IJPPR
INTERNATIONAL JOURNAL OF PHARMACY & PHARMACEUTICAL RESEARCH
An official Publication of Human Journals
ISSN 2349-7203
HUMAN

Human Journals
Research Article
May 2017 Vol.:9, Issue:2

Spectroscopical Study of Chemical Composition of Traditional Medicinal Herb: *Centella asiatica*

IJPPR
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ISSN 2349-7203
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Vaishali N.Agme[1], Dr S.S.Makone*

**Depth of Applied Science, BV College of Engineering, Navi Mumbai, Maharashtra, India*

[1]*Dept. of Swami Ramanand Teerth Marathwada University, Nanded, Maharashtra, India*

Submission: 7 May 2017
Accepted: 12 May 2017
Published: 25 May 2017

Keywords: bioactive constituents, drugs, IR, NMR, alternative medicines.

ABSTRACT

Centella asiatica is one of the most recommended spiritual herbs from the ancient time. IR and NMR Spectroscopical analysis of herb *Centella asiatica* reveals the presence of certain bioactive constituents and functional groups which actually the common origin of many recommended drugs for the treatment of Alzheimer's disease, Psoriasis, Skin Disorders and many more, but the drugs recommended for the treatment of these diseases are having very common adverse effects like vomiting, itching, nausea, kidney or liver dysfunction. Hence, the current approach is the possible alternative solution for the existing synthetic drugs and can provide the solution for the alternative medicines produced from the methanolic extract of *Centella asiatica* with better efficacy.

INTRODUCTION

All over the world, Chinese and Indian medicine is found using directly the medicinal herbs since from the ancient times. Many of the food crops show the presence of medicinally achieve ingredients and the many of the existing medicines are also known to synthesize indirectly from the medicinal plant origin but it is not a common practice. The study of medicinal herbs not only provide the alternative solution for the drugs which are having few adverse effects on the body but also it helps to realize the plant efficacy, toxicity to the human beings as well as animals where these are safe to consume or are poisonous. So the preservation of these traditional medicinal herbs also helps to protect the biological diversity of the nation.

Centella asiatica is reported as the traditional medicinal plants since from the ancient time and is having rich historical background all over the different parts regions of the world. It is very popular medicinal herb used for the treatment of various diseases like Alzheimer's disease, Psoriasis, Diabetes, Skin abnormalities and so many. So the work is carried out to study the exact mechanism action behind the medicinal properties of herb and to provide the basic scientific logic behind the medicinal properties of *Centella asiatica* and also to provide the scientific logic behind its important position as a reputed medicinal herb in the historical period. Many of the Pharmacologists have the great contribution in the development of pharmaceutically active ingredients in the medicinal herb. It is any kind of weed found in many countries like India, Srilanka and particularly applicable for the wound healing purposes[1]. *Centella Asiatic* is the herb known to possess various therapeutic properties like the cardiotonic, nervine tonic, and antiseptic, diuretic also to treat the various skin diseases, to improve longevity and memory[2]. It's biological and pharmacological effects attribute it in the major category of medicinal plants to favor the human health[3].

It is also recommended somewhere for its no toxicity and for its rare side effects, allergies and low potential for the irritation of skin[4]. The Endemic Abundance of *Centella asiatica* (L) contributes to its worldwide consumption and availability and its derived natural components possess low or null toxicity[5]. It is also found in various herbal based creams, gel, ointment because of its wound healing capacity and when it is applied on wounds, it is known to increase the cellular proliferation and synthesis of collagen on the site of wound[6]. It is known for its

wound healing potential so studies show that the collagenase-containing creams, ointments are capable of the wound healing and the extract combined with the collagenase can be the better alternative for the wound healing property[7]. Its extracts are also the rich source of anti-oxidants which protects the cells against the different damaging effects of reactive oxygen species[8].

