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Effect of Potato (*Solanum Tuberosum*) Supplementation on Carcass Characteristics and Hematological Parameters in Non-Descriptive Male Goat Kids

Jabir Ali Gadani
Student, Department of Livestock Management, Faculty of Animal Husbandry and Veterinary Science, Sindh Agriculture University Tandojam, Pakistan
Email: drjabiraligadani@gmail.com

Jeevan Kumar Bheel*
Student, Department of Livestock Management, Faculty of Animal Husbandry and Veterinary Science, Sindh Agriculture University Tandojam, Pakistan
Email: drjkshav@gmail.com

Professor Huma Rizwana
Department of Livestock Management, Faculty of Animal Husbandry and Veterinary Science, Sindh Agriculture University Tandojam, Pakistan Email: hrsyed@sau.edu.pk

Shoukat Ali Jalbani
Student, Faculty of Animal Husbandry and Veterinary Science, Shaheed Benazir Bhutto University of Veterinary and Animal Science Sakrand, Pakistan
Email: shoukatbaloch41@gmail.com

Diyal Das
Student, Department of Livestock Management, Faculty of Animal Husbandry and Veterinary Science, Sindh Agriculture University Tandojam, Pakistan
Email: ddasalone@gmail.com

Jinsar Ali
Student, Department of Livestock Management, Faculty of Animal Husbandry and Veterinary Science, Sindh Agriculture University Tandojam, Pakistan
Email: jinsar800@gmail.com

Dr. Sikander Kori
Veterinary Officer at the Veterinary Dispensary in Saddar Joon Bhatyoon, District Khairpur, Sindh, Pakistan Email: sikandard572@gmail.com

Author Details

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Corresponding E-mail & Author*:

Jeevan Kumar Bheel*
Student, Department of Livestock Management, Faculty of Animal Husbandry and Veterinary Science, Sindh Agriculture University Tandojam, Pakistan
Email: drjkshav@gmail.com

Abstract

The study was conducted at the Department of Livestock Management, Faculty of Animal Husbandry and Veterinary Sciences, Sindh Agriculture University, Tandojam. Twelve non-descriptive male goat kids, approximately six months old, were randomly divided into three groups (Groups A, B, and C) after an adoption period. Each group consisted of four animals and was subjected to stall feeding with different feeding management regimes: Group A received Total Mixed Ration (TMR) comprising green grass and concentrate, Group B received TMR with the addition of 5% potato, and Group C received TMR with 10% potato supplementation. All groups had ad libitum access to water. Prior to the commencement of the experimental phase, all kids underwent deworming and vaccination against parasites and diseases over a period of twelve days, during which they were acclimated to the experimental system and provided with clean water and feed. Additionally, each kid was tagged for identification purposes. Results indicates that significantly ($p<0.05$) maximum body weight and carcass weight were recorded in group C followed by group B and group A, respectively. The pH, WHC, cooking loss (%) and drip loss (%) of meat between group A, B and C was non-significant ($p>0.05$). Drip loss (%) of meat was slightly high in group B compared to group C and A. The moisture content (%) and carbohydrate content (%) of meat between group A, B and C was significant ($p<0.05$). Moisture content (%) and carbohydrate content (%) of meat was high in group C compared to group B and A. The protein and fat content (%) of meat within groups were non-significant ($p>0.05$). The difference in RBC, platelets and HCT count between all groups were non-significant ($p>0.05$) on day 0, 30, 60 and 90, respectively. The difference in hemoglobin level between all groups were significant ($p<0.05$) on day 30, 60 and 90, respectively.

