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A Review on the Recent Advances in Pharmacological Studies on Medicinal Plants; Animal Studies are Done but Clinical Studies Needs Completing

[1]Muhammad Sarwar, [2]Idress Hamad Attitalla and [3]Mohammad Abdollahi
[1]Asian Network for Scientific Information, Faisalabad, Pakistan
[2]Visiting Scientist, School of Biological Sciences, Universiti Sains Malaysia, 11800 USM, Palau Pinang, Malaysia
[3]Faculty of Pharmacy and Pharmaceutical Sciences Research Center, Tehran University of Medical Sciences, Tehran, Iran

Corresponding Author: Muhammad Sarwar, Asian Network for Scientific Information, Faisalabad, Pakistan

ABSTRACT

There is a growing focus on the importance of medicinal plants and traditional health systems in solving the health care problems of the world. Use of plants as a source of medicine has come to new developing world from ancient practices. In this study, the most recent studies published in experimental advances in medicinal plants during January 2010 to April 2011 have been reviewed to indicate the extent of advances using ASCI database. Most of studies addressed antioxidant effects of medicinal plants followed by antimicrobial, anti-diabetic anti-inflammatory, hepatoprotective, antifungal and anticancer properties. Fabaceae was found to be the most abundantly studied family with a total of eleven studied plants, followed by Lamiaceae, Combretaceae, Euphorbiaceae, Leguminosae, Malvaceae, Asteraceae, Apocynaceae, Cucurbitaceae, Rubiaceae, Zingiberaceae, Apiaceae, Compositae, Anarcadiaceae, Acanthaceae, Asciepiadaceae and Rutaceae. In spite of the fact that tremendous efforts were done by the researchers by providing an alternate with minimum side effects, easy accessibility and excellent compatibility, future clinical trials and standardization are still desired as an important steps in drug discovery.

Key words: Medicinal plants, current research, use of medicinal plants, importance of medicinal plants, antimicrobial activities

INTRODUCTION

Use of medicinal plants comes from ancient especially in the Africa, Asia and Latin America where the majority of the world's people live. It is not surprising to estimate that about 90% of people have tried medicinal plants at least once in their life. Information relating to medicinal plants and traditional medicine can be found in documents and databases aimed at readers in a wide range of disciplines including botany, ecology, chemistry, medicine, veterinary science, etc. However, there are few publications reporting current work or reviewing and analyzing recent advances. Access to relevant information by the public decision makers and local communities is still very limited.

Some of medicinal plants have been registered for medical use in some countries and in some cases poor people are dependent on medicinal plants for management of their diseases. Every day, a new study is published in the world journals to confirm pharmacological effects of medicinal

plants that have been used traditionally. Therefore, collection of all data about pharmacological effects of medicinal plants from all search sources if we do not say it is impossible, it is at least unpractical. Just to get an idea, if one search for the key words of medicinal plants and pharmacology together in a general search engine like google, about 1,180,000 records would be found. This indicates the extent of studies conducting in this field. In the present study, Asian Science Citation Index (ASCI) that covers 2622 journals was selected as the basis of search and time of study was limited only to January 2010-April 2011 (Table 1). Therefore, we aimed to collect only parts of studies in pharmacological effects of medicinal plants from the world but we sure, results deserve adequate attention to reach a conclusion in better designing future studies in this field to discover and introduce effective new drugs to world.

Table 1: List of studied plants in last two years for their potential therapeutic activities

