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DRYMARIA CORDATA: REVIEW AT A GLANCE

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ABSTRACT

Drymaria cordata is one of the most important medicinal plants used by the different tribes of India and different parts of the world from the very long period of time. It is one of the traditional herbal medicines used as one of the ingredients in many native poly herbal formulations. In different countries it has different uses such as the plant is used in the treatment of peptic ulcer, headaches, nephritis, female infertility, sleeping disorders, convulsions, and febrile conditions in children. The plant is also used in the treatments of various major or minor ailments including cold, headache, coryza, bronchitis, leprosy, tumors, etc. It is also applied as fumigant for eye troubles, as cerebral stimulant, as a poultice on sore (to treat aching, inflamed and painful body parts) as an antifebrile agent, etc. The plant has been proved to contain chemical compound including alkaloids, flavonoids, tannins, saponins, phenols, terpenoids etc. The present review highlights the pharmacological description, classification, location, chemical constituent, phytochemical analysis, cultivation and collection, pharmacological activities like anti-bacterial activity, analgesic and anti-pyretic, anti-tussive activity, anxiolytic activity, anti-nociceptive, anti-diabetic, sinusitis, cytotoxic activity, anti-HIV and anti-fertility.

Keywords: *Drymaria cordata;* Herbal formulations; Pharmacological description; Chemical constituent; Pharmacological activities

Introduction

The term medicinal plant is defined as a plant that contains various parts which are used in herbalism and some of these have medicinal values and activities. Medicinal plants are the "backbone" of traditional medicine. Medicinal plants are view as a rich source of important ingredient that can be used in development and synthesis of different drugs. Besides that these plants plays a critical role in the development of human culture around the whole world (Singh, 2015). Presently, herb refers to any part of the plant like fruit, seed, stem, bark, flower, leaf, stigma and roots and non-woody plants are also included. Earlier, the term "herb" was referred to non woody plants, including those that come from trees and shrubs. Some herbs are used in medicinal purposes. These medicinal plants are also used as food, flavonoid, medicine or perfume and also in certain spiritual activities (Verma and Kumar, no date). In addition, some plants are regarded as important source of nutrition and hence are recommended for their therapeutic values. Nowadays, the term "Alternative Medicine" has been commonly used in western culture and focuses on the idea of using these plants for medicinal purpose. Medicinal plants are most extensively used as raw materials for the extraction of active ingredients which used in the synthesis of different drugs. Medicinal plants have a promising future because there are about half millions plants around the world, among which most of their medical activities have not investigate yet, and their medical activities could be effective in the treatment of present or future studies(Acta, Abdul and Hassan, 2016). Human beings have depended on nature for their simple requirements for the sources for medicines, shelters, food stuffs, fragrances, clothing, flavors', fertilizers and means of transportation throughout the ages (Dar, Shahnawaz and Qazi, 2017). The existence of traditional cure in the disease treatment process is regarded as a fundamental part of modern pharmaceutical science. Various bio-ingredients of natural products plays a vital role in the discovery of synthetic medicines (Yuan *et al.*, 2016). In developing countries like India traditional medicines provides a cheap and alternative source for primary health care because of their believe in traditional medicines, choices, effectiveness, cultural priorities and most importantly due to lack of modern health facilities (Aziz *et al.*, 2018). Medicinal plants continue to show a presiding role over large percentage of world population in the area of healthcare system and this is mainly true in developing countries, where herbal medicine has a history of prolong use (Acta, Abdul and Hassan, 2016). Among non-industrialized society the use of herbs to cure the diseases is universal. At the end of the twentieth century, different traditions came to dominate the practice of herbal medicine. The utilization of medicinal plants has increased worldwide so far in the context of the massive expansion of traditional medicine and

increasing interest in herbal treatments (Akinyemi, So and Ka, 2018). The analysis of medicinal plants has had overlong past and exceptionally with regard to assessing a plant's medicinal quality. Organoleptic was the first technique used for the assessment in which physical senses of taste, smell, and appearance were used. Then slowly and progressively these led on to more advanced instrumental techniques (Fitzgerald, Heinrich and Booker, 2020). In developing countries like India, where up to one-half of deaths are due to infectious disease it is a major challenge in the world health care to develop a novel, effective and affordable medicines to cure the microbial infection. (Elisha *et al.*, 2017).

