WORLD JOURNAL OF PHARMACY AND PHARMACEUTICAL SCIENCES

SJIF Impact Factor 7.632

Volume 10, Issue 2, 1483-1487 Research article ISSN 2278 – 4357

IN VITRO ANTI MICROBIAL ACTIVITY OF SIDDHA DRUG *KASTURI KARUPPU*

M. Ramani M.D. (S)[1]*, M. K. Tamil Muhil M.D. (S)[2], S. Selvakumar B.S.M.S. M.Sc (Medical Physiology)[2]

[1]*Research Scholar, Department of Siddha, The Tamil Nadu Dr.M.G.R.Medical University, Guindy, Chennai – 32.

[1]Assistant Lecturer, Noi Anugavithi Ozhukkam and Research Methodology Department, JSV College of Siddha and Research Institute, Pali, Ulundurpet, Tamilnadu, India.

[2]Assistant Professor, Department of Physiology, Dhanalakshmi Srinivasan Medical College and Hospital, Perambalur, Tamilnadu, India.

Article Received on
16 Dec. 2020,

Revised on 06 Jan. 2021,
Accepted on 27 Jan. 2021

DOI: 10.20959/wjpps20212-18326

***Corresponding Author**
Dr. M. Ramani M.D. (S)
Research Scholor,
Department of Siddha, The Tamil Nadu
Dr.M.G.R.Medical University, Guindy,
Chennai - 32.

ABSTRACT

Siddha system of medicine is one of the traditional Indian medicines. Siddha system includes herbs, minerals, metallic salts and animal products. *Kasturi karuppu* is a herbo-mineral Siddha medicine mentioned in our Siddha literature indicated for rhinitis, unknown cause of fever, cough and bronchial asthma. In this study *Kasturi karuppu* was investigated for analysis of microbial load and antimicrobial potential against enteric pathogens like *Salmonella species, E.coli, Staphylococcus aureus, Bacillus cereus, Proteus vulgaris, Klebsiella pneumoniae, Pseudomonas aeruginosa* using cup plate method. The findings of the study showed that the microbial load and has excellent anti-microbial activity of ethanolic extracts of *Kasturi karuppu.*

KEYWORDS: *Kasturi karuppu,* Siddha medicine, antimicrobial activity, herbo-mineral formulation.

INTRODUCTION

In recent years much attention has been devoted to Siddha system as the result of its increased use in the successful treatment of infectious diseases. According to Siddha medicine disease is due to imbalance of tridoshas *viz* vatha, pitha, kapha, the three biological

components of the individual human being and is corrected using herbs, metals, minerals.[1] One of the most prevalent problems faced by healthcare services is the increasing prevalence of antimicrobial resistance. Throughout history, medicinal plant-based remedies have been used with varying degrees of success for the management of infectious diseases. Bacterial infection is one of the most serious global health issues in 21st century (Morris and Masterton, 2002).[2] Antimicrobial resistance settings have failed to address this essential aspect of drug usage (Monnet *et al.*, 1998).[3] World health organization has determined anti-microbial resistance as public health problem around the world causing increase of morbidity and mortality. In Siddha system of medicines suitable and safe drugs are available for longer period compared to modern medical system. *Kasturi karuppu* is a Siddha medicine prescribed for rhinitis, cough, unknown cause of fever and bronchial asthma mentioned in Siddha literatures like *Siddha Vaithiya thirattu*[4], *Gunapadam Jeeva Vaguppu*[5] etc. It consists of *Borneo camphor (Pachhai karpooram), Piper longum* (*Thippili*), *Capra aegagrus/ Bezoar (Korosanai), Crocus sativus (Kunguma poo), Red sulphide of mercury* (natural)- vermilion *(Lingum), Hydrargyrum subchloride (Pooram), Sulphur (Ganthagam), Arsenii trisulphidum or Trisulphuret of arsenic (Thalagam), Arsenii disulphidum bisulphuret of arsenic realgar (Manoselai), Hydrargyrum mercury quick silver (Rasam), Carum copticum (Omam), Moschus moschiferus musk (Kasturi).*

The present investigation was undertaken to test the analysis of microbial load and anti-microbial activity of ethanolic extract of *Kasturi karuppu* against some gram positive and gram negative bacteria.

MATERIALS AND METHODS

The Siddha drug was procured from IMCOPS (drug shop), Chennai 106 and used in this present study. Analysis of microbial load[6], Anti-microbial activity[7] was carried by cup plate method. Test was conducted in Regional Research Institute of Unani Medicine (RRIUM)

Report No. 2015-2016 - 10 /dated 10.9.2016

PREPARATION OF EXTRACT

The powder was extracted in soxhlet extraction apparatus with distilled ethanol for 18 hrs and the solvent was removed under vacuum on rotary evaporator to yield a crude extract. This extract was tested for antimicrobial activity on various microorganisms like *Salmonella species, E.coli, Staphylococcus aureus, Bacillus cereus, Proteus vulgaris, Klebsiella*

pneumoniae, Pseudomonas aeruginosa.

CUP PLATE METHOD

The procedure was employed in microbial assay were cylinder plate method or cup plate method. In the cup plate method, the anti -microbial substance diffuses from the cup through a solidified agar layer in a petri dish or a plate to an extant so that the growth of added micro-org is inhibited entirely in a circular area or zone around the cavity containing the solution of a known quantity of anti-microbial substance. The anti-microbial activity is expressed as the zone of inhibition in millimeters, which is measured with a zone reader.

RESULTS AND DISCUSSION

a. Analysis of Microbial Load

The procedures recommended for analysis of Microbial Load as per WHO, 2007.

b. Antimicrobial Activity

The procedures performed using cup plate method as recommended in Indian pharmacopoeia (Anonymous, 1996).

Results of antimicrobial screening ethanolic extract of *KorosanaiMaathrai* powder were measured in terms of zone diameter (table 2) and photographs were shown below. From the study it is revealed that the ethanolic extract shows maximum antimicrobial activity on the above mentioned gram positive and gram negative bacterias. The effect of this extract was found to decrease in the following order against different test organisms.

Table 1: Analysis of Microbial Load.

S. No.	Parameters	Results	Permissible Limit for Internal use
1	Total Bacterial Count (TBC)	Absent	10^5 cfu/g
2	Total Fungal Count (TFC)	Absent	10^3 cfu/g
3	Enterobacteriaceae	Absent	10^3 cfu/g
4	*Escherichia coli*	Absent	10 cfu/g
5	Salmonella Spp	Absent	Absent
6	*Staphylococcus aureus*	Absent	Absent

2. Antimicrobial Activity

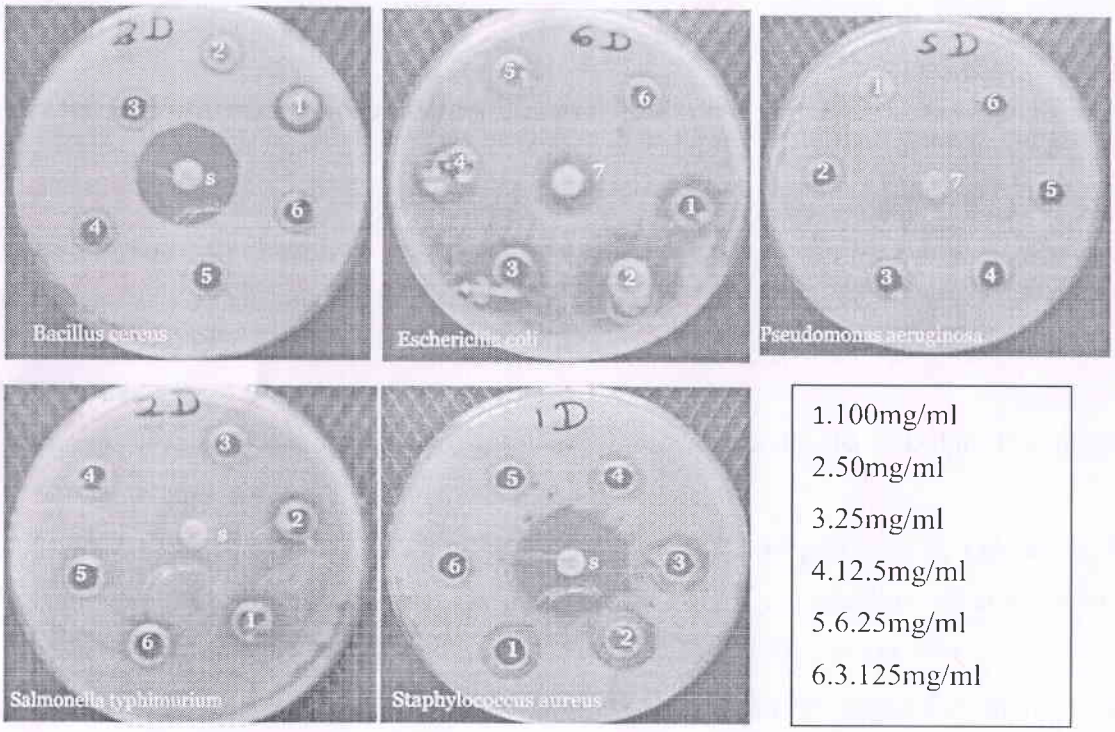


Table 2.

S.No.	Organisms	Zone diameter in mm							MIC mg/ml
		1	2	3	4	5	6	Std	
1	*Staphylococcus aureus*	23	22	21	18	13	11	+	1.56
2	*Salmonella typhimurium*	17	15	14	12	-	-		12.5
3	*Bacillus cereus*	19	15	13	11	10	9	+	3.125
4	*Klebsiella pneumoniae*	-	-	-	-	-	-	-	-
5	*Pseudomonas aeruginosa*	13	11	9	-	-	-	-	25
6	*Escherichia coli*	20	18	15	13	12	10	+	1.56
7	*Proteus vulgaris*	-	-	-	-	-	-	+	-
Conc: 1: 100mg/ml; 2: 50mg/ml; 3: 25mg/ml; 4: 12.5mg/ml; 5: 6.25mg/ml; 6: 3.125mg/ml									

CONCLUSION

The findings of the study showed that the microbial load and has excellent anti- microbial activity of ethanolic extracts of *Kasturi karuppu.* This results of in vitro study demonstrated that siddha medicine can be effective as modern medicine to kill the pathogenic microorganisms.

ACKNOWLEGEMENT

The authors are thankful to this opportunity to express their deepest gratitude to Regional Research Institute of Unani Medicine (RRIUM), P. Meera devisri sagar consultant (microbiology), Department of Siddha, The TN Dr. M.G.R. Medical University, Guindy

EUROPEAN JOURNAL OF BIOMEDICAL AND PHARMACEUTICAL SCIENCES
http://www.ejbps.com

ISSN 2349-8870
Volume: 8
Issue: 5
222-225
Year: 2021

ANTIHYPERGLYCEMIC ACTIVITY OF MEDICINAL HERBS- A REVIEW

Arunkumar G.[1*], Murugavel R.[2], Elavarasi A.[3], Anbuselvi J.[4], Kavitha V.[5] and Thangadurai K.[6]

[1*]Lecturer, Dept of Gunapadam, JSA Medical College for Siddha and Research Centre.
[2]Lecturer, Dept of Research Methodology, JSA Medical College for Siddha and Research Centre.
[3]Lecturer, Dept of Sool,Magalir Maruthuvam, JSA Medical College for Siddha and Research Centre.
[4]Reader, Dept of Sirappu Maruthuvam, JSA Medical College for Siddha and Research Centre.
[5]Vice-Principal, JSA Medical College for Siddha and Research Centre.
[6]Principal, JSA Medical College for Siddha and Research Centre.

***Corresponding Author: Arunkumar G.**
Lecturer, Dept of Gunapadam, JSA Medical College for Siddha and Research Centre.

Article Received on 15/03/2021 **Article Revised on 04/04/2021** **Article Accepted on 25/04/2021**

ABSTRACT
Diabetes mellitus is a condition in which there is a chronically raise in blood glucose concentration. There are two main types of Diabetes Type I (Insulin dependent) and Type II (Non Insulin dependent).The risk factors responsible for diabetes are genetic factor, obesity, hypertension etc. Conventionally many allopathic drugs are used for treatment of diabetes such as sulfonylureas (Glimiprimide), biguanides (Metformin) etc. But the desired effective treatment is still not to be achieved. So researchers are going on for the development of traditional medicine against diabetes mellitus. The ancient Siddha system of medicine has its origin from the genesis of mankind. In Siddha system medicinal plants and human have proved their inseparable unification time and again through all ages. Medicinal plants are promising source and also very useful for the development of traditional Siddha Medicine. In India, Medicinal plants are widely used traditionally for the prevention and cure of diabetes. The review article consists the description of the medicinal plants which are reported to have a good anti-hypergycemic property.

KEYWORDS: Diabetes, Siddha Literature, Medicinal plants, Anti-Hyperglycemia.

INTRODUCTION
Diabetes mellitus is a condition in which there is a chronically raise in blood glucose concentration (Hyperglycemia). Chronic hyperglycemia which is a common effect of uncontrolled diabetes causes long-term damage and failure of several organs such as eyes, kidneys, heart, nerves, and blood vessels.[1].There are two main types of Diabetes Type I (Insulin dependent) and Type II (Non Insulin dependent).

Type I diabetes is known as Insulin dependent which is characterized by deficiency of Insulin production , requires daily administration of insulin. It happens due to the cellular-mediated autoimmune destruction of β cells of pancreas.

Type II diabetes known as Non insulin dependent diabetes which causes due to ineffective use of the insulin by the body. The following risk factors are commonly involved in the development of type II diabetes such as genetic factors, poor diet, obesity, hypertension, insufficient physical activity etc.[2]

As per Siddha literature, urinary disease is classified into two types, they are ***Neerinai Arukkal Noi*** and ***Neerinai Perukkal Noi***. The disease ***Madhumegam*** (Diabetes) is a dreadfull disease,which categorized under ***Neerinai Perukkal Noi.***[3]

Many drugs are used conventionally for the prevention and management of diabetes such as biguanides, sulfonylureas, α- glucosidase inhibitors, DPP-4 inhibitors , dopamine-2 agonists, meglitinides etc. But still effective treatment against diabetes yet to be achieved.[4]

Research is going on for establishing alternative traditional medicine against diabetes. The medicinal plants played an important role in this research as they follows are an exemplary source of drugs. In India many medicinal plants are found to be useful for the management of diabetes. From the ethnobotanical information it is found that approximately 600 plants may possess antidiabetic potential in its activity.[5]

In this review description about the antidiabetic medicinal plants are given which are reported to have good therapeutic activity by thorough literature survey and Research works.

REVIEW

The review work was done by thorough searching of research articles and patents from different sites and books, science direct etc. The literature of scientifically validated plants are also collected which are having good antihyperglycemic avtivity.

MEDICINAL PLANTS FOR MADHUMEGAM (Diabetes Mellitus)

Ficus racemosa (Moraceae)

F. racemosa is commonly known as 'Gular fig'.

The parts used in Ficus are leaves, fruits, bark, latex and sap of the root. The leaf of F. racemosa contains flavonoids, triterpenoids, alkaloids and tannins, and the fruit contains gluanol acetate, tiglic acid, taraxasterol, lupeol acetate, hydrocarbons, sterols, gallic acid, ellagic acid,and aspartic acid etc.

Ficus racemosa shows hypoglycemic activity, to evaluate the study of hypoglycemic activity ethanol extract is used (250mg/kg/day, p.o) lowering of blood glucose level was determined in two weeks. Alloxan diabetic rats they confirm the hypoglycemic activity. Methanolic extract of stem bark also show glucose lowering activity at dose 200-400mg/kg,p.o. this test is done on normal and alloxan induced diabetic rats. whereas, this study was compared with standard antidiabetic agent glibenclamide at dose 10mg/kg it sows antidiabetic activity. B-sitosterol isolated from stem bark it is more potent when compared with other isolated compound. Methanol extract of fruit given in 1,2,3, and 4g/kg it lowers the blood glucose level in normal and alloxan induced diabetic rats. ∝- amyrin acetate is an important constituent isolated from fruits and the dose is given at 100mg/kg which lowers the blood glucose level in 5 to 24 hrs gives results at 18.4% and 17% in sucrose when compared with sterptozotocin induced diabetic rat model.[6]

Tinospora cordifolia (Menispermaceae)

Tinospora commomly known as 'Guduchi'.

Tinospora contains diverse phytochemicals, including alkaloids, phytosterols, glycosides, and mixed chemical cpmpounds. Columbin, tinosporaside, palmatine, saponin, berberin, tinosporic acid, tinosporolaren isolated from tinospora.

To evaluate the hypoglycemic activity in Tinospora cordifolia, diabetes was induced by alloxan monohydrate in 16 hrs fasted rats with single dose.Alloxan injection was prepared in 0.9% in normal saline. Rats with fasting blood glucose level more then 220 mg/dl was used for study. During dose standardization study it was found that 180mg/kg intraperitoneal dose of alloxan was suitable for diabetes induction with the 6-12 months old rats. For this study, animals were divided into three groups as normal control(NC) , diabetic control (DC) , and tinospora ectract (TCE) with diabetic control.

Group- III- This group was injected by alloxan (180mg/kg bw) and fro day 2-30 half an hour prior to feeding , orally administered with Tinospora cordifolia extract (20ml/kg bw). Therefore the blood glucose levels for all three groups – NC- 89.1mg/dl, DC- 298.3mg/dl and TCE – 96.7 mg/dl , where in present study we have observed that the whole plant extract of Tinospora cordifolia very significantly reduces the blood sugar towards the normal blood glucose value.[7]

Cassia auriculata (Fabaceae)

The tamil name of Cassia auriculata known as 'Aavarai'.

Cassia auriculata contains alkaloids, saponins, flavonoids, tannins, phenols, phenol-tannins, quinones, terpenoids, proteins, and amino acids,.In Cassia leaves twenty nine compounds were identified, mainly 3-omethy-d glucose(48.50%), alpha tocopherol-beta-D-mannoside(14.22%0, n-hexadeconoic acid (3.21%), resorcinol (11.8%), octadecenal (2.18%) and carboxylic acid (1.98%).

