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Analysis of Phytochemical Constituents and Anti-Microbial Activity of Some Medicinal Plants in Tamilnadu, India

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Abstract: The aim of the study was to analyze the phytochemical constituents of some selected medicinal plants such as *Tridax procumbens.Linn, Wedelia chinensis* and *Plectranthus amboinicus*. Methanol and ethanol extract of the dried leaves of these plants were collected and used for phytochemical and anti-bacterial analysis. The antibacterial activity was evaluated against different bacterial strains by detecting minimum inhibitory concentration and zone of inhibition. The minimum inhibitory concentration values were compared with control and zone of inhibition were compared with standard antibiotic discs of vancomycin. The Quantitative phytochemical analysis was performed using GC-MS by the essential oil obtained by hydro distillation process. The major peaks obtained for the corresponding plant extract include the following, *Plectranthus amboinicus* (11major peaks), *Wedelia chinensis* (10major peaks) and *Tridax procumbens.Linn* (15major peaks) respectively.

Key word: Medicinal plants · Anti inflammatory · Phytochemical Antimicrobial · Zone of inhibition

INTRODUCTION

India is a country rich in indigenous herbal resources which grow on their varied topography and under changing agro climatic conditions permitting the growth of almost 20,000 plant species, of which about 2,500 are of medicinal value [1].

The medicinal plants are of great importance to the health of individual and communities. The medicinal value of these plants lies in some active chemical substances called phytochemicals that produce a definite physiological action on the human body. The most important of these chemically active (Bioactive) constituents of plants are alkaloids, tannins, flavonoids and phenolic compounds [2].

Pharmacological industries have produced a number of new antibiotics in the last three decades, in spite of that resistance to these drugs by microorganisms has also been increased. In general, bacteria have the genetic ability to transmit and acquire resistance to drugs, which are utilized as therapeutic agents. The world is now looking towards India for new drugs to manage various challenging diseases because of its rich biodiversity of medicinal plants and abundance of traditional knowledge such as Siddha, Ayurveda etc [3-4].

According to World Health Organization medicinal plants would be the best source to obtain a variety of drugs. About 80% of individuals from developed countries use traditional medicine, which has compounds derived from medicinal plants. However, such plants should be investigated to better understand their properties, safety and efficiency [5].

The use of plant extracts and phytochemicals, both with known antimicrobial properties, can be of great significance in therapeutic treatments. In the last few years, a number of studies have been conducted in different countries to prove such efficiency. Phytochemicals are analyzed qualitatively using various tests. Plant essential oils and their components have been known to exhibit biological activities, especially antimicrobial, since ancient time [6].

In the present study, efforts have been taken to analyze the phytochemical compounds antimicrobial activity of the selected three medicinal plants having anti-inflammatory properties. The study also focused on the quantitative analysis of phytochemicals present in these plants using GC- MS.

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3 Tridax procumbens L. is a species of flowering plant in the daisy family. It has strong wound healing property as it is widely used by village people. Some reports from tribal areas state that the leaf juice can be used to cure fresh wounds, to stop bleeding [7]. *Wedelia chinensis* is a very useful herbal medicinal plant. Its leaves can be used in treatment of dermatological disorders, cough, headache, hair loss, lice, strengthening the nervous system, lack of blood, digestive system disorders. The plant is used in uterine hemorrhage and menorrhagia. *Plectranthus amboinicus* is a succulent herb, has the typical four-cornered stem of the Lamiaceae family. The leaves are very thick and succulent, grey-green and hairy. The leaves have also had many traditional medicinal uses, especially for the treatment of coughs, sore throats and nasal congestion, but also for a range of other problems such as infections, rheumatism and flatulence.

MATERIALS AND METHODS

Plant Study Material: Fresh leaves from the selected three plants having medicinal value were collected from Western Ghats of Siruvani hills of Coimbatore. The plant materials were taxonomically identified and authenticated by the Botanical Survey of India and the voucher specimen(No.BSI/SC/5/23/09-10/TECH.1448)wasretained in our laboratory for future reference. The plants were freshly collected to about 5kgs and then the leaves were shade dried until all the water molecules evaporate and the plant gets dried well for grinding. After drying, the plant leaves were ground well using mechanical blender into fine powder and then transferred into airtight containers for future studies. The fine powder is then subjected to soxhlet apparatus for extraction.

