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SCREENING OF PHYTOCHEMICAL AND ANTI-NUTRIENTS COMPOUNDS OF EIGHT FOOD PLANTS SOURCES

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Abstract

Background: Plants are an essential component of the universe. Human beings have used those as medicine from the very beginning of time. Compounds or substances which act to reduce nutrient intake, digestion, absorption and utilization and may produce other adverse effects are referred to as anti-nutrients or anti-nutritional factors. Plant sources contain in their raw state wide varieties of anti-nutrients which are potentially toxic.
Objective: This study was conducted to phytochemical investigation on fruits and plants from India and Iran.
Methods: The plant species are: Alocacia indica ,Asparagus officinalis,Chlorophytum comosum, Cordia Myxa, Eulophia Ochreata, Momordica dioicia, Portulaca oleracia and Solanum indicum were used. A qualitative phytochemical analysis was performed for the presence of polyphenols, saponins, alkaloids,phytic acid, trypsin inhibitor and saponins**.**
Results: The results obtained of the investigated plants showed that the all 8 samples were found to be polyphenols but Portulaca contains highest value(5.86mg/g). All samples showed the presence of alkaloids, All samples except Alocacia and Asparagus showed presence of saponins. All samples except Chlorophytum and Asparagus presence of steroids. Portulaca with(16.9 TIU/g) and Asparagus with(0.8 TIU/g) contain highest and lowest values of trypsin inhibitor respectively. The phytochemical screening revealed moderate phytate contents except Solanum and Portulaca. The level or concentration of these anti-nutrients in plant protein sources vary with the species of plant, cultivar and post-harvest processing treatments. The plants are rich sources of polyphenols appear to have protective effects for human health.

Keywords: Phytochemical screening, Saponins, Steroids, Alkaloids, Anti-nutrients.

Introduction

All edible plants in this study, occurs in the southern part of Iran and India. It is seems this plant contains high contents of anti-nutrients and phytochemicals. Antinutrients or anti-nutritional factors may be defined as those substances generated in natural feedstuffs by the normal metabolism of species and by different mechanisms (for example inactivation of some nutrients, diminution of the digestive process or metabolic utilization of feed) which exerts effect contrary to optimum nutrition. Being an anti-nutritional factor is not an intrinsic characteristic of a compound but depends upon the digestive process of the ingesting animal. Trypsin inhibitors, which are anti-nutritional factors for monogastric animals, do not exert adverse effects in ruminants because they are degraded in the rumen (Abulude, F.O. 2007). Many plant components have potential to precipitate adverse effects on the productivity of farm livestock. These compounds are present in the foliage and seeds of virtually every plant that is used in practical feeding (Alobo, A.P. 2003).

Plants are an essential component of the universe. Human beings have used plants as medicine from the very beginning of time. After various observations and experimentations medicinal plants were identified as a source of important medicine, therefore, treatment through these medicinal plants, began in the early stages of human civilization. In Islam diseases are cured in two ways, first the cure of soul through

prayers and second the cure of ailments through medicines (Apori, S.O. *et al.* 2000;Basu, S.K., *et al.* 2007). Several phytochemical surveys have been published, including the random sampling approach which involved some plant accessions collected from all parts of the world. The major chemical substances of interest in these surveys have been the flavonoids and tannins, however, other diverse groups of naturally occurring phytochemicals such as alkaloids and saponins have also been reported. The natural active compounds classes or secondary metabolites as alkaloids, flavonoids, saponins, tannins and others have attracted researchers to investigate their chemical, toxicological and pharmacological features. The alkaloids represent a group of natural products that has had a major impact throughout history on the economic, medical, political and social affairs of humans. They are a diverse group of low molecular weight nitrogen-containing compounds derived mostly from amino acids (Bressani, R. and Sosa, J.L. 1990). These secondary metabolites are found in about 20 % of plant species and they classified as true alkaloids, A wide range of biological activities of alkaloids have been reported: emetic, anti-cholinergic, antitumor, diuretic, sympathomimetic, antiviral, antihypertensive, hypnoanalgesic, antidepressant, miorelaxant, antitussigen, antimicrobial and anti-inflammatory. However, the alkaloids and other natural compounds have complex activities and it is necessary to analyze pharmacological activities in the general tissues, linking the structure with the activity presented. It is common to find pharmacological results where a single experimental model generalizes a biological answer, but these can't be accepted because all the pathologies in question are also complex and it is necessary to investigate specific experimental models (Chaney, S.G. 2006). Aim of this study was procedures used in preparing the test extracts and the results obtained from the phytochemical screening of 8 Plants obtained from Iran and India.

