Growth Performance of Goat Fed with Indigofera (Indigofera suffruticosa Mill.) and Super Napier (Pennisetum purpureum Schumach x Pennisetm Glaucoma L.)

Satra A. Sabaani

Tawi-Tawi Regional Agriculture College TRAC Compound, Nalil, Bongao, Tawi-Tawi, Philippines.
E-mail: sabaani.satra@gmail.com

Abstracts: It still needs to be thoroughly determined how to incorporate various pasture mixes at varying amounts in goat diets. Fewer farmers are feeding goats varied concentrations of Indigofera and super Napier grass, although many have already practiced incorporating different pasture types into the goats' regular grazing routines. The study aimed to determine how various Indigofera and Super Napier combinations affected goat growth, morphometry, and carcass parameters. A completely randomized design (CRD) was used to conduct the trial, with six treatments replicated four times, with Treatments 1 and 6 acting as a control. The Tukey HSD test performed multiple means comparisons across several treatments. Goats that were fed with 100% Indigofera, 80% Super Napier + 20% Indigofera, and 100% Super Napier significantly outgrew their size, as seen by their final weights of 16.93 kg, 16.68 kg, and 16.57 kg, respectively (3.16 kg, 2.90 kg and 2.67 kg, respectively). Combinations of 60% super Napier + 40% Indigofera and 70% super Napier + 30% Indigofera have a substantial impact on the amount of feed consumed (1.71 kg), whereas 60% super Napier + 40% Indigofera has a considerable impact on the goat's feed efficiency (0.60 and 0.76, respectively). Following a 60-day experiment, 100% Indigofera also had an impact on the chest circumference (57.20 cm), loin eye area (11.66 cm2), gastrointestinal contents (2.90 kg), hot carcass weight (6.72 kg), cold carcass weight (6.45%), pluck weight (0.68 kg), the weight of total trimmable fats (0.33 kg), and the percentage weight of total trimmable fats (2.02%). Additionally, 70% super Napier + 30% Indigofera, 80% SN+20% Indigofera, 70% SN + 30% Indigofera, and 60% SN + 40% Indigofera are suggested by these data.

Keywords: Goat performance, Indigofera, Super Napier.

1. INTRODUCTION

Goats are little ruminants that eat grass, forage, and plant leaves. The cheap initial investment needed for goat production is ideal for small-hold farms. Goats are an essential part of every celebration in the culture, including fiestas, weddings, baptisms, and birthdays. An agricultural system's diversity and economic health can be improved by incorporating animals. Due to their shorter digestive systems than other ruminants, goats need a diet higher in nutrients.

Grazing goats may choose the parts of plants that are highly nutritious and avoid the less nutritious parts because of their small mouths and flexible lips. Each goat can have a daily dry matter intake of up to 5% of its body weight (perhaps more if the forage is highly digestible). To achieve their best growth and development, goats are raised with high-quality feed and an ideal mix of many essential nutrients. To solve the problem of inadequate feed, some agricultural wastes or byproducts are now regarded as alternate feeds for tiny ruminants. In the meat production system, the quantitative features of the carcass are crucial in determining yield, regional composition (commercial cuts), tissue composition, and carcass muscularity.

1.1. The objective of the study

To ascertain whether there is a substantial difference between treatment methods regarding the feed intake, feed conversion efficiency, live weight change, and ultimate weight of goats fed with various combinations of Indigofera and Super Napier grass.

2. METHODOLOGY

Goats were randomly assigned to six treatments, repeated four times, in the completely randomized experimental design. The following were the treatments: 100% super Napier T1, 90 percent super Napier, 10 percent Indigofera, 80 percent super Napier, 20 percent Indigofera T4: 30% Indigofera, 70% Super Napier T5: 40%

Indigofera, 60% Super Napier 100% Indigofera in T6 Treatments 1 and 6 served as the controls because the study was limited to determining the concentrations of super Napier and Indigofera combinations that affect the growth performance, morphometry, and carcass characteristics of goats after 60 days.

The Goat Project at the University of Southern Mindanao in Kabacan, Cotabato, was where the study was carried out. The University of Southern Mindanao's Goat Project's monitor-style goat housing was employed for the study. The goat house was meticulously cleaned before the study began. It was divided into six compartments, each representing one of the six treatments involving four experimental goats. Feeders and waterers were provided for each compartment as needed. In this investigation, 24 experimental goats ranging from 3 to 4 months were employed. The initial weights were selected, and they were then randomly assigned to the various treatments.