Preparation of Plant Extracts (Soxhlet Extraction): The dried plant leaf materials (common for all the 3 plants) were extracted with Methanol and acetone as solvent for 45 hours by soxhlet extractor. The extract was filtered while hot and concentrated in vacuum under reduced pressure using rotary flask evaporator and dried in a dessicator. The concentrated methanol and acetone extracts were obtained as residues and were greenish black solid, black gummy solid and brownish black solid respectively. After which, the residues were transferred into pre-weighed sample containers and were stored and later was used for phytochemical screening and Anti - microbial activity [8-9].

Qualitative Phytochemical Analysis of Plant Extracts: The leaf extract were analyzed for the Flavonoids, Pholabatannins, Glycosides, Phenols, Catachol, Resins, Saponins, Lipids and Fats, Tannins, Acidic compounds, Terpenoids, Reducing sugars, Anthraquinone, Carbohydrates, Steroids and Sterols etc., as follows, [10-13].

Flavonoids (Shinoda or Pew Test): A small quantity of plant extract was dissolved in 5ml of ethanol and treated with few drops of conc.Hcl and 0.5g of magnesium turning and observed for the formation of Pink colour.

Saponins: The 0.5g of extract was added to 5ml of distilled water in a test tube. The solution was vigorously shaken and observed for a stable persistent froth. The frothing was mixed with 3 drops of olive oil and vigorously shaken after which it was observed for the formation of an emulsion.

Pholabatannins: Few drops of 1% aqueous Hcl was added to plant extract in a boiling tube and then allowed to stand and then observed for the development of red precipitate.

Resins: Five milliliter of distilled water was added to the extract and observed for turbidity.

Sterols (Liebermann Buchard Test): The plant extract was dissolved in chloroform and few drops of acetic anhydride were added along with a few drops of conc.sulphuric acid from the sides of the test tube and observed for the formation of blue to blood red colour.

Lipids/Fats: A small quantity of powdered drug was rubbed on a filter paper and observed for a permanent translucent strain.

Steroids: Two milliliter of acetic anhydride was added to 0.5g of extract and 2ml of H_2SO_4 was added along the sides of the test tube and the result was observed.

Tannins: About 0.5g of each extract was taken in a boiling tube and boiled with 20ml of distilled water and then filtered. Added few drops of 0.1% of ferric chloride was mixed well and allowed to stand for some time and observed for brownish green or blue black colour formation.

Glycosides (Keller-Killani Test): About 0.5 ml of alcoholic extract was taken and subjected to the following tests. 1ml of glacial acetic acid containing traces of ferric chloride and 1ml of concentrated sulphuric acid were added to the extract and observed for the formation of reddish brown color at the junction of two layers and the upper layer turned bluish green in the presence of glycosides.

Acidic Compounds: To the alcoholic extract, sodium bicarbonate solution was added and observed for the production of effervescence.

Terpenoids (Salkowski Test): To 0.5 g of extract, 2ml of chloroform was added and then con. H_2SO_4 (3ml) was carefully added to form a layer. A reddish brown colour formation at the interface was noted for the presence of terpenoids.

Reducing Sugars (Fehling's Test): Few drops of Fehling's solution A and B in equal volume were added in dilute extracts and heated for 30 min and observed for the formation of brick red colored precipitate.

Phenols: The extract was added with water.To this 2ml of Ferric chloride solution was added and observed for the formation of green or blue colour.

Carbohydrates (Molisch's Test): Small quantities of alcoholic and aqueous extract were dissolved in 5ml of distilled water and filtered. To this solution, 2-3 drops of alpha-naphthol was added. To this about 1ml of conc. H_2SO_4 was added along the sides of inclined test tube so as to form two layers and observed for the formation of violet colored ring at the interface for the presence of carbohydrates.

Anthraquinone (Borntragers Test): About 0.5g of the extract was taken into a dry test tube and 5ml of chloroform was added and shaken for 5 min. The extract was filtered and the filtrate was shaken with equal volume of 10% ammonia solution. A pink violet or red colour in the ammonical layer was observed for the presence of anthraquinone.

Catachol: To 2g of extract add Erlich's reagent and few drops of concentrated hydrochloric acid and the result was observed.

Anti -Bacterial Activity

Determination of Minimum Inhibitory Concentration: The molten nutrient agar media containing various concentrations of the extract (0,100,200,300,400 and 500 μg/ml) were poured and solidified onto sterile 100mm Petri dishes to give sterile nutrient agar plates with varying dilutions of the extract.(National committee for clinical laboratory standards 2000). Then these plates were kept in the refrigerator (4°C) for 24 hours for uniform diffusion of the extract into nutrient agar media. The plate was then dried at 37°C for 2 hours. One loopful (diameter-3mm) of an overnight grown peptone water culture of each test organisms (*Klebsiella pneumonia, Pseudomonas aeuroginosa-1006, Shigella flexineri, Streptococcus mutant, Staphylococcus aureus-NCTC-74)* was placed in petridish marked by the checker board technique. The spot inoculated plate was incubated at 37°C for 24 hours and MIC value obtained. The experiment was repeated and values were noted [15].