MATERIALS AND METHODS

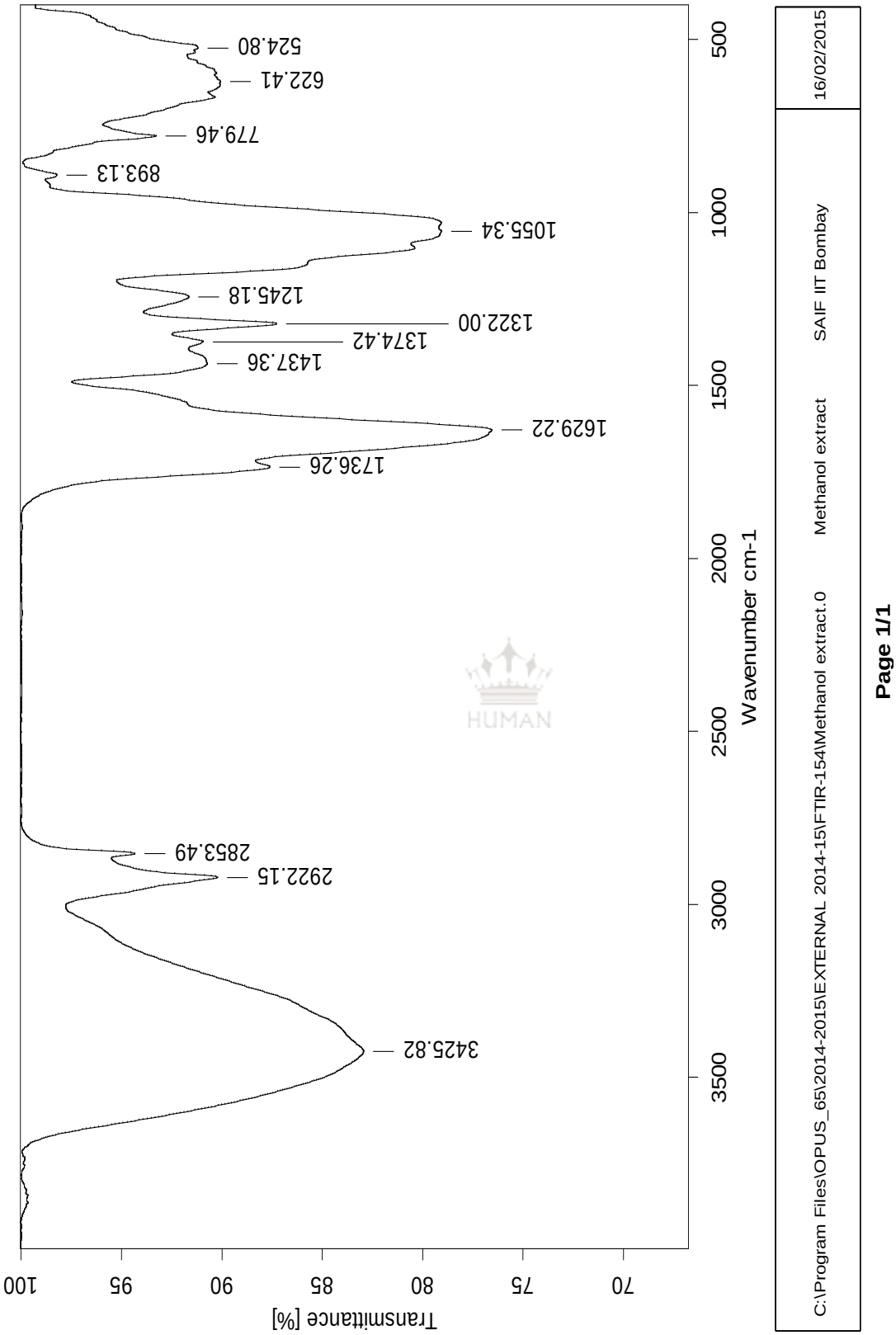
First of all, the site of sampling was selected Go Green Nursery Farm (Tara), Karnataka, Bombay-Goa Highway, The fresh plant's materials were washed under running tap water and then with distilled water. The leaves sample were then separated with the scissor and allowed for air drying, then homogenized to the fine powder and stored in air tight bottles. Thus fine powder was later dissolved in 25gm of 100ml of methanol. The solution was left to stand at room temperature for 24 hours and then was filtered with Whatman filter paper no.1. Then the filtrate was sent to SAIF, IIT-Bombay for IR and NMR analysis.

Since from the last couple of decay scientists are finding their tremendous interests in IR Spectroscopy in many industries like Pharmacy, Medicines, Textile and much more[9].So the IR spectroscopy technique was carried to assess the presence of biologically active functional groups in the components of C.A, IR is also known as vibrational spectroscopy, so it was used to analyze the sample because it is the most reliable way to identify and study the chemicals for given sample through solid, liquid or gas. It clearly shows the interaction of Infra-red radiation with the methanolic extract of C.A and also helps to understand that how light interacts with the compounds/elements of matter.

Then, the sample was sent for the NMR analysis which actually helps to study the magnetic properties of few nuclei of the atoms present in the compounds found in an extract. It also helps to find out the physical and chemical properties of molecules of the components. It helps for the elucidation of structures of molecules due to their chemical shift, Zeeman effects or sometimes the combination of both. The 1H NMR method is unique and helpful technique for the assay of general drug binding properties.

