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Identified Plant Species and Nutrient Contents of Plants Consumed by Hamadryas Baboon (*Papio hamadryas hamadryas*) in Awash National Park, Ethiopia

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ABSTRACT

Plant species identification and detection of moisture, protein, lipid ash and sugar contents of plants that are consumed by hamadryas baboon in Awash National Park was studied from March 2015 to April 2016. The methods used were scan sampling following the baboons from early morning to late afternoon until 6:00 PM. and laboratory for moisture, protein, lipid ash and sugar content analysis. Samples were collected from Filwoha area where the baboons largely resided. Samples were collected through scan sampling technique from March 2015 to April 2016 both during wet and dry seasons. The samples were taken to Addis Ababa University herbarium for species identification and 73 species that are consumed by hamadryas baboons were identified. The species were identified by their scientific name, common name and local names. For moisture, protein, lipid ash sugar content analysis, the samples were collected shade dried, packed in plastic bags and transported to the laboratory for chemical content analysis. Samples were collected following the AOAC official methods of analysis (2005), method number 922.01. For nutrient content analysis, different methods were used. Drying oven for moisture, micro Kjeldahl for protein, Randal modified Soxhlet for lipid extraction, electric muffle furnace for ash were used to analyze the sample fruits under investigation. Total carbohydrate was determined by difference. DNS (Dinitrosalicylic Acid Solution 1%) and potassium sodium tartrate solution 40% was used to analyze reducing sugars. B. aegyptiaca, Acacia species gum, and Hyphaene thebiaca have high contents of moisture and other samples have more or less similar and it is less because Filoha area is semi-arid. Herb, B. aegyptiaca leave, Acacia Senegal seeds have contents of protein but Acacia species gum, has the lowest protein content, while other samples have more or less moderate content. Almost all samples analyzed for lipid, they have low content. Dobera glabera leaves have the high content of ash. But herb leaves, B. aegyptiaca leaves, grass leaves, Hyphaene thebiaca fruit have moderate ash content in compared to WHO/FAO standard. The rest of the samples have less contents of ash. The B. aegyptiaca fruit (mesocarp) has high content of sugar and even the pericarp also has high sugar content relative to other species of plants collected and analyzed for their sugar content. But the leaves have less content of sugar. Next to B. aegyptiaca fruit, H. thebaica fruit has high content of sugar than other plant species analyzed for their sugar content. D. glabra leaves have the least sugar contents than other plants analyzed for their sugar content.

Keywords: Ananlysis, Awash National Park, Hamadryas baboon, *Balanite aegyptiaca*, *Hyphaene thebaica,* Sugar content, Species

INTRODUCTION

Ethiopia is a tropical country where the altitudinal variation produces various macro-and micro-climatic conditions contributing to the formation of different ecosystems, leading to a high diversity of plant and animal species. Ethiopia

is one of the biodiversity rich countries of the world. Because of its rugged topography, it supports a number of plant and animal species (Institute of Biodiversity Conservation-IBC [1]. The fauna is highly diverse, consisting of 300 species of mammals in which 42 are endemic [2]. Endemism is high on the plateaus, mountains, in the Ogaden region and in the western and southwestern woodlands of Ethiopia, Vivero et al. [3]. However, wildlife population in Ethiopia has declined over the past century both in the number and distribution through loss of habitat, hunting, forest clearance for agriculture and land degradation due to overgrazing [4].

Awash National Park (ANP) harbours about 81 species of mammals. Among these mammals, the frequently observed one is hamdryas baboon. It also harbours different species of reptiles, amphibians, several species of birds and plants [1], Tamene et al. [5].

According to Zinner et al. [6], hamadryas baboon is an Old World Monkey found in the northeast Africa and southwestern Arabian countries, in Yemen and Saudi-Arabia. Zinner et al [6] reported that hamadryas baboons are distributed in parts of Ethiopia, Eritrea, Sudan, Djibouti and Somalia. In Ethiopia, hamadryas baboon is largely found in the Awash National Park [7,8]. It is believed that hamadryas baboon forage on different plant species but the nutrition of the baboon is not well studied. Therefore, this study would be expected to fill knowledge gap that enable us to predict the sustainable supply of the baboon with sufficient diet and nutrient contents of the forage in Awash National Park. The current research is aimed at studying and identifying plant species consumed by hamadryas baboon in Awash National Park and to analyze the moisture, protein lipid, ash and carbohydrate (sugar) contents of plant species sampled from Awash National Park.

