Nutritive value of agouti (*Dasyprocta leporina*) meat in comparison to selected domesticated animals

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Presently the world is facing tremendous challenges in feeding persons who reside in developing countries. This is due, among other factors, to increasing incidences of global pandemics and climate change. As such alternative protein sources must be investigated. One such protein source for human consumption can come from the wildlife or non-domesticated neo-tropical animals. One such animal is the agouti (*Dasyprcota leporina*) that has been reported to have the potential to be domesticated. If this animal species is to be used as an animal protein for humans, the nutritive value of its meat must be known. To the authors' knowledge there is little information on the nutritive content of agouti meat. As such the aim of this experiment was to record the proximate composition and mineral content of agouti meat. The meat parameters of the agouti were also compared to other domesticated species (chicken, rabbit and guinea pig). Meat samples from each species were analysed to determine mineral content, proximate composition as well as fatty acid composition. Results showed that the agouti had the highest protein (22.18%) content with the lowest fat (1.96%) and energy (22.50 kJ/g) content when compared with the domesticated species. The mineral analysis showed that agouti meat had the highest iron (87.21µg/g). The agouti and guinea pig had the lowest sodium (7624 and 2135µg/g) contents in comparison to chicken and rabbit. The fatty acid profile of agouti meat was not analysed and this is an area in urgent need for investigation. However, the fatty acid analysis was done for guinea pig, rabbit and chicken meat. The guinea pig meat was found to have the lowest saturated fatty acids (29.06%) and the highest polyunsatured fatty acids (41.92%). This showed that guinea pig meat is a healthy option for human diets if taken in the correct amounts. This study proves that the agouti and guinea pig meat can be a healthy alternative source of animal protein for the developing countries and with further research can be developed into a functional food.

Keywords: *Dasyprocta leporina*, *Cavia porcellus*, *Gallus domesticus*, *Oryctolagus cuniculi*, polyunsaturated fatty acids, saturated fatty acids, developing countries, functional foods

Animal meat provides essential nutrients to humans which cannot be obtained from plants. In a world with an increasing population and increasing prevalence of pandemic diseases food safety is a huge issue in developing countries. Recently, research into alternative food resources from animal protein is being explored. Such animals are labelled mini-livestock (Hardouin et al. 2003) or micro-livestock (Govino and Fielding 2001). Animals which were placed in this category included the guinea pig (*Cavia porcellus*), lappe (*Agouti paca*/ *Cuniculus paca*) and agouti (*Dasyprocta leporina*) (Hardouin et al. 2003; Govino and Fielding 2001). Further to this Brown-Uddenberg et al. (2004) listed the agouti as one neo-tropical animal with the potential to be domesticated and provide be an excellent source of meat protein for rural communities when farmed intensively. Noguiera and Noguiera Filho (2011) stated that intensive production systems of non-domesticated neo-tropical animals are viable sources of income, conservation and food.

Recently, a lot of attention has been given to functional foods for human consumption (Kaur and Das 2011); meat from animals contains functional ingredients that are beneficial to the body (Migdał and Živković 2007). A functional food is defined as a food that provides nutrients and prevents chronic diseases such as obesity, cardiovascular diseases, diabetes and arteriosclerosis (Jiménez-Colmenero et al. 2001; Jew et al. 2009; Hoffmann et al. 2010). People have also shown greater interests in the purchasing meat

0041–3216/2021/040395–405

products which are functional foods (Hathwar et al. 2012; Petrescu and Petrescu-Mag 2018).

Agoutis as mini-livestock can utilize industrial and agricultural by-products and convert them into animal protein. These animals have an omnivorous diet (Lall et al. 2018; Jones et al. 2019; Guimaraes-Silva et al. 2020; Freire Filho et al. 2021) which makes them well suited to utilize a wide array of feedstuff. The guinea pig has been reared intensively in the tropics for its meat by rural villagers (Paterson et al. 2001). However, many obstacles have been highlighted such as high pre-weaning mortality, high veterinary input (due to infectious diseases) and predation. Rearing guinea pigs does provide a source of food and income to these villagers with minimal inputs; they are fed kitchen scraps and grass (Paterson et al. 2001).

