Neo-Tropical Rodent Meat

Subjects: Agriculture, Dairy & Animal Science

Contributor: Kegan Jones

Non-domestic neo-tropical animals have tremendous potential as a source of meat for human consumption. Rodents such as the lappe (Agouti paca), agouti (Dasyprocta leporina), and the capybara (Hydrochoerus hydrochaeris) have been identified as having great potential to be domesticated. These rodents have been used in rural villages by hunters as a source of meat protein.

Keywords: Neo-Tropical Rodent Meat

1. Introduction

Non-domestic neo-tropical animals have tremendous potential as a source of meat for human consumption. Rodents such as the lappe (*Agouti paca*), agouti (*Dasyprocta leporina*), and the capybara (*Hydrochoerus hydrochaeris*) have been identified as having great potential to be domesticated[1]. These rodents have been used in rural villages by hunters as a source of meat protein[2]. These animals are ideal for sustainable agriculture as they have the ability to utilize locally available feedstuff and convert them into animal protein. They can be fed locally available forages and feed by-products for maintenance[3]. The agouti (*D.leporina*) is considered by some authors as an opportunistic feeder[4], others have considered these animals as omnivores as they can consume both plant and animal matter[5][6]. The lappe, agouti, and capybara possess a large cecum which gives them the ability to digest fibrous feeds. The lappe is considered a frugivore with the majority of its diet comprising of fruits and seed[7]. However, the capybara is described as a herbivore and is better able to utilize fibrous feeds than cattle[8]. These rodents are hindgut fermenters which practice cecotrophy.

The agouti has tremendous reproductive potential, having a gestation period between 104 to 120 days[9] [9]. The agouti has the potential to produce three litters per year and one to three offspring per parturition[1][10][11][12]. Thus, one mated pair can produce up to six offspring per year. The adult agouti can weigh 2–5 kg and females obtain sexual maturity at nine months with males becoming sexually mature by twelve months[10][13][14]. Investigators reported that the agouti had a dressing percentage of 57%[13]. These animals can be reared in captivity to produce a sustainable source of meat for subsistence farmers. The agouti is considered a pest to crop farmers and animals are obtained from the wild for intensive production[10][15].

The lappe (*A. paca*) has a mature body weight between 6–14 kg[10][16][17]. It usually produces one offspring per parturitions with two parturitions per year[10][16]. The gestation period of the lappe ranges between 138–172 days[10], 152–156 days[18]. Litter intervals have been reported to range from 247–266 days[16] and have a similar timeframe for sexual maturity as the agouti (9 months for females and 12 months for males)[10]. At present, there are no records in the literature of the dressing percentage and meat yield in the lappe. This is an area that is in desperate need of investigation.

2. Proximate Analysis of Neo-Tropical Rodent Meat

A summary of the proximate analysis of capybara meat is given in Table 1. The meat composition of the capybara (*H. hydrochaeris*), lappe (*A. paca*), and agouti (*D. leporina*) will be discussed in this section. Adult capybaras reared in individual cages fed napier grass and pelleted ration (containing corn and soybean meal) had meat cuts with 75.8% moisture, 21.74% protein, 0.74% lipids, 0.9% ash, and 23 mg/100 g cholesterol of intramuscular fat[19]. Capybara meat has similar protein content as both rabbit and guinea pig meat but differences were seen in lipid content. In general, rabbit meat has protein content ranging from 18.7–22.1% and lipid content ranging from 1.2–12.8%[20][21]. Rabbit meat contained more cholesterol (48–60 mg/100 g) when compared to capybara meat[21]. Guinea pig meat had similar protein content to capybara (22.7–24.8%) but had higher fat content (2.97–4.51 g/100 g)[22]. Guinea pigs also had similar dressing percentage to the capybara and (ranging from 55–67.4%) [23][24][25][26]. Girardi et al.[19] investigated the chemical composition of the capybara meats reared in different conditions. The animals were slaughtered at nine months (20 kg), these animals were fed forages and supplemented with pelletized diet for rabbits. There were no differences recorded for the moisture, protein, and ash for different meat (loin and ham) and rearing conditions (enclosures with and without

ponds). However, there were differences seen in lipid content on commercial cuts (loin 1.81–2.26% and ham 3.93–4.74%). Capybaras that were reared with a pond in its enclosure had lower cholesterol values (45.7–45.9 mg/kg) compared to animals without a pond in their enclosure (51.9–52.1 mg/kg)[19]. The commercial meat cuts of the capybara showed differences in moisture and cholesterol. The shoulder had the highest moisture content, the loin and chop had the lowest moisture content, whilst the ham and chest had intermediate moisture content. Cholesterol values were lowest in shoulder as compared to the other meat cuts[27]. In general, capybara meat can be considered healthier than rabbit and guinea pig meat as it has similar protein content but lower fat and cholesterol content. In recent times, healthy meat is considered as those which contain high levels of protein, low levels of fat, low levels of saturated fatty acid, and high levels of polyunsaturated fatty acids.