Drymaria cordata has been used from the very long periods of time by the different tribes of India and different parts of the world due to its beneficial medicinal values. *Drymaria cordata* is an example of such species that contain very effective medicinal constitutes and economic importance but has not been studied in detail so far. It has been traditionally used as one of the ingredient in many native poly herbal formulations (Kashyap, Sarkar and Banu, 2014). The plant is used in the treatment of peptic ulcer, headaches, nephritis, and female infertility in Central Asia (Cameroon) (Nono *et al.*, 2014a). The scientific assessment of medicinal plants have been started in many countries because of their contributions to the fight against various major and minor ailments (Farnsworth, 1966). *Drymaria cordata* is used to treat sleeping disorders, convulsions, and febrile conditions in children in Nigerian folk Medicine (Adeyemi, Akindele and Nwaubani, 2008). It has been traditionally used in various parts of the world like Africa and Asia as a folk herbal medicine. In tropical Africa, its preparations are used for the treatment of various ailments including cold, headache, coryza, bronchitis, as poultice on sore (to treat aching, inflamed or painful parts), leprosy, tumors, as fumigant for eye troubles, as cerebral stimulant and as anti febrile agent (Burkill, 1985). These medicinal plant can also be used in Burns, skin diseases, snakebite, ringworm, cough, fever, diarrhea, pneumonia, jaundice, muscular sprain etc (Arya, Pandey and Samal, 2017). *Drymaria Cordata* is locally known by different local names such as "Laijabori" in Assamese, Abhijalo in Sikkimese etc. A plant of North East India, has been traditionally used as one of the constituent in many native poly herbal formulations (Focho, Ndam and Fonge, 2009). It contains rich source of several pharmacologically potent compounds and hence are used for various medicinal purposes. The therapeutic potentials of plants are being used traditionally since prehistoric times. Plant products are the main source of pharmaceutical agents used in the traditional remedy (Suresh Kumar *et al*., 2015). *Drymaria cordata* is also used in Cameroon Central Asiaand other African countries for its antitussive, anti-inflammatory, anxiolytic, cytotoxic, analgesic and antipyretic properties and to treat various disorders such as convulsions and ulcers. It is also empirically used to treat mental disorders such as memory disorders (Ngoupaye *et al.*, 2020). The plant appears spontaneously as a weed and its stems grows to nearly one meter long and leaves are rounded, heart-shaped and hairless. It mostly grows in grassland, forest margins, roadsides and cultivated areas, often under shade at mid to higher elevations (Burkill, 1985). The genus *Drymaria Willd. Ex Schultes* is a native of the New World and represented by 48 species worldwide. In the Old World, this genus is represented by two taxa: *Drymaria cordata ssp. Dia-ndra* (Blume) (Duke, 1985) and *Drymaria villosa Schltdl.* and Cham. ssp. Villosa (Bittrich, 1993). Various species of the family Caryophyllaceae are extensively used by many ethnic communities as traditional remedy worldwide. The highest number of plants of these family are used in Chinese traditional medicine (Chandra and Rawat, 2015). *Drymaria cordata* is also enriched with minerals like sodium, potassium, magnesium and calcium. Hwiyang Narzary *et al.*, analysed the mineral concentration in eleven different wild plants and it was found that the concentration of potassium was found higher in the *Drymaria cordata* (11784.13 ± 0.11 mg/100 g) (Narzary and Basumatary, 2017). AO Olowofolahan studied about the GCMS analysis and Phytoprotective effect of chloroform fraction of methanol leaf extract of *Drymaria cordata* against MSG-induced lesions in specific tissues. *Drymaria cordata* is traditionally used as antidote. The protective effect of chloroform fraction of methanol extract of *Drymaria cordata LINN.*(CFDC) against MSG-induced lesions in rat liver, brain and prostate was investigated (Olowofolahan, Olanlokun and Olorunsogo, 2020). In Taiwan this plant is used as a folk medicine for treating fever, rheumatism, hepatoma, malaria, and cancer. Lately, several cyclopeptides,2,3 flavonoids,4 and norditerpenes5 were secluded from this genus (Hsieh *et al.*, 2004). A new C-glycosylflavone, drymaritin, (3-keto-b-digitoxopyranosyl)-40 -O-(b-D-glucopyranosyl)- 7-methoxyl-5,40 -dihydroxylflavone)was isolated from the oily upper phase (SU) of the MeOH extract from aerial parts of *Drymaria cordata* together with two known compounds (cassiaoccidentalin A 2 and anemonin 3). In particular, compound revealed a concentration-dependent radical scavenging activity on DPPH with EC50 of 31.43 g/mL (Nono *et al.*, 2016). Leaves of the *Drymaria cordata* is also used as a potential natural insecticide against mosquitoes to control mosquito borne diseases (An *et al.*, 2017).

