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ANTI-FILARIAL MEDICINAL PLANT RESEARCH: A REVIEW.

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ABSTRACT: Filariaisis is important health problem in tropical areas. Adult parasite exists for many years in filarial patient, producing microfilariae and thus make easy to transmit disease through the mosquito vector. It is a nematode borne disease, include microfilariamia, pulmonary eosinophilia and elephantiasis etc. DEC is popular drug for treatment of filariasis, which cause side effect to patient. So, effective and safe drug is needed against adult parasite. Since few decades various researchers have made effort to identify the anti-filaral potential of various medicinal plants on filarial parasite and many of them have identified significant activity. This review represents the anti-filarial potential of some medicinal plants.

Key words : - Anti-filarials, Medicinal plants, Microfilariae, Adult worms.

INTRODUCTION:

Lymphatic filariasis is a mosquito disease of the tropical countries spread by nematode *Wuchereria bancrofti* and *Brugia malayi* infection. This disease is quite common in the tropical areas. Approximately 120 million populations are infected throughout the world, of which 43 millions are affected with overt physical disabilities from filarial infection. Although the filariasis is never directly fatal, it is a devastating one cause considerable morbidity and social stigma. In 1995, filariasis identified as second important cause of permanent and long term disability next only to mood affecting disorders (WHO, 1995). The world disease burden of lymphatic filariasis was projected 5.8 million DALYs (Disability Adjusted Life Years) and India gives 38% of the disease burden globally.

Approximately 412 million people are living in bancroftian prevalent areas with 31 million people are estimated to be harbor microfilariae and 21 million people suffer from clinical symptom of the disease, with about 7.5 million of lymphoedema cases and 13 million of hydrocele cases (NICD, 1996), whereas millions of peoples are suffering with occult lymphatic filarial infection in prevalent areas without diagnosis. Filariasis is prevalent in all the states and Union territories except Jammu & Kashmir, Punjab, Rajasthan, Meghalaya, Haryana, Nagaland, Himachal Pradesh, Manipur, Mizoram, Tripura and Sikkim. In prevalent areas out of 1500 million children in the age group of 0 -14 years, 14 million harbour microfilaraemia, while 1 million suffer with lymphoedema and 2 million with hydrocele cases (Harinath B. C. *et al.,* 2000). It is precisely recognized by WHO as one of the ten diseases in its tropical disease research (TDR) scheme highlighting the huge disease burden and accordingly launched global programme for elimination of lymphatic filariasis (GPELF) (www.who.int/tdr/diseases).

India's MDA (Mass drug administration) and filariasis elimination programme is being run by Govt. of India by giving Ivermectin and Diethylcarbamazine over past several years and then Albendazole (ABZ) was added for the treatment of 590 million Indians living at risk of

infection (Gayen P, *et al.*, 2013), (Ramaiah, 2009). In India the coverage level of MDA programme varies from 55% to 90% and Odisha has reported the microfilaraemia rate of 0.43% in 2011 as compared to 2.54% in 2004 (Lahariya C, 2008). Although there is significant improvement of reduction in micorfilarae rates still 100% coverage has not been identified from any of the endemic countries. These drugs used for controlling filariasis exhibit numerous side effects. It is already identified that the drug produces changes in the microfilarial surface membranes, thereby rendering them more susceptible to destruction by host defense mechanisms (Hawking F. *et al.*, 1965). Current strategies to control filariasis are not thought to be completely safe and successful. This warrants an effective and safe drug targeted against the adult filarial worm. Some effort has been made by researchers to investigate the effect of several medicinal plants on filarial worm and many of them have been reported to have anti-filarial activity (Maurya SK, *et al.*, 2014).

The World Health Organization (WHO) has recently defined traditional medicine as effective therapeutic practices that have been in existence for hundreds of years, before the progress of modern medicine and are still in use today also. India has a rich tradition of practicing traditional herbal therapeutics in the form of Ayurveda, Unani and Siddha system of medicine, which has got further fillip by the recent introduction of AYUSH scheme by Government of India (http://.indianmedicine.nic.in/html/plants.mimain.htm.#int).

Traditional medicine is the exploitation of therapeutic experience of generations of practicing physicians of traditional systems of medicine. The traditional preparations contain medicinal plants, minerals and organic matter, etc. Herbal drugs comprise traditional medicines, which is mainly use medicinal plant preparations for therapy. The earliest recorded data of their use in Chinese, Indian, Greek, Egyptian, Syrian and Roman texts dates back to about 5000 years. The classical Indian texts include Charak Samhita, Rig-Veda, Atherveda and Sushruta Samhita. The plant medicine has been resulted from rich traditions of early civilizations and scientific legacy. (Kamboj V.P. *et al.*, 2000).