Family	Plants	Potential activity	References
Acanthaceae	*Justicia gendarussa, Strobilanthes crispus, Avicennia alba*	Anti-Inflammatory, Analgesic, Antioxidant, Hepatoprotective, Cytotoxic, Anti-angiogenic, Antioxidant, Gastroprotective, Antiulcerogenic	Jothimanivannan *et al*. (2010), Krishna *et al*. (2010), Muslim *et al*. (2010) and Al-Attar (2011)
Alliaceae	*Allium cepa, Allium sativum*	Antifungal, Antimicrobial	Tagoe *et al*. (2011) and Butkhup and Samappito (2011)
Amaryllidaceae	*Scadoxus multiflorus, Crinum asiaticum*	Anti-mycobacterial, Antibacterial, Antifungal, Antinociceptive	Mariita *et al*. (2011) and Asmawi *et al*. (2011)
Anacardiaceae	*Mangifera indica, Semecarpus anacardium, Lannea acida*	Antioxidant, Hypoglycemic, Antibacterial	Vaghasiya *et al*. (2011), Jaya *et al*. (2010) and Ouattara *et al*. (2011)
Annonaceae	*Xylopia aethiopica*	Hepatoprotective	Patrick-Iwuanyanwu *et al*. (2010)
Apiaceae	*Oliveria decumbens, Anethum graveolens, Astrodaucus orientalis, Smyrnium cordifolium, Cuminum cyminum*	Antibacterial, Antimicrobial biological, Antimicrobial, Antioxidant	Motamedi *et al*. (2010), Jana and Shekhawat (2010), Razavi *et al*. (2011), Khanahmadi *et al*. (2010) and Sultana *et al*. (2010)
Apocynaceae	*Hemidesmus indicus, Alstonia boonei, Caralluma adscendens*	Antibacterial, Anti-malarial, Antioxidant, Hypolipidemic	Joseph *et al*. (2011), Iyiola *et al*. (2011) and Tatiya *et al*. (2010)
Asclepiadaceae	*Leptadenia hastata, Gymenma sylvestre, Calotropis procera*	Anti-androgenic, Antihyperlipidemic, Hepatoprotective, Antioxidant	Bayala *et al*. (2011), Rachh *et al*. (2010) and Chavda *et al*. (2010)
Asphodelaceae	*Aloe vera*	Antifungal	Nidiry *et al*. (2011)
Asteraceae	*Silybum marianum, Artemisia sieberi, Artemisia monosperma, Tithonia rotundifolia*	Anticancerous, Anti-diabetic, Antioxidant	Abdelmeguid *et al*. (2010), Irshaid *et al*. (2010), Al-Soqeer (2011) and Chanda *et al*. (2011)
Balanitaceae	*Balanites aegyptiaca*	Antioxidant	Meda *et al*. (2010)
Bombacaceae	*Bombax ceib*	Antioxidant	Jain *et al*. (2011b)
Brassicaceae	*Brassica nigra*	Antioxidant, Antibacterial	Hussein *et al*. (2010)
Burseraceae	*Commiphora myrrha*	Antimicrobial, Antifungal	Omer *et al*. (2011)
Capparaceae	*Capparis erythrocarpos, Capparis spinosa*	Anti-inflammatory, Anti-pyretic, Antioxidant	Danquah *et al*. (2011) and Al-Soqeer (2011)
Caricaceae	*Carica papaya*	Hypoglycemic	Osadolor *et al*. (2011)
Clusiaceae	*Garcinia indica*	Antimicrobial	Menghani *et al*. (2011)
Combretaceae	*Terminalia muelleri, Terminalia bellerica, Terminalia catappa, Combretum acutum, Combretum sericeum, Guiera senegalensis*	Antibacterial, Anti-Diabetic, Antioxidant, Analgesic, Anti-inflammatory	Anam *et al*. (2010a), Latha and Daisy (2010), Annegowda *et al*. (2010a), Annegowda *et al*. (2010b), Coulidiati *et al*. (2011) and Sombie *et al*. (2011)

