ScienSage

Journal of Advanced Scientific Research

Available online through http://www.sciensage.info

ISSN
0976-9595
Short Communication

PHYSICOCHEMICAL AND PRELIMINARY PHYTOCHEMICAL EVALUATION OF LEAVES OF FIVE COMMON INDIGENOUS WEEDS FOUND IN CENTRAL INDIA

Mukesh Sharma*[1], Amit Alexander[2], Vihangesh Dixit[3], Rupesh Dudhe[4], Ajazuddin[5]

[1]*Department of Pharmacognosy, Rungta College of Pharmaceutical Sciences and Research, Kohka-Kurud Road, Bhilai, Chhattisgarh, India*

[2]*National Institute of Pharmaceutical Education and Research (NIPER), Guwahati, Assam, India*

[3]*Department of Pharmachemistry, Institute of Pharmacy, Bundelkhand University, Jhansi, Uttar Pradesh, India*

[4]*Department of Pharmachemistry, School of Pharmacy, G H Raisoni University, saikhada, saunsar Chhindwara, Madhya Pradesh, India*

[5]*Department of Pharmaceutics, School of Pharmacy & Technology Management, SVKM's NMIMS, Shirpur, Maharashtra, India*

Corresponding author: mukesh.rcpsr@gmail.com

ABSTRACT

Weeds are unwanted plants that interfere with land and water resource use. They can have detrimental effects on human health. Weed flora has not been well studied from a phytosociological and ecological point of view. Weeds can be useful sources of life-saving drugs. The field of phytochemicals is growing in scientific and commercial importance. Many plant compounds and pigments have now a major initiative to research and understand these substances at a fundamental level with important health consequences. The present research deals with the physicochemical and phytochemical evaluation of the leaves of five common indigenous weeds, i.e. *Lantana camara* Linn., *Ocimum gratissimum* Linn., *Cassia alata* Linn, *Zephyranthes minuta* (Kunth) D.Dietr & *Parthenium hysterophorus* Linn. The results of this work can serve as a valuable source of information for future investigations and recommendations for further work. The powdered leaves of all plant weeds were subject to very promising preliminary physical and phytochemical analyses. Physical and fluorescent values of the plant pulver powder have been calculated under ordinary light and UV. The presence of alkaloids is considered to be helpful in the treatment of contaminated or ulcerated tissues and has important cancer prevention and anti-cancer activity. The studies revealed the presence of phytosterols and triterpenoids, alkaloids, tannins, flavonoids, sugar, protein, amino acid, fat, and oils and also concluded that all studied weed leaves may be a good source of phytochemicals, vitamins and minerals. Supplementation of these weeds leaves may be useful for human health associated emerging diseases such as cardiovascular diseases, diabetes, hypertension and cancer.

Keywords: Weeds, phytochemical, physicochemical, extraction.

1. INTRODUCTION

Plants with one or more of their sections which have substances that can be used to cure diseases are considered medicinal plants [1]. With the knowledge available in the old and modern literature, farmers are able to produce additional revenue from the so-called unwanted plants i.e. weeds [2]. The health of individuals and populations is improved by medicinal plants. Plant-based medicines are advantages and are well-known because of their efficacy, easy access and low cost. Herbal medicine may involve whole plant parts that are typically made from different plants and each plant part has different medicinal value, widely used for treatment. They are given orally, inhaled directly into the skin [3]. *Lantana camara* L.(*L. camara*) is a small, annual shrub that can grow to around 2 metres tall and develop dense thickets in a number of environments and belongs to the Verbenaceaea family [4]. *L. Camara* has tiny tubular flowers, each with four petals and clusters of terminal stalks. Among the category of medicinal plant, *L. camara* is one, however it is categorized in India as one of the top ten invasive weeds and poisonous plants on Earth [5]. *Ocimum gratissimum* L. (*O. gratissimum*) is part of the Lamiaceae family and a complex, polymorphic genus of

