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Review Article **Open Access**

Key based reviews may prove phenomenal for contemporary research on medicinal plants especially with regard to *Euphorbia helioscopia* L. and *Achillea millefolium* L.

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Abstract
Medicinal plants are essential natural resources which constitutes one of the potential sources of new products and bioactive compounds for drug development. The two plants from Kashmir Himalaya have been selected for study on ethno-botanical importance. *Achillea millefolium* L. is recommended for the treatment of many different ailments because of its astringent effects. The herb is purported to be a diaphoretic, astringent, tonic. *Euphorbia helioscopia* L. has been widely used for centuries to treat different disease conditions such as ascites, edema, tuberculosis, dysentery, scabies, lung cancer, cervical carcinoma and esophageal cancer. The main aim of this review is to provide the overview of morphological traits viz a viz their medicinal utility to explore the new dimensions. The complete sketch of these aforementioned species has been carried out based on self-observations and secondary sources to enumerate the scientists and researchers about the basic facts and also provide vital basis for future research proposals.

Key words: *Euphorbia helioscopia*; *Achillea millefolium*; Medicinal properties, Compounds.

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1. INTRODUCTION

Before the introduction of chemical based medicines, man relied on the healing properties of natural products from medicinal plants. It is estimated that about 80% of 5.2 billion people of the world live in less developed countries and the World Health Organization (WHO) estimates that about 80% of these people rely almost solely on the conventional medicine. Also in various parts of India, both tribal and rural people depends on the medicinal plant therapy for meeting their health care needs (Shanmugam et al., 2011). Based on the use of plants in traditional medicine, a notable number of modern drugs have also been isolated from different plant species and introduced in modern pharmaceutical industries.

Medicinal plants are essential natural resources which constitutes one of the potential sources of new products and bioactive compounds for drug development (Gangwar et al., *2010*). Today people are impelled to revisit to the ancient and traditional system of plant based medicines or herbal medicines due to growing recognition that they are natural products, non-narcotic, easily biodegradable producing minimum environmental hazards, having no adverse side effects and easily available at affordable prices (Shariff et al., 2006). With the result, the use of natural medicines or herbal drugs has gained impetus and the demand for herbal raw drugs and other products is increasing many folds. The basis for use of plants in medicine is the presence of active ingredients or biologically active principles or secondary metabolites that affect physiological or metabolic processes of living organisms, including human beings. In recent years, secondary plant metabolites (phytochemicals) previously with unknown pharmacological activities have been extensively investigated as a source of medicinal agents (Krishnaraju et al., 2005). These substances are considered as the basis for developing new antimicrobial drugs as they inhibit pathogens and have little toxicity to host cells.

Plants growing at varying altitudes experience the interacting stresses of cold and arid climate, scanty rainfall, high wind velocity, snow storms, blizzards and high ultraviolet radiations (Shepherd and Griffiths, 2006). Broad range of environmental factors such as precipitation, mean temperature, daily thermal amplitudes, soil characteristics, wind speed, temperature extremes, atmospheric pressure, duration of snow-cover, length of the vegetation period, and radiation intensities changes with altitude (Zidorn, 2010). To cope up with this, plants alter their morphological characters and stomatal parameters which are specific for the particular species but are affected by these multiple ecological factors across altitudinal gradient (Beerling and Kelly, 1996). Plants at various altitudes can adapt by avoiding and overcoming the stress conditions by means of various physiological and biochemical mechanism including evolution of a resistance-conferring genotype, or by improvement of genes which can produce ecologically adapted phenotypes or can have a different response related to their resistance to these stress conditions which depends mainly on the morphology, anatomy and life cycle (Kuss, 2005). Climate factors such as rainfall, water availability and temperature change with altitudinal gradients (Zidorn, 2010) also trigger a change in phenological events (Bhat and Muralli, 2001).

