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Phytochemical Profiling of Major Weeds Found In Rajasthan, India

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ABSTRACT

All plants, during their metabolic activity, produce chemical compounds having medical utility. It's estimated that a minimum of 35,000 wild species possesses phytochemicals having therapeutic actions in humans and can be refined to produce drugs. Traditional Medicinal plants have been over-exploited for their antimicrobial activity for a long time, so we need to discover other alternative sources. Another widely and easily available but least important member/ category of the plant kingdom is weed. Weeds are considered a significant threat to major crops. Despite economic losses, many of these noxious weeds are naturally strong competitors and may provide a wide array of phytochemicals such as saponins, flavonoids, glycosides, tannins, alkaloids, and terpenoids. As weeds are inexpensive sources of material, developing cost-effective products from weeds could also be a way of choosing to manage the weeds. It could also help reduce the disturbance of weeds to other economic crops. A brief review of phytochemicals from weeds grow in Rajasthan, India is given below.

Key words : *Weeds, Phytochemicals, tests, Rajasthan, India*

Introduction

All plants, during their metabolic activity, produce chemical compounds having medical utility. It's estimated that a minimum of 35,000 wild species possesses secondary metabolites or phytochemicals responsible for biological activities such as antioxidant, antibacterial, antifungal, anticancer anti-HIV activities (Jack, 2012). These phytochemicals can be refined to produce drugs.

According to the WHO, 80% of the earth's population depends on these traditional medical healthcare systems as they are easily available, economical, effective, and claim no side effects so far (WHO, 2002). Traditional Medicinal plants have been over-exploited for their antimicrobial activity for a long time, so we need to discover other alternative sources.

Another widely and easily available but least important member/ category of the plant kingdom is weed. Weeds are considered a significant threat to major crops as they compete with them for necessities like food, space, sunlight, nutrients, etc., causing a lot of loss in agricultural production (Das, 2008). Despite economic losses, many of these noxious weeds are naturally strong competitors and may provide a wide array of phytochemicals such as saponins, flavonoids, glycosides, tannins, alkaloids, and terpenoids (Gonçalves, 2019). They may have antimicrobial activity, some of which have been explored, and the rest remains to be. As weeds are inexpensive sources of material, developing cost-effective products from weeds could also be a way of choosing to manage the weeds. It could also help

reduce the disturbance of weeds to other economic crops.

Phytochemicals

Phytochemicals literally means various biologically active compounds found in plants. It can have complementary or overlapping mechanisms of action on the body of plant in which it is present. It includes antioxidant effects, antimicrobial effects, change in enzyme and hormone actions, stimulate the immune system, interference with DNA replication and physical action whereby some may bind physically to cell walls thereby preventing the adhesion of pathogens to human cell walls (Njeru, *et al.,* 2011). Some of these phytochemicals are discussed in the following sections.

Alkaloids

They are usually yellow and composed of a ring of organic nitrogenous bases. They taste bitter and are popular for their antimicrobial activity (Kauri and Arora, 2015). Alkaloids may be hazardous as they can dramatically affect the central nervous system, cause severe intoxication, and lead to death (Jack, 2012).

Polyphenols

They are also called phenolics, and compounds containing phenols are called phenolic compounds having phenol rings. Anthocyanin, Isoflavones, and phytoestrogen are examples of some phenolic compounds found in grapes and soy, respectively (Jack, 2012). They help treat diabetes, gut diseases, and cardiovascular issues.

Terpenoids

Terpenes polymerize to form terpenoids, each unit compromised of two paired isoprenes. The different colors in some fruits and vegetables are due to carotenoids, a good example of terpenoids (Jack, 2012). They are used against microbial attack and to cure swelling. They are a well-known treatment for improving skin permeation. The beautiful fragrance of *Rosa indica* is due to the presence of terpenes (Brahmkshatriya and Brahmkshatriya, 2013).

Saponin

Saponins are composed of polycyclic aglycones with one or more sugar branched chains. They are bitter. Foam formation is the characteristics feature of saponins. They have antimicrobial and antioxidant activity. Sapotoxin, i.e., toxic saponins also found in nature (Guclu-Ustundag and Mazza, 2007). Saponins are reported in the extracts of many medicinal plants and weeds such as *Lantana camara* and *Solanum xanthocarpum* weeds, traditionally used as antipyretic, anti-inflammatory, antitumor, and lotion for wounds (Kumar and Pandey, 2014).

Tannins

They are commonly have known as tannic acid. Tannins are composed of water-soluble polyphonolic compounds used as anti-carcinogens and antimicrobial agents (Saxena *et al.,* 2008).

Flavonoids

They are considered an eminent component of pharmaceutical and cosmetics products. They are antioxidant, anti-inflammatory, anti-carcinogenic, and their capacity to modulate intracellular and extracellular enzymes (Panche *et al.,* 2016).