many forms. The plant's therapeutic property was discovered many centuries ago and for quite a while it was the basis for all treatments before the intercession of manufactured medications [6]. *O. gratissimum* is a perennial plant that is woody at the bottom. It has an average height of 1-3 m high. The leaves are wide and chiefly ovate, usually 5-13 cm long and 3-9 cm wide [7]. *Cassia alata* L. (*C.alata*) belongs to the family Leguminosae. It is readily available from many tropical sources. It is a plant that grows 1-4 m tall, and prefers a sunny or moist space. The leaves are green, broad, and divided into 5-14 leaflets, the leaflets often larger and with notched tips [8]. *Zephyranthes minuta* (Kunth) D.Dietr (*Z.minuta*) is belongs to the family Amaryllidaceae. This is one of the top 20 most commonly used plant families for ornamental purposes, and is therefore quite valuable. This species of this genus are commonly known as rain flower, rain lilies. The bulbs have light brown or black tunica and root tissues. The leaves are deciduous with a scale like veined blade. The size of leaves for some plants ranges from tiny to broad [9]. *Parthenium hysterophorus* L. (*P.hysterophorus*) belongs to the family Asteraceae. The plant is a noxious plant that occurs in many regions of the world. This is a weed of global significance which causes severe human and animal health issues coupled with a great threat to biodiversity in addition to losses of agricultural products [10]. *P. hysterophorus* is a small, short-lived herbaceous plant that makes a dense rosette of leaves as it grows. Usually growing no taller than 1.5 to 2 metres, it occasionally reaches 2 metres or more in height [11]. This plant has the medical benefit of secondary metabolites or phytochemicals, which give the human body definite physiological effect. Alkaloids, essential oil, flavonoids, tannins, terpenoids, saponins, phenolic compounds and many more are among the most important types of secondary metabolites or phytochemical components [12]. The foundations for current prescription medications, as we know today, have been these substances. The usage of plant-based medications is as ancient as human civilization and is utilized throughout history in different cultures to cure various maladies. The ancient man began to distinguish between valuable and hazardous plants by way of trail and errors [13].

2. MATERIAL AND METHODS

2.1. Plant material

The plants leaves of *L. camara* L., *O. gratissimum* L., *C. alata* L., *Z. minuta* (Kunth) D.Dietr & *P. hysterophorus* L were collected from Semariya, Village, Baghdumar, Bhilai-Durg region of Chhattisgarh state India, in the month of September 2019.

2.2. Preparations of plant extracts

The leaves were collected from plant parts and completely dried at room temperature under shade for 2 weeks. During the drying process, plant materials were pounded by mortar and pestle and ground in a minute electric mixer. The powdered samples have been held at room temperature and are ready to undergo analysis. The dried leaves of plants were pulverised. The powdered materials were extracted with three different solvents (ethanol, diethyl ether, and hexane) at 40-60°C by continuous percolation in Soxhlet apparatus for 24 hours [14].

2.3. Fluorescence analysis of powdered leaves of plants

Leaf samples were collected and examined under ultraviolet light after being treated with various chemicals and organic agents. Three parameters were taken into account, i.e. a long wavelength of light (365 nm), a short wavelength of light (254 nm), and natural light (400-700 nm). Similarly, extracts were also tested and observed in the ultraviolet (UV) light and fluorescence was observed and deemed useful for identification [15].

2.4. Preliminary phytochemical screening of various extracts from plants

Freshly prepared extracts were screened for phyto-chemical content; several compounds were isolated. The ash content, soluble ash content, insoluble ash content, extractive values of all plants were determined as per standard procedures [21]. The extracts were subjected to preliminary phytochemical screening as a way of determining the presence of specific plant constituents. The term qualitative investigation refers to determining an object's identity based on inspection and analysis. The various extracts of different plants were screened for different active constituents i.e alkaloids, glycosides, volatile Oils, carbohydrates, saponins, tannins and phenolic compoundsthrough chemical testing [16].

2.5. Determination of Physicochemical Properties

2.5.1. Ash Values

Air dried powdered samples of the leaves of all plants were investigated for total ash, acid insoluble ash and water-soluble ash values by following procedure.

2.5.2. Total Ash Value

2gm. of powdered plant samples were accurately weighed and distributed evenly on the bottom of a prepared silica crucible. The crucible was warmed in a muffle furnace until carbon had been driven off. Then the crucibles were allowed to cool and weighed to determine the percentage total ash content.

