Research article

Phytochemical analysis of some medicinal plants

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Abstract: The chemical compounds that formed in plants during normal metabolic process are termed as phytochemicals. The composition of phytochemicals is usually complex in nature and differs among stages of development and plant origin. Phytochemicals used higher plants as warehouse for them which are useful in pharmaceutical industry. Some useful medicinal properties are associated with different parts of plants that result from interaction of secondary metabolic products. The aim of this study was to determine the presence of different phytochemicals in 04 different medicinal plants including Smilax china, Tribulus terristris, Glycyrrhiza glabra and Curcuma amada. This study was conducted in Karachi for determination of phytochemical activity of said plants by using plant extracts. Results showed that saponins were only absent in Curcuma amada while in all the other 3 they were present. Reducing sugar was only present in Smilax china and Glycyrrhiza glabra and tannins were in Smilax china, Tribulus terristris and Glycyrrhiza glabra. Anthocyanins were only positive in Glycyrrhiza glabra. It was concluded that Glycyrrhiza glabra had all 04 targeted phytochemicals (i.e. saponin, reducing sugar, tannins and anthocyanins) while Tribulus terrestris had only saponins and tannins in it. Only saponin, reducing sugar and tannins were present in Smilax china and none of the targeted phytochemical was present in the extract of Curcuma amada.

Keywords: Phytochemical properties, medicinal plants, Smilax china, Tribulus terristris, Glycyrrhiz aglabra, Curcuma amada

Introduction

Phytochemicals are the compounds that are formed in plants during normal metabolic process. The composition of phytochemicals is usually complex in nature and differs among stages of development and plant origin. There are varieties of functions of plants that are associated with these secondary metabolic products, some of them include medicinal effects[1]. The concept of development of semi synthetic and synthetic analogues of plant compound for medicinal use was brought in 20th century[2]. These analogues associated with the maximal therapeutic effects as a result phytochemicals attracted increasing research focus for therapeutic care and food industries[3].

In identifying the sources of industrially and therapeutically important compounds, the screening of phytochemicals in dietary plants is very important[4]. For identification of secondary metabolites in plants, it is imperative to take some crucial steps[5]. There are various types of phytochemicals that found in different types of plants. Each of these has its own unique property and function too. These functions include nutritional benefits, physiological functions, phytotoxicity, Anti-nutritional property, Pro-oxidants, Anti-oxidants, Anti-carcinogenic, Analgesic, Anti-inflammatory properties & other therapeutic effects[9]. Phytochemicals are commercially used in Rotenone, nicotine and pyrethrins and pesticides. Tannins contain astringent activity and antimicrobial agents (isquinones) such as hypericin[11].

Phytochemicals should be evaluated from different extracts of plants. There is a significant method for extraction of phytochemicals, also some traditional extracting procedures are present and there are certain novel extraction methods. As maceration, Soxhlet and percolation methods are mostly used in screening of phytochemical studies. They also include some forward procedures like microwave assisted (MAE), ultrasound-assisted extraction (UAE), accelerated solvent extraction and supercritical fluid extraction (SFE)[14].

The study was aimed to evaluate presence of targeted phytochemicals i.e. saponins, carbohydrates, tannins and anthocynins in some medicinal plants i.e. Smilax china, Glycyrrhiza glabra, Curcuma amada and Tribulus terristris. As we all know, phytochemicals have many significant therapeutic effects, so the evaluation of the presence of these therapeutic effects in targeted plants is the core purpose of this study.

Materials and Methods

This analysis was conducted in the city Karachi for the determination of phytochemical activity of some medicinal plants. From the given plants, extracts were taken, and following test were performed for the indication of their presence. For extraction, we took 04 medicinal plants i.e. Glycyrrhiza glabra, Smilax china, Curcuma amada and Tribulus terrestris. These plants were bought from local market and extracts were prepared in an aqueous environment. Reagents/ chemicals and solutions used in the tests include NaOH solution, Methyl orange (indicator), Fehling's solution A and B & Ferric chloride and aqueous water.

METHODS:

TEST FOR SAPONIN: Took 1 ml of aqueous extract, dissolved in distilled water in test tubes, following by shaking the solution vigorously. Observed for the froth which indicate presence of saponins in the extract.