Disc Preparation: The 6mm (diameter) discs were prepared from Whatmann No.1 Filter paper and were sterilized by autoclave at 12°C. After the sterilization the moisture discs were dried on hot air oven at 50°C. Then various solvent extract discs and control discs were prepared.

Determination of Zone of Inhibition: For the determination of ZOI pure vancomycin were taken as a standard antibiotic for comparison of the results. Two sets of two dilutions (100 and 200 μg/ml) of plants extract were prepared in double distilled water and vancomycin in Mc Cartney bottles. Sterile nutrient agar plates were prepared and incubated at 37°C for 24hrs to check any sort of Contamination. Two sterile filter paper discs (Whatmann no.1) of 6mm diameter were soaked in two different dilutions of crude extract and placed in appropriate position on the surface of the flooded plate, marked as quadrants at the back of the petridishes. The petridishes were incubated at 37 °C f or 24 hrs and the diameter of the zone of inhibition were measured in mm. Similar procedure was adopted for the pure vancomycin and the corresponding zone diameter was compared accordingly. The experiment was repeated in triplicate and average values were noted [16].

GC-MS Analysis: GC-MS analysis was performed in INDIAN INSTITUTE OF SPICES RESEARCH (IISR)-CALICUT-KERALA- [PMT/IISR/28(13)09].

Essential oils were extracted from *Plectranthus amboinicus, Tridax procumbens.L* and *Wedelia chinensis* based on hydro distillation method for GC-MS analysis. GC-MS analysis was performed using SHIMADZU GC - MS QP 2010 using CARBOWAX capillary column and Helium as carrier gas to quantify the major phytochemicals. 0.2µl of essential oil was injected in to the column at the flow rate of 1µl/minute. The injector was operated at 250°C and the oven temperature was programmed as follows; 60°C for 15minutes, then gradually increased to 280°C at 3minutes. The identification of components were based on comparison of their mass spectra with those of Wiley and NBS libraries and those described by Adams as well as comparison of their retention indices.

RESULTS AND DISCUSSION

The present study was carried out on the three plants revealed the presence of bio- active constituents of medicinal value. The phytochemical compounds of these three plants were qualitatively and quantitatively analyzed and the results of both methanol and acetone extracts of all the three plants were more or less same. In the analysis of phytochemical compounds of *Tridax procumbens* L. showed good results for all major phytochemicals except acidic compounds and terpenoids. The analysis of Wedelia chinensis showed the presence of all major compounds except the acidic compounds only. The Phytochemical analysis of *Plectranthus amboinicus* showed the absence of steroids and acidic compounds whereas the rest of the compounds were present. It should be noted that the steroidal compounds are of importance and interest in pharmacy due to sex hormones [17].

The plant product over synthetic compound was the need in the treatment of diseases, because it did not have a deleterious effect in higher plant and animals including man. The urge in research on new drugs from natural sources was now moving out of the herbalists shop, away from the core texts into the drug research laboratories. India is a home to a variety of traditional medicinal system that relay to a very large extent on native plant species for their raw drug material. Therefore, now there is a need to look back towards the traditional medicine which can serve as novel therapeutic agent. The qualitative analysis revealed the presence of the biomolecules such as anthraquinone, catachol, Flavonoids, phenolic compounds, saponins, steroids, tannins and terpenoids. However, this qualitative analysis alone may not ascertain the pharmacological action of the plant.

The genus Plectranthus comprises many species of medicinal interest and their chemistry is poorly known. Several studies have reported that carvocrol and essential oils, present in *Plectranthus amboinicus* and other compounds, modify the constitution and increase the fluidity of the cell membrane. The bactericidal action of these plant extracts was promising by using methanol and acetone extracts. The methanol extract of *Plectranthus amboinicus* showed antibacterial activity against test organisms with the zones of inhibition ranging from 8-14 mm and the acetone extract showed the zone ranging from 8-14 mm. The methanol extract of *Wedelia chinensis* showed antibacterial activity against test organisms with the zones of inhibition ranging from 8-17 mm and the acetone extract shows the zone ranging from 8-13 mm. The methanol extract of *Tridax procumbens.L* showed antibacterial activity against test organisms with the zones of inhibition ranging from 8-11 mm and the acetone extract showed the zone ranging from 8-11 mm revealing its great medicinal potential for the treatment of microbial induced ailments. However future studies should investigate whether the use of this medicinal species interferes with drugs in the antimicrobial therapy.