Euphorbia helioscopia L. (Euphorbiaceae) is widely distributed in China. As a herbaceous plant, the stem of *Euphorbia helioscopia* produces a typical milky juice which may cause toxic reactions following contact with skin and mucous membranes (Wilken and Schempp, 2005). As a traditional Chinese medicine,*E. helioscopia* has been widely used for centuries to treat different disease conditions such as ascites, edema, tuberculosis, dysentery, scabies,

lung cancer, cervical carcinoma, and esophageal cancer (Pang and Lian, 2007; Yang et al., 2007). It is also believed to have antifungal and antibacterial properties (Uzair et al., 2009). During the past decade, numerous studies reported the isolation of various secondary metabolites from *E. helioscopia* such as diterpenoids (Tao et al., 2008), flavonoids (Chen et al., 1979), triterpenoids (Nazir et al., 1998), polyphenols (Wei-Sheng et al., 2009), steroids and lipids (Kosemura et al., 1985). Previously, high contents of quercetin, a plant-derived flavonoid, have been detected in the leaves of *E. helioscopia* (Liu et al., 2011) and its anticancer properties were demonstrated (Caltagirone et al., 2000). Although the antitumor activity of aquatic extract of *Euphorbia helioscopia* root was also studied (Cai et al., 1999a, b), the effects of the whole plant have not been evaluated and the anticancer active fractions and the precise anticancer mechanism of the herb remain unclear.

Achillea millefolium L. (Asteraceae) commonly known as yarrow is a strongly aromatic perennial plant found on meadows, baulks, dry pastures, roadsides, sunny places and fertile soils. Its stem is abundantly covered with moss and produces many leaves. It blossoms from June to October. Its entomophilous head inflorescences of the are made up of white ray flowers and creme disk flowers. Its properties have been known since antiquity and its use is diffused in many cultures from Europe to Asia, in Greece, in the region of Thessaloniki. *A. millefolium* is recommended for the treatment of different ailments (Kokkini et al., 2004); in west Azerbaijan, Iran, the infusion of dried flowers is considered suitable for the treatment of hemorrhoids, dyspepsia, dysmenorrhoea and gastritis (Miraldi et al., 2001); in the Parvati valley, west Himalaya, India, leaves and flowers are used for gastric problems and fever (Sharma et al., 2004). Concerning the bioactivity of this plant, recent studies reported antimicrobial, antiphlogistic, hepatoprotective, antispasmodic and calcium antagonist activities of its polar extracts (Stojanovic et al., 2005; Yaeesh et al., 2006) and a protective effect of its infusions against H_2O_2-induced oxidative damage in human erythrocytes and leucocytes (Konyalioglu and Karamenderes, 2005). Some articles have described anti-malarial activity of flavonoids from plant sources (Saxena et al., 2003; Kaur et al., 2009). Murnigsih and colleagues (2005) screened the activity of water extract of *A. millefolium* against *Plasmodium falciparum* with positive results, stimulating the interest to study the activity of methanolic extract from *A. millefolium* and of its pure compounds.

2.DISTRIBUTION

2.1 Euphorbia helioscopia

Euphorbia helioscopia of the spurge family (Euphorbiaceae) is one of the largest family of flowering plants with about 300 genera and 7500 species. They all produce a mostly white latex which they exude when cut, and this sap is often toxic. Most spurges are herbs, but some especially in the tropics, are shrubs or trees. Some are succulent and resemble cacti because of convergent evolution. This family occurs mainly in the tropics, with the majority of the species in the indo-Malayan region and tropical America. A large variety occurs in tropical Africa, but they are not as abundant or varied as in the two other tropical regions. *Euphorbia* also has many species in non-tropical areas such as the Mediterranean Basin, the Middle East , South Africa and Southern USA (Charles et al., 2007). Fifty species have been reported from Pakistan (eflora of Pakistan) which are mentioned below in (Table 1). Several species of the genus are found in India as shown in table 2.

Table 1. Complete conspectus of *Euphorbia* species.

