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Prevalence of fungal diseases in medicinal plants of Vellore district of Tamil Nadu in India

P. Saranraj[1*], P. Sivasakthivelan[2] and S. Sivasakthi[2]

[1]Assistant Professor of Microbiology, Department of Biochemistry, Sacred Heart College (Autonomous), Tirupattur – 635 601, Tamil Nadu, India.
[2]Department of Microbiology, Annamalai University, Annamalai Nagar – 608 002, Tamil Nadu, India.
*Corresponding Author: *microsaranraj@gmail.com*

Keywords

Medicinal plants, Phytopathogens, Fungal diseases and Vellore district.

Abstract

The prevalence of fungal disease in selected 80 medicinal plants which are surveyed in Vellore district, Tamil Nadu, India was studied in the present research. The medicinal plants which are selected to study the fungal disease prevalence are arranged by Scientific name, Common name, Family name and Disease caused by fungi in medicinal plants. The plants analyzed in this present research are belong to the families such as Acanthaceae, Amaranthaceae, Apiaceae, Apocyanaceae, Asclepiadaceae, Asteraceae, Cucurbitaceae, Euphorbiaceae, Labiatae, Liliaceae, Malvaceae, Papilionoideae, Verbanaceae, Vitaceae, Solanaceae, Lythraceae, Marsileaceae, Poaceae, Mimosaceae, Sapindaceae, Oxalidaceae, Aizoaceae, Araceae, Cruciferae, Mimosoideae, Rubiaceae, Lamiaceae, Basellaceae, Portulaceae, Fabaceae and Zingibesaceae. Some of the commonly observed diseases are Leaf spot, Blight disease, Foot rot, Root rot, Powdery mildew, Downy mildew, White rust, Damping off, Wilt disease, Anthracnose disease and Leaf blight. After the detailed analysis of medicinal plants, it was concluded that the medicinal plants are susceptible to common phytopathogens which belongs to the fungal group and they are affected by various fungal diseases. It is necessary to maintain the medicinal plants in gardens or nurseries by using biopesticides which can make the medicinal plants free from infectious fungal diseases.

1. Introduction

India is one of the few countries in the world known for its indigenous and valuable flora and fauna of an excellent therapeutic potential. India among the 12 mega biodiversity countries of the world with rich vegetation and wide varieties of medicinally valuable plants. Use of medicinal plants in India and many other developing countries could be considered as a 'Living Tradition'. The dependence on plants constitutes a major component of cultural heritage in India which reflected on customs and lifestyles throughout the country. It was estimated that more than 6000 species of plants are now being used in local health traditions in India (Binu *et al*., 1992). The World Health Organization estimated that 80% of developing world populations depend upon traditional medicine to meet their primary health care to cure and prevent their ailments (WHO, 2000). Traditional medicine may include formalized aspects of folk medicine, i.e. longstanding remedies passed on and practiced by lay people. Practices known as traditional medicines include Ayurveda, Siddha, Unani, ancient Iranian, Islamic, traditional Vietnamese, traditional Chinese, traditional Korean, acupuncture, Muti, Ifá,

Kampo in Japan and Jammu in Indonesia and many other forms of healing practices.

In India there is great variation in soil type and all other environmental factors hence it is highly favorable for the growth and development of many types of varieties of medicinal plants. In India more than 2000 varieties of medicinal plants are present (Joseph Jose and Rayalakshmi, 2005). Human being is dependent on higher plants for their health care needs since the beginning of human civilization. To avoid the carcinogenic effect the world population diverted towards plant made medicines; different parts of medicinal plants are used in preparation of medicine and homeopathy in ayurvedic science, homeopathy and naturopathy, for the preparation of different types of medicines against various diseases of human beings, cattle and birds etc. It has observed that the medicinal plants were affected by fungal pathogens which degrade the quality of medicinal plants directly by the physiological and metabolic disturbing processes of plant organ. Hence, we have selected 80 medicinal plants to study the disease conditions of medicinal plants caused by fungi in India. This is the initial stage to divert plant pathologist to study diseases of medicinal plants and their management on which there is very few data is available.

Medicinal plants should be free from microbial infection in general and fungal infection in particular because in the most of the cases fungi infecting the leaves of medicinal plants directly affect photosynthesis by reducing the productivity and formation of secondary metabolites. In addition, the fungal infection also sometimes degrades the quality of medicinally important active principle (D'Aulerio *et al*., 1995; Chutia *et al*., 2006; Pati *et al*., 2008; Shivanna and Mallikarjunaswamy, 2009). Moreover, the pathogenic microorganisms can also produce different types of toxins during pathogenesis, which may alter the nature of the active principle leading to serious health hazards instead of curing the diseases. Fungi causing diseases to medicinal plants may thus play a very important role in curative potency of traditionally used herbal raw materials.

2. Materials and Methods

The Vellore district lies between 12°15' to13°15' north latitudes and 78° 20' to79° 50' East latitudes in Tamil Nadu state. The district is spread over an area of about 6077 km^2 and is bounded on the North and Northeast by Thiruvalluvar District, on the South and Southeast by Kanchipuram District, on the south by Tiruvannamalai district, on the Southwest by Krishnagiri District and on the northwest and north by Andhra Pradesh state. The map of the study area Vellore district, Tamil Nadu, India was showed in Figure – 1. The district receives an annual rainfall is about 448.8 – 1544.6 mm. The minimum and maximum temperature varies between 26.3º and 38.2º. The diseased medicinal plants were observed visually carefully by nacked eyes and the diseases of medicinal plants are confirmed with the help of Plant Pathologist.