A freshly prepared solution of sterptozotocin (45 mg/kg, i.p) in 0.1 M citrate buffer, pH was injected ip in a volume of 1 ml/kg.After 48 hours of sterptozotocin administration, rats with moderate diabetes having glycosuria and hyperglycemia. In the experiment, 36 animals were used and divided into six groups of six rats each. Group I-NC, Group II- DC, Group III- DC with CAE(0.15 g/kg), Group IV- DC with CAE (0.30 g/kg), Group V- DC with CAE (0.45 g/kg), Group VI-Diabetic rats with glibenclamide. The results was Group I- 97.5 mg/dl, Group II- 232 mg/dl, Group III- 216.66 mg/dl, Group IV- 158.6 mg/dl, Group V- 113.3 mg/dl and Group VI- 124.6 mg/dl. Administration of CAE and glibenclamide tends to bring the parameters normal. The effect of CAE at a dose of 0.45g/kg body weight was more highly significant than 0.15 and 0.30g/kg bodyweight.[8]

Terminalia chebula (Combretaceae)

Terminalia chebula commonly known as 'Myrobalan'.

Terminalia contains many of the chemical constituents such as glycosides including the triterpenes arjunglucoside I, arjungenin, and the chebulosides I and II, chebulinic acid, gallic acid, ellagic acid, 2,4 chebulyl-β -D-glucopyranose, teriflavin A, luteolin, and tannic acid.Chebulic acid isolated from ripen fruits.[9]

The blood glucose lowering activity of the chloroform extract was determined in sterptozotocin-induced (75mg/kg, i.p: dissolved in 0.1 M citrate buffer, pH 4.5) diabetic rats after oral administration at the doses of 100, 200, 300 mg/kg. Blood samples were collected from eye retro-orbital plexus of rats before and also 0.5,1,2,4,6,8 and 12 hours after drug administration and the samples were analyzed for blood glucose by glucose-oxidase method using a visible spectrophotometer.

The choloroform extract of T chebula seeds produce significant anti-diabetic effect with various doses in

sterptozotocin-induced diabetic rats. T chebula produced a maximum reduction of blood glucose of 20.85%, 28.85%, and 42.2% at 4hr with doses of 100, 200, and 300 mg/kg respectively.[10]

Strychnos potatorum (Loganiaceae)
Strychnos was commonly known as 'Clearing nut tree'.

Strychnos potatorum consists of chemical constituents such as brucine, loganin, mannose, sucrose, arachidionic acid, linoleic acid, palmitic acid, staeric acid and oleic acid.[11]

On saponification of oil- Stigmasterol, oleanolic acid, saponins containing acid olcanic, galactose and mannose and triterpenes and sterols mannogalactans.[12]

Strychnos has antidiabetic activity, in wistar albino rat, the diabetic condition was induced by ip (ie intraperitoneal) of alloxan at a dose of 100mg/kg of bodyweight. In this study animals were divided into three groups as normal control(NC) , diabetic control (DC) , and tinospora ectract (SPE) with diabetic control.The blood glucose level lowered by 53% with extract treatment , demonstrating the antidiabetic potential of the Strychnos.The insulin level also increased upto 61mu/ml within 30 days of extract treatment.[13]

Phyllanthus emblica (Phyllanthaceae)
Phyllanthus was commonly known as 'Indian gooseberry'.

Emblica fruits contain high amounts of ascorbic acid (Vitamin C).[14] It has bitter taste, that may derive from a high density of ellagitannins such as emblicanin A, emblicanin B. Amla contains punicafolin, polyphenols, flavonoids, kaempferol, ellagic acid and gallic acid.[15]

A freshly prepared solution of sterptozotocin (35mg/kg, i.p) in 0.1 M citrate buffer , pH was injected ip in a volume of 1 ml/kg. After 48 hours of sterptozotocin administration, rats with hyperglycemia. In the experiment, 18 animals were used and divided into three groups of six rats each. Group I- NC, Group II-Phyllanthus low dose (PEL)-200mg/kg and group III-Phyllanthus high dose (PEH)- 400mg/dl.thus PE, extract lowered the fasting glucose levels consistently from 2 weeks to 6 weeks.At the high of PE of 400mg/kg ,was able to reduce the blood glucose levels was 23.17 at 6 weeks .The reduction in blood glucose level was 4.09% at 2 weeks, it is significant in 2 weeks of study period.[16]

Syzygium cumini (Myrtaceae)
Syzygium was commonly known as 'malabar plum, black plum, jamun'.

The chemical constituents in Syzygium was gallic acid, cyanin glycoside, jamboline, triterpenoids, tannins, gallitannins, myricetine, myricl alcohol, ferulic acid, terpineol, fat, resin, corilaginin.[17]

The blood sugar levels measured in normal and experimental rats in initial and at interval 1,5,10 and 15 days of treatment. Sterptozotocin-induced diabetic rats show significant increase in the levels of diabetic level as compared to normal rats.Oral administration of ethyl acetate nad methanol extracts (200) and (400 mg/kg) showed significant decrease ($p<0.05$) in blood sugar level. The isolated compound, mycaminose at a dose level of 50 mg/kg also showed significant decrease in blood glucose level. The standard drug, glibenclamide decreased diabetic level in 15 days.[18]

DISCUSSION

The ancient man was treated numerous diseases using medicinal plants. The herbs are widely used in treatment as they are more efficacy and safe in treating diseases. This review article described about collective of antidiabetic herbs for treating diabetes. Now even after the evolution of the Synthetic drug era the usefulness and credibility of the therapeutic plants are being discerned scientifically. By utilizing the ethno-botanical and ethno-pharmacological actions and research works we came to know about the herbs which have more potent antidiabetic activity. The parts used such as leaf and specific extract such as acetone extract which are more effective in treating diabetes.

CONCLUSION

The concepts of traditional Siddha system of medicine using herbals are about several thousands of years old. In India—many medicinal plants are used traditionally in several form in treatment of diabetes mellitus. Current research is a collection of antidiabetic herbs to treat the diabetes as how much the medicinal herbs are effective , which possess antidiabetic activity to develop effective treatment. The article is prepared for providing proper information about the antidiabetic property possessing herbs, it might be helpful for further research in diabetes.

REFERENCES

1. WHO expert consultation, Report of the expert committee on the diagnosis and classification of diabetes mellitus. Diabetes Care, 2002; 25: 5-20.
2. Newman B., Selby J. V., King M. C., Slemenda C., Fabsitz R., Friedman G.D. Concordance for type II (Non-insulin dependent) diabetes in male twins. Diabetology, 1987; 30: 763. Doi: 10.1007/BF00275741.
3. Kuppusamy mudaliyar.K.N, Siddha Marutuvam (Pothu), 6th Ed., Department of Indian Medicine and Homeopathy, 2004.
4. Inzucchi SE, Bergenstal RM, Buse JB *et al.* Management of hyperglycemia in type 2 diabetes, 2015: A patient approach: Diabetes care, 2015; 38(1): 140-149.
5. Alarcon-Aguilara FJ, Roman-Ramos R, Perez-Gutierrez S, Aguilar-Conteras A, Flores-Saenz JL. Stusy of the anti-hyperglycemic effect of plants used as antidiabetics. Journal of Ethnopharmacology, 1998: 61: 101-110.

6. Vievk kumar, Sureshkumar, Hithesh J, Shivakumar H, Hypogycemic activity of Ficus recemosa in alloxan induced diabetic rats, International journal of pharmaceutical rebiew and research., Volume 1, Issue 2, March-April 2010.
7. Kinkar Shobana B, Patil Kishor G, Antidiabetic activity of Tinos[ora cordifolia in alloxan treated albino rats, Applied research journal, DOI – 20-07-2015.
8. Pari L., Latha M , antidiabetic activity of Cassia auriculata Flowers: Effect on lipid peroxidation in Sterptozotocin diabetes rats, Pharmacuetical biology, 40:7, 512-517, DOI-10.1076/40.7.512.14683.
9. Saleem A, Husheen M, Harkonen P, Philaja K.(2002), Inhibition of cancer cell growth by crude extract and phenolics of Terminalia chebula retz. Fruit, Journal of Ethnopharmacology, 81(3):327-336. DOI- 10.1016/S0378-8741.
10. Nalamolu K, Srinivas N., Antidiabetic and renoprotective effects of the chloroform extract of Terminalia chebula Retz, seeds in Sterptozotocin induced diabetes rats, BMC complementary and alternative medicine, 2006; 6: 17, DOI-10.1186/1472-6882-6-17.
11. Anonymous.Vol.10.New Delhi: CSIR; 1976.Wealth of India.W.Publications and information Directorate, 66-7.
12. 12th ed. London : Balliere- Tindall; 1983.Trease and Evans , Pharmacognosy, 36.
13. Dhasarathan P., Theriappan P.,—Evaluation of antidiabetic activity of Strychnos potatorum in alloxan induced rats, Journal of Medical science, 2011; 2(2): 670-674.
14. Tarwadi K.,Agte V., Antioxidant and micronutrient potential of common fruits available in Indian subcontinent, International journal of Food science and nutrition, Aug 2007; 58(5): 341-9, DOI-10.1080/09637480701243905.
15. Dharmananda S, Emblic myrobalans(Amla), Institute of traditional medicine, sep 2003.
16. Nishant P, Arkapal B, Gyanendra kumar, Rakesh C, Kanchana V,Comparitive study to evaluate the antidiabetic of commercially available extract of Tinospora cordifolia and Phyllanthus emblica in Sterptozotocin induced diabetes rats, International journal of basic & clinical pharmacology, July 2016, DOI- 10.18203/2319-2003.
17. Rohit kumar B., Shashi A., Man Singh. Morphology, phytochemistry and pharmacology of Syzygium cumini- am overview, International journal oh pharmaceutical sciences and research, 2017; 8(6): 2360-2371.
18. Kumar A., Ilavarasan T., Jayachandran., Deecaraman., aravindhan P., Padmanabhan., Krishnan MRV. Antidiabetic activity of Syzygium cuminiand its isolated compound against Sterptozotocin induced diabetes rats, Journal of medicinal plants research, Sep-2008; 2(9): 246-249.

WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.084
Volume 10, Issue 5, 396-404. Review Article ISSN 2277- 7105

HERBAL, MINERAL AND HERBOMINERAL FORMULATIONS FOR TREATING MALE INFERTILITY

Vijayalakshmi R.*[1], Elavarasi A.[2], Arunkumar G.[2], Kavitha V.[3] and Thangadurai K.[4]

[1]UG Scholar, JSA Medical College for Siddha & Research Centre, Ulundurpet, 606107.

[2]Lecturer, JSA Medical College for Siddha & Research Centre, Ulundurpet, 606107.

[3]Vice-Principal, JSA Medical College for Siddha & Research Centre, Ulundurpet, 606107.

[4]Principal, JSA Medical College for Siddha & Research Centre, Ulundurpet, 606107.

Article Received on
27 Feb. 2021,

Revised on 20 March 2021,
Accepted on 10 April 2021

DOI: 10.20959/wjpr20215-20277

***Corresponding Author**
Vijayalakshmi R.
UG Scholar, JSA Medical College for Siddha & Research Centre, Ulundurpet, 606107.

ABSTRACT

The term ***Maladu*** is used for infertility in Siddha Medicine. Infertility is defined as not being able to get pregnant after a year even unprotected sex. Infertility is the most frustrating symptom of couples. Infertility affects an estimated 15% of couples globally, amounting to 48.5 million couples. Siddha system is traditional system for healing various diseases. It is based on combination of ancient medicinal practices and spiritual disciplines. Siddha system accounted for total 4448 diseases, infertility is one among them. Siddha medicine plays a successive treatment for infertility. According to Siddha materia medica large numbers of herbs mentioned to treat infertility condition. Siddha knowledge of treatment of infertility may be beneficial to researchers who are interested in gynaecological problems.

KEYWORDS: Male Infertility, Aan Maladu, herbals, Siddha formulations.

INTRODUCTION

Most people will have the strong desire to conceive a child at some point during their lifetime. Hence, infertility is a significant, social and medical problems affecting couples worldwide. It is "a disease of the reproductive system defined by the failure to achieve a clinical pregnancy after 12 months or more of regular unprotected sexual intercourse". In the modern lifestyle, the increase could be due to at least four factors: delayed childbearing, alterations in semen quality due to habits such as cigarette smoking, alcohol, etc., Siddha medicine, which is also known as 'SIDDHA VAIDYA' has many therapeutic value in curing

and treating of infertility. Here are some herbal and herbomineral formulations that are advised by the Siddhars in the form of kashayam, chooranam, lehgyam, thailam, gulligai, chendhuram, parpam, etc., In Siddha system, Panchabootham plays a vital role. The five elements of Panchabootha's are Earth, Water, Fire, Air, and Space. Any imbalance in the ratio of these elements may cause disease. In case of infertility, the inclusion of air and fire in the uterus causes woman to be sterile. Infertility can be prevented by increasing adherence to a 'fertility diet' pattern.

Infertility may occur, if there are any problems with any of these steps.

CAUSES OF MALE INFERTILITY

Major factors causing infertility in males include:

- Disorders of spermatogenesis
- Obstruction of the efferent ducts
- Disorders of sperm motility
- Sexual dysfunction

ETIOLOGICAL CLASSIFICATION

1.—Disorders of spermatogenesis

A. Hormonal

- Hypothalamic disorder
- Pituitary secretion of FSH and LH
- Hyperprolactineamia
- Hypothyroidism, adrenal gland disorder, diabetes.

B. Primary testicular disorders

- Idiopathic, varicocele
- Chromosomal defect, i.e. Klinefelter syndrome
- Cryptorchism
- Drugs, radiation
- Orchitis (traumatic, mumps, TB, gonorrhoea)
- Chronic illness
- Immunological disorders
- Immotility due to absence of dynein arms.

2. Duct obstruction

- Congenital absence
- Inflammatory block (gonococcal, tubercular)
- Surgical trauma
- Young's syndrome (inspissated mucus) associated with sinusitis and bronchiectasis.

3. Accessory gland disorders

- Prostatitis
- Vesiculitis
- Congenital absence of vas in cystic fibrosis.

4. Disorders of sperms and vesicular fluid

- Sperm acrosome defect
- Zona pellucida binding defect
- Zona penetration defect
- Oocyte fusion defect

5. Sexual dysfunctions

- Low frequency coitus --- wrong time
- Impotence, hypospadias
- Premature ejaculation
- Retrograde ejaculation

6. Psychological factors and environmental factors

- Smoking
- Alcohol consumption
- Tobacco chewing
- Diabetes
- Drugs --- antihypertensive, antipsychotics, sex steroids chemotherapy, beta-blockers, spironolactone, oestrogen.

Characters of Semen In Aan Maladu

Paarkavey aanmaganin vindhu thaanum

Padhamaana thithippu illadhadhaalum

Errkavey salameethil midhandhaalum

Yelilaga uyirpattru irrupadhaalum
Serkavey moothirathil nuraithaan pozhum
Seiyalana karuvadhuvum tharika mattaa
Theerkavey yugimuni sikicha saaram
Thelivaaga paadi vaithaar thirami thaaney.
-Yugimuni[4]

Signs of semen characters as described by the ancient saint *Yugimuni* are devoid of sweetness (absence of fructose), floating on water (decreased semen specific gravity), absence of live sperms (absence of vitality), foamy urine (presence of sperm in urine as froth).

ETIOLOGY OF AAN MALADU

Genetic Cause

Vali - Thathu nashtam (oligozoospermia)
Pitham – Arpa sukilam (oligozoospermia)
Iyyam– Indhiriya kuraivu (oligozoospermia)

Infections

Varaiyaana karpathil malattu puzhu puzhukil
Viraiyana Sukkilam tharaindhathu undilum
Karai maladaaval kaanithu pookinaal
Thuraiyaana pillaidhaan sugamaana sennikkumae

Thirumoolar[3]

As per the *Thirumoolar* says, the sperm is eaten up by the malatu puzhu (may be Anti-sperm antibodies) present in the cervical mucosal lining of the uterus.

Karumpanisai Ammai (Measles)

Arindhapin ivargaulda gunandhaanapa
Andhandha sareerathir kadutha vaarai
Therindhathodu gunakurigal thonrumappa
Thiramana karumpanisai vindhai kollum
Parindhathoru karpathai azhiya pannum
Panpaaga kayarvagalukkum pillai illai
Murindhathoru ivargaluda pillai illai
Muraimaiyudan marundhuvagai sollakkelae

***Agasthiyar Vaisoori Nool*[2]**

The complications of the karumpanisai ammai are irandha Vinthu anukal (Necrospermia), karpam allium (Habitual abortion),

This type of Ammai Noi causes sterility in both men and women. This produces viral epidymo-orchitis in men. This can cause disturbances in spermatogenesis activity.

Testicular Cause

Vithai Vatham (Orchitis)

Beeja Thamba Vatham / Neerandam (Hydrocele)

Unmaiya iranduvirai thaanum veengi
Uyargindra punpol valithu nondhu
Thanmaiyaai salaagaiyathu yetrinaar pal
Thaakkaana peesamengum valithu nondhu
Venmaiyaai neeraruvi thuliyaai veezhum
Vinmumae adikadikku thandu thaanum
Penmaiyaai manamadhudhan pithal kaanum
Peesamaan thambamenrae pesa laamae

Yugimuni[2]

The clinical features are vidhai veekam (Scrotal swelling), pricking pain, scanty micturition, aan kuri vimmudhal (Bulged male genital).

- **Asuva vatham(Crypto-orchidism)**

Sethiyaai sirukuthirai paaichalaagi
Segamella migakulukki koti panni
Methiyaai meleri keezhae nokki
Verikondaar polmirandu andam veengi
Yethiyaa iranduvirai ullae pukki
Inaiyilinga mutsurungi izhindhu novaam
Aadhiya madivayiru isivu kaanum
Maniyasuva vathamenrae ariyalaamae.

