



Review Article

Positive aspects of weeds as herbal remedies and medicinal plants

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ABSTRACT

The weeds are well accepted source of herbal medicines. However, these plants should be managed and removed from agro ecosystems due to their negative impacts on agricultural production systems. However, it is matter of interest that some of well-known weeds are source of drugs and traditional medicine. The weeds have certain biological phytochemicals viz. alkaloids, flavonoids, phenols, terpenes, and saponins etc. which are used to treat health disorders. The demand and importance of natural occurring herbal drugs is rising globally. This is due to their social contentment, easy accessibility, cheapness, effectiveness and no side effect claims. The use of herbs and weeds is based on empirical treatment and experiences from many generations with info accessible solely in native magazines. These medicines possess numerous biologically active ingredients associated with health disorders. Thus their potential has not been fully explored. There is need to improve the quality and analysis of herbal products to be fabricated with research advancements in their efficacy. This review identifies bioactive or phytochemicals present in different plant parts of weeds and ways to extract them are discussed. In addition, the medicinal beneficial aspects of weed species, their medicinal utility and major concerning issues are also highlighted.

Introduction

The word “drug” came from a French word “Drogue” which literally stands for ‘dried plant’. It is estimated that at least 35000 wild species are known to have medicinal value are being practice in developing countries (Jack, 2012). The World Health Organization has admitted that 80% population in developing countries is dependent upon the traditional plants for health care. The call for traditional herbal medicine is growing in the whole world due to their safety and having no side effects, affordable and accessible to all (WHO, 2002).

Historical perspective

The use of medicinal plants dated back to 60000 years as documented by ancient Babylon. In Egyptian regions, the use of traditional medicine was reported about 5000 years ago. The medicinal utility of herbs in Asia and Greece reported back 2500 years (Qazi and Molvi, 2016). In India the Ayurvedic health care system was found for over approximately 5000 years ago (Goyal et al. 2012). The use of traditional medicines in Japan (Kampo) dates back over 1500 years (Watanabe et al. 2011).

Importance of weeds as herbs

The herbal medicine is a practice which involves the herbal material, herbs a whole, their products or their combination to cure the human health related disorders. These herbs are acquired from all plant parts i.e., leaves, shoots, floral parts, roots, and seeds (WHO, 2000). All plants manufacture some chemicals having medical utility through their metabolic pathways. Many plants accomplish some chemicals called bioactive or phytochemicals through their metabolic pathways having medical acceptance. These chemicals are broadly classified into two major classes, primary metabolites (e.g., polysaccharides and fatty contents) and secondary or accessory metabolites which are not prerequisite for primary metabolic events in a smaller group of plants, however some are useful for life sustaining metabolism found only in peculiar species (Bent, 2008). The functions of accessory metabolites are varied. For example, some secondary or accessory metabolites are toxins acclimated to avert predation, and others are pheromones acclimated to allure insects for pollination. As most of the pigments absorb solar energy, so they protect the organisms from radiation and also their attractive colors help in pollination. Antimicrobial plus antioxidative chemicals called Phyto-alexins produced by plants provide protection from microbial attacks. Allelochemicals retards the growth of competitive natural rivals (Jack, 2012).

Phytochemicals of weeds used in medicines

The chemical analysis of individual weed may vary over a specific period of time as it face different and dynamic environmental conditions. Weeds can manufacture a wide array of phytochemicals but most of them are derived from a few bioactive metabolites that may have remedial actions in our body (Jack, 2012). These secondary metabolic ingredients assure safety to plants from damages and disorders and contribute to the plants aroma, flavor and color. They are accepted as phytochemicals which cover several classes such as saponins, flavonoids, glycosides, tannins, alkaloids and terpenoids (Saxena et al. 2013). A brief introduction of weeds phytochemicals is given below.

Alkaloids

They are composed of ring of organic nitrogenous bases. They usually show yellow color but sometimes does not show any color and bitter in taste. They can affect central nervous system dramatically. They are known for their antimicrobial, anticancer as well as anti-inflammatory characteristics (Kauri and Arora, 2015). Alkaloids may be hazardous e.g. alkaloids in *Datura stramonium* results in severe intoxication and may lead to death (Jack, 2012).

