

## Preliminary Phytochemicals Analysis of Some Important Medicinal and Aromatic Plants

<sup>1</sup>Sazada Siddiqui, <sup>1</sup>Arti verma, <sup>1</sup>Ayaz Ahmad Rather, <sup>2</sup>Faraha Jabeen and <sup>3</sup>Mukesh K. Meghvansi

<sup>1</sup>Department of Botany, Institute of Basic Sciences, Bundelkhand University, Jhansi, 284128, U.P. India

<sup>2</sup>Department of Agriculture Science, Bundelkhand University, Jhansi, 284128, U.P. India

<sup>3</sup>Agro-Technology Division Defence Research Laboratory, Post Bag No. 2, Tezpur - 784001 (Assam), India

**Abstract:** The plant growth regulators can be defined as either natural or synthetic compounds that modify the plant growth and development pattern by exerting profound influence on many physiological processes and there by increasing the productivity of crops. There are a large number of synthetic organic chemicals possessing growth-regulating properties and new ones are being added to the list periodically. The response induced by them varies with the plant materials and methods of application. This review describes some vegetative morphological responses in higher plants upon commonly used plant growth regulators with particular reference to their reliability, efficiency, accessibility and biological relevance.

**Key words:** Auxins · Gibberellins · Cytokinins · Abscissic acid · Ethylene · Morphological characteristics · Synthetic growth regulators

### INTRODUCTION

The importance of plant is well known to us. We can not imagine life and its growth without plants. They produce not only food for surviving but also create healthy environment and eco-friendly atmosphere to live.

Each and everything on this earth is depending directly or indirectly, on plants. In very large quantities, the human society depends on plants for food, fuel, fodder, clothes and so on.

Besides the food, plants are primary source of material for other necessity of life. The availability of food to human population and its reasonable quantity is governed by the population density, cultivated land area and plant's disease. Mostly cultivated land area is covered by population and the availability of cultivated land area is almost fixed for the food production because population is the most rising phenomenon than the food production. If we want to raise the food production in the fixed land area then we would have to use highly fertile and disease free plants.

If want to increase the food production in the fix land area than we would increase plant growth. There are many factors which are related to the plant growth for example soil microorganism plant growth promoting rhizobacteria (PGPR) etc.

### MATERIALS AND METHODS

The plants collected and used for preliminary phytochemical analysis are enlisted in Table 1.

#### Details of Plants Studied

##### 1. *Acacia nilotica* (L.) Willd.ex Del.

**Family-(Fabaceae):** It is medium sized tree with short trunk, usually attaining a height of 15 M. Bark almost

Table 1:

S.No	Scientific Name	Family	Extract
1.	<i>Acacia nilotica</i>	Fabaceae	Ether, Alcohol, Aqueous
2.	<i>Ageratum conyzoides</i>	Asteraceae	Methanol, Aqueous
3.	<i>Boerhavia diffusa</i>	Ncytaginaceae	Aqueous, Alcoholic
4.	<i>Cynodon dactylon</i>	Poaceae	Aqueous, Methanol
5.	<i>Cleome viscosa</i>	Cleomaceae	Aqueous
6.	<i>Datura stramonium</i>	Solanaceae	Ether, Aqueous
7.	<i>Euphorbia hirta</i>	Euphorbiaceae	Methanol, Aqueous
8.	<i>Ficus bengalensis</i>	Moraceae	Aqueous
9.	<i>Hyptis suaveolens</i>	Lamiaceae	Aqueous
10.	<i>Hibiscus rosa sinensis</i>	Malvaceae	Ethanol, Aqueous
11.	<i>Jatropha gossypifolia</i>	Euphorbiaceae	Aqueous
12.	<i>Putrangiva roxburghii</i>	Euphorbiaceae	Aqueous
13.	<i>Phyllanthus niruri</i>	Euphorbiaceae	Methanol, Aqueous
14.	<i>Prosopis juliflora</i>	Fabaceae	Aqueous
15.	<i>Polyalthia longifolia</i>	Annonaceae	Aqueous
16.	<i>Sida cordifolia</i>	Malvaceae	Aqueous
17.	<i>Tephrosia purpurea</i>	Fabaceae	Aqueous
18.	<i>Tridax procumbens</i>	Euphorbiaceae	Aqueous, Methanol
19.	<i>Zizyphus jujuba</i>	Rhamnaceae	Aqueous, Methanol
20.	<i>Solanum nigrum</i>	Solanaceae	Acetone, Aqueous

