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Diseases of medicinal plants in India: A review

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Abstract
The present data-base includes a total of 95 diseases occurring on 75 species of medicinal plants in India in general and West Bengal in particular. For each disease, relevant information has been given pertaining to name of disease, name of host plant, causal pathogen, symptoms of disease and suggested management along with citing relevant references. This data-base will provide an updated information in this field of research and will provide a present state of knowledge.

Keywords: India, data-base, diseases of medicinal plants, causal organism, symptoms, management

Introduction
The medicinal plants are receiving global attention because of their multifarious uses like therapeutic purpose, in toiletries, cosmetics, food supplements, green pesticides, etc. In India, since *Vaidic* period and in Mesopotamia for over 5000 years, the uses of medicinal plants are known mostly for therapeutic purpose. Those medicinal plants were used basing on the wisdom of the sages and traditional healers and no scientific validation of their therapeutic values was ever done. Interestingly, now, after scientific validation of many medicinal plants. It appears that what the sages prescribed thousands of years back, are all turning out to be scientifically correct. Due to that, many western scientists who termed the Indian System of Medicines (ISM) as baseless, have all changed their opinion now and are coming to India to learn this Traditional Healing System.
In developing countries, over 80% of population depend upon herbal products in their day-to-day healthcare system and some countries in Asia, Africa, Middle East that percentage reaches still higher. As per WHO, 25% of pharmaceutical drugs which are used now are based upon medicinal plants and 30% drugs sold worldwide contain plant-based compounds (FAO 2005; Avan, 2021) [12, 5]. In many African countries, these traditional medicines have been included in Complementary Healthcare Service.
Due to increasing importance and growing demand of medicinal plants, the cultivation of medicinal plants is growing at a very rapid rate in many of the developing countries like India but not that in developed countries. In-addition, the impact of climate changes, intensive cultivation practices, injudicious uses of pesticides, market oriented, crop management, etc the medicinal plants are becoming victim of pests and diseases and those are causing reduction in production of secondary metabolites and affecting quality and quantity of medicinal plants. The diseases which are caused are mainly due to fungus, bacteria, virus, etc. The diseased medicinal plants fetch less market price. A number of workers reviewed diseases of medicinal plants (Chandel *et al*, 2014; Marimuthu *et al*, 2018; Mondal *et al*, 2018, etc) [6, 27, 33] but no updated data-base is available. During conducting surveys on diseases of medicinal plants in West Bengal, a number of diseases were indentified and those along with others known from India are included in this data-base. For each species, the name of disease, host plant, causal agent, symptoms of disease, suggested management along with relevant references have been included. This will provide an updated information on the subject and will highlight the gaps to the future workers.

Methodology
The data-base has been prepared by consulting the relevant literature on the subject as per as available to the authors. For each disease, the information pertaining to name of disease host plant, causal organism, symptoms of disease and management along with citation of relevant references have been included.

Though different damage symptoms as reported by various workers are available in literature and so also the different management strategies but in this data-base only the major damage symptoms and most acceptable management practice have been included.

Results

A perusal of the available literature indicates the occurrence of 95 diseases occur on 75 species on medicinal plants in India and all those have been tabulated in Table-1, as below:-

Table 1: List of diseases on medicinal plants in India along with there host plant, causal organism, symptoms of damage, suggested management with citation of relevant references