Pharmacognostic Description

During the floristic analysis of the family Caryophyllaceous of the Northeast, Indian specimen of *Drymaria cordata* were fetched from different localities (Chandra and Rawat, 2016). *Drymaria cordata* is a creeping herb that grows in dense patches in moist shady places and also in dry, sun-exposed tropical and subtropical regions of the world (Nono *et al.*, 2014a).

This sweeping annual herb bears countless glandular hairs; stems often root at the nodes, stems angular, glabrous to glandular-hairy, with long simple hairs at the nodes; internodes to 5 times the length of the leaves. The glandular hairs give the plant a sticky feel and enable parts to adhere to clothing (Kashyap, Sarkar and Banu, 2014)

Its stems-green and slender (Nono *et al.*, 2016)

Leaves- opposite and cordate with short petiole, leaves growing in moist and shady places are large up to 2 cm and succulent, while those growing on exposed rocks and sunny places have thin and smaller leaves up to 5 - 7 mm (Nono *et al.*, 2014a)

Flowers- small and green (Nono *et al.*, 2014a), white, borne at the end of branches that is supported by a long stalk (Kashyap, Sarkar and Banu, 2014).

Taste-Moderately bitter

Smell- Pungent

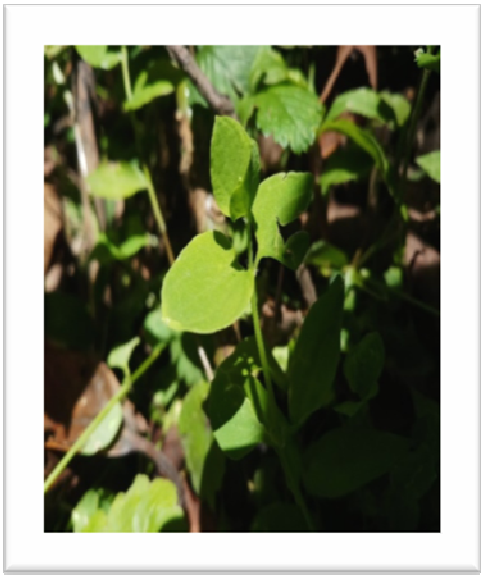

Fig. 1 : Plant with stem and leaves

Fig. 2 : Plant with bud and flower

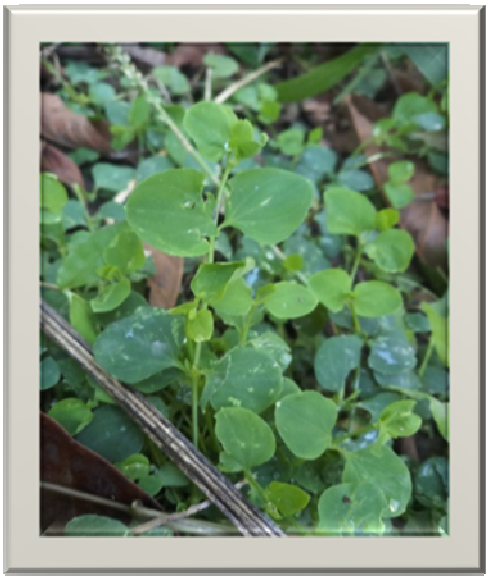

Fig. 3 : Whole plant

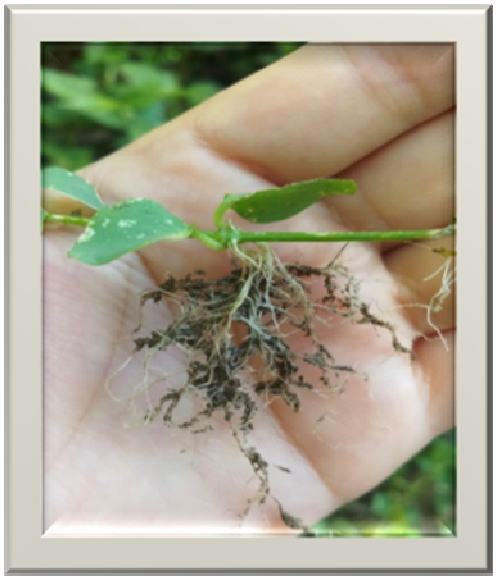

Fig. 4 : Stem and root

Chemical Constituent

The curative properties of medicinal plants are mainly due to the presence of various bioactive compounds in the plants like flavonoids, saponins, alkaloids, phenol, tannins and terpenoids (Karthikeyan, Shanthi and Nagasathaya, 2009).These medicinal plants represents a potential source of novel antibiotic prototypes due to the presence of antimicrobial properties as evidenced by the screening of plant extract and product (Afolayan, 2003), while various research and studies have identified compounds within plants that are effective antibiotics (Basile *et al.