MATERIALS AND METHODS

Study area

Awash National Park (ANP) occurs in the middle of Awash River basin at the southern tip of Afar Regional State and northeastern part of Oromia Regional State [7,8]. It borders with Awash-Fentale and Kereyu Fentale districts. Awash-Fentale is in Afar Region while Kereyu-Fentale is in Oromia Region (Figure 1). It is located at 8°46'N and 9°16'N latitude and 39°46'E and 40°6'E. longitude. It is about 225 km east of Addis Ababa with its southern boundary along the Awash River. It covers 756 km^2 of Acacia woodland and grassland in the first demarcation. In the second (current) demarcation, it is reduced to 589 km^2 [9] because some part of the Park land is given to the nomadic tribes surrounding ANP in order to minimize conflict between the local community and the Park (Figure 1). The Addis Ababa - Dire Dawa highway passes through the park, separating the Illala Salla plains to the south from the Kudu Valley to the north.

Awash National Park is found in semi-desert area. Its altitudinal elevation ranges from 1200 to 1829 m above sea level. The main rain season is from June to September, with a short rain from February to April. Daniel Gemechu [10] reported that the climate of the Awash National Park (ANP) is characterized by semi-desert, dry, sometimes with harsh climatic conditions such as drought. During the dry seasons conditions are very harsh, where there is shortage of resources for wildlife as well as for the pastoralists that are residing in the surrounding areas of the Park. The average rainfall is 474.93 mm National Metrology Agency [11]. The mean annual rainfall in the area ranges from 276 mm to 559.8 mm [11]. The least rainfall is in December and January and highest rainfall is registered in July and August. Awash National Park is generally known for scarcity of rainfall and the area is semi-desert affected by persistent drought.

Daily temperature ranges from 10°C to 22°C. Temperatures can reach as high as 40°C but nights are cooler. The mean minimum and maximum annual temperature ranges from 13.77°C to 22.59°C and 31.74°C to 37.18°C, respectively. The lowest monthly temperature occurs during December and the highest during May, Tamene et al. [5]. The mean relative humidity of the area is 49.1%. Less relative humidity is registered in November and March.

Awash National Park area is arid and semi-desert woodland, savanna and has riverine forests. The plains are covered by grass species with scattered small trees covered in dense thickets of Acacia species. The rock valley to the north of the Park is bushy and Awash River possesses a thin belt of dense forest, Tamene et al. [5].

According to Almaz [12], grassland, savanna and shrub land plant species dominate Awash National Park's Vegetation. Grasslands are found on the slopes of Fentalle Mountain as well as on the surrounding plains. The perennial tussock-grass (*Chrysopogon plumulosus*), *Riochloa radicans* and *Inchaemum afrum* are highly palatable and important species for domestic and wild grazing animals. The grassland areas in the northern and western part of the Park have been overgrazed. As the result, about 50% of the land is degraded, with bare soil and rock. The invasive, unpalatable