-Yugimuni[2]

The clinical features are undescended testis, aan kuri surungal, lower abdominal pain.

Traumatic Cause

Seivadhey kallidaikkaala kondalaal virai irandum

Thuiyavey thalaarasiundaam viraithaan kaanaathagum

Uiyavey moochadaikum occhum kureinthu pogum

Meiyavey kaiyaagathal meyvinil vagaiethamey.

varma laada soothiram 300[12]

Both testes cannot be felt in scrotalsac (Testicular atrophy), scanty micturition, abdominal distension.

Traumatic injuries in the Lumbosacral Nerve Plexus. (Pudental nerve) can cause impotence, leads to infertility.

Internal Medicines In Siddha For Infertility

Formulations in Siddha treatment[11][12][14][15]

S.NO	Name of the formulation	Dosage	Adjuvant	Indications
1.	Aarudhaa chooranam	3 g BD	-	Inthriya nashtam (Spermatorrhoea)
2.	Sandhiragandhi chooranam	12 g OD	Milk/honey/raw rice water/ gooseberry juice	Inthriya nashtam (Spermatorrhoea)
3.	Kathalikani lehgyam	8 g BD/ 10-15 days	-	Thathu balapadum (Strengthening semen)
4.	Vajjirrakandi lehgyam	0.798 g BD	-	Bogam undakum (Libido)
5.	Mahapoornathi lehgyam	0.798 g BD / 48 days	-	Vinthu irrugum (Thickening of semen)
6.	Vennpoosani lehgyam	8 g	-	Vinthu oorum (Increase of semen)
7.	Saambirani kuligai	50 mg	-	Thathu viruthi (Increase of secretion of semen)
8.	Poorana sandhirodhya maathirai	0.0632 g	Butter/ jaggery powder/ ginger juice	Inthriya nashtam (Spermatorrhoea)
9.	Meganaadhi ennai	10 ml BD	-	Maladu (Infertility)
10.	Kalnaar parpam	130 mg	Ghee/ butter	Vinthu oorum (Increase of semen)
11.	Phutparaaga paarpam	-	Honey	Veeriya viruthi (Increase of secretion of semen)
12.	Singhi chendhuram	130 mg BD	Honey / ghee	Thathu vazhukum (Produce Fertile sperms)
13.	Naaga chendhuram	488 mg + TKC	Ghee/ honey/ milk	Vinthu nashtam (Spermatorrhoea)
14.	Thanga chendhuram	65 mg BD/ 40 days	Butter/ ghee	Thathu viruthi (Increase of secretion of semen)
15.	Ullogha	976 mg+	Honey	Vinthu oorum (Increase of

	mandoora chendhuram	TKC		semen)
16.	Thanga urram	130 – 260 mg	-	Janana uruppu noigal (Reproductive disorders), veeriyam undakum (Aphrodisiac), vinthu nashtam (Spermatorrhoea)
17.	Velli uuram	65 – 130 mg	Jathikaai lehgyam	Thathu viruthi (Increase of secretion of semen)
18.	Nandi mezhugu	500 mg BD/ 48 days	Palm jaggery	Sukkila noigal (Sperm disorders), suronidha noigal (Ovulation disorders)
19.	Appalakaaram Podi	3 days (from onset of mensus)	Half lemon pressed in this powder	Maladu (Infertility)
20.	Khomuthira Silasathu	130 mg OD/ 3 days	Yellow yolk of the egg	Aanmai undakum (Aphrodisiac)

The drugs of the following **MOOLIGAI** were selected for treating infertility. These were given in the form of chooranam, lehgyam, kashayam, etc.[16] [17]

S.No	Common Name	Botanical Name	Preparation	Dosage	Indications
1.	Amukkura kizhangu	Withania somnifera	Chooranam – Tuber	2–4 g OD with Ghee	Vinthu perugum (Increase of semen)
2.	Ammanpacharisi	Euphorbia pilurifera	Chooranam	8.5 g OD with Milk	Venneer perukum (Increases semen)
3.	Erukku	Calotropis gigantean	Mathirai	50 mg	Veriyam undakum (Aphrodisiac)
4.	Kasa-kasa	Papver somniferum	Lehgyam	4–8 g	Aanmai perukum (Aphrodisiac)
5.	Karanthai	Ocimum basilicum	Chooranam – Leaves	4–8 g with Butter	Aanmai perukum (Aphrodisiac)
6.	Karungali	Acacia catechu	Gums (Pesin)	1–2 g with Water	Vinthu valarum
7.	Kalyana Murukku	Erythrina variegata	Juice – Leaves	60 ml BD for 2–3 months	Maladu (Infertility)
8.	Seendil	Tinospora cordifolia	Lehgyam		Vinthu oorum (Increase of semen)
9.	Kattu Chirakam	Vernonia anthelmintica	Thailam	With Beetle leaves	Aanmai perukum (Aphrodisiac)
10.	Thazhai	Pandanus odoratissimus	Karkam – Vizhudhu		Maladu (Infertility)
11.	Thippili	Piper longum	Chooranam	1–1.5 g OD with Ghee	Aanmai perukum (Aphrodisiac)
12.	Thuththi	Abutilon indicum	Chooranam – Flower	With Sugar & Milk	Aanmai perukum (Aphrodisiac)
13.	Thettran	Strychnos potatorum	Lehiyam	6.022 g BD for 20 days	Aanmai perukum (Aphrodisiac)

				with Naaga parpam	
14.	Naga mali	Rhinacanthus nasuta	Root boiled with Milk		Aanmai perukam (Aphrodisiac)
15.	Nirmulli	Hygrophila auriculata	Milk soaked seeds with sugar		Aanmai perukam (Aphrodisiac)
16.	Chemparuththi	Gossypium arboreum	Kudineer – Bark	4.2 g for 40 days	Aanmai tharum (Aphrodisiac)
17.	Madhanakama poo	Cycas circinalis	Chooranam – Flower	BD	Aanmai perukum (Aphrodisiac)
18.	Vengayam	Allium cepa	Chooranam – Seed	3–4 g BD	Aanmai undakum (Aphrodisiac)

CONCLUSION

Hence the review provides the detailed information about the male infertility and the Siddha medicines prepared from herbal, mineral and herbomineral formulations for treating it.

REFERENCES

1. Dr.Shanmugavelu. M. Noi Naadal Noi Muthal Naadal thirattu (Part I). Chennai: Directorate of Indian medicine and Homeopathy, 1967, 1st edition.
2. Dr.Shanmugavelu. M. Noi Naadal Noi Muthal Naadal thirattu (Part II). Chsennai: Directorate of Indian medicine and Homeopathy, 1967, 1st edition.
3. Dr.Arangasaaran S. Karpa vaagata thirattu, Thanjavur: Saraswathi pathippagam, 2018, 2nd edition.
4. Venugopal P.M. Magalir maruthuvam. Tamil Nadu: Directorate of Indian medicine and Homeopathy, 1995, 3rd edition.
5. Uththamarayan K.S. Siddha maruththuvanga surukkam. Chennai: Directorate of Indian medicine and Homeopathy, 2006, 2nd edition.
6. Sambasivampillai T.V. Siddha Medical dictionary (Part I-V). Chennai: Department of Indian medicine and Homeopathy, 2011, 3rd edition.
7. Thurairasan K. Noi illa neri. Chennai: Directorate of Indian medicine and Homeopathy, 1993, 1st edition.
8. Kannusamy Pillai S, Kannusamyam ennum vaithiya sekaram, Chennai: Ganesh pathippagam.
9. Vaithiya Sindhamani -Sikicha Rathina theepam (Part II).
10. Varma laada Soothiram – 300.

11. Kuppusamy K.N, Uthamarayan K.S. Siddha vaithiya thirattu. Chennai: Department of Indian medicine and Homeopathy, 2009, 3rd edition.
12. Thiyagarajan R. Gunapaadam Thathu seeva vaguppu, Chennai: Department of Indian medicine and Homeopathy, 1981, 3rd edition
13. Murugesa Muthaliyar K.S. Gunapaadam Mooligai vaguppu (Part I), 2018, 3rd edition.
14. Murugesa Muthaliyar K.S. Gunapaadam Mooligai vaguppu (Part II), 2018, 3rd edition.
15. Thiyagarajan R. Gunapadam thathu seeva vaguppu, Chennai; Department of Indian medecine & homeopathy.
16. Murugeda muthaliyar K.S. Gunapadam mooligai vaguppu, (part1) 2018, 3rd edition.
17. Murugesa mudaliyar K.S Gunapadam mooligai vaguppu (partl ll), 2018 3rd edition.

Indo Global Journal of Pharmaceutical Sciences, 2020; 10(2): 19-25

INDO GLOBAL JOURNAL OF PHARMACEUTICAL SCIENCES
ISSN 2249- 1023

Molecular Docking Studies of Deva Chooranam against the Target Protein 6LU7 of Novel Corona Virus 2019

Thangadurai K [*1], Rengasundari [2], Saravana Siva P [3], Vithyavani N [4], Sivasankari K [5], Ramya R [6], Jeeva Gladys R [7], Kannan K.P. [8]

[1] *Department of Maruthuvam, JSA Medical college for Siddha and research centre, Ulundurpet, Villupuram, Tamilnadu, India*

[2] *Maria Siddha Medical College and Hospital, Thottavaram, Kalkulam Taluk, Kanyakumari District, Tamil Nadu, India.*

[3] *Agara Super speciality Siddha clinic, Thirumullaivoiyil, Chennai, Tamil Nadu-600062, Treasurer - Lions Club of Chennai AAYUSH (DIST.324-A1).*

[4] *SiddhaChikitsalaya, Groundfloor, Rap Towers, SaraswathyNagar, Nellore, Andhra Pradesh-524003, India*

[5] *Freelancer, San Jose, California, United states of America- 95123*

[6] *Department of Sirappu Maruthuvam, Velumailu siddha Medical College,Sriperumbudur, Tamil Nadu, India-602105*

[7] *Department of Research methodology and Medical statistics, Velumailu siddha Medical College,Sriperumbudur, Tamil Nadu, India-602105*

[8] *JSA Siddha Medical College and Research centre, Pali, Ulundurpet, TamilNadu-606104*

Address for Correspondence: Thangadurai, K., drkthangadurai@gmail.com

Received: 15.05.2020
Accepted: 25.05.2020
Published: 21.12.2020

Keywords
Novel coronavirus, Deva Chooranam, Main Protease, Luteolin, Phytocompound.

ABSTRACT: Plants and bioactive compounds have played an important role in the development of several clinically useful therapeutic agents since time immemorial. In the recent years, more emphasis has been placed on identifying plant-derived compounds that can be used as an effective treatment for life-threatening diseases. COVID-19, a new strain of coronavirus (CoV), was identified in Wuhan, China, in 2019. No specific therapies are available and investigations regarding COVID-19 treatment are lacking. Bioactive compounds found in Siddha herbal formulation *Deva Chooranam* which was previously confirmed through molecular docking to have antiviral effects against HIV -RT. The present study aimed to assess *Deva Chooranam* as potential COVID-19 Mpro inhibitor. Molecular docking was performed using Autodock 4.2, with the Lamarckian Genetic Algorithm and results were visualized using pymol. The physiochemical and ADMET(Adsorption, distribution, metabolism and excretion) properties were also analysed.COVID-19 Mpro was docked with several compounds, Eugenol A-Pinene , Atlantone, Myrcene , Luteolin, Apigenin, Kaempferol and docking was analysed using Pymol. The results showed that out of the 7 compounds screened Luteolin appeared to have the best potential binding against the COVID-19 Mpro 6LU7. However, further research is necessary to investigate their potential medicinal use.

Cite this article as: Thangadurai, K.; Rengasundari; Saravana Siva, P.; Vithyavani, N.; Sivasankari, K.; Ramya, R.; Jeeva Gladys, R.; Kannan, K.P. Molecular docking studies of Deva Chooranam against the target protein 6LU7 of novel corona virus 2019. Indo Global J. Pharm. Sci., 2020; 10(2): 19-25. **DOI:** http://doi.org/10.35652/IGJPS.2020.10204 .

INTRODUCTION

The new strain of Coronaviruses (CoVs) was recognized at the end of 2019, initially named 2019-nCoV, and emerged during an outbreak in Wuhan, China.[1] They are large, enveloped, positive-strand RNA viruses that are named for the crown-like spikes on their surface. Rarely, animal coronaviruses can infect people and then spread between people and are an etiologic agent of severe respiratory tract infections in both humans and animals, which can cause disorder not only in the respiratory tract, digestive tract and systemic infections.[2,3] Officially, WHO named this CoV COVID-19 (Coronavirus disease 2019), on February 11, 2020, based on consultations and collaborations with the World

Organization for Animal Health and the Food and Agriculture Organization of the United Nations.[4] While there are, no specific therapies for COVID-19 and investigations regarding the treatment of COVID-19 are lacking, preventive and supportive therapies to prevent further complications and organ damage seems to be essential at this crucial stage. Some earlier preliminary studies have investigated protease inhibitor which is commonly used to treat human immunodeficiency virus (HIV)/acquired immunodeficiency syndrome patients, as a potential target for the inhibition of CoV replication for the treatment of COVID-19-infected patients.[5] The COVID-19 main protease (Mpro), is a potential drug target. In the present study, we investigated Eugenol A-Pinene , Atlantone, Myrcene , Luteolin, Apigenin, Kaempferol as lead compounds from the ingredients *Cedrus deodara* (Devadaru), *Alpinia galanga* (Arathai), *Cinnamomum tamala* (Lavanga pathiri) of *Deva chooranam* as potential inhibitor candidates for COVID-19 Mpro . The findings of the present study will provide other researchers with opportunities to identify a supportive therapy to combat COVID-19.

Literature review on Ingredients of *Deva Chooranam* (DC)

Deva Chooranam (DC) is a Siddha herbal formulation consisting of three medicinal herbs, *Cedrus deodara* (Devadaru), *Alpinia galanga* (Arathai) and *Cinnamomum tamala* (Lavanga pathiri). These herbs have been mentioned in *Agathiyar gunavagadam* a classical Siddha literature is and they are indicated for fever, cough, wheeze, respiratory illness, diarrhea, dysentery, dehydration, respiratory ailments that can be found in the clinical conditions of COVID-19. [6] Previous work on *Aplinia galangal* has confirmed that Virtual screening of natural product compounds into the solvent accessible S3-S4 pocket of PLPro showed that eight compounds found in rhizomes of *Alpinia officinarum* were identified as potential inhibitors of SARS-CoV-2 PLpro. Hence the previous study on structure based molecular docking show these natural product inhibitors are promising drug candidates against SARS-CoV-2.[7] Another study by Mishra et al., in their phytochemical analysis confirmed the presence of various secondary metabolites in *Cinnamomum tamala* such as alkaloids, flavonoids, terpenoids and tannins.[8] Alkaloids show antihelminthic, antidiarrhoeal and antimicrobial activities.[9] and act as inhibitor, stimulator and growth terminator.[10] On the other hand, flavonoids exhibit antiviral, antioxidant and anti-inflammatory activities .Tannins and terpenoids act as primary antioxidants or free radical scavengers and work synergistically with each other to create a broad spectrum of antioxidative actions that generates an operative defense system against free radical attack.[11] The study by Chaurasia JK et al., clearly portrays that non-polar hexane fraction of leaves of *Cinnamomum tamala* possesses immunosuppressive property, which is mediated through modulation of innate immunity.[12] Studies on *Cedrus deodara* showed that *Cedrus* genus have cytotoxic, spasmolytic immunomodulatory, antiallergic, anti-inflammatory and analgesic activities. The essential oil isolated from Cedrus leaves may bear potential for drug development due to its high concentrations of germacrene D and β-caryophyllene and also show bioactivity against bacteria and viruses. [13]

MATERIALS AND METHODS

Target Selection and Preparation

6LU7 is the structure of human coronavirus NL63 main protease in complex with the alpha-ketoamide (S)-N-((S)-4-(benzylamino)-3,4-dioxo-1-((S)-2-oxopyrrolidin-3-yl)butan-2-yl)-2-cinnamamido-4-methylpentanamide (cinnamoyl-leucine-GlnLactam-CO-CO-NH-benzyl). It pays a key role in incorporating the genomic RNA into progeny viral particles and was considered a potential target. The selected structure was optimized by adding the polar hydrogen atom. The macromolecule was converted into PDBQT format before performing docking.

Table 1. List of phytocompounds

S.No	Medicinal Plants	Phytocompounds/Baoactive compounds
1	*Cinnamomum tamala*	Eugenol A-Pinene
2	*Cedrus deodara*	Atlantone Myrcene
3	*Alpinia officinarum*	Luteolin Apigenin Kaempferol
4	AntiHIV drug	Nelfinavir

*The *italic* denotes the botanical name of the medicinal plants

Ligand selection and preparation

The three major plants namely *Cinnamomum tamala, Cedrus deodara, Alpinia officinarum* were considered for the study as they are the active herbs of *Deva Chooranam* (**Table 1**). The main phytocompounds of these medicinal plants were retrieved from Pubchem and all the phytocompounds were optimized before docking an anti-retroviral drug Nelfinavir was also used. The chemical structure of the ligand molecules are given in the (**Fig.1**).

Molecular docking

Docking calculations were carried out using Auto Dock 4.3. Gasteiger partial charges were added to the ligand atoms.

Docking calculations were performed for phytocompounds and standard drug Nelfinavir against the target protein. Essential hydrogen atoms, Kollman united atom type charges, and solvation parameters were added and the target protein and ligands were prepared in AutoDock tools. [14] The X Y and Z coordinates were set at -25 , 12 and 59 respectively. The grid was placed at 25 for X, Y and Z and an Autogrid program was generated. Docking simulations were performed using the Lamarckian genetic algorithm (LGA) and the Solis & Wets local search method. [15] A total of 10 different docking pores were obtained for each docked molecules and the best pore was evaluated.