*, 2000). It has been reported that *Drymaria cordata* is a beneficial medicinal plant with various remarkable phytoconstituents and several biological activities (Bhattacharyya, 2019). Seven major glycolipid classes (stigmasterol, acylatedstigmasteryl glucoside, stigmasteryl glucoside, monogalactosyldiacylglycerol, digalactosyl diacylglycerol, cerebroside and glucocerebroside) from *Drymaria cordata* (Linn.) Willd (Caryophyllaceae Family) are reported by (Ngansop Raymond Nono *et al.*) (Nono *et al.*, 2014a). Using methanol extract Rakhi Bhattacharyya *et al.*, studied the evaluation of the phytoconstituents of *Drymaria cordata*. The preliminary phytochemical screening revealed the presence of alkaloids, flavonoids, phenols, tannins and saponins. The presence of O-H stretch, C-O stretch, C-H stretch, C-H bend, N-H stretch and N-H bend were confirmed through FT-IR analysis. Several bioactive compounds like Cyclohexan-1,4,5-triol-3-one-1-carboxylic acid, Beta-D-glucopyranose-1,6-anhydro, L-gala-L-ido-octose, 3,7,11,15-Tetra-methyl-2-hexadecen-1-ol,n-Hexadecanoic acid, 9,12-Octadecadienoic acids, 9,12-Octadecadienoic acid, methyl ester, Oleyl alcohol and 17-Octadecynoic acid were identified through GC-MS analysis. From this study, it can be concluded that *Drymaria cordata* contains various medicinally important secondary metabolites (Bhattacharyya, 2019).

Classification

Classification Kingdom	–	Plantae
Subkingdom	–	Tracheobionta
Superdivision	–	Spermatophyte
Division	–	Magnoliophyta
Class	–	Magnoliopsida
Subclass	–	Caryophyllidae
Order	–	Caryophyllales
Family	–	Caryophyllaceae
Genus	–	*Drymaria*
Species	–	*cordata* (Kashyap, Sarkar, and Banu 2014)

Location

Drymaria cordata is found widely dispersed in damp and wet areas in the tropics of Africa, Asia and the Americas where its various agricultural and traditional medicinal uses have been reported. In India it is found in several parts of the North East (Patra, 2020) area that includes Arunachal pradesh, Assam, Sikkim (Patra, 2020), Meghalaya (Patra, 2020), Mizoram, Manipur and also found in some area of West Bengal (Latpanchor, Darjeeling, Kurseong etc.). It is also found in Nepal, Bhutan, Nigeria, Cameron (Patra, 2020).

