FACULTY OF AGRICULTURE AND ANIMAL SCIENCES

DEPARTMENT OF ANIMAL PRODUCTION AND SCIENCES

FINAL YEAR PROJECT

NUTRIENT DIGESTIBILITY OF *MORINGA OLEIFERA* SEEDMEAL RATIONS FED TO GROWER PIGS AT ARAPAI CAMPUS FARM.

BY

BWIRE AUGUSTINE

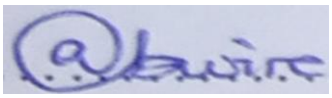
BU/UP 2020/1390

A DISERTATION SUBMITTED TO THE DEPARTMENT OF ANIMAL SCIENCES IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF THE DEGREE OF BACHELOR OF SCIENCE IN ANIMAL PRODUCTION AND MANAGEMENT OF BUSITEMA UNIVERSITY

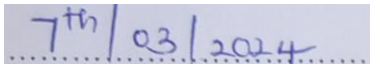
FEBRUARY 2O24.

DECLARATION

I BWIRE AUGUSTINE declare that the information presented in this dissertation is my own work and it has never been presented in this university or any other institute of higher learning for a degree award.



Signature …….



Date…….…….

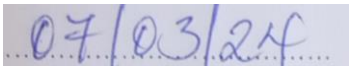
APPROVAL

This dissertation has been submitted to the Department of Animal Production and Management, Busitema University with the approval of my supervisor.

Ms. AKURUT IMMACULATE

Lecturer, Department of Animal Production & Management

Signature……..……



Date ……

ACKNOWLEDGEMENT

Firstly, I acknowledge the Almighty GOD for blessing me with a gift of life during my entire period of study, not limited to that but also His, favor, provision and protection up to date. My parents OUMA RICHARD and NAFULA GETURIDE for paying my school dues and encouraging me to work hard always, Academic supervisor Ms. AKURUT IMMACULATE for the guidance, counseling and corrections. My fellow classmates especially NJUBA DENIS, AWINO DOREEN, AMODING NAUME for all the financial assistance, advice and care at the university, I really respect your contributions in my life.

LIST OF ABBREVIATIONS

ADF	-	Acid detergent fiber
ADL	-	Acid detergent lignin
AOAC	-	Association of official analytical chemists
EE	-	Ether extract
FAAS	-	Faculty of Agriculture and Animal Sciences
CP	-	Crude protein
DAPM	-	Department of animal production and management
GE	-	Goss energy
MOSM	-	*Moringa oleifera* seed meal ration
NDF	-	Neutral detergent fiber
SBM	-	Soya bean meal

List of figures and tables

Table of Contents

ABSTRACT

Moringa oleifera is a highly valuable plant that is gaining value basing on its nutrient profile in consideration with soya bean meal a known plant protein source. However with increasing competition for plant proteins by both humans and animals, arises the need to find alternative protein sources that can substitute soya. It's upon that gap that this research aimed at finding out the nutrient digestibility of *Moringa oleifera* seed meal fed on grower pigs at Arapai farm with the objective of determining palatability and establishing nutrient digestibility of MOSM rations. An experimental design was used in conducting the research with four treatments; T1 (0%), T2 (5%), T3 (10%) and T4 (15%) MOSM inclusion rates. Three replicates were used per treatment in determination of palatability using single bowel method and it was found that there was a significant difference among treatments ,one individual pig was used in establishing the nutrient digestibility of MOSM using total collection method of fecal matter from which 10% of the daily total fecal was collected and prepared for laboratory analysis,

Results from the experiment showed that palatability was highest at (0% MOSM) control feed and increase in Moringa inclusion significantly decreased palatability. On the other hand, increase in Moringa improved both apparent and nutrient digestibility compared to control treatment digestibility. Results obtained show that partial substitution of soya with a % of Moringa significantly improved pig feed in digestibility (figure1) especially at 5% MOSM inclusion which had no negative impacts on desired qualities of palatability and digestibility of soya rather than when used as a whole protein feed.