In the GC-MS analysis, 36 bioactive phytochemical compounds were identified in the essential oil obtained from *Tridax procumbens.L, Wedelia chinensis* and *Plectranthus amboinicus*. The identification of phytochemical compounds was based on the peak area, retention time and molecular formula. The compounds identified for *Plectranthus amboinicus* was Carvocrol [$C_6H_3CH_3(OH)(C_3H_7)$]with RT (38.994) had a peak area 14.21 %, Thymol [$C_{10}H_{14}O$] with RT (37.781) had a peak area 00.79%, cis - Caryophyllene [$C_{15}H_{24}$] RT [19.063] had a peak area 18.06%, t- Caryophyllene RT [19.195] had a peak area 05.30%, p-cymene [$C_{10}H_{14}$] with RT (9.246) had a peak area 10.83%. The compounds identified for *Wedelia chinensis* was Carvocrol [$C_6H_3CH_3$ (OH) (C_3H_7)] with RT (38.668) had a peak area 46.07%, t-Caryophyllene [$C_{15}H_{24}$] with RT (18.959) had a peak area 14.83%. The compounds identified for *Tridax procumbens* was Alpha-pinene [$C_{10}H_{16}$] and Beta - Pinene [$C_{10}H_{16}$] with RT (3.195 and 4.704) had a peak area 10.84% and 04.24%, 1- Phellandrene [$C_{10}H_{16}$] RT [7.054] had a peak area 02.51%, Sabinene [$C_{10}H_{16}$] with RT (6.196) had a peak area 06.98%.

In conclusion the study has revealed the presence of many important separatable phytochemicals such as carvocrol, thymol, cis-caryophyllene, t-caryophyllene, p-cymene, α and β pinene, 1- phyllandrene and sabinene by GC-MS analysis in the selected medicinal plants having anti inflammatory property. Our study also showed the potential antimicrobial activity of these plants in the range of 8-17mm against the test organisms. Further study is required in the separatable phytochemicals for the specific medicinal property of these selected plants.

QUALITATIVE PHYTOCHEMICAL ANALYSIS OF PLANT LEAF EXTRACTS

		TRIDAX PROCUMBENS		WEDELIA CHINENSIS		PLECTRANTHUS AMBOINICUS	
S.NO	NAME OF THE TEST	METHANOL EXTRACT	ACETONE EXTRACT	METHANOL EXTRACT	ACETONE EXTRACT	METHANOL EXTRACT	ACETONE EXTRACT
1.	SAPONINS	+	+	+	+	+	+
2.	PHOLABATANNINS	+	+	+	+	+	+
3.	RESINS	+	+	+	+	+	+
4.	LIPIDS OR FATS	+	+	+	+	+	+
5.	STEROIDS	+	+	+	+	-	-
6.	TANNINS	+	+	+	+	+	+
7.	GLYCOSIDES	+	+	+	+	+	+
8.	ACIDIC COMPOUNDS	-	-	-	-	-	-
9.	TERPENOIDS	-	-	+	+	+	+
10.	REDUCING SUGARS	+	+	+	+	+	+
11.	PHENOLS	+	+	+	+	+	+
12.	CARBOHYDRATES	+	+	+	+	+	+
13.	ANTRAQUINIONE	+	+	+	+	+	+
14.	CATACHOL	+	+	+	+	+	+
15.	STEROLS	+	+	+s	+	+	+
16.	FLAVONOIDS	+	+	+	+	+	+

(+) =PRESENCE (-) =ABSENCE

MINIMAL INHIBITORY CONCENTRATION OF PLANT EXTRACTS OVER DIFFERENT CLINICAL BACTERIAL CULTURES

				MIC (OBTAINED AS POSITIVE)	
S.NO	PLANTS USED	CULTURES USED	DILUTIONS USED	ACETONE EXTRACT µg/ml	METHANOL EXTRACT µg/ml
1.	*Plectranthus amboinicus*	*Klebsiella pneumonia* *Pseudomonas aeuroginosa* *Shigella flexineri* *Streptococcus mutans* *Staphylococcus aureus*	10^{-5} &10^{-6}	100&200	100&200
2.	*Tridax procumbens.L*	*Klebsiella pneumonia* *Pseudomonas aeuroginosa* *Shigella flexineri* *Streptococcus mutans* *Staphylococcus aureus*	10^{-5} &10^{-6}	100&200	100&200
3.	*Wedelia Chinensis*	*Klebsiella pneumonia* *Pseudomonas aeuroginosa* *Shigella flexineri* *Streptococcus mutans* *Staphylococcus aureus*	10^{-5} &10^{-6}	100&200	100&200