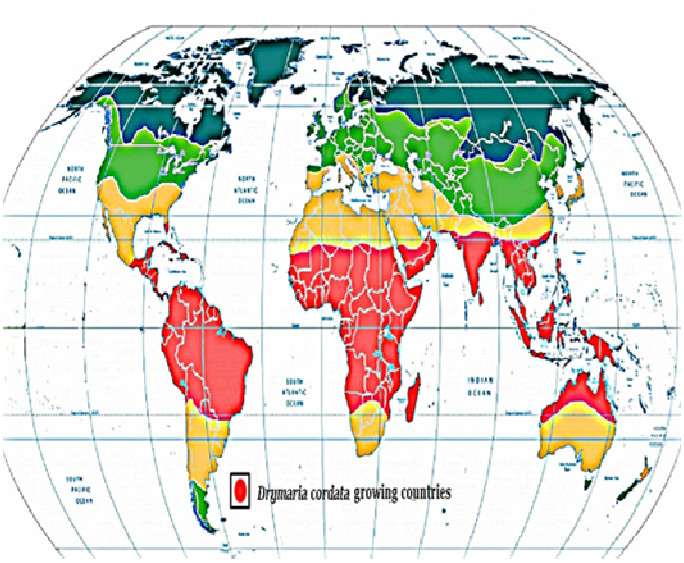

Fig. 5 : *Drymar iaCordata* found in the world.

Fig. 6 : India, Nepal, Bhutan

Cultivation and Collection of *Drymaria cordata*

Cultivation of medicinal plant is gaining ground because of the sky rocketing prices of allopathic medicines which also have side effects. Cultivation of medicinal plants is economically very attractive (Biswas and Cultivation, 2010). *Drymaria cordata* is a small genus of sub-erect herbs found mostly in tropical America, tropical and sub-tropical India, ascending up to 7000 feet in Sikkim, Himalayas and extending Westwards to Punjab (Sankar, 2014). It grows as a weed in cultivated areas which invades tea, coffee plantations as well as riverbanks, ditches and sandbars in rivers. This species is usually found from sea level to 1500 m, especially in shaded areas with moist soil (Ridley, 1931). *Drymaria cordata* (Linn.) Willd. and Schult. (Caryophyllaceae) is commonly known as tropical chickweed in English. It is a creeping herb that is widely distributed in sun exposed tropical and subtropical region of the world and usually grows in dense patches in moist shady place and also in dry areas. Stems are green and slender, leaves are opposite and cordate with short petiole with small and green flower (Nono *et al.*, 2014a).

Drying of *Drymaria cordata*

Drying is the most common and important method for post-harvest preservation of medicinal plants. Drying of this herb allows quick conservation of the medicinal qualities of the plant material in a very easy way. Drying regimen is very important step as it influences the quality of drug and earning from drug (Joachim muller and Albert Heindl, 2006). Due to high initial moisture content of the flowers, leaves and roots the energy demand of drying can be a significant factor. Considerable attention has to be provided in drying process as to produce a high quality product (Mahapatra and Nguyen, 2007). Fresh leaves and aerial part of the *Drymaria cordata* were thoroughly washed and cleaned with tap water. Then, the aerial part of the plant or leaves were dried under shade, ground mechanically, and kept in an airtight container (Patra, 2020) for the further extraction of the plant.

Phytochemical Analysis

The natural bioactive compounds that are found in plants are phytoconstituents. These constituents combines with nutrients and fibers to form an integrated part of defense system that fights against multiple diseases and stress conditions (Singh, 2005). The phytochemical ingredients of the medicinal plants are responsible in the induction of defense mechanism and protects the body from various diseases and infections. These phytochemicals are produced by primary and secondary metabolism in the plants (Wagner and Elmadfa, 2003). According to their functions in plant metabolism, they are basically divided into two groups, i.e. primary and secondary constituents. Primary constituents consists of common sugars, amino acid, proteins and chlorophyll while secondary constituents consists of alkaloids, terpenoid, steroids, flavonoids, etc. (T *et al.*, 2015). After the screening and research of preliminary phytochemicals of *Drymaria cordata* researchers revealed the occurrence of alkaloids, flavonoids, tannins, saponins, tannins, phenols (Karthikeyan, Shanthi and Nagasathaya, 2009).

Table 1: Various Chemical Constituents Present and their test.