TEST FOR CARBOHYDRATES:

For reducing sugars:
At the first step 2ml of the extract was taken, added 1 ml of water followed by 20 drops of Fehling's solution A + Fehling 'solution B in test tube. Presences of brick red color indicated presence of reducing sugar in the given extracts.

TEST FOR TANNINS
1 ml of extract was taken then added 1 ml of distilled water followed by addition of 2 -3 drops of ferric chloride in diluted form. The change of color from green to blue green was observed. If green to blue green color change appears, it indicates presence of cathechic tannins, while if blue black color appear this indicates that Gallic tannins are present.

TEST FOR ANTHOCYANINS
NaOH 50 ml was taken in a burette, then took a beaker containing few ml of aqueous solution of the extract and titered it, the color change was then observed. If the color changes to red color, it indicates

the pH is less than 3, if the color changes to blue color, this indicates the pH is between 4 and 6.

Results

Phytochemical screening of the given plants showed that saponins were only absent in Curcuma amada while in all the other 03 they were present. Reducing sugar was only present in Smilax china and Glycyrrhiza glabra while the tannins were in Smilax china, Tribulus terristris and Glycyrrhiza glabra. The results of Anthocyanins are were only positive in Glycyrrhiz aglabra.

Table 1: Phytochemical analysis in Plant extracts

S. No.	Phytochemicals	Smilax china	Tribulus terristris	Glycyrrhiza glabra	Curcuma amada
1	Saponins	+	+	+	-
2	Reducing sugar	+	-	+	-
3	Tannins	+	+	+	-
4	Anthocyanins	-	-	+	-

DISCUSSION:

Phytochemicals have a number of significant therapeutic effects like Allyl sulfides, Carotenoids, Flavonoids and polyphenols have anti- oxidant activity and reduces the risk of cancer. These are mainly found in onions, lleks, garlic, fruits and vegetables. Similarly Indoles, protease inhibitors and terpenes stimulate the enzymes and reduce the risk of breast cancer by making estrogen less effective. Some phytochemicals that found in soy and cranberry have hormonal actions and physicals actions too like isoflavones and proanthocyanindins respectively. They reduce osteoporosis and menopausal symptoms by working same as estrogen and having anti-adhesion property too. Phytochemicals like saponins and capsaicin interfere with DNA replication and have anti carcinogenic property while Alicin have anti- bacterial effects. All they are found in beans hot peppers and garlic respectively.

In order to identify the sources of industrially and therapeutically important compounds, the screening of phytochemicals in dietary plants is very important. For identification of secondary metabolites in plants, it is imperative to take some crucial steps29.

In our daily life we eat nutrients that contain phytochemicals, but there are some refined foods like liquor or sugar. Few dietary nourishment for example vegetables, fruits, bean, whole grains and herb contain numerous phytochemicals. There are a number of methods for extraction of phytochemicals some of them are traditional extracting procedures in addition to a number of novel extraction methods. As maceration, Soxhlet and percolation methods are mostly used in screening of phytochemicals studies. They also include some forward procedures like microwave assisted (MAE), ultrasound-assisted extraction (UAE), accelerated solvent extraction and supercritical fluid extraction (SFE)30.

In this study we mainly focused on 04 phytochemicals including Saponin that are glucosides with foaming property. Saponins are phytochemicals found in beans, herb and plants and having anti-cancerous effects.

The next are reducing sugars, they have activity of reducing agent as they have free aldehyde group or a free ketone group. Along with monosaccharides there are reducing sugar with some disaccharides, oligosaccharides and polysaccharides. They are involved in reproduction, help to boost immune system, blood clotting and development of disease. They are energy transporters. Tannins are also called tannoids and tannic acid. They are amorphous substance having the color of pale yellow to light brow. Physically they are in the form of powders, spongy volume. They are nayurally present in the plants. They are widely used in many purpose including dyeing of cloths and fabrics, making of ink, it has great importance in medicinal application. The last ones are anthocyanins, they are extracted by many edible plants and have anti- cancer, anti- diabetic, anti- inflammatory, anti-obesity and anti- microbial effects. They are used for the prevention of cardiovascular disease as well 31.