As an alternative source of animal protein the nutritive value of agouti meat must be known. Thus the objectives of this paper were to quantify the nutritive content of agouti meat and compare their nutritive content to other domesticated species such as the guinea pig, rabbit and chicken. If the nutritive value is quantified, then consumers can be informed and agouti meat can be marketed as a functional food.

Material and methods

Ethical approval

All applicable international, national, and/or institutional guidelines for the care and use of animals were followed. The research site has been overseen by veterinarians to ensure animals are kept healthy. Field and laboratory protocols were approved by the Ethics Committee of The University of the West Indies, St Augustine campus (ref no. CEC 550/ 06/20).

Sources of animals

Agouti (*Dasyprocta leporina*)

Four male agoutis approximately 12 months old were obtained from the Wildlife Unit at The University of the West Indies Field Station. This unit is located in Valsayn, Trinidad and Tobago. Agouti used in this experiment were born in captivity and reared in cages or on concrete floors. These animals were clinically healthy and their diet consisted of fresh fruits, forages and vegetables (*Trichantera gigantica*; bananas, *Musa* spp; cassava, *Manihot esculenta*; pawpaw, *Carica papaya* and guava, *Psidium guajava*) that were available on the farm and supplemented with commercial rabbit ration (Mastermix®) which contains approximately 17% crude protein (CP), 2.5% ether extract (EE) and 15% crude fibre (CF). Agoutis were given water *ad libitum*.

Guinea pig (*Cavia porcellus*)

Four male guinea pigs approximately 12 months old were obtained from the Wildlife Unit at The University Field, Trinidad and Tobago. All animals were reared intensively and fed a diet that consisted of a local forage (*Trichanthera gigantea*). Guinea pigs had access to water *ad libitum*.

Rabbit (*Oryctolagus cuniculus*)

Four male rabbits approximately 3 months old were obtained from the rabbitry at The University Field Station, Trinidad and Tobago. All animals were reared intensively and fed a diet that consisted of forage (*Trichantera gigantea*) and Mastermix® rabbit ration (17% CP, 2.5% EE, and 15% CF). Rabbits had access to water *ad libitum*.

Chicken (*Gallus domesticus*)

Four commercially grown broiler chickens approximately 6 weeks old were obtained from a meat shop (pluck shop) in central Trinidad. Broilers were reared on broiler starter ration (23% CP, 11.73 Mj/ kg Metabolizible energy (ME), 3.93% EE, 3.67% CF) for 2 weeks and broiler grower ration (19.91% CP, 11.71 Mj/ kg ME, 3.89% EE, 3.79% CF) for 4 weeks.

Chickens had access to water *ad libitum* throughout the entire grow-out period.

Animal slaughter

All animals were slaughtered using cervical dislocation. Subsequent to cervical dislocation the animals were bled via the jugular vein and carotid artery. After exsanguination the visceral organs and skin were removed from the carcass before storage.

Sample preparation

The meat samples from the whole carcasses of all the animals were analysed for chemical and nutritive values. The meat samples from the agouti, guinea pig, rabbit and the chicken were washed thoroughly and then boiled in hot water to remove the hair and keep the skin intact. Rabbit samples were skinned completely and the chicken samples were plucked to remove the feathers. The meats were then fabricated. The fleshes of the fabricated parts were deboned and placed in plastic bags and refrigerated until they were analysed.

Moisture content

From each animal a 5 g portion of wet meat was collected and weighed. The meat samples were then placed in an oven at 105 ^{0}C for 24 hours. The samples were then removed from the oven, allowed to cool and then re-weighed. The difference in the weights was used as the measure of the amount of water present in the meat samples.

Protein content

A further 5 g sample of wet meat was obtained from the agouti, guinea pig, rabbit and chicken. To each sample, a Kjeldahl catalyst (containing 1 g of sodium sulphate and 0.1 g of copper sulphate-5-hydrate) was added as well as 8 ml of sulphuric acid. The mixture was then placed into a digestion-heating block at 400 ^{0}C for 1 – 2 hours. After heating the mixture was allowed to cool to 35 – 40 ^{0}C. After digestion of the samples, they were placed in a Gerhardt Vapodest Kjeldahl machine and the nitrogen content of the samples were detected and recorded. To convert the nitrogen content into crude protein percentage the nitrogen value was multiplied by a conversion factor of 6.25.