[Concentrations used were 0-control, 100, 200, 300, 400, 500µg/ml]

ZONE OF INHIBITION OF *PLECTRANTHUS AMBOINICUS* OVER CLINICAL BACTERIAL CULTURES

			ZONE OF INHIBITON OF METHANOL EXTRACT OF *Plectranthus amboinicus* (RESULTS IN MM)								
			24 hours of incubation			48 hours of incubation			72 hours of incubation		
S.No	PLANT USED	CULTURES USED	100µg/ml	200µg/ml	Control (VANCOMYCIN)	100µg/ml	200µg/ml	Control (VANCOMYCIN)	100µg/ml	200µg/ml	Control (VANCOMYCIN)
1	*Plectranthus amboinicus*	*Klebsiella pneumonia*	8	11	16	8	11	21	14	11	24
		Pseudomonas aeuroginosa	8	08	15	8	08	22	11	11	24
		Shigella flexineri	8	08	20	8	11	26	11	11	28
		Streptococcus mutans	8	08	21	8	08	25	08	08	30
		Staphylococcus aureus	8	08	19	8	08	24	08	08	28

			ZONE OF INHIBITON OF ACETONE EXTRACT OF *Plectranthus amboinicus* (RESULTS IN MM)								
			24 hours of incubation			48 hours of incubation			72 hours of incubation		
S.No	PLANT USED	CULTURES USED	100µg/ml	200µg/ml	Control (VANCOMYCIN) (mm)	100µg/ml	200µg/ml	Control (VANCOMYCIN) (mm)	100µg/ml	200µg/ml	Control (VANCOMYCIN) (mm)
2.	*Plectranthus amboinicus*	*Klebsiella pneumonia*	08	08	16	08	11	21	11	11	24
		Pseudomonas aeuroginosa	08	08	15	08	08	22	11	11	28
		Shigella flexineri	08	08	20	08	08	22	11	11	24
		Streptococcus mutans	11	11	21	11	11	25	11	14	30
		Staphylococcus aureus	11	11	19	11	11	24	14	14	28

[Tests were done in triplicates and values were expressed as mean in mm]

ZONE OF INHIBITION OF *WEDELIA CHINENSIS* OVER CLINICAL BACTERIAL EXTRACTS

			ZONE OF INHIBITON OF METHANOL EXTRACT OF *Wedelia chinensis* (RESULTS IN MM)								
			24 hours of incubation			48 hours of incubation			72 hours of incubation		
S.No	PLANT USED	CULTURES USED	100µg/ml	200µg/ml	Control (VANCOMYCIN)	100µg/ml	200µg/ml	Control (VANCOMYCIN)	100µg/ml	200µg/ml	Control (VANCOMYCIN)
1.	*Wedelia Chinensis*	*Klebsiella pneumonia*	08	15	16	08	s15	21	11	17	24
		Pseudomonas aeuroginosa	08	08	15	08	08	22	11	11	24
		Shigella flexineri	08	08	20	08	15	26	11	11	28
		Streptococcus mutans	08	08	21	08	08	25	11	11	30
		Staphylococcus aureus	08	08	19	08	08	24	11	11	28

			ZONE OF INHIBITON OF ACETONE EXTRACT OF *Wedelia chinensis* (RESULTS IN MM)								
			24 hours of incubation			48 hours of incubation			72 hours of incubation		
S.No	PLANT USED	CULTURES USED	100µg/ml	200µg/ml	Control (VANCOMYCIN)	100µg/ml	200µg/ml	Control (VANCOMYCIN)	100µg/ml	200µg/ml	Control (VANCOMYCIN)
2.	*Wedelia Chinensis*	*Klebsiella pneumonia*	08	08	16	08	08	21	11	11	24
		Pseudomonas aeuroginosa	08	08	15	08	08	22	11	11	24
		Shigella flexineri	08	08	20	09	09	26	11	11	28
		Streptococcus mutans	11	11	21	08	08	25	12	12	30
		Staphylococcus aureus	11	11	19	08	08	24	12	13	28

[Tests were done in triplicates and values were expressed as mean in mm]