Cardiac glycosides

They are formed by a glycosidic linkage between sugar and other atoms (e.g., oxygen, nitrogen and sulphur, etc.). Digitalis is one of the most familiar cardiac glycosides obtained from the juice of *Digitalis purpurea* leaves. Arrhythmia and cardiac congestion can be treated by using traditional medicine (Jane and David, 2016).

Common cropland weeds with their medicinal importance

Weeds are usually considered harmful for croplands, and farmers spend a huge income eradicating them, but they are not aware of their traditional and medicinal importance. Some of the famous weeds in Rajasthan, India, and their phytochemicals are given below:

Abutilon indicum

Abutilon indicum has been explored phytochemically by various researchers and found to possess several chemical constituents in different parts of the plant.Flower petals of *A. indicum* revealed the presence of flavonoids it includes Gossypetin-7and 8-O-β glucoside, Quercetin-3-O-b-Dglucopyranoside, Luteolin-7-O-β-glupyranoside, Quercetin-3-O-α-rhamnopyranosyl (1-6)-β glucopyranoside and also found luteolin, Chrysoeriol, Chrysoeriol-7-O-β-glupyranoside, Apigenin-7-O-β-glupyranoside,

Cyanidin-3-O-rutinoside (Padma *et al.,* 2009). Quercetin is an important flavanols found in leaf extract (Rajput and Patel, 2012). The aqueous extract of leaves shows tannin, flavonoids, glycosides, and saponin (Prakash *et al.,* 2011). From methanol extract, phenolic acid derivatives like Eudesmic acid, Ferulic acid, and Caffeic acid (Pandey *et al.,* 2011) were also successfully obtained. β-Amyrin-3-palmitate in leaf extract and squalene is a major phytoconstituent from quinones (Macabeo *et al.,* 2014). Sidharth *et al.,* 2016 showed that the compounds 2-Pentanone, 4-hydroxy-4- methyl- seem to be the most stable compound. Three compounds, c-sitosterol, a-sitosterol, and Cholest-5-en-3- ol, 4, 4-dimethyl- were identified. Another phenolic acid-like Glucovanilloylglucose Gallic acid, 4-O-β-Glucosylbenzoic acid, Caffeic acid, Fumaric acid, and P-Coumaric acid have been isolated from the aerial part of the plant (Amit and Gyanender, 2013). From the whole plant of *A. indicum*, flavonoids, asparagine, saponins, mucilaginous substances, alkaloids have been isolated (Kumar *et al.,* 2008; Sharma *et al.,* 2013). Liu *et al.,* in 2009, extract oleanic acid, 2, 6-Dimethoxy-1, four benzoquinone along with Coumarins. Kuo *et al.,* (2009) have studied alkaloids and amides, which are found in the whole plant extract.

Achyranthes aspera

Tiwari *et al.,* (2018) have identified and reported the presence of various phytochemicals in the different parts of *A. aspera*. Extraction was performed using different solvents (methanol, ethanol, acetone, water, and diethyl ether) of different polarities. During this, steroid and terpenoid were found to be absent in all extracts. Alkaloid is present in methanolic, ethanolic, and water extracts using the shaking and boiling method. Tannin is present in the shoot and root of several extracts isolated by different solvents by both methods. Phenol is absent in all extract made by shaking method whereas present in extract using methanol, ethanol, and water as the solvent and using the boiling method. Leaf and inflorescence contain flavonoids. Saponin was present in leaf and inflorescence extract of *A. aspera* by boiling method, whereas it was found in the root and stemmed part by shaking method. Coumarin was found in all extracts except diethyl ether (Tiwari *et al.,* in 2018). Similarly, the aqueous extract of leaves and shoot portion of the plant reveals alkaloids, saponin, tannin, sterols, and glycosides (Saswade, 2019).

Commelina benghalensis

Previous studies have shown that ethanol and aqueous extract of different parts of *C. benghalensis* contain fats, courmarins, steroids, flavonoids, triterpenoids, oils, astringents, alkaloids, reducing agents, tannins, lactones, resins, phenols, amino acids, quinones, and saponins (Cuellar *et al.,* 2010). It also revealed various acids, salicylic acid, caffeic acid, tannic acid, chlorogenic acid, P-courmarins, resorcinol, 8-hydroxyquinoline, quinol, resorcinol, catechol, and anthocyanin (Stirton and Harborne, 1980; Maria and Tony, 1985; Anonymous, 2006). The flower showed dominant anthocyanins presence is cyanidin 3, 7, 3′-triglucoside, acylated with caffeic acid. Another hydroxycinnamic acid is also present. It has been seen that the flavones C-glycosides are the dominant compounds found in the majority of the species of this plant. A vast phytochemical investigation showed an alkanol and sterol presence with a mixture of noctacosanol, n-triacontanol, and n-doctriacontanol in the alkanol stigmasterol, beta-sitosterol, and campesterol in sterol in the ratio 2:1:1(Pandey and Gupta, 1975). Lutein and zeaxanthin were also reported in *C.benghalensis* (Lakshminarayana *et al.,* 2007). A high concentration of carotenoids was also found in this plant (Raju *et al.,* 2007). In 2003, nutraceiticals' presence included vitamin C, proteins, calcium, iron, and many more (Lyimo *et al.,* 2003). The aqueous extract of leaves and shoot portion of the plant reveals alkaloid, saponin, tannin, and sterols (Saswade, 2019).