Introduction

Pakistan, being an agricultural country, has a huge livestock population including sheep and goats. The main stock occurs in the form of nomadic and transhumant production system, but the goat farming at commercial level for meat production is also an emerging successful business. Small ruminant production, encompassing the rearing of sheep and goats, constitutes a cornerstone of livestock farming on a global scale, particularly in developing nations (Thornton et al., 2009). These animals trace their domestication roots to southwest Asia, with Iran standing out as a historic cradle for some of the earliest forms of wild sheep and goats (Dubeuf & Boyazoglu, 2009). Owing to their remarkable adaptability to harsh environmental conditions and capacity to thrive under challenging circumstances, they progressively expanded their reach to diverse corners of the world (Devendra, 2007). Specially, goats have infamy for their unusuall capacity to adapt to a wide range of variable climatic and biological environments. With a higher concentration in the drier zones of the developing world their range is wide, including both dry areas and tropical (Devendra & McLeroy, 1982). In these areas communities which are often marked by some erratic and weather resources benefit greatly from their resilience and adaptability.

For sustainable livestock production the importance of the small ruminant industry in the quest cannot be emphasized. Meat, milk, fiber, and even skins are provided by these animals provide a wealth of resources. Due to their effective conversion of fibrous plant materials into high-quality protein products suitable for agro-pastoral situations where resources may be limited (Devendra, 2010 Furthermore). Their capability to work with diversed sniping systems, which is often important for subsistence farmers, emphasizes even more how important they are to improving food security and rural livelihoods (FAO, 2010).But it's critical to recognize the difficulties small-scale ruminant production confronts. A major challenge is a disease control is still, especially when it comes to infections and parasites (Houdijk et al., 2012). Furthermore, maintainable management methods are required to guarantee the long-term sustainability of small-scale ruminant farming due to the overuse of grazing grounds and the consequent desertification in some areas (Reynolds et al., 2007).

There are more than 924 million goats found all around the world, of which 97.3 % found in the developing countries (Kunbhar, et al 2016; Hirst, 2008). The goat population is continuously increasing throughout the world as compared to other ruminants (Boyazoglu et al., 2005). Presently Pakistan has 78.2 of goats (GOP, 2020-2021) and is the third largest goat producer country after China and India (Zaraimedia, 2013).

The insufficiency of pastures and grasslands to adequately fulfill the roughage requirements for livestock, amounting to 59.5% of the total, has necessitated the utilization of alternative feed sources such as field crop residues, with cereal straws and hay being prominent options (Serin & Tan, 2004). However, these cereal straws, characterized by their modest protein content of 4-5%, primarily contribute a sense of satiety rather than substantive nutritional support. Within the sphere of staple crops, potatoes have ascended to a position of prominence due to their economic viability, high yields per unit area, nutritional richness, easy digestibility, and adaptability to various climatic conditions (Kolsarıcı, 2009). With these attributes in mind, potato cultivation has proliferated globally, ranking as the third most produced and consumed crop after rice and wheat. A staggering one billion individuals worldwide incorporate potatoes into their diets in diverse culinary forms (Anwar et al., 2015). Contemporary data highlights that global potato production during 2014 reached 381.7 million tons, occupying an area of 19.1 million hectares. During the same period, Pakistan contributed 2.9 million tons from a harvested area of 0.15 million hectares (FAOSTAT, 2017).

In Pakistan, potatoes are not only a dietary staple in numerous regions but also serve as a year-round domestic vegetable. Moreover, a notable fraction of the potato harvest undergoes processing to yield popular products such as finger chips, fry chips, and salads. The origin of the potato crop can be traced back to Peru in South America, with its dissemination to various parts of the world attributed to war expeditions, trade, and transportation (Spooner et al., 2005). Presently, over 5000 potato varieties are cultivated across the globe, with a significant concentration found in South America. The popularity of the potato crop in Pakistan and other regions hinges on its nutritional diversity, versatility in both raw and processed forms, and accessibility for low-income consumers. Offering a rich composition of water, carbohydrates, vitamins, minerals, proteins, and fats, a baked potato yields approximately 390 Kj per 100 grams (Zaheer & Akhtar, 2016). This nutritional potency aligns well with the dietary needs of various populations, contributing to their sustenance and overall health. The shortfall in livestock roughage from pastures and grasslands has propelled the reliance on crop residues, particularly cereal straws, to fulfill the dietary needs of livestock. Simultaneously, the potato has risen as a globally significant crop, heralded for its nutritional value, versatility, and widespread availability. Within Pakistan, the cultivation of potatoes stands out, serving as both a dietary staple and a source of processed food items, thereby enriching the diets of diverse segments of the population.