Table 1: IR Interpretation of Methanolic Extract of CA

Sr. No.	Absorption observed (cm^{-1})	Assignment	Absorption expected(cm^{-1})
1	3425.82	-OH in alcohol & Phenols	-OH stretch
2	2922.15	$-CH_3$ & CH_2 in aliphatic compounds	2990-2850 –CH antisym and sym stretching
3	2853.49	Aldehyde –C-H	2900-2800
4	1736.26	>C=0	1600-1900
5	1629.22	>C=0(Amide)	1680-1630
6	1437.36	-C=C	1400-1600
7	1374.42	-S=0	1375-1300
8	1322.00	-C-N	1350-1000
9	1245.18	-F	1400-1000
10	1055.34	Aryl / Vinyl ether -o-	1300-1000
11	893.13	Aromatic -C-H (out of plane bend)	900-690
12	779.46	-Cl	785-540
13	622.41	-Br/-I	<667


Transmittance [%]
100
95
90
85
80
75
70
Wavenumber cm-1
3500
3000
2500
2000
1500
1000
500
3425.82
2922.15
2853.49
1736.26
1629.22
1437.36
1374.42
1322.00
1245.18
1055.34
893.13
779.46
622.41
524.80
C:\Program Files\OPUS_65\2014-2015\EXTERNAL 2014-15\FTIR-154\Methanol extract.0
Methanol extract
SAIF IIT Bombay
16/02/2015
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Then, the sample was sent for the NMR analysis which actually helps to study the magnetic properties of few nuclei of the atoms present in the compounds found in an extract. It also helps to find out the physical and chemical properties of molecules of the components. It helps for the elucidation of structures of molecules due to their chemical shift, Zeeman effects or sometimes the combination of both. The 1H NMR method is unique and helpful technique for the assay of general drug binding properties[10]. The NMR Spectrum was studied and the chemical shifts (∂) are expressed in parts per million (ppm) as ∂ values and coupling constant (J) in Hertz (HZ).

RESULTS AND DISCUSSION

The study of *Centella asiatica* shows that the herb is full of medicinally active constituents. When the IR results were compared with few existing drugs like Rivastigmine commonly employed for the treatment of mental disorder, so many of the common functional groups were observed in the methanolic extract of the herb like. –OH in alcohol / phenols at 3425.82 cm^{-1} , aliphatic-CH_3 at 2922.1 cm^{-1} , aldehydic –CH at 2853.49 cm^{-1} , >C=0 group at 1736.26 cm^{-1} , -C=0(Amide) at 1629.22 cm^{-1} , -C=C at 1437.36 cm^{-1},-S=0 at 1374.2 cm^{-1},-C-N at 1322 cm^{-1}, -F at 1245.18 cm^{-1}, Aryl ether at 1055.34 cm^{-1}, and Cl at 779.4 cm^{-1},etc where Rivastigmine shows the presence of similar functional groups like 3384.25 cm^{-1} , aliphatic-CH_3 at 2900 cm^{-1}, >C=0 group at 1654.03 cm^{-1} , -C=0(Amide) at 1736.26 cm^{-1} , -C=C at 1424.49 cm^{-1}, -C-N at 1340.58 cm^{-1}, -F at 1260.54 cm^{-1}, Aryl ether at 1071.54 cm^{-1}, and Cl at 899.83 cm^{-1}. Following are the possibilities of protons type related to the chemical shifts (∂) values. All the equivalent protons have the same environment but of different molecules will show absorption at the similar place in the spectrum. The following table shows the empirical correlation between chemical shifts and the possible structures. The peaks are observed at the ∂ values 1.2ppm, 1.4ppm, 1.6ppm, 1.7ppm where the expected protons are aliphatic –C-H, 2.1 ppm, 2.2 ppm –CH_3 proton, 3.1ppm, and 3.2ppm –N-Methyl, 3.4ppm, 3.5ppm, 3.6 ppm –methoxy proton, 4.5ppm, 4.6 ppm, 4.8ppm,4.9 ppm –proton attached tom electronegative elements, then at 5.1 ppm alkene proton and at 7.8ppm Ar-H protons are expected.

It shows that the presence of many common functional groups and very closes peak intensities of these functional groups. Hence, we can conclude that *Centella asiatica* can be the alternative solution or the medicine for the treatment of various diseases. It can also have the potential to

gain the similar strength as the existing drugs. Though the results are compared here with a single drug but the fact is same with many drugs. The fact about the side effects and the fact about the prescribed herb can be the best solution for the synthesis of many drugs by using the extract of *Centella asiatica* as the starting reagents. It is also possible to avoid the adverse effects of drugs; the drugs can be manufactured by the combination of the extract of *Centella asiatica.* This kind of combination may be more effective, beneficial to fight strongly against the various kinds of diseases.

