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Research Article

EFFECT OF DIET ON SERUM BIOCHEMICAL PARAMETERS AND PARASITISM OF GRASSCUTTER (*THRYONOMIS SWINDERIANUS*, TEMMINCK, 1827) RAISED IN CÔTE D'IVOIRE

Soro Soronikpoho, Karamoko Yahaya*, Soro Dofara and Fantodji Agathe

Universite Nangui Abrogoua, UFR des Sciences de la Nature,
Laboratoire de Biologie et cytologie Animales,
02 BP 801 Abidjan 02, Côte d'Ivoire

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ABSTRACT

Grasscutter (*Thryonomis swinderianus* Temminck, 1827), breeding has to face with numerous affections among which feeding is one. Since there is a need to improve the knowledge on the physiology of grasscutter serum biochemical parameters and parasites of digestive tract were determined using 32 grasscutters of ten months old, submitted to two different diets. Except creatinine, cholesterol and urea, the level of other parameters as total protein, and total bilirubin was significantly higher with granulate diet ($p<0.05$). Regarding ionic parameters, only the level of calcium, potassium and phosphorus were significantly different ($p<0.05$). As for as concerned enzymes, no significant catalytic activities difference was noticed ($p>0.05$). The proportion of Coccidia was significantly higher with grass cuter receiving forage ($p<0.001$), with the proportion of Trichuris for which no difference was observed.

Key-words: Grasscutter, granulate, forage, serum parameters, parasites, Côte d'Ivoire.

INTRODUCTION

The animal protein intake of average African remains quite below the recommended daily ratio. This forced people, mostly in rural areas, to explore alternative sources of the animal protein to complement the conventional livestock contribution. The quest for alternative animal protein sources has, therefore, engendered attempts to domesticate and breed some wild animals, especially rodents (Ajayi, 1971; Fonweban and Njwe, 1990). African grasscutter is one of the most hunted among these wild rodents (Yeboah and Adamu, 1995; Opara *et al*., 2006).

In most West African countries particularly in Ghana, Côte d'Ivoire and Benin, where the grasscutter exists, it was domesticated for meat production. Asibey (1974) reported that the grasscutter meat is widely recognized as a source of animal protein in subsaharian Africa in general. The meat is sold either as fresh, or dressed and smoked (Barnes, 1994). Den Hartog and De Vos (1973) and Asibey (1974) reported that there is indeed a large market for grasscutter meat in the West African sub regions. Despite the obvious potential of the grasscutter, domestication attempts are constrained by high mortality rate caused by various factors including diseases. Although attempts to domesticate this rodent are going (Eben, 2004), it is still not successful yet (Opara *et al.*, 2006). The lack of progress in such attempts may be attributed to poor understanding of the biology of grasscutter, the lack of veterinary care and other management

*Corresponding author e-mail: y.karamoko@gmail.com

factors. Blood parameters such as haematological and biochemical values are known to be good indicators for assessing the physiological, nutritional and pathological status of animals (Awah and Nottidge, 1998).

Recently Opara *et al.* (2006) and Byanet *et al*. (2008) established the average values of haematological and serum biochemical parameters for grasscutter. However, the influence of the animal diet on such values and gastro-intestinal parasites was not determined yet.

This study intended to establish the values of serum biochemical parameters and determined the gastro-intestinal parasites of domestic grasscutters fed with two different diets.

MATERIAL AND METHODS

Material

Biological Material: Thirty-two (32) grasscutters (16 males and 16 females) from the experimental farm of the University Nangui Abrogoua weaned were used for this study.

Laboratory equipments: The dosage of serum parameters required the use of different equipment comprising a centrifuge, a flame spectrophotometer, a visible/UV spectrophotometer, a haematologic automatic analyzer and a set of reference kits for dosage (BioMerieux, Biosystem and BIOLABO).

Methods

Treatment of the grasscutter: After the weaning, the grasscutters were divided in two groups of 16 animals and kept in batches of 4 grasscutters per pen until the age of 10 months. The first group was fed daily *ad libitum* with green forage (*Panicum maximum*, *Pueraria phaseoloides*, *Pennisetum purpureum*), the stems of *Manhiot esculenta* and a dietary supplement (grains of corn, dried leaflets of *Leucaena leucocephala*, cassava, powder of snails shells or calcined bone and salt). The second was fed with granulates.

Restraint of animals and levies: For handling the grasscutter, general anesthesia was necessary. Thus, they were anaesthetized with a mixture of 0.25 ml/kg of body weight of Acepromazine and 0.1 ml/kg of body weight of Calmivet twenty minutes later. The blood samples were taken at the carotid vein on each side of the armpit of the Forelegs and caecum contents were taken afterward. All samples were taken between seven and eight o'clock in the morning on an empty stomach.