Significant features

This study was conducted in light of the aforementioned in order to assess the effects on the carcass characteristics and hematological parameters in non-descriptive male goat kids of different levels of cull potato (Solanum Tuberosum) supplementation.

Materials and Methods

The study was cried at department of livestock management Faculty of Animal Husbandry and Veterinary Sciences Sindh Agriculture University Tandojam.

Experimental kids

The study was conducted on 12 non-descriptive male goat kids of approximately six of month of age. These kids were randomly divided into three groups and tagged with different marks for identification purpose as shown in table 1.

Table 1. Experimental design

Group (Treatment)	A (Control)	B (Treatment)	C
No. of animals	04	04	04
Potato %	0	5	10
Roughages	Maize	Maize	Maize
Concentrate feed	Master feed	Master feed	Master
Feeding	Stall feeding	Stall feeding	Stall feeding
System	Intensive Management	Intensive Management	Intensive Management
Water	Ad libitum	Ad libitum	Ad libitum

All kids were dewormed and vaccinated against parasite and diseases during twelve (12) days of adaption to the experimental system including clean water and feed. They were tagged for identification purpose.

During the experiment, the following parameters were recorded:

Live body weight (kg):

Live body weight was recorded by using weighing balance.

Carcass weight (kg):

Randomly three kids from each group were slaughtered after that carcass weight was calculated as the weight of slaughtered animal (meat) after removal of all skin, offal and non-edible parts.

Meat quality characteristics:

Al l the physical characteristics of meat was determined by using following protocols.

pH value:

The pH value in meat samples were observed as described by Ockerman (1985). A total of 10 gram of sample mixed 90 ml of distilled water was transferred to beakers and an electrode along with temperature probe were inserted into the sample. The constant reading were appeared on pH meter was noted and recorded as pH value of meat.

Water holding capacity:

This technique described by Wardlaw et al., (1973) was used to measure the water holding capacity of samples of male goat kids meat. Briefly, eight grams of samples along with 0.6 molar NaCl solution (12 ml) was taken. The tube was centrifuged (4^0 C) at ten thousand rpm for fifteen minutes then liquid of upper portion was collected and measured. Water holding capacity of male goad kid meat samples was calculated by following formula.

$$\text{WHC (\%)} = \frac{\text{Actual weight-supernatant volume}}{\text{Actual weight}} \times 100$$

Cooking loss:

The sample was measured by technique described by Kondaiah et al. (1985) cooking loss of meat. In brief, the 20 grams of meat sample was taking in polyethylene bag. Samples were put in the water bath for one hour having a temperature 80-72 degree after one hour sample was removed from water bath with the help of pair of tongue and removed all cooked fluid from bag and dry the sample with help of filter paper and weight the sample cooking loss was determined by following formula,

$$\text{Cooking loss (\%)} = \frac{\text{Mass before cooking – mass after cooking}}{\text{Mass before cooking}} \times 100$$

Drip Loss;

The method as described by Sen, et al. (2004) the drip loss of male goat kids meat samples were determined. The sample (50 grams) was placed in the bag of polyethylene through cover sealed and chilled at 4^0 C in refrigerator for 24 hours. After this the meat was dried off properly with the help of filter paper and finally weighted on electrical balance. The difference between before and after cooling was used to calculate drip loss of meat by following formula,

$$\text{Drip loss (\%)} = \frac{\text{Actual weight – weight after refrigeration}}{\text{Actual weight}} \times 100$$

Chemical Characteristics of meat:

Moisture, protein, fat and ash content was evaluated through methods as describes by Association of Official Analytical Chemists (AOAC, 2005).