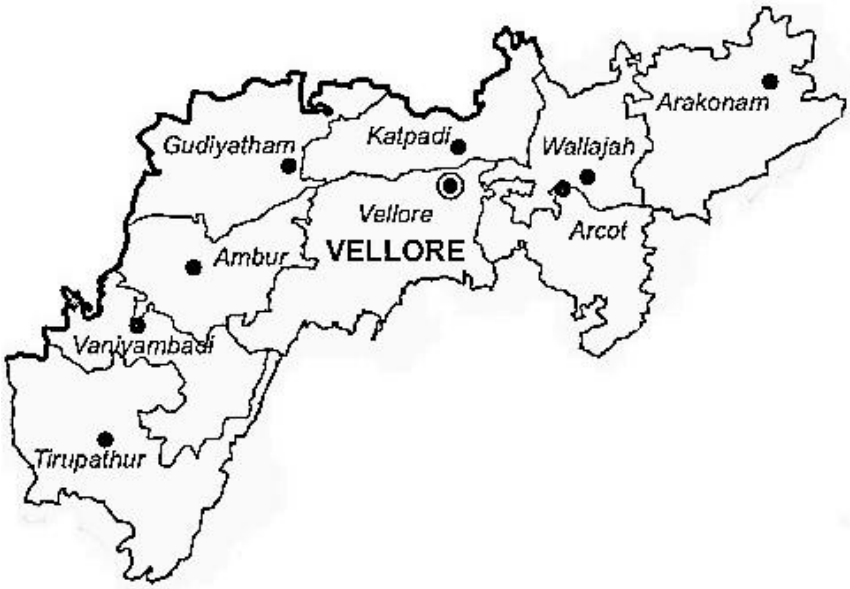

Figure – 1: Map of Vellore District, Tamil Nadu, India

3. Results and Discussion

The prevalence of fungal disease in selected 80 medicinal plants which are surveyed in Vellore district, Tamil Nadu, India was studied in the present research and the list of diseases are furnished in Table – 1. The medicinal plants which are selected to study the fungal disease prevalence are arranged by Scientific name, Common name, Family name and Disease caused by fungi in medicinal plants. The plants analyzed in this present research are belong to the families such as Acanthaceae, Amaranthaceae, Apiaceae, Apocyanaceae, Asclepiadaceae, Asteraceae, Cucurbitaceae, Euphorbiaceae, Labiatae, Liliaceae, Malvaceae, Papilionoideae, Verbanaceae, Vitaceae, Solanaceae, Lythraceae, Marsileaceae, Poaceae, Mimosaceae, Sapindaceae, Oxalidaceae, Aizoaceae, Araceae, Cruciferae, Mimosoideae, Rubiaceae, Lamiaceae, Basellaceae, Portulaceae, Fabaceae and Zingibesaceae. Some of the commonly observed diseases are Leaf spot, Blight disease, Foot rot, Root rot, Powdery mildew, Downy mildew, White rust, Damping off, Wilt disease, Anthracnose disease and Leaf blight. The phytopathogenic fungi which are responsible for causing the disease in medicinal plants also listed in Table – 1 in a clear manner.

Table – 1: Prevalence of fungal disease in selected medicinal plants surveyed in Vellore district, Tamil Nadu, India

S. No	Name of the plant	Common Name (Tamil)	Family	Fungi causing diseases in Medicinal plants
1	*Adhatoda vasica*	Adathodai	Acanthaceae	*Rhizoctonia solani* (Leaf spot), *Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Alternaria porri* (Leaf spot), *Alternaria tenuissima* (Leaf spot), *Cercospora adhatodae* (Leaf spot), *Colletotrichum gloeosporioides* (Leaf spot), *Curvularia lunata* (Leaf spot), *Curvularia penneseti* (Leaf spot) and *Curvularia cragrotidis* (Leaf spot).
2	*Andrographis paniculata*	Seriyanangai or Nilavembu	Acanthaceae	*Fusarium moniliforme* (Foot rot), *Rhizoctonia solani* (Leaf spot), *Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Alternaria porri* (Leaf spot), *Alternaria tenuissima* (Leaf spot), *Cercospora adhatodae* (Leaf spot), *Colletotrichum gloeosporioides* (Leaf spot), *Curvularia lunata* (Leaf spot), *Curvularia penneseti* (Leaf spot) and *Curvularia cragrotidis* (Leaf spot).
3	*Hygrophila auriculata*	Nirmulli	Acanthaceae	*Rhizoctonia solani* (Leaf spot), *Alternaria alternata* (Blight disease), *Cercospora adhatodae* (Leaf spot), *Pythium butleri* (Root rot), *Colletotrichum gloeosporioides* (Leaf spot), *Curvularia lunata* (Leaf spot), *Curvularia penneseti* (Leaf spot) and *Curvularia cragrotidis* (Leaf spot).
4	*Alternanthera sessilis*	Ponnakanni	Amaranthaceae	*Pernospora farinose* (Downy mildew), *Pernospora alta* (Downy mildew) and *Pernospora lami* (Downy mildew).
5	*Amaranthus graecizans*	Serukeerai	Amaranthaceae	*Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Alternaria porri* (Leaf spot), *Alternaria tenuissima* (Leaf spot), *Albugo cruciferarum* (White rust), *Albugo bliti* (White rust) and *Pythium butleri* (Root rot).