Table 1: Continued

Family	Plants	Potential activity	References
Commelinaceae	*Commelina benghalensis, Palisota hirsuta*	Analgesic, Anxiolytic	Hasan *et al*. (2010) and Woode *et al*. (2010)
Compositae	*Aspilia africana, Vernonia ambigua, Gynura procumbens, Gochnatia polymorpha*	Antifertility, Anti-malarial, Antioxidant, Antispasmodic	Oyesola *et al*. (2010), Builders *et al*. (2011), Puangpronpitag *et al*. (2010) and Schlemper *et al*. (2011)
Cucurbitaceae	*Citrullus colocynthis, Cucurbita maxima, Cucumis melo, Benincasa hispida*	Anesthetic, Anti-diabetic, Anti-inflammatory, antioxidant, Antiulcer, Analgesic, Hypolipidemic	Ramanathan *et al*. (2011), Saha *et al*. (2011), Gill *et al*. (2011a), Gill *et al*. (2010) and Rahbar and Nabipour (2010)
Ebenaceae	*Diospyros melanoxylon*	Antiplasmodial	Saxena *et al*. (2011)
Euphorbiaceae	*Alchornea cordifolia, Acalypha hispida, Euphorbia hirta, Emblica officinalis, Cnidoscolus aconitifolius, Phyllanthus emblica*	Antibacterial, Antioxidant, Enzyme inhibition, Anti-Diabetic, Anticancer Anti-inflammatory, Hepatoprotective, Proliferative	Gatsing *et al*. (2010), Onocha *et al*. (2011), Bangou *et al*. (2011), Widharna *et al*. (2010), Deshmukh *et al*. (2010), Oyagbemi and Odetola (2010) and Luanpitpong *et al*. (2011)
Fabaceae	*Senna spectabilis, Pongamia pinnata, Acacia concinna, Albizia lebbeck, Caesalpinia sappan, Cassia spectabilis, Peltophorum pterocarpum, Cassia occidentalis, Trigonella foenumgraecum, Tephrosia calophylla, Zapoteca portoricensis*	Anticonvulsant, Antidiabetic, Anti-hyperlipidemic, Antimicrobial, Antioxidant, Growth, Hepatoprotective	Bum *et al*. (2010), Kumar *et al*. (2010), Menghani *et al*. (2011), Butkhup and Samappito (2011), Krishnan *et al*. (2010), Jain *et al*. (2011a), Arya and Yadav (2011), Semalty *et al*. (2010), Adinarayana *et al*. (2011) and Agbafor *et al*. (2011)
Fagaceae	*Quercus resinosa*	Antioxidant	Rivas-Arreola *et al*. (2010)
Hypericaceae	*Hypericum perforatum*	Antioxidant	Bitiren *et al*. (2010)
Lamiaceae	*Salvia verticillata, Rosmarinus officinalis, Thymus vulgaris, Salvia syriaca, Scutellaria baicalensis, Hedeoma drummondii, Origanum vulgare, Plectranthus tenuiflorus*	Antidiabetic, Antifungal, Anti-inflammatory, Antioxidant, Antimicrobial, Wound healing	Eidi *et al*. (2011a), Centeno *et al*. (2010), Eidi *et al*. (2011b), Yeh *et al*. (2010), Viveros-Valdez *et al*. (2011), Emanuel *et al*. (2010), Dailami *et al*. (2010) and Khorshid *et al*. (2010)
Lauraceae	*Cinnomomum iners*	Antioxidant	Mustaffa *et al*. (2010)
Leguminosae	*Indigofera tinctoria, Cassia fistula, Acacia nilotica, Paltophorum ferrugineum, Parkia clappertoniana, Tamarindus indica*	Antibacterial, Antioxidant, Anti-inflammatory, Antipyretic, Antimycobacterial, Antifungal, Antioxidant, Hypolipemic, Hepatoprotective	Renukadevi and Suhani Sultana (2011), Gobianand *et al*. (2010), Mariita *et al*. (2011), Chanda *et al*. (2011), Khairunnuur *et al*. (2010) and Patrick-Iwuanyanwu *et al*. (2010)
Liliaceae	*Chlorophytum borivilianum, Linum usitatissimum*	Antibacterial, Hypoglycemic	Sundaram *et al*. (2011) and Abuelgassim (2010)
Loganiaceae	*Strychnos potatorum*	Antinociceptive, Antipyretic	Sanmngapriya and Veukataraman (2010)
Malvaceae	*Hibiscus rosasinensis, Abelmoschus manihot, Cienfuegosia digitata, Sida alba*	Anti-Diabetic, Anti-inflammatory, Antioxidant	Mandade and Sreeuivas (2011), Jain and Bari (2010), Konate *et al*. (2010) and Anokwuru *et al*. (2011)
Moraceae	*Ficus exasperata, Ficus deltoidea*	Anticonvulsant, Antidiabetic	Woode *et al*. (2011) and Adam *et al*. (2010)
Nyctaginaceae	*Boehavia diffusa*	Antimicrobial	Menghani *et al*. (2011)