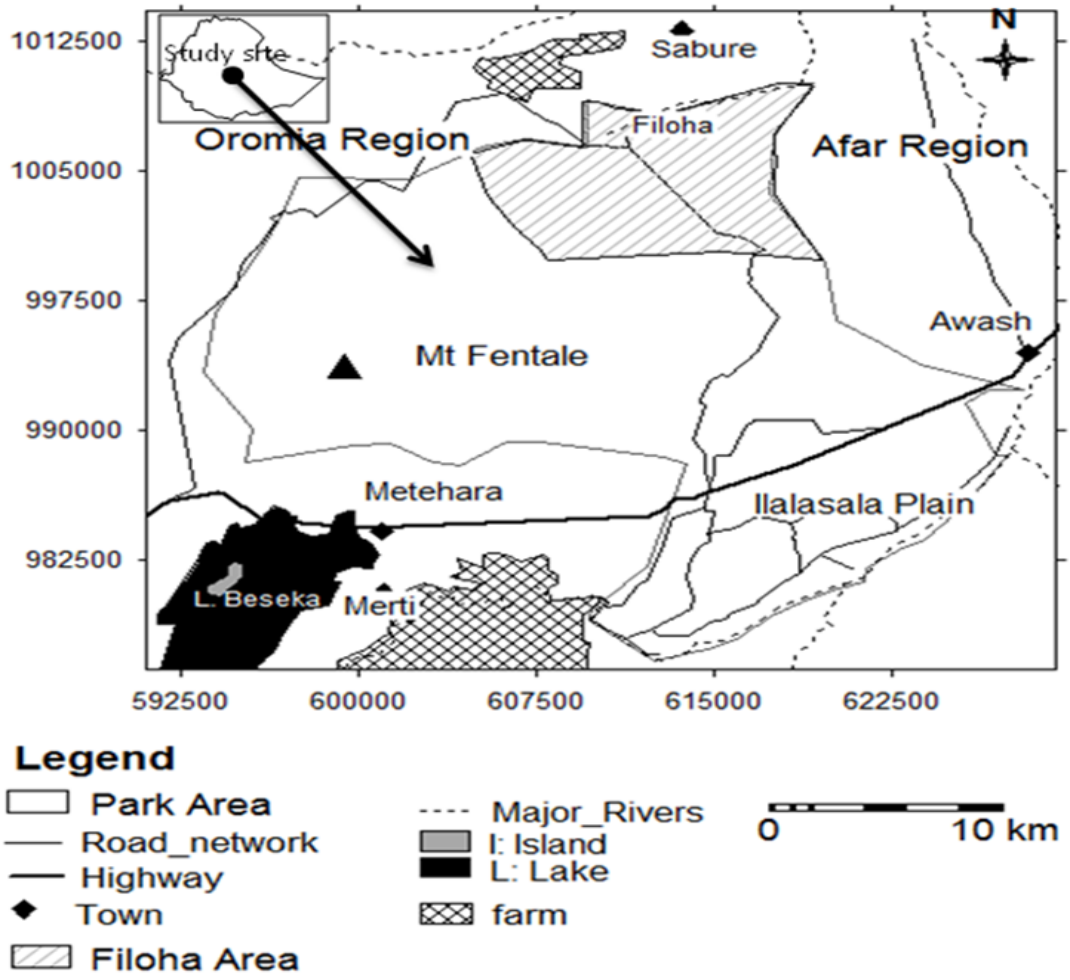

Figure 1: Map of Awash National Park (study area)

species of plants such as needle grass *Aristida* species dominate the north and western parts of the Park. Lowland Acacia species (*A. tortilis*, *A. senegal*) and *Balanites aegyptiaca* are the most common large trees in the savanna, while the shrubby and very spiny small Acacia species (*A. nubica* and *A. mellifera*) dominate overgrazed areas. Shrubby areas around the grassland are more mixed with some Acacia, Cadaba species, *Psiadia incana* and Vernonia species. The riverine trees, *Dobera glabra* and *Syzygium guineense*, possess large fruits that provide food to wildlife species including birds and mammals. Filwoha hot springs are surrounded by *Hyphaene thebaica*, *Sporobolus consimilis* and *Sporobolus spicatus* species on the saline soil [12].

Sample collection

Plant samples consumed by hamadryas baboons were collected in the field by following the baboons starting from early in the morning to late afternoon. The samples of plants were *Balanites aegyptiaca* (desert date) leaves and fruits, *Hyphaene thebaica* (doum palm) fruits, *Dobera glabra* (garsa) leaves, Acacia *senegal* (gum Arabic) seeds, *Grewia tenax* fruits, herb leaves, Acacia species gum, grass leaves and seeds. Samples were collected from Filwoha area where the baboons largely resided. Samples were collected through scan sampling technique during 2014 to 2015 both during wet and dry seasons. The collected samples were shade dried, packed in plastic bags and transported to the laboratory for chemical content analysis. Samples were collected following the AOAC (Association of Analytical Chemists) official methods of analysis [13], method number 922.01.

Sample preparation

The leaves, fruits and seeds were ground finely using mixer or milling apparatus (RF/5900W, Samyang Jeonja, Go Yang, Korea). Fruits samples were separated into outer layer (pericarp), pulp (mesocarp) and inner layer (endocarp) mechanically by hand. The Acacia gum sample was ground using manual mortar. The samples were prepared following