Mineral analysis

Flame atomic absorption (Zn, Fe and Ca)

Approximately 5 g of dried meat from each animal were added to 10 mL nitric acid. The mixture was then left for 24hrs to pre-digest and then pre-heated to 130 – 135 ^{0}C for extraction. This mixture was then filtered. The samples were then placed into a flame atomic absorption spectrometer and records were taken on the air/acetylene flow rate, lamp current and wavelength. For the determination of zinc and iron, standard concentrations of 0.5, 1.0, 2.5, 5.0 and 10.0 ppm were analysed. For calcium determination the standards of 0.01, 0.05, 0.10, 0.20 and 0.30 ppm were calibrated using the flame atomic absorption spectrometer. An addition of 10 mL of lanthanum chloride were added to the filtrate after extraction.

Flame emission photometry (Na and K)

The sodium and potassium standards and samples were aspirated using a flame emission spectrophotometer. The sodium and potassium standards used were 0.25, 0.50, 1.0 and 2.0 ppm

Crude fat content

Soxhlet apparatus was set up to measure crude fat of the meat samples. From each animal 5 g of meat were added to 5 mL of anhydrous sodium sulphate and then finely grounded. The dried meat sample was then placed into a cellulose thimble and placed into a glass condenser of the apparatus. N-hexane was then added to the ground dried meat sample and heated to 60 ^{0}C using a water bath. This mixture was then spun for 20 cycles for fat extraction.

Gross energy

Approximately 10 g of meat from each animal were placed in an oven at 103 ^{0}C and left overnight. The dried meat samples were then pulverised. Pellets were made from each dried meat sample which weighed 0.8 g. Each pelleted sample was then analysed individually for total energy in a Parr1261 Bomb Calorimeter. The gross energy value of each meat sample was recorded in calories per gram and then converted into joules per gram using a conversion factor of 4.18. The gross energy of guinea pig was not analysed in this experiment.

Fatty acid analyses

Each of the meat samples of guinea pig, rabbit and chicken was transformed to fatty acid methyl esters (FAME) and the FAME profiles of the fats were analysed using capillary gas chromatography; 0.1 g of each meat sample was mixed with 1 mL of 3% sodium methoxide. The agouti meat samples were not analysed from fatty acid analysis. This mixture was then vortexed in an ultrasonic bath for 30 minutes; 3 mL of heptane was then added to the mixture and re-vortexed for 30 minutes in the ultrasonic bath; 30 mL of 20% sodium chloride was then added to the mixture and further vortexed. This mixture was then allowed to stand to facilitate separation. The upper heptane layer was then removed and anhydrous sodium sulphate added to the heptane fractions. The samples were then refrigerated (4 ^{0}C) until gas chromatography analyses were done.

Capillary gas chromatography (GC) was done using a column (AT 1000 60m x 0.25 mm i.d), temperature programme (160 ^{0}C for 5 mins, 160 – 240 ^{0}C at 20 ^{0}C /min; hold for 15 mins) and helium flow rate (0.75 mL/min, sample split ratio 90:10). A 1μl standard sample of FAME was injected into the GC and the temperature programme initiated. Each species that was analyzed was done using four replicates to obtain means and standard errors of the mean.

Statistical analysis

Data obtained on the nutritional composition (moisture, gross energy, crude fat, crude protein and mineral content) of the meat were analyzed using one-way analysis of variance in Excel. Samples from each species were replicated four times to obtain means and standard errors of the mean. Where there were significant differences in meat groups the Tukey test was carried out to determine where the differences existed; the significant value for the Turkey test was P = 0.05. Descriptive statistics were presented for the fatty acid composition of the meat samples.

Results

The carcasses of the agoutis, guinea pigs, rabbits and chickens were weighed post slaughter. The agouti had the highest mean carcass weight, 1.42 kg; the guinea pig had the lowest mean carcass weight, 0.34 kg; and the chicken and rabbit had mean carcass weights of 1.12 and 0.97 kg respectively.

