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Weed as potential source of phytochemicals

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Abstract

Many varieties of plants are used as medicine. Traditional medicines are the actual originator of modern medicines. Different phytochemicals obtained from many weeds plants like *Sida cordifolia* of Malvaceae, are used to cure illness such as fever, headache, and intestinal parasitic infections, flowers of *Leucas aspera* of family Lamiaceae are used as expectorant, stimulants and insecticide etc. A weed is a plant growing where it is not desired. Not only they are unwanted but they also compete for resources lowering the productivity of crop plants. By exploring the medicinal properties of such weeds, we can compensate for the loss they create. Abundance and accessibility of weeds increases their potential future as medicinal plants. In this review we are bringing forth plant profile, important secondary metabolites and therapeutic role of four potential weed plants.

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Introduction

A weed is a plant considered undesirable in a particular situation, "plant in the wrong place". Some common examples are plants unwanted in human controlled settings such as farm field, gardens, lawns, and parks. Volunteer's crops (plants) are regarded as weeds in a subsequent crop. A few examples of broadleaf weeds are clover, *Dandelion, Sida cordifolia*, other grassy type weeds are Nutsedge, pampas grass, and bermuda grass. Weeds can be divided into annual, biennial, and perennials. They are in general harmful to the crops and can dominate the vegetation if not cared for. Most of the weeds are invasive and aggressively competing for resources. The losses due to weeds are more than any disease or insects. Hence their eradication is a difficult but necessary step. Using chemicals negatively affects other plants and the ecosystem (Zimdahl, 2013).

Like other plants, weeds have important chemical compounds. These chemical compounds can be treated as novel ligand molecules which can act against disease. (Mc Carthy and O'Mahony 2011; Rattanata *et al.,* 2014) Various weeds of medicinal importance and their parts such as flowers, fruits, leaf, berries, roots and rhizomes, tubers, seeds, sap, gel, barks etc. are extracted and used in traditional medicines. The indigenous knowledge and practices can be positively utilized, expanding the roots of ethno botany. Also by exploring the medicinal utility of such weeds we can compensate the loss they create. Abundance and accessibility of weeds increases their potential future as medicinal plants.

The phytochemical analysis of these weeds gives an idea about secondary metabolites present in them. Secondary metabolites are metabolic intermediates or products which are not essential to growth and life of producing plants but rather required for the interaction of plants with their environment and produced in response to stress like protection against some pathogens or from adverse climatic conditions like, frost and drought. They can be divided into four major classes such as alkaloids, terpenes, phenolics and glycosides.

Discovery of these secondary metabolites and their use against many diseases was a major back through. Many modern medicines have their origin in indigenous practices. Like alkaloid from *Amaranthus spinosus,* it helps in treatment of vermicide, abortion, ulcers and sores (Peter & Gandhi, 2017). *Sida cordifolia* of Malvaceae, are used to cure illness such as fever, headache, and intestinal parasitic infections.

Flowers of *Leucas aspera* belonging to family Lamiaceae has been traditionally used as expectorant (treats cough), aperients (relieves constipation), insecticide and stimulant (Garbis *et al*., 2001). In this review we are bringing forth plant profile, important secondary metabolites and therapeutic role of four potential weed plants having some important phytochemicals that can be used as medicinal plant.

Plant Profile

Phyllanthus niruri

Scientific classification:

Kingdom- Plantae

Clade- Tracheophytes

Order- Malpighiales

Family- Phyllanthaceae

Genus- *Phyllanthus*

Species- *niruri*

Phyllanthus niruri. Flora of Peninsular India-Sankara *et al*., 2019.

Habit and distribution: It is a widespread tropical plant commonly found in coastal areas, known by the common names gale of the wind, stonebreaker or seed under leaf.

Origin: Phyllanthus niruri originated in India.

Description: It grows 50-70cm. (20-28 in) tall and bears ascending herbaceous branches. The bark is smooth and light green.

Phytochemicals: Phyllanthus niruri contains phytochemicals like- flavonoids, alkaloids, Terpenoids, lignins, Polyphenols, tannins and saponins.

Lactuca virosa
Scientific classification:
Kingdom- Plantae
Order- Asterales
Family- Asteraceae
Genus- *Lactuca*
Species- *virosa*

Lactuca virosa. Flora of Peninsular India-Sankara *et al.*, 2019.