Table 2. Physiochemical properties of phytocompounds

Ligands	Canonical SMILES	Formula	Molecular Weight (kDa)	Lipinski rule	H-bond acceptors	H-bond donors
Eugenol	C=CCc1ccc(c(c1)OC)O	C10H12O2	164.2	0	2	1
Alpha-Pinene	CC1=CCC2CC1C2(C)C	C10H16	136.23	0	0	0
Alpha-Atlantone	CC(=CC(=O)C=C(C1CCC(=CC1)C)C)C	C15H22O	218.33	0	1	0
Myrcene	C=CC(=C)CCC=C(C)C	C10H16	136.23	0	0	0
Luteolin	Oc1cc(O)c2c(c1)oc(cc2=O)c1ccc(c(c1)O)O	C15H10O6	286.24	0	6	4
Apigenin	Oc1ccc(cc1)c1cc(=O)c2c(o1)cc(cc2O)O	C15H10O5	270.24	0	5	3
Kaempferol	Oc1ccc(cc1)c1oc2cc(O)cc(c2c(=O)c1O)O	C15H10O6	286.24	0	6	4
Nelfinavir	OC(C(NC(=O)c1cccc(c1C)O)CSc1ccccc1)CN1CC2CCCCC2CC1C(=O)NC(C)(C)C	C32H45N3O4S	567.78	1	5	4

[a]H denotes Hydrogen.

Table 3. Hydrogen bond-interaction profile of ligands against target protein 6LU7

Phytocompounds	Binding energy (Kcal/mol)	Number of Interactions	Amino Acid – HB interactions				
Luteolin	-7.1	5	LYS102	SER158	ASP153	THR111	GLN110
Apigenin	-6.7	3	THR292	THR111	GLN110	-	-
Kempferol	-6.4	3	PHE294	ASP295	GLN110	-	-
Atlantone	-6.2	1	SER158	-	-	-	-
Eugenol	-5.5	3	GLN110	THR111	PHE112	-	-
Nelfinavir	-6.2	2	GLY138	LYS137	-	-	-

[a]HB – denotes Hydrogen Bond , [b] LYS-Lysine, [c]SER- Amino acid,[d] ASP- Aspartate, [e]THR-Threonine, [f]PHE- Phenylalanine [g]GLN-Glutamic acid

Table 4. ADMET analysis of the best ranked Ligands

Ligands	GI absorption	BBB penetration	Bioavailability Score	Synthetic Accessibility
Eugenol	High	Yes	0.55	1.58
Luteolin	High	No	0.55	3.02
Apigenin	High	No	0.55	2.96
Kaempferol	High	No	0.55	3.14

[a] GI - Gastro Intestinal, [b] BBB – Blood Brain Barrier

Physiochemical and ADMET analysis

The physiochemical properties of all the phytocompounds used in the study was evaluated and out of which the finally screened hits were evaluated for their ADMET properties. All the properties were predicted using the software Swiss ADMET.

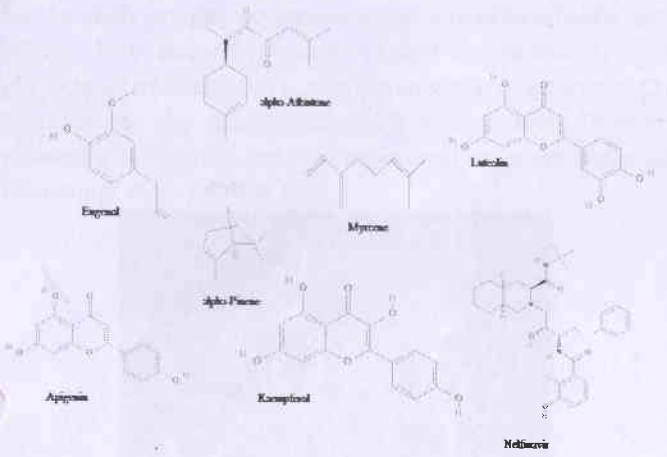


Figure 1. Chemical Structure of Ligand Molecules.

RESULTS AND DISCUSSION

The important phytocompounds from the three important medicinal plants namely *Cinnamomum tamala, Cedrus deodara and Alpinia officinarum* were taken for the study. The target protein 6LU7 was targeted for the phytocompounds Eugenol, α-Pinene, Atlantone, Myrcene, Luteolin, Apigenin and Kaempferol and anti retroviral drug Nelfinavir. The physiochemical properties of the phytocompounds were determined and it was found that except the FDA approved drug Nelfinavir rest fit well into the Lipinski rule of five the details is given in **Table 2**.

The ligand molecules were subjected to docking analysis using Autodock 4.1 version and the binding site was identified and the active site is given in the **Fig 2**. The result of the interaction profile of phytocompounds above a binding energy value of -5.5 Kcal/mol were tabulated in **Table 3**. The results were further scrutinized based on the binding energy and amino acids contributing in the formation of hydrogen bonds. The best ligands that potentially inhibit 6LU7, and their docked confirmation is given in (**Fig 3 to Fig 6**). The docking study revealed that the ligand Luteolin exhibited the highest binding energy of -7.1Kcal/mol followed by Apigenin with a binding energy of -6.7kcal/mol. The phytocompounds Kempferol and Eugenol exhibited a binding energy of -6.4kcal/mol and -5.5kcal/mol respectively.

The ADMET analyses of the best ranked phytocompounds were predicted and it was observed that all the compounds have good gastrointestinal adsorption with a bioavailability of 0.55, futher the phytocompounds did not cross the blood brain barrier as detailed in **Table 4**. As it is well known fact that the new Coronavirus (CoV) identified as COVID-19 is responsible for the viral pneumonia outbreak that commenced in Wuhan during 2020[16]. The major theme of the study evolved as there is no approved antiviral to effectively treat this infection. The study was famed in such a way that we can come out few phytocompounds that could serve the purpose. A computer assessed drug screening was performed for the phytocompounds obtained for the few herbal plants which is widely used in the treatment of different infections. The target protein used in this study was the main protease (Mpro). Mpro that played a key role in the viral replication5,6 and so it was believed that targeting this protein will provide effective outcome.

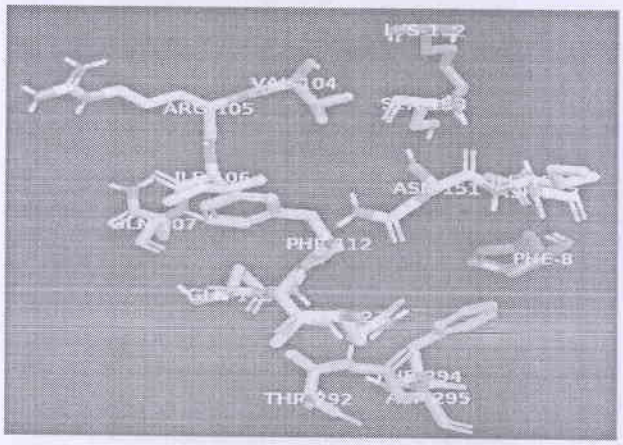


Figure 2. Active site of Main protease of COVID 19 (6LU7)

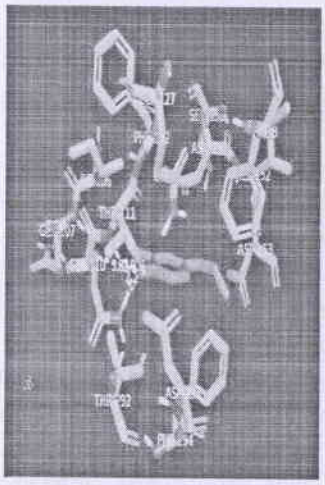


Figure 3. Docked confirmation of luteolin with the active site of 6LU7 and key HB interactions

Now research on COVID 19 is a very important since the outbreak is a pandemic and it has already killed many and it is a common threat around the globe. Many countries are following different mode of drug regime to treat and there is an urgent need for new drugs, hence this led to this research work to provide new insight in the development of antivirals and to fight against COVID 19. Since the compounds chosen for the study are phytocompounds this would be of least side effects. Few researchers have worked on various sets of phytocompounds like flavanoids targeting the spike protein.[7] For example, the constituents of black tea against the main protease and reported that theaflavin digallate as the potential inhibitor of main protease.[17]

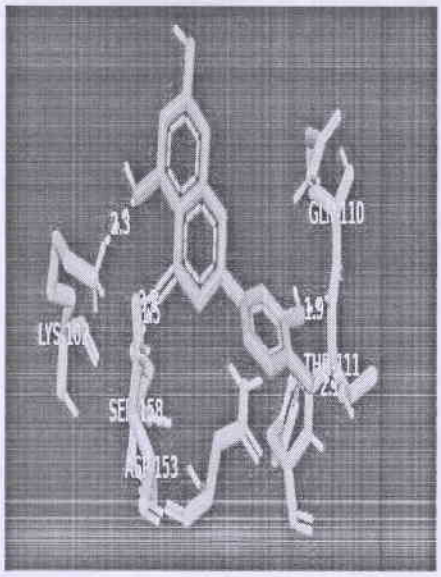


Figure 4. Docked confirmation of Apigenin with the active site of 6LU7 and key HB interactions

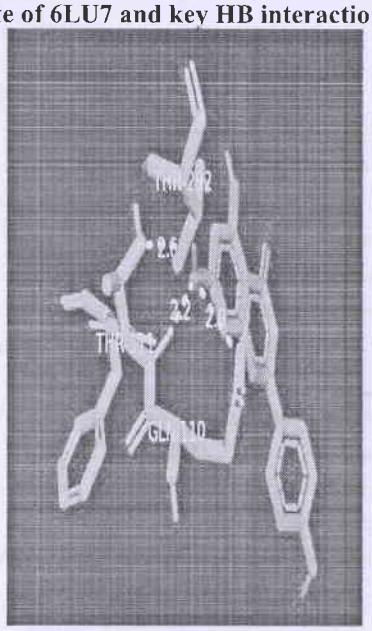


Figure 5. Docked confirmation of Kempferol with the active site of 6LU7 and key HB interactions

Flavonoids are believed to the common group of phytocompounds having potential activity in the prevention and treatment of several diseases that includes antioxidant, anti-inflammatory, antimicrobial and anticancer activities.[18] In general the flavonoids are reported to have effective antiviral activity against various viruses.[19-21] In our study we have taken the major phytocompounds from the three plants namely *Cinnamomum tamala, Cedrus deodara and Alpinia officinarum* which are the major constituents of the Siddha drug the *Deva Chooranam* a clinically important formulation for the treatment of HIV. We have performed a previous study to evaluate the antiviral activity of major phytocompounds from the three medicinal against HIV Protein using an *in silco* approach.[22]

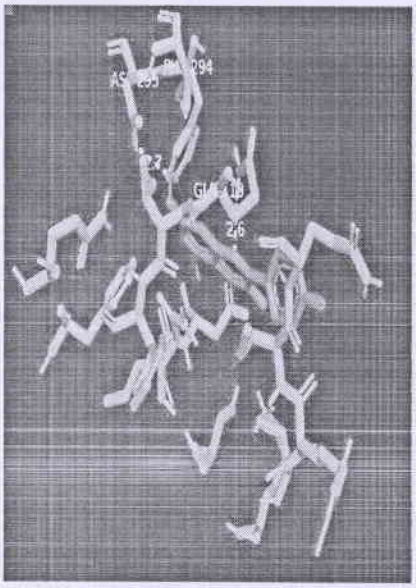


Figure 6. Docked confirmation of Eugenol with the active site of 6LU7 and key HB interactions

In our present study, the phytocompounds were docked to the active site of 6LU7, the main protease of Coronavirus and it was found that the compound Luteolin showed the highest binding energy of -7.1 forming hydrogen bonding with LYS102, SER158, ASP153, THR111 and GLN110. Luteolin is one of the most common flavonoid present in edible plants and traditional medicinal plants. S Adem et al 2020 had reported that hesperidin, rutin, diosmin had the highest binding energy out of the 80 flavoniod docked against the same target 6LU7.[23] From this study it is positive to note that phytocompounds could serve as effective, safe and cost effective with no side effects. Such studies could come up with new intervention which can serve the scientific community for future studies.

CONCLUSION

The novel coronavirus is an emerging problem with no approved drug or treatment protocol is available to treat this pandemic infection. Many researchers are working on the various aspects of novel coronavirus and in this study we have tried to shed light into the use of phytocompounds as an effective candidate in the treatment of the infection. Outcome of this study has come out with a flavonoid luteolin which has already reported to have many biological activates. Based on the docking study performed it was found that luteolin found to posses highest binding affinity against Mpro that plays a key role in the viral replication of Novel Corona virus 2019. Therefore it can be recommended for further investigation to prove its use in the antiviral therapy.

ACKNOWLEDGEMENT

The author wishes to acknowledge Dr.Yuvaraj M.S, Anesthetist, Bharathirajaa Hospital and research centre Pvt Ltd, Chennai, India for his kind contribution and support towards publishing this study.

CONFLICTS OF INTEREST

Authors declare that there are no conflicts of Interest among them.

FUNDING INFORMATION

Nil

DATA AVAILABILITY

Not declared.

REFERENCES

1. Lee PR, Hsueh PI, Emerging threats from zoonotic coronaviruses-from SARS and MERS to 2019- nCoV. J. Microbiol. Immunol. Infect. 2020, 1–3.

2. Malik YS, Sircar S, Bhat S, Sharun K, Dhama K, Dadar M, Tiwari R, Chaicumpa W. Emerging novel Coronavirus (2019-nCoV) - Current scenario, evolutionary perspective based on genome analysis and recent developments. Veterinary quarterly. 2020, 40: 1–12.

3.CDC Health Alert Network Advisory Update and Interim Guidance on Outbreak of 2019 Novel Coronavirus (2019-nCoV) in Wuhan, China. URL: https://www.cdc.gov/csels/dls/locs/2020/outbreak-of-2019-novel-coronavirus-2019-ncov-in-wuhan-china.html

4.World Health Organization (WHO), "Novel Coronavirus (2019-nCoV)," WHO Bull., 2020;1–7, URL: https://www.who.int/docs/default-source/coronaviruse/situation reports/20200121-sitrep-1-2019-ncov.pdf

5. Xu Z, Peng C, Y Shi Z, Zhu K, Mu Wang X. Nelfinavir was predicted to be a potential inhibitor of 2019-nCov main protease by an integrative approach combining homology modelling , molecular docking and binding free energy calculation. bioRxiv . 2020.

6. Mudhaliyar M, Gunapadam Mooligai vaguppu. 4th edition, Tamilnadu Siddha medical council: Chennai;1988.

7. Goswami D, Kumar M, Ghosh SK, Das A. Natural Product Compounds in Alpinia officinarum and Ginger are PotentSARS-CoV-2Papain like Protease Inhibitors. ChemRxiv, 2020.

8. Mishra AK, Singh BK, Pandey AK. Rev. Infect. Dis, 2010, 1: 134-139.

9. Prashant T. Phytochemical screening and Extraction. International Pharmaceutica Sciencia., 2001

10.Abbass MN, Rana FA, Chemical evaluation of weed seeds mixed with wheat grains at harvest. J anim plant sci. 2012, 22: 283-288.

11. Potterat O. Antioxidants and free radical scavengers of natural origin. Curr. Org. Chem. 2001,1: 415-440.

12. Chaurasia JK, Pandey N, Tripathi YB. Effect of hexane fraction of leaves of Cinnamomum tamala Linn on macrophage functions. Inflammopharmacology. 2010, 18: 147–154.

13. Saab AM, Gambari R, Sacchetti G, Guerrini A, Lampronti I, Tacchini M, El Samrani A, Medawar S, Makhlouf H, Tannoury M, Abboud J. Phytochemical and pharmacological properties of essential oils from Cedrus species. Natural Product Research. 2018, 32: 1415-1427.

14 Morris GM, Goodsell DS, Halliday RS, Huey R, Hart WE, Belew RK Olson AJ. Automated docking using a Lamarckian genetic algorithm and an empirical binding free energy function. J. Comput. Chem.1998,19: 1639-1662.

15.Solis FJ, Wets RJB. Minimization by random search techniques. Mathematics of operations research.1981, 6:19-30.

16 Chen W, Horby PW, Hayden FG, Gao GF. A novel coronavirus outbreak of global health concern. The Lancet, 2020, 395:470–473.

17. Manish, Studies on Computational Molecular Interaction between SARS-CoV-2 Main Protease and Natural Products .ChemRxiv,2020.

18. López-Lázaro M. Distribution and biological activities of the flavonoid luteolin. Mini reviews in medicinal chemistry, 2009, 9: 31-59.

19.Gescher K, Hensel A, Hafezi W, Derksen A, Kuhn J. Oligomeric proanthocyanidins from Rumex acetosa L. inhibit the attachment of herpes simplex virus type-1. Antiviral Res, 2011, 89: 9-18.

20.Roh C, Jo SK. (-)-Epigallocatechin gallate inhibits hepatitis C virus (HCV) viral protein NS5B. Talanta., 2011, 85: 2639-2642.

21. Chen C, Qiu H, Gong J, Liu Q, Xiao H, Chen XW, Sun BL, Yang RG. Epigallocatechin-3-gallate inhibits the replication cycle of hepatitis C virus. ArchVirol, 2012,157:1301-1312.

22. Thangadurai K, Rengasundari R, Vinayak S, Gayatri R, Suresh K, Banumathi V. In vitro free radical scavenging assay (DPPH (2, 2- diphenyl 1-2 picrylhydrazyl method) of Siddha HIV herbal formulation Deva Choornam. World Journal of Pharmaceutical Research, 2018, 7 : 770-775.

23. Adem S, Eyupoglu V, Sarfraz I, Rasul A, Ali M. Identification of Potent COVID-19 Main Protease (Mpro) Inhibitors from Natural Polyphenols: An in Silico Strategy Unveils a Hope against CORONA. MDPI, Preprints 2020; 2020030333.