Table 1: Continued

Family	Plants	Potential activity	References
Pandanaceae	*Pandanus odoratissimus*	Anti-Inflammatory	Londonkar *et al.* (2010)
Papaveraceae	*Argemone mexicana*	Antibacterial	Rahman *et al.* (2011)
Pedaliaceae	*Sesamum radiatum*	Antibacterial	Osibote *et al.* (2010)
Piperaceae	*Peperomia pellucida*	Anti-inflammatory, Antioxidant	Mutee *et al.* (2010)
Plantaginaceae	*Plantago ovata*	Antibacterial	Motamedi *et al.* (2010)
Poaceae	*Cynodon dactylon, Oryza sativa*	Anti-Inflammatory, Antioxidant	Garg and Paliwal (2011) and Muntana and Prasong (2010)
Rubiaceae	*Myrmecodya pendens, Nauclea latifolia, Uncaria calophylla, Uncaria longiflora*	Anticancer, Antidepressant, Myorelaxant, Anxiolytic, Antimicrobial, Antioxidant	Soeksmanto *et al.* (2010), Taiwe *et al.* (2010), Okiei *et al.* (2011) and Ahmad *et al.* (2011)
Rutaceae	*Zanthoxylum capense, Zanthoxylum zanthoxyloïdes, Ruta chalepensis*	Anticonvulsant, Antiplasmodial, Antispasmodic	Amabeoku and Kinyna (2010), Gansane *et al.* (2010) and Moazedi *et al.* (2010)
Sapindaceae	*Nephelium longan*	Antibacterial, Cytotoxic, Antioxidant	Ripa *et al.* (2010)
Sargassaceae	*Sargassum micracanthum*	Antioxidant	Ham *et al.* (2010)
Scrophulariacea	*Scrophularia striata*	Antibacterial	Bahrami and Ali (2010)
Sterculiaceae	*Mansonia gagei*	Antimicrobial	Butkhup and Samappito (2011)
Theaceae	*Camellia sinensis*	Antioxidant, Photochemoprotective	Bitiren *et al.* (2010) and Kaur and Saraf (2011)
Umbelliferae	*Ferula assafoetida*	Anti-Diabetic	Abu-Zaiton (2010)
Urticaceae	*Urtica dioica*	Antioxidant	Bitiren *et al.* (2010) and Mehri *et al.* (2011)
Verbenaceae	*Vitex negundu*	Antimicrobial, Hepatoprotective	Menghani *et al.* (2011) and Mahalakshmi *et al.* (2010)
Vitaceae	*Cissus populnea, Ampelocissus grantii*	Antibacterial, Antioxidant, Antimicrobial	Osibote *et al.* (2010) and Zongo *et al.* (2010)
Zingiberaceae	*Zingiber officinale, Alpinia galangal, Curcuma longa, Kaempferia parviflora*	Antifungal, Antimicrobial, Antioxidant, Vasorelaxant	Tagoe *et al.* (2011), Singh *et al.* (2011), Butkhup and Samappito (2011), Tep-areenan and Sawasdee (2010) and Snkandar *et al.* (2010)
Zygophyllaceae	*Fagonia indica*	Analgesic, Antimicrobial, Cytotoxic	Shehab *et al.* (2011)

Fabaceae was found to be the most abundantly studied family with a total of eleven studied plants. Almost all plant parts like roots, leaves, flowers, pods and seeds were used for various purposes. *Acacia concinna, Albizia lebbeck, Caesalpinia sappan* and *Cassia spectabilis* have been reported for their antimicrobial properties (Krishnan *et al.*, 2010; Menghani *et al.*, 2011; Butkhup and Samappito, 2011). Different plant parts extract of *Cassia occidentalis* and *Peltophorum pterocarpum* have shown potential antioxidant activity (Arya and Yadav, 2011; Jain *et al.*, 2011a). *Pongamia pinnata, Senna spectabilis* and *Tephrosia calophylla* are reported for their anti-hyperlipidemic, anti-diabetic, anticonvulsant and hepatoprotective activity, respectively (Kumar *et al.*, 2010; Bum *et al.*, 2010; Adinarayana *et al.*, 2011).

Second important family with eight studied plants was Lamiaceae. Plant parts like leaves, aerial parts and whole plant have been employed for various medicinal purposes. Plants of this family are mostly used due to their potential antioxidant (*Rosmarinus officinalis* and *Origanum vulgare*), antifungal (*Rosmarinus officinalis* and *Thymus vulgaris*) and anti-inflammatory activity (*Salvia syriaca* and *Scutellaria baicalensis*). Aerial parts of *Salvia verticillata* have shown

potential anti-diabetic activity (Eidi *et al*., 2011a). Significant antioxidant, antifungal, anti-inflammatory and anti-diabetic activities of these plants show the medicinal importance of this family.