Bressan et al.[27] quantified the lipid content of various meat cuts of captive reared adult capybara as 0.85% with no significant difference in the lipid content of commercial cuts. In contrast, further work done found that the loin had the lowest fat content, the ham, ribs *L. dorsi*, and bottom sirloin having the highest fat content. The brisket of the capybara had intermediate values for fat[29]. The mineral content of the capybara meat was also investigated, with significant differences noted in the meat cuts for iron content. On average capybara meat had 0.03% calcium, 0.2% phosphorus, and 0.0005% iron. The ribs had the highest iron content (0.0007%) and the *L. dorsi* having the lowest iron content (0.0004%) [29]. Jardim et al. [30] noticed the effect of sex and slaughtering method on chemical parameters in capybara meat. The *L. dorsi* muscle was analyzed and there were no differences observed on the effect of sex on moisture, protein, ash, and cholesterol. In contrast, female capybaras had higher level of lipids in comparison to males[30][31][32] and meat from female carcasses had higher levels of cholesterol[30].

Table 1. Proximate analysis of the meat products and edible offal of capybara (*H. hydrochaeris*).

Roca et al. [33] investigated the proximate composition of raw meat as well as smoked meat products of capybara. The capybara meats were cured and smoked, the curing mixture consisted of consisted of water, common salt, refined sugar, polyphosphates, sodium nitrite, natural flavoring, and sodium erythorborate. The pieces were subjected to dry heat of 50 °C for one hour and smoking for six hours, with cooking carried out in direct steam. The smoked meat products showed different chemical composition in comparison to the raw meat. The smoked meat had a reduction in moisture (67.72%) and increases in protein (24.93%), lipids (2.77%), and ash (2.16%)[33]. There were no significant differences recorded in the taste, strange taste, and strange aroma of the smoked meats. However, the smoked meats had higher values in tenderness and juiciness[33].

The *L. dorsi*, *Semimembranosus*, liver, and heart of the capybara were analyzed. *L. dorsi* had similar chemical properties as the *Semimembranosus* muscle. However, visceral organs such as the liver had chemical properties that were dissimilar to the muscle with the heart having the highest moisture content and lowest protein content [34]. In the literature search that was conducted, there were no published articles on the chemical composition of agouti (*D. leporina*) or lappe (*A. paca*) meat. However, the moisture content for the leg cut in the agouti was 78.99% (Ali and Jones unpublished). This

is an area in desperate need of attention due to the enormous potential these animals have as a protein source for rural communities. Some work was published on the physical properties of the meats of lappe and agouti as well as the fatty acid profile of lappe meat. These properties will be discussed in a subsequent section of this document.