CONCLUSION:

It is concluded that the Glycyrrhiza glabra had all 04 targeted phytochemicals (i.e. saponin, reducing sugar, tannins and anthocyanins) while Tribulus terrestris had only saponins and tannins in it. Only saponin, reducing sugar and tannins were present in Smilax china and none of the targeted phytochemical was present in the extract of Curcuma amada.

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REFERENCES:

1. *Molyneux, R. J., Lee, S. T., Gardner, D. R., Panter, K. E., & James, L. F. (2007). Phytochemicals: the good, the bad and the ugly?. Phytochemistry, 68(22-24), 2973-2985.*
2. *Webster, F. X. (1994). Phytochemical Dictionary: A Handbook of Bioactive Compounds from Plants, Jeffrey B. Harborne and Herbert Baxter, editors. JOURNAL OF CHEMICAL ECOLOGY, 20, 815-815.*
3. *Higdon, J., & Victoria, J. D. (2007). Riboflavin. Micronutrient Information Center, Linus Pauling Institute, Oregon State University. Afr. J. Pharm. Pharmacol, 2, 29-36.*
4. *Sharma, P. (2018). Preliminary phytochemical screening of Ankola seed. Pharma. Innovation J, 7(6).*
5. *Higdon, J., & Victoria, J. D. (2007). Riboflavin. Micronutrient Information Center, Linus Pauling Institute, Oregon State University. Afr. J. Pharm. Pharmacol, 2, 29-36.*
6. *Higdon, J., & Victoria, J. D. (2007). Riboflavin. Micronutrient Information Center, Linus Pauling Institute, Oregon State University. Afr. J. Pharm. Pharmacol, 2, 29-36.*
7. *Kitani, Y., Zhu, S., Omote, T., Tanaka, K., Batkhuu, J., Sanchir, C., ... & Komatsu, K. (2009). Molecular analysis and chemical evaluation of Ephedra plants in Mongolia. Biological and pharmaceutical bulletin, 32(7), 1235-1243.*
8. *Yang, R. Y., & Keding, G. B. (2009). Nutritional contributions of important African indigenous vegetables. African indigenous vegetables in urban agriculture. Earthscan, London, 105-143.*
9. *Ganzera, M., Lanser, C., & Stuppner, H. (2005). Simultaneous determination of Ephedra sinica and Citrus aurantium var. amara alkaloids by ion-pair chromatography. Talanta, 66(4), 889-894.*
10. *Shibamoto, T., & Bjeldanes, L. F. (2009). Introduction to food toxicology.*
11. *White, L. M., Gardner, S. F., Gurley, B. J., Marx, M. A., Wang, P. L., & Estes, M. (1997). Pharmacokinetics andcardiovascular effects of ma-huang (Ephedra sinica) in normotensive adults. The Journal of Clinical Pharmacology, 37(2), 116-122.*
12. *Shaw, D. (2010). Toxicological risks of Chinese herbs. Planta medica, 76(17), 2012-2018.*