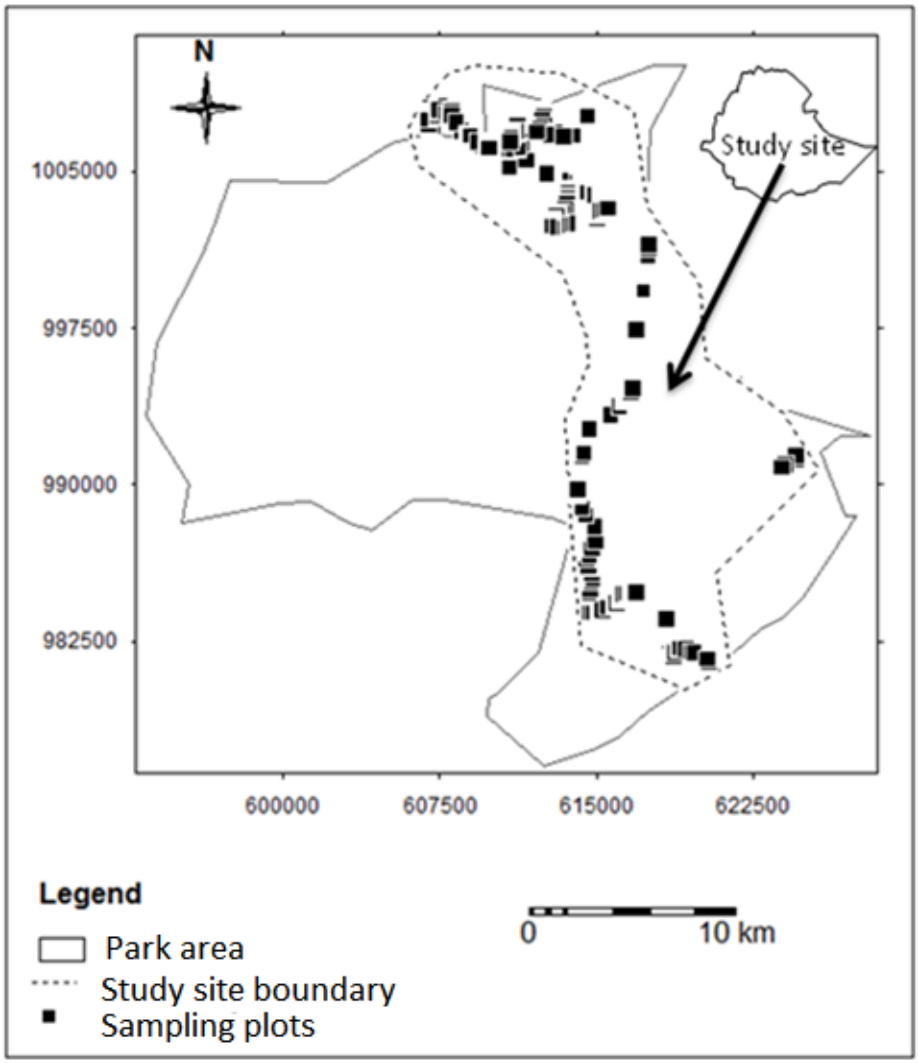

Figure 2: Map of the study site and sampling plots

the AOAC official methods of analysis [13], method number 922.02. In all samples the moisture, lipid, protein and ash were determined. In all samples under analyses, total carbohydrate contents of the samples were determined by differences in each of the samples. The total contents of crude protein, lipid, ash and moisture were added and subtracted from 100 to get carbohydrate contents of the analyzed samples.

Samples were also analyzed for reducing sugar determination using DNS (Dinitrosalicylic colorimetric method).

Proximate analyses

Leaves, fruits, seeds and gum samples of *Balanite aegyptiaca*, grass, *Grewia tenax*, *Acacia senegal*, herb, *Dobera glabra*, *Hyphaene thebaica* and Acacia species gum were weighed 1-2 g each using analytical balance and put in a drying oven (J-300M, JISICO Co., Seoul, South Korea) with pre-adjusted 105°C temperatures for 3 h. Then, cooled in a desicator for 1 h. The samples were weighed and measured after drying and then the moisture contents of the samples were calculated for each sample. The moisture content of the samples was analyzed following the AOAC official methods of analysis [13], method number 930.15.

Leaves, fruits, seeds and gum samples of *Balanite aegyptiaca*, grass, *Grewia tenax*, *Acacia senegal*, herb, *Dobera glabra*, *Hyphaene thebaica* and Acacia species gum were weighed and measured 1 g each using analytical balance. The weighed and measured samples were put in an electric muffle furnace (J-FM2, JISICO. Co., Seoul, South Korea) with a temperature pre-adjusted at 550°C for an overnight (12 h). Then transferred to a desiccator for cooling at room temperature for 1 h. Samples were weighed and measured after drying and then ash contents of the samples were calculated for each sample. Ash contents of the samples were analyzed following the AOAC official methods of analysis [13], method number 942.05.