References

1. Brown-Uddenberg, R.C. Conceptualization of an Intensive Production Model for the Agouti (Dasyprocta leporina) a Neo-tropical Rodent in Trinidad. Master's Thesis, University of the West Indies, Kinston, Jamaica, 2001.
2. Nunes, A.V.; Guariento, R.D.; Santos, B.A.; Fischer, E. Wild meat sharing among non-indigenous people in the southwestern Amazon. Behav. Ecol. Sociobiol. 2019, 73, 26.
3. John, E.N.; Jones, K.R. Evaluation of Unconventional Supplements to the Diet of Intensively Reared Agouti (Dasyprocta leporina) in Trinidad, West Indies. Vet. Sci. 2020, 7, 108.
4. Lall, K.R.; Jones, K.R.; Garcia, G.W. Nutrition of six selected neo-tropical mammals in Trinidad and Tobago with the potential for domestication. Vet. Sci. 2018, 5, 52.
5. Jones, K.R.; Lall, K.R.; Garcia, G.W. Omnivorous Behaviour of the Agouti (Dasyprocta leporina): A Neotropical Rodent with the Potential for Domestication. Scientifica 2019, 2019, 3759783.
6. Guimaraes-Silva, M.A.; de Morais, A.R.; de Carvalho, F.M.V.; Moreira, J.C. Camera traps reveal the predation of artificial nests by free-ranging Azara's agoutis, Dasyprocta azarae Lichtenstein, 1823, in central Brazil. Austral Ecol. 2020, doi:10.1111/aec.12941.
7. Dubost, G.; Henry, O. Comparison of diets of the acouchy, agouti and paca, the three largest terrestrial rodents of French Guianan forests. J. Trop. Ecol. 2006, 22, 641–651.
8. Baldizán, A.; Dixon, R.M.; Parra, R. Digestion in the capybara (Hydrochoerus hydrochaeris). S. Afr. J. Anim. Sci. 1983, 13, 27–28.
9. Fortes, E.A.M.; Ferraz, M.S.; Bezerra, D.O.; Conde Junior, A.M.; Cabral, R.M.; Sousa, F.C.A.; Almeida, H.M.; Pessoa, G.T.; Menezes, D.J.A.; Guerra, S.P.L.; et al. Prenatal development of the agouti (Dasyprocta prymnolopha Wagler, 1831): External features and growth curves. Anim. Reprod. Sci. 2013, 140, 195–205.
10. Govoni, G.; Fielding, D. Paca (Agouti paca) and Agouti (Dasyprocta spp.)- Minilivestock Production in the Amazonas State of Venzuela. Biol. Trop. 2001, 19, 56–60.
11. Jones, K.R.; Garcia, G.W. Anthelmintic usage on the reproductive parameters in captive reared agoutis (Dasyprocta leporina) in Trinidad, West Indies. Trop. Agric. 2020, 97, in press.
12. Mohammed, R.; Legall, G.; Garcia, G.W. Towards the determination of a "Weaning Age" for intensive production of agouti (Dasyprocta leporina). Livest. Res. Rural Dev. 2018, 30, 1–8.
13. Jones, K.R.; Garcia, G.W. Anthelmintic usage on the performance of the Agouti (Dasyprocta leporina) reared intensively in Trinidad and Tobago, West Indies. Trop. Agric. 2020, 97, in press.
14. Jones, K.R.; Lall, K.R.; Garcia, G.W. Dystocia in a Captive Reared Agouti (Dasyprocta leporina) in Trinidad and Tobago, West Indies. Vet. Sci. 2020, 7, 30.
15. Brown-Uddenberg, R.C.; Garcia, G.W.; Baptiste, Q.S.; Counand, T.; Adogwa, A.O.; Sampson, T. The Agouti (Dasyprocta leporina, D. aguti) Booklet and Producers' Manual; GWG Publications: Champ Fleurs, Trinidad; Tobago, Trinidad, 2014.
16. Mayor, P.; Guimaraes, D.A.; Lopez, C. Functional morphology of the genital organs in the wild paca (Cuniculus paca) female. Anim. Reprod. Science 2013, 140, 206–215.
17. El Bizri, H.R.; Fa, J.E.; Valsecchi, J.; Bodmer, R.; Mayor, P. Age at sexual maturity, first parturition and reproductive senescence in wild lowland pacas (Cuniculus paca): Implications for harvest sustainability. Anim. Reprod. Sci. 2019, 205, 105–114.
18. Ribeiro, V.M.F.; Satrapa, R.; Diniz, J.V.A.; Fêo, H.B.; Flórez, L.M.M.; Satrapa, R.A.; Oba, E. Synchronization of estrus in paca (Cuniculus paca L.): Possible impacts on reproductive and productive parameters. Braz. J. Vet. Res. Anim. Sci. 2017, 54, 27–35.
19. Girardi, F.; Cardozo, R.M.; de Souza, V.L. de Moraes, G.V.; dos Santos, C.R.; Visentainer, J.V.; Zara, R.F.; de Souza, N.E. Proximate composition and fatty acid profile of semi confined young capybara (Hydrochoerus hydrochaeris hydrochaeris L. 1766) meat. J. Food Compos. Anal. 2005, 18, 647–654.