13. *Smith, A. (2000). Oxford Dictionary of Biochemistry and Molecular Biology: Revised Edition. Oxford University Press.*
14. *Halliwell, B. (2007). Dietary polyphenols: good, bad, or indifferent for your health?. Cardiovascular research, 73(2), 341-347.*
15. *Samani, N. B., Jokar, A., Soveid, M., Heydari, M., & Mosavat, S. H. (2016). Efficacy of the hydroalcoholic extract of Tribulus terrestris on the serum glucose and lipid profile of women with diabetes mellitus: A double-blind randomized placebo-controlled clinical trial. Journal of evidence-based complementary & alternative medicine, 21(4), NP91-NP97.*
16. *Higdon, J., & Victoria, J. D. (2007). Riboflavin. Micronutrient Information Center, Linus Pauling Institute, Oregon State University. Afr. J. Pharm. Pharmacol, 2, 29-36.*
17. *Stevens, J. (2003). The Ephedra story. Application Note, 215, 1-6.*
18. *Freitag, H., & Maier-Stolte, M. (1989). The Ephedra-species of P. Forsskål: identity and typification. Taxon, 38(4), 545-556.*
19. *Parsaeimehr, A., Sargsyan, E., & Javidnia, K. (2010). A comparative study of the antibacterial, antifungal and antioxidant activity and total content of phenolic compounds of cell cultures and wild plants of three endemic species of Ephedra. Molecules, 15(3), 1668-1678.*
20. *Bagheri-Gavkosh, S., Bigdeli, M., Shams-Ghahfarokhi, M., & Razzaghi-Abyaneh, M. (2009). Inhibitory effects of Ephedra major host on Aspergillus parasiticus growth and aflatoxin production. Mycopathologia, 168(5), 249.*
21. *Roopashree, T. S., Dang, R., Rani, S. R. H., & Narendra, C. (2008). Antibacterial activity of antipsoriatic herbs: Cassia tora, Momordica charantia and Calendula officinalis. International Journal of Applied research in Natural products, 1(3), 20-28.*
22. *Kitani, Y., Zhu, S., Omote, T., Tanaka, K., Batkhuu, J., Sanchir, C., ... & Komatsu, K. (2009). Molecular analysis and chemical evaluation of Ephedra plants in Mongolia. Biological and pharmaceutical bulletin, 32(7), 1235-1243.*
23. *SAGARA, K., OSHIMA, T., & MISAKI, T. (1983). A simultaneous determination of norephedrine, pseudoephedrine, ephedrine and methylephedrine in Ephedrae Herba and oriental pharmaceutical preparations by ion-pair high-performance liquid chromatography. Chemical and pharmaceutical bulletin, 31(7), 2359-2365.*
24. *Liu, Y. M., Sheu, S. J., Chiou, S. H., Chang, H. C., & Chen, Y. P. (1993). A comparative study of commercial samples of Ephedrae herba. Planta medica, 59(04), 376-378.*
25. *Schneeman, B. O. (2015). Qualified Health Claims: Letter Regarding Tomatoes and Prostate Cancer (Lycopene Health Claim Coalition)(Docket No. 2004Q-0201). US Food and Drug Administration.*
26. *Smith-Warner, S. A., Spiegelman, D., Yaun, S. S., Albanes, D., Beeson, W. L., Van Den Brandt, P. A., ... & Hunter, D. J. (2003). Fruits, vegetables and lung cancer: a pooled analysis of cohort studies. International journal of cancer, 107(6), 1001-1011.*
27. *Sansalone, S., Leonardi, R., Antonini, G., Vitarelli, A., Vespasiani, G., Basic, D., ... & Russo, G. I. (2014). Alga Ecklonia bicyclis, Tribulus terrestris, and glucosamine oligosaccharide improve erectile function, sexual quality of life, and ejaculation function in patients with moderate mild-moderate erectile dysfunction: a prospective, randomized,*
28. *placebo-controlled, single-blinded study. BioMed research international, 2014.*
29. *Adaikan, P. G., Gauthaman, K., Prasad, R. N., & Ng, S. C. (2000). Proerectile pharmacological effects of Tribulus terrestris extract on the rabbit corpus cavernosum. Annals of the Academy of Medicine, Singapore, 29(1), 22-26.*
30. *Sansalone, S., Russo, G. I., Mondaini, N., Cantiello, F., Antonini, G., & Cai, T. (2016). A combination of tryptophan, Satureja montana, Tribulus terrestris, Phyllanthus emblica extracts is able to improve sexual quality of life in patient with premature ejaculation. Archivio Italiano di Urologia e Andrologia, 88(3), 171-176.*
31. *Sellandi, T. M., Thakar, A. B., & Baghel, M. S. (2012). Clinical study of Tribulus terrestris Linn. in Oligozoospermia: A double blind study. Ayu, 33(3), 356.*
32. *Sengupta, G., Hazra, A., Kundu, A., & Ghosh, A. (2011). Comparison of Murraya koenigii–and Tribulus*

terrestris–based oral formulation versus tamsulosin in the treatment of benign prostatic hyperplasia in men aged> 50 years: a double-blind, double-dummy, randomized controlled trial. Clinical therapeutics, 33(12), 1943-1952