S. No.	Name of the species
1.	*Euphorbia tirucalli*
2.	*Euphorbia milii*
3.	*Euphorbia lathyris*
4.	*Euphorbia caducifolia*
5.	*Euphorbia nivulia*
6.	*Euphorbia neriifolia*
7.	*Euphorbia royleana*
8.	*Euphorbia hirta*
9.	*Euphorbia indica*
10.	*Euphorbia hypericifolia*
11.	*Euphorbia hispida*
12	*Euphorbia kanaorica*
13	*Euphorbia granulate*
14	*Euphorbia clarkeana*
15	*Euphorbia marginata*
16	*Euphorbia thymifolia*
17	*Euphorbia cyathophora*
18	*Euphorbia pulcherrima*
19	*Euphorbia grossheimii*
20	*Euphorbia tibetica*
21	*Euphorbia caeladenia*
22	*Euphorbia sororia*
23	*Euphorbia osyridea*
24	*Euphorbia densa*
25	*Euphorbia aserbajdzhanica*
26	*Euphorbia multifurcata*
27	*Euphorbia heterophylla*
28	*Euphorbia petiolata*
29	*Euphorbia inderiensis*
30	*Euphorbia thyrsoidea*
31	*Euphorbia boissieriana*
32	*Euphorbia aucheri*
33	*Euphorbia prolifera*
34	*Euphorbia dracunculoides*
35	*Euphorbia microsciadia*
36	*Euphorbia talaina*
37	*Euphorbia cyrtophylla*
38	*Euphorbia pamirica*
39	*Euphorbia micractina*
40	*Euphorbia cornigera*
41	*Euphorbia cognate*
42	*Euphorbia helioscopia*
43	*Euphorbia jacquemontii*
44	*Euphorbia thomsoniana*
45	*Euphorbia wallichii*
46	*Euphorbia peplus*
47	*Euphorbia falcate*
48	*Euphorbia maddenii*
49	*Euphorbia seguieriana*
50	*Euphorbia lathyris*

Table 2: Species of *Euphorbia* in India (Source: Hooker, 1887).

1.	*Euphorbia humilis*
2.	*Euphorbia virgata*
3.	*Euphorbia prolifera*
4.	*Euphorbia nana*
5.	*Euphorbia fusiforms*
6.	*Euphorbia acaulis*
7.	*Euphorbia khandalensis*
8.	*Euphorbia panchganiensis*
9.	*Euphorbia tortilis*
10.	*Euphorbia antiquorum*
11.	*Euphorbia susan*

The general distribution of *E. helioscopia* includes the south of Scandinavia, Middle and Southern Europe, the Mediterranean, the Balkans, Asia Minor, Kurdistan, Iran, India, the Himalayas, Japan, China, North Africa (Keller et al., 1934). It is an adventives plant in North America. In the territory of the former USSR, the species is distributed in the European part, Crimea, Central Asia. It is also

sparsely distributed in Western Siberia (in the Tyumen, Tobolsk, Kurgan and Novosibirsk areas) (Nikitin, 1983). In Indian subcontinent, it is distributed in Bihar, Haryana, Himachal Pradesh, Jammu and Kashmir, Punjab, Tamil Nadu and Uttar Pradesh (Govaerts et al., 2000).

2.2 *Achillea millefolium*

The Asteraceae or Compositae (commonly reffered to as the aster, daisy, compositae (Blackwell, 2006; Jaffery, 2007) is an exceedingly large and widespread family of angiosperms (Stevens, 2001). The family has more than 23,600 currently accepted species, spread across 1,620 genera and 13 subfamilies. In terms of number of species the Asteraceae are rivaled only by the Orchidaceae (Stevens, 2001). It is also the largest plant family in Pakistan, represented by over 650 species distributed in 15 tribes (Gafoor, 2002). The family is cosmopolitan in distribution, occurring in all continents except Antarctica (Hicking and King, 1997). The family is most abundant in mountain sub-tropical latitude. It is most common in the arid and semiarid regions of the subtropical and lower temperate latitudes (Barkely et al., 2006). It is highly evolved family among angiosperms and is generally regarded as occupying the highest position in plant kingdom due to its great preponderance and cosmopolitan range (Chopra, 1970). As per e flora of China, this family comprises of 1,700 genera and 24,000 species, cosmopolitan in distribution (except Antarctica), 15 tribes, 248 genera (18 endemic ,49 introduced),and 2,336 species (1,145 endemic ,109 introduced).