Early in the morning, workers in the goat project picked super Napier grass and Indigofera legume from several plots. The gathered grass was sliced into pieces between two and four inches long, and the leaves of the legume plants were plucked off the stems and branches and fed to the test goats as fresh food. Before administering the precise dosage of the super Napier and Indigofera combo per treatment, each goat received 50 grams of concentrate daily.

The appropriate dosages of the super Napier and Indigofera combo were fed to the goats. They received food four times per day. Meals were delivered at 8:00 am, 11:00 am, 2:00 pm, and 5:00 pm. Water that was fit for drinking and potable was made accessible during the investigation. Every day before feeding, feeders, and waterers were cleaned and washed. Pens and the space around them were cleaned frequently to prevent foul odors and potential fly infestations.

With Albendazole, internal parasites were treated in all goats. Waterers were cleaned and washed every morning before providing clean drinking water. The area was kept clean to prevent the growth of insects that spread disease. Fecal contents were eliminated daily to prevent accumulation.

2.1. Parameters monitored

Growth Performance

Final weight (kg) = weight of goat at the end of the 60-day duration of the study

Weight Gain (kg) = final weight – initial weight

Live weight change (%) = live weight change (kg)/final weight x 100

Feed intake = feed given minus feed refused

Feed efficiency = weight gain/feed intake

2.2. Analytical Statistics

The collected data were examined using the analysis of variance method for Complete Randomized Design. The mean significant differences between the various treatments were ascertained using a one-way analysis of variance. The Tukey HSD test calculated the significant results for multiple mean comparisons.

3. RESULTS AND DISCUSSION

After 60 days, the growth performance of goats.

Initial weight (kg/head)

Goats ranged in weight from 13.76 to 13.90 kg at birth (Table 1, column 1). Because the goats were distributed randomly to test the impact of the Super Napier and Indigofera combination on their growth performance, statistical analysis did not find any differences in the beginning weight of the goats that were statistically significant.

Final weight (kg/head)

Compared to the other treatments, the treatments using the ratios of Indigofera and Super Napier ratios of 90%: 10% and 80%: 20% produced goats with better final weights, averaging 16.93 kg and 16.57 kg, respectively (Table 1, column 2).

Table 1. Initial weight (kg), final weight (kg), live weight change (kg), live weight change (%), feed intake (kg) and feed efficiency after 60 days of goats fed with Indigofera and Super Napier grass combination.

	Parameters					
Treatments	Initial weight (kg)	Final weight (kg)[1/]	Live weight change (kg)[1/]	Live weight change (kg)[1/]	Feed intake (kg)[1/]	feed efficiency[1/]
100% S	13.90	16.57^{a}	2.67^{a}	16.11^{ab}	1.59^{c}	1.68^{c}
90% SN, 10% 1	13.81	15.91^{a}	2.10^{b}	13.19^{b}	1.67^{b}	1.26^{d}
80%SN, 20% 1	13.78	16.68^{a}	2.90^{a}	17.38^{a}	1.66^{b}	1.75^{b}
70%SN, 30% 1	13.76	14.75^{b}	0.99^{c}	6.71^{c}	1.64^{b}	0.60^{d}
60%SN, 40% 1	13.78	15.08^{b}	1.30^{c}	8.62^{c}	1.71^{a}	0.76^{d}
100% 1	13.77	16.93^{a}	3.16^{a}	18.67^{a}	1.23^{d}	2.57^{a}
Mean	13.80	15.99	2.19	13.45	1.58	1.43
CV	2.28	3.48	16.82	15.41	1.52	15.59

Note: 1/ Means of the same letter superscript do not differ significantly at 1% Tukey HSD.

Live weight change (kg/head)

Compared to other treatments, the treatment with 80% Super Napier and 20% Indigofera led to a better live weight change (kg) of goat with a mean of 2.90 kg (Table 1, column 3).

Live weight change (%)

Compared to other treatments, therapy with an 80%:20% mixture of Super Napier and Indigofera led to a better live weight change (%) of goats, with a mean of 17.38%. (Table 1, column 4).

Feed intake (kg/head)

Compared to previous treatments, a blend of 60% Super Napier and 40% Indigofera improved goats' feed intake, with a mean intake of 1.71 kg (Table 1, column 5).

