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ANTINUTRITIONAL FACTORS OF SOME WILD EDIBLE FRUITS FROM KOLHAPUR DISTRICT

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Abstract

Total 8 wild edible fruits were studied for their antinutrional factors viz. *Ficus racemosa* L., *Elaeagnus conferta* Roxb. *Flacourtia indica* (Burm. f.) Merr., *Glycosmis pentaphylla* (Retz.) DC., *Ziziphus rugosa* Lamk., *Meyna laxiflora* Robyns., *Cordia dichotoma* Linn., *Grewia tiliifolia* Vahl. etc. The highest level of phytate were present in *Ficus racemosa*., *Glycosmis pentaphylla* shows the highest level of oxalic acid and tannin is higher in *Flacourtia indica* where as saponin is rich in *Meyna laxiflora.*

Keywords: Wild edible fruits; antinutritional factor

Introduction

The fruits are nature's gift to mankind. These wild fruits are chief source of vitamins, minerals and proteins. These constituents are essential for normal physiological well being and help in maintaining healthy state through development of resistant against pathogens (Bal, 1997). Although the wild fruits are delicious and nutritious, more consumption of such fruits are hazards to our body, so before eating it must be checked weather it contain proper amount of antinutritional factors. The antinutritional factors such as phytic acid, tannin, saponin, oxalic acid, have adverse effect on health through inhibition of protein digestion, growth, iron and zinc absorption (Liener et al 1980, Larsgon et al 1996.) Oxalic acid and its content have deleterious effects on human nutrition and health, mainly by decreasing calcium absorption and aiding the formation of kidney stones. (Savage, 2002). The formation of oxalate crystal is said to take place in digestive tract (Thompson and Yoon, 1984). Inositol hexakisphosphate (InsP6), commonly known as phytate, is major component of plant storage organs where it serves as phosphate source for germination and growth (Aberoumond, 2009). Phytic acid is an organic acid found in plant materials (Heldt, 1997). Phytate bind minerals in the gastrointestinal tract, making dietary minerals unavailable for absorption and utilization by the body (Oberleas, 1983). It decreases calcium bioavailability and form calcium phytate complexes that inhibit the absorption of Fe, Zn (Plaami, 1997). Tannins forms complexes with proteins and reduce their digestibility and palability (Eka, 1985).

Saponin is a group of substances that occur in plants and can produce soapy lather with water (Arnold, 1960). Saponin are naturally occurring oily glycosides occurring in wide variety of plants when eaten, they are dangerous when injected into the blood stream and quickly haemolyse red blood carpuscals (Applebaum et al,1969).

So this study, aims to analyze such type of antinutritional factors from edible food.

Materials and Methods

Fruits of *Ficus racemosa* L., *Elaeagnus conferta* Roxb., *Flacourtia indica* (Burm. f.)Merr., *Glycosmis pentaphylla* (Retz.) DC., *Ziziphus rugosa* Lamk., Meyna *laxiflora* Robyns., *Cordia dichotoma* Linn., *Grewia tiliifolia* Vahl. etc were collected from various localities of Kolhapur district. Samples were washed to remove dirt and dried at room temperature. Samples were then transeferd to grinding machine to make powder

Analysis of samples

Total oxalate was determined according to Day and Underwood (1986) procedure. To 1 g of the ground powder, 75 ml of 15 N H_2SO_4 was added. The solution was carefully stirred intermittently with a magnetic stirrer for 1 h and filtered using Whatman No 1 filter paper. 25 ml of the filtrate was then collected and titrated against 0.1 N KMnO4 solutions till a faint pink colour appeared that persisted for 30 second.

Phytate was determined using Reddy and Love (1999) method. 4 g of the ground sample was soaked in 100 ml of 2% HCl for 5 h and filtered. To 25 ml of the filtered, 5 ml 0.3% ammonium thiocyanate solution was added. The mixture was then titrated with Iron (III) chloride solution until a brownish-yellow color that persisted for 5 min was obtained.