Materials and Methods

Collection of Plant Samples

Five wild edible plants were also collected from India viz *Asparagus officinalis*, *Chlorophytum comosum, Codia myxa, Portulaca oleracia and Solanum indicum* were collected from Iran in October 2006 and April 2007. Remain plants viz *Eulophia Ochreata, Momordica dioicia* and *Alocacia indica* were purchased from were collected from various localities of Maharashtra (India). Efforts made to collect these plants in flowering and fruiting conditions for the correct botanical identification. Healthy and disease free edible plant part/s selected each variety of fruit and vegetables were collected for phytochemical screening.

Samples preparation

Fresh plants were cleaned with water and external moisture wiped out with a dry cloth. The edible portion of the individual fruits was separated, dried in a hot air oven at 50°C for 1 hr. The dried samples were then powdered in blander for further study. Some of the plants dried under shade so as to prevent the decomposition of chemical compounds present in them.

Determination of the Phytochemical Composition

The other portion was oven-dried, to a constant weight and ground into powders, which was then packed into dark polythene bags and stored in a desiccator for subsequent uses in the phytocmemical analysis.The phytochemical screening of the sample was carried out as described by Sofowora and Harbone (Harbone, J.B. 1973). The sample was screened for alkaloids, polyphenols, phytates, steroids and saponins.

Determination of Trypsin inhibitor

According to AOCS 2005, used solutions contain sodium hydroxide, trypsin, acetic acid and BAPA, by method colorimetric in absorption at 410 nm.

Determination of Phytic acid

Phytate was determined by the methods of Early and DeTurk (1944) by method colorimetric in absorption at 420 nm. used solution contain a solution containing 1.2% HC1 and 10% Na2S04,0.6% HCl containing 5% Na2SO4, 3ml of nitic acid.

Table 1. Species, habitat and consumption of plants in Iran and India

Botanical name	Family	part(s) used	Habitat	Typical consumption
Alocacia indica Sch.	Araceae	Stem	Roadside weed	During famine
Asparagus officinalis DC	Liliaceae	Stem	Garden	Regularly
Chlorophytum comosum Linn.	Liliaceae	Root Tubers	Garden	During famine
Cordia myxa Roxb.	Boraginaceae	Fruits	Disturbed	Regularly
Eulophia ocherata Lindl.	Orchidaceae	Tubers	Disturbed	Regularly
Momordica dioica Roxb.	Cucurbitaceae	Fruits	Disturbed	Regularly
Portulaca oleracia Linn.	Portulacaceae	Stem and leaves	Garden	Regularly
Solanum indicum Linn.	Solanaceae	Fruits	Disturbed	Regularly

Table 2. Phytochemical constituents of plants species obtained from Iran and India

Species	Persian/Indian names	English name	[a]Phe. (mg/g)	[b]Alk.	[c]Sap.	[d]Phy. (mg/100g)	[e]Try. In.(TIU/g)	[f]Ste.
Alocacia indica Sch.	Mankanda	Polly Dwarf	0.87	-	+3	312.4	7.9	-
Asparagus officinalis DC.	Marchubeh	asparagus root	3.17	-	+4	340.8	**0.8**	+4
Portulaca oleracia Linn.	Parpin	Moss Rose	**5.86**	-	-	823.6	**16.9**	-
Momordica dioicia Roxb.	Kaksa	Wild Balsam apple	3.69	-	-	284.2	9.3	-
Eulophia ochreata Lindl.	Salab panja	Wild coco	2.43	-	-	255.6	3.1	-
Solanum indicum Linn.	Angirak	egg plant	7.02	-	-	695.8	10.6	-
Cordia myxa Roxb.	Sepestan	Large sebesten	4.02	-	-	248.0	1.39	-
Chlorophytum comosum Linn.	Segafi	spider plant	1.36	-	-	468.8	4.7	+4