Nutritional content

The nutritional content of the agouti, guinea pig, rabbit and chicken are summarised in Table 1. There were no significant differences (P = 0.48) in the moisture content of the meats of the four species of animals. The average moisture contents of the four species ranged from 63.37% (guinea pig) to 78.70% (rabbit).

However, there were significant differences noted in gross energy (P = 0.03), crude protein (P < 0.001) and crude fat (P < 0.001). Chicken meat yielded the highest gross energy with no significant difference noted in agouti and rabbit meat. The meat of the agouti (22.18%) and rabbit (20.43%) had the highest crude protein contents, chicken had the lowest crude protein content

(7.58%) and guinea pig had an intermediary crude protein value (15.19%). Guinea pig meat had the highest fat content (14.31%) and the agouti (1.96%) and rabbit (2.24%) had the lowest fat content in their meat.

Table 1: Mean nutritional content of agouti, guinea pig, rabbit and chicken meat (n = 4 for each species)

	Agouti	**Guinea pig**	**Rabbit**	**Chicken**	**SEM**	**P value**
Moisture (%)	65.17	63.37	78.70	75.50	7.86	0.482
Gross energy (kJ/g)	22.50^{b}	-	23.16^{b}	26.41^{a}	0.50	0.03
Crude Protein (%)	22.18^{a}	15.19^{b}	20.43^{a}	7.58^{c}	1.47	< 0.001
Crude fat (%)	1.96^{c}	14.31^{a}	2.24^{c}	12.17^{b}	0.19	< 0.001

SEM - standard error of mean, $^{a, b, c}$ superscripts represent statistical significance using Turkey test at P = 0.05

Mineral content

The mineral contents of the meat of the neo-tropical rodents (agouti and guinea pig) and domestic livestock (rabbit and chicken) are summarised in Table 2. There were significant differences in all the mineral parameters for the meat samples. Guinea pig had significantly less zinc in its meat in comparison to the agouti, rabbit and chicken. Agouti meat had the highest iron (87.21 µg/g) content with guinea pig having the lowest iron (15.48 µg/g) concentration in its meat.

Guinea pig meat had the greatest calcium content in comparison to agouti, rabbit and chicken. The sodium content of guinea pig meat was the lowest with the rabbit having the highest sodium content. Similar results were seen with potassium content with guinea pig having the lowest content and rabbit having the highest content. In summary agouti meat had the highest iron content; guinea pig meat had the highest calcium content and the lowest zinc, iron, sodium and potassium content.

Table 2: Mean mineral content of the meat of agouti, guinea pig, rabbit and chicken (n = 4 for each species)

	Agouti	**Guinea pig**	**Rabbit**	**Chicken**	**SEM**	**P value**
Zinc (µg/g)	85.98^{a}	20.99^{b}	86.97^{a}	82.15^{a}	10.49	0.04
Iron (µg/g)	87.21^{a}	15.48^{c}	29.26^{b}	25.45^{b}	8.38	< 0.001
Calcium (µg/g)	19.40^{b}	56.14^{a}	28.31^{b}	10.77^{b}	10.57	0.02
Sodium (µg/g)	7624^{b}	2135^{c}	12,956^{a}	9120^{b}	619.3	< 0.001
Potassium (µg/g)	10,072^{b}	2130^{c}	18,815^{a}	11,311^{b}	867.1	< 0.001

SEM- standard error of mean, $^{a, b, c}$ superscripts represent statistical significance using Turkey test at P = 0.05

Fatty acid composition

The fatty acid composition of the meats of the guinea pig, rabbit and chicken are summarised in Table 3. The fatty acid analysis was not done on the meat of the agouti and this data is essential and should be further investigated. Rabbit meat had the highest content of myristic acid (C14:0), palmitic acid (C16:0) and hexadecadienoic acid (C16:2). Rabbit meat also had the highest concentration of total saturated fatty acids (SFA) and lowest unsaturated fatty acid (UFA) content.

Chicken meat had the highest amount of palmitoleic acid (C16:1), stearic acid (C18:0), oleic acid (C18:1), arachidic acid (C20:0) and eicosadienoic acid (C20:2). Chicken meat had the lowest content of myristic acid (C14:0), palmitic acid (C16:0), linoleic acid (C18:2) and linolenic acid (C18:3). Chicken meat also had the highest content of total monounsaturated fatty acids (MUFA), the lowest content of total polyunsaturated fatty acid (PUFA) and the lowest ratio of total polyunsaturated fatty acids to saturated fatty acid (0.68).