In conclusion, inclusion of MOSM reduced feed palatability however; digestibility was generally improved. It should be noted that the optimum inclusion rate was established to be 5% as it facilitated a relatively better palatability and digestibility score.

Since this study focused on one category of pigs, I recommend that further research can be conducted on other categories of pigs as well as other animal species.

CHAPTER ONE: INTRODUCTION

1.1 Background

Moringa oleifera belongs to the monogeric family of shrubs and trees known as Moringaceae. Research shows that it originated from India found in the Asian continent(Tree & Oleifera, n.d.), thereafter it spread to the rest of the world including the tropics *(Mallenakuppe et al., 2019)*. *Moringa oleifera* is the most popular of the 13 species of Moringa and it is known by various names; " horseradish tree in Florida, malunggay in Philippines, nebeday in Senegal, benzolive tree in Haiti, drumstick tree in India *(Raja et al., 2017*).

Moringa oleifera is a fast growing deciduous tree which can grow to a maximum of about 10-12m, the trunk measuring 45cm in diameter. Tropical conditions have been found ideal for the growth of moringa oleifera (*Qaisar & Zaki, 2022)*. According to Liu (2018), all moringa parts can be utilized as food and as ethno medicine for many diseases for both humans and animals.

Moringa oleifera seeds are the reproductive part of moringa tree enclosed in a pod, the seeds are eaten raw, roasted, powdered and used as a water purifier. According to Saa *et al.*, (2019), Seeds contain 19% and 31% proteins and lipids respectively that are useful in the diets of animals. They also contain a high ratio of monounsaturated and saturated fatty acids *(Leone et al., 2016),* and a polyelectrolyte which is a coagulant *(Bichi, 2013)*. Moringa seeds are also used in cosmetics and the medical department

Moringa oleifera is a highly valuable tree with a remarkable nutritional profile. It is estimated to have 28.50%, 25.02%, 10.42% and 11.38% carbohydrates, proteins, fats and dietary fiber nutrients according to a study by Qaisar &Zaki (2022) that it adds in diets of animals (pigs). Moringa use in pig feed formulation increases daily weight gain, amino acid profile though minor contribution to the pork quality.

The tree has been also used to prevent and cure diseases that are more than 300 according to the ayurvedic traditional medicine. It has been found to have anti-inflammatory, antiasthmatic, analgesic, antipyretic *(Koul, 2015),* antifungal and antibacterial, wound healing, anticancer properties among others *(Fidrianny et al., 2021).* These uses have made the tree to be called " a

REFERENCES

Abdel-raheem, S. M., & Hassan, E. H. (2021). Saudi Journal of Biological Sciences Effects of dietary inclusion of Moringa oleifera leaf meal on nutrient digestibility , rumen fermentation , ruminal enzyme activities and growth performance of buffalo calves. *Saudi Journal of Biological Sciences*, *28*(8), 4430–4436. https://doi.org/10.1016/j.sjbs.2021.04.037

Anwar, F., Latif, S., Ashraf, M., & Gilani, A. H. (2023). *Moringa oleifera : A Food Plant with Multiple Medicinal Uses*. *25*(November 2006), 17–25. https://doi.org/10.1002/ptr

Arise, A. K., Arise, R. O., Sanusi, M. O., Esan, O. T., & Oyeyinka, S. A. (2014). *Effect of Moringa oleifera flower fortification on the nutritional quality and sensory properties of weaning food*. *6*, 65–71.

Auwal, M. M., Yelwa, M. J., Abubakar, I., Jamilu, B., Anchau, G. H., & Tanimu, B. F. (2019). *Oriental Journal of Physical Sciences The Levels of Antinutritional Factors in Moringa Oleifera and Vernomia Amygdalina Leaves Found in Some Part of Plateau State , Nigeria*. *04*(2), 6–10.

Batte, E. R., Ruge, T., Farms, R., Village, K., & Sub-county, B. (2020). *Moringa tree cures man ' s money woes*.