Values are Means ± SD of triplicate determinations

[a]Phe.=Total phenols, [b]Alk.= Alkaloids, [c]Sap.= Saponins, [d]Phy.= Phytic acid, [e]Try.= Trypsin inhibitors. [f]Ste.=Steroids

Results and Discussion

The phytochemical screening revealed that *Chlorophytum comosum* root tubers is very rich in steroids, and phytates (Table 2). All these have potential health promoting effects, at least under some circumstances (Dillard, C.J. and German, J.B. 2000). Also same table shows some of the anti-nutrients present in *Chlorophytum comosum* root tubers. We found low polyphenols content in this plant. It is lower than those reported by Apori *et al.* (Apori, S.O. *et al.* (2000).

Chlorophytum comosum has moderate phytate content. It is lower than those reported by (Elegbede, J.A. 1998). 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, UK, *et al.* 1985). However, the phytate content can further be lowered by processing (Eriyamremu, G.E. and Adamson, I. 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}+. 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, C.N. and Ikenebomeh, M.J. 2008).and thus they may aid in lessening the metabolic burden that would have been placed on the liver.

Protease inhibitors are widely distributed within the plant kingdom, including the seeds of most cultivated legumes. Protease inhibitors have the ability to inhibit the activity of proteolytic enzymes within the gastrointestinal tract of animals (FAO/WHO/UNU.1991). Trypsin inhibitor and chymotrypsin inhibitor are protease inhibitors occurring in raw legume seeds. Protease inhibitors are the most commonly encountered class of anti-nutritional factors of plant origin. These inhibitor shave been reported to be partly responsible for the growth-retarding property of raw legumes. The retardation has been attributed to inhibition of protein digestion but there is evidence that pancreatic hyper-activity, resulting in increased production of trypsin and chymotrypsin with consequent loss of cystine and methionine is also involved (Fasidi, I.A. and Olorunmaiye, K.S. 1994). Trypsin inhibitors have been implicated in reducing protein digestibility and in pancreatic hypertrophy (Nwokolo, E.N. and Bragg, B.B. 1977). Trypsin inhibitors are polypeptides that form well characterized stable complexes with trypsin on a one-to-one molar ratio, obstructing the enzymatic action . Protease inhibitors are inactivated by heat especially moist heat, because of even distribution of heat (Marounck, M., *et al.* (2001).

The values of bioactive substances present in *Portulaca oleracea* such as polyphenols were closely related to those earlier reported by Abulude (Abulude, F.O. 2007).on plants such as *mangifera indica, Techtona garandis* and *Cola nitida.* It has been reported that the presence of bioactive substances in plants play a role in preventing colorectal carcinoma, hyperchloestrolcamia and renal calculi (Oguntona, T. (1998). It is documented the absent of saponins is negative point because it control human cardiovascular disease and reduce cholesterol. Poly phenols have been shown to have antibacterial, anti-inflammatory, antiallergic, antiviral and antineoplastic activity (Ojiako, O.A. and Igwe, C.U. 2008).

Conclusion

In conclusion, our results show that presence of antinutrients in plant protein sources for livestock feeding is a major constraint that reduces their full utilization. To be able to justify the overall nutritional potential or value of any plant protein source, proper assessment of the type, nature and concentration of the antinutrients present in the protein source and also the bioavailability of nutrients to the ingesting animal is necessary.

The *Eulophia ochreata* and *Cordia myxa* plants present the lowest values of total phytic acid and *Cordia myxa* and *Asparagus officinalis* have very low concentrations of trypsin inhibitor. Even if all plants have a safe concentration of total phytic acid and trypsin inhibitor, the gap between storage and the processing could imply passage of time and the amount of these compounds could increase. In conclusion, the edible plants studied could be divided into two groups, each suitable for different technological processes.

1st Group: *Alocacia indica* and *Eulophia ochreata* and *Chlorophytum comosum*

They often have high values of trypsin inhibitor; for these reasons, it is better to employ them in low temperature processes such as minimally processed foods and stir-fry foods, because they have high concentrations of trypsin inhibitor that could increase during the storage period.

2nd Group: *Asparagus officinalis*, *Cordia myxa*, *Solanum indicum*

These cultivars should not be used in high temperature processes and should be cooked without the peel. We suggest their use for domestic purposes and home cooking.

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