**REVIEW OF LITERATURE**

*Drymaria cordata* (L.) Willd. ex Roem. & Schult. has been researched widely due to its medicinal properties. Several workers have reported the utility of the plant periodically. Few significant reports with respect to folklore usage, *in vitro*, mycorrhizal, phytochemical and antimicrobial studies are scripted below.

**Medicinal Properties – Folklore Usage**

The use of *Drymaria cordata* to treat snake bites and its topical application for burns and skin diseases by the war Jaintia tribes of Megahalaya was documented by Kumar in 1987.

Exhaustive list of medicinal plants of Kerala forests was made by Nambiar *et al.*, in 1985. Their information is supplemented with information collected from ayurvedic practitioners- and tribals based in Kerala. *Drymaria cordata* is known to occupy the Southern hill-top and tropical evergreen forests. It is also seen in tea plantations as a weed. According to them the juice of plant *Drymaria cordata* has laxative and antifebrile properties.

Saklani and Jain, in 1994 have documented the use of pounded leaf of *Drymaria cordata* in curing snake bite. It is also used for the cure of tooth ache by Idu Mishmi tribes of Dibang Valley. Records of medicinal plants used by the traditional healers of Darjeeling Himalayas have been documented by Chettri (2004) in which the antipyretic use of *Drymaria cordata* is mentioned.
A general ethnomedicinal survey of lower Palni Hills of Tamil Nadu was made by Ganeshan et al., in 2004. They have enumerated *Drymaria cordata* along with other species of plants used by the Paliyan and Pulayan tribes of Palni Hills. The leaf paste of *Drymaria cordata* with *Urena lobata* is used for the treatment of cutaneous infections by the *Meche* people of Jhapa District, Eastern Nepal (Rai, 2004).

Borah et al., (2006) reported that the extract of whole plant of *Drymaria cordata* along with small amount of lime taken thrice daily in the empty stomach can be used in the treatment of jaundice. *Drymaria cordata* is used as a folklore medicine by Bangnis, a demographically dominant tribe of East Kameng, Arunachal Pradesh. The whole plant (leaves + stem) is used as a remedy for swelling and inflammation (Gupta, 2006).

Barua et al., (2007) have specified the usage of *Drymaria cordata* as a wild vegetable and used in the treatment of fever in Majuli and Darrang districts of Assam. While Jain et al., (2007) have documented the herbal remedies from the wet lands of Manipur, North Eastern India. *Drymaria cordata* is applied externally as poultice against muscular pain. The plant extract along with little honey is effective in cough and dysentery.

*Drymaria cordata* is used as an ethnoveterinary plant of Uttaranchal used in the treatment of skin diseases (Pande et al., (2007). The economic importance and ecological status of herbaceous species including *Drymaria cordata* present in the Sholas of Nilgiris is well document by Paulsamy et al., (2007). According to them, *Drymaria cordata* is a common herb, the paste of which is known to relieve headache.
The use of *Drymaria cordata* (Chick weed; ‘Calabar Woman’s eye) as a folk medicine in treating sleeping disorders, convulsions and febrile conditions in children in Nigeria has been made known by Adeyemi *et al.*, in 2008.

Bhattacharjya and Borah (2008) have listed the medicinally important weed species, which are being used by the rural people, particularly the women in Nalbari district, Assam. Hynniewtaw and Kumar in 2008 have reported the use of *Drymaria cordata* against leprosy by the traditional healers of Meghalaya. The use of tender shoots of *Drymaria cordata* as a vegetable and in the treatment of sinusitis by the Karbi tribes of Assam has been documented by Kar and Borthakur (2008).

Ramashankar and Rawat in 2008 have reported the uses of *Drymaria cordata* Willd. by the tribal groups of North East India particularly Arunachal Pradesh and adjoining areas of Assam in the treatment of various ailments. Reports on the use and ethnomedicinal value of *Drymaria cordata* utilized by the Khamptis of Arunachal Pradesh has been revealed by Sen *et al.*, in 2008. The Whole herb of *Drymaria cordata* is wrapped in banana leaf and burned in a chula and the smoke when inhaled is known to relieve headache.