6	*Amaranthus spinosus*	Mullikkirai	Amaranthaceae	*Curvularia lunata* (Leaf spot), *Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Alternaria porri* (Leaf spot), *Alternaria tenuissima* (Leaf spot), *Albugo cruciferarum* (White rust), *Albugo bliti* (White rust) and *Pythium butleri* (Root rot).
7	*Lannea coromandelica*	Anaikarai	Amaranthaceae	*Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Alternaria porri* (Leaf spot), *Alternaria tenuissima* (Leaf spot), *Albugo cruciferarum* (White rust), *Albugo bliti* (White rust) and *Pythium butleri* (Root rot).
8	*Achyranthes aspera*	Naivooruvi	Amaranthaceae	*Alternaria alternata* (Blight disease), *Albugo cruciferarum* (White rust), *Albugo bliti* (White rust) and *Pythium butleri* (Root rot).
9	*Amaranthus artis*	Araikeerai	Amaranthaceae	*Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Alternaria porri* (Leaf spot), *Alternaria tenuissima* (Leaf spot), *Albugo cruciferarum* (White rust), *Albugo bliti* (White rust) and *Pythium butleri* (Root rot).
10	*Amaranthus viridis*	Kuppaikeerai	Amaranthaceae	*Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Alternaria porri* (Leaf spot), *Alternaria tenuissima* (Leaf spot), *Albugo cruciferarum* (White rust), *Albugo bliti* (White rust) and *Pythium butleri* (Root rot).
11	*Amaranthus blitum*	Mulaikeerai	Amaranthaceae	*Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Alternaria porri* (Leaf spot), *Alternaria tenuissima* (Leaf spot), *Albugo cruciferarum* (White rust), *Albugo bliti* (White rust) and *Pythium butleri* (Root rot).
12	*Amaranthus spinosus*	Mullikeerai	Amaranthaceae	*Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Alternaria porri* (Leaf spot), *Alternaria tenuissima* (Leaf spot), *Albugo cruciferarum* (White rust), *Albugo bliti* (White rust) and *Pythium butleri* (Root rot).
13	*Celosia argentea*	Pannaikeerai	Amaranthaceae	*Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Alternaria porri* (Leaf spot), *Alternaria tenuissima* (Leaf spot), *Albugo cruciferarum* (White rust), *Albugo bliti* (White rust) and *Pythium butleri* (Root rot).
14	*Spinacea oleracea*	Palakeerai	Amaranthaceae	*Pernospora farinose* (Downy mildew), *Pernospora alta* (Downy mildew), *Pernospora lami* (Downy mildew), *Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Alternaria porri* (Leaf spot), *Alternaria tenuissima* (Leaf spot), *Albugo cruciferarum* (White rust), *Albugo bliti* (White rust) and *Pythium butleri* (Root rot).
15	*Centella asiatica*	Vallari	Apiaceae	*Botryotina fuckeliana* (Leaf spot), *Glomerella cingulata* (Leaf spot), *Fusarium oxysporum* (Damping – off and Wilt disease) and *Pectobacterium carotovorum* (Leaf spot).

16	*Coriandrum sativum*	Kothamalli	Apiaceae	*Botryotina fuckeliana* (Leaf spot), *Glomerella cingulata* (Leaf spot), *Fusarium oxysporum* (Damping – off and Wilt disease) and *Pectobacterium carotovorum* (Leaf spot).
17	*Catharanthus roseus*	Nithyakalyani	Apocyanaceae	*Levillula umbelliferarum* (Powdery mildew), *Curvularia lunata* (Leaf spot), *Curvularia penneseti* (Leaf spot), *Curvularia cragrotidis* (Leaf spot), *Cercospora barlericola* (Leaf spot), *Septoria lycopersici* (Leaf spot), *Sphaceloma poinsettiae* (Anthracnose disease) and *Phyllosticta capitalensis* (Leaf spot).
18	*Wrightia tinctoria*	Vetpalai	Apocyanaceae	*Ascochyta pinodes* (Leaf Blight and Leaf spot), *Cercospora barlericola* (Leaf spot), *Septoria lycopersici* (Leaf spot), *Sphaceloma poinsettiae* (Anthracnose disease) and *Phyllosticta capitalensis* (Leaf spot)
19	*Ervatamia divaricata*	Nantiyavarttam	Apocyanaceae	*Levillula umbelliferarum* (Powdery mildew), *Curvularia lunata* (Leaf spot), *Curvularia penneseti* (Leaf spot), *Curvularia cragrotidis* (Leaf spot), *Cercospora barlericola* (Leaf spot), *Septoria lycopersici* (Leaf spot), *Sphaceloma poinsettiae* (Anthracnose disease) and *Phyllosticta capitalensis* (Leaf spot).
20	*Plumeria rubra*	Segappu Arali	Apocyanaceae	*Levillula umbelliferarum* (Powdery mildew), *Curvularia lunata* (Leaf spot), *Curvularia penneseti* (Leaf spot), *Curvularia cragrotidis* (Leaf spot), *Cercospora barlericola* (Leaf spot), *Septoria lycopersici* (Leaf spot), *Sphaceloma poinsettiae* (Anthracnose disease) and *Phyllosticta capitalensis* (Leaf spot).
21	*Calotropis gigantean*	Erukkam	Asclepiadaceae	*Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Alternaria porri* (Leaf spot), *Alternaria tenuissima* (Leaf spot), *Cercospora barlericola* (Leaf spot), *Mycosphaerella linicola* (Leaf spot) and *Myrothecium roridum* (Leaf spot)
22	*Hemidesmus Indicus*	Nannari	Asclepiadaceae	*Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Alternaria porri* (Leaf spot), *Alternaria tenuissima* (Leaf spot), *Cercospora barlericola* (Leaf spot), *Mycosphaerella linicola* (Leaf spot) and *Myrothecium roridum* (Leaf spot).
23	*Pentatropis capensis*	Upilankodi	Asclepiadaceae	*Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Alternaria porri* (Leaf spot), *Alternaria tenuissima* (Leaf spot), *Cercospora barlericola* (Leaf spot), *Mycosphaerella linicola* (Leaf spot) and *Myrothecium roridum* (Leaf spot).
24	*Pergularia daemia*	Uttamani	Asclepiadaceae	*Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Alternaria porri* (Leaf spot), *Alternaria tenuissima* (Leaf spot), *Cercospora barlericola* (Leaf spot), *Mycosphaerella linicola* (Leaf spot) and *Myrothecium roridum* (Leaf spot).