Food efficiency

Goats treated with an 80%:20% mixture of Super Napier and Indigofera had greater feed efficiency, with a mean of 1.75 compared to other treatments (Table 1. Column 6).

Goats were given 20% and 80% Super Napier. After 60 days, Indigofera had the highest ultimate weight, which was a significant finding (P 0.01). This is explained by the fact that nutrients, crude protein, and necessary amino acids are rich in nutrients (Pugh, 2016). According to Fernandez (2014), animals were predicted to gain once their diets contained 22% crude protein, and goats digest crude fiber remarkably well. The weight difference between the final and original weights was divided by the amount of feed consumed between the dates the initial and final weights were recorded to measure feed efficiency (SAS, 1999).

In this study, multiple doses of the Super Napier and Indigofera combination were offered to goats, and statistically significant variations in feed efficiency were found (P=0.01). Super Napier, in conjunction with 80% + 20% of the grass-legume mixture, was more effective than the other treatments. Therefore, goats have been given this mixture, effectively transforming the feed into meat (Linn et al., 2009).

4. CONCLUSIONS AND RECOMMENDATIONS

In terms of final weight (kg), live weight change (kg), weight change (%), and feed efficiency, it can be concluded that goats fed an 80/20 mixture of Super Napier and Indigofera saw improved growth performance. Higher weights in the hot carcass, cold carcass, pluck, total trimmable fats, and larger chest circumferences (cm) were also noted.

According to the study, feeding goats a diet consisting of 80% Super Napier and 20% Indigofera is highly advised. Since the study was only carried out for 60 days, it may be repeated for longer. Additionally, investigations on digestibility can be performed to identify the combinations that are the simplest to digest.

REFERENCES

[1] Abdullah L., D. Apriastuti & T. Apdini. 2012. Use of Indigofera zollingeriana as Forage Protein Source in Diary Goats. Retrieved on September 21, 2017, from Rationhttp://cdn. Aphca.org//dmdocuments/First Asia Dairy Goat Conference/1ADGC Abdullah Indigofera zollingeriana.pdf.

[2] Altarriba, J., Varona, L., Moreno, C., Yagüe, G., & Sañudo, C. (2005). Consequences of selection for growth on carcass and meat quality in Pirenaica cattle. Livestock Production Science, 95(1-2), 103-114.

[3] Amorim, G. L., Batista, Â. M. V., de Carvalho, F. F. R., Guim, A., Cabral, A. M. D., & de Moraes, A. C. A. (2008). Substituição do milho por casca de soja: consumo, rendimento e características de carcaça e rendimento da buchada de caprinos. Acta Scientiarum. Animal Sciences, 30(1), 41-49.

[4] Anderson A.G. 2016. Forage Nutrition 101. Crude Protein. Copyright 2011-2016 Anderson Hay and Grain, Co. Inc., All Rights Reserved. Retrieved on September 25, 2017, from www.anderson-hay.com/blog/nutrition-101-crude-protein.

[5] Bernard, J.K & Montgomery. M.J. (2010). Managing Intake of Lactating Dairy Cows. UT Extension.

[6] Bianchi, G., Bentancur, O., Garibotto, G., Feed, O., Franco, J., & Seņudo, C. (2006). Efecto del tiempo de maduración postmortem sobre la calidad sensorial de la carne de corderos corriedale y cruza. Agrociencia Uruguay, 10(1), 81-87.

[7] Bianchi, G., Bentancur, O., & Sañudo, C. (2006). La maduración de la carne de cordero como una herramienta para mejorar su terneza y calidad sensorial. Revista argentina de producción animal, 26(1), 39-55.

[8] Buckmaster, D.R.(2010). Indoor Hay Storage: Dry Matter Loss and Quality Changes. Archived June 2010, at the Wayback Machine.

[9] Defillips, R. A., Maina, S. L., and Crepin, J. 2002. Medicinal Uses of Indigofera suffructicosa Retrieved from : http://botany.si.edu/bdg/medicinal/index/.html. Smithsonian Museum. http://tropical.theferns.info/viewtropical.php?id=Indigofera+suffruticossa.

[10] Eiras, C. E., Marques, J. D. A., Torrecilhas, J. A., Zawadzki, F., Moletta, J. L., & Prado, I. N. D. (2013). Glycerin levels in the diets for crossbred bulls finished in feed-lot: ingestive behavior, feeding and rumination efficiency. Acta Scientiarum. Animal Sciences, 35, 411-416.