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Saponin was determined using the method of Birk et al. (1963) as modified by Hudson and El-Difrawi (1979). 20 ml of 20% aqueous ethanol was added to 10 g of the ground sample and agitated with a magnetic stirrer for 12 h at 55°C. The solution was then filtered using Whatman No.1 filter paper and the residue reextracted with 200 ml 20% aqueous ethanol. The extract was reduced to 40 ml under vacuum and 20 ml diethyl ether added in a separating funnel and shaken vigorously. The aqueous layer was recovered and ether layer discarded. The pH of the aqueous solution was adjusted to 4.5 by adding NaOH, and the solution shaken with 60 ml n-butanol. The combined butanol extracts were washed twice with 10 ml of 5% aqueous NaCl and evaporated to dryness in a fume cupboard to give a crude saponin which was weighed.

Tannin was determined using the method of Trease and Evans (1978). 1 ml of the methanolic extract was treated with 5 ml Folin Dennis reagent in a basic medium and allowed to stand for colour development. The absorbance of the reaction mixture of each sample was measured at 760 nm spectrophotometrically.

Results and Discussion

Table 1 Oxalate, pyhtate, tannin and saponin content of some wild edible fruits

Name of the fruit	Oxalate	Phytate	Tannin	Saponin
Grewia tiliifolia	1.01	0.62	1.636	A
	±0.255	±0.091	±0.0472	
Cordia dichotoma	2.133	0.2	1.386	A
	±0.2081	±0.1	±0.0152	
Ziziphus rugosa	2.5	0.39	1.8434	31.7
	±0.3605	±0.0889	±0.0321	±0.6082
Ficus racemosa	1.166	0.7	1.456	A
	±0.1527	±0.2	±0.0351	
Meyna laxiflora	0.8667	0.2667	1.06	53.366
	±0.1527	±0.0577	±0.0529	±0.472
Flacourtia indica	0.7934	0.3534	1.956	A
	±0.132	±0.04163	±0.030	
Elaeagnus conferta	0.934	0.3134	1.456	A
	±0.115	±0.030	±0.0416	
Glycosmis pentaphylla	1.64	0.566	1.916	38.566
	±0.052	±0.0577	±0.030	±0.351

Glycosmis pentaphylla shows the highest level of oxalic acid. *Flacourtia indica* rich in tannin. The highest level of phytate were present in *Ficus racemosa*, where as saponin is rich in *Meyna laxiflora*.

Jin et al. (1999), worked on the nutritional analysis of 52 species of fruits, from southern Yunnan. *Elaeagnus conferta* and *Flacourtia indica* are two of them. The soluble tannin in *Elaeagnus conferta* is (0.43) and in present study it is (1.456 +0.0416), *Flacourtia indica* is (0.26) and in present study it is (1.956+0.030). The values in present study are higher than previous author, but the all over values of soluble tannin is higher in *Pouteria grandifolia* (2.44) than present study.

The fruits of *Cassipourea congoensis* and *Nuclea latifolia* fruits were assessed for their mineral, vitamins and antinutritional factors by, Nkafamiya et.al (2006). Among these fruits the *Cassipourea congoensis* fruit was rich in oxalate (11.40+1.50), phytate(2.57+0.41) and saponin (8.16+0.21). Tannin content is high in *Nuclea latifolia* (4.62+0.14) fruit. Except saponin all values, obtained in present study are less than previous author.

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). *Cassipourea congoensis* seeds were rich in oxalate (10.21±1.11), tannin (2.84±0.12) and saponin (7.17±0.18). Whereas Balanites *aegytiaca* is rich in phytate (2.18±0.14). Except saponin, all values are higher in previous authors result than present study.

Umaru et al. (2007) studied the 16 wild edible fruits for their antinutritional factors. Phytate was

highest in *Sclerocarya birrea* (3.56±0.54%) and *Haematostaphis barteri* (3.30±0.10% which is more than values obtained in present study (0.7 + 0.2 in *Ficus racemosa*). *B. aegyptiaca, Detarium microcarpum* and *Parkia biglobosa* had the highest saponin values of 16.01±0.02, 12.10±0.05 and 12.23±0.46% respectively, but it is less than values obtained in present study (53.366 + 0.472, *Meyna laxiflora.*), Tannin was highest in *B. aegyptiaca* (7.40±0.14%), closely followed by *Hyphaena thebaica* (6.39±0.5%) and *Borassus aethiopum* (5.90±0.13%), in present study tannin is rich in *Flacourtia indica*(1.956+ 0.030). While the highest level of oxalate was found in *Zizyphus spinachristi*, *Zizyphus mauritiana* and *Balanite aegyptiaca* (16.20±2.12%, 15.50±1.50% and 14.50±2.08%, respectively) which is higher than present study, (1.64+0.052, *Glycosmis pentaphylla*).

