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Screening of anti-nutritional factors from some wild edible plants

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ABSTRACT

In present investigation, ten wild edible plants viz. Ensete Superbum (Roxb.) Cheesuran, Gmelina arborea Roxb, Oroxylum indicum (L.),Vent, Bauhinia recemosa Lam. Caryota urens L, Smilax zeylanica L, Woodfordia fruticosa (L.) Kurz, Commelina benghalensis L, Garcinia indica (Du Petit-Thou.) Choisy, Zanthoxylum rhetsa (Roxb.) DC were studied for their antinutrional factors. The highest level of phytate was found in Ensete Superbum (0.12 ±0.02), Oxalate was highest in Smilax zeylanica (0.11±0.17) where as tannin was highest in Bauhinia recemosa Lam. and saponin is absent in all plants. The values of antinutrients in all above studied plants are below the toxic levels of antinutrients.

Key words: Wild edible plants, antinutrients, oxalate, phytate, saponin and tannins.

INTRODUCTION

Wild edible plants are rich in several nutrients and rural people consumed frequently. However, the main problem related to the nutritional exploitation of these kinds of plants is the presence of antinutritional and toxic principles (Guil *et al*, 1997). Flower antinutritional factor that can affect the availability of nutrients required by the body.

Table 1. List of wild edible plants and their edible part

Sr. o.	Name of Plant species	Family	Vernacular Name	Edible plant part
1.	*Ensete Superbum* (Roxb.) Cheesuran	Musaceae	Ran-keli, Chaveli-keli	Flower
2.	*Gmelina arborea* Roxb	Verbenaceae	Shivan	Fruit
3.	*Oroxylum indicum* (L.) Vent,	Bignoniaceae	Tetu	Fruit
4.	*Bauhinia recemosa* Lam.	Caesalpiniaceae	Apata	Fruit
5.	*Caryota urens* L	Areceae	Ardhashishi,	Fruit
6.	*Smilax zeylanica* L	Smilacaceae	Chopchini	Leaves
7.	*Woodfordia fruticosa* (L.) Kurz	Lytharaceae	Dhayati	Flower
8.	*Commelina benghalensis* L	Commelinaceae	Kena	Leaves
9.	*Garcinia indica* (Du Petit-Thou.) Choisy	Clusiaceae	Kokam	Leaves
10.	*Zanthoxylum rhetsa* (Roxb.) DC	Rutaceae	Tirphal, Chirphal.	Fruit

The anti-nutritional factors may be defined as those substances generated in natural feed stuffs by the normal metabolism of the species and by different mechanisms (e.g., inactivation of some nutrients, diminution of the digestive process or metabolic utilization of feed) which exert effects contrary to optimum nutrition (Kumar, 1983).

Therefore this study was conducted to asses the levels of antinutritional factors of ten wild edible plants for awareness and exploitation.

MATERIALS AND METHODS

Material: Plants of *Ensete Superbum* (Roxb.) Cheesuran (flower), *Gmelina arborea* Roxb (fruit), *Oroxylum indicum* (L.) Vent (fruit), *Bauhinia recemosa* Lam. (fruit), *Caryota urens* L (fruit), *Smilax zeylanica* L (leaves), *Woodfordia fruticosa* (L.) Kurz (Flower), *Commelina benghalensis* L (leaves), *Garcinia indica* (du petit-thou) Choisy (leaves) , *Zanthoxylum rhetsa* (Roxb.) DC (fruit) were collected from various localities of Kolhapur district. Samples were washed to remove dirt and dried at room temperature. Samples were then transferred to grinding machine to make powder.