Linoleic acid (C18:2), linolenic acid (C18:3) and eicosenoic acid (C20:1) were highest in guinea pig meat. Palmitoleic acid (C16:1), hexadecadienoic acid (C16:2), stearic acid (C18:0) and arachidic acid (C20:0) were lowest in guinea pig meat. Guinea pig meat had the lowest total SFA and the highest totals USFA and PUFA. Guinea pig meat also had the highest ratio of total PUFA to SFA (1.44). Our experiment showed that guinea pig meat had the highest concentration of crude fat but this fat was high in PUFA and low in SFA. Chicken meat had a lower crude fat value (12.17%) in comparison to guinea pig (14.15%) but the fatty acid composition of chicken fat was higher in saturated fatty acids and lower in polyunsaturated fatty acids.

Table 3: Mean and standard deviation for fatty acid composition (%) of the meat of guinea pig, rabbit and chicken (n = 4 for each species)

Fatty acids	**Guinea pig**	**Rabbit**	**Chicken**
C14:0 (myristic acid)	1.60 ± 0.06	2.95 ± 0.07	0.47 ± 0.10
C16:0 (palmitic acid)	22.46 ± 4.44	24.57 ± 3.28	22.32 ± 1.48
C16:1 (palmitoleic acid)	1.41 ± 0.62	2.82 ± 1.56	6.28 ± 2.45
C16:2(hexadecadienic acid)	0.76 ± 0.04	5.68 ± 1.87	0.00 ± 0.00
C18:0 (stearic acid)	4.76 ± 1.04	5.84 ± 0.76	6.39 ± 0.28
C18:1 (oleic acid)	27.37 ± 3.87	24.64 ± 4.68	43.84 ± 7.64
C18:2 (linoleic acid)	37.32 ± 8.84	30.54 ± 10.72	18.60 ± 4.72
C18:3 (linolenic acid)	3.38 ± 0.84	2.14 ± 0.76	1.15 ± 0.15
C20:0 (arachidic acid)	0.24 ± 0.06	0.29 ± 0.09	0.46 ± 0.10
C20:1 (eicoseneic acid)	0.31 ± 0.04	0.20 ± 0.02	0.00 ± 0.00
C20:2(eicosadienoic acid)	0.44 ± 0.12	0.32 ± 0.16	0.48 ± 0.08
Total SFA	29.06 ± 2.08	33.65 ± 1.88	29.64 ± 2.04
Total USFA	70.99 ± 3.84	66.34 ± 3.65	70.35 ± 4.48
Total MUFA	29.09 ± 4.88	27.66 ± 4.56	50.12 ± 15.14
Total PUFA	41.90 ± 10.65	38.68 ± 9.45	20.23 ± 5.45
Total PUFA/Total SFA	1.44 ± 0.02	1.15 ± 0.12	0.68 ± 0.16

SFA - saturated fatty acids (C14.0,C16.0,C18.0,C20.0); USFA - unsaturated fatty acids (C16.1,C16.2,C18.1,C18.2,C18.3,C20.1,C20.2) MUFA - monounsaturated fatty acids (C16.1,C18.1,C20.1); PUFA - polyunsaturated fatty acids (C16.2,C18.2,C18.3,C20.2)

Discussion

Nutritional content

The information obtained from the proximate analysis of rabbit meat in this experiment varied from data that was previously published. Gasperlin et al. (2006) found that rabbit meat contained 72.7% moisture, 22.1% protein, 1.31% minerals and 4.1% fat. Pla et al. (2004) found similar values for rabbit meat based on whole carcass analysis with respect to the crude protein and moisture content but reported higher values for fat (7.09%). The *longissimus dorsi* muscles of rabbits fed sage were analyzed by Simonová et al. 2010 and had moisture content of 74.7%, protein 21.37%, fat 3.53% and energy content 49.1kJ/g; all these values were higher than those obtained in the present study. Rabbits that were slaughtered in the summer period (Dalle Zotte et al. 2016) had similar values as those reported by Simonova et al. (2010). Dalle Zotte (2002) reviewed meat characteristics on the rabbit and found that rabbit meat had higher values for energy (61.8 Kj/g), protein (21.3%) and lipid content (6.8%). In summary, the rabbit meat obtained from this study had less energy, protein and fat in comparison to previously reported work. Variances in proximate analysis values of meat can be due to the environment, diet, sex as well as age of animal at slaughter.