Indo Global Journal of Pharmaceutical Sciences(ISSN 2249 1023; CODEN- IGJPAI; NLM ID: 101610675) indexed and abstracted in CrossRef (DOI Enabling), UGC CARE Journal List, EMBASE (Elsevier), National Library of Medicine (NLM) Catalog (NCBI), ResearchGate, Publons (Clarivate Analytics), CAS (ACS), Index Copernicus, Google Scholar and many more. For further details, visit http://iglobaljournal.com

WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.084
Volume 10, Issue 10, 639-666. Review Article ISSN 2277- 7105

POTENTIALS OF ANTI CANCER ACTIVITY OF SOME MEDICINAL PLANTS-AN UPDATE

Deepa D.*[1], Thiruvalluvara M.[1], Parandhaman M. N.[2] and Kavitha V.[3]

[1]Lecturer, Dept. of Noi Nadal, [2]Lecturer, Dept. of Aruvai Thol Maruthuvam,
[3]Vice Principal, JSA Medical College for Siddha and Research Centre, Ulundhurpet, Kallakurchi dist.

Article Received on
13 June 2021,
Revised on 04 July 2021,
Accepted on 25 July 2021
DOI: 10.20959/wjpr202110-21267

***Corresponding Author**
Deepa D.
Lecturer, Dept of Noi Nadal
Ulundhurpet, Kallakurchi
Dist.

ABSTRACT

Siddha system of medicine was a fruitful gift of God sponsored through the great spiritual scientists called Siddhars. This system of medicine has been being practiced in South India from the ancient time. The unique nature of siddha system of medicine was a reverse pharmacology which paved a new way for new drug discovery in most of the complicating diseases including cancer. Cancer is a life threatening disease which continues to be a global burden, despite the advancement of various technological and pharmaceutical improvements over the past two decades. Methods for treating cancer include surgery, radiotherapy and chemotherapy in addition to other specialized techniques. On the other hand, medicinal plants have been traditionally employed either as the complementary medicine or dietary agents in the treatment and management of cancer. Medicinal plants are a rich source of secondary metabolites with interesting biological and pharmacological activities. Among these metabolites, glycosides are naturally occurring substances and have outstanding therapeutic potential and clinical utility. Thus, some of the medicinal plants containing affluent of glycosides to treat various kinds of cancers.

KEYWORDS: Siddha, Life threatening, Cancer, chemotherapy, Glycosides.

INTRODUCTION

Our human body is made up of millions of tiny cells, Normally the process of cell cycle involved in the order of growth, division and then it involved in terminating the process of growth and dividing. This normal phenomenon undergoes mutation; thus cancer cells occur.

Cancers may cause due to this cellular reproduction process goes out of control Cancer is one of the most life-threatening diseases, with more than 100 different types occurring due to some molecular changes within the cell. It is the third leading cause of death worldwide following cardiovascular and infectious diseases.[1] It is estimated that 12.5% of the population dies due to cancer (WHO, 2004). The disease is widely prevalent, and in the West, almost a third of the population develops cancer at some point of time during their life. Although the mortality due to cancer is high, many advances have been made both in terms of treatment and understanding the biology of the disease at the molecular level.[2] Cancer is a malignant disease that is characterized by rapid and uncontrolled formation of abnormal cells which may mass together to form a growth or tumour, or proliferate throughout the body. Next to heart disease cancer is a major killer of mankind. Present study aims the anticancer evaluation of some medicinal plants to eradicate this deadly disease.

1. TERMINALIA CHEBULA

Botanical Classification

Kingdom : Plantae
Division : Angiosperms
Class : Rosids
Order : Myrtales
Family : Combretaceae
Genus : *Terminalia*
Species : *T. chebula*

Plant Description

Terminalia chebula is a medium to large deciduous tree growing to 30 m (98 ft) tall, with a trunk up to 1 m (3 ft 3 in) in diameter described in Figure 1. The leaves are alternate to subopposite in arrangement, oval, 7–8 cm (2.8–3.1 in) long and 4.5–10 cm (1.8–3.9 in) broad with a 1–3 cm (0.39–1.18 in) petiole.[3] They have an acute tip, cordate at the base, margins entire, glabrous above with a yellowish pubescence below. The fruit is drupe-like, 2–4.5 cm (0.79–1.77 in) long and 1.2–2.5 cm (0.47–0.98 in) broad, blackish, with five longitudinal ridges.[3] The dull white to yellow flowers are monoecious, and have a strong, unpleasant odour. They are borne in terminal spikes or short panicles. The fruits are smooth ellipsoid to ovoid drupes, yellow to orange-brown in colour, with a single angled stone.

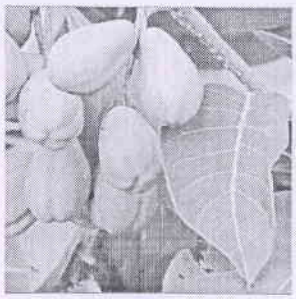


Fig 1.

Chemical Constituents

A number of glycosides have been isolated from *haritaki*, including the triterpenes arjunglucoside I, arjungenin, and the chebulosides I and II. Other constituents include a coumarin conjugated with gallic acids called chebulin, as well as other phenolic compounds including ellagic acid, 2,4-chebulyl-β-D-glucopyranose, chebulinic acid, gallic acid, ethyl gallate, punicalagin, terflavin A, terchebin, luteolin, and tannic acid.[4,5] Chebulic acid is a phenolic acid compound isolated from the ripe fruits.[6,7] Luteic acid can be isolated from the bark[8,9] *Terminalia chebula* also contains terflavin B, a type of tannin, while chebulinic acid is found in the fruits.[10]

Anticancer Activity of Terminalia Chebula

The anticancer activities of extracts were studied at Advanced Center for Treatment, Research and Education in Cancer (ACTREC), Mumbai where 14 cell lines were maintained in ideal laboratory conditions. The cell lines were grown in RPMI 1640 medium containing 10% fetal bovine serum and 2mM L-glutamine. For present screening experiment, cells were inoculated into 96 well microtiter plates 90μL/well at appropriate plating densities, depending on the doubling time of individual cell lines. After cell inoculation, the microtiter plates were incubated at 37°C, in 5% CO2, 95% air and 100% relative humidity for 24 h prior to addition of experimental drug. After 24 h, cells from one plate of each cell line were fixed in situ with TCA, to represent a measurement of the cell population for each cell line at the time of drug addition (Tz). Experimental extracts were solubilized in appropriate solvent at 400-fold the desired final maximum test concentration and stored frozen prior to use. At the time of drug addition, an aliquot of frozen concentrate was thawed and diluted to 10 times the desired final maximum test concentration with complete medium containing test article at a concentration of 100, 200, 400 and 800 μg/ml. Aliquots of 10 μl of these different dilutions were added to

the appropriate micro-titer wells already containing 90 µl of cell suspension, resulting in the required final drug concentrations of 10, 20, 40 and 80 µg/ml.

However, Terminalia chebula was active against leukemia cell line (K562) at LC50 less than 10µg/ml analogous to prostrate cancer cell line. Apparently, the promising active principle in Terminalia chebula inhibits both prostrate cancer and leukemia indicating need to investigate underlying mechanism by which this activity was exhibited. Further, all these plant-extracts need to be screened against different cell lines apart from the selected cell lines to confirm the activity.

2. SEMICARPUS ANACARDIUM

Botanical Classification

Kingdom : Plantae
Division : Magnoliophyta
Class : Magnoliopsida
Order : Sapindales
Family : Anacardiaceae
Genus : *Semecarpus*
Species : *anacardium*

Plant Description

It is a moderate-sized deciduous tree described in Figure 2 found in the outer Himalayas and hotter parts of India up to 3500 ft. height. The plant is found in abundance in Assam, Bihar, Bengal and Orissa, Chittagong, central India and western peninsula of East Archipelago, Northern Australia.[11] It is a medium-to-large size tree, 15–25 m in height with grey bark exfoliating in small irregular flakes, leaves simple alternate, obviate – oblong, 30–60 cm long and 12–30 cm broad, rounded at the apex coriaceous glabrous above and more or less pubescent, beneath. The flowers are greenish white, in panicles and appear with new leaves in May and June, easily recognized by large leaves and the red blaze exuding resin, which blackens on exposure. The nut is about 2.5 cm long, ovoid and smooth lustrous black. It is frequently found in drier rather than damp localities. The fruit ripens from December to March and are 2–3 cm broad. No specific soil affinity. It is a moderate shade bearer, obliquely ovoid or oblong drupe, 2.5 to 3.8 cm long, compressed, shining black when ripe, seated on an orange-colored receptacle form of the disk, the base of the calyx and the

extremity of the peduncle. The bark is grey in color and exudes an irritant secretion on incising.[12]

Fig 2.

Chemical Constituents

The most significant components of the *S. anacardium* Linn. are bhilwanols, phenolic compounds[13] biflavonoids,[14] sterols and glycosides.[15] Bhilwanol from fruits was shown to be a mixture of cis- and transisomers of ursuhenol; this compound consists mainly of 1,2,dihydroxy-3(pentadecadienyl 8',11')benzene and 1,2,hydroxy-3(pentadecadienyl 8')benzene[16] Other components isolated are, anacardoside,[17] semecarpetin[17] nallaflavanone[18], jeediflavanone, semecarpuflavanone[19], galluflavanone,[20] anacarduflavone mono-olefin I, diolefin II, bhilawanol-A, bhilawanol-B, amentoflavone tetrahydroamentoflavone semicarpol, anacardic acid, tetrahydrobustaflavone, O-trimethyl biflavanone A1, O-trimethyl biflavanone A2,[21] O-tetramethyl bifl avanone A1, O-hexamethyl bichalcone A, O-dimethyl biflavanone B, O-heptamethyl bichalcone B1, O-hexamethyl bichalcone B2, O-tetramethyl biflavanone C., phenolics.

Anticancer Activity of Semicarpus Anacardium

SA nut extract for inhibitory effect on human breast cancer cells (T47D). Cytotoxicity analyses suggested that these cells had become apoptotic. *Semecarpus anacardium* was discovered to induce rapid Ca(2+) mobilization from intracellular stores of T47D cell line, and its cytotoxicity against T47D was well correlated with altered mitochondrial transmembrane potential. At the molecular level, these changes are accompanied by decrease in Bcl(2) and increase in Bax, cytochrome c, caspases and PARP cleavage, and ultimately by internucleosomal DNA fragmentation. Taken together, our results provide unprecedented evidence that SA triggers apoptotic signals in T47D cells.[22]

The protective efficacy of preparation named as Kalpaamruthaa (KA) (includes SA nut milk extract, dried powder of Phyllanthus emblica fruit and honey) on the peroxidative damage and abnormal antioxidant levels in the hepatic mitochondrial fraction of 7,12-dimethylbenz(a)anthracene (DMBA)-induced mammary carcinoma rats. DMBA-treated rats also showed decline in the activities of mitochondrial enzymes. In contrast, rats treated with SA and KA showed normal lipid peroxidation antioxidant defenses in mitochondrial enzymes, and indicate the anticarcinogenic activity of KA during DMBA-initiated mammary carcinogenesis. On the basis of the observed results, KA can be considered as a readily accessible, promising and novel cancer chemopreventive agent.[23]

The restoration of energy metabolism in leukemic mice treated by SA nut milk extract. Leukemia-bearing mice showed a significant increase in LPOs, glycolytic enzymes, a decrease in gluconeogenic enzymes and significant decrease in the activities of TCA cycle and respiratory chain enzymes as compared to control animals: *Semecarpus anacardium* treatment was compared with standard drug imatinib mesylate. *Semecarpus anacardium* administration to leukemic animals resulted in clearance of the leukemic cells from the bone marrow and internal organs.

3. VINCA ROSEA

Botanical Classification

Kingdom : Plantae
Division : Angiosperms
Class : Rosids
Order : Gentianales
Family : Apocynaceae
Genus : *Catharanthus*
Species : *C. roseus*

Plant Description

A Vinca is found in blue, purple and white color described in Figure 3. It is a type of annular or corneal plant. Vinca is near about 0.52 to 1 cm in length and its leaves is oblong, ovate, glossy and bitter in taste with slight odour (Erdogrul, 2002).

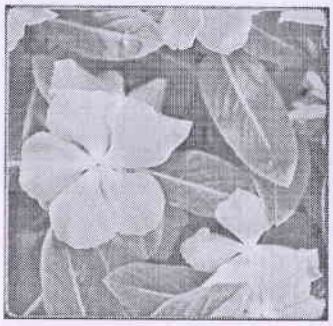


Fig 3.

Chemical Constituents

In vinca plant constitute of vinblastine and vincristine, on the chemotherapy medication it is used for several types of cancers. These are the biosynthesized from the compuling on the cantharanthine and vindoline alkaloids (Hirata, 1994). Vinorelbin agent are semisynthetic chemotherapeutic which are used to treat non small cell of lung cancer (Keglevich, 2012). They can be prepared either from vindline and catharthine (Keglevich, 2012; Ngo, 2009) or from the vinca alkaloid leurosine (Hardowin *et al*., 2002), in both case via anhydrovinblastin (Ngo, 2009). vinca flower is constitute of Rosinidin pink anthracynidin pigments which are responsible for the flower color (Ngo, 2009).[24]

Anticancer Activity of Vinca Rosea

Vinca cause cytotoxicity is due to their interactions with disruption of microtubule function and tubulin, especially of microtubules comprising the mitotic spindle fiber and causing metaphase arrest. They can perform some other biochemical response which can be effective or may not be effective on microtubules. Have some effect which do not interrupted the microtubule only after treatment of cells with clinically irrelevant doses of the vinca. Vinca and other anti microtubule drug are also shows effect on both malignant cells and non-malignant cells in the non-mitotic cell cycle, because microtubules are involved in various nonmitotic functions.

Vinca are connected to binding sites of tubulin which is separate from the taxanes, colchicine, podophyllotoxin and guanosin-5'-triphosphate. Binding occur rapidly and can reverse too. Maintains the existence of vinca binding site/mole of tubulin dimer. 16-17 high affinity binding sites in each microtubule which is located at the end of per microtubule. The vinca bind at the binding site and interrupts microtubule congregations, but low drug concentration can be decreasing the rates of both growth and shortening at the assembly end of the

microtubule that can cause produces a " kinetic cap "and suppresses function. The distributing effects of the vinca on microtubules dynamics, particularly at the ends of mitotic spindle, which causes metaphase arrest, occur at drug concentrations below those that decrease microtubule mass.[25] The vinca and other microtubule distort agents have power to inhibit malignant angiogenesis in vitro.

The vinca alkaloids and other microtubule disrupting agents have power to inhibit malignant angiogenesis *in vitro*. For example, VBL with concentrations range from 0.1 to 1.0 pmol/L blocked endothelial proliferation, chemotaxis and spreading on fibronectin, all essential steps in angiogenesis, but other normal fibroblasts and lymphoid tumors were unaffected at these minute concentrations. In combination with antibodies against vascular endothelial growth factor, low doses of VBL increased antitumor response considerably, even in tumors resistant to direct cytotoxic effects of the drug[26] Vinca alkaloids inhibit cell proliferation by binding to microtubules, which can cause a mitotic block and apoptosis. VCR and related compounds produce destabilization of microtubules by binding to tubulin and blocking the polymerization.[27] The anticancer active ingredients Vinblastin and Vincristine are derived from the leaf and stem of vinca. They inhibit the growth of human tumors. Vinblastine is used experimental or treatment of neoplasmas and for Hodakins disease, choric carcinoma. Vincristine and anothers active ingredients are used for leukemia in children (Banskota, 2002; Wang, 2004).[28]

4. PLUMBIGO ZEYLANICA

Botanical Classification

Kingdom : Plantae
Division : Angiosperms
Class : Rosids
Order : Caryophyllales
Family : Plumbaginaceae
Genus : *Plumbago*
Species : *P. zeylanica*

Plant Description

P. zeylanica is a subscadent, pretty perennial shrub described in Figure 4. Leaves and roots of P. zeylanica. with semi woody stems and numerous branches. Its leaves are simply alternate, ovate, narrowed into petiole, oblong-lanceolate and acute. Its flowers are borne in spikes,

wheras the rachis of the spike is pubescent or glandular (Figure 1). The Corolla white tube is long and slender. The roots are cylindrical and are irregularly bent having transverse shallow fissures at bents (Figure 1). Its fruits are oblong and its capsules are enclosed by persistent viscid calyx (Bhattacharjee, 1998; Chen et al., 2011.

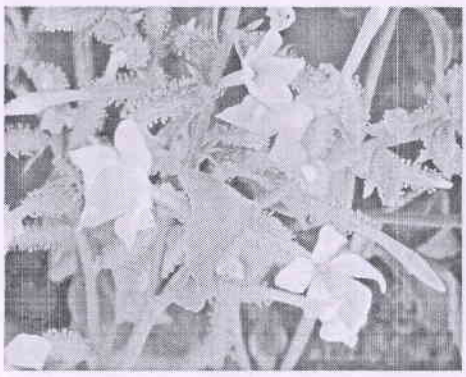


Fig 4.

Chemical Constituents

The chemical constituents from the Plumbago zeylanica L. the chemical constituents were isolated by various column chromatographic methods and their structures were elucidated as plumbazeylanone, plumbagic acid,β-sitosterol, lupeol, lup-20(29)-en-3,21-dione, norcanelilline, 3-O-glucopyranosylplumbagicacid methylester, uridine, daucosterol.