Constituent	Test	Result
ALKALOID	Mayer's Test, Dragendorff's Test,	Mayer's test; Formation of white Creamy PPT after addition of Mayer's reagent. Dragondroff's test; Formation of orange reddish ppt after the addition of Dragonndroff's reagent to extract. (Bhattacharyya, 2019) (Venkatesan, Sankar and Sankar, 2003)
FLAVONOID	Shinoda Test	Shinoda Test; formation of pink, crimson red, or green color after addition of magnesium ribbon with drop wise HCl. (Bhattacharyya, 2019) (Venkatesan, Sankar and Sankar, 2003)
SAPONIN	Foam Test	Formation of foam after vigorously shaking the extract with distilled water (Bhattacharyya, 2019) (Venkatesan, Sankar and Sankar, 2003)
TANNINS	Ferric-Chloride ($FeCl_3$) Test	Appearance of dark green color after the addition of $FeCl_3$. (Bhattacharyya, 2019) (Venkatesan, Sankar and Sankar, 2003)
PHENOLS	Ferric-Chloride ($FeCl_3$) Test, Shinoda Test	Appearance of blue green color after treating the extract with $FeCl_3$ (Bhattacharyya, 2019)

Reported Pharmacological Activities

Medicinal plants are a reservoir of biologically active compounds with therapeutic properties that over time have been discovered and used by diverse groups of people for treatment of various ailments. Medicinally beneficial plants have pharmacological benefits due to bioactive phytochemicals produced in the plant tissues as primary and secondary metabolites (Egamberdieva *et al.*, 2016).

The literature reported that the crude extracts of medicinal herbs has tremendous effect on the disease curing process than the isolated ingredients and this may be due to their synergistic actions (Zhou *et al.*, 2016). The integral part of modern pharmaceutical science in the disease treatment procedure is the existence of traditional remedies. Numerous bio-ingredients of natural products have a significant role in finding synthetic medicines (Ojha *et al*., n.d.).(Ojha *et al*.) studied on analysis of different parts of the five medicinal plant including *Drymaria cordata*. Plant was washed, air dried and crushed in powder form. Three different extracts of each powdered material were prepared and standard phytochemical analysis procedure was followed for the analysis of physicochemical properties of plants and the identification of active chemical constituents. As a result, *Drymaria cordata* were found to be useful in the treatment of several diseases as well as to generate the source of income (Ojha *et al.*, no date). *Drymaria cordata* (L.) Willd. ex Schult. has several pharmacological, traditional and nutritive values. Till date, there are least reports available on its phytochemical profile (Sahoo, Manchikanti and Dey, 2010). Its roots can be applied externally to heal pain and are alexipharmic. Pharmacologically, the plant has been reported to possess anti-urolithiatic (Nizami *et al.*, 2012) and anti-inflammatory properties (Dewanjee, Dua and Sahu, 2013). It is also used as an antidote, laxative, appetizer, stimulant, depurative, emollient and febrifuge in both humans and animals. A number of biologically active compounds have been isolated from the leaves of this taxon including drymaritin which exhibits ant- HIV properties(Kashyap, Sarkar and Banu, 2014).

Drymaria Cordata has various pharmacological activity, some of them are mention below;

1. **Anti-bacterial**- The most serious infection is the infectious disease caused by antibiotic resistant bacteria that leads to increasingly difficult therapeutic problems (Mohammadi *et al.*, no date). Therefore, there is an urgent need for intensive research efforts on discovering new antimicrobial agents for development of alternative antimicrobial agents to combat these obstacles(Darwish *et al.*, 2002). Pulok K. Mukherjee *et al*. evaluated the anti-microbial properties. Different extracts of *Drymaria cordata Willd* (aerial parts) were tested for antibacterial efficacy to fight against *Staphylococcus aureus* ATCC 29737, Escherichia coli ATCC 10536, *Bacillus subtilis* ATCC 6633, *Bacillus pumilis* ATCC 14884 and *Pseudomonas aeruginosa* ATCC 25619. The effects produced by the extracts were found to have significant activities against all the organisms being tested and the effects so produced were compared with those of chloramphenicol. The most effective one was found to be of methanol extract (Mukherjee *et al.*, 1997 and Nono *et al.*, 2014a).

