



RESEARCH ARTICLE

BIOCHEMISTRY

EVALUATION OF PHYTOCHEMICAL CONSTITUENTS OF THE ROOTS OF LICORICE , INDIAN GINSENG , INDIAN MADDER AND INDIAN SARSAPARILLA

S.REKHA AND A. PARVATHI*

Department of Botany, Holy Cross College (Autonomous), Tiruchirappalli – 620 002, Tamil Nadu, India.



A. PARVATHI

Department of Botany, Holy Cross College (Autonomous), Tiruchirappalli – 620 002,
Tamil Nadu, India.

ABSTRACT

Ethanollic extracts of the dried roots of *Glycyrrhiza glabra* L. (Licorice), *Withania somnifera* (L.) Dunal (Indian Ginseng) , *Rubia cordifolia* L. (Indian Madder) and *Hemidesmus indicus* (L.) R.Br. (Indian sarsaparilla) were analysed for their phytochemical constituents. The qualitative analysis showed the presence of various phytochemicals like alkaloids, cardiac glycosides, flavonoids, HCN, indoles, juglones, phenols, saponins, steroids, tannins and terpenoids. Further, Some of these phytochemicals were also quantitatively estimated. The paper deals with the significance of these roots in traditional medical systems with respect to their phytochemicals.

KEYWORDS

Phytochemical analysis, traditional medical system.

INTRODUCTION

Since origin of human's life, plants continued to play a curative and therapeutic role in preserving human health against diseases. The wide spread use of herbal remedies in health care preparation has been described in ancient texts like vedas and the Bible. India being a subtropical country is a good repository of plants that are widely used in the preparation of herbal medicines. In India plants have been traditionally used for human and veterinary health care^{1,2,3}. The roots of the present study are immensely valuable in traditional medicine of Chinese herbal medicine, Tibetan medicine and Ayurvedic medicine.

***Glycyrrhiza glabra* L.**

Commonly known as licorice. It belongs to the family Fabaceae. It is a herbaceous, perennial and native to southern Europe and parts of Asia. The roots are sweet, refrigerant, tonic and mild laxative. The compound Glycyrrhizic acid found in liquorice, is now routinely used throughout Japan for the treatment and control of chronic viral hepatitis. It can also be used for autoimmune conditions including lupus, scleroderma, rheumatoid arthritis and animal dander allergies⁴. Licorice is useful in conventional and naturopathic medicine for both mouth ulcers and peptic ulcers^{5,6}. They are useful to treat cough, bronchitis, ulceration of urinary tract and anaemia. Glycyrrhizin, a triterpenoid compound, accounts for the sweet taste of *Glycyrrhiza glabra* root⁷.

***Withania somnifera*[L.] Dunal**

Commonly known as Indian ginseng. It belongs to the family Solanaceae. It is a shrub and cultivated in many of the drier regions of India. It is traditionally used to treat the conditions such as chronic fatigue, dehydration, bone weakness,

muscle weakness, constipation, rheumatism, memory loss, nervous exhaustion, neurodegenerative disorders and spermatorrhoea^{8,9,10,11}. In addition, there are registered clinical trials in progress to determine *Withania somnifera* as useful for treating tuberculosis, bone cancer, bipolar disorder, and diabetes¹².

***Rubia cordifolia* L.**

Commonly known as Indian Madder. It belongs to the family Rubiaceae. It is a perennial, herbaceous, climbing plant. They are common throughout India. The roots are used to cure urinary disorders and skin diseases¹³. It is also used as antiinflammatory¹⁴, haemostatic¹⁵, antidiarrhetic and antipyretic. It is also used in the cure of leucoderma, urinary discharges, jaundice and piles¹⁶.

***Hemidesmus indicus* (L.) R.Br.**

Commonly known as Indian sarsaparilla. It belongs to the family Asclepiadaceae. It is a perennial climber and growing widely in upper Gangetic plains and Eastwards of Bengal and from Central to South India. The roots and woody portion has been used traditionally for curing various ailments like stomach pain, fever, venereal diseases, rheumatism and also act as blood purifier¹⁷. It serves as an alterative tonic, demulcent, diaphoretic and traditionally been used to treat venereal diseases, skin diseases and urinary infections¹⁸.

Hence, the present study is taken up to screen the phytochemicals of the roots of four selected traditionally used medicinal plants.