*Habit and distribution: Lactuca virosa*is biennial, it can grow upto 200cm. Commonly known as lettuce, is a genus of flowering plants in the daisy family, Asteraceae. The genus includes at least 50 species distributed worldwide, but mainly in temperate Eurasia.

Origin: This weed is grows in various areas of the World, including Iran, Australia, France, Germany and Scotland.

*Description: Lactuca virosa*is stouter, the stem and leaves are purple flushed, and the leaves are less divided, but more spreading, similar to *Mycelis muralis* but showing more than 5 florets.

The achene is purple black, without bristles at the tip. In the northern hemisphere, it flowers from July to September.

Phytochemicals: The plant sap contains lactucarium.

Jatropha curcas
Scientific classification:
Kingdom- Plantae
Order- Malpighiales
Family- Euphorbiaceae
Genus- *Jatropha*
Species- *curcas*

Jatropha curcas. Flora of Peninsular India-Sankara *et al.*, 2019.

Habit and distribution: Jatropha curcas is a species of flowering plant in the spurge family, Euphorbiaceae. The common names in English include Physic nut, Barbados nut, poison nut, bubble bush or purging nut.

Origin: It is native to the American tropics, most likely Mexico and Central America.

Description: It is a small evergreen plant, of the *Acanthaceae* family, with broad, Lanceolate (sharp and pointed like a lance) 10 to 16cm. in length, 5cm.wide.

Phytochemicals: The latex contains Jatrophin which is believed to have anticancer properties.

Andrographis peniculata

Scientific classification

Kingdom- Plantae

Order- Lamiales

Family- Acanthaceae

Genus- *Andrographis*

Species- *paniculata*

Andographis paniculata. Flora of Peninsular India- Sankara *et al*., 2019.

Origin and distribution: Commonly known as creat or green chiretta, is an annual herbaceous plant in the family Achanthaceae.

Origin: It is native to India and Sri Lanka. Common name is king of Bitter.

Description: The plants grows as an erect herb to a height of 30 -110cm in moist, shady places. The stem is dark green, square in cross-section with longitudinal furrows and wings along the angles. The lance-shaped leaves have hairless blades. Measuring up to 8cm (3.1 in) long by 2.5cm (0.98in).

Phytochemicals: The herb contains diterpenoids, flavonoids and polyphenols as the major bioactive components.

Table 2. Important chemicals and their activities in *Phyllanthus niruri, Lactuca virosa, Jatropha curcus, Andrographis paniculata*.

Plant Name	Chemicals	Parts	Activities	Reference
Phyllanthus niruri	3,5,7,-trihydroxyflavonal-4'-o-alpha -l-(-) -rhamnopyranoside.	Root		Shimizu, M., Ito, T., Terashima, S., et. Al., 1984.Inhibiton of Lens Aldose reductase by Flavonoids.photochemistry, 23 ; 1885-1888.
	4- methoxy – norse curinine	Plant	ACE – Inhibitor Aldose reductase inhibitor	
	4- methoxy- securinine	Plant		
	5,3',4'- trihydroxyflavonone – 7-o- alpha - l-(-) -rhamnopyranoside	Root		
	Astragalin	Plant		
	Brevifolin - carboxylic acid	Plant	Aldose reductase inhibitor	Shimizu, M., Horie, S., Terashima, S., Ueno, H., et. Al., 1989.Studies on Aldose reductase inhibitor from Natural products. II. Active components of a Paraguayan crude Drug ' Para – parai mi, *Phyllanthusniruri,* chem. Pharm. Bull. 37(9) ; 2531-2532, 1989
	Cymene	Leaf	CHE –inhibitor	Grundy, D. L. and still, C. C., inhibition of acetycholinesterases by pulegone- 1,2 – epoxide, Oest. Biochem&Physiol., 23, 1985,383- 8
	Hypophylianihine	Plant	Acaricide	
	Limonene	Leaf	Allelochemic	
	Lupa -20 (29) -ene-3beta – ol, lupeol	Root	Anti EBV AntiangiogenicAntiedemic	
	Niranthin, nirtetralin	Leaf	AntihepatotoxicPiscicide	
	Phyltetralin	Leaf	11B- HSD – Inhibitor	Nigg, H. N. And Seigler, D. S., eds. 1992.Phytochemical Resources for Medicine and Agriculture. Plenum press, new York. 445pp
	Rutin	Plant	5- HT – inhibitor Aldehyde- Oxidase inhibitor	
	Saponins	Plant	Antihepatomic	
Lactuca virosa	Beta - amyrin	Plant	Analgesic	