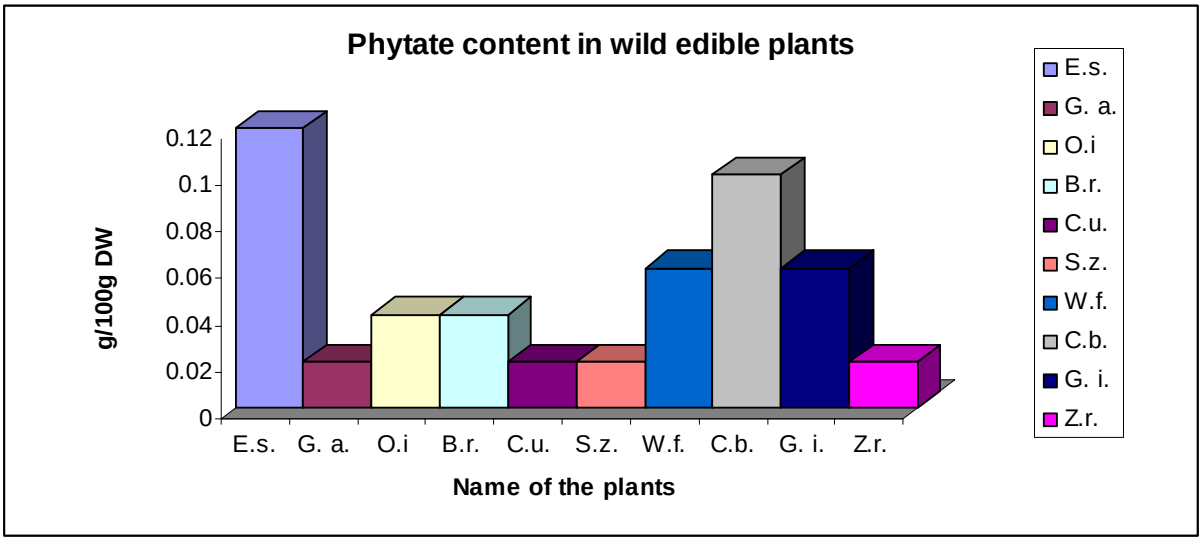
Methods: Total oxalate was determined according to Day and Underwood (1986) procedure. Phytate was determined using Reddy and Love (1999) method. Saponin was determined using the method of Birk et al. (1963) as modified by Hudson and El-Difrawi (1979). Tannin was determined using the method of Trease and Evans (1978).

RESULTS AND DISCUSSION

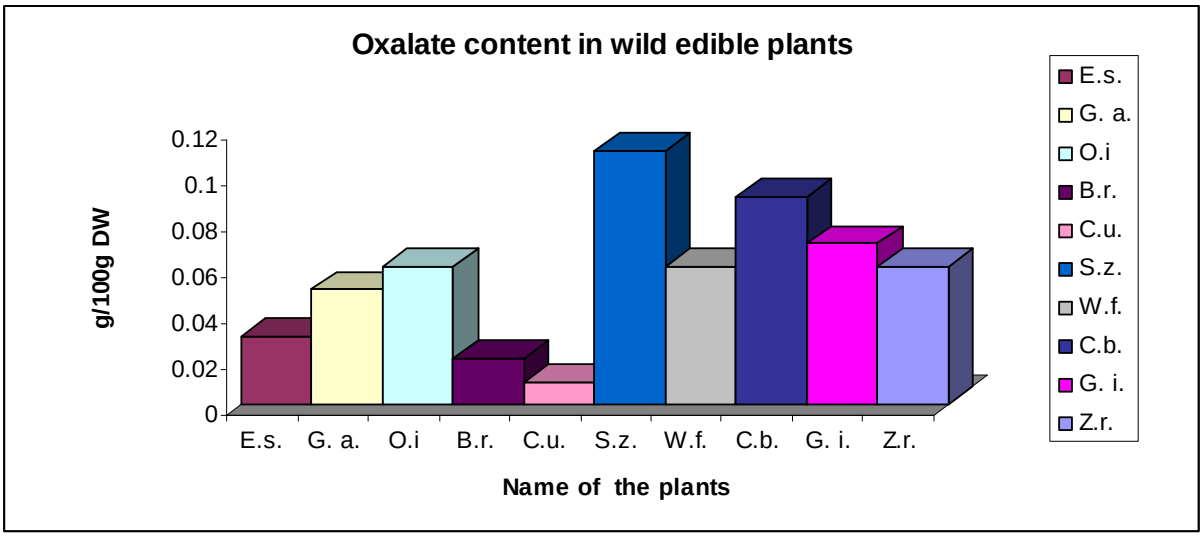
Table 2. Oxalate, Phytate, Tannin and Saponin content of some wild edible plants