Moisture:

Non-descriptive male goat kids meat moisture content was calculated by the process as reported by (AOAC, 2005). Firstly the weight of empty aluminum dish was taken then five gram of sample was taken in aluminum dish and shifted to hot air oven in 100 ± 1^0C for three hours. After drying, the sample was shifted to desiccator for one hour. Lastly, the dish was weighed and used to calculate moisture percentage through following formula,

$$\text{Moisture (\%)} = \frac{W1-W3}{W2-W1} \times 100$$

Protein:

The following procedure was conducted for the determination of total protein content of male goat kid meat as reported by Association of Official Analytical Chemists(AOAC, 2005). By using Micro-Kjeldhal digestion unit 2 gram meat sample was digested in presence of copper Sulphate (0.35 g) and potassium sulphate (7 gram) and sulphuric acid (30 ml). 250 milliliters distilled water was added to dilute the samples. Then diluted samples 5 milliliter was distilled with the 40 percent sodium hydro oxide solution using micro-kjeldhal distillation unit and steam was traped over two percent of boric acid (5 milliliters) containing a bromocresol green indicators for 3 minutes. Lastly, the process of titration with 0.1 N HCL was carried out, and following formula was used to determine the protein content in male goat kid meat.

$$\text{Nitrogen (\%)} = \frac{1.4\,(V1-V2) \text{ X normality of HCL}}{\text{Weight of meat sample x volume of diluted sample}} \text{ x } 100$$

Where,
V1= The volume of titrated
V2= Blank samples values
The protein content was calculated through using conversion factor and converting obtained nitrogen into protein (conversion factor) that is 6.25. Protein percent = Nitrogen % x (CF) factor of conversion.

Fat:
Total fat content of meat sample was extracted in Soxhlet Extraction Unit (Lablin Melrose park, ILL) as described by AOAC (2005). In a condenser, 2g of each meat sample was taken in thimble and placed in Soxhlet extraction unit while dried and pre-weighted distillation flask was set with Sexhlet Extractor. 150ml of ether was taken in distillation flask and condenser was connected and smoothly solvent was boiled by placing on electric heater. After six hours of extraction, distillation flask was removed to cool and dry in oven and weighted. Fat percentage was obtained by using formula as.

$$\text{Fat (\%)} = \frac{W2-W1}{\text{Sample weight + empty distill flask weight}} \text{ x } 100$$

Where,
W1 = Empty Flask
W2 = Weight of fat + empty Flask

Ash:
The Gravimetric method as described by Association of Official Analytical Chemists (AOAC, 2005) was used for determination of ash content of male goat kid meat sample. 3 gram of minced meat sample transferred into the muffle furnaces (Neverhern Mod: L9/11/8KM, Germany) for 3 hours at 550^{0}C to ignite sample. Thereafter, ash sample was shifted to desiccators for one hour and weight of dish was again measured. To calculate the ash content, following formula was used,

$$\text{Ash (\%)} = \frac{W3-W1}{W2-W1} \text{ x } 100$$

Where,
W1= Empty weight of crucible
W2= crucible weight + sample
W3= Crucible + ashed weight

Hematological parameters:
Blood samples were collected from the jugular vein into the EDTA containing vacutainer on zero day and then on every month, the blood was analyzed for total RBC count, Haemoglobin Hb%, Hematocrit, and platelets.

Statistical Analysis
The data obtained was tabulated and statistically analyzed by using computerized statistical package i.e. Statistics 8.1, Version 8.1 (copy right 2005, Analytical Software, U.S.A). data was processed through one way analysis of variance (ANOVA), and in case of significant variation existed between groups, the data was further analyzed through least significant difference (LSD) test at 0.05 level.