Plants of Combretaceae family have been reported for their potential use as antibacterial, antioxidant, anti-inflammatory and anti-diabetic activities. Fruits, leaves, galls and aerial parts have been analyzed for their potential use as therapeutic properties. Various plant extracts of *Terminalia catappa, Combretum acutum, Combretum sericeum* and *Guiera senegalensis* have shown significant antioxidant activity (Annegowda *et al*., 2010a, b; Coulidiati *et al*., 2011; Sombie *et al*., 2011). Leaves and fruits of *Terminalia muelleri* and *Terminalia bellerica* have been reported for antibacterial and anti-diabetic activities, respectively (Anam *et al*., 2010b; Latha and Daisy, 2010).

Six plants of Euphorbiaceae family have shown their potential medicative effects. Mainly leaves, fruits and flowers of these plants have been screened for their potential therapeutic potentials. Plants have shown their significant remedial effects for a wide range of diseases. Significant anticancer activity of *Acalypha hispida* and *Euphorbia hirta* has been proven in various studies (Onocha *et al*., 2011; Bangou *et al*., 2011). *Alchornea cordifolia, Euphorbia hirta, Emblica officinalis* and *Cnidoscolus aconitifolius* have been reported in different studies for potential antibacterial, anti-diabetic, anti-inflammatory and hepatoprotective activities, respectively (Gatsing *et al*., 2010; Widharna *et al*., 2010; Deshmukh *et al*., 2010; Oyagbemi and Odetola, 2010).

Plant parts like leaves, beans and even whole plant of Leguminosae family have been explored for their potential curative effects. *Acacia nilotica* plant is reported for its antimycobacterial, antibacterial and antifungal due to its various pharmacologically active substances (Mariita *et al*., 2011). Ethanolic extract of *Indigofera tinctoria* leaves have shown significant antibacterial, antioxidant and cytotoxicity activity (Renukadevi and Suhani Sultana, 2011). *Paltophorum ferrugineum* have been reported for its profound antioxidant activity in different studies (Chanda *et al*., 2011; Khairunnuur *et al*., 2010). *Cassia fistula* and *Parkia clappertoniana* have been reported for their significant Anti-inflammatory and Hepatoprotective activities, respectively (Gobianand *et al*., 2010; Patrick-Iwuanyanwu *et al*., 2010).

Proven anti-diabetic, antioxidant and anti-inflammatory activity of plants belonging to Malvaceae family makes it an important family with respect to the potential therapeutic activities of these plants. Significant antioxidant activities of *Cienfuegosia digitata*, *Hibiscus sabdariffa*, *Sida acuta* Burn and *Sida alba* have been reported in different studies (Konate *et al*., 2010; Anokwuru *et al*., 2011). *Abelmoschus manihot* and *Hibiscus rosasinensis* are known for their profound Anti-inflammatory and Anti-diabetic potentials (Jain and Bari, 2010; Mandade and Sreenivas, 2011).

Plant of Asteraceae family have shown significant therapeutic activities against important diseases like diabetes and cancer. *Silybum marianum* and *Artemisia sieberi* have been reported for their significant anticancerous and Anti-diabetic activities (Abdelmeguid *et al*., 2010; Irshaid *et al*., 2010). *Artemisia monosperma* and *Tithonia rotundifolia* two other plants of Asteraceae have been reported for significant antioxidant properties (Al-Soqeer, 2011; Chanda *et al*., 2011).

Stem roots and in some cases whole plant of species associated with Asclepiadaceae family have been examined for their possible medicinal uses. Studied plants of this family have shown antimalarial, antibacterial, antioxidant and hypolipidemic activity. Various extracts of *Leptadenia hastata, Calotropis procera* and *Gymenma sylvestre* have shown significant Anti-androgenic, Hepatoprotective and Antihyperlipidemic activities (Bayala *et al*., 2011; Chavda *et al*., 2010; Rachh *et al*., 2010).