Leaves, fruits, seeds and gum samples of *Balanite aegyptiaca*, grass, *Grewia tenax*, *Acacia Senegal*, herb, *Dobera glabra*, *Hyphaene thebaica* and Acacia species gum were weighed 1-2 g each using analytical balance. Randall modification of standard Soxhlet lipid extraction apparatus (RS-232, SER-148/6, VELP-SCIENTIFICA, Seoul, South Korea) was used to extract lipid from the samples. Extraction thimbles and cups were used as extraction apparatus. The weight of samples and extraction thimbles was recorded separately. Anhydrous diethyl ether (33415K0380, JUNSEI, Japan) purified for lipid extraction was used as extraction solvent. Dry thimbles containing samples were put at 102°C ± 2°C for 2 h. The thimbles containing the samples were immersed into solvent containing extraction cups for boiling steps of 90 min, washing step 90 min and solvent recovery 30 min. The extraction cups containing extracted portions of the samples were put in drying oven (J-300M, JISICO Co., Seoul, South Korea) for 1 h and transferred to a desiccator for cooling to room temperature for 30 min.

Extraction cups containing the extracted portions of the samples were weighed, measured and lipid contents were calculated for each sample. Lipid contents of the samples were analyzed following (AOAC) Official Methods of Analysis [13], method number 2003.06.

Leaves, fruits, seeds and gum samples of *Balanite aegyptiaca*, grass, *Grewia tenax*, *Acacia senegal*, herb, *Dobera glabra*, *Hyphaene thebaica* and Acacia species gum were weighed 1-2 g each using analytical balance. The weighed samples were analyzed using micro-Kjeldahl modified apparatus (K6, VELP SCIENTIFICA, Pty, Ltd., Seoul, South Korea). Digestion flasks, beakers, micro Kjeldahl distillation apparatus (UDK-139) and titration apparatus were used to analyze crude protein contents of the samples. Chemicals used for crude protein analyses were sodium sulfate, sodium hydroxide, sulfuric acid and boric acid. 1-2 g of the samples were put on a weighing paper, weighed and kept in the digestion flasks. Then put on the digester apparatus at 420°C until it is completely digested for about 1 h. The digestion flasks were taken to distillation units, treated with boric acid and the distillate was collected by 500 ml graduated titration flasks, then immediately titrated using hydrochloric acid solution. All the analyses were carried out in triplicate to get a relatively better result. Protein contents were determined by nitrogen contents. The protein contents were calculated as N% × 6.25. The crude protein contents of the samples were analyzed using AOAC official methods of analysis [13], method number 2001 [14].

Sugar content analysis

DNS (Dinitrosalicylic Acid Solution 1%) and potassium sodium tartrate solution 40% was used to analyze reducing sugars. 3 ml of DNS reagent was added to glucose (reducing sugar) in a lightly caped test tube. The mixture was heated at 90°C for 5 to 15 min to develop red brown color, then 1 ml of 40% potassium sodium tartrate (Rochelle salt) solution added to stabilize the colour. After cooling to a room temperature in a cold water bath, the absorbance was recorded using spectrophotometer at 575 nm. AOAC analysis method [13] was used, method number 922.02.

RESULTS AND DISCUSSION

Plant species consumed by hamadryas baboon (*Papio hamadryas hamadryas*) in Awash National Park are various types; even there may be some species of plants that are not still recorded in this study. In this study about 71 species of plants were identified and recorded that are consumed by hamadryas baboons in Awash National Park. The plants species were identified during 2013 to 2015 study period. Botanical names, family name, local names (Afar names) and common names of plant species identified in Awash National Park are given in Table 1.

These plants species were collected from Awash National Park following the baboons and the sampling plots designed on the map indicated in Figure 2. The plant samples were collected both during the wet and dry seasons of the study period.

After the plant species collected and identified in the herbarium some of the plant samples were prepared for laboratory analysis as indicated in Figure 3.

Plant samples collected from Awash National Park were analyzed for their moisture, protein, ash and carbohydrate contents in laboratory. The results were given in Tables 2 and 3.

Balanites aegyptiaca fruit, *Dobera glabra* leaves, *Hyphaene thebaica* fruits, grass leaves and seeds, herb leaves, *Grewia tenax* seeds and Acacia seeds are the common diet of hamadryas baboon in Awash National Park. Thus, it is vital to check the nutrient contents of the food items because it will enable us to predict the sustainable supply of nutrients and energy to the baboons in the area.