Diseases	Plants	Causal organisms	Symptoms	Management	Reference
Anthracnose	*Adhatoda vasica* (L.) Nees.	*Colletotrichum gloeosporioides*	Appearance of leaf spots with dark centers	Seed treatment with thiram at the rate of 2kg/ha or zineb 2.5kg/ ha	The noni website. college of tropical agriculture and human resources, 2022
Anthracnose	*Aloe vera* L. *(Aloe barbadensis* Mill	*Colletotrichum gloeosporioides*	Round green water-soaked lesions appear with tan to light brown at the center	Application of Carbendazim, Mancozeb or Bordeaux mixture	Mondal *et al*., 2018 [33]; Avan. M, 2021 [5]
Anthracnose	*Hibiscus rosa-sinensis* L.	*Colletotrichum gloeosporioides (Glomerella cingulate)*	The infected plant shows yellowish brown or dark brown spots on chlorotic yellow halo on leaves.	Spraying of Bordeaux mixture 1% or spraying of Carbendazim and spraying *Pseudomonas fluorescens* at 3 weeks interval	Sweta & Sundararaj, 2022 [58]
Anthracnose	*Origanum vulgare, Salvia officinalis*	*Colletotrichum dematium*	Anthracnose lesions appear on leaves	Application of Carbendazim, Mancozeb or Bordeaux mixture	Mondal *et al*., 2018 [33]; Avan. M, 2021 [5]
Aerial blight	*Mentha arvensis* L.	*Rhizoctonia solani*	Typical blight symptoms appear on infected plants.	Mancozeb and carbendazim	Mondal *et al*., 2018 [33]
Alternaria blight	*Cassia angustifolia*	*Alternaria alternata*	Biochemical changes occurred due to infection of the disease	Mancozeb and carbendazim	Marimuthu *et al*., 2018 [27]
Alternaria blight and Rust	*Adhatoda vasica* (L.) Nees.	*Puccinia thwaitesii*	Symptoms appear in the form of brown spots distributed on entire leaf lamina	Some bioagents like *Trichoderma harzianum, T. viride, Aspergillus niger*, and *A. flavus* used in control	Sweta & Sundararaj, 2022 [58]
Alternaria leaf blight	*Chlorophytum borivilianum, Mentha* spp., *Pelargonium* spp., *Plantago ovata*	*Alternaria alternata*	Brown necrotic lesions of irregular nature appear with surrounding chlorotic halo on infected leaf	Mancozeb, Bordeaux mixture, Copper oxychloride, Carbendazim and extract of *Ocimum sanctum, Zingiber officinale* may be used for control	Avan. M, 2021 [5];
Alternaria leaf blights	*Rauvolfia serpentina* (L.) Benth. ex Kurz, *Withania somnifera*	*Alternaria tenuis, A. alternata*	The effected leaf shows brown necrotic irregular lesions surrounding chlorotic halo	Mancozeb, Bordeaux mixture, Copper oxychloride, Carbendazim and extract of *Ocimum sanctum, Zingiber officinale* used in control	Avan. M, 2021 [5]
Aerial blight or Rhizoctonia leaf blights	*Coleus forskohlii* Briq	*Rhizoctonia solani*	Symptoms include rottening, appearance of leaf spot which gradually increase, become light tan to brown and finally become necrotic	Mancozeb, Carbendazim, *Trichoderma*+ Organic fertilizer	Mondal *et al*., 2018 [33]; Avan. M, 2021 [5]
Bacterial leaf blight	*Acorus calamus*	*Xanthomonas campestris P.V.O. oryzae*	Appearance of lesions along veins and yellowish lesions in leaf blades.	Application of Bordeaux mixture, copper-mercury fungicides, copper oxychloride and streptomycin solution	Vanitha & Kandaswami,1998 [71]
Black flag and stem, leaf and fruit blight	*Morinda citrifolia* L.	*Phytophthora sp. Sclerotium rolfisii*	Infected leaves showing wilting and complete necrotic appearance with blackened petiole and stems.	Pruning, removal and destroying the diseased plant parts, promoting good air circulation	Scot & Zoila, 2010 [50]
Botrytis blight	*Hibiscus rosa-sinensis* L.	*Botrytis cinerea*	Lesions appear on tips of stems but not on leaves	Application of fungicide at regular interval	Rivera & Wright,2002
Botrytis leaf blights	*Dianthus caryophyllus, Pelargonium* spp., *Rosa chinensis, Rosa damascena*	*Botrytis cinerea*	The infected leaf shows concentric ring lesions followed by wilting and drying of flowers	Application of fungicide	Vinodkumar and Nakkeeran,2017
Choanephora blight	*Hibiscus rosa-sinensis* L.	*Choanephora infundibulifera*	Flowers show reddish purple spots and infected lesions become water-soaked, reddish brown	Application of potassium bicarbonate or copper hydroxide or mancozeb	Sweta & Sundararaj, 2022 [58]
Colletotrichum leaf blight	*Chlorophytum borivilianum, Rauvolfia serpentina* (L.) Benth. ex Kurz	*Colletotrichum dematium, C. capsica*	The symptoms include minute, pinhead circular reddish-brown lesions on leaves.	Mancozeb or Carbendazim or Bordeaux mixture	Gautam, 2014 [15]
Colletotrichum leaf blights	*Cymbopogon citratus, C. flexuosus*	*Colletotrichum caudatum*	Small chlorotic spots appear on lower surface of leaves which later merge to form a big patch	Mancozeb or Carbendazim or Bordeaux mixture	Ramappa and Shovanna, 2013 [42]; Smitha *et al*., 2014 [56]
Curvularia leaf blight	*Cymbopogon citratus, C. flexuosus, C. martinii, Cymbopogon nardus*	*Curvularia andropogonis*	Small, round, reddish-brown spots appear on edges and tips of leaves. Later, those spots	Dithane M-45 or Dithane Z-78 2g/L of water at 10-15 days interval will manage this disease	Khare *et al*., 2020 [24]