MATERIALS AND METHODS

The material for the present study were collected in and around Tiruchirappalli,

Tamil Nadu. The roots were cleaned and shade dried. The powdered roots were extracted with 80% ethanol. The extracts were filtered using whatmann filter paper.

Preliminary phytochemical tests of ethanol extracts of each root was carried out for alkaloids, cardiac glycosides, flavonoids, HCN, indoles, juglones, phenols, saponins, steroids, tannins and terpenoids^{19,21}. The crude alkaloids, flavonoids, phenols, saponins and tannins were quantified²⁰.

RESULTS AND DISCUSSION

The results of the study were presented in table- I and II. The results of the study clearly indicated that all the roots contained alkaloids, flavonoids, phenols, steroids and tannins. HCN, indoles were uniformly absent in all the roots investigated. Where as, the presence of Cardiacglycosides and juglones was observed only in *Rubia cordifolia*. The presence of saponins was observed only in *Withania somnifera*.

The roots were quantified for the metabolites such as alkaloids, flavonoids, phenols, saponins and tannins . The alkaloid content in the root of *Glycyrrhiza glabra* was found to be highest ($0.75 \pm 0.40 \mu\text{g} / \text{g}$) followed by *Rubia cordifolia* ($0.65 \pm 0.30 \mu\text{g} / \text{g}$). where as, *Hemidesmus indicus* and *Withania somnifera* showed the approximately same amount ($0.55 \pm 0.20 \mu\text{g} / \text{g}$ and $0.57 \pm 0.20 \mu\text{g} / \text{g}$) of alkaloids.

The roots of *Withania somnifera* contained highest amount of the flavonoids ($4.39 \pm 0.42 \mu\text{g} / \text{g}$) followed by *Rubia cordifolia* ($1.86 \pm 0.07 \mu\text{g} / \text{g}$). where as, *Hemidesmus indicus* and *Glycyrrhiza glabra* showed the approximately same amount ($0.98 \pm 0.09 \mu\text{g} / \text{g}$) of flavonoids. The total phenol content ranged between $0.15 \pm 0.32 \mu\text{g} / \text{g}$ (*Hemidesmus indicus*) to $0.20 \pm 0.36 \mu\text{g} / \text{g}$. (*Glycyrrhiza glabra*)

The highest amount of Saponins is registered in the roots of *Withania somnifera* ($5.26 \pm 1.18 \mu\text{g} / \text{g}$) followed by *Hemidesmus indicus* ($3.01 \pm 0.19 \mu\text{g} / \text{g}$).

The range of tannin content varied from $6.63 \pm 0.19 \mu\text{g} / \text{g}$ (*Hemidesmus indicus*) to $0.52 \pm 0.07 \mu\text{g} / \text{g}$ (*Rubia cordifolia*).

Table – I
Qualitative estimation of phytochemical constituents

Sl. no	Name of the plant	alkaloid	Cardiac glycosides	flavonoids	HCN	indoles	juglones	phenols	saponins	steroids	tannins	triterpenoids
1	<i>Glycyrrhiza glabra</i>	+++	-	+	-	-	-	++	-	+	+++	-
2	<i>Hemidesmus indicus</i>	+	-	+	-	-	-	++	-	+++	+++	+++
3	<i>Rubia cordifolia</i>	+	+++	++	-	-	+++	++	-	+++	+	++
4	<i>Withania somnifera</i>	++	-	+++	-	-	-	++	+++	+++	+++	+++

+= present ; ++ =strongly present ; +++ = very strongly present ; - = absent

Table -II
Quantitative estimation of phytochemical constituents

Sl. No	Name of the plant	Alkaloids	Flavonoids	Tannins	Saponins	Total phenols
1	<i>Glycyrrhiza glabra</i>	0.75±0.40 µg / g	0.98±0.09 µg / g	6.60± 0.17 µg / g	-	0.20±0.30 µg / g
2	<i>Hemidesmus indicus</i>	0.55±0.20 µg / g	0.98±0.09 µg / g	6.63±0.19 µg / g	3.01±0.19 µg / g	0.15±0.32 µg / g
3	<i>Rubia cordifolia</i>	0.65± 0.30 µg / g	1.86± 0.07 µg / g	0.52± 0.07 µg / g	-	0.17 ± 0.29 µg / g
4	<i>Withania somnifera</i>	0.55± 0.20 µg / g	4.39±0.42 µg / g	6.62 ± 0.18 µg / g	52.60±1.18 µg / g	0.16 ±0.37 µg / g

