Advances in Bioresearch
Adv. Biores., Vol 11 (5) September 2020: 162-165

Print ISSN 0976-4585; Online ISSN 2277-1573
Journal's URL:http://www.soeagra.com/abr.html
CODEN: ABRDC3
DOI: 10.15515/abr.0976-4585.11.5.162165

Advances in Bioresearch

REVIEW ARTICLE

A review on plants having Anti- *Mycobacterium tuberculosis* Potential

Shweta Sharma[1], Vishal Khandelwal[2]*
[1]Department of Biochemistry, National JALMA Institute for Leprosy & Other Mycobacterial Diseases (ICMR), Tajganj, Agra 282004, Uttar Pradesh, India
[2*]Department of Biotechnology, GLA University, Mathura-281406, UP, India
Corresponding author- vishal_k80@rediffmail.com

ABSTRACT
Tuberculosis (TB) is a disease that has affected mankind from very ancient time, and caused by Mycobacterium tuberculosis. Plants are an important source of biologically active secondary metabolites which have enormous therapeutic potential. In this review, medicinal plants have shown active against TB with their minimum inhibitory concentration (MIC), which is evaluated by microplate alamar blue assay (MABA) and resazurin microtitterplate assay (REMA) methods. This review work helps in use of medicinal plant to treatment of TB, and decrease the emergence of multidrug-resistant (MDR), extensively drug-resistant (XDR).
Keywords: *Tuberculosis, Anti-TB activity, plant.*

Received 21.04.2020 Revised 11.06.2020 Accepted 21.08.2020

How to cite this article:
S Sharma, V Khandelwal. A review on plants having Anti- *Mycobacterium tuberculosis* Potential. Adv. Biores., Vol 11 (5) September 2020: 162-165

INTRODUCTION

Tuberculosis (TB) is an infectious disease caused predominantly by *Mycobacterium tuberculosis* (Mtb), has plagued human since antiquity. It is most commonly transmitted by inhalation of aerosols and droplet nuclei which are discharged in the air when a TB patient coughs and sneezes. TB disease usually affects the lungs but can be migrate to any part of the body. Tuberculosis can affect the lymph nodes, pleura, bones & joints, the genitor-urinary tract, the nervous system, abdominal tuberculosis [1]. In 2018, the Word Health Organization estimated that there were 10 million TB cases worldwide. There was an estimated 1.2 million (range 1.1-1.3 million) TB death among HIV positive people in 2018, and an additional 251000 deaths (range, 223000-281000) 3 among HIV positive people (60% reduction from 620000 in 2000) [2].

Drug-resistant TB continues to be a public health threat. In 2018 there were about half a million new cases 5 of rifampicin-resistant TB (of which 78% had multidrug resistant TB). The three countries with the largest share of the global burden were India (27%), China (14%) and the Russian Federation (9%) [2].

First line drugs are essential, most effective and necessary component of short course treatment for TB. TB can be treated effectively by using first line drugs Isoniazid (INH), Rifampicin (RIF), Pyrazinamide (PZA), Ethambutol (EMB) and Streptomycin (SM). Second line drugs are clinically less effective than first-line drugs and also have some severe side-effects. TB can be treated effectively by using second line drugs, Fluoroquinolones (FQs), Amikacin (AMK), Capreomycin (CAP), Ethionamide/prothionamide (ETH), p-Amino Salicylic Acid (PAS) and Cycloserine (CS). MDR-TB can be raised when the first-line drugs are misused or mismanaged, inappropriate treatment, inadequate drug quality and supply. XDR-TB is defined as MDR-TB that is resistant to quinolones and any one of the injectable such as kanamycin or amikacin [2].

The treatment of TB necessitates complex drug regimens, with adverse effects and interactions, and is associated with poor patient compliance of multidrug-resistant (MDR-TB) and extensively drug- resistant

(XDR-TB) strains. Patients with MDR or XDR-TB require a lengthy course of a combination of drugs that are more expensive, more toxic, and not always effective. Current anti-TB therapy, consist of multiple drugs and involves a lengthy regimen associated with significant risk for the generation of drug-resistant organisms[3]. Furthermore, these lengthy anti-TB therapy exhibit hepatic toxicity. Keeping the aforesaid facts in view, new and effective alternatives for the treatment of TB are urgently needed and in this context, medicinal plants are representing a potential against TB.