Bantawa and Rai (2009) have made an ethnobotanical survey and listed the locally available plants used by the traditional practitioners in Darjeeling Himalaya to cure many diseases and disorders. The ethnobotanical use of *Drymaria cordata* in the treatment of soot throat and constipation was revealed by Focho *et al.*, (2009). According to their survey, the juice extract of whole plant of *Drymaria cordata* mixed with salt is used for gargling.
The application of *Drymaria cordata* in the treatment of burns, boils, headaches, diarrhoea, dysentery, pneumonia, skin diseases, mouth sores, tongue sores, fever, food poison and insect bites has been enumerated by Adhikari *et al.*, 2010. The juice of whole plant of *Drymaria cordata* mixed with *Psidium guajava* fruit used in the treatment of gastritis and stomach disorders by the *Adi* tribes of Arunachal Pradesh was recorded by Kagyung *et al.*, (2010).

Samuel *et al.*, (2010) have surveyed and described the use of medicinal plants used by the tribes of Pachalur and Periyur districts of Tamil Nadu. According to their survey, *Drymaria cordata* is externally applied on the joints to heal wounds.

Saikia *et al.*, in 2010 have reported the use of *Drymaria cordata* by the *Bodo* tribes of Assam. The young twigs roasted with banana leaves are inhaled during sinusitis. Srivastava along with the *Nyishi* community in 2010, have documented the plants used by *Nyishi* and *Hill Mari* tribes of Arunachal Pradesh. They have reported the use of *Drymaria cordata* in the treatment of skin diseases, ringworms and sinus.

Balangcod and Balangcod in 2011, have listed the medicinal plants used by the *Kalangua* tribes in Philippines. According to them, the leaves of *Drymaria cordata* are applied on boils. The documentation of the ethnobotanical use of *Drymaria cordata* by the local people of Macchegaun, Nepal in the treatment of sinusitis and headache was done by Joshi *et al.*, (2011).

Saha *et al.*, in 2011 have listed the ethnomedicinal knowledge of tribes of Darjeeling hills. Based on their survey, the leaves of *Drymaria cordata* are used in the treatment of sinusitis and pneumonia.
A list of the edible plants of Nokrek Biosphere Reserve, Meghalaya used by the Garo tribes was published by Singh et al., (2012). The whole plant of *Drymaria cordata* also known as *Samsit halap* (Garo name) is consumed as vegetable.

Dutta and Sarma in 2013, have documented several medicinal plants that are being used by the local communities living in the fringe of Chirang Reserve Forest of Kokrajhar District, Assam. According to the usage of tribes residing in this forest, the whole plant juice of *Drymaria cordata* has laxative and anti febrile properties.

**In vitro studies**

Micropropagation is one of the essential components of plant biotechnology. Micropropagation is considered an important substitute to overcome the problems of traditional method of vegetative propagation. There are limited literatures pertaining to tissue culture studies in *Drymaria cordata* (L.) Willd. ex Roem. & Schult. However, few literatures on micropropagation studies are cited below.

The technique of plant cell and tissue culture offers an ample scope for in vitro rapid clonal multiplication (Murashige, 1977). Plant improvement initiatives primarily depend on the availability and efficient induction of genetic variability. Micropropagation has a great commercial potential due to the speed of propagation, decreased production space requirement and the ability to multiply elite clones exhibiting superior growth and enhanced stress tolerance (Garton and Mosses, 1985; Kane et al., 1989).

Although several media formulations have been used for in vitro culture of tissues of various plant species, the composition described by Murashige and Skoog (MS medium, 1962) is the most commonly
used. The kind and concentration of growth regulator included in the culture medium largely determine the success of culture. Root and shoot induction and the process of differentiation from unorganised callus are controlled by the relative concentrations of auxins and cytokinins in the medium (Bajaj et al., 1988).