The composition of guinea pig meat found in this study varied from those noted by other authors. The fat content in this study for guinea pig was high in comparison to the study by Figueiredo et al. (2020). They obtained a fat content of 2.97% (in females) and 4.51% (in males) but in this study the value obtained was 14.15%. Figueiredo et al. (2020) analysed the muscle of female guinea pigs and found that it had higher moisture (75.7%) and protein content (24.5%) in comparison to this study. It should be noted that Figuiredo et al. (2020) analysed intramuscular fat of the meat but in this experiment the fat content may be higher due to the inclusion of subcutaneous fat that was homogenized in the meat.

There were vast differences in the proximate composition of meat found with chickens in this study in comparison to previous studies. Higher levels of protein were found in chicken whole carcass, breast, thigh and heart muscle in comparison to results obtained from meat in this study. Previously reported protein values ranged from 22.04% (Ali et al. 2007) in the breast, 15.6% (Demirbas 1999) in the heart, 19.9 % in industrial breast, 20.1% in free range breast, 15.7% in industrial thigh, 18% in free range thigh, and 16.9% in both industrial and free range drumstick (Da Silva et al. 2017). The fat content of chickens in this study was higher than other reported studies. Demirbas (1999) reported chicken meat fat of 0.92% and da Silva et al. (2017) reported a value of 5%. The reason for the variation in fat content can be due to the environment and diet of the chickens in captivity. Variation in the techniques used in the meat analysis may also contribute to the variation in meat fat. The protein content of the chicken in this study was much lower than those reported in the literature. The lower value can be attributed to storage environment as well as the laboratory analysis used to calculate crude protein.

The moisture content of approximately 75% was similar to other reports (Demirbas 1999; Ali et al. 2007; da Silva et al. 2017). To the authors knowledge there is no published information on the chemical composition of the agouti meat and this is the first record of this in the literature. The agouti meat was found to have higher crude protein and lower crude fat and moisture content. This makes the agouti a highly nutritious meat source that is low in fat for the health conscious population. The energy content in the agouti is also lower than that of the rabbit and the chicken. This is significant due to its low caloric value. The proximate composition of the agouti meat is similar to parameters reviewed for capybara (*Hydrochaerus hydrochoerus*) meat by Ali and

Jones (2020), who reported an average protein content of 20.04 – 22.1%, moisture content of 74.1 – 77.4% and fat content of 0.2 – 1.75%.

Mineral content

There is a dearth of information on the mineral content of rabbit meat. Our result for iron content was 29.2 µg/g which was lower than 34.2 µg/g as reported by Dalle Zotte et al. (2016). Valenzuela et al. (2011) found higher iron content (83 µg/g) and zinc (95 µg/g). Mineral content in meat is also affected by several factors which were mentioned in the previous section. The mineral content in the chicken meat in this study was higher in comparison to the mineral content found in chicken heart and gizzard (Demirbas 1999). To the authors knowledge there is no previously published information on the mineral profile of agouti meat. The mineral profile of the animals in this study showed that the agouti had higher levels of iron and low levels of sodium. The agouti meat can therefore provide an important source of iron for reproductive women as well as for persons suffering with blood disorders, since the iron content can increase the level of haemoglobin in the blood. The low level of sodium is essential in the prevention of cardiovascular diseases.