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, in boiling seed 2.85, in roasted 2.05 and in autoclaved seeds it is 3.95. The obtained values of phytic acid in all stages are higher than values in present study (0.7+0.2).

Ojoyako and Igwe (2008) worked on the nutritive, antinutritive, and hepatoxic properties of *Trichosanthes anguina* (snake tomato) fruits from Nigeria. They analysed oxalate (0.58+0.12), phytate (o.11+0.02) and tannin (0.02+0.05), from tomato fruit. These results are some what related to values obtained in present study viz. oxalic acid (1.64+0.052), phytic acid (0.7+0.2), and tannin (1.956+0.030).

The nutrient levels and phytate contents of leaves, fruits and stem of *Corhorus olitorius* were determined by Ndlovu and Afolayan in 2008 and the results were compaired with those of cabbage nad spinach. The phytic acid level in *C. olitorius* is 11.71, in cabbage 6.52 and in spinach 14.64. Among these 3 vegetables, spinach contains the highest phytate level and these values are higher than values of phytic acid in present study (0.7+ 0.2).

Aberoumand (2009) studied the balance between the nutrient and antinutrients in some plant food, in which *cordia dichotoma* is one of them. He analysed the phytic acid conent in this fruit that is 248mg/100g, this value is higher than the value calculated in the present study (0.2+ 0.1).

Osabor et al. (2009) worked on the profile of afican bread fruit (*Treculia africana*), they studied the antnutritional factors like oxalate and phytic acid, the values obtained are (3.01+0.11) and (0.76+0.01) respectively. In present study, *Glycosmis pentaphylla* is rich in oxalic acid (1.64+0.052) and *Ficus racemosa* is rich in phytic acid (0.7+0.2). The values obtained by Osabar et.al are higher than the present study.

Llelaboye and pikuda (2009) determine the mineral and antinutritional factors of some lesser known crop seeds. Among these seeds the highest level of tannin (25.30 mg/100g) and saponin (2097mg/100g) was found in *Trichosanthe cucumerina* seeds whereas *Citrillues vulgaris* seeds were rich in oxalic (40.65mg/100g) and phytic acid (20.12mg/100g). The obtained values of antinutritional factors in present study, viz oxalic acid (1.64+0.052), phytic acid (0.7+0.2), saponin (53.366+ 0.472) and tannin (1.956+0.030) are less than values obtained by Llelaboye and pikuda (2009).

Five food grains (groundnut, millet, wheat, guinea corn and breadfruit) commonly consumed in Nigeria were evaluated for their phytochemical contents by Odoemelam, and Osu (2009). Some of the antinutritional factor studied by them is saponin (0.08±0.02), Phytic acid (0.20±0.0) and Tannin (0.61±0.02) respectively, these values are lesser than values obtained in the present study. Saponin (53.366+ 0.472), phytic acid (0.7+0.2) and tannin (1.956+0.030).

Bello et al. (2008) studied the chemical compositions and antinutrients of some lesser known Nigerian fruits, viz. *Cola millenii*, *Strychnos innocua*, *Bombax glabra, Artocarpus heterophyllus, Parkia biglobosa and Gardenia erubescens.* The highest level of tannin is present in *Cola millenii* mesocarp is 1.33 ± 0.06 , phytic acid in Strychnos innocua seed (6.65 ± 0.60), oxalic acid *in Strychnos innocua* juice (1.17 ± 0.10) All these values are lesser than the present studied values [tannin (1.956+0.030), phytic acid (0.7+0.2) and oxalic acid (1.64+0.052)].

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 Phytate (1.64+0.04) and saponin (1.82+0.08) were found in *M. whytii* fruits while oxalate (1.88+0.06) and tannin (2.41+0.02) found to be rich in *S. mombin* fruits. The values of saponin (53.366+0.472) in present study are higher and phytic acid (0.7+0.2) are lower than previous author while other two values i.e. oxalate (1.64+0.052), and tannin (1.956+0.030) are some what related to previous author.