The genus *Achillea* is one of the most important genera in the Asteraceae family (Mabberley, 1997). *Achillea millefolium* L. grows wild all around Europe, Asia, North Africa and North America and it is widely used in Italian folk medicine (Passalacqua et al., 2007; Vitalini et al., 2009). It is native to the temperate regions of Northern Hemisphere in Asia, Europe, and North America (Simonetti, 1990). Yarrow grows from sea level to 3500 meters in elevation. It is frequently found in the mildly distributed soil of grasslands and open forests (Dodson and Dunmire, 2007). The plant is native to Eurasia and is found widely from the UK to China. In North America , both native and introduced genotypes, and both diploid and polyploid plants are found (Alan, 2008). The plant is found in Australia as an introduction. It has been introduced as a feed for livestock in places like New Zealand (Royal New Zealand Institute Of Horticulture, 2000) and Australia. At global scale it is distributed along temperate zones and boreal zones of Northern Hemisphere and to a lesser extent in more southern regions. It has been recorded from south-eastern Queensland, eastern New South Wales, Victoria, Tasmania, south Australia and the southern parts of Western Australia (Auld and Medd, 1996). *A. millefolium* is widely spread in Victoria where it is present in mostly the drier parts in the northwest of the state. In New South Wales it is generally found in the eastern parts of the state south from Lismore and most common in highland regions (Hardin, 1992). It is quite common and widespread in Tasmania, particularly in well settled and agricultural areas in the north and east of the state (Buchanan, 2007). In Western Australia there are only scattered occurrences of the species near inhabited areas in the southern and south-western parts of the state (Coleman, 1997). It has also been recorded as locally naturalized around Stanthorpe in the cooler highland areas of south-eastern Queensland (Bostock and Holland, 2007). *A. millefolium* is also naturalized in many other parts of the world, including North America and New Zealand (Blood, 2001). Two subspecies of this species are recognized from Pakistan (Linneaus, 1753) - ***Achillea millefolium*** subspecies ***chitralensis*;** plants are shorter (upto 30 cm), synflorescence 2-3 cm broad, Capitula 15-30 per synflorescence and ***Achillea millefolium*** subspecies ***millefolium*;** plants are taller (upto 100 cm), synflorescence 4-15 cm broad, Capitula 50-150 per synflorescence. The following 10 species are reported to be found from China (e flora of China) which are mentioned in table 3.

Table 3: Species of *Achillea* in China.

S. No	Species
1	*Achillea acuminate*
2	*Achillea alpine*
3	*Achillea asiatica*
4	*Achillea impatiens*
5	*Achillea ledebourii*
6	*Achillea millefolium*
7	*Achillea nobilis*
8	*Achillea salicifolia*
9	*Achillea setacea*
10	*Achillea wilsoniana.*

3. Morphology

3.1 Euphorbia helioscopia

Euphorbia helioscopia is an annual plant growing in arable land and distributed ground. It grows to 10-50 cm tall, with a single, erect, hairless stem, branching towards top. The leaves are oval, broadest near the tip, 1.5-3 cm long, with a finely toothed mardin. The leaves are alternate, seldom opposite, with stipules. Stipules may be reduced to hairs, glands, or spines, or in succulent species are sometimes absent. The flowering lasts from mid spring to late summer (Blamey and Greywilson, 1989). The flowers can be monoecious or dioecious. The stamens (the male organs) can number from one to 10 (or even more). The female flowers are hypogynous, that is, with superior ovaries. (Charles et al., 2007). The fruit is usually a schizocarp, but sometimes a drupe.