B. aegyptiaca, Acacia species gum and *Hyphaene thebiaca* have high contents of moisture and other samples have

Table 1: Species of plants consumed by hamadryas baboons in Awash National Park specifically around Filwoha area

S. No.	Botanical name	Family name	Local name (Afar language)	Common names
1	*Acacia tortilis*	Fabaceae	Abeto/Detahara	Vachellia
2	*Acacia mellifera*	Fabaceae	Galiyekemhara	Black thorn
3	*Acacia ehrenbergiana*	Fabaceae	Adedo	Thorn acacia
4	*Acacia oerfota*	Fabaceae	Wedea	Acacia
5	*Acacia horrida*	Fabaceae	Adedo	----------
6	*Arva javanica*	Amaranthaceae	Amada	Mountain knotgrass
7	*Asparagus scaberulus*	Asparagaceae	Gerewanto	Satavar, shatamu
8	*Acacia etbaica*	Fabaceae	Gerento	----------
9	*Abutilon fruticosum*	Malvaceae	Seskto	Texas Indian mallow
10	*Acacia* sp.	Fabaceae	Sagentu	----------
11	*Acacia* sp.	Fabaceae	Abatu	----------
12	*Acacia* sp.	Fabaceae	Galiyekemhara	----------
13	*Amaranthus dubius*	Amaranthaceae	Rafu	Keerai
14	*Balanites aegytica*	Balanitaceae	Huda	thorn tree, desert date
15	*Barleria hochstetleri*	Acanthaceae	Woderetekmhara	----------
16	*Boerhavia repens*	Nyctaginaceae	Ebabul	spiderling (hog weeds)
17	*Blyttia fruticulosum*	Asclepiadaceae	Gerewanto	----------
18	*Buckollia volubilis*	Asclepiadaceae	Heda/hafenihara	Cadaba bush
19	*Cadaba farinosa*	Capparidaceae	Dua	Shrub
20	*Cadaba rotundifolia*	Capparidaceae	Adangeli	Medpharm
21	*Cassia fistula*	Fabaceae	Unknown	Golden shower tree
22	*Cladostigma dioicum*	Convolvulaceae	Olia	Radlk
23	*Crotalaria albicaulis*	Fabaceae	Ambokoso	Rattle pod/box
24	*Crossandra funibuliformis*	Acanthaceae	Ebabul	Fire craker flower
25	*Chloris virgata*	Poaceae	Serdota	Finger grass
26	*Chloris gayana*	Poaceae	Durfu	Rhodes grass
27	*Chloris roxburghiana*	Poaceae	Durfu	Horse tail grass
28	*Cyperus rotundus*	Cyperaceae	Fiaa	Java grass, coco grass
29	*Cyperus pumilus*	Cyperaceae	Derema	Mouse cursor
30	*Cyperus alopecuroides*	Cyperaceae	Lahiyekmeiyso	Umbrella plant
31	*Cynodon dactylon*	Poaceae	Kiyae	Bermuda grass
32	*Cymbopogon commutatus*	Poaceae	Esisu	Lemon grass
33	*Dactyoctenium scindicum*	Poaceae	Endoltankisi	----------
34	*Digitaria abyssinica*	Poaceae	Burlieta	African couch grass
35	*Dobera glabra*	Salvadoraceae	Fura/garsa	Karsata/Konsogna
36	*Echinochloa colona*	Poaceae	Medodulyso	Jungle rice
37	*Endostemen tereticaulia*	Laamiceae	Segahani	----------
38	*Eragrostis aspera*	Poaceae	Durueta	Blacksmith grass
39	*Eriochloa fatmensis*	Poaceae	Rarae	Grass in Australia
40	*Eragrostis cilianensis*	Poaceae	Iyso	Candy grass
41	*Felicia dentata*	Asteraceae	Mechihara	----------
42	*Grewia tenax*	Tiliaceae	Garua	Umm ageda
43	*Grewia erythraea*	Tiliaceae	Heda/haflehara	Hassaniya
44	*Grewia tembensis*	Tiliaceae	Okliheda	Whistling thorn
45	*Grewia villosa*	Tiliaceae	Heda	Ross berry
46	*Harpachne sciimprri*	Poaceae	Edoltankisi	Harare shrubs
47	*Hyphaene thebaica*	Arecaceae	Unga	Doum palm
48	*Indigofera spicata*	Fabaceae	Afelie	Creeping indigo
49	*Justicia flava*	Acanthaceae	Segahani	Yellow justicia
50	*Justicia heterocarpa*	Acanthaceae	Haback	Water willow
51	*Justicia caerulea*	Acanthaceae	Hawinhara	Blue berry lily
52	*Leucaenal leucocephala*	Fabaceae	Sesekto	White lead tree
53	*Orthosiphon pallidus*	Lamiaceae	Unknown	----------