Sabahelkhier et al. (2010) studied the effect of maturity stage on the protein fractionation, in vitro protein digestibility and antinutrition factors, tannin and phytic respectively, which are higher than tannin content of studied fruits (1.956+0.030). The results reveal the high tannin content reduces the digestibility of the protein because tannin acts as antienzymatic activity. In addition, tannin reacts with protein to form insoluble complex compound. The phytic acid of 105, 90 and 75 days maturity are 0.40, 0.20 and 0.15 mg/g,

respectively. This result is similar to the present work. Phytic acid interacts with protein forming complex compound and reduces the bioavailability of protein and inhibits the action of pepsin, trypsin and amylase. These results explain the lowering of protein digestibility in the pineapple fruit.

The wild edible tubers, rhizome, corm, roots and stems were consumed by the tribal Valaiyans of Madurai district, Western Ghats. This study was conducted by Mohan and kalidas (2010). From fourteen wild tubers they analysed the antinutritional factors like tannin and oxalic acid. The studied tubers are *Aponogeton natans* (L.) Engler & k, *Cissus vitiginea* L., *Cycas circinalis* L., *Cyphostemma setosum* (Roxb) Alston, *Decalepis hamiltonii* Wight & Arn., *Dioscorea pentaphylla* L. var. *pentaphylla*, *Dioscorea oppositifolia* L. var. *oppositifolia, Dioscorea spicata* Roth., *Dioscorea tomentosa* Koen. Ex. Spreng., *Kedrostis foetidissima* (Jacq.) Cogn, *Maerua oblongifolia* (Forsk.) A. Rich, *Momordica diocia* Roxb ex Willd, *Nymphaea pubescens* Willd *Nymphaea rubra* Roxb ex Andrews *Parthenocissus neilgherriensis* (Wight) Planch. From all these tubers, *Dioscorea pentaphylla* L. var. *pentaphylla*, contains the highest tannin level(0.44+0.06) and *Cycas circinalis* L., contain the highest oxalate level (0.78+0.08) these obtained values of antinutritional factors are somewhat related to the values of wild edible fruits, Tannin [(1.956+0.030), and oxalic acid (1.64+0.052)].

The wild edible tubers of *Asparagus racemosus,Curculigo orchioides, Dioscorea bulbifera* var. *vera*, *Dioscorea oppositifolia* var. *dukhumensis*. *D.oppositifolia* var. *oppositifolia*, *D. pentaphylla* var.*pentaphylla, D. tomentosa* and *Dolichos trilobus* were analyzed for proximate and mineral and certain anti-nutritional factors. This study was carried out by Arinathan et al.. (2009). The antinutritional factors such as total free phenol, tannin, and hydrogen cynide. The *Dioscorea bulbifera* var.*vera* is rich in tannin. 2.55±0.07. These results are somewhat related to present study.

The leguminous seeds (*Mucuna ghana*, *Mucuna preta* and *Mucuna veracruz* mottle) were assessed by Amoo et al. (2009), for their proximate functional and physicochemical properties. Among all these three seeds the *Mucuna preta* seeds were rich in oxalate (8.31±0.03), Phytic acid 85.47±0.62, and tannin 10.30±1.15. The results obtained in present study were lesser than the previous author. [oxalic acid (1.64+0.052) phytic acid(0.7+0.2), and tannin(1.956+0.030)]. *Ficus asperifolia* and *Ficus sycomorus* leaves were assessed to determine proximate nutrient content, mineral and amino acid composition and antinutritional factors. This study is carried out by Nkafamiya et al. (2010). The antinutrients analyzed include oxalate, tannin, saponin, phytate, alkaloids and hydrogen cyanide (HCN). Their results shows that *Ficus asperifolia* is rich in oxalate (3.78 ± 0.28), tannin 5.60 ± 0.10), saponin (2.67 ± 0.28) and Phytate (2.01 ± 0.12). All values of antinutritional factors are higher than present study, except saponin.

From the above references it was observed that this study is necessary to evaluate their antinutritional factors, which was harmful to the human health.

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