Total of four studies were found exploring the therapeutic potential of four medicinal plant of Cucurbitaceae family. Seed, fruit, leaf and aerial parts of these plants possess significant therapeutic activities. *Benincasa hispida* seeds have been reported for their potential antioxidant, Anti-inflammatory, Antiulcer and Analgesic activities (Gill *et al*., 2010, 2011b). Methanolic extract of *Cucurbita maxima* aerial parts have shown significant anti-diabetic activities (Saha *et al*., 2011).

Plants of Rubiaceae family are well reported for their potential therapeutic activities (Karou *et al*., 2011). Leaves and roots of *Nauclea latifolia* have been reported for significant antimicrobial, antidepressant, myorelaxant and anxiolytic activities (Okiei *et al*., 2011; Taiwe *et al*., 2010). Stem and leaves of *Uncaria calophylla* and *Uncaria longiflora* have shown potential antioxidant activities (Ahmad *et al*., 2011). Significant anticancer and antimicrobial activities of *Myrmecodya pendens* and *Nauclea latifolia* are reported in different studies (Soeksmanto *et al*., 2010; Okiei *et al*., 2011).

Plants of Zingiberaceae family were explored for their antimicrobial, antioxidant, vasorelaxant and antifungal activities. *Alpinia galangal* and *Curcuma longa* have shown strong inhibitory effect on different microbes (Butkhup and Samappito, 2011; Singh *et al*., 2011). *Kaempferia parviflora* and *Zingiber officinale* have been reported for their profound antioxidant and antifungal effects, respectively (Butkhup and Samappito, 2011; Tagoe *et al*., 2011).

Seeds, leaves, roots and other aerial parts of plants from Apiaceae family have shown strong antibacterial, antimicrobial and antioxidant activity. Ethanolic extract of *Smyrnium cordifolium* aerial parts have shown significant antimicrobial and antioxidant activities (Khanahmadi *et al*., 2010). Different reports have proven the antibacterial, anticancer, antioxidant activities of *Anethum graveolens*, *Astrodaucus orientalis* and *Cuminum cyminum*, respectively (Jana and Shekhawat, 2010; Razavi *et al*., 2011; Sultana *et al*., 2010).

Plants belonging to Compositae family have been screened for a range of therapeutic activities. *Vernonia ambigua* and *Aspilia africana* have been reported for their potential anti-malarial and antifertility activities (Builders *et al*., 2011; Oyesola *et al*., 2010). Leaf extract of *Gynura procumbens* and *Gochnatia polymorpha* have shown significant antioxidant and antispasmodic activities, respectively (Puangpronpitag *et al*., 2010; Schlemper *et al*., 2011).

Plant of Anarcadiaceae were found to be effective for a range of important diseases like cancer, diabetes, oxidative stress and infections. Bark extract of *Lannea acida* is reported to have significant antibacterial activity (Ouattara *et al*., 2011). Different reports have shown significant anticancer, antioxidant and hypoglycemic activities of *Sclerocarya birrea*, *Mangifera indica* and *Semecarpus anacardium*, respectively (Bangou *et al*., 2011; Vaghasiya *et al*., 2011; Jaya *et al*., 2010).

Various parts of Acanthaceae plants have been investigated for heptoprotective, anti-inflammatory and antioxidant activities. Anti-Inflammatory, Analgesic, antioxidant and hepatoprotective activities of *Justicia gendarussa* stem and aerial parts have been reported in various studies (Jothimanivannan *et al*., 2010; Krishna *et al*., 2010). Al-Attar (2011) reported the hepatoprotective, gastroprotective and antiulcerogenic activities of *Avicennia alba* leaves extract.

Leaves, stems and roots of Asciepiadaceae plants were analyzed for their potential therapeutic effects. Chavda *et al*. (2010) concluded that *Calotropis procera* root bark have significant antioxidant and hepatoprotective and potentials. Anti-androgenic and antihyperlipidemic activites of *Leptadenia hastata* and *Gymenma sylvestre* are well proven, respectively (Bayala *et al*., 2011; Rachh *et al*., 2010).

Plants of Rutaceae family have been studied and promising anticonvulsant, antimalarial and antispasmodic activities are reported. Gansane *et al.* (2010) proved the bark of *Zanthoxylum zanthoxyloïdes* have significant antimalarial activities. Leaves of *Zanthoxylum capense* and *Ruta chalepensis* have been reported for their significant anticonvulsant and antispasmodic activities, respectively (Amabeoku and Kinyua, 2010; Moazedi *et al.*, 2010).