Analysis of serum parameters: The blood samples were centrifuged at 3000 rpm for ten minutes. Sera obtained were then frozen at-20° C until they were used for the determination of the values of different biochemical parameters.

The methods used to analyze the parameters in this study are listed in Tables 1, 2 and 3. Ionic and biochemical parameters were obtained using a UV-visible spectrometer at different wavelengths according to the reference guidelines while potassium and sodium were determined by a flame spectrometer.

Hematological parameters were determined with a hamatologic automatic analyzer (Coulter STKS, Beckman)

Identification of gastro-intestinal parasites: Mac-Master technique has been used to identify eggs of nematodes, cestodes and coccidian oocystes. For eggs of trematodes, which are heavier, the sedimentation method was used. The visible parasites were macroscopically explored with a magnifying glass.

Statistical analysis

Kolmogorov-Smirnov test was applied to assess the influence of diet on serum parameters and parasites infestations were evaluated using the Statisca 7.1 software.

Table 1. Methods used for the analysis of metabolites.

Parameters	Colorimetric methods	λ (nm)
Urea	urease	600
Glucose	Glucose oxidase and peroxidase	500
Creatinine	kinetics with picric acid and alkaline	500
Cholesterol	Cholesterol esterase, oxidase and peroxidase	500
Total protein	Cupric and alkaline ions	550
Total bilirubin	Total: DMSO and sulfanilic acid	550

Table 2. Methods for the analysis of enzymes.

Parametrs	Enzymatic kinetic methods	λ (nm)
TGO	Disappearance of NADH	340
TGP	Disappearance of NADH	340
PAL	Disappearance of PNP	405

Table 3. Methods for the analysis of ions.

Parameters	Flame spectrometry methods	λ (nm)
Sodium	at temperature of 2000° Kelvin	589
Potassium	at temperature of 2000° Kelvin	767
Parameters	Colorimetric methods	λ (nm)
Chlorine	in nitric acid medium and in the presence of thiocyanate ions	500
Calcium	alkaline and in the presence of O-cresol phthalein	500
Magnesium	in alkaline and presence of calmagite	530
Phosphorus	in an acid medium and in the presence of ammonium molybdate	600

RESULTS

The main characteristics of the distributions of serum values measured in animals are gathered in table IV. Significant higher values were obtained for the glucose, total protein and total bilirubine ($p<0.05$) with the granulate diet. Only cholesterol appeared to be significantly different with the green forage diet. As for ionic parameters, only potassium, calcium and phosphorus have registered significantly different values. The parasites found in the gastro-intestinal tract of grasscutters at the end of breeding are summarized in Table 4.

Only two species of parasites e.g. Emeria and Trichuris have been isolated. The number of Emeria was significantly higher compared to Trichuris for animals receiving the green forage diet (Table 5).

Table 4. Serum parameters of grasscutters according the diet.

Parameters	Unity	Rations		Difference
		Green forage	Granule	
Metabolites				
Urea	g/l	0.29	0.25	0.04
Glucose	g/l	1.76	2.33	0.57*
Creatinine	m g/l	11.75	10	1.75
Cholesterol	g/l	0.96	0.86	0.1*
Total protein	g/l	36.5	64.98	28.48*
Total bilirubin	m g/l	19	26.8	7.8*
Enzymes				
TGO	UI/l	199	297.2	98.2
TGP	UI/l	187.5	288.2	100.7
PAL	UI/l	157	149.4	7.6
Minerals (ions)				
Sodium	mEq/l	138.25	137.6	0.65
Potassium	mEq/l	4	3.92	0.08*
Chlorine	mEq/l	100	99.8	0.2
Calcium	mg/l	86	83.4	2.6*
Magnesium	mg/l	20.45	20.74	0.29
Phosphorus	m g/l	53.75	66	12.25*

Values with the sign (*) are significant ($p<0.05$).

Table 5. Parasites infestation of grasscutters according the diet.

Parasites		Rations		Difference
		Fourrage	Granule	
Parasites	Ascaris	0	0	0
	Trichuris	593	818	225
Eggs of Cestodes	Tapeworm	0	0	0
Eggs of Protozoa	Coccidia	4065	0	4065*
Nematodes	Ascaris	0	0	0
	Trichuris	3	0	3
Cestodes	Tapeworm	0	1	1
Protozoa	Coccidia	4	1	3

* Values are significant ($p<0.05$).