Cytokinin levels were shown to be most important for multiplication of many medicinal plants. The inclusion of low concentration of auxins along with cytokinin triggered the rate of shoot proliferation in some genotypes (Ravishankar and Venkataraman, 1988; Barna and Wakhlu, 1988; Upadhyay et al., 1989; Shasany et al., 1998).

An efficient protocol for high frequency direct regeneration in Drymaria cordata using leaf explants on (MS) medium supplemented with NAA and BAP was reported by Ghimire et al., (2010). According to them BAP or TDZ were critical for inducing multiple shoots. Highest mean number of shoots was obtained on MS supplemented with 0.1mg/l NAA and 1.0 mg/l BAP.

Several strategies such as manipulating the nutrient, optimizing the culture conditions, feeding of precursor and elicitation can be applied in order to substantially increase the yields of secondary metabolites in plant cell cultures (Kumar and Sopory, 2010). Effect of vitamins on in vitro organogenesis of plant has been described by Abrahamian and Kantharajah (2011).

Tejavathi and Indira in 2011, for the first time have reported direct multiple shoot regeneration from the nodal explants of Drymaria cordata. Maximum number of shoot regeneration was observed on MS medium supplemented with BAP. All concentrations of BAP and KN facilitated shoot bud differentiation. BAP proved to be more efficient hormone than KN at inducing multiple shoots. Rooting
occurred on MS basal medium either alone or in combination with low concentration of IBA (0.49 μM).

Tejavathi and Indira (2013) have documented the indirect shoot regeneration from leaf callus cultures of *Drymaria cordata*. They reported callusing from *in vitro* grown leaves on MS medium containing NAA + BAP. They also studied the effect of TDZ in inducing shoot regeneration on solid medium as well as by filter paper technique.

**Arbuscular Mycorrhizal Fungi studies**

Arbuscular mycorrhizal studies in *Drymaria cordata* has not been reported by previous workers. However reviews on the effect of arbuscular mycorrhizal fungi in general are mentioned below.

Mycorrhiza is the mutualistic non pathogenic association between soil borne-fungi with the roots of higher plants. According to Callow *et al.*, (1978) the arbuscular mycorrhizal fungi synthesize polyphosphate in various granules that is absorbed from soil phosphate and the granules are broken down in the arbuscules to inorganic phosphate for release to the host thereby effecting the plant growth. The effects of mycorrhizal colonization may be attributed to improved water uptake, increased photosynthesis or elevated cytokinin levels which stimulates stomatal opening (Barea and Azcon-Aguilar, 1982).

Grotkass *et al.*, (2000) reported an increase in percentage of rooting in mycorrhizal (90%) compared to the non-inoculated controls (60%) and reduction of weaning stress, while Rai in 2001, reported that mycorrhization of tissue-cultured propagules has the potential to produce plants with increased levels of biologically active secondary metabolites.
The mycorrhizal fungi increase the uptake capabilities of plants, particularly for immobile ions and also for water, nitrogen and phosphorus through their hyphae extending into the soils, thereby improving plant nutrition. Rani and Bhaduria (2001) and Mulani et al., (2002) observed higher colonization and uptake of more nutrients in medicinal plants when they are associated with AM fungi, which act as natural biofertilizers.

The overall growth of *Cichorium intybus* (Murugan and Selvaraj, 2003) and *Plectranthus amboinicus* (Hemalatha and Selvaraj, 2003) were found to be significantly high when inoculated with AM fungi. Biradar and Reddy, (2007) have demonstrated the benefits of AM associations in five medicinal plants such as *Mucuna pruriens*, *Hyptis suaveolens*, *Ocimum sanctum*, *Clitoria ternatea* and *Ocimum gratissimum*.