Recently many reports have been published highlighting the harmful effects of oxidative stress (Abdelhalim and Moussa, 2010; Saalu, 2010; Marjani, 2010; Abdollahi *et al.*, 2004, 2005; Rezaie *et al.*, 2007). In this review almost 32% of total studied plants have shown potential antioxidant activity showing the high interest of scientists towards finding the new antioxidant agents. Many studies have reported the alarming increased prevalence of pathogenic bacteria and development of resistance to antibiotics (Rattanasena and Somboonwatthanakul, 2010; Ghorashi *et al.*, 2010; Rafeey *et al.*, 2010; Mahmood and Hamid, 2010). Second most almost 14% of total reported plants have been explored for antimicrobial studies and 13% of plants have shown specifically antibacterial activity indicating that this microbial problem is also among scientists priorities. Haque *et al.* (2011) concluded that use of medicinal plants could help to prevent or maintain diabetes. Antidiabetic activity was the third (10%) most reported therapeutic potential of total reviewed medicinal plants which justifies the conducted research. Karim *et al.* (2011) has provided a list of nineteen herbs that are proved to be effective against diabetes. Recently different studies have reported the prevalence of fungal diseases (Nweze, 2010; Reddy *et al.*, 2010), six percent of reviewed plants in this study have shown potential antifungal activity. Nine and six percent of plants have shown anti-inflammatory and hepatoprotective activity, respectively. It is well known that phytochemicals have potential used as anticancer agents (Haque *et al.*, 2010) and four percent of plants have shown significant anticancer activity showing the scientists interest in combat against cancer.

According to Hasani-Ranjbar *et al.* (2010a), there is no review on the use of herbal medicines in the management of drug-induced hyperprolactinemia in human and they reviewed all existing data on the efficacy of herbal medicines in the management of drug-induced hyperprolactinemia in human.

In another systematic review, Hasani-Ranjbar *et al.* (2010b, c) focuses on the efficacy and safety of Teucrium species that are effective in the management of different conditions in human and animal. In this review they found some animal and one human study showed hypoglycemic effects of Teucrium. In one animal study, Teucrium decreased serum cholesterol and triglyceride in hyper-lipidemic rats. Some studies indicated anti-oxidant, anti-spasmodic, anti-nociceptive and anti-inflammatory properties of Teucrium. According to histopathological and biochemical evidences, high doses or long-term administration of Teucrium may induce progressive impairment of neuromuscular coordination and reversible or irreversible hepatic damage. Teucrium has antidiabetic effect by enhancing secretion of insulin from the pancreas. The flavonoids and sterols are responsible for the anti-inflammatory activity of this plant. Isolation and characterization of Teucrium constituents is suggested to reach suitable drugs.

In a review focuses on the efficacy and safety of effective herbal medicines in the management of hyperlipidemia in human Hasani-Ranjbar *et al.* (2010c) searched out in world known databases with the search term Hyperlipidemia and herbal medicine or medicine traditional. They reviewed fifty three relevant clinical trials for efficacy of plants. This study showed significant decrease in total cholesterol and LDL cholesterol after treatment with Daming capsule (DMC), chunghyul-dan,

Glycyrrhiza glabra, garlic powder (Allicor), black tea, green tea, soy drink enriched with plant sterols, licorice, Satureja khuzestanica, Monascus purpureus Went rice, Fenugreek, Commiphora mukul (guggul), Achillea wilhelmsii C. Koch, Ningzhi Capsule (NZC), cherry, Compositie Salviae Dropping Pill (CSDP), shanzha xiaozhi capsule, Ba-wei-wan (hachimijiogan), rhubarb stalk, Silybum marianum, Rheum Ribes and Jingmingdan granule (primrose oil). Conflicting data exist for red yeast rice, garhc and guggul. No significant adverse effect or mortality were observed except in studies with DMC, guggul and Terminalia belerica, Terminalia chebula, Emblica officinalis, ginger and garlic powder (*Allium sativum*). They finally concluded that out of fifty three, 22 natural products were found effective in the treatment of hyperlipidemia that deserve further works to isolate and characterization of their constituents to reach novel therapeutic and more effective agents.