2. **Analgesic and Anti-inflammatory-**Pain is defined an unpleasant sensory and emotional experience associated with actual or potential tissue damage.(Hassan *et al.*, 2015)**.** Inflammation is a protective mechanism by which the body remove the harmful stimuli such as pathogens, damaged cells or irritants and initiate the healing process in the body (Paliwal *et al.*, 2017). Akindele *et al*., conducted a research to investigate the analgesic and antipyretic properties of the whole plant extract of *Drymaria cordata*. The acetic acid-induced writhing, formalin, and tail clip tests were used to evaluate analgesic activity while the 2,4-dinitrophenol (DNP)-, d-amphetamine-, and yeast-induced hyperthermia tests were used to investigate antipyretic activity in rodents. The results obtained in this study demonstrate that the aqueous whole plant extract of *Drymaria cordata* possesses analgesic and antipyretic properties mediated through peripheral and central mechanisms (J.* and , Ibe I. F., 2012). Olufunmilayo O. Adeyemi *et al*., studied about the anti-inflammatory activity of the aqueous extract of *Drymaria cordata* was evaluated using the carrageenan, egg albumin, xylene induced oedema models and pleurisy test and the results obtained in this study suggest that the aqueous extract of *Drymaria cordata* possesses anti-inflammatory activity mediated possibly by the inhibition of one or a combination of mediators like histamine, serotonin, kinins and prostaglandins(Adeyemi, Akindele and Nwaubani,

2008). The analgesic activity can be attributed to the phyto-constituents viz. tannins, diterpenes, triterpenes and steroids present in the DCHE extract. In conclusion, DCHE (*Drymaria cordata* hydroethanolic extract) can be developed as a potent analgesic and anti-nociceptive agent in future (Battineni *et al.*, 2018)**.**

3. **Anti-tussive-** The most important defensive reflex that enhances the clearance of secretions and particles from the airways is coughing that protects the lower airways from the aspiration of foreign materials. Therapeutic suppression of cough may be either disease-specific or symptom related (Blasio *et al.*, 2011). Mukherjee *et al*., 1997 studied the antitussive properties of the methanol extract of *Drymaria cordata*. The study reported the effect of the methanol extract of *Drymaria cordata* on a cough model induced by sulfur dioxide gas in mice in a dose dependent manner. The methanol extract of *Drymaria cordata* exhibited important antitussive activity when compared with the control (Mukherjee *et al.*, 1997 and Nono *et al.*, 2014a).

4. **Anxiolytic-** The word "anxiety" can be defined by various range of related phenomena: a class of psychiatric disorders, particular patterns of behavior in animal models, and trait-like negative affect. Another view on anxiety specifies a future-oriented emotional state experienced by all humans to varying degrees (Grupe and Nitschke, 2013). Anxiety is considered excessive or pathological when it arises in the absence of challenge or stress, when it is out of proportion to the challenge or stress in duration or severity, when it results in significant distress, and when it results in psychological, social, occupational, biological, and other impairment. The anxiolytic effect of *Drymaria cordata* has been reported from the hydroethanolic extracts of its leaves. The hydroethanolic extract of *Drymaria cordata* was administered at 25, 50 and 100mg/kg (p.o.) to analyze the anxiolytic effect of the extract. The presence of phytochemicals such as triterpines, diterpines, tannins and steroids have been implicated to be the contributor to its anxiolytic activity (Barua *et al.*, 2009) (Nono *et al.*, 2014a)**.** The presence of phytochemicals viz. triterpenes, diterpenes, steroids and tannins might contribute to its anxiolytic activity (Battineni *et al.*, 2018).

5. **Antinociceptive-**Pain, an unpleasant experience caused by intense or damaging stimuli, is primarily protective in nature and act as a sensorial modality to indicate the presence of tissues injury (Zakaria *et al.*, 2018). There are various types and causes of pain, but all relate to a sensation of physical or emotional discomfort that affects daily routine negatively (Nawaz, Akram and Asif, 2013). Antinociceptive are drugs that control pain. A medicinal plant have been used in Unani system of medicine since ancient times and is the major source of drugs of herbal origin of most of the population of World (Nawaz, Akram and Asif, 2013). Baruah; Pal *et al*., conducted study to understand the analgesic and anti-nociceptive properties of the whole plant extract of *Drymaria cordata*, various models viz. acetic acid induced writhing model (female mice), Eddy's hot plate (mice) and tail flick model (rat) were used for the study, while formalin-induced paw licking model (mice) was used for anti-nociceptive study (Barua *et al.*, 2011).