DISCUSSION

Compared to most of domestic rodents for which serum biochemical parameters have been sufficiently studied, domestic grasscutter values have not been investigated too much. Only the works of Farougou *et al.* (1992), Opara *et al* (2006) and Byanet *et al.* (2008) constitute the first data. Though, no research has exhaustively evaluated metabolites, ionics and enzymtics parameters so far. Thus comparison of the present results with other values is limited. One of the difficulties faced with the present study was the collection of blood. Anaesthethic products were used to limit the stress and to facilitate the blood collection. The analysis of results (Tables 4 and 5) lets to the following observations.

Metabolites

Grasscutters fed with granulate have registered an average value of glucose (33 ± 0.33 g/l) and of protein (64.98 ± 8.18 g/l) significantly higher

($p<0.05$) compared to the ones which received the green forage diet. For these ones the average values were respectively 1.76 ± 0.47 g/l for the glucose and 38.25± 17.67 g/l for total protein. This decrease of glucose and total protein with the green forage could be explained by the deficiency of such nutriments in forage. Likewise, during the consumption, grasscutters to sort their food which does not permit to make profit of all nutriments served. Though, the granulate is a homogeneous mixture, which consequently limit the effect of sorting. This observed difference can be related with a larger proportion of parasites in green forage diet. Parasites compete with the host on available nutrient, reducing their concentration in blood. Thus they impoverish the blood of host. However, our values of glycemia and total protein are in agreement with the findings of Farougou *et al.* (1992) who obtained some values ranging between 1.47 to 2.32 g/l. et 46 to 72 g/l.

The level of cholesterol, with an average value of 0.96 ± 0.52g/l was significantly higher for the grasscutters which received green forage (0.86 ± 0.25 g/l). The opposite observation was made for the total bilirubin, with a significantly difference ($p<0.05$). The level of total protein was thus higher for animals receiving granulate. The weak value of cholesterol compared with the one of Opara *et al.* (2006) who obtains 1.26 ± 0.16 g/l, explain this by different factors such as breeding conditions, the diet, the season, the technical methods of dosage and the geographic area. Such a justification was also reported by Nazifi *et al.* (1999).

No previous study has taken into account the level of grasscutter bilirubin. Means values obtained with granulate diet (26.8 ± 7.8 mg/l) and green forage diets (19 ± 3.01 mg/l) are higher than the values obtained by Fonzegue *et al*. (2007) in rabbits (7.25 ± 1.07 mg/l). This gap may be justified by the difference between species.

Ions

Only the level of potassium, calcium and phosphorus showed significant differences. The phosphorus mean value with green forage diet (53.75 ± 8.4 mg/l) was significantly low. This decrease may be explained by the weak nutritive value of green forage and the daily wastage. However, calcium level with the same diet is raised significantly. This increase is related to direct consumption of snail shell burnt powder mixed in the complement diet. The recorded values stay in the interval (73 mg/l à 98 mg/l) given by Boucher and Mouaille (1996) during their experiment on rabbits in tropical area. Farougou *et al*. (1992) has obtained 0.08±0.01 mg/l for the calcium mean value and 0.03±0.00 mg/l for phosphorus with adult grasscutters of one to three years old. Coles (1979) and Lamand *et al.* (1976) show that the age of the animal can influence these parameters.

No significant different was noticed with enzymes (TGO, TGP and PAL) parameters during this study.

Parasites

Grasscutters fed with green forage have demonstrated a significantly higher number of coccidian ($p<0.05$). This results from the ingestion by the animals of contaminated forage with coccidian eggs which may come from the farm environment (Santolini, 2004). Indeed, the mixture of diet residue with the feces may cause proliferation of micro-organisms to which animals directly exposed. The weak number of larval and adult form may be due to regular treatment against parasites.

CONCLUSIONS

This study allowed to evaluate susceptible variations of serum biochemical parameters according the diet of grasscutters (*Thryonomys swinderianus*) raised in captive conditions. Thus, certain metabolites values glucose, protein, cholesterol and bilirubin and some ions (potassium, calcium and phosphorus) have showed significant variation related to the diet. However, despite the observed variation of values, they stay in line with already published results.

The granulate seems to be a good opportunity to reduce parasites infection of raised grasscutters. Therefore, in order to improve knowledge on the grasscutter physiology, it would be necessary to conduct additional study considering more serum biochemical and hematological parameters according to age and physical conditions of this rodent.

CONFLICT OF INTERESTS

The authors declare that there are no conflicts of interests associated with this article.

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