ZONE OF INHIBITION OF *TRIDAX PROCUMBENS*. LINN OVER CLINICAL BACTERIAL CULTURES

			ZONE OF INHIBITON OF METHANOL EXTRACT OF *Tridax procumbens* (RESULTS IN MM)								
			24 hours of incubation			48 hours of incubation			72 hours of incubation		
S.No	PLANT USED	CULTURES USED	100µg/ml	200µg/ml	Control (VANCOMYCIN)	100µg/ml	200µg/ml	Control (VANCOMYCIN)	100µg/ml	200µg/ml	Control (VANCOMYCIN)
1.	*Tridax procumbens. Linn*	*Klebsiella pneumonia*	08	08	16	08	08	21	11	11	24
		Pseudomonas aeuroginosa	08	08	15	08	08	22	11	11	24
		Shigella flexineri	08	08	20	08	08	26	11	11	28
		Streptococcus mutans	08	08	21	08	11	25	11	11	30
		Staphylococcus aureus	08	08	19	08	11	24	11	11	28

			ZONE OF INHIBITON OF ACETONE EXTRACT OF *Tridax procumbens* (RESULTS IN MM)								
			24 hours of incubation			48 hours of incubation			72 hours of incubation		
S.No	PLANT USED	CULTURES USED	100µg/ml	200µg/ml	Control (VANCOMYCIN)	100µg/ml	200µg/ml	Control (VANCOMYCIN)	100µg/ml	200µg/ml	Control (VANCOMYCIN)
2.	*Tridax procumbens. Linn*	*Klebsiella pneumonia*	08	08	16	08	09	21	11	11	24
		Pseudomonas aeuroginosa	11	08	15	11	09	22	11	11	24
		Shigella flexineri	08	08	20	08	10	26	11	11	28
		Streptococcus mutans	11	08	21	08	08	25	11	11	30
		Staphylococcus aureus	08	08	19	08	08	24	11	11	28

[Tests were done in triplicates and values were expressed as mean in mm]

RESULTS FOR GC - MS ANALYSIS OBTAINED FROM THE ESSENTIAL OIL OBTAINED FROM THE FRESH AND DRY LEAVES OF PLANT EXTRACTS

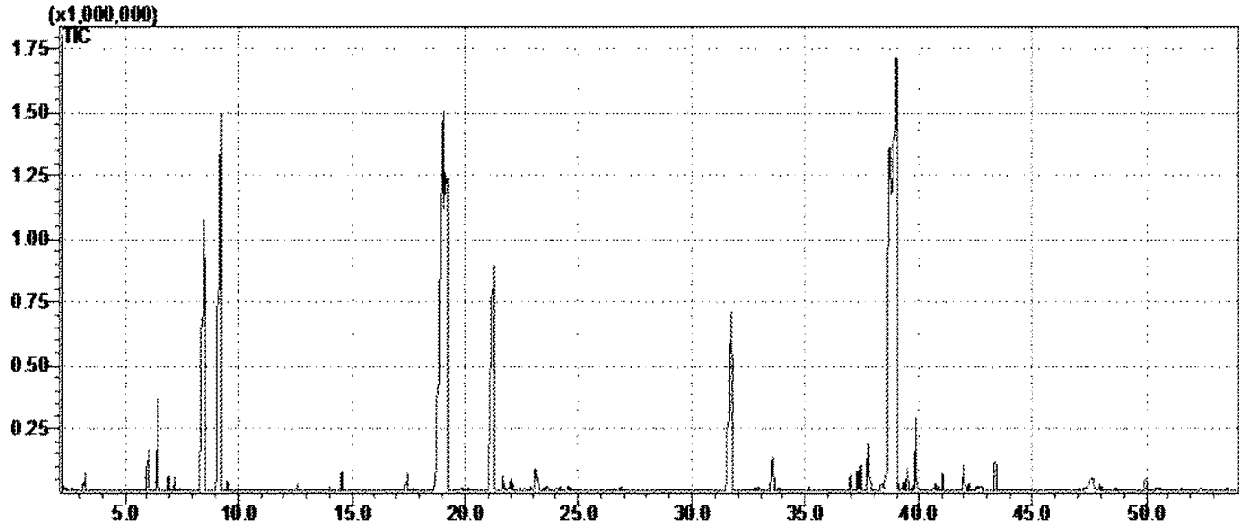
S.NO	NAME OF THE PLANT	COMPOUNDS IDENTIFIED (IN NOs)	MAJOR COMPOUNDS	MOLECULAR FORMULA	RT	PEAK AREA%
1.	PLECTRANTHUS AMBOINICUS	11	Carvocrol	$C_6H_3CH_3(OH)(C_3H_7)$	38.994	14.21
			Thymol	$C_{10}H_{13}O$	37.781	00.79
			Cis - Caryophyllene	$C_{15}H_{24}$	19.063	18.06
			t-Caryophyllene	$C_{15}H_{24}$	19.195	05.30
			p-cymene	$C_{10}H_{14}$	09.246	10.83
2.	WEDELIA CHINENSIS	10	Carvocrol	$C_6H_3CH_3(OH)(C_3H_7)$	38.668	46.07
			t-Caryophyllene	$C_{15}H_{24}$	18.959	14.83
3.	TRIDAX PROCUMBENS	15	Alpha - pinene	$C_{10}H_{16}$	3.195	10.84
			Beta-pinene	$C_{10}H_{16}$	4.704	04.24
			l- phellandrene	$C_{10}H_{16}$	7.054	02.51
			sabinene	$C_{10}H_{16}$	6.196	06.98