Plants contain numerous phytoceuticals utilized in conventional therapeutics. Plant based principles can be obtained from any part of the plant like bark, leaves, flowers, roots, fruits, seeds and the others (Gordon MC *et al.,* 2001). The systematic identification of plant species for the use of discovering new active compounds is a regular activity in some laboratories in India (Davies J *et al.,* 1994). Many compounds of pharmacological interest for allopathic drugs also originate from plant resources. However, there is lack of accurate guidelines to study the plant compounds and till date a very small portion of this wonderful potential drug range has been scientifically screened (Kamboj V.P. *et al.,* 2000). So, it is need of constant research on the plant based research for the identification of the active principle in the plants. This review discusses some of the medicinal plants that are being used to investigate anti-filarial research activity by various researchers to develop safe drug for lymphatic filariasis.

Various workers have made efforts by contributing anti-filarial data generation by screening therapeuting potential of medicinal plants by various screening systems.

The effect on aqueous and alcoholic extracts of the leaves of Sencio nudicaulis Buch. Ham. was studied on the spontaneous movements of the whole worm and nerve-muscle preparation of the Setaria cervi and on the survival of microfilariae in vitro. Alcohol extract shown better results than

aqueous extract (Singh R. et al., 1996). CDRI compound 92 / 138 a, synthetic analogue of a aplysinopsin synthetic marine alkaloid was evaluated in experimental filarial infections Litomosoides carinni in cotton rats and Acanthocheilonema vitae adults in Mastomys coucha in vivo and in vitro, which is active in both systems (Singh SN et al., 1997).

The crude extract of the stem bark of Streblus asper, a traditionally used medicinal plant of India, revealed significantly macrofilaricide activity against Litomosoides carinii and B. malayi in rodents. The study revealed two cardiac glycosides, K029 (asperoside) and K030 (Strebloside) of the extract to be responsible for anti-filarial activity. Of the two glycosides, the more effective macrofilaricide was K029 which was active at 50 mg/kg orally against Litomosoides carinii (>90%), B. malayi (>70%), and Acanthocheilonema vitae (>70%), in their respective hosts. The glycosides were also active in vitro against all the three filarial species significantly weak activity was detected in glycon and aglycon portions of the parent glycosides (K029 and K030). Several cardiac glycosides of other origins did not show any comparable anti-filarial efficacy. The aglycosidic portion of the extract however, showed poor adulticidal activity (44.5% activity at 1 gm/kg) against Litomosoides carinii (Dr. Ranjit Kumar Chatterji et al., 1999).

In vitro effects of ethanol and aqueous extracts of the medicinal plant Cardiospermum halicacabum on adult worms and microfilariae of Brugia pahangi were investigated. The aqueous extracts at > 500 µg/ml significantly reduced microfilariae release from worms, while ethanol extracts at 2mg/ml, inhibited the release of microfilariae from worm (Khunkitti W. et al., 2000). The effect of aqueous and alcohol extracts of the roots of Saxifraga stracheyi engl. on the spontaneous movements of both the whole worm and the nerve muscle preparation of the Setaria cervi and on the survival of microfilariae in vitro studied. The concentration required to inhibit the movements of the whole worm preparation was 140 µg/ml for aqueous and 250 µg/ml for alcohol extracts (Rajinder Singh et al., 2000).

Relative movability value of B. malayi worm observed with five aqueous extracts from three plant species, i. e., dried husk (HX), dried seeds (SX) and dried leaves (LX) of Xylocarpus granatum (Miliaceae), dried stems (ST) of Tinospora crispa (Menispermaceae) and dried leaves (LA), of Andrographics paniculata (Acanthaceae) were tested in vitro for 24 hrs. observation. Dried seeds (SX) extract of Xylocarous granatum demonstrated the strongest activity then other extracts (Zaridah MZ et al., 2001).

The macrofilaricidal property of the plant, Plumbago indica/rosea was investigated in vitro against Setaria digitata, a filarial parasite of cattle. Anti-filarial activity screened on concentration ranging 0.05, 0.04, 0.02 and 0.01 mg/ml and the worm motility was compared with that of solvent control. Complete inhibition of motility was observed for concentrations ranging from 0.02 to 0.05 mg/ml whereas in the control all the worms were active (Nisha Mathew et al., 2002).

Effect of alcoholic and aqueous extracts of the fruits of the Ficus racemosa Linn., on the spontaneous movements of the whole worm and nerve muscle preparation of Setaria cervi and on the survival of microfilariae in vitro was screened. Alcohol extract shown better effect than aqueous extract (Mishra V et al., 2005).

Effect of alcoholic and aqueous extracts of flowers of Azadirachta indica were tested in vitro for their potential anti-filarial activity against Setaria cervi. Alcoholic and aqueous extracts had almost similar lethal effect on the microfilariae of Setaria cervi (Mishra V. et al., 2005).

The Anti-filarial activity of aqueous extracts of Andrographis paniculata leaves was screen on adult parasites at doses 5 and 10mg/ml in terms of reduction in relative motility of worms i.e. 0% after 24hrs of treatment against B. malayi (Zaridah, et. al, 2008).