			coalesce to become reddish-brown necrotic lesions		
Curvularia leaf blights	*Cymbopogon citratus, C. flexuosus, Vetiveria zizanioides*	*Curvularia trifolii*	The infected leaf shows long reddish-brown necrotic lesions	Mancozeb, Bordeaux mixture, Copper oxychloride, Neem oil, *Kalanchoe heterophylla*, *Curcuma amada* and *Adhatoda vasica* extracts,	Smitha *et al*., 2014 [56]
Ellisiella leaf blight	*Cymbopogon citratus, C. flexuosus, C. martinii*	*Ellisiella caudate*	Small grey necrotic spots appear on the leaf surface at the initial stage. Later, the lesions enlarge, coalesce and premature dry off leaves	Bordeaux mixture (1%) at 15 days interval will manage this disease	Mahato *et al*., 2022 [26]
Leaf blight	*Aristolochia bracteata*	Colletotrichum dematium	The spots subsequently increase in size petiole and stems g*et al*so infected	Spraying of fungicide like mancozeb, carbendazim and copper oxychloride	Tekade *et al*., 2015 [61]
Leaf blight	*Cassia angustifolia*	*Phyllosticta* spp.	Appearance of oval water-soaked spots on lower leaf surface. The spots develop whitish grey color	Seed treatment and spraying of fungicide like mancozeb and carbendazim will control	Chandel *et al*.,2014 [6]; Mondal *et al*., 2018 [33]
Leaf blight	*Coleus forskohlii* Briq	*Curvularia lunata*	Initially water-soaked leaf spots appear, gradually increase in size and then turn brown.	Mancozeb, carbendazim and copper oxychloride	Tekade *et al*., 2015 [61]
Leaf blight	*Costus speciosus* Koen ex. Retz	*Curvularia paradissi, Drechslera maydis*	The upward cutting of young leaves is very common symptom of this disease.	Copper oxychloride or mancozeb	Mondal *et al*., 2018 [33]
Leaf blight	*Cymbopogon citratus* (DC.) Stapf	*Curvularia andropogonis*	In case of severe infestations, the entire leaf dries up. The disease causes decreasing of leaf size along with reduction in oil yield.	Mancozeb	Mondal *et al*., 2018 [33]
Leaf blight	*Gloriosa superba, Morinda citrifolia* L., *Ocimum gratissimum*	*Alternaria alternata*	The disease symptoms appear with small, brownish spots on leaves which later turn into concentric rings	Mancozeb, Carbendazim	Marimuthu *et al*., 2018 [27]
Leaf blight	*Hibiscus rosa-sinensis* L.	*Nigraspora sphaerica*	The blighted leaf turned greyish to dark brown and wither.	Application of Mancozeb 1kg or Iprobenphos 500ml or Carbendazim 250g/ha	TNAU AgriTech Portal. Crop Protection. Cpdisgraindis,2022 [64]
Leaf blight	*Kalanchoe pinnata*	*Cercospora* sp.	The leaf looks pinkish at the basal part, of the leaf and then blackish patches appear.	Mancozeb, Carbendazim and Spraying of Bordeaux mixture	Author's personal observation
Leaf blight	*Mucuna pruriens* (L.) DC., *Piper longum* Linn.	*Colletotrichum gleosporioides*	Appearance of dark brown lesions surrounded by chlorotic halos are the initial symptoms of this disease.	Spraying of Bordeaux mixture	Sweta & Sundararaj, 2022 [58]
Leaf blight	*Ocimum sanctum* L.	*Alternaria* sp.	Early blight symptoms like black lesion appear on older leaves. Later, spots enlarge and form concentric rings in a bull's eye pattern	Mancozeb, Carbendazim	Soma *et al*., 2017 [57]
Leaf blight and bud rot	*Rauvolfia serpentina* (L.) Benth. ex Kurz	*Alternaria tenuis, A. alternata*	Dark colored circular spots having yellowish margin appear on ventral surface of leaves which increase in size to become dark brown circular lesions.	Spraying with mancozeb	Shivanna *et al*., 2014 [52]
Leaf blight or Anthracnose	*Acorus calamus*	*Colletotrichum gloeosporioides*	Towards the margin of the leaf roundish or oval patches appear which later turn brownish.	Spraying of Bordeaux mixture	Mondal *et al*., 2018 [33]
Leaf web blight	*Andrographis paniculata (Burm.f.) Wall. ex Nees, Azadirachta indica* L.	*Rhizoctonia solani*	In this case entire leaf source shows blighted symptoms and defoliate. The severity of the disease is in high humid conditions.	Mancozeb, Carbendazim *Trichoderma*+ Organic fertilizer	Mondal *et al*., 2018 [33]
Macrophomina leaf blights	*Chlorophytum borivilianum, Rauvolfia serpentina* (L.) Benth. ex Kurz	*Macrophomina phaseolina*	Necrotic lesions appear on edges on tip of infected leaves	Metalaxyl+ Mancozeb, *Pseudomonas fluorescens*	Meena and Kadam, 2021 [30]