[THE MAJOR COMPOUNDS HAVING 95%COMPARISION WITH THE COMPOUNDS IN THE WILEY AND NBS LIBRARIES]

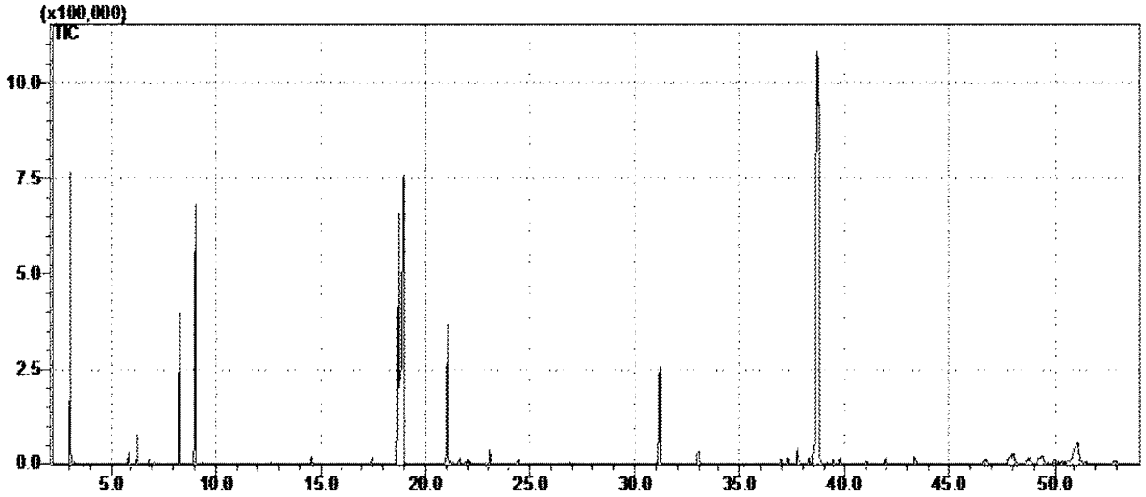
RESULTS OF GC-MS ANALYSIS OF ESSENTIAL OIL OBTAINED FROM PLANT LEAVES DRY EXTRACT

(ACKNOWLEDGEMENT)

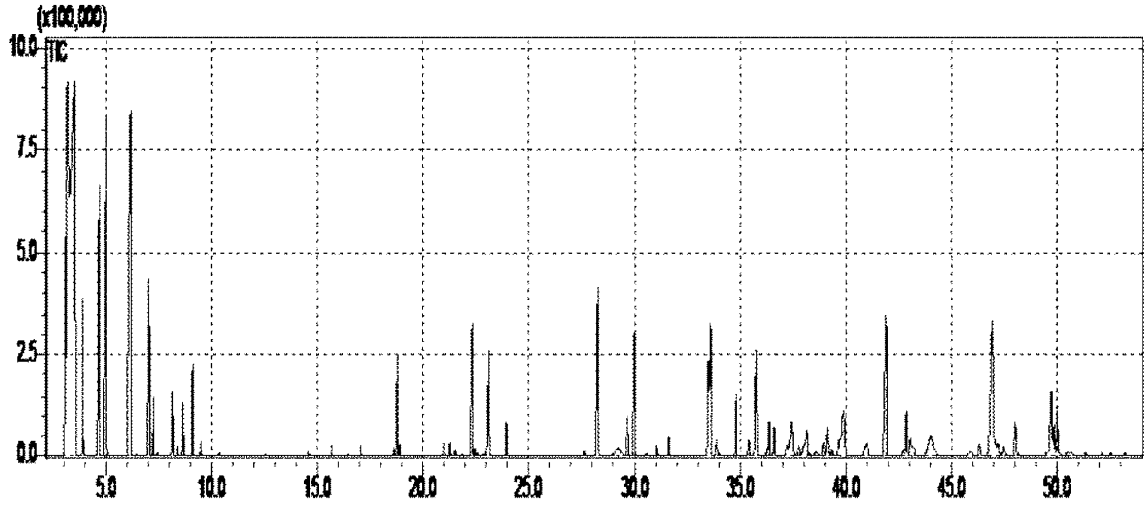
(INDIAN INSTITUTE OF SPICES RESEARCH - IISR -KERALA) [PMT/IISR/28(13)09]



