

Nutritional value of *Grewia flavescens*: Implications for household food security in northeastern Rift Valley of Ethiopia

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Abstract

Grewia flavescens A. Juss, commonly known as donkey berry is an under-utilised wild plant species in Ethiopia. It is used for food and fodder for humans and livestock, respectively. Agricultural expansion and increased frequencies of drought are reducing areas under *G. flavescens*. A quantitative ethnobotanical study of *G. flavescens* was undertaken in six areas of east Shewa, Ethiopia. Both structured questionnaire and focus-group interviews were conducted with about 120 households to collect information to facilitate formulation of policies for conservation and optimal utilisation of this plant. Tissue analysis of this plant revealed that the species has substantial nutrients including, Fe (8.84-9.52), Zn (0.11-0.31), P (95.535-96.537), Ca (179.11-180.750), Na (7.61-8.415), K (103.8-105.5), Mg (51.53-52.535), Mn (17.812-18.235) and Cu (0.0025-0.112) mg per 100g dry matter basis. Amounts of these nutrients significantly ($P < 0.05$) varied between transhumance and settled farming land use systems. It is recommended that research and policy support be put in place to exploit the potential of this nutrient rich plant species.

Key words: East Shewa, food security, *Grewia flavescens* nutrition, wild fruit

Résumé

Grewia flavescens A. Juss, communément connu sous le nom de baie de l'âne est une espèce de plante sauvage sous-utilisée en Ethiopie. Elle est utilisée comme nourriture et fourrage pour les humains et le bétail, respectivement. L'expansion agricole et les fréquences accrues de la sécheresse réduisent les régions sous *G. flavescens*. Une étude ethnobotanique quantitative de *G. flavescens* a été entreprise dans six régions de l'Est de Shewa, en Ethiopie. A la fois le questionnaire structuré et les interviews dans les groupes de discussion ont été menés auprès

d'environ 120 ménages pour recueillir des informations afin de faciliter la formulation des politiques pour la conservation et l'utilisation optimale de cette plante. L'analyse des tissus de cette plante a révélé que l'espèce a des éléments nutritifs importants, y compris, Fe (8,84 - 9,52), Zn (0,11- 0,31), P (95,535 - 96,537), Ca (179.11 - 180.750), Na (7,61 - 8,415), K (103.8 - 105.5), mg (51.53 - 52.535), Mn (17.812 - 18.235) et Cu (0,0025 - 0,112) mg par 100g de matière sèche de base. Les quantités de ces éléments nutritifs ont varié de façon significative ($P < 0,05$) entre la transhumance et les systèmes établis d'utilisation des terres agricoles. Il est recommandé que la recherche et le soutien politique soient mis en place pour exploiter le potentiel de cette espèce de plante riche en éléments nutritifs.

Mots clés: Est de Shewa, sécurité alimentaire, nutrition de *Grewiaflavescens*, fruits sauvages

Background

Plants contribute directly and indirectly to livelihoods of human beings and animals. Although some of these plants are domesticated, majority are still in the wild. Wild foods provide diversity of nutrients in the diet of many households in semi-arid and humid tropics. They are especially important in times of food shortage and an important means of coping and adaptation to changing environment (Asfaw and Tadesse, 2001; Harris and Mohammed, 2003; Debela *et al.*, 2010). Despite the reliance in agricultural societies' on crop plants, the tradition of eating wild plants has not completely disappeared. Their nutritional role and health benefits continue to be reported worldwide (Pardo-de-Santayana *et al.*, 2007). Increased consumption of wild-foods enables people to cope better with erratic, untimely rains and drought without facing severe food shortages, famine and general asset depletion (Mathys, 2000; Saied *et al.*, 2008, Debela *et al.*, 2010). The preferred and commonly used wild edible plants are however becoming rare due to population pressure. This has been exacerbated by the increasing incidence of climate change and variability. Among diverse wild plants in semi arid east Shewa, Ethiopia, *Grewia flavscense* (donkey berry) (Family: Tiliaceae) is a widely used multipurpose shrub (Debela *et al.*, 2011). Fruits of *G. flavescens* are important as a diet supplement and in times of food scarcity in drylands. However, in spite of the potential of wild edible plants to household food security, they have not fully analysed for nutritional composition (Guindad and Lemessa, 2000, Debela *et al.*, 2011). This information could easily encourage their cultivation in conventional agriculture, and also to exploit their

multipurpose usefulness. Therefore, this study was to determine nutritional values and major food substances composition fruits and analyse the multipurpose uses of *G. flavescens* in the semi-arid part of east Shewa, Ethiopia.

Literature Summary

Wild foods provide valuable nutrients in the diet of many households (Harris and Mohammed, 2003). *Grewia flavescens* locally known as “Amurji” in Oromo language is one of the widely used wild edible plants in Ethiopia. It is especially important in times of food shortage (Guinand and Lemessa, 2001). Knowledge of wild foods varies according to localities and lifestyles of people (Balemie and Kebebew, 2006). Wild foods are getting scarce because their habitats are continuously reducing due to expansion of agricultural land and to some extent due to climate change. Thus, rural communities are deprived more and more of the nutritional benefits from these plants and also income. Therefore, there is need to institute measures to ensure continued existence of these species. This calls for among others focused analysis of nutrient composition of these species.