25	*Eclipta prostrata*	Karisalankanni	Asteraceae	*Cercospora barlericola* (Leaf spot) and *Septoria lycopersici* (Leaf spot).
26	*Eclipta procera*	Mangel Karisalankanni	Asteraceae	*Cercospora barlericola* (Leaf spot) and *Septoria lycopersici* (Leaf spot).
27	*Cichorium intybus*	Kasinikeerai	Asteraceae	*Cercospora barlericola* (Leaf spot) and *Septoria lycopersici* (Leaf spot).
28	*Lactuca sativa*	Manalikeerai	Asteraceae	*Cercospora barlericola* (Leaf spot) and *Septoria lycopersici* (Leaf spot).
29	*Coccinia grandis*	Kovai	Cucurbitaceae	*Fusarium oxysporum* (Damping – off and Wilt disease) and *Phytophtora nicotianae* (Damping - off)
30	*Cucumis sativus*	Vellari	Cucurbitaceae	*Fusarium oxysporum* (Damping – off and Wilt disease) and *Phytophtora nicotianae* (Damping - off).
31	*Cucurbita moschata*	Poosani	Cucurbitaceae	*Fusarium oxysporum* (Damping – off and Wilt disease), *Phytophtora nicotianae* (Damping - off), *Erysiphe cichoracearum* (Powdery mildew) and *Sphaerotheca fuliginea* (Powdery mildew).
32	*Lagenaria siceraria*	Sorakkai	Cucurbitaceae	*Fusarium oxysporum* (Damping – off and Wilt disease) and *Phytophtora nicotianae* (Damping - off).
33	*Mukia maderaspatana*	Musumusukai	Cucurbitaceae	*Fusarium oxysporum* (Damping – off and Wilt disease) and *Phytophtora nicotianae* (Damping - off).
34	*Momordica somnifera*	Pavakai	Cucurbitaceae	*Fusarium oxysporum* (Wilt disease), *Erysiphe cichoracearum* (Powdery mildew) and *Phytophtora nicotianae* (Damping - off).
35	*Acalypha indica*	Kuppaimeni	Euphorbiaceae	*Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Alternaria porri* (Leaf spot), *Alternaria tenuissima* (Leaf spot), *Ascochyta pinodes* (Leaf Blight and Leaf spot), *Cercospora barlericola* (Leaf spot), *Pestalotia rhododendri* (Leaf spot) and *Phoma herbarum* (Leaf spot).
36	*Phyllanthus amarus*	Kilanelli	Euphorbiaceae	*Alternaria solani* (Leaf spot), *Alternaria tenuissima* (Leaf spot), *Ascochyta pinodes* (Leaf Blight and Leaf spot),*Cercospora barlericola* (Leaf spot), *Pestalotia rhododendri* (Leaf spot) and *Phoma herbarum* (Leaf spot).
37	*Euphorbia heterophylla*	Amman paccarici	Euphorbiaceae	*Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Alternaria porri* (Leaf spot), *Alternaria tenuissima* (Leaf spot) and *Cercospora barlericola* (Leaf spot).
38	*Leucas aspera*	Thumbai	Labiatae	*Fusarium oxysporum* (Wilt disease), *Rhizoctonia solani* (Leaf spot), *Alternaria alternata* (Blight disease), *Curvularia lunata* (Leaf spot), *Cercospora barlericola* (Leaf spot), *Corynespora cassiicola* (Leaf spot), *Myrothecium roridum* (Leaf spot), *Phyllosticta capitalensis* (Leaf spot) and *Glomerella cingulata* (Leaf spot).

39	*Ocimum sanctum*	Thulasi	Labiatae	*Rhizoctonia solani* (Leaf spot), *Alternaria alternata* (Blight disease), *Curvularia lunata* (Leaf spot), *Curvularia cragrotidis* (Leaf spot), *Cercospora barlericola* (Leaf spot) and *Glomerella cingulata* (Leaf spot)
40	*Ocimum basilicum*	Karpura Thulasi	Labiatae	*Fusarium oxysporum* (Wilt disease), *Rhizoctonia solani* (Leaf spot), *Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Alternaria porri* (Leaf spot), *Alternaria tenuissima* (Leaf spot), *Curvularia lunata* (Leaf spot), *Curvularia penneseti* (Leaf spot), *Curvularia cragrotidis* (Leaf spot), *Geotrichum candidum*, *Cercospora barlericola* (Leaf spot), *Corynespora cassiicola* (Leaf spot), *Myrothecium roridum* (Leaf spot), *Phyllosticta capitalensis* (Leaf spot) and *Glomerella cingulata* (Leaf spot)
41	*Aloe vera*	Kathazai	Liliaceae	*Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Alternaria porri* (Leaf spot), *Alternaria tenuissima* (Leaf spot), *Fusarium oxysporum* (Wilt disease), *Colletotrichum pestalotiopsis* (Leaf spot) and *Aspergillus verocosa* (Leaf spot).
42	*Abutilon indicum*	Thuthi	Malvaceae	*Cercospora barlericola* (Leaf spot), *Fusarium solani* (Damping – off and Wilt disease) and *Colletotrichum gloeosporioides* (Leaf spot).
43	*Hibiscus rosasinensis*	Semparuthi	Malvaceae	*Cercospora barlericola* (Leaf spot), *Fusarium solani* (Damping – off and Wilt disease) and *Colletotrichum gloeosporioides* (Leaf spot).
44	*Hibiscus cannabinus*	Pulichakeerai	Malvaceae	*Cercospora barlericola* (Leaf spot), *Fusarium solani* (Damping – off and Wilt disease) and *Colletotrichum gloeosporioides* (Leaf spot).
45	*Melochia corchorifolia*	Pinnakukeerai	Malvaceae	*Cercospora barlericola* (Leaf spot), *Fusarium solani* (Damping – off and Wilt disease) and *Colletotrichum gloeosporioides* (Leaf spot).
46	*Lablab purpureus*	Avarai	Papilionoideae	*Cercospora barlericola* (Leaf spot), *Colletotrichum gloeosporioides* (Leaf spot), *Curvularia lunata* (Leaf spot), *Curvularia penneseti* (Leaf spot) and *Curvularia cragrotidis* (Leaf spot).
47	*Sesbania grandiflora*	Agathei	Papilionoideae	*Botryodiploidia oncidii* (Leaf spot), *Cercospora barlericola* (Leaf spot), *Ciliochorella castaneae* (Leaf spot), *Cochliobolus carbonum* (Leaf spot), *Colletotrichum gloeosporioides* (Leaf spot),*Curvularia lunata* (Leaf spot), *Curvularia penneseti* (Leaf spot), *Curvularia cragrotidis* (Leaf spot), *Phomopsis longicolla* (Leaf spot), *Phyllosticta capitalensis* (Leaf spot) and *Pestalotia rhododendri* (Leaf spot)