In recent year, there has been an increasing interest in natural product based medicines fromplant origin. The plants are an important source of biologically active secondary metabolites which have enormous therapeutic potential. World Health Organization (WHO) estimates that about 80% of population living in Africa, and 40% of the population from china are using plant based traditional medicines (TM) for their primary health care needs. In many countries, TM continues to be widely used, even though allopathic medicine is often readily available (World Health Oraganization 2002-2005). The medicinal plants are back bone of TM and around 3300 million people in the under developed countries utilized medicinal plants on a regular basis. Products of natural origin contain a unique pool of incredibly chemically diverse molecules that have specifically evolved to interact with biological targets and have already provided some invaluable leads for drug design. Plants- based medicines, in particular, are widely by traditional healers in different parts of the world, including for the treatment of TB and TB relatedsymptoms [4], [5], [6].

TRADITIONAL MEDICAL KNOWLEDGE

Medicinal plants, since ancient time, have been used effectively in all cultures as source of medicine. The common use of herbal therapies and healthcare arrangements, as those defined in ancient texts such as the Vedas and the Bible and obtained from commonly used traditional herbs and medicinal plants, has been traced to the occurrence of natural products with medicinal properties [7], [8].

Ayurveda, means the science of life (Ayur = Life, Veda = Science), is an ancient medical knowledge which was developed in India thousands of years ago and describes numerous plants to treat several diseases. Traditional knowledge of herbal medicine can serve as a powerful approach to drug discovery. Plants are an important source of medicines for indigenous people and have a highly significant role in indigenous pharmacopoeias. These are easily available to all tribal peoples of the forest areas. The World Health Organization reported that 80% of world's population depends on traditional medicine, and a major part of the traditional therapies involve the use of plant extracts or their active constituents [9], [10].

Medicinal plants have shown activity against TB with their minimum inhibitory concentration (MIC), which is evaluated by microplate alamar blue assay (MABA) and resazurin microtitter plate assay (REMA) methods, list is given below.

Table1: Antimycobacterial activity of plants extract against *Mycobacterium tuberculosis*

Plant Name	Family	Part use	Traditional uses of plants	Extract	MIC (µg/ml) against TB	References
Allium sativum	Liliaceae	Bulb	Effective against bacterial, viral, fungal and parasitic infection	Aqueous	1.95	[11]
Plumbago zeylanica	Plumbaginaceae	Root	Cough, TB, swelling and ulcer	Ethanolic	31.25	[12]
Sphaeranthus indicus	Asteraceae	Floral head	Chest complaints and dysentery	Ethanolic	31.25	[13]
Ocimum basilicum	Lamiaceae	Seeds	Antibacterial, Antiviral, and Antifungal	80% Methanol	25	[14]
Cyperus rotundus	Cyperaceae	Root	Chest complaints, prolonged cough and fever	Ethanolic	62.5	[15]
Aegle marmelos	Rutaceae	Leaves	Anti-inflammatory	Hexane, acetone and methanol	100	[16]
Calophyllum brasiliense	Clusiaceae	Leaves	Antibacterial	Dichloromethane and aqueous	125	[17]

Curcuma caesia	Zingiberaceae	Rhizome	Chest complaints, cold and TB	Ethanolic	125	[18]
Stachytarpheta cayennesis	Verbenaceae	Leave and root	Antibacterial	Aqueous	>200	[19]
Glycyrrhiza glabra	Fabaceae	Root	Cold, cough, sore throat, TB and leprosy	Ethanolic	250	[6],[19]
Holarrhena antidysenterica	Apocynaceae	Seeds	Chest complaints, prolonged cough and leprosy	Ethanolic	250	[20]
Mallotus philippenesis	Euphorbiaceae	Fruits	Chest complaints, TB, leprosy and wounds	Ethanolic	250	[6]
Alstonia scholaris	Apocynaceae	Bark	Chest complaints, fever and TB	Ethanolic	500	[21]
Cocculus hirsutus	Menispermaceae	Leaves	Chest complaints, prolonged cough and leucorrhoea	Ethanolic	500	[22]
Pueraria tuberosa	Fabaceae	Tuber	Prolonged cough, and urinary troubles	Ethanolic	500	[18]
Eulophia nuda Lindl	Orchidaceae	Tubers	Chest complaints, and snake bite	Ethanolic	500	[22]
Adhatoda vasica	Acanthaceae	Leaves	Use in Asthma	Aqueous	2% v/v	[23]

CONCLUSION

Traditional knowledge and the use of plant-based medicines remain important in the prevention and treatment of disease. This is important because the traditional medicine is often quickly accessible and affordable to the rural communities. The emergence and spread of MDR strains around the world is making TB control a difficult task. This review makes an attempt to give scientific account to use of medicinal plant extract in tuberculosis treatment**.**