Burni et al., (2009) have observed and recorded the AM colonization in the weed *Stellararia media*, while the symbiotic response of *Dianthus caryophyllus* root stock to different mycorrhizal fungi was studied by Kerur and Lakshman (2009). According to the study made by Karthikeyan et al., (2009), plants grown in soil with the addition of AM fungus have shown improved growth and development as compared to control plants. Their study revealed the positive effect of *G. fasciculatum* on some medicinal plants. According to them, the medicinal plants when inoculated with *G. fasciculatum* resulted in increased total chlorophyll and protein content.

A significant increase in the shoot height, dry mass and total chlorophyll of two species of *Zizyphus*, as compared with non-inoculated control plants was recorded by Al-Qarawi and Alshahrani in 2010. This increase was due to the degree of mycorrhizal infection which brings about beneficial effects.
Bilalis et al., (2011) have shown that mycorrhizal symbiosis is an important factor influencing weed growth. AM enhances the competitive ability and growth of competitive weeds in organic olive crops. An increase in secondary metabolite accumulation and root growth enhancement in Chlorophytum borivilianum as an effect of mycorrhizal inoculation was reported by Dave et al., in 2011. According to them G. mosseae contributed 5 fold (0.56 gms to 2.8 gms/plant) enhancements in saponin accumulation followed by G. intraradices (0.56 gms to 2.7 gms/plant) in comparison to non-mycorrhizal plants.

The beneficial effects of black pepper (Piper nigrum L.) and sorghum (Sorghum bicolor (L.) Moench) inoculated with arbuscular mycorrhizal fungi were observed by Rajesh et al., in 2011. According to them there was increased accumulation of protein, polysaccharide and nucleic acids in the leaf samples indicating the direct correlation between the arbuscular mycorrhizal fungi and the crop response to inoculation of the AM fungi. They also noticed significant anatomical differences in plant leaf structures. Tejavathi et al., in 2011 have reported the enhanced effect on biomass, primary and secondary metabolites in AM inoculated normal and micropropagated plants of Adrographis paniculata.

The significant effect of bioinoculants on growth of Mentha spicata was reported by Kumar in 2012. According to his study, efficient strains of AM fungi can be commercially utilized for their beneficial effects with other beneficial rhizospheric microflora in establishment of seedlings, increase in productivity and reduction in fertilizer application for obtaining economic production of Mentha spicata under field conditions.
Tejavathi and Jayashree in 2013, studied the effect of AM fungal association on the growth performance of commonly occurring medicinal weeds. Among the various AMF species used in their study, *Glomus fasciculatum* was found to be more compatible with all the selected medicinal herbs with 100% colonization and efficient in enhancing the growth performance.

**Phytochemical and therapeutic studies**

*Drymaria cordata* has been exploited for its medicinal properties. A number of biologically active compounds have been isolated from *Drymaria cordata*, which are known to cure severe ailments.

Dominguez *et al.*, (1975) for the first time obtained triterpene acetates and D-(+)-Pinitol from *Drymaria drumondii* and reported the presence of saponins in the ethanol extract.

Alfombrilla (*Drymaria arenarioides*) is a highly toxic short lived perennial plant found in Mexico. The toxicity of its saponin content was recorded by Williams in 1978.

Castillo and Fernando (1984) have extracted the active principles of *Drymaria cordata* (L.) Willd. ex. R. and S. by column chromatography. The four components isolated were characterized through UV, IR and NMR spectroscopy, which revealed the presence of a flavonoid which is polyphenolic and aromatic in nature. They also reported the presence of an alkaloid.

Vargas *et al.*, (1988) have reported that the methanolic extract of aerial parts of *Drymaria arenarioides contains* norditerpenes and norditerpene glycosides whose structures were established by chemical and spectroscopic techniques.
The efficacy of methanolic extract of *Drymaria cordata* for its effect on a cough model induced by sulfur dioxide gas in mice was investigated by Mukherjee *et al.*, (1997b). The extract showed significant inhibition of cough like the standard drug codeine phosphate in the same dose dependant manner thus exhibiting antitussive activity via the central nervous system.