[11] Zawadzki, F. (2013). Glicerina, antioxidantes e carotenóides sobre a qualidade e traçabilidade da carne de bovinos e ovinos.

[12] Food and Agriculture Organization (FAO) 2017. Animal Production and Health. Agriculture and Consumer Protection Department. Retrieved from : https://www.fao.org/ag/againfo/themes/en/meat/qualitymeat.html.

[13] Feeding Habits of Goats. (2017), from http://goatindia.com/category-feeding-habits-of-goats.html Feeding of Goats. Retrieved from : https://sites.google.com/site/viveklpm/sheep-and-goats-production-management/feeding-of-goats.

[14] Fernandez, D. (2014). Balancing Rations for Sheep and Goats. Arkansas, Chicago, United State of America. Retrieved from : https://www.uaex.edu.

[15] Françozo, M. C., Prado, I. N. D., Cecato, U., Valero, M. V., Zawadzki, F., Ribeiro, O. L., ... & Visentainer, J. V. (2013). Growth performance, carcass characteristics and meat quality of finishing bulls fed crude glycerin-supplemented diets. Brazilian archives of biology and technology, 56, 327-336.

[16] Goetsch, A.L., T.A. Gipson, A. R. Askar and R. Puchaia (2010). Invited Review of Feeding Behavior of Goats. Journal Animal Science 88:361-373, 10, 2527/jas 2009-2332.

[17] Guerrero, A., Campo, M. M.; Cilla, I., Olleta, J. L., Alcalde, M. J., Horcada, A.; Sanudo, C. (2013). A comparison of la boratory-based and meat. Journal of Sensory Studies, 1(1),1-8.

[18] Kava, R. (2001). Archived June 21, 2010, at the Wayback Machine. ACSH.

[19] Leite V, Marguiafaval, Moraes D, Teixeira S. (2009). Fruit anatomy of Neotropical species of Indigofera (Leguminosae, Papillionoideae) with functional and taxonomic implications. The Journal of the Torrey Botanical Society. 136 (2): 203-211.

[20] Linn, J., Raeth-Knight, M., & Litherland, N. (2009, October). Role of feed (dairy) efficiency in dairy management. In Proceedings of the 44th Pacific Northwest Animal Nutrition Conference, Boise, Idaho (pp. 167-176).

[21] Machado, E. J. 2008. Super Napier from Thailand. Published: June 6, http://mb.com.ph/Agriculture/Agri Plain Talk/157002/A super napier from Thailand.

[22] Martínez-Cerezo, S., Sañudo, C., Medel, I., & Olleta, J. L. (2005). Breed, slaughter weight and ageing time effects on sensory characteristics of lamb. Meat Science, 69(3), 571-578.

[23] Martínez-Cerezo, S., Sañudo, C., Panea, B., Medel, I., Delfa, R., Sierra, I., ... & Olleta, J. L. (2005). Breed, slaughter weight and ageing time effects on physico-chemical characteristics of lamb meat. Meat Science, 69(2), 325-333.

[24] Mattos, C. W., Carvalho, F. F. R. D., Dutra Júnior, W. M., Véras, A. S. C., Batista, Â. M. V., Alves, K. S., ... & Miranda, S. B. D. (2006). Características de carcaça e dos componentes não-carcaça de cabritos Moxotó e Canindé submetidos a dois níveis de alimentação. Revista Brasileira de Zootecnia, 35, 2125-2134.

[25] Meat Goat Production Handbook, (2007) Langston University.

[26] Medeiros, G. R. D., Carvalho, F. F. R. D., Batista, Â. M. V., Dutra Júnior, W. M., Santos, G. R. D. A., & Andrade, D. K. B. D. (2009). Efeito dos níveis de concentrado sobre as características de carcaça de ovinos Morada Nova em confinamento. Revista Brasileira de Zootecnia, 38, 718-727.

[27] Miranda-De La Lama, G. C., Villarroel, M., Olleta, J. L., Alierta, S., Sañudo, C., & Maria, G. A. (2009). Effect of the pre-slaughter logistic chain on meat quality of lambs. Meat Science, 83(4), 604-609.

[28] Miranda-De La Lama, G. C., Pascual-Alonso, M., Guerrero, A., Alberti, P., Alierta, S., Sans, P., ... & María, G. A. (2013). Influence of social dominance on production, welfare and the quality of meat from beef bulls. Meat Science, 94(4), 432-437.