6. **Anti-diabetic**-Diabetes also known as Diabetes mellitus or type 2 diabetes is a chronic health condition traditionally characterized by elevated levels of glucose in your blood. Diabetes prevalence has been rising more rapidly with every passing day (Sarup, Jana and Bhatia, 2016). Diabetes is a serious metabolic disorder and plenty of medical plants are used in traditional medicines to treat diabetes. These plants have no side effects and many existing medicines are derived from the plants (Kooti *et al.*, 2016). Susmita Patra *et al*., studied about the anti-diabetic activity of *Drymaria cordata* and investigate the antidiabetic effect of methanol extract from *Drymaria cordata* leaf (DCME) in streptozotocin (STZ) and nicotinamide (NA)-induced type 2 diabetes in rats. Diabetic Wistar albino rats were treated with DCME at 200 mg/kg and 400 mg/kg orally for 28 days. The results demonstrate the significant antidiabetic potential of *Drymaria cordata* leaf in albino rats plausibly by reducing oxidative stress and serum lipids levels, justifying the folkloric use of this plant in the treatment of diabetes (Patra, 2020).

7. **Sinusitis**- Acute rhinosinusitis is defined pathologically by transient inflammation of the mucosal lining of the paranasal sinuses lasting less than 4 weeks. Clinically, it is characterised by nasal congestion, rhinorrhoea, facial pain, hyposmia, sneezing, and, if more severe, additional malaise and fever (Ah-see, 2015). Ayam Victor Singh surveyed on the uses of *Drymaria cordata* by the meiteis for treating sinusitis and develop the new method. In this method, fresh leafy shoots were wrapped in seven layers of banana leaves, and tied with a thread and steam cooked in a limited amount of water, by keeping on a separator in pressure cooker/ kettle. After steam cooked, and before cooling down, a small pipe was inserted through a hole made on the wrapped banana leaf and the vaporized essential oil from the free end of the pipe was inhaled by the nose which was blocked due to sinusitis. Treatments of sinusitis to a total number of 100 volunteer patients were conducted giving different doses of treatment i.e. 2 – 3 inhalations per day for 2 - 3 days, one week or two weeks respectively depending on the level of sinusitis. After survey it was found that large number of patients with acute sinusitis had been cured through this practice, without expensive treatment or surgery (Singh, 2017).

8. **Cytotoxic activity-** The cytotoxic effect of *Drymaria cordata* hydroethanolic extract on HeLa (cervix adenocarcinoma) cell line was determined using a modification (Koduru *et al.*, 2007) of the MTT assay (Mosmann, 1983). It was potentially cytotoxic showing over 50% activity at 500 µg/ml (Sowemimo *et al*., 2009). Moreover one anti-leukemic compound ($C_{17}H_{22}O_2$) which is effective as inhibitory to primary cultures of human encomia cells has been isolated from this plant (Asolkar *et al.*, 1992).

9. It is also used in anti-HIV (Hsieh *et al.*, 2004), Infertility (Nono *et al.*, 2014b), Convulsion (Nono *et al.*, 2014a; Nono *et al.*, 2014b).

Conclusion

The term medicinal plants include various parts of plants used in herbalism and some of these plants have medicinal activities. Medicinal plants are the "backbone" of traditional medicine. These medicinal plants consider as a rich source of ingredients which can be used in drug development and synthesis. *Drymaria Cordata* is one of the most important medicinal plant used from the very long periods of time by the different tribes of India and different parts of the world. *Drymaria cordata* is an example of such species which has enormous medicinal value and economic importance but has not been studied in detail so far. The occurrence of different bioactive compound including alkaloids, flavonoids, tannins, saponins, phenols, terpenoids has been discussed. Present review also revealed that *Drymaria cordata* is used in the treatment of peptic ulcer, headaches, nephritis, and female infertility, sleeping disorders, convulsions, and febrile conditions in children, The plant is also used in the treatment of diverse ailments including cold, headache, coryza, bronchitis, as poultice on sore, leprosy, tumors, as fumigant for eye troubles, as cerebral stimulant and antifebrile agent. The present review spotlight different the different pharmacological activity like anti-bacterial activity, analgesic and anti-pyretic, anti-tussive activity, anxiolytic activity, anti-nociceptive, anti-diabetic, sinusitis, cytotoxic activity, anti-HIV, anti-fertility. In this regard, further studies about *Drymaria cordata* need to be carried out to explore its potential in preventing and treating the diseases. This review can also be use in the clinical purpose in development of novel drugs and can also be used in further investigation.

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