3.2 Achilea millefolium

A. millefolium is an erect herbaceous perennial plant that produces one to several stems 0.2-1metre in height, and has a spreading rhizomatous growth form. Leaves are evenly distributed along the stem, with the leaves near the middle and bottom of the stem being the largest. The leaves have varying degree of hairiness (pubescence). The leaves are 5-20 cm long, bipinnate or tripinnate, almost feathery and arranged spirally on the stems. The leaves are cauline and more or less clasping (Linnaeus, 1753). In new Mexico and Southern Colorado, it is called plumajillo (Spanish for 'little feather') from its leaf shape and texture. Many members have composite flowers in the form of flower heads (capitula or pseudanthia) surrounded by involucre of bracts. The plant has a strong, sweet scent, similar to chrysanthemums.

4. Medicinal importance

4.1 Euphorbia helioscopia

The family contains a large variety of phytotoxins (toxic substances produced by plants), mainly diterpene esters, alkaloids, glycosides, and ricin-type toxins (Charles et al., 2007). The milky latex is a characteristic of subfamily Euphorbioideae. The latex is poisonous and mostly used as laxative. In *E. helioscopia*, active ingredients are used in pharmaceutical industry. It is also a plant used in the Chinese traditional medicine (Wen and Yue-Wei, 2006). Hydrolysable tannins can be found in *E. helioscopia.* Helioscopinin A, Helioscopinin B can be found together with the 8 other tannins. Helioscoponin-A showsanti-allergic and anti-asthmatic activities in guinea pigs, It is suggested that this

compound exerts its activities through antagonism on leukotriene D4-induced responses (Koh Dongsoo et al., 2001). Euphorbia species have yielded numerous diterpenoids and triterpenoids possessing various biological activities with controverting biological activities, such as tumor promoting and antitumor (Kirtikar and Basu, 2003).

4.2 Achillea millefolium

Many uses from these plants were reported as antiviral, antipyretic, antimalaria, antitumor, anticoagulant, antioxidant, antihepatitis, inducing activity etc. (Nemeth, 2005).

It contains isovaleric acid, salicylic acid, asparagin, sterols, flavonoids, bitters, tannins and coumarins. The dark blue essential oil, extracted by steam distillation of the flowers, has been used as an anti-inflammatory (Choudhary et al., 2007*)* or in chest rubs for colds and influenza (Skwarek, 1979). The leaves of *A. millefolium* encourage *c*lotting, so it can be used fresh for nosebleeds. The aerial parts of the plant are used for phlegm conditions as a bitter digestive tonic to encourage bile flow, and as a diuretic. The aerial parts act as a tonic for the blood, stimulate the circulation, and can be used for high blood pressure, it is also useful in menstrual disorders and as an effective sweating remedy to bring down fevers (Simonetti, 1990). Yarrow intensifies the medicinal action of other herbs taken with it. It is reported to be associated with the treatment of pain (Noureddini and Rasta 2008), antiphlogistic and gastrointestinal disorders choleretic (Benedek et al., 2006), inflammation (Tamas et al., 2008*)*, emmenagogue (Vegeto et al., 2007) and stomachache (Andre et al., 2010).

5. ETHNOBOTANICAL IMPORTANCE

5.1 Euphorbia helioscopia

The leaves and the lattices of this genus are used in the ayurvedic system of medicine for bronchitis and rheumatism. Euphorbia species have been used in Turkish folk medicine for rheumatism, swelling, and especially as a wart remover, however it causes inflammation and diarrhea. The plant lattics of this genus have been used in fish poisioning and insecticide (Uzair et al., 2009). Based on traditional information, the leaves and the lattics of this genus are used in the Ayurvedic system of medicine for bronchitis and rheumatism (Barla et al., 2006). Furthermore, it is stated to possess inflammatory, antiarthritic, antiamoebic, spasmolytic, antiviral, hepatoprotective and antitumor activities. For hundreds of years with traditional Chinese medicine, it has been used for the treatment of cancers, tumors and warts. It is well known that this species contains irritant and tumor-promoting constituents (Yang et al., 2009). The roots of *E. helioscopia* are having antihelmintic properties and the whole plant possesses anti-periodic, anti-tumoral, cathartic properties. The leaves and the stem of the *E. helioscopia* are used as febrifuge and vermifuge. The oil from the seeds has purgative properties, the roots are used as antihelmenthic. The seeds mixed with roasted pepper have been used in the treatment of cholera (Uzair et al., 2009*)*. Based on some ethnobotanical survey for medicinal plants used traditionally in different countries, it has been recorded that *E. helioscopia* is used by local people in pakistan as cathoratic, antihelminthic and purgative (Qureshi, 2007). In addition the milky juice from the leaves and fresh stem is used to release pus (Ahmed et al., 2006). In china, *E. helioscopia* has been used as a traditional folk medicine for the treatment of malaria, bacillary dysentery and osteomyelitis (Lu zq et al., 2008).