black to dark brown, deeply cracked or longitudinally fissured. Found through out drier regions of India. Bark yields several Polyphenolic compounds, Catechin, Epicatechin, Cpigallocatechin, Quercetin, Gallic acid, Leucocyanidin, Gallate, Sucrose and Tennin, Mdigallic acid and Chlorogenic acid, Gum contains Galactose, L-rhaminose, L-arasinose and its derivatives along with four Aldobiononic acids. Seeds contain Amino acids, Fatty acids and Ascorbic acid along with as the minor constituent.

***Ageratum conyzoides* Linn.**

**Family-(Asteraceae):** It is an annual herb 30-50cm, stem erect hairy green or purple. It is found as a common weed every where. The plant yields 0.7-2% essential oil constitution of Ageratochromene, Dimethoxy ageratochromene, Cardimine and Caryophyllene, Alkaloids, Saponins, Monoterpene and Sesquiterpene.

***Boerhaavia diffusa* Linn.**

**Family-(Ncytagiaceae):** This is a perennial diffuse herb with root stock and many procumbent branches, which occur through out India, as a weed in waste lands and road sides. Plant contains Alkaloids, Trancotanol hentriacontane, Sisterol, Ursolic acid, 5, 7-dihydroxy, 3, 4-dimethoxy, 6, 8-dimethyleflavone, Glucose, Fructose, Sucrose and Hypoxanthine-9-1-arabinoside molding hormone, Acydysone. The plant is bitter astringent, cooling, antihelminthic and diuretic, aphrodisiac, stimulant, aphrodisiac and stimulant, expectorant.

***Cynodon dactylon* (L.) pers.**

**Family-(poaceae):** It common all over India ascending up to 2700 meter usually found along Waste land, road sides, uncultivated area, also grown in garden it is herb and show antiviral and fungal activity. It contains Sterol, Tannin and Flavonoids.

***Cleome viscosa* L.**

**Family-(Cleomaceae):** This is an annual herb with strong pungent odour and clothed with glandular and simple hairs, which is found as a weed throughout the plains in India. The aerial parts contain a macro cyclic diterpene, -20-0x0 10-oic acid and a bicyclic diterpene cleomeolide. The seeds contain Coumarino-lignans, Cleomiscosin A, B, C and D. Febrifuge, Laxative and Tonic.

***Datura stramonium* Linn.**

**Family-(Solanaceae):** It is herbaceous annual bushy in nature and attains a maximum height of 120cm. The corolla of its flowers is ten angled broad. Fruits have very slender

prickles. Seeds are brown. The plant has been cultivated in some European countries, In India; it is grown in Banglore, Ahmedabad, Pune, Lucknow, Pilani and Jammu. Dried leaves of *D. stramonium* contain Alkaloids, Hyoscine and Atropine.

***Euphorbia hirta* Linn.**

**Family-(Euphorbiaceae):** An erect herb up to 50 cm. tall with greenish yellow or white flowers, stem covered with yellowish hairs. Leaves are small in opposite pairs. The active compounds present in *Euphorbia hirta* are Alkaloids, Saponins, Tannins, Phylate, Oxalate and Flavonoids.

***Ficus bengalensis* L.**

**Family-(Moraceae):** Ficus is a large even green tree 20 to 30 feet in height usually growing on rocky ravines. It has antibacterial and fungal activity.

***Hyptis suaveolens* (Linn) Poit**

**Family-(Lamiaceae):** An annual herb from the aerial parts of many species of the genus Hyptis (Labiatae). Several essential oils, di and Triterpenoides, Steroid, a Flavonoids glycoside, certain agglutins, fatty compounds and lactones were reported earlier. Two cytotoxic Principles,  $\beta$ - Pellatin and 4-dimethyl-deoxy Podophyllotoxin were isolated from the leaves of *Hyptis verticillata*. The plant also contains phellendrone, eugenol and  $\beta$ - element.

