figure 7 demonstrated that the survival rate of 22 Saanen kid was significantly greater than the mortality rate, exhibiting a difference of 72.8%.

It was observed that male kid had higher live weight than female kid. This result is consistent with previous studies(Kari et al. 2019; Al-Dawood et al. 2020; Erdem et al. 2021). The differences in growth of the kid are caused by differences in sex chromosomes, possibly in the position of growth-related genes,, physiological traits and the difference in endocrinal system (Sodiq 2012). Rapid physical development of male kid' is associated with higher live weight and the presence of androgenic hormones, which have a significant impact onon the growth process (Tesema et al. 2017). However, in the second week, the live weight of male kid is slightly lower than female kid. This could be related to the condition of the male kid in the second week, where 4 of the 7 male kid had diarrhea before the treatment.For twin kid, as the litter size increases, individual birthweight decreases because the mother does not have the physiological capacity to adequately supply the fetuses with metabolic substrates (Teke et al. 2009). This statement contradicts current research as the average live weight of twin kid is higher compared to single kid. However,this is in agreement with a previous study (Teke et al. 2009), which found that mode of delivery had little effect on the live weight of kid goats during the weaning period, such that twins were weaned from birth to 45 weeks of age.According to a study by Kari eat al., (2019), these differences could be related to differences in maternal mothering ability,, as well as feed intake and farm management practices. All these factors could affect the weight of the kid after weaning. In the present studies, this situation could be related to the fact that the farm management more focused on twin kid. This is also true for the twin kid that were provided with

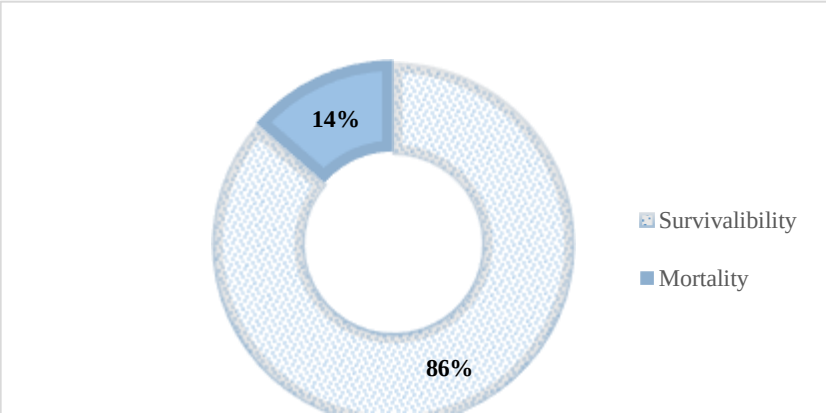


Figure 7. The survival rates of Saanen goat kid during the 6- weeks experimental period

multivitamins by the workers in the second week of sampling. The live weight of kid increased with the age of the dam, while in this study, the age of the dam in twin kid was 5 to 6-year-old and older than age of the dam in single-born kid. This statement agrees with Sodiq (2012), who claimed that the weights of young goat at birth and weaning were lower than those of older goats. The better development of mother's uterus with increasing parity and age might explain the parity of the mother effect, which has a great influence on growth before weaning (Vonnahme et al. 2018).

The mortality rate of kid before weaning has a massive impact on goat production. The survival rate of kid in this study was 86.4%, which was higher than in previous studies, that reported 79% (Ince 2010). However, the percentage of kid mortality in the current study was 13.6%, which is slightly higher than the 12.58% reported in a previous study in Bangladesh (Faruque et al. 2017). Previous studies have found that environmental factor in addition to disease have an impact on mortality rate (Khandoker et al. 2018; Chauhan et al. 2019). Farm management, coccidiosis, and weather conditionsduring the first week after birth could contribute to the high mortality rate of kid (Yıldırır et al. 2019).

In the present study, 2 of 3 mortality case were from female kid, and 1 case was from male kid ($p>0.05$). Tesema and colleagues found that sex and litter size did not effect kid survival but kid survival rate before weaning increased with maternal age (Tesema et al. 2017). This is consistent with the present study, whereas all 3 deaths were from kid of young mothers. In addition, the inconsistent pellet supply at this farm should be considered This situation might have caused nutritional stress and lead to a loss of the maternal body weight and a decrease in milk yield.

CONCLUSION

The growth of goat kid before weaning is influenced by their sex and the age of their mother. The survival rate of kid before weaning is not affected by their sex or litter size, but it is influenced by the age of the mother. Male kid tend to have higher average live weights over six weeks compared to female kid. It is important to improve feeding and management, especially for larger litters, in order to maintain body weight. Additionally, when managing Saanen goats, the difficulty of accurately measuring live weight under severe pellet deficiency conditions should be considered to improve production.

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