5.2 Achillea millefolium

The genus name *Achillea* is derived from mythical greek character, Achilles, (Hutchens, 1973), who reportedly carried it with his family to treat battle wounds. This medicinal use is also reflected in some of the common names such as staunchweed and solider's woundwort (Simonetti, 1990). Principal traditional uses besides stopping the flow of blood from wounds included treatment of fevers, the common cold, diarrhea, dysentery and hypertension. Yarrow has also been used in folk medicine as a cure for toothache, earache, and the diseases of lungs, bladder and kidneys. Yarrow has been revered as a powerful healing herb and magical plant for centuries. It was used in counter magical practices to drive out the devil of those who had become possessed (www. Sacredearth.com). *A. millefolium* has been seen historical use as in traditional medicine, often because of its astringent effects (Simonetti, 1990). The herb is purported to be a diaphoretic, astringent, tonic (Hutchens, 1973), stimulant and mild aromatic. *Achillea* species have been used by local people as folk or traditional herbal medicines. Bumadaran is a popular name for several species of *Achillea* in Persian language. They are reported as tonic, anti-inflammatory, anti-spasmodic, diaphoretic, diuretic and emmenagogic agents and have been used for the treatment of hemorrhage, pneumonia, rheumatic pain and wound healing in Persian traditional literature (Zargari et al., 1996; Saeidnia et al., 2005). Native Americans and early settlers used yarrow for its astringent qualities that made it effective in wound healing and anti-bleeding (Dodson and Dunmire, 2007). *Achillea* species are most important indigenous economic plants of Anatolia. The Herbal tea prepared from *Achillea* species are traditionally used for abdominal pain and flatulence in Turkey (Honda et al., 1996). In terms of Chinese medicine, *Achillea* can be said to have three main actions : clear exterior wind (diaphoretic), tonify deficiency (tonic) and clear heart phlegm (anti-hypertension) (Ross, 2003). The consumption of herbal teas from different species of *Achillea*, especially for the treatment of the gastrointestinal tract, is common in folk medicine (Skocibusic et al., 2004). Chinese proverb claim yarrow brightens the eyes and promotes intelligence. *A. mellifolium* is used in folk medicine as an emmenagogue (Bakkali et al., 2008).

6. PHENOLOGY

Flowering phenology is an important life history trait because the timing of reproduction and the schedule of reproductive expenditures across time can strongly influence individual fitness (Primack, 1985; Rathcke and Lacey, 1985; Fenner, 1998) and hence flowering phenology is of fundamental interest for understanding of species interaction and community functions. Johnston and Pickering, (2004) investigated the phenology of *A. millefolium* along altitude and disturbance gradients in the snowy mountains of Australia and reported that the altitude and disturbance did not affect percentage cover of vegetation. Flowering started earlier and lasted longer in the low mountain sites compared to high sub alpine sites. The population growing next to buildings were reported to have two to three times more inflorescences per m^2 than those along road verges (both populations subjected to different degrees of disturbances). Maria et al., 2007 studied the phenological patterns of Asteraceae in four habitat types (dry grassland, wet grassland, cultivated land and road side) within three selected districts of central Uganda for one year. The authors reported that flowering is partly dependent on annual rainfall. In all habitats flowering occurs throughout the year but with a peak between August and November. The flowering showed decline during the wet season. Fruiting also occurs throughout the year but with a peak between August and October.

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