***Hibidius rosa sinensis* Linn**

**Family-(Malvaceae):** It is tall & bushy shrub branched almost following on the round when grow in moist soil. Leaves alternately arranged. Flowers are axillary and haveterminal seed. It contains Alkaloid, Phenol, Steroids etc. which have antimicrobial activity.

***Jatropha gossypifolia* Linn.**

**Family-(Euphorbiaceae):** It is a deciduous soft wooded shrub, 2-3 mm in height with sticky juice and occurs throughout India, in plains and in hedges. The leaves are galactogogue, rubefacient, Supurative and have insecticidal properties and are useful in ulcers, tumours and scabies. It also contains lectins, Phorpolesters, Jatrophine, Curcin.

***Putranjiva roxburghii* Linn**

**Family-(Euphorbiaceae):** A medium sized evergreen tree with dark grey bark reaching 10-15 meter in height, divided into many thin wiry minutely pubescent branches importing the crown a near compact shape leaves dark green leathery, shining, elliptic oblong, 5-8 cm long. Flower amnocious or dioecious with out petal.

***Phyllanthus niruri* Webster**

**Family-(Euphorbiaceae):** An erect much branches annual herb up to 45 cm in height; Leaves small, simple appears to be distichously. Flowers very small creamy white, axially, hanging down below the branchlets.

The active compounds present in this herb are Gallic acid, Ellagic acid,  $\beta$ -sitosterol, Quercetin, dehydrochebulic acid and Methyl brevofofin cauboxylate.

***Prosopis juliflora* (SW) D.C.**

**Family(Fabaceae):** This is a shrub or small tree which grows to a height of up to 12m and has a trunk with a diameter of up to 1.2 m. Plant contains Alkaloids, Projulinine, Juliflorine, Juliflocin & Triterpenes.

***Polyolthia longifolia* (Pendula)**

**Family-(Annoaceae):** A handsome tree of pyramidal shape with drooping short & thin branches & glossy green leaves. The tree is col in outline reaching a height of 10-15 meter.

***Sida cordifolia* Linn**

**Family-(Malvaceae):** The plant is under shrub, branched, soft haired and with stellate hair nearly in all parts of the plant. The plant is a common weed distributed through out the tropical and subtropical region of India and Ceylon in waste places and scrub jungles up to an altitude of 1050 meters. Seed contains alkaloid, a fatty oil, phytosterol mucin, resin, resin acids and potassium nitrate. The main portion of the Alkaloid is ephedrine.

***Tephrosia purpurea* (L.) pers**

**Family-(Fabaceae):** This is a much branched sub erect herbaceous perennial, 30-60 cm in height with spreading branches. It occurs through out India, along waste lands and road sides. It contains Sitostesol, Lupcol, Retin chloride, Isolanchocarpin, Lanceolatin A and Pengamal. Karangin, karangin, 5,7 Dimethoxy-8, Flacanone, 2-Methoxy-3-9-difyarosy coumestone, Flevichapparins, B and C, Methyl Karanjic acid and Purpurin.

***Tridax procumbens* Linn.**

**Family-(Asteraceae):** A semi prostrate perennial herb, taproot, slender, wavy with many lateral branches, Occur through out the tropical and subtropical belt of the world and is frequently found in annual crops, road sides, pastures, fallow land and waste areas the plant contains Alkaloids, Flavonoids, Saponins.

***Zizyphus jujuba* Linn.**

**Family-(Rhamnaceae):** A sub deciduous, spinous tree or shrub. Stem grey brown, young branched densely tomentose. Leaves variable, elliptic, ovate oblong. Prickles solitary, straight or curved. Flowers in short axially, Sub-sessile cymes.

***Solanum nigrum* Linn.**

**Family(Solanaceae):** An erect or rambling sparingly or often branched usually glabrous herb leaves are ovate or oblong, sinuate toothed or lobed, narrowed at both ends.