The anti-inflammatory effect of methanol extract of *Drymaria cordata* was reported by Mukherjee *et al.*, (1998). Their observations were based on both actute and chronic experimental models in albino rats. Their studies indicated a significant anti-inflammatory activity against carrageenin, histamine, serotonin and dextran induced rat hind paw oedema.

A new flavonoid glycoside namely drymaritin A was isolated from the whole plant of *Drymaria diandra* by Ding *et al.*, in 1999. By spectroscopic analysis, its structure was elucidated as 6-trans-[2-O-(alpha-rhamnopyranosyl)]-ethenyl-5,7,4'-trihydroxy-flavone.

Ding *et al.*, in 2000 have reported the occurrence of drymarians A and B, two new cyclopeptides in *Drymaria diandra*, whose structures were analysed by spectroscopic analysis as cyclo (-Phe₁-Pro₁-Pro₂-Pro₃-Phe₂-Phe₃-Val-lle-Ala-) and cyclo (Pro₁-Phe-Tyr-Pro₂-Gly-Leu-).

Evaluation of twelve commonly used medicinal plants including *Drymaria cordata* in Taiwan for their *in vitro* antiviral activity and cell cytotoxic effect was done by Chiang *et al.*, (2003). Their study showed that the hot water (HW) extract of these plants exhibited anti-HSV and anti-ADV activities at different magnitudes of potency.

Hsieh *et al.*, in 2003 have for the first time reported the presence of anemonin and norserquiterpenes like 3-oxo-α-ionol and
megastima-4,7-diene-3,9-dione in *Drymaria diandra*, a species found growing in Taiwan.

Many naturally occurring products have been reported to contain large amount of antioxidant other than vitamin C, E and carotenoid (Javanmardi *et al.*, 2003). The preliminary photochemical studies on leaves of *Drymaria cordata* were carried out by Venkatesan *et al.*, in 2003. They have reported the presence of alkaloids, saponins, flavonoids in the alcoholic, chloroform, petroleum ether and benzene extracts of *Drymaria cordata*, a well known folklore medicine in Sikkim.

Hsieh *et al.*, (2004a) reported a new anti-HIV alkaloid, drymaritin, and a new C-glycoside flavonoid, diandraflavone, along with eight known compounds, torosaflavone A, isovitexin, spinasterol β-D-glycoside, p-hydroxybenzoic acid, p-hydroxybenzaldehyde, cis-p-coumarate, methyl 5-hydroxy-4-oxopentanoate, and glycerol-α-lignocerate, from *Drymaria diandra*. Drymaritin exhibited anti-HIV effects in H9 lymphocytes with an EC₅₀ value of 0.699 µg ml⁻¹ and a TI of 20.6. Diandraflavone showed significantly selective inhibition on superoxide anion generation from human neutrophils stimulated by fMLP/CB with an IC₅₀ value of 10.0 µg ml⁻¹.

Hsieh *et al.*, in (2004b) have isolated four cyclic peptides, diadrine A–D (1–4), from the MeOH extract of *Drymaria diandra*. Their structures were elucidated by chemical and spectroscopic analyses. Cyclopeptide 1 showed a selective inhibitory effect on collagen-induced platelet aggregation with an IC₅₀ value of 44.2 µM.

The cooling and edible properties of *Drymaria cordata* was cited by Pullaiah in 2006. He has also reported the presence of cordacin an antileukemic compound known to inhibit primary cultures of
human leukemia cells at 0.25 μg ml\(^{-1}\) and established epithelial cells at 10 μg ml\(^{-1}\).

