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Diversity and bioactive compounds from Endophytes of medicinal plants: A short review

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Abstract

Endophytes are an endosymbiotic group of microorganisms that grows and colonies in a plant tissue. Endophytes can be readily isolated on microbial or plant growth media. Secondary metabolites, such as alkaloids, phenolic acids, quinones, steroids, saponins, tannins, and terpenoids are obtained from endophytes and are serving as a potential candidate for antifungal, antiviral antibacterial, anti-insect, anticancer properties. Plant sources are being extensively explored for new chemical entities for therapeutic purposes, endophytic microbes also constitute an important source for drug discovery. This review aims to comprehend the contribution and uses of endophytes as an impending source of drugs against various human diseases and the medicinal use.

Introduction

The term endophyte was first introduced by De Bary (1866) and are defined as microbes (fungi or bacteria) that grows within plant tissues without causing any noticeable symptoms of disease. Over the past few decades, endophytes have received much attention. Plant-microbe interaction has constantly been a fascinating field of research for taxonomists, ecologists, agronomists, chemists as well as evolutionary biologists. The endophytic microbial community has the ability to influence plant growth and yield, suppress plant associated pathogens, increase stress tolerance of plants, solubilise phosphate, contribute nitrogen to plants as well as many essential nutrients for plants, such as proper growth and development, thus enhance their ability to withstand the environmental stresses. Endophytes manufacture a massive array of bioactive compounds, such as antibiotics, antitumor and anti-infection agents, which opens up a new prospect for the drug analysis sector in the field of drug research. In this short review, we tried to emphasize on the potential benefits of microbial endophytes and their significance Diversity of endophytes

Endophytes are more frequently isolated from the different part of the plant, like root, shoot and leaves. Khawar et.al (2008) isolated and reported 183 endophytes from *C.roseus* and among this 13 were fungi belonging to species *Drechslera*, *Curularia*, *Bipolaris*, *Altaranaria* and *aspergillus* etc.

Bacon et.al (1977) reported endophytes from *Festuca arundinaceae* (Tall Fescue) belonging to fungal species such as *Astragalus mollissimus*, *Oxytropis*, and *Oxytropis sericea*.

Karsten et.al (2007) reported endophytes phoma sp isolated from *Fagonia cretica*. The *F.cretica* is used against fever, thirst, vomiting, dysentery and urinary discharges.

Kajula et.al endophytes from Scots pine (*pinus sylvestris* L) and Labrador tea. This plant used in the treatment of the remedy for the bladder, kidney and rheumatic affection.

Raviraja (2005) studied and isolate endophytes from the plant of kuderemukh range of Western Ghat of India and reported about eighteen endophytes.the most common endophytic fungi were *Curvularia clavata*, *c.lunata*, *C. pallescens* and *fusarium oxysporum*.

Bioactive compounds from Endophytes:

a) *Piriformospora indica*

Piriformospora indica was discovered by Varma et.al (1998) from the desert soil of Rajasthan and showed the growth promoting effect among the desert plant, this fungus interact with the plant in a manner as like arbuscular mycorrhizal; fungi. This fungus and widely reported to be used as bio fertilizer, bio protector and growth regulator. This fungus can also be reported to be used as bio controlling agent to prevent plant pathogen.

b) Novel and eco-friendly drug production:

Many eco-friendly drug obtained from endophytes fungi rather than bacteria. Natural product from fungal endophytes can be grouped into several categories, including alkaloid, steroids, terpenoids, isocoumarins, quinone, phenylpropanoid and lignans, phenol and phenolic acids, aliphatic metabolites, lactone,etc.from the phoma spp of endophytes antimicrobial ,antiviral, and insecticidal and immune suppressor drug were reported by Iwhii et.al(2000).

Yang et.al (2006) reported two new 12- membered ring lactones compound from *Cladosporium tenuissimum*. The cytotoxic effect shown by the Chaetominine, against the human leukemia K 562 and colon cancer SW1116 cell line was higher than the drug % fluorouracil (Jiao et.al 2006)

c) The anticancer and antituberculosis compounds;

Taxol the first anticancer compound produced by endophytes. This compound prevent tubulin molecule from depolymerisation during the process of cell division.(Tan and Zou 2001)

The second novel and potent anticancer compound obtained from endophytes is Camptothecin it is neoplastic agent. And was isolated from *Camptotheca acuminata*. Ergoflavin anticancer is also reported from Indian Endophytes *Miimusops elengi*. Another compound secalonic acid D, a mycotoxin belonging to ergochrome class, is known to have potent anticancer activities and was isolates from mangrove endophytes.

Rukachaisirikul et.al (2007) reported endophytic phomopsis species which produces secondary metabolites like phomoenamide, phomonitroester and Deacetyl phomoxanthone, and showed antibacterial activity against *mycobacterium tuberculosis*.

d) Alkaloids:

Alkaloids like amines and amide are reported from *Neotyphodium* endophytes, these alkaloids are toxic to insect and mammals and herbivores.

e) Phenol, phenolic acid and antioxidants;

Fungal endophytes usually have pronounced biological and antioxidant activities. Pestacin and isopestiacin are two novel dihydroisobenzofuran carrying phenol possessing antifungal and antioxidant activity. These compounds were isolated from *Pestalotiopsis* microspore and isopestacin.

F) Antibiotics, antifungal and antiviral compounds;

The antibiotic is the low molecular substance produced by one microorganism and inhibits the growth of other microorganisms at very low dilution. Since from the discovery of first antibiotics near about 2000 antibiotics have been discovered so far. Antibiotics are also reported from endophytes, for example Cryptocandin is a unique antimycotic peptide isolated from *Cryptosporiopsis quercina*, similarly antifungal compound *Pestalotiopsis* microspore isolated from *Torreya taxifolia*.

Two novel human cytomegalovirus protease inhibitors, mecytonic acid, have been isolated from the endophytes like *Cytonaema* sp.

The presently in India many drug seller sells chemically synthesized drugs without perception which leads to accumulate in the environment and the multidrug resistance pathogen reveals in the environment, to cope with his situation natural metabolite from the endophytes will be a good remedy, apart from this, the chemically synthesized product beyond the reach of poor Indian people, so that products from plant endophytes will reduce the prizes of the drugs and save the life of peoples. There still one challenge to produce active metabolite from the endophytes because a natural interaction between the plant and its endophytes cannot be made in the laboratory. But the product from endophytic will be the boon for the growing human population.

From this we can conclude that the endophytic organism can be a source of many alkaloids, antibiotics, antiviral and antifungal compound and can be good remedy against multidrug resistance pathogen. Future perspectives and conclusion

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