48	*Vitex negundo*	Nochi	Verbanaceae	*Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Alternaria porri* (Leaf spot), *Alternaria tenuissima* (Leaf spot), *Aspergillus niger* (Leaf spot), *Aspergillus flavus* (Leaf spot), *Fusarium oxysporum* (Wilt disease), *Fusarium solani* (Damping – off) and *Colletotrichum gloeosporioides* (Leaf spot).
49	*Cissus quadrangularis*	Perandai	Vitaceae	*Erysiphe bicellate* (Powdery mildew), *Ascochyta pinodes* (Blight disease), *Fusarium oxysporum* (Wilt disease) and *Fusarium solani* (Damping – off and Wilt disease).
50	*Solanum trilobatum*	Thuthulai	Solanaceae	*Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Alternaria porri* (Leaf spot), *Alternaria tenuissima* (Leaf spot), *Curvularia cragrotidis* (Leaf spot),*Curvularia lunata* (Leaf spot), *Curvularia penneseti* (Leaf spot), *Pithomyces chartarum* (Leaf spot), *Aspergillus flavus* (Leaf spot), *Penicillium citrinum* (Leaf spot), *Erysiphe bicellate* (Powdery mildew), *Cladosporium oxysporum* (Leaf spot), *Cladosporium allii* (Leaf spot) and *Colletotrichum gloeosporioides* (Leaf spot).
51	*Solanum nigrum*	Manathakalli	Solanaceae	*Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Alternaria porri* (Leaf spot), *Alternaria tenuissima* (Leaf spot), *Curvularia cragrotidis* (Leaf spot), *Pithomyces chartarum* (Leaf spot), *Aspergillus flavus* (Leaf spot), *Penicillium citrinum* (Leaf spot), *Erysiphe bicellate* (Powdery mildew), *Ascochyta pinodes* (Leaf Blight and Leaf spot), *Cercospora barlericola* (Leaf spot), *Cladosporium oxysporum* (Leaf spot),*Cladosporium allii* (Leaf spot), *Curvularia lunata* (Leaf spot), *Curvularia penneseti* (Leaf spot), *Colletotrichum gloeosporioides* (Leaf spot) and *Phyllosticta capitalensis* (Leaf spot).
52	*Solanum torvum*	Cuntai	Solanaceae	*Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Alternaria porri* (Leaf spot), *Alternaria tenuissima* (Leaf spot), *Curvularia cragrotidis* (Leaf spot), *Pithomyces chartarum* (Leaf spot), *Aspergillus flavus* (Leaf spot), *Penicillium citrinum* (Leaf spot), *Erysiphe bicellate* (Powdery mildew), *Ascochyta pinodes* (Leaf Blight and Leaf spot), *Cercospora barlericola* (Leaf spot),*Cladosporium oxysporum* (Leaf spot), *Cladosporium allii* (Leaf spot), *Curvularia lunata* (Leaf spot), *Curvularia penneseti* (Leaf spot), *Colletotrichum gloeosporioides* (Leaf spot) and *Phyllosticta capitalensis* (Leaf spot).