Anticancer Activity of Plumbigo Zeylanica

Preparation of extract drug and mode of administration In the present anticancer study, ethanolic extract of plumbago zeylanica (EEPZ) in the dose of 100 mg/kg and 200 mg/kg were prepared as suspension by dissolving the ethanolic extract in propylene glycol and sterile physiological saline containing Tween 20 to get the desired concentration8, 9.Administration of EEPZ reduces the tumour volume, packed cell volume and viable tumour cell count in a dose dependant manner when compared to EAC control mice. In EAC control mice the median survival time was 22±0.25 days. Whereas, it was significant increased median survival time (24±0.33, 29±0.49) with different doses (100 and 200 mg/kg) of EEPZ and standard drug respectively. The mean survival time and effect of EEPZ (100mg/kg, 200mg/kg) at different doses on tumour volume, viable and non viable cell count, are shown in table 2 and 3. EEPZ at the dose of 100 and 200 mg/kg the haemoglobin content in EAC bearing mice were increased to 10.6±0.057and 11.45±0.057.The haemoglobin contents in the EAC control mice (9.8± 0.02) was significantly decreased as compare to normal mice

(12.85± 0.25). (Table-7)The total WBC count was significantly higher in the EAC treated mice when compared with normal mice. Whereas EEPZ treated mice significantly reduced the WBC count as compared to that of control mice. Significant changes observed on differential count when extract treated mice compared with EAC control mice.[29] The ethanolic extract of Plumbago possessed significant anticancer and antioxidant activity due to its higher terpenoids and flavonoids content. Further investigation on different biological activities of this plant with different modes will not only validate the types of activities claimed by ayurvedic, siddha and traditional practitioners, but also will bring out plumbago zeylanica Linn. against Ehrlich Ascites Carcinoma in animal model. Results indicates that ethanolic extract of plumbago zeylanica Linn. possess significant anticancer activity and also reduce elevated level of lipid peroxidation due to higher content of terpenoids and flavonoids. Thus ethanolic extract of plumbago zeylanica Linn. could have vast therapeutic application against cancer.[30]

5. ANNONA RETICULATA

Botanical Classification

Kingdom : Plantae
Division : Angiosperms
Class : Rosids
Order : Magnoliales
Family : Annonaceae
Genus : *Annona*
Species : *Reticulata.*

Plant Description

A tree about 6m high. Bark thin and grey described in Figure 5. Leaves simple, alternate, 3.5-8 x1.5-4 cm, oblong – lanceolate or elliptic, obtuse or subacute, pellucidpunctate, glabrous above, glaucous and pubescent beneath when young; lateral nerves 8-11 pairs, petiole upto 2 cm long. Flower bisexual, drooping, green, solitary, leaf opposed or 2-4 on short extra axillary branchlets. Fruit globose, 5-10 cm in diameter, usually with a glaucous bloom on the surface when young, yellowish-green when ripe, easily broken into large pieces; areoles well marked, pulp white, sweet. Seeds many, arilate, brownish-black, smooth or polished and hard.[31]

Fig 5.

Chemical Constituents

Dopamine, Salsolinol, Coclaurine, Sesquiterpenes mainly Spathenelol, Muurolene, Copaene, Eudesmol, Acetogenin e Squamone, Solamin, Annomonicin, Rolliniastatin 2, Annoreticuin-9-one. Triterpenoid e annonaretin A.[32,33,34,35]

Bark Monotetrahydrofuron acetogenins, Reticulatacin, Diterpenes: (e)- kau-M-en-19-oiac cid acid and methyl 1b, 17-dihydro-(e)-kauran-19-oate, Alkaloids: Liriodenine, Copaene, Patchoulane and 1H-cycloprop (e) azulene, (-)Kau-16-en-19-oic acid, Bistetrahydrofurone acetogenin, Bullatacin.[36,37] Stem bark Dopamine, Salsolinol, Coclaurine, Diterpenes.

Anticancer Activity of Annona Reticulata

The antitumor activity was tested, when all the mice were divided into eight groups. Each group comprised of 4 mice (n=4), each mouse was weighed and received 1x106 EAC cells/mouse. This day was considered as day - 0. From the next day (Day - 1), group - 1,2, and 3 received (i.p.) methanol extract dissolved in DMSO at equally divided doses of 50mg/kg, 100mg/kg and 200mg/kg for 5 consecutive days, respectively. Similarly, group - 4 and 5 received (i.p.) petroleum ether extracts dissolved in DMSO at equally divided doses of 50mg/kg and 100mg/kg and group - 6 and 7 received (i.p.) same doses of chloroform extract for 5 consecutive days. The control group received nothing (positive control) or DMSO (negative control) for the same duration. All the mice were weighed on day - 5 and day - 10 and after day - 10, their length of survival was monitored. The weight and survival time readings of the treated group were compared with those of control. The mean survival time and percentage increase in life span. After treatment with various concentrations of different extracts for 5 consecutive days and further 5 days observation, mice those were in control group, chloroform group, and petroleum ether group showed significant rise in body weight (8% - 14% of weight on day - 1) compared to that of methanol group (0.45% - 0.94% of weight on day - 1) (Figure 5). Mice receiving methanol extract showed increased percentage

of weight gain with decreasing dose (50mg/kg - 0.94%; 100mg/kg - 0.74%, and 200 mg/kg - 0.45%).

6. TAXUS BUCCATA

Botanical Classification

Kingdom : Plantae
Division : Angiosperms
Class : Pinopsida
Order : Pinales
Family : Taxaceae
Genus : *Taxus*
Species : *buccata*

Plant Descrption

It is a small to medium-sized evergreen tree described in Figure 6, growing 10–20 m (35–65 ft) (exceptionally up to 28 m or 92 ft) tall, with a trunk up to 2 m (6 ft 7 in) (exceptionally 4 m or 13 ft 1 in) in diameter. The bark is thin, scaly brown, coming off in small flakes aligned with the stem. The leaves are flat, dark green, 1–4 centimetres (½–1+½ in) long and 2–3 mm (3⁄32–⅛ in) broad, arranged spirally on the stem, but with the leaf bases twisted to align the leaves in two flat rows either side of the stem, except on erect leading shoots where the spiral arrangement is more obvious. The leaves are poisonous.[38,39]

The seed cones are modified, each cone containing a single seed, which is 4–7 mm (3⁄16–¼ in) long, and partly surrounded by a fleshy scale which develops into a soft, bright red berry-like structure called an aril. The aril is 8–15 mm (5⁄16–9⁄16 in) long and wide and open at the end. The arils mature 6 to 9 months after pollination, and with the seed contained, are eaten by thrushes, waxwings and other birds, which disperse the hard seeds undamaged in their droppings. Maturation of the arils is spread over 2 to 3 months, increasing the chances of successful seed dispersal. The seeds themselves are poisonous and bitter, but are opened and eaten by some bird species including hawfinches,[40] greenfinches and great tits.[41] The aril is not poisonous, it is gelatinous and very sweet tasting. The male cones are globose, 3–6 mm (⅛–¼ in) in diameter, and shed their pollen in early spring. The yew is mostly dioecious, but occasional individuals can be variably monoecious, or change sex with time.[42]

Fig 6.

Anticancer Activity of Taxus Buccata

Cytotoxic activity of the methanolic extract of leaves displayed the highest flavonoid content, it was used for the cytotoxic activity of the methanolic extracts of T. baccata leaves and seed cones was analyzed on HCT-116 and MDAMB-231 cell lines, using an MTT viability assay. The effect of both extracts was expressed by IC50 (inhibitory dose that inhibits cells growth for 50%). The T. baccata leaf extract was cytotoxic on HCT-116 cells with IC50 values lower than 30 µg/ml, which was considered good cytotoxic activity for crude extracts (Suffness and Pezzuto, 1990), while the extract of seed cones showed weaker effects. The extracts did not produce significant cytotoxic effects on the MDA-MB-231 cell line further cytotoxicity tests.[39,40]

7. *COCOS NUCIFERA*

Botanical Classification

Kingdom : Plantae
Division : Angiosperms
Class : Monocots
Order : Arecales
Family : Arecaceae
Genus : *Cocos*
Species : *Nucifera*

Plant Descrption

Cocos nucifera is a large palm, growing up to 30 m (100 ft) tall described in Figure 7, with pinnate leaves 4–6 m (13–20 ft) long, and pinnae 60–90 cm (2–3 ft) long; old leaves break away cleanly, leaving the trunk smooth.[41] On fertile soil, a tall coconut palm tree can yield up to 75 fruits per year, but more often yields less than 30.[42,43,44] Given proper care and

growing conditions, coconut palms produce their first fruit in six to ten years, taking 15 to 20 years to reach peak production.[45]

True-to-type dwarf varieties of Pacific coconuts have been cultivated by the Austronesian peoples since ancient times. These varieties were selected for slower growth, sweeter coconut water, and often brightly-colored fruits.[46] Many modern different varieties are also grown, including the Maypan coconut, King coconut, and Macapunó. These vary by the taste of the coconut water and color of the fruit, as well as other genetic factors.[47]

Phytochemical studies of the coconut fiber (mesocarp) ethanolic extract revealed that the presence of phenols, tannins, leucoanthocyanidins, flavonoids, triterpenes, steroids, and alkaloids[48] while a butanol extract recovered triterpenes, saponins, and condensed tannins[49] Notably, compounds like flavonoids having antioxidant action are widely distributed in edible vegetables, fruits, and many herbs[50-52] Condensed tannins are reported to possess antihelminthic activity by binding to proteins present in the cuticle, oral cavity, esophagus, and cloaca of nematodes, thus intensifying the physical and chemical damage in helminth.[53]

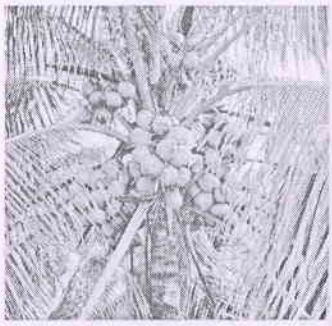


Fig 7.

Chemical Constituents

The lyophilized extract and fractions, as well as ethyl acetate extracts, from the *C. nucifera* fiber are rich in polyphenols, compounds such as catechins, epicatechins, tannins, and flavonoids.[54,55,56,57] The constituents of the liquid albumen were identified as vitamin B, nicotinic acid (B3, 0.64µg/mL), pantothenic acid (B5, 0.52 µg/mL), biotin (0.02 µg/mL), riboflavin (B2, <0.01 ng/mL), folic acid (0.003 µg/mL), with trace quantities of vitamins B1, B6, and C, pyridoxine, thiamine, folic acid, amino acids, L-arginine, plant hormones (auxin, 1,3-diphenylurea, cytokinin), enzymes (acid phosphatase, catalase, dehydrogenase, diastase, peroxidase, RNA polymerases), and growth-promoting factors.[58-60] Furthermore, oil extracted from the solid albumen is primarily lauric acid and alpha tocopherol.[61] Root

phenolic compounds were identified as flavonoids and saponins.[62] Other compounds identified in leaf epicuticular wax were lupeol methylether, skimmiwallin, [3b-methoxy-25-ethyl-9,19-cyclolanost-24(241)-ene], and isoskimmiwallin [3b-methoxy-24-ethyl-9,19-cyclolanost-25(251)-ene].[63]

Anticancer Activity of Coccus Nucifera

Cytotoxic activity against MCF-7 (human breast cancer cell line) was performed following the standard protocol of the National Cancer Institute, using the metabolic reduction of 3-(4,5-dimetylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) (Sigma Aldrich, USA) by the mitochondrial succinate-dehydrogenase as a measure of viability of the cells. MCF-7 cells were seeded (4×10^4 cells per well) in a final volume of 100 µl/well in 96-well plates and incubated with Roswell Park Memorial Institute medium (RPMI-1640,Sigma-Aldrich, USA) supplemented with gentamicin (0.05 mg/ml), L-glutamine (Gibco, Invitrogen, Carlsbad, CA, USA; 2 mM), NaHCO3 (Sigma-Aldrich, USA 4.6 mM), HEPES buffer (Sigma-Aldrich, USA 25 mM), and FBS (10%) (Gibco), at 37°C. After attachment, they were treated with test samples. After incubation at 37°C for 72 h, the cells were fixed with cold trichloroacetic acid at 20% (w/v) for 2 h and stained with Sulforhodamine B (SRB) (Sigma-Aldrich, USA) dye for 30 minutes. The protein-bound dye is dissolved in Tris base solution for OD determination at 540 nm on an ELISA Plate Reader. Adriamycin diluted in DMSO was used as the positive control (normal IC_{50} value 20–50 nM).

8. PLUMERIA RUBRA

Botanical Classification

Kingdom : Plantae
Division : Angiosperms
Class : Dicots
Order : Gentianales
Family : Apocynaceae
Genus : *Plumeria*
Species : *P. rubra*

Plant Descrption

Plumeria rubra belongs to the dogbane family and grows as a spreading shrub or small tree to a height of 2–8 m (5–25 ft) and similar width[64] described in Figure 8. It has a thick succulent trunk and sausage-like blunt branches covered with a thin grey bark. The branches

are somewhat brittle and when broken, ooze a white latex that can be irritating to the skin and mucous membranes. This latex found in the stem of the plants is in fact toxic, but not deadly unless present in large quantities.[65] The large green leaves can reach 30 to 50 cm (12 to 20 in) long and are arranged alternately and clustered at the end of the branches. The boles of these plants can be up to 25 cm in the wild. It tends to be smaller in cultivation.

They are deciduous, falling in the cooler months of the year. The flowers are terminal, appearing at the ends of branches over the summer. Often profuse and very prominent, they are strongly fragrant, and have five petals. The flowers give off their fragrance in the morning and in the evening. This fragrance is similar to that of rose, citrus, and cinnamon. The colors range from the common pink to white with shades of yellow in the centre of the flower.[66] Initially tubular before opening out, the flowers are 5–7.5 cm (2–3 in) in diameter, and only rarely go on to produce seed - 20-60 winged seeds are contained in a 17.5 cm (7 in) pod. The fruits are cylindrical pods that are rarely found in cultivation.

Fig 8.

Chemical Constituents

The flower volatile constituents of Plumeria rubra L. grown in foothills of north India were analyzed by gas chromatography (GC) and GC-mass spectrometry (GC-MS). Altogether 31 constituents, representing 94.0% of flower essential oil and 89.2% of steam volatile extract were identified. Benzyl esters (49.0%, 41.4%), aliphatic alkanes (25.8%, 7.2%), oxygenated monoterpenes (0.1%, 27.1%), oxygenated sesquiterpenes (9.5%, 8.8%), and diterpene (9.4%, 0.2%), were the major class of constituents. Benzyl salicylate (26.7%, 33.5%), benzyl benzoate (22.3%, 7.9%), geraniol (trace, 17.2%), (E,E)-geranyl linalool (9.4%, 0.2%), tricosane (8.3%, 1.1%), linalool (0.1%, 8.0%), nonadecane (7.0%, 3.8%), (E)-nerolidol (7.0%, 5.5%), and pentacosane (4.4%, 0.3%) were the major constituents identified in flower oil and hydrodistilled volatile distillate.

Anticancer Activity of Plumeria Rubra

Tumor cells Ehrlich ascites carcinoma (EAC) cells were obtained from Bhopal Cancer Research Centre, Bhopal (MP), India. EAC cells were maintained in vivo in Swiss albino mice by weekly intraperitoneal (i.p.) inoculation of 1×106 cells/mouse after every ten days. EAC cells 9 days old were used for the screening of the MEMP. Viable/non-viable tumor cell count (Tryphan blue dye assay) The cells were then stained with tryphan blue (0.4% in normal saline) dye. The cells that did not take up the dye were viable and those that took the stain were nonviable. These viable and nonviable cells were counted. Cytotoxicity was assessed by incubating 1 X 106 EAC cells in 1 ml phosphate buffer saline with varying concentration (50-1000 µg/ml) of the extract at 37°C for 3 hour in CO2 atmosphere. The viability of cells was determined by tryphan blue dye where as visible cells exclude the dye.The pharmacological studies showed significant anticancer properties at the dose of 200mg/kg and 400 mg/kg with ethanolic extract of leaves of Plumeria rubra (Linn). Therefore further studies are required to isolate and characterize the active principles of Plumeria rubra (Linn) which can offer enhanced anti-cancer activity and to establish their mechanism of action.

9. CENTELLA ASIATICA

Botanical Classification

Kingdom : Plantae
Division : Angiosperms
Class : Dicots
Order : Apiales
Family : Apiaceae
Genus : *Centella*
Species : *C.asiatica*

Plant Descrption

Centella asiatica (CA), a clonal, perennial herbaceous creeper belonging to the family *Umbellifere* (*Apiceae*) is found throughout India shown in Figure 9 growing in moist places up to an altitude of 1800 m. It is found in most tropical and subtropical countries growing in swampy areas, including parts of India, Pakistan, Sri Lanka, Madagascar, and South Africa and South pacific and Eastern Europe. About 20 species related to CA grow in most parts of the tropic or wet pantropical areas such as rice paddies, and also in rocky,

higher elevations.[67] It is a tasteless, odourless plant that thrives in and around water. It has small fan-shaped green leaves with white or light purple-to-pink or white flowers and it bears small oval fruit (fig. 1). The whole plant is used for medicinal purposes.[68]

Fig. 9.

Chemical Constituents

The primary active constituents of CA are saponins (also called triterpenoids), which include asiaticosides, in which a trisaccharide moiety is linked to the aglycone asiatic acid, madecassoside and madasiatic acid.[69] These triterpene saponins and their sapogenins are mainly responsible for the wound healing and vascular effects by inhibiting the production of collagen at the wound site. Other components isolated from CA, such as brahmoside and brahminoside, may be responsible for CNS and uterorelaxant actions, but are yet to be confirmed by clinical studies. Crude extract containing glycosides isothankuniside and thankuniside showed antifertility action in mice.[70,71] Centelloside and its derivatives are found to be effective in the treatment of venous hypertension. In addition, the total extract contains plant sterols, flavonoids, and other components with no known pharmacological activity[72] namely, abundant tannins (20-25%), essential acid (0.1% with beta-chariophylen, trans-beta-pharnesen and germachrene D), phytosterols (campesterol, sitosterol, stigmasterol), mucilages, resins, free aminoacids (alanine, serine, aminobutyrate, aspartate, glutamate, lysine and treonine), flavonoids (derivates of chercetin and kempferol), an alkaloid (hydrochotine), a bitter component (vallerine), fatty acids (linoleic acids, linolnelic, oleic, palmitic and stearic acids).