**A. Collection and Identification of Plant Material:**

Plant material must be botanical identification based on the literature & placed in herbarium all data about the collection must be observed and documented.

**B. Sampling of Plant Material:**

Fresh leaves of 20 different plants species free from disease were collected during the month of January 2008 from Kamasan hill & different location of district Jhansi. The leaves were washed thoroughly 2-3 times with running tap water, leaf material was then air dried under shade. After complete shade drying the plant material was grinded in the mixer, the powder was kept in small plastic bags with proper labeling.

**C. Extraction of Plant Material:**

Preparation of Aqueous extracts: In the first grinded leaves material of 5gm. weighed using an electronic balance & 5g of plant material were crushed in 25ml of sterile water, then heat at 50-60c and it was filtered using Whatt man filter paper no. 1. then filtrate was centrifuged at 2500 rpm for 15 minutes & the filtrate was collected in sterile bottles and was stored by refrigeration at 5°C until use [1].

**Preliminary Phytochemicals Analysis:**

This was carried out according to the methods described by Trease & Evans (1989). Qualification phytochemicals analysis of the crude powder of the 20 plants for the identification of phytochemicals like as a tannins, alkaloid, steroid, phenols & Terpenoid, Flavonoid etc [2].

**Tannins:** (200 mg plant material + 10 ml distilled water + filtered) 2 ml filtrate + 2ml FeCl<sub>3</sub> Blue, → Black precipitate indicate the presence of Tannins & Phenols.

**Alkaloids:** (200 mg plant material + 10 ml Methanol + filtered) 2 ml filtrate + 1% HCl + steam 1 ml filtrate + 6 drops Mayer's reagent/ Wagner's reagent / Dragendorff's reagent produced → Creamish/ Brown/ Red/ Orange precipitate indicate the presence of alkaloids.

**Saponins:** 0.5 ml filtrate + 5 ml distilled water → frothing persistence indicate presence of Saponins.

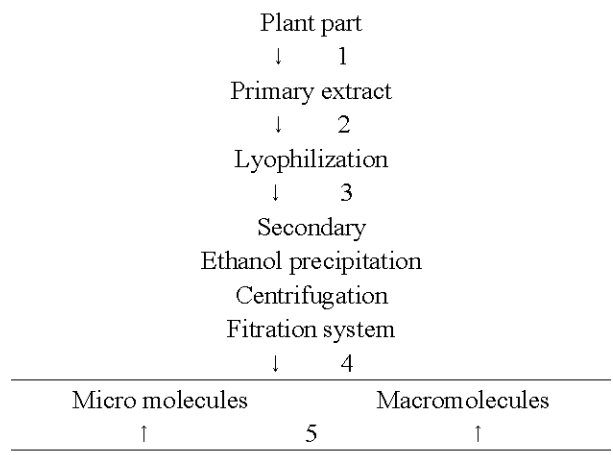
**Terpenoids:** 2 ml filtrate + 2 ml acetic anhydride + conc. H<sub>2</sub> SO<sub>4</sub> → Blue, green ring indicate the presence of Terpenoids.

**Cardiac glycosides: (Keller kiliani test):** 2 ml filtrate + 1ml Glacialacetic acid + FeCl<sub>3</sub> + conc. H<sub>2</sub> SO<sub>4</sub> → Green, Blue precipitate indicates the presence of Cardiac Glycosides.

**Steroids: (Liebermann Burchard reaction):** (200mg plant material + 10 ml Chloroform + filtered) 2 ml filtrate + 2ml Acetic anhydride + conc. H<sub>2</sub> SO<sub>4</sub> Blue, Green ring indicate the presence of Steroids.

**Flavonoids: (200 mg plant material + 10 ml Ethanol + filtered):** 2 ml filtrates + conc. Hcl + Magnesium ribbon → Pink, Tomato, Red colour indicate the presence of Flavonoids, Glycoside.

**Extraction separation, purification & identification of bioactive Phytocompounds:**



**Major Classes and Subclasses of Phytochemicals:** Chemical constituents of plants can be classified in different ways, based on biosynthetic origin, solubility & presence of certain key function group.