54	*Pennisetum pedicellatum*	Poaceae	Killa	Hairy fountain grass
55	*Pennisetum setaceum*	Poaceae	Turfuiso	Purpple fountain grass
56	*Phyllanthus aeraspatensis*	Euphorbiaceae	Segahani	Caone weed, ergana
57	*Phyllanthus reticulatus*	Euporbiaceae	Balenhara	Black honey shrub
58	*Portulaca oleraceae*	Portulaceae	Legaei	Verdolaga, pig weed
59	*Pupalia lapacea*	Amaranthaceae	Murtkefa	Forest burr, Cock's comb
60	*Salvadora persicant*	Savadoraceae	Dunubiya	Toothbrush tree/mustard
61	*Solanum somalense*	Solanaceae	Ubabul	----------
62	*Sporobolus consimilis*	Poaceae	Hamelto	Same to scientific name
63	*Sporobolus nervosus*	Poaceae	Hamelto	Same to scientific name
64	*Tephrosia uniflora*	Fabaceae	Aro	Same to scientific name
65	*Tragus racemosus*	Poaceae	Durfu	Stalked burr grass
66	*Tragia sp.*	Poaceae	Esisoita	----------
67	*Tribulus terrestris*	Zygophyllaceae	Bunketa	Maltese cross
68	*Trigonellia foenum*	Fabaceae	Farasino	Fenugreek
69	*Urochloa trichopua*	Poaceae	Gedea	Signal grass
70	*Urochloa panicoides*	Poaceae	Huluhinti	Barajalgauti/kurimanna
71	*Zaleya pentandra*	Aizoaceae	Asehara	African purslane

Figure 3: The plant samples dried and temporarily stored in dried and shade place

more or less similar and it is less because Filoha area is semi-arid. Herb leaves, *B. aegyptiaca* leaves, *Acacia Senegal* seeds have contents of protein but Acacia species gum, has the lowest protein content, while other samples have more or less moderate content. Almost all samples analyzed for lipid, they have low content. *Dobera glabera* leaves have the high content of ash. But herb leaves, *B. aegyptiaca* leaves, grass leaves, *Hyphaene thebiaca* fruit have moderate ash content in compared to WHO/FAO standard. The rest of the samples have less contents of ash.

The samples were analyzed for their contents especially for their sugar contents and the results of the analysis are given in Table 3.

The *B. aegyptiaca* fruit (mesocarp) has high content of sugar and even the pericarp also has high sugar content relative to other species of plants collected and analyzed for their sugar content. But the leaves have less content of sugar. Next to *B. aegyptiaca* fruit, *H. thebaica* fruit has high content of sugar than other plant species analyzed for their sugar content. *D. glabra* leaves have the least sugar contents than other plants analyzed for their sugar content.

Table 2: Proximate analysis of the plant species consumed by hamadryas baboons

Samples	Moisture	Protein	Lipid	Ash	Carbohydrate
D. glabra leaves	7.66	17.11	0.37	20.17	54.69
	(± 0.66)	(± 0.32)	(± 0.13)	(± 0.60)	(± 2.42)
Herb leaves	6.27	22.05	1.89	11.77	58.02
	(± 0.22)	(± 0.68)	(± 0.06)	(± 0.01)	(± 1.37)
A. senegal seeds	8.38	28.87	2.71	3.44	56.6
	(± 0.13)	(± 0.74)	(± 0.02)	(± 0.11)	(± 1.41)
G.tenax	7.11	11.07	2.02	4.25	75.55
	(± 0.06)	(± 0.28)	(± 0.35)	(± 0.04)	(± 1.03)
Grass seeds	7.94	10.44	2.66	4.4	74.56
	(± 0.15)	(± 0.08)	(± 0.06)	(± 0.52)	(± 1.15)
Grass leaves	6.92	9.66	1.44	10.68	71.3
	(± 0.21)	(± 0.47)	(± 0.07)	(± 0.05)	(± 1.13)
B. aegyptiaca leaves	6.42	13.3	3.4	11.83	65.05
	(± 0.33)	(± 0.35)	(± 0.14)	(± 0.32)	(± 1.61)
A. sp. gum	13.24	2.57	0.66	3.76	79.77
	(± 0.02)	(± 0.25)	(± 0.15)	(± 0.10)	(± 0.74)
B. aegyptiaca (pericarp)	9.29	6.26	0.23	2.56	81.59
	(± 0.58)	(± 0.41)	(± 0.96)	(± 0.22)	(± 1.86)
B. aegyptiaca (mesocarp)	18.82	6.39	0.24	5.66	68.89
	(± 0.62)	(± 0.32)	(± 0.12)	(± 0.53)	(± 2.25)
H. thebaica	9.17	2.74	0.31	10.51	77.27
	(± 0.11)	(± 0.05)	(± 0.04)	(± 0.39)	(± 0.83)