Sr. No.	Name of Plant species	Edible plant part	Antinutritional factors			
			Oxalate (g/100g DW.)	Phytate (g/100g DW.)	Tannin (g/100g DW.)	Saponin (g/100g DW.)
1.	*Ensete superbum* (Roxb.) Cheesuran	Flower	0.03±0.005	0.12±0.02	0.0033±0.0002	A
2.	*Gmelina arborea* Roxb	Fruit	0.05±0.01	0.02±0.011	0.0192±0.0003	A
3.	*Oroxylum indicum* (L.) Vent,	Fruit	0.06±0.01	0.04±0.005	0.0930±0.0017	A
4.	*Bauhinia recemosa* Lam.	Fruit	0.02±0.00	0.04±0.011	0.266±0.005	A
5.	*Caryota urens* L	Fruit	0.01±0.005	0.02±0.005	0.0376±0.001	A
6.	*Smilax zeylanica* L	Leaves	0.11±0.17	0.02±0.05	0.1110±0.006	A
7.	*Woodfordia fruticosa* (L.) Kurz	Flower	0.06±0.01	0.06±0.005	0.2040±0.02	A
8.	*Commelina benghalensis* L	Leaves	0.09±0.005	0.10±0.57	0.008±0.001	A
9.	*Garcinia indica* (Du Petit-Thou.) Choisy	Leaves	0.07±0.02	0.06±0.0057	0.020±0.0057	A
10.	*Zanthoxylum rhetsa* (Roxb.) DC	Fruit	0.06±0.01	0.02±0.0057	0.002±0.0005	A

Results of the phytochemical analysis of ten wild edible plants are depicted in table 1. Phytic acid binds calcium, iron, zinc and other minerals, thereby reducing their availability in the body FAO (FAO. 1990), It also inhibits protein digestion by forming complexes with them (Wallingford, 1985). However, the phytate content can further be lowered by processing (Eriyamremu and Adamson, 1994). The knowledge of the phytate level in foods is necessary because high concentration can cause adverse effects on the digestibility. Phytate forms stable complexes with Cu^{2+}, Zn^{2+}, Co^{2+}, Mn^{2+}, Fe^{2+} and Ca^{2+}. Aberoumand (2011) carried out the screening of phytochemical and anti-nutrients compounds of eight food plants sources. The phytate content of these plants were *Alocacia indica Sch.* 312.4 mg/100g; *Asparagusofficinalis DC.* 340.8 mg/100g; *Portulaca oleracia Linn.* 823.6 mg/100g; *Momordica dioicia Roxb.* 284.2 mg/100g; *Eulophia ochreata Lindl.* 255.6 mg/100g; *Solanum indicum Linn.* 695.8 mg/100g; *Cordia myxa Roxb.* 248.0 mg/100g; *Chlorophytum comosum Linn.* 468.8 mg/100g. Aberoumond and deokule (2009) carried out the nutritional values of some wild edible plants from Iran and India. They observed phytic acid values of some plants were 323.6mg/100g (*Portulaca oleracia*); 695.8mg/100g (*Solanum indicum*) 255.6 mg/100g (*Eulophia*). In present study, phytic acid were higher in *Ensete Superbum* (Roxb.) i.e. 0.12 ± 0.02 g/100g and were lower in *Gmelina arborea* Roxb (0.01 ± 0.011 g/100g). Biochemical evaluation of *Cassipourea congoensis* and *Nuclea latifolia* was carried out by Nkafamiya *et al.* (2006). The fruits of *Cassipourea congoensis* and *Nuclea latifolia* were assessed chemically for the presence of mineral, vitamins and antinutritional factors. Phytate content in *Cassipourea congoensis* was (2.57 $\pm$ 0.41%). The effect of boiling, roasting and autoclaving on the levels of some antinutrient factors (Trypsin inhibitor, Phytic acid, and Haemagglutinin) present in the seeds of vegetable cowpea (*Sesquipedalis*) were studied by Udensi *et al.* (2007). The level of phytic acid in raw seeds is 4.25 mg/100g, in boiling seed 2.85 mg/100g, in roasted 2.05 mg/100g and in autoclaved seeds it is 3.95 mg/100g. The nutrient levels and phytate contents of leaves, fruits and stem of *Corhorus olitorius* were determined by Ndlovu and Afolayan (2008). The phytic acid level in *Corhorus olitorius* is 11.71%. These values were higher than phytic acid reported from all the plants in present study.