In vitro and in vivo anti-filarial efficacy of Trachyspermum ammi fruit crude as well as active fractions was tested at doses 0.01 to 0.5mg/ml on adult worms were reported in terms of motility inhibition and MTT reduction assays for S. digitata and B. malayi (Methew N. et. al, 2008).

Ethyl acetate, acetone and methanol Seed extracts of Centratherum anthelminticum showed inhibition in spontaneous motility of the nerve-muscle preparation of S. cervi characterized by decreased amplitude and frequency of contractions (Singhal KC et. al., 1992).

Macrofilaricidal activities of 11 Guatemalan medicinal plants were tested in vitro against B. phangi. Neurolaena lobata leaf ethanolic extract was reported to be effective on micro as well as macrofilariae in terms of worm motility and MTT reduction assays (Fujimaki Y. et. al, 2005).

Sphaeranthus indicus whole plant Methanolic extract showed macrofilaricidal activity for S. digitata at dose below 4mg/ml after incubation at 100 min (Nisha M. et. al, 2007.)

Leaves of Alnus nepalensis contains diarylheptanoid compound has shown effective anti-filarial activity against B. malayi microfilaria and adult parasites. IC 50 was found to be 6.57 - 10.31µg / ml (Yadav D. et. al, 2013.).

Galactolipids component contains in ethanolic extract of Bauhinia racemosa leaves has identified promising macrofilaricidal activity against B. malayi as compared to Ivermectin and DEC drug in terms to dose and efficacy (Sashidhara KV et. al, 2012)

The Caesalpinia bonducella seed kernel extract showed effective micro-filaricidal as well as macrofilaricidal activity using in vitro and in-vivo animal models (Gaur RL et. al, 2008).

20 medicinal plants were tested against Setari digitata in vitro. Among 20 plants only four plants C. anthelminticum, C. deodara, R. communis, and S. indicus have shown significant anti-filarial activity (Mathew N. et. al, 2007).

Methanolic extract of Ricinus communis seed has shown promising anti-filarial activity against dult S. digitata & B. malayi at dose 1mg/ml with 72.39% in MTT assay. (Shanmugapriya R et. al, 2012).

Aqueous and alcoholic extract of Mallotus philippensis leaves has given promising anti-filarial activity for S. cervi due to alteration in cuticular permeability. Alcoholic extract shown better effect than aqueous extract in LC 50 and LD 90 dose responses (Singh R et. al, 1997)

Excoecaria agallocha Leaves Methanolic extract identified dose dependent anti-filarial activity against S. digitata at 10µg/ml concentration on the developmental stages of parasite (Patra JK et. al, 2009).

Triterpenoid saponnins compound acaciaside A and acaciaside B contained in funicles of Acacia auriculiformi has shown anti-filarial activity against S. cervi microfilariae and adult. At 4 mg/ml concentration 100% inhibition achieved in micrifilariae and adult worms within 100 min and 35 min respectively (Ghosh M. et. al, 1993).

Plant Butea monosperma L. leaves Methanol and Hexane-ethanol extracts screened for anti-filarial activity against S. cervi. Methanol (IC50 1.25 mg/ml) extract shown potent anti-fillarial activity then Hexane-ethanol (IC50 3.6 mg/ml) as compared to controls (Deshmukh M et. al, 2014).)

Aqueous and alcoholic extract Pongamia pinnata Leaves & fruits at concentrations 250and 120µg/ml exhibited inhibition of spontaneous

movement of Setaria worm. The 25 µg/mL, 5 µg/mL and 20 µg/mL concentration inhibited Nerve–muscle preparation respectively due to cuticular permeability barrier. Uddin Q et. al, 2003).

Psoralea corylifolia Leaves & seeds extract at 60 and 30µg/ml showed potent effect on S. cervi whole worm respectively. Alcoholic seed extract shown better effect than alcoholic leaves and seeds Qamaruddin et. al, 2002).

Various plant extract was tested against S. digitata Strebulus aper whole plant extract shown significant anti-filarial activity (Mathai A. et. al, 1992).

Asparagus adscendens (Whole plant) the alcoholic and aqueous extract showed microfilaricidal S. cervi activity with LC50 value of 8 and 3ng/ml respectively Alcoholic extract shown better results than aqueous extract. Phytochemical studies revealed the presence of several sapogenins and saponins (Comley J.C et. al, 1990,).)

CONCLUSION:

This review represents the anti-filarial potential of some medicinal plants against various species and life forms of filarial parasites. India has rich tradition of practicing Ayurveda, Homeopathy, Siddha and Unani system of medicine using traditional knowledge. The pharmacological research of these plants has still been limited. The Extensive research on these plants was carried out for anti–inflammatory, anti–oxidant, anti–cancer, anti–bacterial, epilepsy, arthritis and diabetes by various researchers, however, there is a partial focus on the anti-filarial medicinal plant research. Anti-filarial database generated by various researchers is very significant and satisfactory toward the development of potent anti-filarial drug candidate but need depth study using modern tools to develop ant filarial therapeutic range against adult parasites.

CONFLICT OF INTEREST:

Authors declare that there is no conflict of interest.

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