Fatty acid composition

Several studies have been done on the fatty acid composition of rabbit meat. The total saturated fatty acid in this study (33.65%) was less than those reported by Gasperlin et al. (2006) 42%, Dalle Zotte (2002) 38.6%, Betancourt and Diaz (2014) 36% and Dalle Zotte et al. (2016) 37.8%. Dalle Zotte et al. (2016) reported lower levels (25.4%) of monounsaturated fatty acids (MUFA) as compared to this study (27.66%). However, other authors found higher values of MUFA in rabbit meat; 29% (Gasperlin et al. 2006), 32% (Dalle Zotte 2002), 29% (Betancourt and Diaz 2014). The polyunsaturated fatty acid (PUFA) content in rabbit meat in this study was higher than those reported by other researchers. Total PUFA content reported in rabbit meat were 24% (Dalle Zotte 2002), 29% (Gasperlin et al. 2006), 35% (Betancourt and Diaz 2014) and 37.3% (Dalle Zotte et al. 2016). The major polyunsaturated fatty acid reported in this study was linoleic acid (C18:2), which is a similar finding to other studies (Dalle Zotte 2002; Gasperlin et al. 2006; Betancourt and Diaz 2014; Dalle Zotte et al. 2016). The major saturated fatty acid identified was palmitic (C16:0), which is similar to other reports (Dalle Zotte 2002; Gasperlin et al. 2006; Betancourt and Diaz 2014; Dalle Zotte et al. 2016).

Guinea pig meat has been reported to be highly nutritious with high levels of PUFA in comparison to SFA. The levels of SFA found in guinea pig meat in this study were less than those reported by other authors. Betancourt and Diaz (2014) found a SFA level of 32.6% and Mustafa et al. (2019) reported 42.06 %. This study also had higher levels MUFA and PUFA compared with other reports. MUFA content reported by Mustafa et al. (2019) in guinea pig meat was 24.28%, less than what was reported in this study. Betancourt and Diaz (2014) reported MUFA levels of 26.1% which was also below what was observed in this study. The PUFA levels found in this study was also higher than levels reported by other authors, 33.33% (Mustafa et al. 2019) and 40.3% (Betancourt and Diaz 2014).

Chicken breast meat data reported by Ali et al. (2007) showed a higher content of SFA (35.76%) and PUFA (27.75%), as compared to chicken meat in this study. The MUFA content in this study was higher than 36.49% as reported by Ali et al. (2007). This study found that the palmitic acid (C16:0) was the highest constituent of the saturated fatty acid, which was not in agreement with that reported by Ali et al. (2007). They found that stearic acid (C18:0) was the highest constituent amongst the fatty acids. However, Ali et al. (2007) is in agreement with this study that the highest content of PUFA was linoleic acid (C18:2).

Several authors have reported that oleic acid was the MUFA with the highest concentration in the breast, thigh and legs of chicken (Almeida et al. 2006; Zelenka et al. 2008) and palmitic acid was the SFA with the highest concentration (Almeida et al. 2006). Zelenka et al. (2008) also noted that palmitic acid was the SFA in the highest concentration in chicken breast and thigh meat. Thigh meat had higher levels of palmitic acid when compared to the breast, similar to the findings of Zelenka et al. 2008, who also found similar results with linoleic acid having the highest concentration amongst the PUFA. In this study there were lower concentrations of SFA (32.36%) and PUFA (27.68%), whilst there was a higher concentration of MUFA (36.35%) in chicken meat in comparison to data reported by Riovanto et al. (2012).

Comparison of the fatty acid profiles of the animals in this study showed that guinea pig meat had the highest concentration of PUFA and lowest concentration of SFA. Further work should be done on the fatty acid composition of agouti meat and comparisons can be made with other hystricomorphic rodents such as the lappe (*Cuniculus paca/ Agouti paca*), guinea pig (*Cavia porcellus*) and capybara (*H. hydrochaeris*).

Conclusion

Agouti meat is a very nutritive food source for the developing world with high concentrations of protein and low fat in comparison to the meat of rabbit, guinea pig and chicken. Agouti meat was high in iron and low in sodium in comparison to other meats analyzed in this study, providing a healthy option for people with cardiovascular diseases and blood deficiencies. The fatty acid profiles of the meats showed that the guinea pig had the lowest proportion of saturated fatty acids and highest proportions of polyunsaturated fatty acids in comparison to the rabbit and the chicken. This shows that guinea pig meat is a healthy option, if taken in the correct proportions, and with regular exercise, can decrease chances of developing chronic lifestyle diseases. The fatty acid profile of the agouti was not analysed and this is an area of future research.

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