It is classified as Phenolic compound recognized by their hydrophilic nature & their common origin from aromatic precursor Shikimic acid.

There are many groups of phytochemicals as followed:

**1- Phenolic Polyphenols:**

- I. Simple Phenols & Phenolic acid,
- II. Quinones,
- III. Flavones & Flavonoids flavona,
- IV. Tannins,
- V. Coumarins,
- VI. Lignins,
- VII. Phenyl propanoids,
- VIII. Phenyl propens
- IX. Cynogenic glycoside.

**2- Terpenoids & Essential oil:**

**3- Alkaloids:**

**4 – Lectins & Polypeptides:**

**RESULTS AND DISCUSSION**

Preliminary phytochemical analysis of screened many plant species was presented in Table 4. Preliminary phytochemicals Analysis revealed the presences of Alkaloids and Saponins. The Other secondary metabolites like Tannins, Flavonoids, Steroids, Cardiac glycosides etc., were the present in trace amounts in some of the plants. Table -4 indicate the preliminary phytochemicals analysis of screened many plant species.

Phytochemicals are as antimicrobial compounds & pesticides of antimicrobial agents which found in aromatic and essential oil plants which have made great contribution for quick and effective management of plant disease and microbial contamination in several agricultural condition;

Phytochemicals preserved by screening of plant parts eg. Leafs, roots, stems, fruits etc, reveals the presence of carbohydrates (free reducing starch, sugar etc.) Saponins, Steroids, Tannins Phenole and Terpenoids. There are many solvent of use in plant extraction, for example- Methanol, Ethanol, Aqueous, Ether, Chloroform etc.

The most phytochemical classified as secondary metabolities are produce mainly bytheshoot part of the plant, often, their function in the plant is unknown but some phytochemicals are known to have structural, functional and general defence against plant pathogens.

Table 2: Major classes and subclasses of phytochemicals with their mechanism of Action

Class	Subclass	Example(s)	Mechanism of action
Phenolics	Simple Phenols	Catechol Epicatechin	Substrate deprivation, membrane disruption.[3,4,5]
	Phenolic acids Quinones	Cinnamic acid Hypericin	Bind to adhesions, complex with cell wall, inactivate enzymes. [6,7]
	Flavonoids	Chrysin	
	Flavones	Catechins	
	Flavonols	Flavone	Bind to adhesions, Complex with cell wall. It produce high conc. disrupt microbial membrane. [8,9,10,11,12,13]
		Abyssinone	Inactivate enzymes, Inhibit HIV reverse transcriptase. [14,15]
	Flavonols Tannins	Totarol Ellagitannin	Bind to proteins. Bind to adhesions, enzyme. Inhibition, Substrate deprivation complex with cell wall. Membrane disruption, Metal ion complications. [16,17,18,19]
	Coumarins	Warfarin	Interaction with eukaryotic DNA. (antiviral activity). [20,21,22]
	Eugenol		Lyses of spore and inhibition of mycelia growth.Strong antifungal activity against pathogenic fungi.
Terpenoids, Essential oils	Triterpene Sterols	Menthall	
	Saponins	Capsaicin	Membrane disruption. Inhibitory to fungi & bacteria. [24]
Alkaloids		Berberine Piperine	Intercalate into cell wall and/or DNA. [25,26,27,28]
Lectins and Polypeptides		Mannose-specific Agglutinin Fabatin	Block viral fusion or adsorption, Form disulfide bridges. [29,30,31]

Table 3: (Solvent used for active component extraction)

Water	Ethanol	Methanol	Chloroform	Dichloromethanol	Ether	Acetons
Anthocyanins [32]	Tannins [34]	Anthocyanins	Terpenoids [45]	Terpenoids [46]	Alkaloids	Flavonols[47]
Starches	Polyacetylenes [23]	Terpenoids [40]	Flavonoids [8]		Terpenoids	Coumarins
					Fattyacid	
Tannins [16]	Polyacetylenes [31,35]	Saponins				
Saponins[33]	Flavonol [35,36]	Tannins[40]				
Terpenoids	Terpenoids[37]	Xanthoxylines				
Polypeptides	Sterols[38]	Totarol[40]				
Lectins	Alkoloids [39]	Quassinoids [41]				
	Propolis	Lactones [42]				
		Flavones [43]				
		Phenones[3]				
		Polyphenols [44]				

These compounds in bold are commonly obtained only in one solvent.