Bhokre, S. M., Rajanna, N., & Chandra, A. S. (2021). *Effect of Inclusion of Moringa oliefera Leaf Meal on the Growth Performance , Nutrient Digestibility and Carcass Characteristics of Deccani Lambs*. *I*. https://doi.org/10.18805/ajdfr.DR-1686.Submitted

Bichi, M. H. (2013). A Review of the Applications of Moringa oleifera Seeds Extract in Water Treatment. *Civil and Environmental Research*, *3*(8), 1–11.

Biel, W., Jaroszewska, A., & Łysoń, E. (2017). Nutritional quality and safety of moringa (Moringa oleifera Lam., 1785) leaves as an alternative source of protein and minerals. *Journal of Elementology*, *22*(2), 569–579. https://doi.org/10.5601/jelem.2016.21.3.1249

Coppin, J. (2008). *A STUDY OF THE NUTRITIONAL AND MEDICINAL VALUES OF MORINGA*.

Cuevas-Rodríguez, E. O., León-López, L., Escobar-Zúñiga, Y., Milán-Carrillo, J., Domínguez-Arispuro, D. M., & Gutiérrez-Dorado, R. (2020). Chemical proximate composition, antinutritional factors content, and antioxidant capacity of anatomical seed fractions of Moringa oleifera. *Acta Universitaria*, *30*, 1–11. https://doi.org/10.15174/au.2020.2892

Dubey, D. K., Dora, J., Kumar, A., & Gulsan, R. K. (2013). A Multipurpose Tree- Moringa oleifera. *International Journal of Pharmaceutical and Chemical Sciences*, *2*(1), 415–423. www.ijpcsonline.com

Fahey, G. C., Novotny, L., Layton, B., & Mertens, D. R. (2019). Critical factors in determining fiber content of feeds and foods and their ingredients. *Journal of AOAC International*, *102*(1), 52–62. https://doi.org/10.5740/jaoacint.18-0067

Feedipedia, A. (2016). *Feedipedia*. 7–14.

Fidrianny, I., Kanapa, I., & Singgih, M. (2021). Phytochemistry and pharmacology of moringa tree: An overview. *Biointerface Research in Applied Chemistry*, *11*(3), 10776–10789. https://doi.org/10.33263/BRIAC113.1077610789

Frona, D., Janos, S., & Harangi-Rakos, M. (2019). The challenge of feeding the poor. *MDPI Journal for Sustainability*, *2017*, 3–4.

Gao, X., Yang, W., Li, S., Liu, S., Yang, W., Song, S., Sheng, J., Zhao, Y., & Tian, Y. (2023). Moringa oleifera leaf alleviates functional constipation via regulating the gut microbiota and the enteric nervous system in mice. *Frontiers in Microbiology*, *14*(December). https://doi.org/10.3389/fmicb.2023.1315402

Gopalakrishnan, L., Doriya, K., & Kumar, D. S. (2016). Moringa oleifera: A review on nutritive importance and its medicinal application. *Food Science and Human Wellness*, *5*(2), 49–56. https://doi.org/10.1016/j.fshw.2016.04.001

Gull, I., Javed, A., Aslam, M. S., Mushtaq, R., & Athar, M. A. (2016). Use of Moringa oleifera Flower Pod Extract as Natural Preservative and Development of SCAR Marker for Its DNA Based Identification. *BioMed Research International*, *2016*. https://doi.org/10.1155/2016/7584318

Hassan, O. G. A., Allak, M. A., El, G. M., & Gamal, G. (2023). Influence of substituting soybean meal with moringa seed cake on feed intake , growth performance , digestibility , blood parameters and economics of fattening crossbred calves. *Tropical Animal Health and Production*, *55*(3), 1–11. https://doi.org/10.1007/s11250-023-03638-9

Idris, M. A., & Jami, M. S. (2016). *Moringa Oleifera Seed Extract : A Review on Its Environmental Applications*. *11*(6), 1469–1486.