2.5.3. Acid Insoluble Ash Value

The ash obtained from the total ash was treated with 25 ml HCl. The insoluble ash was removed from the ore by washing it through a filter with hot water. The filter paper along with the residue were placed in a tarred silicone crucible and then heated until constant weight was reached. The concentration of insoluble acids was measured.

2.5.4. Water-Soluble Ash Value

The total ash was boiled with 25 ml of water. The substance is collected on filter paper which is washed with hot water, heated above 450°C for 15 minutes, and then placed into a furnace. The weights of non-elemental substances were subtracted from the weight of elemental substances. The weight difference represents the water soluble weight of the ash. The percentage of ash soluble in water was found [17].

2.5.5. Water soluble extractive Values

Finely powdered dried plant matter with about 15 gm. of it was accurately weighed in a sealed glass-stopper conical flask. 300ml of water was added while vigorously shaking the flasks, then reweighed. A small flask was heated for 1 hour then attached with a reflux condenser and boiled for 6 hours, cooled, and weighed, then filtered rapidly through a dry filter and weighed.

2.5.6. Alcohol soluble extractive value

Approximately 15gm of finely powdered air-dried plant material was accurately weighed into a glass stoppered container. A solution of 100 ml of alcohol (90% by volume) was added to a flask then shaken for 24 hours and then re-weighed. The sample evaporated, cooled and was weighed [18].

3. RESULTS AND DISCUSSION

All findings from this analysis are shown in the respective tables 1-17. The powdered leaves of all plant weeds were subject to very promising preliminary physical and phyto-chemical analyses. Fluorescence characteristics were investigated under common and UV (366nm), where the sample of powdered leaves and leaf extracts demonstrated the visibility of varying colours, as shown in tables 7-11. Ash value was determined, to provide an idea of the soil or inorganic composition and other contaminants along with the substance. The result of total ash, acid insoluble ash, sulfated ash and water soluble ash and results are as shown in Table 12. Extractive values that are mainly useful in evaluating exhausted or adulterated drugs were also calculated. Extractive values for water soluble and alcohol soluble were also calculated (Table 12). Preliminary profiling phytographs were carried out for the extract of leaves of plant weeds where the consistency was found to be sticky on the non-polar solvent to not so polar (Table 1). The percentage return percentage of extracts was also evaluated whereby the maximum yield was found respectively in the aqueous and ethanolic extract of the *Lantana camara* leaves 28.45% and 26.10 % (Table 12). The preliminary phytochemical test indicates that terpenes, phytosterols, phenolic compounds, carbo-hydrates and saponins are present (Table 13-17). All plant weeds were tested for preliminary phytochemical analysis, i.e. alkaloids, flavonoids, saponins, volatile oils, phenols and tannins, glycosides and terpenoids, and other primary metabolites, such as protein, carbohydrate and secondary metabolite In all plant extracts, the presence of phytochemicals indicates that alkaloids are considered to be helpful in the treatment of contaminated or ulcerated tissues and have important cancer prevention and anti-cancer activity, and that similar findings have also been made in previous studies. Development of standards is an essential part of the accurate identification and consistency of crude drugs. Macroscopy, microscopy and physiochemical parameters of crude medicinal products that give the exact identification, purity and consistency of medicines a detailed note [14]. Flavonoids have been shown to have effects on membrane permeability and to inhibit membrane-bound enzymes including ATPase and phospholipase. Anti-carcinogens were proposed as possible for saponins found in plants [18]. They have surface-active properties due to the amphiphilic nature of their chemical structure. The presence in this plant of these phenolic compounds contributed to their antioxidant properties and hence to their usefulness for herbal medicinal items. This plant is routinely used in the treatment of different diseases amongst several tribes in Asian country [19]. The identification of the location of secondary metabolites in plant parts used in the preparation of drugs is extremely important for the

prevention and taxonomic hierarchy of adulteration too [20]. The presence of volatile oils that have essential plant fitness functions such as the attraction of pollinators, photosynthesis thermal tolerance and the security of herbivores. Phytophagous insects have established strategies to use these volatiles for their own good to either colonise a suitable host for eating, reproducing and oviposing or escape an unappropriate host [21]. The possible use of those phytochemical attractants in integrated mosquito control is also highlighted. For the health of individuals and communities, medicinal plants are more significant. Plant-based medicines are benefits and are well known for their safety, convenient availability and inexpensive cost. Herbal medicinal products may comprise whole plant parts that are mostly made from various plants. They are given orally, they are inhaled straight into the skin.