Table 4: Preliminary phytochemical analysis of screened plant species

S.N.	Plant name	Alkaloid	Tannin	Saponin	Flavonoid	Steroid	Carliac	Phenol	Terpenoid
1.	<i>Acacia niolotica</i>	+	+	+	+	+	-	+	-
2.	<i>Ageratum conyzoid</i>	-	+	+	+	-	-	+	-
3.	<i>Boerhaavia diffusa</i>	+	+	+	+	-	-	+	-
4.	<i>Cynodon dactylon</i>	-	+	-	-	-	-	+	-
5.	<i>Cleome viscosa</i>	-	+	-	+	-	-	-	+
6.	<i>Datura stramonium</i>	+	+	-	-	-	-	-	+
7.	<i>Euphorbia hirta</i>	-	+	+	+	-	-	+	-
8.	<i>Ficus benghalensis</i>	-	-	+	+	+	-	+	-
9.	<i>Hyptis suaveolens</i>	+	+	-	+	+	-	-	-
10.	<i>Hibiscus rosa sinensis</i>	+	+	-	-	+	-	+	-
11.	<i>Jatropha gossypifolia</i>	-	-	-	-	+	+	-	-
12.	<i>Putranjiva roxburghii</i>	+	-	+	+	-	-	+	-
13.	<i>Phyllanthus niruri</i>	-	-	+	-	-	+	+	-
14.	<i>Prosopis juliflora</i>	+	+	+	-	-	-	-	+
15.	<i>Polyolthia longifolia</i>	-	+	+	+	-	-	+	-
16.	<i>Sida caraiifolia</i>	+	+	-	-	-	-	+	-
17.	<i>Tephrosia purpurea</i>	-	-	+	+	-	-	+	-
18.	<i>Tridax procumbens</i>	-	+	+	+	+	-	+	+
19.	<i>Zizyphus jujuba</i>	-	-	+	-	+	-	-	+
20.	<i>Solanum nigrum</i>	+	+	-	-	-	-	-	+

(+)- Indicate the presence of phytochemicals (-)- Indicate the absence of phytochemicals

Green plants represent a reservoir of effective chemicals, the raptants and can provide valuable sources of natural pesticides (48-49).

Generally these release chemicals which are used as human pathogenic but sometimes these are used as plant pathogenic. The phenomenon of antimicrobial activity, where a plant species chemically interferes with germination, growth and development of micro-organism which causes the plant diseases.

Phytochemicals is readily available over the counter from herb suppliers, natural food stores & self medication with these substances is common place. Many reporters have reported that phytochemicals are present in virtually all plant tissues e.g. Leaves, roots, stems, fruits etc. Phytochemicals must be concentrated in leaves, stems & roots rather than fruits & flowers. Plant extract is the best source of Phytochemicals, which used as medical treatment but their uses as well as other alternative form of phyto-treatment. Among the great variety of secondary compounds found in plants, Phenolics & Terpenoids represent the main antimicrobial agents currently know. Aromatic compounds such as phenol, phenolic acids, Alkaloids & Lectins & its derivative e.g. Flavonoids, Fannins Coumarinns have been identified as antimicrobial agents.

#### ACKNOWLEDGEMENT

The authors are grateful to the Head Department of Botany, Bundelkhand University, Jhansi, India, for providing the necessary laboratory facilities. Thanks are also due to Dr. Guruprasad, K. Division of Reproductive Medicine, Dr. Sneha G. Kalthur, Department of Ananoty, KMC, Manipal and Nazia Kirmani and Qmar Nyab Ghoury, Abdul Quadir Arafat for their constant encouragement and constructive suggestions while preparing the manuscript.

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