Study Description

The study was conducted in Fantalle and Boosat districts, in East Shewa Zone of Oromia National Regional State, Ethiopia. East Shewa (7°12'-9°14'N, 38°57'-39°32'E) is located in the northern part of the Great East African Rift Valley. A quantitative ethnobotanical study of *G. flavescens* was conducted from October 2009 to June 2010 in Boosat and Fantalle districts covering 6 semi arid sites of east Shewa, Ethiopia. Data on use and management of this plant was gathered using a semi-structured interview of 120 randomly chosen household heads, key-informants and focus group discussions. Direct field explorations by the researchers were also undertaken. Nutritional analysis of the plant was also done following standard laboratory methods (AOAC, 1990). Plants were sampled from both settled farmer fields and from transhumance land use. Data generated were qualitatively and quantitatively, and analysed using SPSS Software version 16.

Research Application

Ecological field inspection showed that *G. flavescens* was abundant in enclosed pasture and traditional agro-forestry systems in semi arid east Shewa. Field exploration, focus group discussions and key informants interviews revealed that *G. flavescens* was considered a drought tolerant fruit producing liana. Identified uses of *G. flavescens* included use of dried or fresh fruits as human food, leaves for fodder, for live fencing

and wood for fuel. The plant also bee fodder and shade and mulching material. Leaves and fruits were mostly eaten by cattle, sheep, goat, and camel. Farmers and pastoralists kept the crop as live fences and in culturally protected grooves. Fruits are eaten by poultry.

Nutritional composition and proximate composition of *G. flavescens* fruit pulp. Analysis of *G. flavescens* fruit nutrient composition and revealed that it is rich in major food substances (carbohydrates, proteins, total minerals) and also in essential nutrients (Table 1). There was a significant interactive effect ($P<0.05$) between transhumance and settled farming land uses for dry matter (DM), moisture, , crude fibre (CF), crude protein (CP) and ether extract (EE) (Table 1). Thus, land use has a significant effect on the nutritional content of *G. flavescens*.

Table 1. Proximate composition of *G.flavescens* fruit pulp growing in settled farms (SF) and in transhumance.

Interactions	DM	Moisture	Ash	CF	CP	EE	NFE	CHO	OM
Settled farms	79.25	20.74	6.06	7.73	0.76	6.58	78.87	86.61	93.94
Transhumance.	56.39	43.61	5.40	5.64	2.27	0.0000	86.69	82.33	94.60
P (0.05)	0.0025**	0.0025**	0.8493	0.0003**	0.0240*	<.0001**	0.0621	0.1755	0.8493

DM = dry matter, CF = crude fiber, CP = Crude protein, EE = ether extract (crude fat), NFE =Nitrogen free extract, CHO=Total Carbohydrate, OM=Organic matter.

The mineral contents of *G. flavescens* was also significantly affected by land use ($P<0.05$) (Table 2). Phosphorus content was high for samples collected from transhumance land use. Calcium and manganese contents on the other hand were higher for samples collected from settled farmers' land (Table 2). The food composition and nutrient content of *G. flavescens* is in most cases compared to other food sources such as *Sorghum bicolor* and *Amaranthus hybridus* (Mohammed et al. 2011). Akubugwo et al.(2008) reported that *Amaranthus hybridus* L. leaves contain Na (7.48), K (54.01), Ca (44.31), Magnesium (231.59), Fe (13.70); Zn (3.78) and P (34.94). This indicates that *G. flavescens* has a high nutritional and food value and thus a high potential to contribute to households food and nutrition security.

The results show that *G. flavescens* is an important food plant in the semi-arid areas of Ethiopia. It is rich in major food substances and minerals, providing nutrients to human beings

Table 2. Nutrient and tannin content of fruit pulp of *G. flavescens* growing in settled farms (SF) and in transhumance.

Land use	Nutrient contents (per 100 g dry basis)									
	P	Ca	Fe	Zn	Cu	Na	K	Mg	Mn	CT
Settled farms	95.535	180.75	8.487	0.1100	0.0025	7.610	103.80	52.53	18.235	913.3
Transhumance	96.537	179.11	9.520	0.3100	0.1120	8.415	105.50	51.53	17.812	910.3
LSD (5%)	0.1806	0.7824	0.1594	0.8667	0.03726	0.1816	1.589	0.662	0.0505	2.07
P	0.014	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.005	<0.001	0.008

P = Phosphorus, Ca = Calcium, Fe = Iron, Zn = Zink, Cu = Copper, Na = Sodium, K = potassium, Mg = magnesium, Mn = manganese, CT = condensed tannin.

	and livestock. The importance of this species is likely to increase, especially in light of climate change being experienced in Ethiopia and neighboring countries.
Recommendation	From the study it is recommended that appropriate policies and strategies for conservation, mass cultivation and integration of <i>G. flavescens</i> into dryland agrobiodiversity for diversification of food sources be made. Local use and management of <i>G. flavescens</i> need to be supported by scientific research.
Acknowledgement	We thank RUFORUM, The Rockefeller Foundation and IDRC, and the Association of African Universities for funding the study. We also thank local people and district management of east Shewa, Ethiopia for sharing valuable information and facilitating the field work. The University of Nairobi hosted the principal researcher while Jimma University provided administrative support. The College of Agriculture and Veterinary Medicine at the University of Nairobi availed laboratory and ICT facilities and field vehicle. We appreciate their contributions.
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