53	*Physalis minima*	Sodaku	Solanaceae	*Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Alternaria porri* (Leaf spot), *Alternaria tenuissima* (Leaf spot), *Curvularia cragrotidis* (Leaf spot), *Pithomyces chartarum* (Leaf spot), *Aspergillus flavus* (Leaf spot), *Penicillium citrinum* (Leaf spot), *Erysiphe bicellate* (Powdery mildew), *Cercospora barlericola* (Leaf spot),*Cladosporium oxysporum* (Leaf spot),*Cladosporium allii* (Leaf spot), *Curvularia lunata* (Leaf spot), *Curvularia penneseti* (Leaf spot) and *Colletotrichum gloeosporioides* (Leaf spot).
54	*Datura metel*	Vellaiumattai	Solanaceae	*Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Alternaria porri* (Leaf spot), *Alternaria tenuissima* (Leaf spot), *Curvularia cragrotidis* (Leaf spot), *Pithomyces chartarum* (Leaf spot), *Aspergillus flavus* (Leaf spot), *Penicillium citrinum* (Leaf spot), *Erysiphe bicellate* (Powdery mildew), *Ascochyta pinodes* (Leaf Blight and Leaf spot), *Cercospora barlericola* (Leaf spot),*Cladosporium oxysporum* (Leaf spot), *Cladosporium allii* (Leaf spot), *Curvularia lunata* (Leaf spot), *Curvularia penneseti* (Leaf spot), *Colletotrichum gloeosporioides* (Leaf spot) and *Phyllosticta capitalensis* (Leaf spot).
55	*Datura alba*	Vellaiumattai	Solanaceae	*Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Alternaria porri* (Leaf spot), *Alternaria tenuissima* (Leaf spot), *Curvularia cragrotidis* (Leaf spot), *Pithomyces chartarum* (Leaf spot), *Aspergillus flavus* (Leaf spot), *Penicillium citrinum* (Leaf spot), *Erysiphe bicellate* (Powdery mildew), *Ascochyta pinodes* (Leaf Blight and Leaf spot), *Cercospora barlericola* (Leaf spot), *Cladosporium oxysporum* (Leaf spot), *Cladosporium allii* (Leaf spot), *Curvularia lunata* (Leaf spot), *Curvularia penneseti* (Leaf spot), *Curvularia cragrotidis* (Leaf spot), *Colletotrichum gloeosporioides* (Leaf spot) and *Phyllosticta capitalensis* (Leaf spot).
56	*Datura stramonium*	Umattai	Solanaceae	*Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Alternaria porri* (Leaf spot), *Alternaria tenuissima* (Leaf spot), *Curvularia cragrotidis* (Leaf spot), *Pithomyces chartarum* (Leaf spot), *Aspergillus flavus* (Leaf spot), *Penicillium citrinum* (Leaf spot), *Erysiphe bicellate* (Powdery mildew), *Ascochyta pinodes* (Leaf Blight and Leaf spot), *Cercospora barlericola* (Leaf spot),*Cladosporium oxysporum* (Leaf spot), *Cladosporium allii* (Leaf spot), *Curvularia lunata* (Leaf spot), *Curvularia penneseti* (Leaf spot), *Curvularia cragrotidis* (Leaf spot), *Colletotrichum gloeosporioides* (Leaf spot) and *Phyllosticta capitalensis* (Leaf spot).

57	*Withania somnifera*	Ashwagandha	Solanaceae	*Aecidium withaniae* (Leaf spot), *Mucor mucedo* (Leaf spot), *Rhizopus solani* (Leaf spot), *Fusarium solani (*Wilt disease), *Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Alternaria porri* (Leaf spot), *Alternaria tenuissima* (Leaf spot), *Pithomyces chartarum* (Leaf spot), *Aspergillus niger* (Leaf spot), *Erysiphe bicellate* (Powdery mildew), *Cercospora barlericola* (Leaf spot),*Cladosporium oxysporum* (Leaf spot), *Cladosporium allii* (Leaf spot), *Curvularia lunata* (Leaf spot), *Curvularia penneseti* (Leaf spot), *Curvularia cragrotidis* (Leaf spot) and *Colletotrichum gloeosporioides* (Leaf spot).
58	*Lawsonia inermis*	Maruthani	Lythraceae	*Pernospora farinose* (Downy mildew), *Pernospora alta* (Downy mildew) and *Pernospora lami* (Downy mildew).
59	*Marsilea minuta*	Aarakkerai	Marsileaceae	*Pernospora farinose* (Downy mildew), *Pernospora alta* (Downy mildew) and *Pernospora lami* (Downy mildew).
60	*Cynodon dactylon*	Arugampul	Poaceae	*Ascochyta pinodes* (Blight disease), *Fusarium oxysporum* (Wilt disease) and *Fusarium solani* (Damping – off and Wilt disease).
61	*Chrysopogon zizanioides*	Vetiver	Poaceae	*Ascochyta pinodes* (Blight disease), *Fusarium oxysporum* (Wilt disease) and *Fusarium solani* (Damping – off and Wilt disease).
62	*Mimosa pudica*	Thottasurungi	Mimosaceae	*Ascochyta pinodes* (Blight disease), *Fusarium oxysporum* (Wilt disease) and *Fusarium solani* (Damping – off and Wilt disease).
63	*Cardiospermum halicacabum*	Mudakkaththa n	Sapindaceae	*Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Alternaria porri* (Leaf spot), *Alternaria tenuissima* (Leaf spot), *Cercospora barlericola* (Leaf spot), *Phomopsis longicolla* (Leaf spot) and *Colletotrichum gloeosporioides* (Leaf spot).
64	*Oxalis corniculata*	Pulichcha keerai	Oxalidaceae	*Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Alternaria porri* (Leaf spot), *Alternaria tenuissima* (Leaf spot), *Albugo cruciferarum* (White rust), *Albugo bliti* (White rust) and *Pythium butleri* (Root rot).
65	*Gisekia pharnaceoides*	Manalikkirai	Aizoaceae	*Curvularia lunata* (Leaf spot), *Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Alternaria porri* (Leaf spot), *Alternaria tenuissima* (Leaf spot), *Albugo cruciferarum* (White rust), *Albugo bliti* (White rust) and *Pythium butleri* (Root rot).

