



Antibiotic Potential of Endophytes from Some Medicinal Plants: A Review

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ABSTRACT

MDR phenomenon among various human pathogens is a serious problem ahead researchers and health community. With the uncontrolled use of various chemicals and improper practice of medication among peoples, the genetic and molecular evolution has been occurred in various pathogens. Due to frequent exposure to several antibiotics, one has made few molecular changes making itself used to that particular medicine and made it effectless. By considering this, the various alternatives from medicinal plants which are mentioned in Ayurveda are becoming the bull's eye for pharmaceutical industry. With the improvements in research technologies and development in equipments, now it becomes somewhat easier and fruitful job to go for the isolation and identification of novel bioactive compounds.

Keywords: MDR; Bioactive; medicinal plants; medication; Ayurveda

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INTRODUCTION

Drug resistance for antimicrobial drugs which is used in the treatment of many infectious diseases is increasing day by day. This makes treatment of critical infections to be difficult one. This matter encourages for the research of new antimicrobial drugs with effective action which provide relief from illnesses. Compounds which are obtained from natural products and especially from those of plants and microbes origin have been proved as promising novel source for development of new pharmaceutical products. The chances of getting an alternative compound is more in a novel source. Hence, endophytic microbes are selected as an essential sources of antimicrobial compounds. Endophytes (fungi and bacteria) live within the plant tissue and in all parts of plants. Endophytic fungi are recognized as an ecological attachment of microorganisms that may provide sources for new alternative having useful biological activities. Endophytes are a poorly investigated group of microorganisms which is capable to provide a vast and major source of bioactive compounds having use in a different areas (e.g. pharmaceuticals, industrial, etc.). Most screening programmes for antibiotic potential has focused on soil fungi and less towards endophytes. As a result, they are lacking behind for screening programmes related to endophytes, which suggests that there is lot of majority remain undiscovered. Endophytes are known to produce bioactive compounds which were isolated from its host plant. This idea was developed after the finding of anticancer molecule taxol from *Taxomyces andreanae*. This endophyte was isolated from its host plant *Taxus brevifolia*. Initially *Taxus brevifolia* was unique source for taxol [1]. Bioactive compounds obtained from endophytes have a wide range of biological activities. Fungal endophytes were found in healthy tissues of plants. Microbes which are living in an internal tissues of plant without causing any harmful effect are known as endophytic microbes [2]. The most common endophytes are fungi while several bacterial reports are also available. Endophytes have a wide range of antimicrobial producing strains which are the vital sources of antimicrobial substances [3].

PLANT SELECTION PROCESS

Medicinal plants are one of the oldest forms of medicine till known. Every plant has at least one endophytic microbe. The following process is generally considered for plant selection;

- 1) Plant species which possesses the property to produce important notifiable drugs or which are of ethnomedicinal importance.
2. Plants located in some diverse ecological conditions for e.g., elevated temperature ranges, higher saline soil and plants in draught areas.

ISOLATION AND IDENTIFICATION OF ANTIBIOTIC POTENTIAL OF ENDOPHYTIC MICROBES

Sudipta Roy and Debdulal Banerjee, [2] found that in primary screening four endophytic bacteria (Vrl 42, Vrp 44, Vrb 45, Vrb 46) were found producing antimicrobial compound against the various test pathogens among all the isolated endophytes of *Vinca rosea*. One bacterium (Vrb 46) isolated from the stem of *V.rosea* have shown antimicrobial activity against all the test pathogens.

[5] isolated total 18 isolates of endophytic bacteria. The endophytic bacteria isolated from *Acacia catechu* have shown antibacterial activity. Here 80% isolates inhibited the growth of *S. Aureus*. 85% of isolates inhibited growth of *Salmonella typhi* and 60% of isolates showed inhibitory growth of *Klebsiella pneumoniae*. Out of isolated endophytic fungi *Glomerella cingulata* VBAC09 and *Alternaria alternata* VBAV19 isolated from *J. Adhatoda* showed very good antibacterial activity against Gram positive as well as Gram negative bacteria [6-9]. It can produce at least two different antibacterial compounds as evidenced from TLC analysis. In addition it also showed anti-candidal activities. Deepanwita Deka and Dhruva Kumar Jha, [5] obtained sixty-nine isolates. The endophytic fungi viz., *Acremonium falciforme*, *Nigrospora sphaerica*, *P. chrysogenum* were obtained from bark and leaf samples of *Litsea cubeba*. The fungus *Chaetomium* sp., *Aureobasidium* sp., *Periconia hispidula* were isolated only from the bark. The fungus *Acrophialophora* sp. was obtained from the leaf samples. The present study expresses that out of sixty-nine isolates, thirty-six isolates from bark and thirty-three from leaf samples, sheltered *L. cubeba*. Fungal endophytes from *P. Juliflora* which were further processed for antibacterial and antifungal assay on solid medium. 17 Out of 44 endophytic fungi gave antibacterial activity against the pathogenic bacteria and 10 endophytic fungi showed antifungal activity against plant pathogens. U.S.E. Endophytic fungus *Colletotrichum gloeosporioides* obtained from *V. Negundo* plant is an excellent source for the production of antibiotics for *S. aureus* [10].