The traditional healers of Tanzania used *Drymaria cordata* for the treatment of fungal infections. Moshi *et al.*, in 2007 evaluated the toxicity of *Drymaria cordata*. According to them, *Drymaria* showed LC\(_{50}\) value greater than 240 μg ml\(^{-1}\) in the brine shrimp lethality test.

The anti-inflammatory activity of the *Drymaria cordata* was demonstrated by Adeyemi *et al.*, (2008). The results obtained in their study suggested that the aqueous extract of *Drymaria cordata* possesses anti-inflammatory activity and was able to inhibit the oedema induced by carrageenan and egg albumin models.

Veitch and Grayer (2008), have described more than 600 new examples of naturally occurring flavonoids along with their biological activity, biosynthesis, synthesis and ecological or chemosystematic significance. They have also reported the presence of several flavone C-glycosides such as drymariatin B, diandraflavone, drymariatin C and drymariatin D in the ethanol extracts of leaf and whole plant of *Drymaria cordata*. Diandraflavone showed selective inhibition of superoxide generated from human neutrophils induced with formyl-L-methionyl-L-leucyl-phenylalanine (IC\(_{50}\)=10.0 μg ml\(^{-1}\)).

Barua *et al.*, (2009) have reported the anxiolytic effect of hydroethanolic extract (DCHE) of *Drymaria cordata*. Various concentrations of DCHE was administered to different experimental models. The phytochemical screening of DCHE revealed the presence of triterpenes, diterpenes, steroids and tannins, which contribute to its anxiolytic activity.

The free-radical scavenging properties like DPPH, nitric oxide radical, superoxide and anti-lipid peroxidation activity were
evaluated by Mandal et al., (2009). They quantified the phenolic constituents in methanol extracts from leaves and stems of Drymaria diandra plant growing in Darjeeling. They found that the stem showed moderate class of anti-lipid peroxidation against thioburbituric acid but the leaves have high anti-lipid peroxidation activity. Their study suggested that Drymaria diandra possesses antioxidant activity, which might be helpful in preventing or slowing down stress induced diseases. The plant also possesses many phytochemicals which could be beneficial for human health.

The cytotoxic activity of ethanolic extracts of Drymaria cordata along with other few selected Nigerian plants in traditional cancer treatment using the MTT assay on the HeLa (cervix adeno carcinoma) cell line was carried out by Sowemimo et al., (2009). The whole plant of Drymaria cordata was found to be potentially cytotoxic exhibiting 50% activity at 500 µg ml⁻¹.

Wetzel et al., in 2009 have proposed a revised structure of the alkaloid drymaritin. According to them, the structure of drymaritin as reported by Hsieh et al., in 2004 is not 5-methoxycanthin-4-one alkaloid but identical to a known alkaloid cordatanine (4-methoxycanthin-6-one). Their structural elucidation is a result of extensive revaluation of the NMR and spectroscopic data published and related alkaloids.

The anti-inflammatory properties of Drymaria cordata methanolic extract (DCME) in formalin induced paw licking model in mice was revealed by Barua et al., 2010. According to their studies, DCME possesses anti-inflammatory properties which could be due to the presence of flavonoids, alkaloids and steroids.

Barua et al., (2011) have reported that the hydroethanolic extract of Drymaria cordata possesses promising analgesic and anti-
nociceptive properties, which are probably peripherally mediated via inhibition of prostaglandin synthesis as well as central inhibitory mechanism. Thus, may be of potential benefit for management of pain.

The evaluation of phytochemicals in various medicinal plants popularly used in Nepal including *Drymaria cordata* was done by Ghimire *et al.*, (2011). They screened the methanolic crude extracts and recorded a fair amount of antioxidant activity, flavonoids and phenolic contents.