The results are the mean of triplicate estimation ± standard error

CONCLUSION

phytochemical analysis of the four roots revealed the presence of significant phytochemicals such as alkaloids, flavonoids, indoles, phenols, steroids and tannins that are therapeutically important. All the roots responded negatively to the HCN test indicating the non-cyanophoric nature of roots. Alkaloids and flavonoids are the potential phytochemicals which boost the immune system and are of anti-inflammatory in nature and particularly useful in maintenance of healthy circulations. The presence of tannins indicates the astringent potential of the roots that protect internal organs of body. Cardiac glycosides supports and

strengthens the function of the heart. Steroids and Saponins are used in hormonal activity; whereas, triterpenoids are used as strong expectorants. The present study emphasizes the need for intensive research for the development of phytochemicals that play greater role in healthcare.

ACKNOWLEDGEMENTS

The authors are grateful to UGC ,New Delhi for providing financial assistance through Major Research project and authorities of Holy Cross College (Autonomous) , Tiruchirappalli for facilities.

REFERENCES

1. Kalia AN. Text book of industrial pharmacognosy.pp3-4, (2005).
2. Nair RT. Kalariya J and ChandaS. Antibacterial activity of some selected Indian medicinal flora. *Tuky J.biol.*29 : pp41-47 ,(2004).
3. Stiffness M and Douros J. Current status of the NLC plants and animals product programme. *J.Nat.Prod.*45: pp1-45. (1982).
4. Winston ,David; Steven Maimes. Adaptogens. Herbs for strength, stamina and stress relief. (2007).
5. Das SK. Das V. Gulati AK and Singh VP. Deglycyrrhizinated liguorice in aphthous ulcers. *The journal of the associat ion of physicians of India.*37(10).647,(198).
6. Krause R. Bielenberg J. Blaschek W and Ullmann U. Invitro anti-Helicobacter pylori activity of extractum liquiritiae, glycyrrhizin and its metabolites. *The journal of antimicrobial chemotherapy.*54(1) : 243-264, (2004).
7. Chopra RN. Nayar SL and Chopra IC. Glossary of Indian medicinal plants. NISCIR, CSIR. (2002).
8. Mirjalili MH. Moyano E. Bonfill M. Cusido RM and Palazon J. Steroidal lactones from *Withania somnifera*, an ancient plant for novel medicine. *Molecules* 14(7):2373-2393,(2009).
9. Murthy MRV. Ranjekar PK. Ramassamy C and Deshpande M. Scientific basis for the use of Indian ayurvedic medicinal plants in the treatment of neurodegenerative disorder:Central Nervous system Agents in medicinal chemistry.10(3) : pp.238-246, (2010).
10. Scartezzini P and Speroni E. Review on some plants of Indian traditional medicine with antioxidant activity. *Journal of Ethnopharmacology.*71(1-2): pp23-43,(2000).
11. Shoeb Ahmad Abdul Hannan Rahman SZ and Shemawasi. Role of *withania somnifera* in the management of abnormal nocturnal emission. *Unimed kulliyat.* Vol 2(1):45-49, (2006).
12. World Health Organization International clinical Registry program. 2008.
13. JoshanRani S. Nagarauk R and Anuradha P. Antibacterial properties of extracts of



- Indian medicinal plants. *Biomedical and pharmacology journal* 3(1):123-128,(2010).
14. Antarkar DS. Bhatt M. Chinwalla T and Vaidya AB. *International journal of pharmaceutical science* . 15 : 185 , (1984).
 15. Kosuge T. Ochi A. Yokota M and Yoshida M. *Med.and aro. Plant abs.*4:169, (1982).
 16. Sivarajan VV and Balachandran I. *Ayurvedic Drugs and their plant sources* . oxford and IBH publishing co. (1994).
 17. Treas and Evans . *Text book of pharmacognosy* . 15: 471,(1989).
 18. Jain A and Basal E. Inhibition of propionibacterium acnes –induced mediators of Inflammation by Indian Herbs. *Phytomedicine* 10: pp:34-38, (2003).
 19. Gibbs RD. *Comparative chemistry and phylogeny of flowering plant. Tans Roy. Soc. canser.* 48, (1954).
 20. Harborne JB. *Phytochemical methods*, London,Chapman and Hall Ltd.Pp.49-188,(1973).
 21. Harborne JB. *Phytochemical methods. A guide to modern techniques of plant analysis.* Chapman and Hall, London. (1984).