Ijarotimi, O. S., Adeoti, O. A., & Ariyo, O. (2013). Comparative study on nutrient composition, phytochemical, and functional characteristics of raw, germinated, and fermented Moringa oleifera seed flour . *Food Science & Nutrition*, *1*(6), 452–463. https://doi.org/10.1002/fsn3.70

Indah, A. S., Permana, I. G., & Despal. (2020). Determination dry matter digestibility of tropical forage using nutrient compisition. *IOP Conference Series: Earth and Environmental Science*, *484*(1). https://doi.org/10.1088/1755-1315/484/1/012113

Ismail, M. A. O., & Abdalla, H. (2015). *Effect of Moringa (Moringa oleifera Lam) Seeds on the Performance and Carcass Characteristics of Broiler Chickens*. *5*(8), 66–74.

Karimuribo, E. D., Chenyambuga, S. W., Makene, V. W., & Mathias, S. (2011). Characteristics and production constraints of rural-based small-scale pig farming in Iringa region,

Tanzania. *Livestock Research for Rural Development*, *23*(8).

Kasolo, J. N., Bimenya, G. S., Ojok, L., Ochieng, J., & Ogwal-Okeng, J. W. (2010). Phytochemicals and uses of Moringa oleifera leaves in Ugandan rural communities. *Journal of Medicinal Plants Research*, *4*(9), 753–757.

Koul, B. (2015). *Moringa oleifera Lam .: Panacea to several maladies Moringa oleifera Lam .: Panacea to several maladies Bhupendra Koul * and Neikuozo Chase*. *January*.

Leitanthem, V. K., Chaudhary, P., Maiti, S., Mohini, M., & Mondal, G. (2023). Impact of Moringa oleifera Leaves on Nutrient Utilization, Enteric Methane Emissions, and Performance of Goat Kids. *Animals*, *13*(1), 1–15. https://doi.org/10.3390/ani13010097

Leone, A., Spada, A., Battezzati, A., Schiraldi, A., Aristil, J., & Bertoli, S. (2016). Moringa oleifera seeds and oil: Characteristics and uses for human health. *International Journal of Molecular Sciences*, *17*(12). https://doi.org/10.3390/ijms17122141

Li, Y. S., Tran, H., Bundy, J. W., Burkey, T. E., Kerr, B. J., Nielsen, M. K., & Miller, P. S. (2016). Evaluation of collection method and diet effects on apparent digestibility and energy values of swine diets. *Journal of Animal Science*, *94*(6), 2415–2424. https://doi.org/10.2527/jas.2016-0275

Mallenakuppe, R., Homabalegowda, H., Gouri, M. D., Basavaraju, P. S., & Chandrashekharaiah, U. B. (2019). History, Taxonomy and Propagation of Moringa oleifera-A Review. *SSR Institute of International Journal of Life Sciences*, *5*(3), 2322–2327. https://doi.org/10.21276/ssr-iijls.2019.5.3.7

Moyo, B., Masika, P. J., Hugo, A., & Muchenje, V. (2011). *Nutritional characterization of Moringa (Moringa oleifera Lam .) leaves*. *10*(60), 12925–12933. https://doi.org/10.5897/AJB10.1599

Nakanishi, K., & Iwashita, T. (2007). Natural Products. *EMagRes*, *2007*(4), 3–7. https://doi.org/10.1002/9780470034590.emrstm0340

Nasehi, P. (2018). Research Article Research Article. *Archives of Anesthesiology and Critical Care*, *4*(4), 527–534. http://www.globalbuddhism.org/jgb/index.php/jgb/article/view/88/100

Olusanya, R. N., Kolanisi, U., van Onselen, A., Ngobese, N. Z., & Siwela, M. (2020). Nutritional composition and consumer acceptability of Moringa oleifera leaf powder (MOLP)-supplemented mahewu. *South African Journal of Botany*, *129*, 175–180. https://doi.org/10.1016/j.sajb.2019.04.022

Qaisar, A., & Zaki, M. (2022). *“ The Moringa Tree and its Many Uses , especially in the Agricultural F ield ” Researcher : Arwa Qaisar Mohammed Zaki Mhdawi*. 31–38.