[29] Monsón, F., Sañudo, C., & Sierra, I. (2005). Influence of breed and ageing time on the sensory meat quality and consumer acceptability in intensively reared beef. Meat science, 71(3), 471-479.

[30] Monsoon, F., Sanudo, C., Bianchi G., Alberti, P., Herrera, A., Arino, A. (2007). Carcass and meat quality of yearning bulls as affected by the dexamethasone. Journal of Muscle Foods, 18(2), 173-185.

[31] Oliveira, A. N. D., Selaive-Villarroel, A. B., Monte, A. L. S., Costa, R. G., & Costa, L. B. A. (2008). Características da carcaça de caprinos mestiços Anglo-Nubiano, Boer e sem padrão racial definido. Ciência rural, 38, 1073-1077.

[32] Castañer, J. L. O., Astiz, C. S., & Alfranca, I. S. (1992). Producción de carne en la agrupación ovina churra tensina: Calidad de la canal y de la carne en los tipos ternasco y cordero de cebo: Meat production in churra tensina breed: Carcass and meat quality in fattening light lamb and fattening light-heavy lamb. Archivos de Zootecnia, 41(153), 197-208.

[33] OSÓRIO, J. C. D. S., Sierra, I., Sañudo, C., Maria, G., & Osório, M. T. (1995). Estudio comparativo de la calidad de la canal en el tipo" ternasco" según procedencia. Current Agricultural Science and Technology, 1(3).

[34] OSÓRIO, J. D. S., Osório, M. T. M., OLIVEIRA, N. D., & Siewerdt, L. (2002). Qualidade, morfologia e avaliação de carcaças. Pelotas: Universidade Federal de Pelotas.

[35] Panea, B., Alberti, P., Olleta, J. L., Campo, M. M., Ripoll, G., Altarriba, J., & Astiz, C. S. (2008). Intrabreed variability and relationships for 41 carcass and meat traits in Pirenaica cattle. Spanish Journal of Agricultural Research, 6(4), 546-558.

[36] Panea Doblado, B., Alcalde Aldea, M., Ripoll García, G., Horcada Ibáñez, A., Teixeira, A., Sañudo Astiz, C., & Olleta Castañer, J. L. (2011). Influencia de la raza y el peso de sacrificio o el sistema de lactancia sobre la textura de la carne de cabrito.

[37] Panea, B., Ripoll, G., Olleta, J. L., & Sañudo, C. (2011). Efecto del sexo y del cruzamiento sobre la calidad instrumental y sensorial y sobre la aceptación de la carne de añojos de la raza avileña-negra ibérica. ITEA-Información Técnica Económica Agraria, 107(3), 239-250.

[38] Partida, J. A., Olleta, J. L., Campo, M. M., Sañudo, C., & María, G. A. (2007). Effect of social dominance on the meat quality of young Friesian bulls. Meat science, 76(2), 266-273.

[39] Partida, J. A., Olleta, J. L., Sañudo, C., Albertí, P., & Campo, M. M. (2007). Fatty acid composition and sensory traits of beef fed palm oil supplements. Meat Science, 76(3), 444-454.

[40] Paulino, J. V., Groppo, M., & de Pádua Teixeira, S. (2011). Floral developmental morphology of three Indigofera species (Leguminosae) and its systematic significance within Papilionoideae. Plant Systematics and Evolution, 292, 165-176.

[41] Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD) 2016. Helpdesk.dost.gov.ph/alldir. Retrieved October 2017.

[42] Sañudo, C., Muela, E., Campo, M. M., Valero, M. V., Resconi, V., Monge, P., ... & Prado, I. N. (2013). Effect of castration age, protein level and lysine/methionine ratio in the diet, on meat composition of Friesian steers intensively reared. XV Jornadas sobre Producción Animal, Zaragoza 14 y 15 de mayo de 2013, 619-621.

[43] Pugh, D. G. (2016). Nutritional Requirements of Goats. Retrieved March 27, 2017, from MSD Manual Veterinary Manual:www.msdvetmanual.com.

[44] Rashid, M. (2008). Goat and their Nutrition. Manitoba, Canada. Retrieved from: https://www.gov.mb.ca/agriculture/livestock/production.

[45] Resconi, V. C., Campo, M. M., i Furnols, M. F., Montossi, F., & Sañudo, C. (2009). Sensory evaluation of castrated lambs finished on different proportions of pasture and concentrate feeding systems. Meat Science, 83(1), 31-37.