Mohammadirad and Abdollahi (2011) conducted a study to provide a systematic review on the animal or human evidences linking aluminium (Al) toxicity to oxidant/antioxidant imbalance. Embase, Scopus, Pubmed, Web of Science, Google Scholar and SID databases were searched up to 1st October 2010. Over 50 studies including animal and human linking oxidative stress to Al were reviewed. Most of animal and human studies show a significant increase in lipid peroxidation (LPO) by Al. The maximum LPO was reported in the brain. Data about changes of enzymatic antioxidants such as Superoxide Dismutase (SOD), Catalase (CAT), Glutathione Peroxidase (GPx) post exposure to Al are controversial. Animal studies showed that vitamin E, C, melatonin and pinoline reduce LPO in Al-exposed subjects. Al can affect body oxidant/antioxidant balance in favor of oxidative toxic stress. Among parameters tested in various studies, LPO seems the best indicator of Al toxicity. The role of iron homeostasis in mediation of cytotoxic effects of Al seems important. Since, oxidant/antioxidant imbalance is involved in the pathogenesis of many diseases including inflammatory bowel diseases, diabetes, osteoporosis; it would not be surprising to track roles of Al in many deliberating diseases in future.

Momtaz *et al.* (2010) had undertaken a study to explore the possible biochemical activities of *Hyaenanche globosa* Lamb and its compounds. In this study they evaluated two different extracts (ethanol and dichloromethane) of four different parts (leaves, root, stem and fruits) of *H. globosa* for their possible antibacterial, antityrosinase and anticancer (cytotoxicity) properties. Two pure compounds were isolated using column chromatographic techniques. Active extracts and pure compounds were investigated for their antioxidant effect on cultured 'Hela cells'. Antioxidant/oxidative properties of the ethanolic extract of the fruits of *H. globosa* and purified compounds were investigated using Reactive Oxygen Species (ROS), Ferric-Reducing Antioxidant Power (FRAP) and Lipid Peroxidation Thiobarbituric Acid Reactive Substance (TBARS) assays. The ethanolic extract of the leaves and fruits of *H. globosa* showed the best activity, exhibiting a minimum inhibitory concentration (MIC) of 3.1 mg mL^{-1} and a minimum bactericidal concentration (MBC) of 1.56 and 6.2 mg mL^{-1}, respectively, against *M. smegmatis*. The study showed that the ethanolic extract of the fruits of *H. globosa* (F.E) found the highest percentage of inhibitory activity of monophenolase (90.4% at 200 mug mL^{-1}). In addition, F.E exhibited 50% inhibitory concentration (IC (50)) of 37.7 mug mL^{-1} on the viability of 'HeLa cells' using cytotoxicity MTT assay. Subsequently, F.E was fractionated using phase-partitioning with n-hexane, ethyl acetate and n-butanol. The cytotoxicity of these fractions was determined in vitro using different cancer cell lines. The n-hexane fraction exhibited the highest activity of toxicity. Therefore, this fraction was subjected to further separation by chromatographic methods. Two pure compounds known as:

'Tutin' and 'hyenanchin' were isolated and their structures were determined by NMR spectroscopic methods. Unpredictably, none of them showed significant ($p<0.01$) inhibition on cell viability/proliferation at the concentrations that were used. F.E showed significant anti-tyrosinase, antibacterial and cytotoxicity effects, therefore it can be considered as an effective inhibitor alone or in combination with other plant extracts.

CONCLUSION

In conclusion, the latest published literature (in ASCI Database) on medicinal plants is mainly focused on six families (Fabaceae, Asteraceae, Combretaceae, Euphorbiaceae, Leguminosae and Malvaceae). Most of the plants were explored for their antioxidant, antimicrobial, antibacterial and anti-diabetic activities however, researchers did not overshadow the anti-inflammatory, hepatoprotective, antifungal and anti-cancerous activities of studied plants. In past two years some unexplored plants were also added as an alternate of synthetic drugs because their phytochemical and pharmacological properties were investigated and published for the first time. In short, this study has summarized the latest literature published on medicinal plants. In spite of the fact that tremendous efforts were done by the researchers to help mankind by providing an alternate with minimum side effects, easy accessibility and excellent compatibility, future clinical trials and standardization are still desired as an important steps in pharmacognosy.

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