Maruthamuthu *et al*, [11] isolated 22 endophytic fungi. Out of 22, antibacterial screening was performed out with the extracts of the 7 fungal species against the few bacterial pathogens (e.g. *Corynebacterium diphtheria*, *Proteus vulgaris*, *Staph. aureus*, *E. coli* and *Sal. Typhi*). Endophytic fungi obtained from the crude extracts of medicinal plant leaves of *Vitex negundo* and *Ocimum basilicum* showed good inhibitory activity against all the tested microbe strains.

DISCUSSION

Above literature study clearly demonstrated that herbal medicines are the promising source of novel medicine in the future pharmaceutical industry. Various scientists hereby clearly showed that not only bacteria but fungi which are associated with various plant tissues such as leaf, bark, stem, roots, etc. in the form of endophytes are playing a significant role against various human pathogens whenever combined with regular medicines.

CONCLUSION

This review study represents the potential use of endophytes for the betterment of human society and its health. As we all are facing various diseases and pandemics (e.g., Corona), it is very essential that there should be the development of new drugs which are capable to defeat the various pathogens which are getting resistant to regular medicines and hence it is a need of time to explore endophytes which are associated with medicinal plants.

REFERENCES

1. Kini K.R., et al., (2007). New hopes from endophytic fungal secondary metabolites. *Bol. Soc. Quin. Max*, Vol1(1), 19-26.
2. Stierle, A., Stierle, D. and Strobel, G. (1993). Taxol and taxane production by *Taxomyces andreanae*, an endophytic fungus of Pacific yew. *Science*, 260(5105), 214-216.
3. Banerjee D. and Roy S. (2010). Isolation of antimicrobial compound by endophytic bacteria from *V. rosea*. *Int. J. Cur. Res.*, Vol. 5, 47-51.
4. Gautam V., et al., (2020). Isolation, Identification and Antibacterial activity of endophytic bacteria from leaves of *Acacia catechu*. *Journal of Animal Research*: Vol. 10(3), 397-403.
5. Barman S., Ghosh R., Gond S.K., Mandal N. and Mandal N.C. (2016). Assessment of antimicrobial activity of endophytic fungi isolated from *J. adhatoda*. *UGB journal of plant biology and biotechnology*, Vol. 1((1).
6. Deka D. and Jha D.K. (2018). Antimicrobial activity of endophytic fungi from leaves and barks of *Listea cubeba*, a traditional important medicinal plant of north-east India. *Jordan journal of biological sciences*. Vol. 11(1), 73-79.

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7. Raveesha R.K. and Srivastava A.(2015). Antimicrobial potential of fungal endophytes isolated from leaves of *Prosopis juliflora*, an important weed. *Int. J. Pha. &Pha. Sci.*, Vol. 7(12), 28-136.
8. Anand T.D., Arivudainanbi Ezhil, Karunakaran C.,Rajendran A. And Shanmugaiah V., (2011). Novel bioactive metabolites producing endophytic fungus *Colletotrichum gloeosporioides* against multidrug resistant *S. aureus*. *FEMS Immunol. Med. Microbiol.* 61, 340-345.
9. Kaushik N.,Kharkwal H., Kulkarni G.T., Malhotra B. and Sharma A. (2020). Therapeutic agents from endophytes harboured in Asian medicinal plants. *Phytochemistry Reviews* 19, 691-720.
10. Abirami G. and Boominathan M.(2016). Antimicrobial activity of endophytic fungi isolated from medicinal plant *Hugonia mystax*. *Journal of academia and industrial research*, Vol. 4(12), 257-262.
11. Maruthanmuthu M.,Palanichamy P. and Thangavel A. (2014). Chemical Science review and letters ethyl acetate extraction of antibacterial compounds of endophytic fungi isolated from medicinal plants. *Chemical Science Review and Letters*, Vol. 3(10), 78-182.

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