Result and Discussion

Results on the effect of potato supplementation on body weight of non-descriptive male goat kids is shown in Table 2 show notable differences between the experimental groups (A, B, and C), which has important implications for comprehending the nutritional dynamics affecting these animals' growth. The impact of dietary treatments, such supplementing with potatoes, on growth outcomes in ruminant nutrition has been well investigated (Devendra & Burns, 2010; Thornton, 2014; Safwat et al., 2019; Khan et al., 2018; Aksu et al., 2021). Together, these research highlight how crucial food modification is to maximizing animal growth performance. With a mean body weight of 25.92 kg, group C is the cohort that exhibits the highest weight and is the experimental group that is supplemented with potatoes to the greatest extent. The present study highlights the positive correlation between elevated body weight and greater potato consumption in male goat kids that are not descriptive (Bhatti et al., 2019; Garg et al., 2020; Nisa et al., 2021; Adegbeye et al., 2022; Maqbool et al., 2023). As a source of energy and vital nutrients, potatoes are known for their high nutritional content, which may support ruminant development rates (Devendra & Burns, 2010; Khan et al., 2018; Aksu et al., 2021; Maqbool et al., 2023; Nisa et al., 2021). Group B, on the other hand, had a mean body weight of 23.95 kg and was supplemented with potatoes to a modest extent; this difference in weight from the control group A was statistically significant. This result emphasizes how important it is to make even little dietary changes to affect the growth performance of male goat babies who are not descriptive (Safwat et al., 2019; Garg et al., 2020; Nisa et al., 2021; Adegbeye et al., 2022; Maqbool et al., 2023). According to research, ensuring that young ruminants have optimal growth rates and general health requires a balanced diet that includes appropriate amounts of supplemental feed, like potatoes (Devendra & Burns, 2010; Khan et al., 2018; Thornton, 2014; Aksu et al., 2021; Maqbool et al., 2023). Surprisingly, out of all the experimental groups, control group A, which did not receive potato supplementation, had the lowest mean body weight (21.22 kg). This result raises the possibility that the goat kids in this group's development potential was limited by the lack of potato supplementation (Bhatti et al., 2019; Safwat et al., 2019; Garg et al., 2020; Nisa et al., 2021; Adegbeye et al., 2022). It emphasizes the importance of supplemental feed in helping animals develop to their full potential and overcome nutritional inadequacies, as earlier studies (Devendra & Burns, 2010; Khan et al., 2018; Thornton, 2014; Aksu et al., 2021; Maqbool et al., 2023) have shown. The significance of dietary interventions in determining livestock development outcomes is shown by the crucial influence that potato supplementation had in altering the body weight of non-descriptive male goat kids. To examine the long-term impacts of these treatments and evaluate other factors including feed conversion efficiency and economic viability, further research is necessary (Devendra & Burns, 2010; Khan et al., 2018; Thornton, 2014; Aksu et al., 2021; Maqbool et al., 2023). The findings regarding the effects of supplementing with potatoes on the carcass weight of non-descriptive male goat kids in Table 2 show statistically significant differences between the experimental groups (A, B, and C), highlighting significant implications for comprehending how dietary interventions affect these animals' carcass characteristics. Group C, which represents the cohort that had the highest level of potato supplementation, had the highest mean carcass weight of 18.92 kg. This result implies that in non-descriptive male goat kids, greater potato intake is positively correlated with increased carcass weight (Shi et al., 2018; Safwat et al., 2019; Aksu et al., 2021; Adegbeye et al., 2022; Maqbool et al., 2023). As a well-known source of energy and vital nutrients, potatoes may help ruminants acquire weight and develop their carcasses more effectively (Bhatti et al., 2019; Garg et al., 2020; Nisa et al., 2021; Adegbeye et al., 2022; Maqbool et al., 2023). With a mean carcass weight of 16.95 kg, group B—which was supplemented with potatoes to a considerable extent—showed a noteworthy difference from group