E.s.- Ensete superbum (Roxb.) Cheesuran., G.a- Gmelina arborea Roxb., O.i.- Oroxylum indicum (L.) Vent, B.r.- Bauhinia recemosa Lam., C.u.- Caryota urens L, S.z- Smilax zeylanica L, W.f.- Woodfordia fruticosa (L.) Kurz, C.b.- Commelina benghalensis L, G.i.- Garcinia indica (Du Petit-Thou.) Choisy, Z.i.- Zanthoxylum rhetsa (Roxb.) DC.



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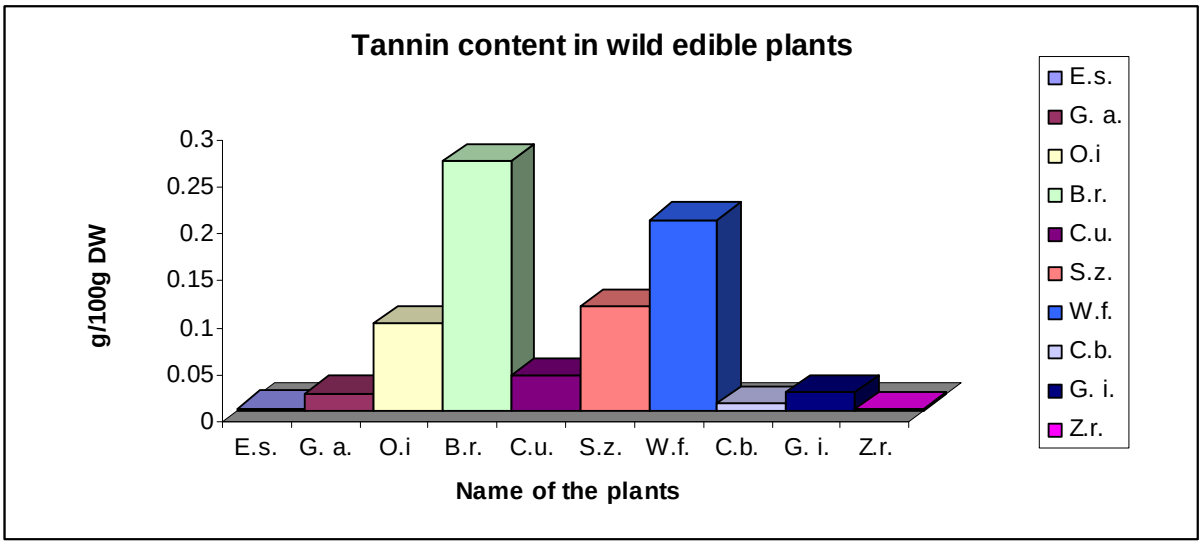
According to Savage (2002), oxalate and its contents have deleterious effects on human nutrition and health, mainly by decreasing calcium absorption and aiding the formation of kidney stones. The formation of oxalate crystal is said to take place in digestive tract (Thompson and Yoon, 1984) Nutritional and toxic factors in selected wild edible plants were carried out by Guil et al (1997) and Mohan and kalidas (2010). The seeds of the fruits of some wild plants, *Cassipourea congoensis* (Tunti), *Nuclea latifolia* (Luzzi), *Deterium microcarpum* (Tallow), *Balanites aegytiaca* (Betu), and *Gemlin arborea* (Melina) were analysed to establish their proximate compositions and the physico chemical characteristics of the oils by Nkafamiya *et al.* (2007). They have evaluated some oxalate content of some seeds. *Gemlina arborea* is one of them. They observed 9.16+0.13% oxalate in seeds of *G. arborea* and in present study 0.05+0.06g/100g in fruits. The calcium oxalate which is insoluble may causing kidney stone (Ojoyako and Igwe, 2008) also reported by Bello et al (2008). Nkafamiya et al (2010) analyzed some antinutrients include oxalate, tannin, saponin, phytate, alkaloids and hydrogen cyanide (HCN). Results showed that *Ficus asperifolia* is rich in oxalate (3.78 ± 0.28mg/100g). In present study, among ten wild edible plants, oxalate is higher in *Smilax*