Passalora blight	*Pimpinella anisum*	*Passalora malkoffii*	Ground parts of infected plant show lesions and drying. Inflorescences also are affected	Mancozeb, Carbendazim	Avan. M, 2021 [5]
Phoma leaf blight	*Origanum vulgare*	*Phoma multirostrata var. macrospora*	Small, black parts appear on top and bottom of infected leaf and young shoots	Mancozeb	Garibaldi *et al*., 2013 [14]
Phytophthora leaf blight	*Piper longum* L.	*Phytophthora* sp.	Initially, brownish lesions appear on dorsal surface of the leaf, towards apical 1/3 part of leaf margin. Subsequently, those spots coalesce to form brownish patches.	Copper oxychloride or mancozeb and biological control with *Trichoderma* spp.	Authors' personal observation
Rhizoctonia leaf blights	*Mentha* spp., *Origanum vulgare*, *Rauvolfia serpentina* (L.) Benth. ex Kurz, *Rosmarinus officinalis*	*Rhizoctonia solani*	Water-soaked irregular spots appear and spread inward	Mancozeb, Carbendazim *Trichoderma*+ Organic fertilizer	Mondal *et al*., 2018 [33]; Avan. M, 2021 [5]
Sclerotinia blights	*Mentha arvensis* L.	*Sclerotinia sclerotiorum*	Infected plants show chocolate brown appearance and also show die back symptoms.	Use of biocontrol agent like *Trichoderma harzianum* and *Gliocladium virens*	Mondal *et al*., 2018 [33]; Avan. M, 2021 [5]
Stem blight	*Morinda citrifolia* L.	*Sclerotium rolfsii*	Foliar chlorosis occurs accompanied with wilting	Plantation in the low-lying areas to be avoided, should have proper drainage system	Sweta & Sundararaj, 2022 [58]
Black necrotic spots on leaves	*Murraya koenigii* (L.) Spring	*Colletotrichum gloeosporoides*	Necrotic spots appear scattered on upper surface of leaves and the spots coalesce to form blackish patch	Application of Carbendazim, Mancozeb or Bordeaux mixture	Authors' personal observation
Blue mold	*Emblica oficinalis*	*Penicillium citrinum*, *P. islandicum*	Soft colorless spots occur on infected fruits. Blue green spores appear on those parts of the plants	Sodium hypochlorite Borax to be applied.	Prakash, 2012 [40]
Cardamon mosaic virus (cdmv)	*Elettaria cardamomum*		The symptoms appear on the ventral surface of the leaf with spread of yellow and green mosaic pattern which spread all along the leaf lamina.	Destroying the affected plant	Authors' personal observation
Damping off	*Atropa belladonna* L.	*Pythium ultimum*, *P. debayanum*, *Rhizoctonia solani* & Phytophthora parasitica	It causes pre and post emergences damping off in young seedling stage.	Copper oxychloride or mancozeb and biological control with *Trichoderma* spp.	Mondal *et al*., 2018 [33]