Polyphenols

They are also called phenolics having phenol rings. They are helpful in treating the gut diseases, diabetes and cardiovascular issues. Anthocyanin from grapes, Isoflavones and phyto estrogen from soy are phenolic compounds (Jack, 2012). The aqueous extracts of *Euphorbia hirta* and *Trianthema portulacastrum* weeds show antioxidant and antibacterial characteristics (Rattanata et al. 2014).

Terpenoids

Terpenes polymerises into terpenoids, each unit compromised of two paired isoprenes. They are named after the number of units in chain e.g. monoterpenes, diterpenes or triterpenes etc. The beautiful fragrance of *Rosa indica* and *Lavandula* is due the presence of terpenes. The different colors in some fruits and vegetables are due to carotenoids which is good example of terpenoids (Jack, 2012). They are used against microbial attack and to cure inflammation. They are well known treatment for improving skin permeation (Brahmkshatriya and Brahmshatriya, 2013).

Saponin

They are glucosidics with soap foam characteristics. Saponins are composed of polycyclic alycones with one or more sugar branched chains. Sapogenin or aglycon is tripenes (steroids). They are antimicrobial and antioxidant in nature. They are bitter in taste. Some of them are toxic and called sapotoxin (Guclu-Ustundag and Mazza, 2007). Saponins are reported in the extracts of *Lantana camara* and *Solanum xanthocarpum* weeds which are used traditionally as antipyretic, anti-inflammatory, antitumor, and lotion for wounds (Kumar and Pandey, 2014).

Tannins/ tannic acid

They are composed of water soluble polyphenolic compounds. They commonly have known as tannic acid which is derived originally from the use of tannins in tanning the hide of animals in tanneries. Their traditional uses include as anti-carcinogens and antimicrobial agents (Chung et al. 1998; Saxena et al. 2013).

Flavonoids

They are diversified group of polyphenols considered as eminent component of pharmaceutical and cosmetics products. They are antioxidant, anti-inflammatory, anti-carcinogenic in nature along with their capacity to modulate the functions of intracellular and extracellular enzymes (Panche et al., 2016).

Cardiac glycosides

They are formed by a glycosidic linkage between a sugar and other atoms (e.g. oxygen, nitrogen and sulphur etc.). Digitalis is one of the most familiar cardiac glycoside obtained from the juice of *Digitalis purpurea* (foxglove) leaves. They are used as a traditional medicine in case of arrhythmia and cardiac congestion (Jane and David, 2016).

Collection and cleaning of medicinal weeds

The early or late collection of herbal plants may result inferior quality of drugs. The time when plant has maximum amount of bioactive phytochemicals is considered ideal for herb collection (Hamayun et al. 2006). After the collection the whole drug or plant parts should be cleaned thoroughly to remove all kind of foreign particles. Roots should be washed but leaves and other parts such as flowers and seeds should never be washed (Henkel, 1904).

Drying of medicinal weeds

A brighter color of sample is strongly desirable that could be achieved by drying under shade. Their quality degraded if they are not dried properly. The humidity in air may also deteriorate quality and may favor fungal attack (Hamayun et al. 2006).

Packing and storage of medicinal weeds

The dried herbs are then packed in polythene bags or jute sacks properly. The drug quality may reduce if packed and stored in poor conditions. Environmental factors (humidity, temperature and light) may have adverse effect on drug value. Additionally poor storage may also result insect attack, ultimately reduce the quantity as well as quality (Hamayun et al., 2006).

Collection of different parts of weeds

Roots

Plant roots collected during growing season may have lower profile of phytochemicals. Therefore time of collection is important. The roots in annual plants are collected just prior to

flowering stage and in biennial/ perennial plants after the upper parts have dried. After collection roots are washed and dried under shade. Sometimes roots are sliced for better drying (Henkel, 1904).

Leaves and herbs

Leaves are collected when the flowering stage appears. A bright green color is desirable which is obtained if leaves are dried carefully under shade. All leaves, small tender stems and flowers are collected In case of herb collection. However, large and hard stems are not desirable. The precautionary measures and curing steps are same as in root (Henkel, 1904).