Anticancer Activity of Centella Asiatica

The crude extract of *Centella asiatica* showed its anticancer effect in ehrlich ascites tumour cells (EAC), dalton's lymphoma ascites tumour cells (DLA). Oral administration of crude extract of *Centella asiatica* showed an anticancer effect along with the increased the life span of tumour bearing mice. The presence of active components such as Triterpenes, phenolic

and flavanoids constituents were responsible for the potent anti proliferative effect of this medicinal plant. Asiatic acid is a pentacyclic triterpene an active component of this medicinal plant *Centella asiatica* decreased the viability of the cells and induced the process of apoptosis in human melanoma SK-MEL-2 cells The aqueous extract of the medicinal plant *Centella asiatica* leaves explored a promising activity against the mouse melanoma B16F1 cells, human breast cancer MDA MB-231 cell and rat glioma (C6) cell lines. The of methanolic extract of the medicinal plant *C. asiatica* explored the process of apoptosis in different cancer cell lines, eg: MCF-7 cells.[73-77]

10. CALOTROPIS GIGANTEA

Botanical Classification

Kingdom : Plantae
Division : Angiosperms
Class : Dicots
Order : Gentianales
Family : Apocynaceae
Genus : *Calotropis*
Species : ***C. gigantea***

Plant Descrption

A large shrub, much branched, gregarious, young branches covered with white, cottony hairs, contains milky latex shown in Figure 10 Stem: Erect, branched, cylindrical, solid, contains milky latex. Leaves: 4-8 inches long, decussate, obovate or elliptic-oblong, shortly acute, subsessile, cordate or often amplexical at the base. Inflorescence: Umbellate cymes. Flowers: Large, white, not scented, peduncles arising between the petioles. Flower-buds ovoid, angled, Calyx lobes 5, divided to the base, white, ovate; corolla broadly rotate, valvate, lobes 5, deltoid ovate, reflexed, coronate-appendages broad, obtusely 2-auricled below the rounded apex which is lower than the staminal-column. Stamens 5, anthers short with membranous appendages, inflexed over the depressed apex of the pentagonal stigma. Pollinium one in each cell, pendulous caudicles slender. Carpels 2 distinct, styles 2, united to the single pentagular stigma, ovary 2-celled, ovules many.

Fig 10.

Chemical Constituents

Four new chemical constituents including one naphthalene derivative, named calotropnaphthalene, two terpene derivatives, namely calotropises juiterpenol and calotropisesterterpenol and an aromatic product designated as calotropbenzofuranone along with a known compound, sucrose, have been isolated from the roots of the Calotropis gigantea. The structures of these chemical constituents have been established as 1-methoxy-4-ethyl naphthalene, 6-(2-methyl-2, 3-dihydroxypenty1)-11, 11-dimethyl cyclohex-8-ene-10-one-7-oic isopentenyl ester, 14-(15, 15-dimethyl cyclohexanyl-14, 19, 25-tricyclo)- 3,7,11-trihydroxymethylene-tridecane and 8,15-dihydro benzofuranyl-18-hepta-7,15-dione-16-oic acid, respectively.[78]

Anticancer Activity of Calotropis Gigantea

In EAC tumor bearing mice, a regular rapid increase in ascitic tumor volume was observed. Ascitic fluid is the direct nutritional source for tumor cells and a rapid increase in ascitic fluid with tumor growth would be a means to meet the nutritional requirement of tumor cells.[79,80] In this investigation, treatment with ME and CF decreased the viable tumor cell count and increased the life span of the tumor bearing mice. The reliable criteria for judging the value of any anticancer drug are the prolonga-tion of the life span of animals.[81] ME and CF by decreasing the nutritional fluid volume and arresting the tumor growth increases the life span of EAC-bearing mice. Thus, ME and CF has potent antitumor activity against EAC bearing mice. Myelosupression is a frequent and major complication of cancer chemotherapy. In this study, ME and CF treatment and subsequent tumor inhibition resulted in appreciable improvements in hemoglobin content, RBC and WBC counts. These observations assume great significance, as anemia is a common complication in cancer and the situation aggravates further during chemotherapy since a majority of antineoplastic agents exert suppressive effects on erythropoiesis and thereby limiting the use of these drugs. The improvement in hematological profile of the tumor bearing mice following the treatment with

ME and CF could be due to the action of the different phytoconstituents present in the extract and fraction. Numerous studies on the enzymes of carbohydrate metabolism in cancer showed that actively dividing neoplastic tissues require more energy than normal cells. The consequent display of a high rate of glycolysis in malignant conditions is clinically manifested in the increased activity of several serum enzymes. In our study, fourteen (14) days of inoculation with EAC brought the significant elevation in the levels of SGOT and SALP. Treatment with ME and CF restored the elevated biochemical parameters more or less to normal range thereby indicating the protective effect on the tumour induced complication However some extent of hepatotoxicity was associated with the treatment of ME (20 mg/kg) and CF (40 mg/kg) as indicated by the elevation in the levels of SGPT. Some phytochemicals present in ME and CF may be responsible for this elevation. The result of the present investigation is quite encouraging and it explores in vivo the potent anticancer activity of ME and CF of root bark of C. gigantea L. probably because of its direct cytotoxic effect. No significant results were obtained for PEF. In vitro some phytochemicals with potent cytotoxic effect have already been reported from the root bark of C. gigantea. Our preliminary thin layer chromatography (TLC) screening also showed that ME and CF contained flavonoid, glycosides, saponin, steroids and terpenoids type compounds. Many such type of compounds are known to possess potent antitumor properties. Further investigations are in progress in the laboratory to identify the active principles involved in this antitumor activity and investigate the mechanism of inhibition.

CONCLUSION

This review explored about Ten traditional medicinal plants with its active components, which were responsible for its anticancer activity. These traditional medicines were involved in treating cancer as well as reducing the adverse effect of the alternative medicines including chemotherapy and radiotherapy due to the naturally presence of anti oxidants in the traditional medicinal herbs. In this review the authors made much more effect in collecting the various anticancer medicinal plants from various research articles using search engines like Google scholar, Pubmed, Scopus, Medline tools. This review will provide more informations about the medicinal plants in the field of cancer and also it will be more usefull to the persons who were seeking for the best medicines for cancer with minimal side effects.

AKNOWLEDGEMENT

First and foremost I would like to thank the Almighty for his showers, grace, strength and caliber for doing various research. In the name of *Siddhars* who has given me power and courage to accomplish this work, I bow my head on thanks and gratitude to *Siddhars* for their blessings.

Anticancer Agent: Uncontrolled growth of cell & destroy body tissue is called cancer. Anticancer agents are those which work against the cancer.

REFERENCES

1. American Cancer Society. Cancer Facts & Figures. Atlanta: American Cancer Society, 2010.
2. Guy BF. A brief history of cancer: Age-old milestones underlying our current knowledge database. Int J Cancer, 2015; 136(9): 2022-36.
3. Flora of china, 13: 311,313.
4. Archived copy". Archived from the original on 2013-12-03. Retrieved 2014-05-18
5. *Saleem, A.; Husheem, M.; Härkönen, P.; Pihlaja, K. "Inhibition of cancer cell growth by crude extract and the phenolics of Terminalia chebula retz. Fruit". Journal of Ethnopharmacology, 2002; 81(3): 327–336.* doi:10.1016/S0378-8741(02)00099. PMID 12127233.
6. *Lee, H. S.; Jung, S. H.; Yun, B. S.; Lee, K. W. "Isolation of chebulic acid from Terminalia chebula Retz. And its antioxidant effect in isolated rat hepatocytes". Archives of Toxicology, 2007; 81(3): 211–218.* doi:10.1007/s00204-006-0139-4. PMID 16932919. S2CID 25751621.
7. *Lee, H. S.; Koo, Y. C.; Suh, H. J.; Kim, K. Y.; Lee, K. W. "Preventive effects of chebulic acid isolated from Terminalia chebula on advanced glycation endproduct-induced endothelial cell dysfunction". JournalofEthnopharmacology, 2010; 131(3): 567574.* doi:10.1016/j.jep.2010.07.039. PMID 20659546.
8. *Nierenstein, M.; Potter, J.* "The distribution of myrobalanitannin". *The Biochemical Journal, 1945; 39(5): 390 92.* doi:10.1042/bj0390390. PMC 1258254. PMID 16747927.
9. *Han, Quanbin; Song, Jingzheng; Qiao, Chunfeng; Wong, Lina; Xu, Hongxi.* "Preparative isolation of hydrolysable tannins chebulagic acid and chebulinic acid from Terminalia chebula by high-speed counter-current chromatography" (PDF). *J. Sep. Sci., 2006; 29(11): 1653–1657.* doi:10.1002/jssc.200600089. PMID 16922284

10. Skehan P., Storeng R., Scudiero D., Monks A., McMahon J., Vistica D., Warren J. T., Bokesch H., Kenney S. and Boyd M. R.; New Colorimetric Cytotoxicity Assay for Anticancer-Drug Screening J. Natl. Cancer Inst, 1990; 82: 1107.
11. Kirtikar KR, Basu BD. Vol. 3. Dehradun, India: International Booksellers and Publishers. Indian medicinal plants, 1975; 667. [Google Scholar]
12. Bhitre MJ, Patil S, Kataria M, Anwikar S, Kadri H. Antiinflammatory activity of the fruits of *Semecarpus anacardium* Linn. *Asian J Chem.,* 2008; 20: 2047–50.
13. Rao NS, Row LR, Brown RT. Phenolic constituents of *Semecarpus anacardium. Phytochemistry,* 1973; 12: 671–81. [Google Scholar]
14. Ishatulla K, Ansari WH, Rahman W, Okigawa M, Kawanon N. Bioflavanoids from *Semecarpus anacardium* linn. *Indian J Chem.,* 1977; 15: 617–22. [Google Scholar]
15. Govindachary TR, Joshi BS, Kamal VM. Phenolic constituents of *Semecarpus anacardium. Indian J Chem.,* 1971; 9: 1044. [Google Scholar]
16. Indap MA, Ambaye RY, Gokhale SV. Anti tumour and pharmacological effect of oil from *Semecarpus anacardium* Linn.f. *Indian J Physiol Pharmacol,* 1983; 27: 83–91. [PubMed] [Google Scholar]
17. Majumdar SH, Kulkarni SB, Chakraborthy GS. Medicinal potientials of *Semecarpus anacardium* nut: A review. *J Herb Med Toxicol,* 2008; 2: 9–13. [Google Scholar]
18. Murthy SS. Semicarpetin: A bifl avonoid from *Semecarpus anacardium. Phytochemistry,* 1988; 27: 3020–2. [Google Scholar]
19. Murthy SS. A biflavanone from *Semecarpus anacardium. Phytochemistry,* 1983; 22: 1518–20. [Google Scholar]
20. Murthy SS. Naturally occurring biflavonoid derivatives: Galluflavanone, a new biflavonoid from *Semecarpus anacardium. Indian J Chem.,* 1985; 24: 398–402. [Google Scholar]
21. Rahman KM, Rahman MS, Begum Rashid B. Preliminary cytotoxicity screening of some medicinal plants of Bangladesh, Dhaka Univ. *J Pharm Sci.,* 2008; 7: 47–52. [Google Scholar]
22. Gedam PH, Sampathkumaran PS, Sivasamban MA. Composition of bhilawanol from *Semecarpus anacardium. Indian J Phytochem,* 1974; 13: 513–5. [Google Scholar]
23. Murthy SS. New biflavonoid from Semecarpus *anacardium* linn. *Clin Acta Turcica,* 1992; 20: 30. [Google Scholar]
24. Ngo, Quoc Anh, Roussi, Fanny, Cormier, Anthony; Thoret, Sylviane; Knossow, Marsel, Cruenard, Daniel; Gueritte, Francoise. "Synthesis and Biological evalution of vinca

alkaloids and and phomopsin hybrids". *Journal of Medicinal Chemistry,* 2009; 52(1): 134-142. doi:10 . 1021/jm801064y. PMID 19072542.

25. Vacca A, Iurlaro M, Ribatti D, Minischetti M, Nico B, Ria R, et al. Antiangiogenesis is produced by nontoxic doses of vinblastine. *Blood.,* 1999; 94: 4143–55. [PubMed] [Google Scholar]
26. Klement G, Baruchel S, Rak J, Man S, Clark K, Hicklin DJ, et al. Continuous low-dose therapy with vinblastine and VEGF receptor-2 antibody induces sustained tumor regression without overt toxicity. *J Clin Invest,* 2000; 105: R15–24. [PMC free article] [PubMed] [Google Scholar]
27. Wang LG, Liu XM, Kreis W, Budman DR. The effect of antimicrotubule agents on signal transduction pathways of apoptosis: A review. *Cancer Chemother Pharmacol,* 1999; 44: 355–61. [PubMed] [Google Scholar]
28. Banskota A.H. Antiproliferrtive activity of vietnamose medical plants. *Biological Pharmaceutical Bulletin*., 2002; 25(6): 753-60.
29. Ng TB, Gao W, Li L, Niu SM, Zhao L, Liu J, Shi LS, Fu M , Liu F, Rose (Rosa rugosa) – flower extract increases the activities of antioxidant enzymes and their gene expression and reduce lipid peroxidation. Biochem. Cell Biol., 2005; 83: 78-85.
30. Teresa K, Joseph S, Preparative Layer Chromatography, chromatographic science series, 1995.
31. Kapoor L.D, Hand book of Ayurvedic Medicinal Plants, CRC Press LLC, First Indian Reprint, 2005; 41–42, ISBN No. 0-8493- 2929-9.
32. Nirmal SA, Gaikwad SB, Dhasade VV, Dhikale RS, Kotkar PV, Dighe SS. Anthelmintic activity of Annona reticulata leaves. Res J Pharm Biol Chem Sci., 2010; 1: 115e118 13. Bhalke RD, Chavan MJ. Analgesic and CNS depressant activities of extracts of Annona reticulata Linn. bark. Phytopharmacology, 2011; 1: 160e165.
33. Mazumder UK, Gupta M, Maiti S and Mukherjee M. Antitumor activity of *Hygrophilaspinosa* on ehrlich ascites carcinoma and sarcoma-180 induced mice. *Indian J Expt Biol*., 1997; 35: 473-477.
34. Islam RM, Rahman SM, Ahmed M, et al. Antinociceptive activity studies with methanol extract of Annona reticulata L. (annonaceae) and Carissa carandas L. (Apocynaceae) leaves in Swiss albino mice. Adv Nat Appl Sci., 2012; 6: 1313e1318.
35. Thang TD, Kuo PC, Huang GJ, et al. Chemical constituent from the leaves of Annona reticulata and their inhibitory effects on NO production. Molecule, 2013; 18: 4477e4486.19. Chavan MJ, Kolhe DR, Wakte PS, Shinde DB. Analgesic and anti-

inflammatory activity of Kaur-16-en-19-oic acid from Annona reticulata L. Bark. Phytother Res., 2012; 26: 273e276.

36. Saad JM, Huri Y, Rupprecht JK, et al. Reticulatacin: a new bioactive acetogenin from Annona reticulata (Annonaceae). Tetrahedron, 1991; 47: 2751e2756.
37. Chavan MJ, Wakte PS, Shinde DB. Analgesic and anti-inflammatory activities of the sesquiterpene fraction from Annona reticulata L. Bark. Nat Prod Res., 2012; 26: 1515e1518.
38. Emami, A., Sadeghi-aliabadi, H., Saedi, M. and A. Jafarian. Cytotoxic evaluations of Iranian Conifers on cancer cells. Pharm. Biol., 2005; 43: 299-304.
39. *Snow, David; Snow, Barbara. Birds and Berries. London: A & C Black, 2010; 29-30. ISBN 9781408138229.*
40. Jump up to:[a] [b] Dallimore, W., & Jackson, A. B. *A Handbook of Coniferae and Ginkgoaceae* 4th ed. Arnold, 1966.
41. T. Pradeepkumar, B. Sumajyothibhaskar, and K.N. Satheesan. *Management of Horticultural Crops* (Horticulture Science Series Vol.11, 2nd of 2 Parts). New India Publishing, 2008; 539–587. ISBN 978-81-89422-49-3.
42. Jump up to:[a] [b] Grimwood, 18.
43. Sarian, Zac B. (August 18, 2010). New coconut yields highArchived November 19, 2011, at the Wayback Machine. *The Manila Bulletin*. Retrieved April 21, 2011.
44. Ravi, Rajesh. (March 16; 2009). Rise in coconut yield, farming area put India on top Archived May 15, 2013, at the Wayback Machine. *The Financial Express*. Retrieved April 21, 2011.
45. *"How Long Does It Take for a Coconut Tree to Get Coconuts?". Home Guides – SF Gate. Archived from the original on November 13, 2014.*
46. Jump up to:[a] [b] [c] *Lebrun, P.; Grivet, L.; Baudouin, L. "Use of RFLP markers to study the diversity of the coconut palm". In Oropeza, C.; Verdeil, J.K.; Ashburner, G.R.; Cardeña, R.; Santamaria, J.M. (eds.). Current Advances in Coconut Biotechnology. Springer Science & Business Media, 2013; 83–85. ISBN 9789401592833.*
47. *"Coconut Varieties". floridagardener.com. Archived from the original on October 20, 2015. Retrieved May 19, 2016.*
48. Matos FJA. Introdução è fitoquímica experimental. 2nd edn. Fortaleza: Imprensa Universitária, 1997.
49. Costa CT, Bevilaqua CM, Morais SM, Camurca-Vasconcelos AL, Maciel MV, Braga RR, et al. Anthelmintic activity of *Cocos nucifera* L. on intestinal nematodes of mice. Res

Vet Sci., 2010; 88: 101–103. doi: 10.1016/j.rvsc.2009.05.008. » https://doi.org/10.1016/j.rvsc.2009.05.008

50. Chao J, Lee MS, Amagaya S, Liao JW, Wu JB, Ho LK, et al. Hepatoprotective effect of shidagonglao on acute liver injury induced by carbon tetrachloride. Am J Chin Med., 2009; 37: 1085–1097.
51. Huang X, Kojima-Yuasa A, Xu S, Kennedy DO, Hasuma T, Matsui-Yuasa I. Combination of *Zizyphus jujuba* and green tea extracts exerts excellent cytotoxic activity in HepG2 cells via reducing the expression of APRIL. Am J Chin Med., 2009; 37: 169–179.
52. Yook HS, Kim KH, Park JE, Shin HJ. Antioxidative and antiviral properties of flowering cherry fruits (*Prunus serrulata* L. var. spontanea). Am J Chin Med., 2010; 38: 937–948.
53. Hoste H, Jackson F, Athanasiadou S, Thamsborg SM, Hoskin SO. The effects of tannin-rich plants on parasitic nematodes in ruminants. Trends Parasitol, 2006; 22: 253–261, doi: 10.1016/j.pt.2006.04.004. » https://doi.org/10.1016/j.pt.2006.04.004
54. Mendonca-Filho RR, Rodrigues IA, Alviano DS, Santos AL, Soares RM, Alviano CS, et al. Leishmanicidal activity of polyphenolic-rich extract from husk fiber of *Cocos nucifera* Linn. (Palmae). Res Microbiol, 2004; 155: 136–143, doi: 10.1016/j.resmic.2003.12.001. » https://doi.org/10.1016/j.resmic.2003.12.001
55. Rodrigues S, Pinto GAS. Ultrasound extraction of phenolic compounds from coconut (*Cocos nucifera*) shell powder. J Food Eng 2007; 80: 869–872.
56. Freitas JCC, Nunes-Pinheiro DCS, Pessoa AWP, Silva LCR, Girão VCC, Lopes-Neto BE, et al. Effect of ethyl acetate extract from husk fiber water of *Cocos nucifera* in *Leishmania braziliensis* infected hamsters. Rev Bras Farmacogn, 2011; 21: 1006–1011, doi: 10.1590/S0102-695X2011005000138. » https://doi.org/10.1590/S0102-695X2011005000138
57. Magda RR. Coco soft drink: health beverage from coconut water. Food Market Technol, 1992; 6: 22–23.
58. Yong JW, Ge L, Ng YF, Tan SN. The chemical composition and biological properties of coconut (*Cocos nucifera* L.) water. Molecules, 2009; 14: 5144–5164, doi: 10.3390/molecules14125144. » https://doi.org/10.3390/molecules14125144
59. Solangih A, Iqbal ZA. Chemical composition of meat (kernel) and nut water of major coconut (*Cocos nucifera* L.) cultivars at coastal area of Pakistan. Pak. Am J Bot., 2011; 43: 357–363.