Raja, R. R., Sreenivasulu, M., Vaishnavi, S., Navyasri, D. M., Samatha, G., & Geethalakshmi, S. (2017). *Moringa Oleifera-An Overview RA Journal of Applied Research Moringa Oleifera-An Overview Corresponding Author*. *September 2016*. https://doi.org/10.18535/rajar/v2i9.05

Razis, A. F. A., Ibrahim, M. D., & Kntayya, S. B. (2014). Health benefits of Moringa oleifera. *Asian Pacific Journal of Cancer Prevention*, *15*(20), 8571–8576. https://doi.org/10.7314/APJCP.2014.15.20.8571

Roser, M., & Ortiz-Ospina, E. (2017). *World Population Growth For Semester 2 (H) Geography Students Paper-CC3 (TH) Topic-7*. *2*, 1–21.

Saa, R. W., Fombang, E. N., Ndjantou, E. B., & Njintang, N. Y. (2019). Treatments and uses of Moringa oleifera seeds in human nutrition: A review. *Food Science and Nutrition*, *7*(6), 1911–1919. https://doi.org/10.1002/fsn3.1057

Semanka, T., Seifu, E., & Sekwati-Monang, B. (2022). Effects of Moringa oleifera seeds on the physicochemical properties and microbiological quality of borehole water from Botswana. *Journal of Water Sanitation and Hygiene for Development*, *12*(9), 659–670. https://doi.org/10.2166/washdev.2022.100

Sharma, B., Tripathy, S., Kantwa, C. R., & Ghaswa, R. (2020). *Moringa oleifera : The Miracle Tree on the Earth*. *9*(8), 2623–2632.

Shi, R., Dong, S., Mao, J., Wang, J., Cao, Z., Wang, Y., Li, S., & Zhao, G. (2023). Dietary Neutral Detergent Fiber Levels Impacting Dairy Cows' Feeding Behavior, Rumen Fermentation, and Production Performance during the Period of Peak-Lactation. *Animals*, *13*(18). https://doi.org/10.3390/ani13182876

Singh, M., Singh, S., Verma, D., Singh, M., & Verma, D. (2020). *Morphological and Pharmacognostical Evaluation of Moringa oleifera Lam . (Moringaceae): A Plant with High Medicinal Value in Tropical and Subtropical Parts of the World*. *14*(28), 138–145.

Society, N., Production, A., Journal, N., & Production, A. (2017). *No Title*. *44*(4), 316–324.

Su, B., & Chen, X. (2020). Current Status and Potential of Moringa oleifera Leaf as an Alternative Protein Source for Animal Feeds. *Frontiers in Veterinary Science*, *7*(February), 1–13. https://doi.org/10.3389/fvets.2020.00053

Taiwo, P., Philip, O., & Alikwe, C. N. (2014). *Proximate Analysis and Chemical Composition of Raw and Defatted Moringa oleifera Kernel*. 92–100.

Tendency, C., Critically, T., & Everyday, A. (n.d.). *Chapter 10 . Experimental Design : Statistical Analysis of Data Purpose of Statistical Analysis Descriptive Statistics Using Statistical Software Case Analysis General Summary Detailed Summary Key Terms Review Questions / Exercises*. 1–38.

Tree, M., & Oleifera, M. (n.d.). *The miracle tree with tremendous natural multipurpose activities MORINGA OLEIFERA*.

Valentine, R. (2017). *Economic Analysis of Small Scale Piggery Enterprises and Income of Peasants in South-South and South-East Parts of Nigeria*. *7*(14), 66–74.

Yuangsoi, B., & Charoenwattanasak, S. (2015). *Partial replacement of protein in soybean mean.*