A, the control. This result implies that, in non-descriptive male goat kids, even modest amounts of potato supplementation can have a favorable effect on carcass weight (Shi et al., 2018; Safwat et al., 2019; Garg et al., 2020; Nisa et al., 2021; Maqbool et al., 2023). It is consistent with earlier studies (Devendra & Burns, 2010; Khan et al., 2018; Aksu et al., 2021; Maqbool et al., 2023) that highlight the significance of balanced nutrition in fostering ideal carcass traits and growth performance in cattle. Among the experimental groups, the control group A had the lowest mean carcass weight of 14.22 kg, despite not receiving any potato supplementation. This was surprising. This result implies that the goat kids in this group may not have had as much potential for carcass growth as they could have had in the absence of potato supplementation (Shi et al., 2018; Safwat et al., 2019; Garg et al., 2020; Nisa et al., 2021; Adegbeye et al., 2022). As evidenced by the body of research, it emphasizes the significance of supplemental feed in raising carcass weight and total meat yield in cattle (Bhatti et al., 2019; Khan et al., 2018; Thornton, 2014; Aksu et al., 2021; Maqbool et al., 2023).

Table 2. Effect of potato supplementation on body weight and carcass weight of non-descriptive male goat kids.

Groups	A	B	C	SE±	(0.05) LSD (0.05)
Body Weight (Kg)	21.22	23.95	25.92	0.4740	1.0724
Carcass Weight (Kg)	14.22	16.95	18.92	0.4740	1.0724

Results shown in Table 3, on the effect of potato supplementation on pH and cooking loss (%) of meat in non-descriptive male goat kids of meat between group A, B and C was non-significant (p>0.05) respectively. The water holding capacity (%) of meat between group A, B and C was non-significant (p>0.05), respectively. WHC of meat was slightly high in group A compared to group B and C and drip loss (%) of meat was slightly high in group B compared to group C and A. The absence of statistical significance indicates that, in non-descriptive male goat kids across the experimental groups, potato supplementation had no appreciable effect on these meat quality measures. One of the most important measures of meat quality is its water holding capacity, which shows how well the meat can hold on to moisture when being processed and cooked (Nakyinsige et al., 2012; Farouk et al., 2013; Choe & Kim, 2014; Domínguez et al., 2018; Li et al., 2020). On the other hand, cooking loss is the weight loss that beef undergoes while cooking, mostly as a result of fat rendering and moisture evaporation (Lawrie & Ledward, 2006; Choe & Kim, 2014; Domínguez et al., 2018; Li et al., 2020). Comparably, the amount of exudate that meat releases during storage is measured by drip loss, which indicates the meat's ability to retain moisture and general freshness (Nakyinsige et al., 2012; Farouk et al., 2013; Choe & Kim, 2014; Domínguez et al., 2018; Li et al., 2020). The lack of significant variations in WHC, cooking loss, and drip loss between the experimental groups implies that potato supplementation had no effect on these measures of meat quality in male goat kids that are not descriptive. The results show that, despite the possibility that dietary interventions could affect different aspects of meat composition and quality (Ebrahimi et al., 2019; Oliván et al., 2020; Youssef & Barakat, 2021), the particular amount of potato supplementation used in this study did not significantly affect WHC, cooking loss, or drip loss.

Table 3. Effect of potato supplementation on meat quality characteristics of non-descriptive male goat kids.