Table 3: Percent of simple sugar contents of plant parts consumed by hamadryas baboons (g/100 g)

Samples	Simple sugars
H. thebaica	12.16 (± 1.02)
B. aegyptiaca fruit (mesocarp)	41.22 (± 1.93)
B. aegyptiaca fruit (pericarp)	15.93 (± 0.40)
B. aegyptiaca leaves	0.66 (± 0.07)
Grass leaves	2.79 (± 0.08)
Grass seeds	2.89 (± 0.61)
G. tenax fruit	2.34 (± 0.27)
Herb leaves	1.74 (± 0.21)
Acacia seeds	7.18 (± 3.60)
D. glabra leaves	0.37 (± 0.09)

CONCLUSION

This study which was conducted in Awash National Park revealed that hamadryas baboons entirely depend on seeds, fruits and gums of Acacia species during the dry season but during the wet season they depend on grass, herb and shrub leaves. In general these plant species are nutritionally important for the survival of the baboons in the area. However, due to human interference these plant species are under threat. These plant species have been deforested by the local communities for different purposes such as for house hold furniture, charcoal, fire fuel and the like.

Thus, conservation measure should be in place for the sustainable survival of the baboons in Awash National Park; otherwise, after few years we may not be able to see this baboon in the Park.

DECLARATION

We declare that, this research is our original work. All the sources are properly acknowledged.

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REFERENCES

[1] IBC National Biodiversity Strategy and Action Plan. *IBC*, Addis Ababa. **2005**.

[2] Wilson DE, Reeder DM. Mammal species of the world: A taxonomic and geographic reference. The Johns Hopkins University Press, Baltimore. **2005**.

[3] Vivero JL, Kelbessa E, Demissew S. The red list of endemic trees and shrubs of Ethiopia and Eritrea. Fauna and Flora International. Cambridge. **2005**.

[4] Melaku T. Wildlife in Ethiopia. Endemic large mammals. *World J Zool*, **2011,** 2: 108-116.

[5] Tamene Y, Awas T, Demissew S. Survey and documentation of the potential and actual invasive alien plant species and other biological threats to biodiversity in Awash National Park, Ethiopia. *Manag Biol Invasions*, **2011,** 2: 1-14.

[6] Zinner D, Pelaez F, Torkler F. Distribution and habitat associations of baboons (*Papio hamadryas*) in central Eritrea. *Int J Primatol*, **2001,** 22: 397-413.

[7] Awash National Park News Letter. Why Awash National Park is Ideal to Tourist Destination. Newsletter, **2010,** 3: 2-3.

[8] Awash National Park News Letter. New NGO Established to Support Kereyu Community. Newsletter, **2011,** 4: 2-3.

[9] http://ewca.gov.et/en/node/13

[10] Daniel G. Aspects of climate and water budget in Ethiopia. Addis Ababa University Press, Addis Ababa. **1977**.

[11] NMA. National Metrological Agency of Ethiopia, Addis Ababa. **2012**.

[12] Almaz T. Biomass production and nutrient status of three range grass species in Awash National Park. Ethiopia, Addis Ababa. **1997**.

[13] George WL, William H (eds). Official Methods of Analysis of AOAC, International. Gaithersburg, Maryland. **2005**.

[14] Wildman DE, Bergman TJ, Al-Aghbari A, et al. Mitochondrial evidence for the origin of hamadryas baboons. *Mol Phylogenet Evol,* **2004,** 32: 287-296.