Table 1: Results of the successive solvent extraction consistency, colour and percentage yield of leaves of selected plants Parameters

	Extracts		
	Diethyl ether	**N-Hexane**	**Ethanol**
Lantana Camara			
Consistency	Waxy	Oily	Viscous
Colour (Visible/ Day light)	Dark green	Greenish brown	Greenish brown
Percentage Yield (%w/w)	2.10	1.95	2.85
Ocimum gratissimum			
Consistency	Sticky	Waxy	Viscous
Colour (Visible/ Day light)	Dark Green	Greenish black	Greenish brown
Percentage Yield (%w/w)	3.20	2.30	3.45
Cassia alata			
Consistency	Non sticky	Oily	Viscous
Colour (Visible/ Day light)	Green	Greenish brown	Greenish brown
Percentage Yield (%w/w)	1.85	2.65	3.05
Zephyranthes minuta			
Consistency	Sticky	Oily	Non sticky
Colour (Visible/ Day light)	Yellowish green	Greenish brown	Greenish black
Percentage Yield (%w/w)	1.20	2.95	3.30
Parthenium hysterophorus			
Consistency	Skicky	Oily	Viscous
Colour (Visible/ Day light)	Dark Green	Greenish brown	Greenish brown
Percentage Yield (%w/w)	1.45	1.95	2.20

Table 2: Results of behavior analysis of plant powder with different chemical reagents of *lantana camara*

Reagent	Observation	Inference
Powder + Iodine	Dark brown colour observed	Absence of starch
Powder + $HgCl_2$	Light to dark Blue colour observed	Presence of alkaloids
Powder + Ammonia	Merry Pink colour observed	Presence of glycosides
Powder + $AgNO_3$	White precipitate not formed	Absence of proteins
Powder + Picric acid	Yellow colour found	Presence of alkaloids
Powder + Water shaking	Foam not produced	Absence of saponins
Powder + Con. H_2SO_4	Black colour	Presence of starch
Powder +FeCl3	black colour	Presence of tannins
Powder + Con. HNO_3	Brown to black colour	Absence of tannins

Table 3: Results of behavior analysis of plant powder with different chemical reagents of *Ocimum gratissimum*

Reagent	Observation	Inference
Powder + Iodine	Yellowish brown observed	Absence of starch
Powder + $HgCl_2$	Dark Blue colour observed	Presence of alkaloids
Powder + Ammonia	Pink colour observed	Presence of glycosides
Powder + $AgNO_3$	Slight precipitate not formed	Absence of proteins
Powder + Picric acid	Dark Yellow	Presence of alkaloids
Powder + Water shaking	Foam not produced	Absence of saponins
Powder + Con. H_2SO_4	Dark yellow colour	Absence of starch
Powder +$FeCl_3$	Bluish black colour	Presence of tannins
Powder + Con. HNO_3	Orange brown colour	Presence of tannins

Table 4: Results of behavior analysis of plant powder with different chemical reagents of *Cassia alata*

Reagent	Observation	Inference
Powder + Iodine	Black colour observed	Presence of starch
Powder + $HgCl_2$	Blue colour observed	Presence of alkaloids
Powder + Ammonia	Light Pink colour observed	Presence of glycosides
Powder + $AgNO_3$	Slight precipitate formed	Presence of proteins
Powder + Picric acid	Colour changed	Presence of alkaloids
Powder + Water shaking	Foam not produced	Absence of saponins
Powder + Con. H_2SO_4	Black colour	Presence of starch
Powder +$FeCl_3$	Bluish black colour	Presence of tannins
Powder + Con. HNO_3	Orange brown colour	Presence of tannins

Table 5: Results of behavior analysis of plant powder with different chemical reagents of *Zephyranthes minuta*

Reagent	Observation	Inference
Powder + Iodine	Black colour observed	Presence of starch
Powder + HgCl2	Blue colour observed	Presence of alkaloids
Powder + Ammonia	Light Pink colour observed	Presence of glycosides
Powder + AgNO3	Slight precipitate formed	Presence of proteins
Powder + Picric acid	Colour changed	Presence of alkaloids
Powder + Water shaking	Foam not produced	Absence of saponins
Powder + Con. H2SO4	Black colour	Presence of starch
Powder +FeCl3	Bluish black colour	Presence of tannins
Powder + Con. HNO3	Orange brown colour	Presence of tannins