Damping off	*Cassia angustifolia*	*Rhizoctonia bataticola*	Symptoms include water-soaked lesions followed by brown discoloration on the collar region of plant	Application of biocontrol agent like *Trichoderma* with organic manure etc. spraying of fungicides like mancozeb and carbendazim	Chandel *et al.*,2014 [6]
Damping off	*Cymbopogon citratus* (DC.) Stapf	*Pythium aphanidermatum*	The infected seedlings become yellow and the plant collapses	Mancozeb, Copper oxychloride and Carbendazim *Trichoderma* spp.	Mondal *et al*., 2018 [33]; Avan. M, 2021 [5]
Damping off	*Dianthus caryophyllus*	*Rhizoctonia solani*	Yellowing of infected seedlings with falling of plants are the symptoms of the affected plants	Mancozeb, Copper oxychloride and Carbendazim *Trichoderma* spp.	Mondal *et al*., 2018 [33]; Avan. M, 2021 [5]
Damping off	*Lavandula* spp., *Rosa* spp.	*Rhizoctonia solani*, *Botrytis cinerea*, *Alternaria alternata*, *Colletotrichum* spp.	The infected seedlings become yellow and the plant collapses	Mancozeb, Copper oxychloride and Carbendazim *Trichoderma* spp.	Mondal *et al*., 2018 [33]; Avan. M, 2021 [5]
Damping off	*Papaver somniferum*	*Fusarium solani*	Yellowing of infected seedlings with falling of plants are the symptoms of the affected plants	Mancozeb, Copper oxychloride and Carbendazim *Trichoderma* spp.	Mondal *et al*., 2018 [33]; Avan. M, 2021 [5]
Damping off	*Pimpinella anisum*	*Rhizoctonia solani*, *Fusarium* spp., *Alternaria tenuis*	Yellowing of infected seedlings with falling of plants are the symptoms of the affected plants	Mancozeb, Copper oxychloride and Carbendazim *Trichoderma* spp.	Mondal *et al*., 2018 [33]; Avan. M, 2021 [5]
Damping off	*Rosa chinensis*, *Rosa damascena*	*Phythophthora* spp. *Alternaria* spp. *Rhizoctonia* spp. *Sclerotinia* spp. *Pythium* spp.	The infected leaf shows concentric ring lesions followed by wilting and drying of flowers	Mancozeb	Avan. M, 2021 [5]
Damping off	*Salvia officinalis*	*Fusarium oxysporum*, *F. moniliforme*, *F. solani*, *Rhizoctonia solani*	Seedlings become yellow	Mancozeb, Copper oxychloride and Carbendazim *Trichoderma* spp.	Mondal *et al*., 2018 [33]; Avan. M, 2021 [5]
Damping off	*Santalum* spp.	*Fusarium* spp. *Phythophthora* spp. *Rhizopus* spp.	Seedlings become yellow and drying of flowers	Mancozeb, Copper oxychloride and Carbendazim *Trichoderma* spp.	Mondal *et al*., 2018 [33]; Avan. M, 2021 [5]
Damping off	*Sesamum indicum*	*Rhizoctonia solani*, *Fusarium* spp., *Alternaria tenuis*	Seedlings become yellow	Mancozeb, Copper oxychloride and Carbendazim	Mondal *et al*., 2018 [33]; Avan. M, 2021 [5]