CONCLUSION

The extract after the current study shows many basic functional groups relatively found in much more synthetic drugs, so the extract can be further found more efficient to implement for drug synthesis and development of many drugs with consideration of the safety of human health[11]. As the herb is also found to show the antinociceptive and anti-inflammatory activities, so it can be the good source for the treatment of inflammatory condition[12]. As all over the world, the people have the strong belief on the action of medicinal herbs on various chronic diseases like Diabetes, Cancer, AIDS and the trust is regarding the failure of conventional medicines applicable for these diseases, so this extract with combination with certain medicine can play the vital role[13]. There are many pieces of evidence which suggest that the extract of medicinal herbs, when extracted into the pure form, is capable of producing various pharmacological effects which are actually distinct from their original form, so can become more effective and efficient[14]. The plants showing the presence of naturally occurring chemicals, similar to their anthropogenic counterparts, are biologically active and capable of modulating the physiological processes in human beings, [15] so can have better future in the pharmaceutical industries.

REFERENCES

1) B. Antony, G. Santhakumari, V. Sheeba, B. Merina, J.Mukkadan, " "Hepatoprotective effects of Centella Asiatica (L) in Carbon Tetra –induced liver injury in Rats", Indian Journal of Pharmaceutical Sciences, Nov/Dec 2006, P.N.772-776.

2) S.Shakir Jamil, Quassia Nizami, Mehboob Salam, "Centella Asiatica (L), Urban OA Review" Natural Product Radiance, Vol 6 (2) 2007, P.N. 158-170.

3) Ikay Erdogan Orhan, "Centella Asiatica (L) Urban: From Traditional Medicines to modern medicine with Nueroprotective potential," Evidence based complementary and alternative medicine 2012.

4) Kashmira J.Gohil, Jagruti Patel, Anuradha Gujjar, "Pharmaceutical Review of Centella Asiatica (L): A Potential herbal cure all" Indian ? Journal of Pharma Science, 2010 Sep-Oct ,72 (5): 546-556.

5) Claudia Cerella, Mareika Kelke, Elodie Viryl, MarioDicato, Claus, Jacob Marc, "Phytochemicals-Bioactive impacts on health" Dec-2011.
6) Kashmira J.Gohil, Jagruti Patel, Anuradha Gujjar, "Pharmaceutical Review of Centella Asiatica(L): A Potential herbal cure all" Indian Journal of Pharma Science, 2010 Sep-Oct ,72 (5): 546-556.
7) Aylin Turel, Ermertcan MD, Sevinc Jnan, Serup Ozturkcan MD, Cemal Bilac MD, Serap Cilaker, " Comparision of the effects of Collagenase and extract of Centella Asiatica in an experimental model of wound healing: An immunohistochemical and Histopathological study" " Internatinal Journal of Tissue Repair and Regenaration" Vol 16, Issue 5, Sep/oct 2008.
8) M.S.Ashwat, Saraf Shailendra, saraf Swarnalata, "In vitro Antioxidant activity of ethanolic extract of Centella Asiatica", Research Journal of Medicinal Plants, 13-16, 2007.
9) Satoru Tsuchikawa, ' A review of recent Near IR for wood and paper" Journal of Applied Spectroscopy Review" Vol 42, 2007, Issue 1.
10)Feigon I, Denny WA, Leupin w, Kearn DR, " Interaction of anti-tumor drugs with natural DNA: 1H NMR study of binding mode and kinetics" Journal of Medicinal Chemistry 1984,27(4):450-465.
11)B.K.Dash, HM Faruquee, SK Biswas, MK Alam, SM Sisir, UK Pradhan, " Antibacterial and antifungal activities of several extracts of Centella Asiatica (L) against some human microbes" Life Sciences and Medicine Research, Vol 4, LSMR-35,2011.
12)M.N.Somchit, MR Sutaiman, A. Zuraini, L. Samsuddin, N.Somchit, DA Israf, S.Moin, " Antiseptic and anti-inflammatory effects of Centella Asiatica" Indian Journal of Pharmacology, Vol 36, 2004, PN 377-380.
13)Lisa Carbin Winslow, MD, David J. Kroll, "Herbs as medicines" JAMA Internal Medicine, 1998; 158(20): 2192-2199.
14)Joseph Chang, "Medicinal herbs: Drugs or Dietary supplements" Biochemical Pharmacology, Feb 2000, vol 59(3), 211-219.
15)Coastas Loannides, "Xenobiotic Metabolism: An Overview" enzyme systems that metabolize Drugs and other Xenobiotics, 2001.