Nikomtat *et al.*, (2011) demonstrated the inhibitory efficiency of dichloromethane and methanol extracts of *Drymaria diandra* Blume against herpes simplex virus type 2 (HSV-2) infection. Both the extracts showed potent inhibitory activity against herpes simplex virus infection thus can be considered as a potential anti-HSV agent. The cytotoxic activity of ethanolic extracts of *Drymaria cordata* on HT29 (colon cancer) and MCF-7 (breast cancer) cell lines was determined by Sowemimo *et al.*, (2011). The whole plant extract of *Drymaria cordata* was found to exhibit low cytotoxicity when compared to other traditional Nigerian plants.

Akindele *et al.*, (2012) assessed the aqueous extract of whole plant of *Drymaria cordata* obtained from Nigeria and revealed the presence of glycosides, saponins (0.85%), alkaloids (1.42%), flavonoids (1.49%), phenols (1.96%) and tannins (20.61%). They investigated the analgesic and antipyretic properties of the whole plant extract of *Drymaria cordata* in rodents using different pharmacological models and demonstrated that these phytochemicals probably were responsible for the analgesic and antipyretic activities. The CNS depressant and anticonvulsant activity of hydroethanol extract of *Drymaria cordata* (DCHE) in various behavioral models was evaluated by Barua *et al.*, in 2012.
Antioxidants are known to play an important role in cerebellar development. Antioxidants may prevent oxidative damage in degenerative diseases thus critical in the wellness and health maintenance (Imosemi, 2013).

Studies on antimicrobial activity

There is not sufficient literature available on the antimicrobial activity of *Drymaria cordata*. However, cited below are studies carried out by few workers to determine the antimicrobial efficacy of plant extracts against various pathogenic organisms.

According to Kubo *et al.*, 1981, the crude extracts of some well known medicinal plants are used to control plant pathogens. The antibacterial effect of different extracts of *Drymaria cordata* (aerial parts) against *Staphylococcus aureus* ATCC 29737, *Escherichia coli* ATCC 10536, *Bacillus subtilis* ATCC 6633, *Bacillus pumilis* ATCC 14884 and *Pseudomonas aeruginosa* ATCC 25619 was observed by Mukherjee *et al.*, (1997a). The effects produced by the extracts were found to have significant activities against all the organisms being tested. Of the various extracts tested, methanolic extract was found to be most effective.

Mathabe *et al.*, (2006) reported that methanol, ethanol, acetone and hot water extracts from different plant parts of various medicinal plants showed remarkable antibacterial activity against *Vibrio cholera*, *E.coli*, *Staphylococcus aureus*, *Shigella* species and *Salmonella typhi*.

The antimicrobial activity of isolated essential oil of *Minuartia meyeri* (Boiss.) Bornm. (Caryophyllaceae) was reported by Yayli *et al.*, in 2006. They have described the moderate activity of essential oil
against gram positive and gram negative bacteria, but no antifungal activity was observed against 2 Yeast like fungi.

Antibacterial activities of aqueous and methanol extracts of some medicinal plants reported by Girish and Satish, (2008) against some human pathogenic bacteria showed the methanol extracts had wider range of activity against most pathogens which indicates that the methanol extracts of all selected plants may contain the active components. The use of plant extracts and phytochemicals, both with known antimicrobial properties are of great significance to therapeutic treatments (Nagesh and Shanthamma, 2009). The methanol extracts of forty nine different plant extracts were screened for antifungal activity, out of which forth three plant extracts exhibited varying degrees of inhibition activity against the fungi (Varaprasad et al., 2009).

Mostly the pharmacological activity of medicinal plants resides in its secondary metabolites which are comparatively smaller molecules in contrast to the primary metabolites. These natural products provide evidence to synthesize new structural types of antimicrobial and anti fungal chemicals that are relatively safe to man (Kailmuthu et al., 2010).

Sindhu and Manorama (2012) have detailed the antibacterial efficacy of various extracts of Polycarpaea corymbosa Lam. (Caryophyllaceae) against human pathogens. According to them, the acetone and methanolic extracts showed considerably good antibacterial activity against all bacteria and fungi tested.