20. Dalle Zotte, A. Perception of rabbit meat quality and major factors influencing the rabbit carcass and meat quality. Livest. Reprod. Sci. 2002, 75, 11–32.
21. Pla, M.; Pascual, M.; Arino, B. Protein, Fat and Moisture Content of Retail Cuts of Rabbit Meat Evaluated with the NIRS Methodology. World Rabbit Sci. 2004, 12, 149–158.
22. Cavani, C.; Petracci, M.; Trocino, A.; Xiccato, G. Advances in research on poultry and rabbit meat quality. Ital. J. Anim. Sci. 2016, 8, 741–750.
23. de Figueiredo, L.B.F.; de Souza Rodrigues, R.T.; Leite, M.F.S.; Gois, G.C.; da Silva Araújo, D.H.; de Alencar, M.G.; Oliveira, T.P.R.; Neto, A.F.; Junior, R.G.C.S.; Queiroz, M.A.Á. Effect of sex on carcass yield and meat quality of guinea pig. J. Food Sci. Technol. 2020, 57, 3024–3030.
24. Barba, L.; Sanchez-Macias, D.; Barba, I.; Rodriguez, N. The potential of non-invasive pre-and post- mortem carcass measurements to predict the contribution of carcass components to slaughter yield of guinea pigs. Meat Sci. 2018, 149, 59–65.
25. Mustafa, A.F.; Chavarr, E.C.; Mantilla, J.G.; Mantilla, J.O.; Paredes, M.A. Effect of feeding flaxseed on performance, carcass trait, and meat fatty acid composition of Guinea pigs (Cavia porcellus) under northern Peruvian conditions. Trop. Anim. Health Prod. 2019, 51, 2611–2617.
26. Oda, S.H.; Bressan, M.C.; Freitas, R.T.; Miguel, G.Z.; Vieira, J.O.; Faria, P.B.; Savian, T.V. Centesimal composition and cholesterol content in commercial cuts of capybaras (Hydrochaeris hydrochaeris L. 1766). Ciênc. Agrotecnol. 2004, 28, 1344–1351.
27. Bressan, M.C.; Oda, S.H.; Cardoso, M.D.; Miguel, G.Z.; Freitas, R.T.; Vieira, J.O.; Faria, P.B.; Savian, T.V.; Ferrão, S.P. Fat acids composition of the capybara (Hydrochaeris hydrochaeris L. 1766) commercial cuts. Ciênc. Agrotecnol. 2004, 28, 1352–1359.
28. Nogueira-Filho, S.L.G.; Mendes, A.; Tavares, E.F.K.; Nogueira, S.S.C. Cecotrophy behaviour and use of urea as a non-protein (NPN) source for capybara (Hydrochoerus hydrochaeris). Trop. Anim. Health Prod. 2013, 45, 1703–1708.
29. Felix, G.A.; de La Paz, I.C.; Piovezan, U.; Garcia, R.G.; Pinheiro, M.S.; Fernandes, A.R.; Lima, K.A.; Rezende, M.A. Meat and Carcass Characteristics of Free-Living Capybaras (Hydrochoerus hydrochaeris); Embrapa Pantanal-Artigo em periódico indexado (ALICE): Brazil 2014.
30. Jardim, N.S.; Bressan, M.C.; Lemos, A.L.; Thomazini, M.; Ferreira, M.W. Lipid content and fatty-acids of capybara meat (Hydrochaeris hydrochaeris). Ciênc. Agrotecnol. 2003, 27, 651–657.
31. Oda, S.H.; Bressan, M.C.; Miguel, G.Z.; Vieira, J.O.; Faria, P.B.; Savian, T.V.; Kabeya, D.M. Effect of slaughter method and gender on the meat quality of capybara (Hydrochaeris hydrochaeris). Ciencia e Tecnologia de Alimentos (Brazil). 2004..
32. Pinto, M.F.; Ponsano, E.H.; Almeida, A.D.; Heinemann, R.J.; de Souza, W.M. Characteristics and technological potential of the capybara meat. Cienc. Rural 2007, 37, 868–872.
33. Roca, R.D.; Veiga, N.; Neto, R.B.; Cervi, R.C. Sensorial characteristics of smoked meat of capybara. Pesqui. Agropecu. Bras. 1999, 34, 487–492.
34. Saldanha, T.; Santana, D.M.; Gaspar, A. Total lipids, fatty acid composition and cholesterol content of capybara (Hydrochoerus hydrochaeris) meat. Braz. J. Food Technol. 2002, 5, 245–250.