REFERENCES

1. Revised National TB Control programme. (2019).
2. WHO, Global TB Report. (2019).
3. Plalomino, J.C., Ramos, D.F., da silva, P.A. (2009) New anti-tuberculosis drugs: strategies, sources and new molecules. Curr .Med. Chem., 16, 1898-1904.
4. Copp, B.R., Pearce, A.N. (2007) Natural product growth inhibitors of Mycobacterium tuberculosis. Nat. Prod. Rep.,24, 278-297.
5. Santhosh, R.S., Suriyanarayanan, B. Plants: a source for new antimycobacterial drugs. Plants Med.,80, 9-21.
6. Gupta, V.K., Kaushik, A., Chauhan, D.S., Ahirwar, R.K., Sharma, S., Bisht, D. (2018) Antimycobacterial activity of some medicinal plants used traditionally by tribes from Madhya Pradesh, India for treating TB related symptoms. J.Ethnopharmacology., 227, 113-120.
7. Arya, V. (2011) A review on anti-Tuberculosis plants. Int . J.pharmaTech.Res, 3(2), 872-880.
8. Berdy, J. (2001) Bioactive microbial metabolites. J. Antibiot (Tokyo).,58, 1-26.
9. Rates, S.M. (2001) Plants as source of drugs. Toxicon, 39(5), 603-613.
10. Samy, R.P.,Pushparaj, P.N., Gopalkrishnakone, P. (2008) A compilation of bioactive compounds from Ayurveda. Bioinformation, 3(3), 100- 100.
11. Viswanathan, V.,Phadatare, A.G., Mukne, A. (2014) Antimycobacterial and antibacterial activity of Allium sativum bulbs. Indian J Pharm Sci, 76(3), 256-61.
12. Tilak, J.C., Adhikari, S., Devasagayam, T.P. (2004) Antioxidant properties of Plumbago zeylanica, an Indian medicinal plant and its active ingredient, plumbagin. Redox Rwp., 9, 219-227.
13. Galani, V.J., Patel, B.G., Rana, D.G. (2010) Sphaerathus indicus Linn: a phytopharmacological review. Int.J. Ayurveda Res, 1(4), 247-253.
14. Balcha, E., Mengiste, B., Gebrelibanos, M., Worku, A. G.(2014) Evaluation of in vitro antimycobaterial activity of selected medicinal plants in Mekelle. Ethiopia World Appl Sci.J., 31, 1217-1220.
15. Srivastava, R.K., Singh, A., Shukla, S.V. (2013) Chemical investigation and pharmaceutical action of Cyperus rotundus- a review. J. Biol. Act. Prod. Nat, 3(3), 166-172.
16. . Kaur, R.,Kaur, H. (2015) Antitubercularacivity and phytochemical screening of selected medicinal plants. Orient J. Chem.,31, 597-600.
17. Pires, C.T., Brenzan, M.A., Scodro, R.B., Cortez, D.A., Lopes, L.D., Siqueira, V.L. (2014) Antimycobacterium tuberculosis activity and cytotoxicity of Calophlylum brasiliense Cambess (Clusiaceae). Mem. Inst Oswaldo Cruz ,109(3), 324-9.
18. Pandey, D., and Gupta, A.K. (2014) Antibacterial efficacy of Curcuma caesia from Bastar District of Chhattisgarh India. Int. J pharma. Sci. Res, 5(6), 2294-2301.

19. Tiwari, B., Shailajan, S., Menon, S., and Kulkarni, S. (2019) Tuberculosis: History, Epidemology, Antitubercular Drugs and Plant based Altenatives. India J. PharmaSci,81(2), 200-210
20. Jamadagni, P.S., Pawar, S.D., Jamadagni, S.B., Chougule, S., Gaidhani, S.N. (2017) Review of Holarrhena antidysenterica (L.) wall. ex A. DC: Pharmacognostic, Pharmacological, and toxicological perspective. Pharmacogn. Rev, 11(22), 141-144.
21. Antony, M., James, J., Mishra, C.S., Sagadevan, L.D.M., Veettil, A.K.T., Thankamani, V. (2014) Antimycbacterial activity of the plant extracts of the Alstonia scholaris. Int. J. Curr. Pharm. Res, 2014, 40-42.
22. Khare, C.P. (2007) Indian Medicinal Plants. An illustrated Dictionary. Springer- Verlag, Berlin/Heidelberg.
23. Gupta, R., Thakur, B., Singh, P., Singh, H.B., Sharma, V.D., Katoch, V.M. (2010) Anti-tuberculosis activity of selected medicinal plants against multi drug resistant *Mycobacterium tuberculosis* isolates. Indian J Med Res., 809- 813.