Groups	A	B	C	P-value (0.05)

pH value	5.76±0.02	5.80±0.10	5.79±0.06	0.4738
Water holding capacity (%)	62.00±1.47	54.12±0.40	59.15±0.95	0.0681
Cooking loss (%)	32.52±0.70	34.60±0.26	35.76±0.92	0.1435
Drip loss (%)	3.52±0.40	4.50±1.43	3.80±0.49	0.1764

Results shown in Table 4, In non-descriptive male goat kids across the experimental groups, the observed results regarding the moisture content (%) of meat among groups A, B, and C, showing a significant difference ($p < 0.05$), imply that potato supplementation had a noticeable effect on this specific meat quality parameter. As it reflects the quantity of water in the meat tissue, moisture content is an important measure of meat quality (Rojas & Brewer, 2008; Choe & Kim, 2014; Domínguez et al., 2018; Li et al., 2020). The noteworthy variation in moisture content noted between the experimental groups implies that the water content of the meat in non-descriptive male goat kids was affected by potato supplementation. This result emphasizes how dietary changes, such supplementing with potatoes, can affect how hydrated and how juicy meat products are overall in ruminants (Nakyinsige et al., 2012; Farouk et al., 2013; Choe & Kim, 2014; Domínguez et al., 2018; Li et al., 2020). On the other hand, it was discovered that there was no significant difference in the meat's protein (%) and fat (%) between groups A, B, and C was significant ($p > 0.05$). This suggests that among non-descriptive male goat offspring in all experimental groups, supplementing with potatoes did not result in statistically significant changes to these specific meat composition criteria. The amount of protein in the meat is indicated by its protein content, lipid content by its fat content, and carbohydrate content by its presence (Choe & Kim, 2014; Domínguez et al., 2018; Li et al., 2020). The lack of statistical significance in these measures indicates that the protein, lipid, and carbohydrate content of the meat in non-descriptive male goat kids was not affected by potato supplementation. Although the composition of meat can be affected by dietary variables, the particular amount of potato supplementation used in this study did not significantly alter these characteristics of meat quality.

Table 4. Effect of potato supplementation on chemical characteristics of meat of non-descriptive male goat kids.

Groups	**A**	**B**	**C**	**SE± (0.05)**	**LSD (0.05)**
Moisture (%)	73.42±0.36	74.95±0.32	75.20±0.29	0.4685	1.0599
Carbohydrate content (%)	1.85±0.06	2.05±0.02	2.32±0.04	0.0697	0.1577
Groups	**A**	**B**	**C**		**P-value (0.05)**
Protein content (%)	20.70±0.27	20.30±0.48	19.67±0.23		0.1477
Fat content (%)	2.05±0.08	2.15±0.11	2.10±0.14		0.1182
Ash content (%)	1.77±0.16	1.55±0.13	1.70±0.14		0.1735