GC profile of volatile oil of *Plectranthus. amboinicus* dry leaf extract



GC profile of volatile oil of *Wedelia. chinensis* dry leaf extract



GC profile of volatile oil of *Tridax procumbens.Linn* dry leaf extract

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REFERENCES

1. Choudhari, M.M. and J.K. Maheshwari, 2009, Ethnobotany in South Asia, Middle East Journal of Scientific Research, 4(3): 144-146.
2. Edeoga, H.O., D.E. Okwu and B.O Mbaebie, 2005. Phytochemical constituents of some Nigerian Medicinal plants, African Journal of Biotechnology, 4(7): 685-688.
3. Cohen, J.I., J.B. Alcorn and C.S. Potter, 1991. Utilization and conservation of genetic resources, International Projects for sustainable Agriculture Economy of Botany, 45: 190-199.
4. Chithravadivu, C., S. Manian and K. Kalaichelvi, 2009. Qualitative analysis of selected medicinal plants, Middle-East Journal of Scientific Research, 4(3): 144-146.
5. Arunkumar, S. and M. Muthuselvam, 2009. Analysis of Phytochemical Constituents and Antimicrobial Activities of *Aloe Vera L.* Against clinical pathogens, World Journal of Agricultural Sciences, 5(5): 572-576.

6. Ana, P.A.D. Gurgel, G. da Silva and Ana R.S. Grangeiro, 2009. Antibacterial Effects of *Plectranthus amboinicus* (Lour) Spreng (Lamiaceae) in Methicillin Resistant *Staphylococcus aureus* (MRSA) Latin American Journal of Pharmacy, 28(3): 460-4.
7. Ikewuchi Jude, C., C. Ikewuchi Catherine and M. Igboh Ngozi, 2009. Chemical Profile of *Tridax Procumbens Linn,* Pakistan Journal of Nutrition, 8(5): 548-550.
8. Sofowora, A., 1982. Medicinal Plants and Traditional Medicine in African John Willey and Sons, pp: 142-146.
9. Alade, P.I. and O.N. Irobi, 1993, Antimicrobial Activities of crude leaf extracts of *Acalypha wilkensiana*, Journal of Ethanopharmacology, 39: 171-174.
10. Sofowora, A., 1993. Medicinal Plants and Traditional Medicine in Africa, John Wiley and son Ltd., pp: 150-153.
11. Trease, G.E. and W.C. Evans, 1989. Pharmocognosy, 11th Edition. Brailiar Tiridel and MacMillan Publishers, London, pp: 155-265.
12. Herborne, J.B., 1973. Phytochemical Methods 3rd Edition, Chapman and Hall Ltd., London, pp: 135-203.
13. Ngbege, J., R.A. Yarkubu and D.A. Njam, 2008. Phytochemical screening for active compounds in *conarium schweinfurthii* (Atile) leaves from Jos North, Plateau State Nigeria. Research Journal of Biological Science, 3(9): 1070-1078. WWW.medwelljournals.com/fulltext/rijbs/2008/1076.pdf.
14. Odebiyi, A. and J.A. Sofowora, 1978. Phytochemical screening of Nigerian medicinal plants part II Lioydia, 403: 234-246.
15. Mishra, U.S., S.R. Behera and P.N. Murthy, 2009, Antibacterial and Analgesic effects of the Leaves of *Dichrostachys Cinerea*, International Journal of Pharmacy and Pharmaceutical Sciences Volume1. Issue 2.
16. Mishra, U.S., R. Kumari, A. Mishra, P.N. Murty and P. Das, 2007. Antibacterial effect if stem bark of *Azadirachta indica*. J.T.R. Chem., 14 Suppl 2: 16-19.
17. Okuwa, D.E., 2001. Evaluation of the chemical Composition of indigenous spices and Flavoring Agent. Global Journal of Pure and Applied Science, 7(3): 455-459.