66	*Pistia stragiotes*	Akayattamarai	Araceae	*Fusarium oxysporum* (Wilt disease), *Rhizoctonia solani* (Leaf spot), *Alternaria alternata* (Blight disease), *Corynespora cassiicola* (Leaf spot), *Myrothecium roridum* (Leaf spot), *Phyllosticta capitalensis* (Leaf spot) and *Glomerella cingulata* (Leaf spot).
67	*Typhonium trilobatum*	Karunai	Araceae	*Erysiphe bicellate* (Powdery mildew), *Ascochyta pinodes* (Blight disease), *Fusarium oxysporum* (Wilt disease) and *Fusarium solani* (Damping – off and Wilt disease).
68	*Brassica juncea*	Katuku	Cruciferae	*Pernospora farinose* (Downy mildew), *Pernospora alta* (Downy mildew), *Pernospora lami* (Downy mildew), *Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Alternaria porri* (Leaf spot), *Alternaria tenuissima* (Leaf spot), *Albugo cruciferarum* (White rust), *Albugo bliti* (White rust) and *Pythium butleri* (Root rot).
69	*Cleome gynandra*	Nalvelai	Capparaceae	*Botryotina fuckeliana* (Leaf spot), *Glomerella cingulata* (Leaf spot), *Fusarium oxysporum* (Damping – off and Wilt disease) and *Pectobacterium carotovorum* (Leaf spot).
70	*Mimosa pudica*	Tottalvati	Mimosoideae	*Levillula umbelliferarum* (Powdery mildew), *Curvularia lunata* (Leaf spot), *Curvularia penneseti* (Leaf spot), *Curvularia cragrotidis* (Leaf spot), *Cercospora barlericola* (Leaf spot), *Septoria lycopersici* (Leaf spot), *Sphaceloma poinsettiae* (Anthracnose disease) and *Phyllosticta capitalensis* (Leaf spot).
71	*Morinda coreia*	Nuna	Rubiaceae	*Curvularia lunata* (Leaf spot), *Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Alternaria porri* (Leaf spot), *Alternaria tenuissima* (Leaf spot), *Albugo cruciferarum* (White rust), *Albugo bliti* (White rust) and *Pythium butleri* (Root rot).
72	*Ixora coccinea*	Idlipoo	Rubiaceae	*Curvularia lunata* (Leaf spot), *Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Alternaria porri* (Leaf spot), *Alternaria tenuissima* (Leaf spot), *Albugo cruciferarum* (White rust), *Albugo bliti* (White rust) and *Pythium butleri* (Root rot).
73	*Plectranthus amboinicus*	Karpuravalli	Lamiaceae	*Puccinia achilpeae* (Rust disease), *Puccinia graminis* (Rust disease), *Puccinia menthe* (Rust disease), *Puccinia malvacearum* (Rust disease), *Puccinia absinthi*, *Puccinia dracunculine* (Rust disease), *Uromyces glycyrrhizae* (Rust disease) and *Verticillium dahliae* (Wilt disease)

74	*Mentha arvenis*	Pudhina	Lamiaceae	*Puccinia achilpeae* (Rust disease), *Puccinia graminis* (Rust disease), *Puccinia menthe* (Rust disease), *Puccinia malvacearum* (Rust disease), *Puccinia absinthi*, *Puccinia dracunculine* (Rust disease), *Uromyces glycyrrhizae* (Rust disease), *Verticillium dahliae* (Wilt disease) and *Verticillium albo - atrum* (Wilt disease)
75	*Basella alba*	Kodipasalai	Basellaceae	*Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Alternaria porri* (Leaf spot), *Alternaria tenuissima* (Leaf spot), *Cercospora barlericola* (Leaf spot), *Phomopsis longicolla* (Leaf spot) and *Colletotrichum gloeosporioides* (Leaf spot).
76	*Portulaca oleraceae*	Paruppukeerai	Portulaceae	*Cercospora barlericola* (Leaf spot), *Fusarium solani* (Damping – off and Wilt disease) and *Colletotrichum gloeosporioides* (Leaf spot).
77	*Portulaca quadrifida*	Mukulikeerai	Portulaceae	*Cercospora barlericola* (Leaf spot), *Fusarium solani* (Damping – off and Wilt disease) and *Colletotrichum gloeosporioides* (Leaf spot).
78	*Trigonella faenum*	Vendhayakeerai	Fabaceae	*Cercospora barlericola* (Leaf spot), *Fusarium solani* (Damping – off and Wilt disease) and *Colletotrichum gloeosporioides* (Leaf spot).
79	*Clitoria ternatea*	Sangu Pushpam	Fabaceae	*Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Alternaria porri* (Leaf spot), *Alternaria tenuissima* (Leaf spot), *Cercospora barlericola* (Leaf spot), *Phomopsis longicolla* (Leaf spot) and *Colletotrichum gloeosporioides* (Leaf spot).
80	*Curcuma longa*	Manjal	Zingibesaceae	*Alternaria alternata* (Blight disease), *Alternaria solani* (Leaf spot), *Curvularia lunata* (Leaf spot), *Curvularia cragrotidis* (Leaf spot), *Cercospora adhatodae* (Leaf spot), *Phyllosticta capitalensis* (Leaf spot), *Magnaporthe grisea* (Blast disease), *Colletotrichum gloeosporioides* (Leaf spot) and *Sphaceloma poinsettiae* (Anthracnose disease).

Previously, Bilgrami (1963) reported list of leaf spot diseases of same ornamental plants. Sutare and Kareppa (2010) studied the fungal diseases of *Adhatoda zeylanica.* Anthracnose caused by *Colletotrichum gloeosporioides* on plants like Indian fig cactus (Kim *et al.,* 2000) and *Jatropha curcas* (Kwon *et al.,* 2012) was recorded form Korea whereas, on *Olea europaea* (Sergeeva *et al.,* 2008) from Australia; *Blepharocalyx salicifolius* (Larran *et al.,* 2011) from Argentina and *Allium cepa* (Sikirou *et al.,* 2011) from Benin during last couple of years.