				Trichoderma spp.	
Damping off	*Withania somnifera*	*Rhizoctonia solani*	The affected seedlings produce yellowish patch which darkens with time. Later whole seedlings collapse.	Mancozeb M-45 (0.25%) or Copper oxychloride 50WP at the rate of 0.4% and *Trichoderma* spp.	Mondal *et al*., 2018 [33]; Avan. M, 2021 [5]
Die back	*Hibiscus rosa-sinensis* L.	*Botrytis* sp. & *Erwinia* sp.	Stem coloration changes due to rotting which become light brown die back.	Application of copper biocide on the rotting stem	Hidden Valley Hibiscus. Dieback [Internet],2022
Die back	*Rauvolfia serpentina* (L.) Benth. ex Kurz	*Colletotrichum dematium*	Numerous spots appear in scattered manner on surface of leaves, twigs and flowers.	Mancozeb	Mondal *et al*., 2018 [33]; Avan. M, 2021 [5]
Dieback	*Catharanthus roseus*	*Pythium aphanidermatum*	The tip buds of young branches fade away and dry up	Mancozeb	Avan. M, 2021 [5]
Flat stem	*Costus speciosus* Koen ex. Retz; *Tinospora cordifolia* (Thunb.) Miers	*Phytoplasma* (Lee *et al*.,2000)	Affected branches of the plant expressed flattening of stems during winter season	Spraying of systemic insecticide like dimethoate, imidacloprid.	Marimuthu *et al*., 2018 [27]
Gray mold	*Dianthus caryophyllus, Ocimum sanctum* L., *Rosa cinensis, Rosa damascena*	*Botrytis cinerea*	The effected stems and leaves show gray brown hairy growth.	Mancozeb or Zineb and *Aloe vera* cake, thyme oil and gelatin	TNAU, 2013 [63]; Romero *et al*., 2017 [46]
Grey blight or grey rot or pestalotiopsis leaf spot	*Cymbopogon citratus, C. flexuosus, C. martinii*	*Pestalotiopsis* sp.	Small spots develop on leaf margins and tips. Later, such spots sprayed on entire leaf.	Spray Carbendazim (0.1%) after heavy rain followed by wettable sulphur (0.1%)	Mahato *et al*., 2022 [26]
Hibiscus witches' broom	*Hibiscus rosa-sinensis* L.	*Candidatus phytoplasma brasiliense*	The affected leaf shows witches' broom effect shoots become distorted certain flowers become blighted.	Require cultural control including pruning are suggested	Montano *et al*., 2001 [34]; University of California Agriculture & Natural Resources. Garden Plants disease [Internet],2022
Leaf blotch	*Rauvolfia serpentina* (L.) Benth. ex Kurz	*Cercospora serpitinae*	Purple colored blotches appear on ventral surface of leaf which later coalesce to become irregular, such leaves gradually die.	Spraying of Zineb or mancozeb	Mondal *et al*., 2018 [33]
Leaf brown or black spot	*Tabernaemontana divaricata* and *T. coronaria* (L.) R. Br. Ex Roem. & Schult	*Phytophthora citrophthora*	Appearance of brown or black spots and patches with water-soaked or yellow-edged appear on infected plants	Seed treatment benomyl +thiram 1gm each per kg of seed	Rana, 2017 [43]
Alternaria leaf spot	*Carthamus tinctorius*	*Alternaria carthami*	Infected leaf shows dark brown circular spots	Mancozeb+ Propiconazole (DMAPR, 2012) [9], Benomyl, Mancozeb, Carbendazim and *Trichoderma viride*	DMAPR, 2012 [9]; Chauhan and Ravi, 2020 [7]
Alternaria leaf spot	*Dianthus carophyllus*	*Alternaria dianthi*	The symptoms of the disease are appearance of dark brown circular spots on infected leaves	Mancozeb+ Propiconazole (DMAPR, 2012) [9], Benomyl, Mancozeb, Carbendazim and *Trichoderma viride*	DMAPR, 2012 [9]; Chauhan and Ravi, 2020 [7]; Avan. M, 2021 [5]
Alternaria leaf spot	*Hyoscyamus* spp., *Mentha* sp, *Ocimum basilicum, Origanum vulgare, Papaver somniferum, Pelargonium* spp., *Plectranthus amboinicus* Lour., *Salvia officinalis*	*Alternaria alternata*	Dark brown circular spots appear on infected leaves	Mancozeb+ Propiconazole (DMAPR, 2012) [9], Benomyl, Mancozeb, Carbendazim and *Trichoderma viride*	DMAPR, 2012 [9]; Chauhan and Ravi, 2020 [7]; Avan. M, 2021 [5]
Alternaria leaf spot	*Withania somnifera*	*Alternaria alternata* *A. tenuis*	Initially brown and black spots appear on the leaves, suddenly with yellow halo which appear on leaves on the upper side	Seed treatment with Mancozeb M-45 (0.3%) or Copper oxychloride 50WP (0.4%) will be suitable	Mondal *et al*., 2018 [33]; Avan. M, 2021 [5]
Angular leaf spot	*Azadirachta indica* L.	*Xanthomonas azadiractae*	Water-soaked angular spots appear on leaves which in turn become pale yellow and finally defoliate	Spraying of copper oxychloride 50WP (0.4%) or streptocycline (0.05%)	Mondal *et al*., 2018 [33]
Bacterial leaf spot	*Hibiscus rosa-sinensis* L., *Ocimum sanctum* L.	*Pseudomonas cichorii*	The lesions become necrotic and center becomes surrounded by yellowish halo and water-soaked dark spots on leaves	Avoid overhead irrigation, using clean and sterile equipment and restriction of movement from infected field to healthy field.	Moreira *et al*., 2015 [35]
Carpospora leaf	*Datura metel* L.,	*Cerpospora jamaicensis*	Scattered leaf spots	Mancozeb M-45 (2.5g/L) at 10	Mondal *et al*., 2018 [33]