Table 6: Results of behavior analysis of plant powder with different chemical reagents of *Parthenium hysterophorus*

Reagent	Observation	Inference
Powder + Iodine	Brown colour	Absence of starch
Powder + $HgCl_2$	Blue colour observed	Presence of alkaloids
Powder + Ammonia	Light Pink colour observed	Presence of glycosides
Powder + $AgNO_3$	No white precipitate formed	Absence of proteins
Powder + Picric acid	Yellow color	Presence of alkaloids
Powder + Water shaking	Foam not produced	Absence of saponins
Powder + Con. H_2SO_4	Reddish brown color	Presence of steroids
Powder +$FeCl_3$	Pale brown colour	Presence of flavonoids
Powder + Con. HNO_3	blood red colour	Presence of anthroquinone

Table 7: Results of fluorescence analysis of plant powder of *Lantana Camara*

Reagent	Long UV light (366nm)	Short UV light (254nm)	Visible/Day light
Powder + 1N HCl	Black	green	Olive green
Powder + 50%HCl	Blackish green	Light green	Light green
Powder + 50% H2SO4	Black	green	Greenish yellow
Powder + 50% HNO3	Blackish Green	Light green	Light Green
Powder + 1N NaOH	Dark green	Green	Dark brown
Powder + Alcoholic NaOH	Brick Red	Dark green	brownish black
Powder + Water	Black	Green	Light brownish
Methanol	Blackish brown	Green	Greenish brown

Table 8: Results of fluorescence analysis of plant powder of *Ocimum gratissimum*

Reagent	Long UV light (365nm)	Short UV light (254nm)	Visible/Day light
Powder + 1N HCl	Dark Green	Green	Light green
Powder + 50%HCl	Brownish green	Light green	Olive green
Powder + 50% H_2SO_4	Yellowish green	Light green	Greenish yellow
Powder + 50% HNO_3	Dark Green	Light green	Green
Powder + 1N NaOH	Black	Green	brown
Powder + Alcoholic NaOH	Brown	Dark green	Light brown
Powder + Water	Yellowish green	Green	Brownish green
Methanol	Blackish brown	Green	Greenish brown

Table 9: Results of fluorescence analysis of plant powder of *Cassia alata*

Reagent	Long UV light (365nm)	Short UV light (254nm)	Visible/Day light
Powder + 1N HCl	Dark green	Light green	Olive green
Powder + 50%HCl	Green	Light green	Olive green
Powder + 50% H_2SO_4	Blackish brown	Light green	Greenish yellow
Powder + 50% HNO_3	Dark green	Light green	Light red
Powder + 1N NaOH	Dark green	Green	Dark brown
Powder + Alcoholic NaOH	Brick Red	Dark green	Light brownish black
Powder + Water	Dark green	Green	Light brownish black
Methanol	Blackish brown	Green	Greenish brown

Table 10: Results of fluorescence analysis of plant powder of *Zephyranthes minuta*

Reagent	Long UV light (365nm)	Short UV light (254nm)	Visible/Day light
Powder + 1N HCl	Green	Light green	Olive green
Powder + 50%HCl	Blackish green	Light green	Olive green
Powder + 50% H_2SO_4	Dark green	Green	Greenish yellow
Powder + 50% HNO_3	Green	Light green	Yellowish green
Powder + 1N NaOH	Yellowish green	Brown	Dark brown
Powder + Alcoholic NaOH	Reddish green	Dark green	Light brownish black
Powder + Water	Yellowish green	Green	Light green
Methanol	Brownish green	Light green	Greenish brown

Table 11: Results of fluorescence analysis of plant powder of *Parthenium hysterophorus*

Reagent	Long UV light (365nm)	Short UV light (254nm)	Visible/Day light
Powder + 1N HCl	Dark green	Light green	Olive green
Powder + 50%HCl	Green	Blakish green	light green
Powder + 50% H_2SO_4	Dark green	Light green	Greenish yellow
Powder + 50% HNO_3	Green	Light green	Light green
Powder + 1N NaOH	Light green	Green	Dark brown
Powder + Alcoholic NaOH	Dark brown	Dark green	Light brownish black
Powder + Water	Dark brown	Green	Light brownish black
Methanol	Blackish brown	Green	Greenish brown