Flowers

The best and ideal time of collection is when they are opened and color is yet not faded. They curing include drying them under shade in the same manner as root and leaves (Henkel, 1904).

Seeds

They are collected when fully matured or just before grain pod opens. After collection winnowing should be done to remove the impurities and undesirable plant parts (Henkel, 1904).

Tests for common phtochemicals in weeds

Preparation of ethanolic extract

The oven dried plant material is ground into fine powder, and weighed material of 100g is taken into soxhlet apparatus and submerged in 600 ml ethanol (C₂H₅OH) separately in sealed bottles and kept for duration of one week. Then extract is filtered through whatman's no.1 filter paper. The extract then stored in properly closed jars and placed in refrigerator. A extract of desired concentration could easily be made from this stock solution (Sofowara, 1993).

Mayer's test for alkaloids

The extract is evaporated and the residues are heated with hydrochloric acid (2%) solution in waterbath. After cooling and filtration a few drops of Mayer's reagent are added. When yellow color appears, it confirms alkaloids (Siddiqui and Ali, 1997).

Alkaline reagent test for flavonoids

A few drops of sodium hydroxide are added in known quantity (1 ml) of plant extract. The yellow shade appears which disappears when few drops of diluted hydrochloric acid (HCl) are added, which confirms the existence of flavonoids (Roopashree *et al.*, 2008).

Test for terpenoid

A known quantity (4 ml) of ethanolic extract is treated with 0.5 ml of acetic anhydride (C₄H₆O₃) and 0.5 mL of chloroform (CHCl₃). Then a few drops of concentrated sulphuric acid (H₂SO₄) were added. Violet color confirms the existence of terpenoids (Barboza *et al.* 2009).

Test for polyphenoles

A known quantity (5 ml) is dissolved in 20 ml distilled water then few drops of one % lead acetate [Pb(C₂H₃O₂)₂] are added. The presence of phenol is confirmed when white precipitates are formed (Singh and Bag, 2013).

Test for saponins

A known quantity (50 ml) of phenolic extract is diluted with twenty mL distilled water and agitated in measuring cylinder for fifteen minutes. The existence of saponins are confirmed by the formation of one cm foamy layer (Roopashree *et al.*, 2008).

Keller Killiani test for cardiac glycoside

One ml extract is dissolved in one ml of anhydrous acetic acid and then allowed to cool. Then add few drops of ferric chloride solution and finally two ml of concentrated sulphuric acid is added in this solution. A reddish brown ring is appeared which indicates the presence of glycosides (Singh and Bag, 2013).

Test for tannins

First of all take half ml herbal extract, add one ml distilled water and few drops of ferric chloride solution. Then observe blue green coloration for catechic tannins and blue black coloration for gallic tannins confirms their presence in extract (Iyengar, 1995).

Common cropland weeds with their medicinal importance

Weeds usually considered harmful for croplands and farmers spends a huge income to eradicate them but they are not aware about their traditional and medicinal importance. Some of famous weeds in Punjab Pakistan and their therapeutic and remedial uses are given in table 1.

Table 1. Therapeutic and traditional uses of some common weeds of croplands in Punjab Pakistan