[46] Resconi, V. C., Campo, M. M., Montossi, F., Ferreira, V., Sañudo, C., & Escudero, A. (2010). Relationship between odour-active compounds and flavour perception in meat from lambs fed different diets. Meat Science, 85(4), 700-706.

[47] Rhee, K. S., Myers, C. E., & Waldron, D. F. (2003). Consumer sensory evaluation of plain and seasoned goat meat and beef products. Meat science, 65(2), 785-789.

[48] Ripoll, G., Albertí, P., & Joy, M. (2011). Influence of alfalfa grazing-based feeding systems on carcass fat colour and meat quality of light lambs. Meat Science, 90(2), 457-464.

[49] Sahlu, T., Hart, S. P., & Goetsch, A. L. (1999). Effects of level of feed intake on body weight, body components, and mohair growth in Angora goats during realimentation. Small Ruminant Research, 32(3), 251-259.

[50] Sanudo, C., Campo, A. M. M., Muela, E., Olletta, C. J. L., Delfa, B. R.; Jimenez, B. R., J., Alcaldea M., Horcada, I. A., Oliveira, I., Cilla, I. (2012). Carcass characteristics and instrumental meat quality of sucking kids and lambs. Spanish Journal of Agricultural Research, 10(3).690-700.

[51] Sañudo, C., Campo, M. M., Sierra, I., María, G. A., Olleta, J. L., & Santolaria, P. (1997). Breed effect on carcase and meat quality of suckling lambs. Meat Science, 46(4), 357-365.

[52] Sañudo, C., Santolaria, M. P., Maria, G., Osorio, M., & Sierra, I. (1996). Influence of carcass weight on instrumental and sensory lamb meat quality in intensive production systems. Meat Science, 42(2), 195-202.

[53] Sañudo, C., Nute, G. R., Campo, M. M., Maria, G., Baker, A., Sierra, I., ... & Wood, J. D. (1998). Assessment of commercial lamb meat quality by British and Spanish taste panels. Meat Science, 48(1-2), 91-100.

[54] Sarian, Z. B. 2014. Super Napier Planting Guide. Retrieved from: http://www.zacsarian.com/super-napier-planting-guide/.

[55] Statistical Analysis System Institute. (1999). SAS/STAT user's guide (Vol. 3). SAS Publ..

[56] Shelton, M., Snowder, G., & Figueiredo, E. A. P. D. (1984). Meat production and carcass characteristics of the goat. Technical report

series/Small Ruminant Collaborative Research Support Program (USA).

[57] Siqueira, E. R. D., Simões, C. D., & Fernandes, S. (2001). Efeito do sexo e do peso ao abate sobre a produção de carne de cordeiro. Morfometria da carcaça, pesos dos cortes, composição tecidual e componentes não constituintes da carcaça. Revista Brasileira de Zootecnia, 30, 1299-1307.

[58] Smith, C. O. (2000). Feed intake, growth and body composition changes in Spanish and Tennessee Stiff-legged goats (Doctoral dissertation, Prairie View A & M University).

[59] Standley P.C. and J. A. Steymark (1976). Indigofera suffructicosa http://www.archive.org/. Retrieved from: http://tropical.theferns.info/viewtropical.php?id=Indigofera+suffruticos .

[60] Ueckerman, L. (1996). Master of Science Ag. Thesis, University Pretoria, Republic of South Africa.

[61] Van Saun, R.J. (2017). Determining Forage Quality: Understanding Feed Analysis. Retrieved from: https://extension.psu.edu/determining-forage-quality-understanding-feed-analysis.

[62] Wattiaux, M.A. (2010). Dairy Essentials. Chapter 2. Composition and Analysis of Feed. Babcock Institute.

[63] Wildeus, S., Luginbuhl, J. M., Turner, K. E., Nutall, Y. L., & Collins, J. R. (2007). Growth and carcass characteristics in goat kids fed grass-and alfalfa-hay-based diets with limited concentrate supplementation.

[64] Yami,A. (2008). Formulation of Rations for Sheep and Goats. (R. Markel, Ed.) Ethiopia. Retrieved from: http://www.esgpip.org.

[65] Yanez, E.A., Resende, K.T., Ferreira, A.C.D. (2004) Utilizacao de medidas biometricas para predizer cacacteristicas cabritos Saanen. Revista Brasileira de Zootecnia, 33(6). 1564-1572.

DOI: https://doi.org/10.15379/ijmst.v10i2.1159