Table 12: Results of physicochemical parameters of all plant leaves

S. No	Parameters	*L. Camara* (%) w/w	*O. gratissimum* (%) w/w	*C. alata* (%) w/w	*Z. minuta* (%) w/w	*P. Hysteronphorus* (%) w/w
1	Total ash	8.45	18.5	11.5	7.5	14.4
2	Acid insoluble ash	2.15	2.65	3.45	2.25	4.15
3	Water soluble ash	1.05	8.4	11.4	6.4	9.3
4	Loss on drying	0.38	1.3	0.45	0.85	3.15
5	Water soluble extractive value	28.45	15.38	10.28	9.30	12.48
6	Alcohol soluble extractive value	26.10	9.4	6.5	8.2	24.3

Table 13: Results of phytochemical analysis of various extract of plant of *Lantana Camara*.

Phytochemical	Diethyl ether	N-Hexane	Ethanol,
Alkaloids	+	+	+
Glycosides	+	+	+
Steroids	-	-	+
Flavonoids	-	+	+
Tannins & phenolic compounds	+	+	+
Proteins and free amino acids	-	-	-
Carbohydrates	-	+	+
Volatile oils	+	+	+
Saponins	+	+	-

(+): presence (-): absence

Table 14: Results of phytochemical analysis of various extract of plant of *Ocimum gratissimum*

Phytochemical	Diethyl ether	N-Hexane	Ethanol
Alkaloids	-	-	+
Glycosides	+	+	+
Steroids	-	-	+
Flavonoids	+	+	+
Tannins & phenolic compounds	-	+	+
Proteins and free amino acids	-	-	+
Carbohydrates	-	+	+
Volatile oils	+	+	+
Saponins	-	-	-

(+): presence (-): absence

Table 15: Results of phytochemical analysis of various extract of plant of *Cassia alata*

Phytochemical	Diethyl ether	N-Hexane	Ethanol
Alkaloids	-	-	+
Glycosides	+	+	+
Steroids	-	-	+
Flavonoids	+	+	+
Tannins & phenolic compounds	+	+	+
Proteins and free amino acids	-	-	+
Carbohydrates	-	+	+
Volatile oils	+	+	+
Saponins	-	-	-

(+): presence (-): absence

Table 16: Results of phytochemical analysis of various extract of plant of *Zephyranthes minuta*

Phytochemical	Diethyl ether	N-Hexane	Ethanol
Alkaloids	-	-	+
Glycosides	+	-	-
Steroids	-	-	+
Flavonoids	+	+	+
Tannins & phenolic compounds	-	-	-
Proteins and free amino acids	-	-	+
Carbohydrates	-	+	+
Volatile oils	-	-	-
Saponins	-	-	-

(+): presence (-): absence

Table 17: Results of phytochemical analysis of various extract of plant of *Parthenium hysterophorus*

Phytochemical	Diethyl ether	N-Hexane	Ethanol
Alkaloids	+	+	+
Glycosides	+	+	+
Steroids	-	-	+
Flavonoids	+	+	+
Tannins & phenolic compounds	-	-	-
Proteins and free amino acids	-	-	-
Carbohydrates	-	+	+
Volatile oils	-	-	-
Saponins	-	-	-

(+): presence (-): absence

4. CONCLUSIONS

Medicinal plant research (weeds) seeks to identify pharmacologically and economically valuable lead molecules. Since, India has a great potential to use these weeds as tools and skills gained through experience in conventional medicinal products as well as in population and economic benefits. The recording of our conventional information needs immediate attention. This contest may be used as a diagnostic method for medicinal plant standardization in a preliminary pytochemical and physicochemical assessment of weed leave. The work involves the preparation of various extracts for thorough analysis by successive solvent extraction. Under UV light and normal light, fluorescence analyses of various consecutive extracts and powder were noted, which indicates their characteristics. The WHO proposed physicochemical determinations and authentic phytochemical procedures in compliance with various physicochemical parameters such as ash value, extractive value. In the preliminary qualitative chemical analyses, glycosides, carbohydrates, Phytosterols and triterpenoids, saponins and phenolic tannins have been found in various extracts.