zeylanica L 0.11 ± 0.17 g/100g and lower in *Caryota urens* L 0.01 ± 0.005 g/100g. The lower values were obtained in all plants in present study than reported by previous authors.

In present work saponin is totally absent in all studied wild plants. Saponins reduce the uptake of certain nutrients including glucose and cholesterol at the gut through intra-lumenal physicochemical interaction. Hence, it has been reported to have hypocholesterolemic effects (Esenwah and Ikenebomeh, 2008; Umaru *et al*. (2007). Adepaju (2009) worked on the proximate composition and micronutrient potentials of three locally available wild fruits in Nigeria, these are *Spondias mombin, Dialium guineense* and *Mordii whytii*. Highest level of of saponin (1.82 $\pm$ 0.08) were found in *M. whytii* fruits. *Citrullus colocynthis* (L.) Schrad was analysed for its chemical composition including bioactive secondary metabolites like flavonoid, saponin, alkaloid and phenolic compounds etc; dietary vitamins and transition elements. This study was carried out by Asyaz, *et al*. (2010). The results confirm the presence of 0.52mg/100g saponin. Hess et al. (2003) determined the saponin rich tropical fruits and its effect on fermentation and methanogenesis in faunated and defaunated rumen fluid. They were studied three fruit species *Sapindus saponaria, Enterolobium cyclocarpum* and *Pithecellobium saman. They observed* 120 mg/g DM saponin from *Sapindus saponaria*; 19 mg/g DM saponin from *Sapindus Enterolobium cyclocarpum*; 17 mg/g DM saponin from *Pithecellobium saman.* In present study, all plants showed absence of saponin.



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According to (Jambunathan and Singh, 1981), tannins are known to inhibit the activities of digestive enzymes and hence the presence of even a low level of tannin is not desirable from nutritional point of view. Arinathan *et al.* (2009) studied antinutritional factors such as total free phenol, tannin, and hydrogen cynide. The *Dioscorea bulbifera* var.vera is rich in tannin (2.55 ± 0.07). Aganga and Adogla Bessa (1999) evaluated tannin and crude protein degradation of mature leaves and twigs from 13 indigenous browseable trees and shrubs. They evaluated families like Capparidaceae (Boscia), Combretaceae (Combretum) and Tiliaceae (Grewia). They obtained the tannin values which were ranged from 0.26 % for *Boscia foetida* to 9.5 % for *Grewia retinervis* respectively. Ramakrishna *et al.* (2006) were carried out the anti-nutritional factors from Indian Bean (*Dolichos lablab*). They have reported 0.85±0.01 mg/100g of tannin from *Dolichos lablab* seeds. All the above wild plants contained these antinutrients. Flowers of *Woodfordia fruticosa* (L.), *Ensete Superbum* (Roxb.); fruits of *Gmelina arborea* Roxb, *Oroxylum indicum* (L.), *Bauhinia recemosa* Lam., *Caryota urens* L, *Zanthoxylum rhetsa* (Roxb.) DC and leaves of *Smilax zeylanica* L, *Commelina benghalensis* L *and Garcinia indica* contained lower amount of all the antinutrients analysed and hence they are safe for consumption.

CONCLUSION

From present investigation, we concluded that phytate, oxalate and tannin were present below the standard level of RDA and saponin was totally absent in all wild edible plants. The low values of antinutritional factors gives us idea about the suitability of plants for consumption. However consumption in large amount of plants with higher levels of antinutrients should be avoided.

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