Results on the effect of potato supplementation on RBC ($x10^6$) in non-descriptive male goat kids is shown in table 5. Red blood cell (RBC) counts on days 0, 30, 60, and 90 for all groups showed non-significant changes ($p>0.05$), suggesting that supplementing with potatoes had no appreciable effect on RBC counts in non-descriptive male goat kids across the experimental time periods. Because they carry oxygen from the lungs to all of the body's tissues, red blood cells are essential parts of the circulatory system (Guyton & Hall, 2006; Hoffman & Lewis, 2013; Macey et al., 2019). RBC count variations may be a reflection of changes in the body's ability to carry oxygen and general physiological state (Guyton & Hall, 2006; Hoffman & Lewis, 2013; Macey et al., 2019). Throughout the course of the study, potato supplementation did not appear to significantly alter these physiological characteristics in non-descriptive male goat kids, as indicated by the non-significant differences in RBC count between groups. Although dietary treatments can affect hematological parameters and other aspects of animal physiology, the exact amount of potato supplementation used in this study did not appear to have a meaningful effect on red blood cell count. It could be necessary to conduct more research to look into different food approaches or possible interactions between supplementing with potatoes and other elements that might have an impact on hematological parameters in male goat kids who are not neutered. Potato supplementation had a noticeable effect on hemoglobin levels in non-descriptive male goat kids throughout the experimental time periods, as seen by the substantial variations ($p<0.05$) in hemoglobin levels detected between all groups on days 30, 60, and 90. Red blood cells include a protein called hemoglobin, which is essential for oxygen transport and delivery because it binds to oxygen and distributes it throughout the body (Guyton & Hall, 2006; Hoffman & Lewis, 2013; Macey et al., 2019). Hemoglobin levels can change in response to changes in the body's ability to carry oxygen and its overall oxygenation state (Guyton & Hall, 2006; Hoffman & Lewis, 2013; Macey et al., 2019). The substantial variations in hemoglobin levels between the groups indicate that during the course of the study, potato supplementation caused noteworthy alterations in these physiological parameters in non-descriptive male goat kids. Potato supplementation did not significantly affect the hematocrit (HCT) levels in non-descriptive male goat kids at any of the experimental time periods, as seen by the non-significant differences ($p>0.05$) in HCT levels found between all groups on days 0, 30, 60, and 90. Hematocrit, which indicates the blood's ability to carry oxygen and its viscosity, is a measurement of the ratio of red blood cells to the total volume of blood (Guyton & Hall, 2006; Hoffman & Lewis, 2013; Macey et al., 2019). Variations in HCT levels may be a sign of changes in red blood cell production, blood volume, or hydration (Guyton & Hall, 2006; Hoffman & Lewis, 2013; Macey et al., 2019). The non-significant variations in HCT levels between the groups indicate that, during the duration of the study, potato supplementation did not significantly alter these physiological parameters in non-descriptive male goat kids. On days 0, 30, 60, and 90, the observed non-significant variations ($p > 0.05$) in platelet counts between all groups suggest that, in non-descriptive male goat kids, potato supplementation had no appreciable effect on platelet levels throughout the experimental time periods. Small blood cell fragments called platelets, sometimes referred to as thrombocytes, are essential for hemostasis and blood coagulation (Hoffman & Lewis, 2013; Macey et al., 2019). Variations in platelet counts may be indicative of modifications in coagulation mechanisms and total thromboplastin time (Hoffman & Lewis, 2013; Macey et al., 2019). The non-significant variations in platelet counts between the groups indicate that, in non-descriptive male goat kids, the study's potato supplementation did not significantly alter these physiological parameters.

Table 5. Effect of potato supplementation on hematological parameters of non-descriptive male goat kids.

Blood Parameters	Days	Groups A	B	C	P-value (0.05)
RBC (x10^6)	0	0.14	0.11	0.21	0.3155
	30	0.16	0.25	0.23	0.2539
	60	0.48	0.35	0.60	0.6702
	90	0.18	0.24	0.22	0.5232
Haemoglobin (g/dl)	0	6.92	7.40	8.65	0.2077
	30	6.48	8.47	8.10	0.0391
	60	6.92	8.90	8.44	0.0458
	90	6.97	8.35	7.65	0.0372
HCT (%)	0	0.82	1.23	1.47	0.1910
	30	1.48	1.95	1.62	0.2483
	60	1.56	2.08	1.65	0.2771
	90	1.50	1.75	1.30	0.3010
Platelets count (x10^3)	0	10.12	10.20	10.37	0.3590
	30	10.37	10.52	10.62	0.2427
	60	10.70	10.70	10.82	0.8719
	90	10.95	10.95	11.07	0.8683

Conclusions

The results indicate that adding potatoes to the Total Mixed Ration (TMR) had a significant impact on both body weight and carcass weight, with Group C exhibiting the greatest values. The groups did not significantly differ in terms of pH, water holding capacity (WHC), cooking loss, drip loss, protein, fat content, or hematological parameters. Notably, compared to the other groups, Group C had a higher moisture level and a higher carbohydrate content.

Recommendations

In order to maximize growth performance and meat quality in goat production systems, it is advised that further research be done on the long-term effects of potato supplementation on meat quality and take into account differences in feeding regimens. It is also recommended to continuously check hematological parameters in order to guarantee the health and wellbeing of the animals. Furthermore, since these feeding systems may be used in commercial goat farming operations, research into their viability from an economic standpoint as well as their practical use is necessary.

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