60. Tangwatcharin P, Khopaibool P. Activity of virgin coconut oil, lauric acid or monolaurin in combination with lactic acid against *Staphylococcus aureus* Southeast Asian J Trop Med Public Health, 2012; 43: 969–985.
61. Arlee R, Suanphairoch S, Pakdeechanuan P. Differences in chemical components and antioxidant-related substances in virgin coconut oil from coconut hybrids and their parentes. Int Food Res J., 2013; 20: 2103–2109.
62. Pal D, Sarkar A, Gain S, Jana S, Mandal S. CNS depressant activities of roots of *Coccos nucifera* in mice. Acta Pol Pharm., 2011; 68: 249–254.
63. Erosa FE, Gamboa-León MR, Lecher JG, Arroyo-Serralta GA, Zizumbo-Villareal D, Oropeza-Salín C, et al. Major components from the epicuticular wax of *Cocos nucifera* Rev Soci Química México, 2002; 46: 247–250.
64. D.J. Ecobichon, Fixed Dose Procedure, Guidline 420, The Basis of Toxicity Testing, II edition, (CRC Press, 1997) 43. 5. R.A. Turner Screening method in Pharmacology, (Academic Press, New York, 1965) 299. 6. S.K. Natesan, S. Badami, S. H. Dongre, A. Godavarthi, Journal of Pharmacological Sciences, 2007; 103: 12–23.
65. "Botanica. The Illustrated AZ of over 10000 garden plants and how to cultivate them", p. 691. Könemann, 2004. ISBN 3-8331-1253-0
66. Criley, Richard A (February 1998). "Ornamentals and Flowers OF-24: Plumeria" (PDF). *Cooperative Extension Service, C/T/A/H/R*. Department of Horticulture, College of Tropical Agriculture & Human Resources, University of hawaii at Manoa. Retrieved 31 January 2010. NINE
67. Bown D. *Encyclopaedia of Herbs and their Uses.* London: Dorling Kindersley, 1995; 361–5. [Google Scholar]
68. Singh P, Singh JS. Recruitment and competitive interaction between ramets ans seedlings in a perennial medicinal herb, *Centella asiatica. Basic Appl Ecol,* 2002; 3: 65–76. [Google Scholar]
69. Singh B, Rastogi RP. A reinvestigation of the triterpenes of *Centella asiatica. Phytochem,* 1969; 8: 917–21. [Google Scholar]
70. Heidari M, Jamshedi AH, Akhondzadeh SH, Ghaffari NM, Sadeghi MR, Khansari GM, et al. Evaluating the effects of *Centella asiatica* on spermatogenesis in rats. *Med J Reprod Infertility,* 2007; 7: 367–74. [Google Scholar]
71. Duke J. *Handbook of Medicinal Herbs.* Boca Raton, FL: CRC Press, 1985; 101–1. [Google Scholar]

72. Srivastava R, Shukla YN, Kumar S. Chemistry and pharmacology of *Centella asiatica*: a review. *J Med Arom Plant Sci.,* 1997; 19: 1049–56. [Google Scholar]
73. Chul PB, Kefa BO, Eung-Seok L, Soo LY, Jung-Ae K. Asiatic Acid Induces Apoptosis in SK-MEL-2 Human Melanoma Cells. Cancer Lett., 2005; 218(1): 81-90.
74. Cho CW, Choi DS, Cardone MH, Kim CW, Sinskey AJ, Rha C. Glioblastoma cell death induced by asiatic acid. Cell Biol Toxicol, 2006; 22(6): 393-408.
75. Heidari M, Heidari-Vala H, Sadeghi MR, Akhondi MM. The inductive effects of *Centella asiatica* on rat spermatogenic cell apoptosis *in vivo*. J Nat Med., 2012; 66(2): 271-8.
76. Rai N, Agrawal RC, Khan A. Chemopreventive Potential of *Centella asiatica* on B6F10 Melanoma Cell Lines in Experimental Mice. Pharmacologyonline, 2011; 1: 748-58.
77. Suboj B, Jose P, Priya PS, Vinod V, Karedath AAT, Priya S, Srinivas G. Apoptosis Induction of *Centella Asiatica* on Human Breast Cancer Cells. Afr J Trad Complement Altern Med., 2009; 6(1): 9-16.
78. Kiuchi F, Fukao Y, Maruyama T, Obata T, Tanaka M, Sasaki T, et al. Cytotoxic principles of a Bangladeshi crude drug, akond mul (roots of Calotropis gigantea L.). Chem Pharm Bull, 1998; 46: 528-530.
79. Zhu-Nian W, Mao-Yuan W, Wen-Li M, Zhuang H, Hao-Fu D. A new cytotoxic pregnanone from Calotropis gigantea. Molecules, 2008; 13: 3033-3039.
80. Shimizu M, Azuma C, Taniguchi T, Murayama T. Expression of cytosolic phospholipase A2 in murine C12 cells, a variant of L929 cells, induces arachidonic acid release in response to phorbol myristate acetate and Ca2+ ionophores, but not to tumor necrosis factor- J Pharmacol Sci., 2004; 96: 324-332.
81. Wang L, Ran Q, Li DH, Yao HQ, Zhang YH, Yuan ST, et al. Synthesis and anti-tumor activity of 14-O-derivatives of natural oridonin. Chin J Nat Med., 2011; 9(3): 194-198.

WORLD JOURNAL OF PHARMACY AND PHARMACEUTICAL SCIENCES

SJIF Impact Factor 7.632

Volume 10, Issue 6, 1594-1598 Research Article ISSN 2278 – 4357

A SCIENTIFIC VALIDATION IN FREE RADICAL SCAVENGING ACTIVITY OF *GANDHGA CHENDHOORAM* THROUGH DPPH ANALYSIS

Kayalvizhi S.*, Samroothul Parveen I.[2] and Saravanan A.S.[3]

[1]Lecturer, Department of Gunapadam, JSA Medical College for Siddha and Research centre, Pali, Ulundhurpet.

[2,3]Post graduate, Department of Gunapadam (Pharmacology), GSMC, Chennai.

Article Received on
08 April 2021,

Revised on 29 April 2021,
Accepted on 20 May 2021

DOI: 10.20959/wjpps20216-19111

***Corresponding Author**
Dr. Kayalvizhi S.
Lecturer, Department of Gunapadam, JSA Medical College for Siddha and Research centre, Pali, Ulundhurpet.

ABSTRACT

A free radical can be defined as any molecular species capable of independent existence that contains an unpaired electron in an atomic orbital. Which cause damage to the cell and also lead to many health related problem. Herbals that contain polyphenol content which helps to prevent the formation of free radicals. Siddha is one of the traditional system of medicine in India. In Siddha aspect, polyphenol content herbals known as *Kayakarpam* which is known as antioxidant and some metals, minerals and animal product preparation also called *Karpam. Karpam* used to treat the disease and prevent the disease and also it has anti aging property. In this study to evaluate the antioxidant property of *Gandhga Chendhooram* through the DPPH assay analysis. The result of this study, IC_{50} value (165.728µg/mL) of the extracts is high in level in the GC Ascorbic acid used as a standard. According to the result, GC possesses significant antioxidant property.

KEYWORDS: *Kayakarpam*, *Gandhga Chendhooram,* Antioxidant, *Chendhooram, Siddha.*

INTRODUTION

Antioxidants are the substances that can prevent, damage to the cells to the cells caused by free radicals[1], unstable molecules that the body produces as a reaction to environmental and other pressures.[2] They are sometimes called "free-radical scavengers." Oxidative stress has

been linked to heart disease, cancer, arthritis, stroke, respiratory diseases, immune deficiency, emphysema, Parkinson's disease, and other inflammatory or ischemic conditions.

Antioxidants are helps to neutralize free radicals in our bodies, and this is thought to improve the overall health. Antioxidants can protect against the cell damage that free radicals cause, known as oxidative stress.[3]

In Siddha aspect antioxidant compared to *Kayakarpam* which prevent the aging process and mostly herbals are used for *kayakarpa muraigal* at the same time metals, minerals and animal products *(seeva porulgal)* are also used as *Kayakarpam*.[4] *Chendhuram* is one kind of *perumarunthugal* in Siddha literature. *Gandhaga chendhooram* is effective medicine to treat arthritis and PCOD. In this study to evaluate the antioxidant property of *Gandhga Chendhooram* through the DPPH assay analysis.

MATERIALS AND METHODS

Selection of the drug

For this present study, herbo mineral formulation of *Gandhaga chendooram* was taken as the compound drug preparation were taken from the *Siddha* classical literature ***"Anuboga Vaithiya Navaneetham"*** written by **Hakkim.P.Mohamad Abdul Sayabu** Page No-38.[5]

Collection of the trial drug

The raw drugs are *Gandhagam* and *Lingam* was bought from Ramasamy chetty country shop at Parrys, Chennai.

Plant material was collected from around Anna Hospital campus, Arumbakkam, Chennai.

Identification and authentication

All raw drugs were identified and authenticated by the Botanists and the experts of *Gunapadam* (Pharmacology) at Government Siddha Medical College, Arumbakkam, and Chennai.

The specimen samples of the identified raw drugs were preserved in the laboratory of P.G *Gunapadam* for future references.

Ingredients

- *Sulphur*
- *Red Sulphide of Mercury*
- *Calotropis gigantea*

Purification[6]

Purification process was done as per classical Siddha literature **"*Gunapadam Thathu seeva vaguppu*".**

After the purification process, the *Gandhaga Chendhooram* was prepares as per SOP in "*Anuboga Vaithiya Navaneetham*".[5a] After the preparation, *Gandhaga Chendhooram* was kept in an air tight container and labeled as *GC.*

DPPH ASSAY[7]

Reagent Preparation

0.1mM DPPH solution was prepared by dissolving 4mg of DPPH in 100ml of ethanol.

Procedure

Different volumes of extracts 1.25µl - 20µl (12.5 - 200µg/ml) from a stock concentration 10mg/ml were made up to a final volume of 20µl with DMSO and 1.48ml DPPH (0.1mM) solution was added. A control without the test compound, but an equivalent amount of distilled water was taken. The reaction mixture incubated in dark condition at room temperature for 20 minutes. After 20 minutes, the absorbance of the mixture was read at 517nm. 3ml of DPPH was taken as control.

Calculation

$$\% \text{ inhibition} = \frac{control - test}{control} X100$$

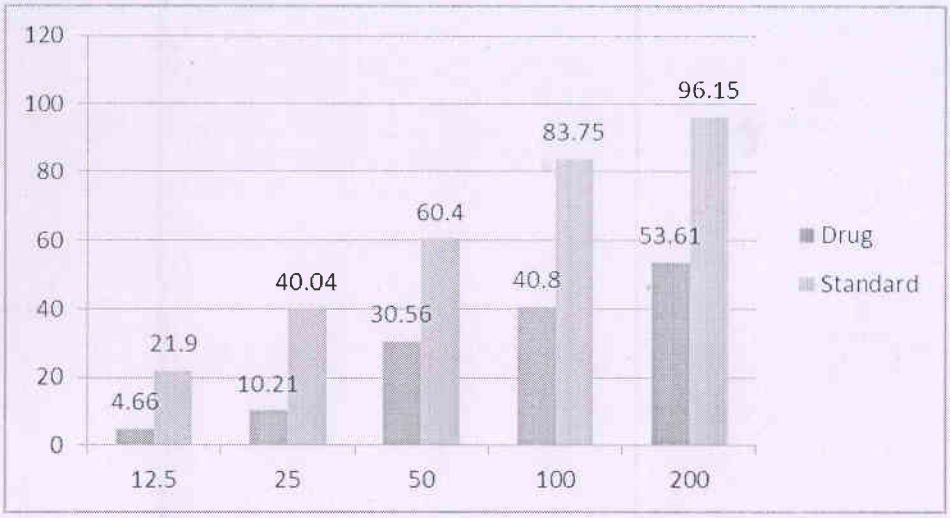
RESULT

Table No.1: DPPH assay on *GC.*

Concentrations (µg/ml)	Absorbance		Percentage of inhibition	
	Drug	Standard	Drug	Standard (Ascorbic acid)
12.5	1.5109	1.4044	4.66	21.90
25	1.4229	1.0782	10.21	40.04
50	1.1004	0.7121	30.56	60.40
100	0.9381	0.2921	40.80	83.75
200	0.7352	0.0692	53.61	96.15

**µg/ml: microgram per millilitre. Drug: GC (12.5-200µg/µl). Standard: Ascorbic acid (10mg/ml DMSO)*

Chart.No.2.DPPH assay on *GC*



IC50 Value – GC- 165.728µg/mL(Calculated using ED50 PLUS V1.0 Software)

INTERPRETATIONS

DPPH assay were used for the determination of antioxidant activity of the different extracts. DPPH stable free radical method is an easy, rapid and sensitive way to survey the antioxidant activity of GC extract. The antioxidant molecules can quench DPPH free radicals by providing hydrogen atom or by electron donation and a colorless stable molecule 1, 1 diphenyl-2- picrylhydrazil is formed and as a result of which the absorbance at 517nm of the solution is decreased.

In the present study, the GC extract was analyzed to decolorize DPPH and the free radical scavenging activity Ascorbic acid (10 mg/ ml DMSO) was used as a reference and result was expressed as the percentage decrease in absorbance. In the present study, the extract of GC was found to possess concentration dependent scavenging activity on DPPH radicals.

The values of DPPH free radical scavenging activity of the GC extract was given in (Table.No.1) expressed in the percentage. The extract of GC showed the highest DPPH scavenging activity (53.61%) at 200µg/ml and the lowest percentage of inhibition (4.66%) at 12.5µg/ml. Ascorbic acid (Standard) showed highest percentage of inhibition (96.15%) at 200µg/ml and the lowest percentage of inhibition (21.90%) at 12.5µg/ml.

This indicated that % of inhibition increased with increase in concentration of both the standard and GC extract. The GC extract has less free radicle scavenging activity compared to the standard. From the present study, it was concluded that the GC extract has a marked

low level antioxidant activity at higher concentrations. Antioxidant capacities of the extracts were expressed in terms of IC_{50} value of the extracts and low IC_{50} value corresponds to a high antioxidant capacity.

CONCLUSION

Hence the in vitro study of DPPH assay free radicle scavenging activity shows a less antioxidant property when compared to standard drug ascorbic acid and IC_{50} value (165.728µg/mL) of the extracts are high in level. Some other assays have to be studied to evaluate the efficacy of antioxidant activity in different assays and in vivo studies of GC. This assay confirms that the drug GC has significant antioxidant property.

BIBLIOGRAPHY

1. Sirisha Gawaji. Antioxidants. Department of Food Science and Nutrition. Modern Chemistry &Applications. Andhra University, Andhra Pradesh, India, 2021.
2. Samiyah Alhamed, Jawzah Alnakhli, William Boadi, Ryan Beni. Triphenylmethanol Conjugates of Triptorelin as Anti-Lipid Peroxidation Prodrugs. Department of Chemistry, Tennessee State University, Nashville TN, USA, September, 2019; 9: 3.
3. Megan Ware.How can antioxidants benefit our health. News letter [29 May 2018]; Available at: https://www.medicalnewstoday.com/articles/301506.php
4. Thiyagarajan. R.Sidddha Maruthuva Sirappu. Published by Department of Indian Medicine and Homoeopathy., Reprinted, 2017; 29.
5. Hakkim.P.Mohamad Abdul Sayabu. Anuboga Vaithiya Navaneetham.First edition. Chennai, 1905; 38. (Part 6).
6. Thiyagarajan.R. GunapadamThathu seeva vaguppu.Published by Department of Indian Medicine and Homoeopathy., Reprinted, 2004; 302.
7. Chang et al., DPPH assay, 2001.