5. DECLARATION

5.1. Plant authentication

The herbarium was authenticated by Dr. SunitaGarg, Emeritus Scientist, CSIR-NISCAIR, Ministry of Science and Technology, Government of India, New Delhi, India. The plant name has been checked with http://www.theplantlist.org mentioning the data of accessing that website. Voucher specimen number details are given below:-

1. *L. camara* L. - NISCAIR/RHMD/consult/ 2019/3498-99-2)
2. *O. gratissimum* L. - NISCAIR/RHMD/consult/ 2019/3498-99-1)
3. *C. alata* L. - NISCAIR/RHMD/consult/ 2019/3498-99-4)
4. *Z.minuta* (Kunth) D. Dietr - NISCAIR/RHMD/ consult/2019/3498-99-5)
5. *P. hysterophorus* L - NISCAIR/RHMD/consult/ 2019/3498-99-3)

Conflict of interest

None declared

6. REFERENCES

1. Kumar A, Agarwal S, Singh A, Deepak D. *Indian Journal of Scientific Research,*2012; **3**:107-111.
2. Makokha DW, Irakiza R, Malombe I, Le Bourgeois T, Rodenburg. J. *African J. Bot*, 2017; **108**:321-330.
3. Gupta A, Naraniwal M, Kothari V. *Int. J. Appl. Nat. Sci.*, 2012; **1**:8-26.
4. Shukla D, Wijayapala S, Vankar PS. *Int. J. Mosq. Res.*, 2018; **5:**19-24.
5. Mkindi A, Mpumi N, Tembo Y, Stevenson PC, Ndakidemi PA, Mtei K, Machunda R, Belmain SR . *Ind. Crops Prod.*, 2017; **110:**113-122.
6. Pushpangadan P, George V. *International Scholarly Research Notices*,2012; **6**:13-19
7. Rehman JU, Ali A, Khan IA. *Fitoterapia* , 2014; **95**:65-74.
8. Kamaraj C, Rahuman AA, Mahapatra A, Bagavan A, Elango G. *Parasitol. Res.,* 2010; **107:**1337-1349.
9. Katoch D , Singh . *Med. Aromat. Plants,* 2015; **4**:1-8
10. Mondal NK, Chowdhury A, Dey U, Mukhopadhya P, Chatterjee S, Das K, et al. *Asian Pacific J. Trop. Dis.*, 2014; **9**:24-31.
11. Hernández YS, Sánchez LB, Bedia MMG, Gómez LT, Rodríguez EJ, Miguel HMGS, et al. *Phytochem. Lett.,* 2011; **4:**134-137.
12. Sahebi M, Hanafi MM, Van Wijnen AJ, Akmar ASN, Azizi P, Idris AS, et al. *Int. Biodeterior. Biodegrad.*, 2017; **122**:151-164.
13. Makokha DW, Irakiza R, Malombe I, Le Bourgeois T, Rodenburg J. *African J. Bot.,* 2017; **7**:185-192.
14. Nancy P, Ashlesha V. *Int. J. Pharm. Pharm. Sci.,* 2016; **8:**325-332.
15. Dhoke S, Dwivedi M, *J. Med. Plants Stud.,* 2016; **10:**2-4.
16. Cunha LF, Costa CM, Barroso PR, Kato KC. *Rodriguésia.,* 2020; **7**:2-15.
17. Kedar KA, Pawar KT, Chaudhari PD, Chaudhari SR. *Journal of Pharmacy Research,* 2012 ; **5:**4125-4126.
18. Thavamani SB, Kumar S, Dhanapal CV. *J. Pharmacogn. Phytochem.,* 2017; **6**:26-32.
19. Chandrasekaran R, Gnanasekar S, Seetharaman P, Krishnan M, Sivaperumal S. *Biocatal. Agric. Biotechnol.,* 2017; **10:**75-82.
20. Sharma M. *Int. J. Curr. Microbiol. Appl. Sci.,* 2014; **3:**801-832.
21. Sharma OP, Makkar HPS, Dawra RK. 1988 ; **26:**975-987.