The pathogen was reported to cause a number of plant diseases in India also. *Colletotrichum gloeosporioides* causing anthracnose in bell pepper seed crop was recorded by Gupta *et al.* (2009). Similarly, anthracnose of *Aloe vera* leaves caused by *Colletotrichum gloeosporioides* was reported by Avasthi *et al*. (2011). They observed the loss of mucilaginous gel in affected area which ultimately leads the death of infected leaves. Occurrences of *Colletotrichum gloeosporioides* on Noni (Hubballi *et al.,* 2012) and on *Jasminum grandiflorum* form Jaipur, Rajasthan (Sharma *et al.,* 2012) and on *Pedilanthus tithymaloides* (Gautam *et al.,* 2012) were recorded recently from India.

In current years, there are some reports on fungal diseases in medicinal plants, but they are not complementary. Powdery mildews, *Erysiphe* and *Levillula* genera were reported from different region of Iran. *Erysiphe sordido* was reported from way bread (*Plantago major*) and *Indian plantago* seed (*Plantago psyllium*). *Erysiphe graminis*, *Erysiphe bicellata*, *Erysiphe artemisiae, Erysiphe communis*, *Levillula malvacearum*, *Levillula compositarum*, *Sphaerotheca fuliginea*, *Levillula taurica* and *Levillula leguminosarum* were reported from maidenhair fern (*Adiantum capillus veneris*), bitter sweet (*Solanum dulcamara*), estragon (*Artemisia dracunculus*), flixweld (*Descurainia sophia*), marsh mallows (*Althaea officinalis* and *Malva silvestris*), yarrow (*Achillea millefolium*), dill (*Aniethum graveolens*), coriander (*Coriandrum sativum*) and licorice (*Glycyrrhiza globra*), respectively.

Also, *Erysiphe hyperici* and *Levillula guttiferarum* was reported from johns-worth hypericum (*Hypericum perforatum*) (Ershad, 1996). Moreover, leaf spot diseases, *Cercospora* and *Septoria* genera were reported in some medicinal plants. *Cercospora althaeina*, *Cercospora ricinella*, *Septoria rubiae, Septoria rechingeri* and *Septoria sisymbrii* were isolated from marsh mallows, castor, madder (*Rubia tinctorum*), currant fraited rhubarb (*Rheum ribes*) and flixweld, respectively. Downy mildew caused by *Pernospora* genus, this genus including *Pernospora farinose*, *Pernospora alta* and *Pernospora lamii* were isolated from spinach (*Spinacia oleracea*), way bread and summer savory (*Satureia hortensis*), respectively (Ershad, 1996). Also, rust disease including *Puccinia* and *Uromyces* genera were found in medicinal plants. *Puccinia menthae* and *Puccinia serhylli* were found in wild thyme (*Thymus serpllum*). *Puccinia achilpeae, Puccinia graminis, Puccinia menthe, Puccinia malvacearum, Puccinia absinthi, Puccinia dracunculine, Uromyces glycyrrhizae* were found in yarrow, maidenhair fern, peppermint (*Mentha piperita*) and pudding grass (*Mentha pulegium*), marsh mallows, estragon, madder, licoric, respectively. Loose smut, *Ustilago nuda* was reported in maidenhair fern, white rust, *Albugo candidates* was found in flixweld and mother's heart (*Capsella bursapastoris*) (Ershad, 1996).

Fungal diseases also were reported on medicinal plants around the world. *Rhizoctonia solani* was identified as a leaf spot disease in malabar nut (*Adhatoda vasica*) in India (Verma *et al.*, 2006). *Pithomyces chartarum* is known to cause leaf spot diseases of ashwagandha (*Withania somnifera*) in India (Verma *et al.*, 2007). Wilt disease of cucumber (*Cucumis sativus*) caused by *Fusarium oxysporum* f. sp. *cucumerinum* has been recorded in Turkey for a long time (Yildiz and Delen, 1977). Also *Fusarium oxysporum* f. sp. *radicis-cucumerinum* causes wilting accompanied by root and stem rot has been reported in this country (Karaca and Kahveci, 2009) and in British Columbia (Punja and Parker, 2000). Macrophomina phaseolina was found to cause root rot in medicinal coleus (*Coleus forskohlii*) in India (Kamalakannan *et al.*, 2005). *Peronospora lamii* causing damage to sage (*Salvia officinalis*) and rosemary (*Rosmarinus officinalis*) reported from the UK (Humphreys Jones *et al.*, 2006).

Fusarium wilt caused by *Fusarium solani* on commercial field lavender was identified in China (Ren *et al.*, 2007). Several species of powdery mildew fungi have been recorded on rosemary (*Leveillula* spp.) from Europe and *Podosphaera fuliginea* from USA (Farr and Rossman, 2009). Powdery mildew on rosemary associated with Golovinomyces biocellatus in Asia (Park *et al.*, 2009). *Podosphaera fusca* (syn. *Sphaerotheca fusca* and *Sphaerotheca fuliginea*) has been recorded to infect German chamomile (*Matricaria chamomilla*) in Canada, Egypt, Germany, Switzerland, Russia (Farr and Rossman, 2009). *Golovinomyces cichoracearum* (*Erysiphe cichoracearum*) is a rather common powdery mildew species infecting German chamomile in Europe (Farr and Rossman, 2009) and has been reported in Korea (Park *et al.*, 2010). There is no any report on vascular wilt disease, root rot and plant death on medicinal plants on the medicinal plants so far. Only damping-off disease caused by *Phytophtora nicotianae* and *Fusarium oxysporum* were deducted from castor and cumin seed (*Cuminum cyminum*), respectively.

4. Conclusion

After the detailed analysis of medicinal plants, it was concluded that the medicinal plants are susceptible to common phytopathogens which belongs to the fungal group and they are affected by various fungal diseases. It is necessary to maintain the medicinal plants in gardens or nurseries by using biopesticides which can make the medicinal plants free from infectious fungal diseases.

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