Plant Name	Chemicals	Parts	Activities	Reference
	Beta - sitosterol	Seed	Antiedemic Anti-inflammatory Androgenic - Angiogenic - Anorexic	Martindale 28th
	Citric -acid	Plant	Allergenic - Alpha – Amylase inhibitor - Antiaphthic	Martindale's 28th
	Germanicol, hyoscyamine	Plant	Analgesic Anticholinergic	Watt, J. M. And Breyer – Brandwijk, M. G. 1962. The medicinal and poisonous plants of southern and eastern Africa. E. &S.living tone, Ltd. Edinburg &London.1457pp. Martindale's 29th
	Lactucerin, lactucerols, lactucic - acid	Plant	Antitumor CNV - Depressant	Jeffery. B. Harborne and H. Baxter, eds. 1983. Phytochemical Dictionary. A handbook of Bioactive compounds from plants. Tayor& Frost, London, 791pp.
	Lactupicrin	Latex Exudate	Antifeedant Pesticide	Jacobson, M., Glossary of plant - Derived insect Deterrents, CRC press, Inc., Boca Raton, FL, 213p, 1990.
	Malic - acid	Plant	Antiatherosclerotic Antibacterial Antifibromyalgic	
	Mannitol	Plant	Allergenic Analgesic Anthelmintic	Martindale's 29th ANON. 1948- 1976. The wealth of India raw materials. Publications and information Directorate, CSIR, new Delhi. 11 volumes.
	Oxalic -acid	Latex Exudate	Acaricide - Antiseptic -	Jeffery B. Harborne and H. Baxter, eds. 1983. phytochemical Dictionary. A handbook of Bioactive compounds from plants. Taylor & frost, London. 791pp.
	Squalene	Seed	Antibacterial Antitumor Antioxidant	Jeffery B. Harborne and H. Baxter, eds. 1983.phytochemical Dictionary. A handbook of Bioactive compounds from plants. Taylor & Frost, London. 791pp.
	Taraxasterol	Plant	AntiedemicAntiinflammatory	
	Tocopherol	Seed	5 HETE - Inhibitor Allergenic Analgesic 100	warbach, M. 1993.Healing with food. Harper Collins, New York, 443pp.
	7- keto - beta - sitosterol	Seed		
	Alphh - amyrin	Leaf	Analgesic Antiedemic IC43 Antiinflammatory	
	Arabinose, arachidic – acid, beta - amyrin	Seed	Analgesic - Antiedemic IC27 Antiinflammatory	Martindale's 28th
Jatropha curcas	Beta - sitosterol - 3 -o - beta -d - glucoside	Leaf	Androgenic Angiogenic Anorexic	Martindale's 28th
	Beta - sitosterol - beta - d- glucoside	Seed	Antileukemic - Antitumor - Hypoglycemia	Economic & Medicinal plant Research, 6 : 158.
	Campesterol	Leaf	Antioxidant IC37 Hypocholesterolemic	Duke, J. A. Writeups Or information summaries on approximately 2,000 economic plants, USDA, ARS. Beltsville,