| Botanical Name | Local Name | Plant Parts Used | Therapeutic and Traditional Uses | Reference |
|---------------------------------|---------------|----------------------|--|---|
| <i>Cannabis sativa</i> | Bhang | leaf, fruit and seed | abating of abdomen issues, gonorrhoea, and as a nerve stimulant | Sahu, 1984 |
| <i>Cyprus rotundus</i> | Dheela ghaas | leaves | dysentery, Gut disorders and epilepsy | Qureshi <i>et al.</i> , 2010; Panda <i>et al.</i> , 2014 |
| <i>Lantana camara</i> | Lantana | leaves | Wounds healing | Sahu, 1984 |
| <i>Solanum nigrum</i> | Mako | leaf, fruit and seed | Inflammation of kidney, bladder, scrotum and testicles; heart diseases, cough and toothache. | Sahu, 1984 Panda <i>et al.</i> , 2014 |
| <i>Parthenium hysterophorus</i> | Gajar booti | leaf, fruit and seed | dysentery and malaria | Panda <i>et al.</i> , 2014 |
| <i>Portulaca oleracea</i> | Kulfa | whole plant | diabetic plus swollen and bleeding gums | Panda <i>et al.</i> , 2014 |
| <i>Amaranthus viridis</i> | Jangli cholai | whole plant | dysentery and inflammation | Panda <i>et al.</i> , 2014 |
| <i>Chenopodium album</i> | Bathu | leaves | vitaligo , itching and pain killer | Panda <i>et al.</i> , 2014; Qureshi, <i>et al.</i> , 2010 |
| <i>Mimosa pudica</i> | Chui mui | leaves and stem | used to relieve toothache, treatment of snake biting | Panda <i>et al.</i> , 2014 |
| <i>Cynodon dactylon</i> | Khabal ghaas | leaves | anterior nosebleeds | Panda <i>et al.</i> , 2014 |
| <i>Datura stramonium</i> | datura | leaves | asthma | Panda <i>et al.</i> , 2014 |
| <i>Euphorbia heliscopia</i> | Chatri dohdhk | stem | expel the placenta from the womb | Gueye, 2002 |
| <i>Anagallis Arvensis</i> | Billi boti | whole plant | skin rashing and infected wounds | Kumar <i>et al.</i> , 2013 ; Jabeen <i>et al.</i> , 2009 |
| <i>Cichorium intybus</i> | Kasni | leaves and seeds | liver tonic, cardiogenic, diuretic jaundice and asthma | Sala, 1994; Jabeen <i>et al.</i> , 2009 |
| <i>Melilots indica</i> | Zaed sangi | leaves and flowers | external warts, woundsa and ocular infections | Shinwari and Khan, 2000; Jabeen <i>et al.</i> , |

| Botanical Name | Local Name | Plant Parts Used | Therapeutic and Traditional Uses | Reference |
|-----------------------------|--------------|----------------------|--|--|
| | | | | 2009 |
| <i>Coronopus didymus</i> | Jangli halon | whole plant | allergy, fever, low blood glucose level and prevent liver damages | Busnardo, <i>et al.</i> , 2010 |
| <i>Convolvulus arvensis</i> | Lehli | roots | Source of vit. K, blood coagulation characteristics, cure bleeding piles | Qureshi <i>et al.</i> , 2010 |
| <i>Carthamus Oxycantha</i> | Pohli | leaf, fruit and seed | prevent lipid accumulation, diabetes, kidney stone and liver damages | Bakhsh <i>et al.</i> , 2007; Jabeen <i>et al.</i> , 2009 |
| <i>Avena fatua</i> | Jangli jai | seeds | serve as nerve stimulant and stimulate bowel movement | Islam <i>et al.</i> , 2006 |
| <i>Rumex Dentatus</i> | Jangli palak | leaves and stem | small pox, pneumonia and cough | Hussain <i>et al.</i> , 2006 |
| <i>Vicia sativa</i> | Rivari | leaves | anti-septic properties. | Jabeen <i>et al.</i> , 2009 |
| <i>Galium aparine</i> | Wari booti | leaves | diuretic, skin toner, prevent tumor and inflammation | Gulshan <i>et al.</i> , 2012 |
| <i>Melilotus alba</i> | Senji | Whole plant | eye toner, reduce rheumatic swollen joints pain | Gulshan <i>et al.</i> , 2012 |
| <i>Medicago denticulata</i> | maina | seeds | anemia, Haemorrhage | Gulshan <i>et al.</i> , 2012 |
| <i>Boerhaavia Coccinea</i> | Itsit | Whole plant | Diuratic, laxative and antidote to rat-poisoning | Gulshan <i>et al.</i> , 2012 |
| <i>Rumex obtusifolius</i> | Jangli palak | Roots, leaves | rejuvenate the liver and gallblader, jaundice and anemia | Gulshan <i>et al.</i> , 2012 |
| <i>Tribulus terrestris</i> | Bakhra | Root, seed, leave | gonorrhoea, coughs and scabies, stomachic and appetizer | Gulshan <i>et al.</i> , 2012 |

Why People Use Herbal/ Traditional Medicine?