Lantana camara

Phytochemical triterpenoid Ä12-oleanane and Ä12-ursane were reported from the aerial part of *L. camara* (Begum *et al.,* 1995). Similarly, other new triterpenes, hederagenin, 25-hydroxy- 3-oxooleanan-12-en-28-oic acid, camarilic acid, camaricinic acid, 3β, 19α-dihydroxyursan-28-oic acid and 21, and 22â-epoxy-3β-hydroxyolean-12-en-28-oic acid were isolated from *L. camara* (Singh *et al.,* 1996; Wollenweber *et al.,* 1997; Misra and Laatsch, 2000). Begum *et al.,* in 2006, described the presence of three new pentacyclic triterpenoids lantacin, camarin, and camarinin in aerial parts of *L. camara* (Begum *et al.,* 2006). This result shows that *L. camara* is rich in terpenoids. Khan *et al.,* in 2002 presented a GC-MS analysis of oil collected from leaves and flowers and recorded that *L. camara* oils also contain 1, 8-cineole,

Sabinene, α- humulene, β-caryophyllene, 8-hydroxybicyelogermaerene, α-cadinene, β and γ-elemene, α-copaene and sesquiterpenoids humulene epoxide III as major constituents (Khan *et al.,* 2002; Banik and Pandey, 2008; Kuhad *et al.,* 2010; Zoubiri *et al.,* 2011).

The aqueous extract of leaves shows the presence of saponin, tannin, terpenoid, and phenols (Prakash *et al.,* 2011; Chavan *et al.,* 2013) while fruit, stem, and leaves indicated the presence of alkaloids, flavonoids, tannins, saponins, glycosides and terpenoids in of L. camara (Bashir *et al.,* 2018).

Solanum nigrum

The *Solanum nigrum* fruit contain four steroidal alkaloid glycosides, solamargine, solasonine, α, and β-solanigrine (Varsheny and Sharma, 1965; Elsadig *et al.,* 1997). Stem and roots show the presence of two furostanol glycosides and one spirosestanol glycoside from a methanol extract (Sharma *et al.,* 1983).Ikeda *et al.,* in 2000 obtained two known saponins, Nigrumnins I and nigrumnin II from the whole plant of *S. nigrum*. Other five non saponins isolated were 3,4-dihydroxhbenzoic acid, 6-methoxyhydroxycoumarin, syringaresinol-4-O-beta-D-glucopyranoside, Pinoresinol-4-O-beta-D glucopyranoside, P-hydroxybenzoic acid, and 3-methoxy-4-hydroxyienzoic acid (Wang *et al.,* 2007).

It has been found that *S. nigrum* contains the substances such as glycoprotein, a total alkaloid, steroidal saponins, and steroid alkaloid, exhibiting antitumor activity. New glycoprotein (150 KDa) has been isolated from this plant, consisting of protein content, carbohydrate content, and hydrophobic amino acids such as glycine and proline (Lee and Lim, 2006). Some researchers found the high concentration of ascorbic acid in fruit than root in *S. nigrum* (Kapoor *et al.,* 2004). In 2016, studies on whole plants through spectroscopic analysis, chemical degradation, and derivatization led to identifying six new steroidal saponins (Zhou *et al.,* 2006). Solanum nigrum seeds have high lipid content. Their protein content and minerals elements (Mg being prominent) are considerable, and *S. nigrum oil* is an important lenoleic acid source (Dhellot *et al.,* 2006). The investigation on *S. nigrum* leaves reveals that the protein is abundant in shady areas while alkaloids, saponins, tannins, flavonoids are present in abundance(Gogoi and Islam, 2012). Other researchers conducted similar studies, and the phytochemical screening of the crude extracts revealed secondary compounds such as alkaloids, flavonoids, steroids, tannins, and phenols (Djaafar and Ridha, 2014; Hadi *et al.,* 2017).

Conclusion

Weeds are generally considered as unwanted plants that are commonly found everywhere and interfere with main crops. Thus these are usually neglected by the community, but they also have therapeutic uses. After the present investigation, it can be concluded that potent secondary metabolites/ phytochemicals highlight the importance of weeds as medicinal plants. It has disclosed a new hope for developing novel and innovatively advanced agents from weeds that could replace synthetic improved medicinal agents. However, there is a need for more research to explore the potential of weed flora in croplands.

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