Plant Name	Chemicals	Parts	Activities	Reference
				MD 20705.
	Curcin, dulcitol carbohydrates	Seed	Antitumor Sweetener	Jeffery B. Harborne and H. Baxter, eds. 1983 phytochemical dictionary. A handbook of bioactive compounds from plants. Taylor & Frost, London. 791pp.
	Isovitexin	Leaf	ACE - inhibitor IC50 Antioxidant Cancer- Preventive	Stitt, P. A. Why George Should eat Broccoli, Dougherty CO, Milwaukee, WI, 1990, 399pp.
	Linoleic - acid	Seed	5- Alpha - Reductase - inhibitor AntiMS Antiacne	Economic & Medicinal plant Research, 6 : 189
	Myristic - acid	Seed	Antioxidant IC71 Cancer – Preventive Cosmetic	Stitt, P. A. Why George should eat Broccoli, Dougherty CO, Milwaukee, WI, 1990, 399pp. Jeffery B. Harborne and H. Baxter, eds. 1983. Phytochemical dictionary. A Handbook of Bioactive compounds from plants. Taylor & frost &, London. 791pp.
	Palmitic – acid, palmitoleic - acid	Seed	5- Alpha - Reductase inhibitor - Soap	
	Rhamnose, stachyose	Seed	Flatugenic	Singh, J. Gupta, k., and Arora, S. K. 1993. Changes in the anti - nutritional factors of developing seeds and pod walls of fenugreek (*Trigonellafoenum graecum* L.), plant foods for Human nutrition. 46: 77-84, 1994.
	Stigmasterol, stigmast-5-ene - 3- batao 7-alpha- diol	Leaf	Antihepatotoxic Antiinflammatory Antinociceptive	
	Vitexin	Leaf	ACE-inhibitor Antidermatitic Antiedemic	
	Taraxasterol	Bark	Antiinflammatoryind ometacin	
	14- deoxy -11-dehydroandrographolide	Plant	Antibacterial - Anticholestatic	
Andrographisp aniculata	5-hydroxy-7, 8,2,'3'-tetramethoxyflavone	Plant	3Antihepatotoxic	
	Andrographolide, neoandrographolide	Plant	Antibacterial Antidysenteric Antioxidant	
	Panicoline	Root		

*Unless otherwise noted all references are to Duke, James A. 1992. Handbook of phytochemical constituents of GRAS herbs and other economic plants. Boca Raton, FL. CRC Press.

Medicinal Value

Phyllanthus has been used in traditional medicine for various illnesses, like jaundice, chronic dysentery, skin disease etc. It can help treat high blood pressure and a range of other conditions. Some practitioners of herbal medicine use *Phyllanthus niruri*as as an antidiuretic. In a study, researchers found that *Phyllanthus niruri* has a diuretic effect in rats. It also has antiseptic, diuretic, antiviral, anti- diabetic, hypotensive and antipyretic properties and is also used in the treatment of jaundice, diarrhea, dysentery, wound, ulcers and urogenital diseases.

Lactuca is often ingested for its mild analgesic and sedative effects. It was used in the 19th century by physicians when opium could not be obtained. It was studied extensively by the council of the pharmaceutical society of Great Britain in 1911. The whole plant is rich in a milky sap that flowers from any wounds. This hardens and dries when in contact with the air; the sap contains “lactucarium; which is

used in medicine for its anodyne, antispasmodic, digestive, diuretic, hypnotic, and sedative properties.

Traditionally *Jatropha* is used for treating dysentery and diarrhea. *J. curcas* has been known for its antibacterial activity against *Staphylococcus aureus*, *Escherichia coli* and *Pseudomonas aeruginosa*. It has also been used for treatment of a wide spectrum of ailments related to skin, cancer, digestive, respiratory and infectious diseases.

Andrographis is used traditionally to treat liver disorders, bowel complaints of children, colic pain, common cold and upper respiratory tract infection. *A. paniculata*' cools' and relieves internal heat, inflammation and pain and is used for detoxication. In covid-19 it is helpful in decreasing C reacting protein and inflammation. It promotes digestion, Protects the liver and gall bladder is Vermicidal and Anti-acne: Protect skin from pimples. Though *Andrographis* appears to have weak direct antibacterial action, it has remarkably beneficial effects in reducing diarrhea and symptoms arising from bacterial infections as recommended by Ayurveda in India. Expectorant-promotes mucus discharge from the respiratory system, blood sugar reducer, and immune enhancement, laxative-aids bowel elimination.

Conclusion

In a recent study it was proposed that Andrographolide from the *Andrographis paniculata* possess anti-dengue activity against dengue-2-viruses as revealed from *in vitro* and in silico method. Anti-syndrome (SARS) coronavirus, activity of *Andrographis paniculata* extract and it's major components Andrographolide showed promising anti-viral potential. Likewise stem bark extracts from *Jatropha curcas* was reported to have antimicrobial activity. We can conclude that study of potential compounds from weeds may lead to development of new drugs. Either they may become the base for the development of a medicine or used as phytomedicines for the treatment of diseases.

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