Accessible and affordable

The evidences for use of herbal drugs in various societies is ample, these traditional health care systems have been used in nursing numerous ailments even without the proper awareness of their ingredients and precise role (Patel et al. 2012). The inflated use of traditional medicine is attributed to their wide social and cultural acceptance, as alternative remedial approaches have been about for centuries (Wassie et al. 2015). In addition, these herbal remedies are also affordable to all population in comparison to costly allopathic medicine (Maroyi, 2013). In highly populated regions, the rural citizenry has about no approach to advanced health care systems; therefore, they are accountable to use of herbal medicines for their basal healthcare needs (Pandey et al. 2013).

Traditional and alternative healthcare system

Herbal weeds are concluded to be more healthful in comparison to accepted bio-synthetic pharmaceutical drugs. The health hazard effects of conventional or synthetic drugs have been reported several times in comparison to toxic level of traditional drug (Pal and Shukla, 2003). Some other reasons for accepting traditional medicinal healthcare system include;

- (i) Assurance of less toxicity and have more efficacy (Calixto, 2000)
- (ii) Improved quality due to the innovative and applied research in herbal medicine (Qazi and Molvi, 2016)
- (iii) to abate symptoms of chronic ailments (Barnes and Bloom, 2007)

It has been reported that the overall 51.7% population depends upon traditional sources of medication while 48.3% people prefer synthetic medicinal facilities. It highlights the increasing trends in adopting herbal medicine in Pakistan (Shaikh *et al.*, 2009).

Challenges to the use of medicines prepared from weeds and/or herbs

Safety claims and toxicological concerns

The use of herbal medicines is mostly considered safe but their misuse could have side effects too as they have toxic ingredients (George, 2011). In some countries the appraisal of toxicity of herbal drug and their derived products is not taken into consideration before marketing. In addition, these countries working technological facilities to maintain high standards and quality, thus there are chances of toxic components present in drug for consumption (Ekor, 2014). It has been reported that pyrrolizidine alkaloids may be fatal because they cause veno-occlusive disease (Bent, 2008). Some herbs such as *Ephedra sinica* and *Echinacea sp.* can cause vomiting and nausea while herbs taken as tea can cause gastrointestinal troubles and diarrhea (Cui *et al.*, 2016). A study on 260 Asian traditional medicines has indicated that the products derived from weed and/or herbs have high levels of heavy metals plus undesired constituents (Rana and Rana, 2014).

Quality control concerns

The formulation as well as quality is considered vital for the acceptance of herbal medicine in modern ages. The quality of available drugs in the market is serious threat to the popularity and global acceptance of these medicines (Verma and Singh, 2008). Environmental factors, nutrients, time and method of harvesting, collection and curing methods as well as transportation can also affect the quality of drug being prepared. Some chemicals in herbs are temperature sensitive and readily decomposed so they should be dried at relatively lower temperature (Calixto, 2000).

Insufficient research framework

In many countries herbal medication is aimed to maintain, support and promote health. However, the concern about safety, quality and efficacy is increasing. However at present only few institutes are conducting research in the field of herbal medicines, so little advancement in this field (Gilani and Atta-ur-Rahman, 2005).

Need for scientific and clinical evaluation

In order to alleviate quality and safety concerns the researchers, manufacturing companies and drug regulatory authorities must include scientific and clinical evaluation methods to achieve the public confidence (Rana and Rana, 2014). Toxicity assessment can reveal the risks associated to the use of herbal medicines (Ifeoma and Oluwakanyinsola, 2013). The evaluation involves quality, safety, efficacy, and stability assessment (Kamboj, 2005).

Conclusion

Weeds are generally considered as those plants which interfere with crops so these are usually neglected by community but they also have therapeutic uses. The present study will be able to introduce these folk medicines to the public which are derived from weeds, ultimately reducing the dependency on costly biosynthetic medicines. The abundance of secondary metabolites e.g. alkaloids, saponins, phenols and tannins etc. in the weeds have curative and healing effects. It has disclosed a new hope for the development of novel and innovatively advanced agents from weeds which could replace synthetic improved medicinal agents. However, there is need of more research in this regard so as to explore the potential of weed flora in croplands.

Conflicts of Interest

No conflicts of interest have been declared.

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