spot	*Datura stramonium* L.		become coalesced leaf spot and turn brown	days interval or carbendazim (1.0g/L) or cercobin (2.5g/l) at 15 days interval	
Cercospora leaf spot	*Andrographis paniculata* (Burm. f.) Wall. ex Nees., *Emblica officinalis*, *Theobroma cacao* L., *Trigonella foenum-graecum* L.	*Cercospora* sp.	Disease appears on leaves in the form of dark brown spots, either circular or oval in shape, having brownish margin and grey in the centre	Soil application of neem cake + leaf waste of eucalyptus, neem oil or neem seed extract+ neem cake and *Pseudomonas fluorescens*	Arumugam *et al*., 2010 [4]; Author personal observation
Cercospora leaf spot	*Atropa belladonna* L.	*Cercospora atropa*	Round or angular brown spots appear with chestnut color margin on both surfaces of leaf.	Copper oxychloride or mancozeb or carbendazim	Mondal *et al*., 2018 [33]
Cercospora leaf spot	*Piper longum* Linn.	*Cercospora piperata*	Round or irregular grey spots with dark brown or blackish border appear on older leaves	Spraying Mancozeb, Copper oxychloride @2kg/ha	Sweta & Sundararaj, 2022 [58]
Cercospora leaf spot	*Ocimum sanctum* L.	*Cercospora ocimicola*	Light whitish or greyish centered irregular spots appear which become surrounded by darker halo	Soil application of neem cake + leaf waste of eucalyptus, neem oil or neem seed extract+ neem cake and *Pseudomonas fluorescens*	Arumugam *et al*., 2010 [4]; Moreira *et al*.,2015 [35]
Cercospora leaf spot	*Pimpinella anisum*	*Cercospora malkoffii*	The symptoms include appearance of necrotic spots on leaves with dark brown edges	Thiophanate-methyl or Benomyl	Singh, 2006 [72]
Cercospora leaf spot	*Rauvolfia serpentina* (L.) Benth. ex Kurz	*Cercospora rauvolfiae, C. serpitinae*	Appearance of dark brown spots on the upper surface of leaf especially towards the leaf margin	Mancozeb spraying is suggested for its control	Mondal *et al*., 2018 [33]; Avan. M, 2021 [5]; Author personal observation
Cercospora leaf spot	*Sesamum indicum*	*Cercospora sesami*	On the leaves, necrotic spots with dark brown edges appear scatteredly	Thiophanate-methyl or Benomyl	Singh, 2006[72]
Colletotrichum leaf spot	*Ocimum sanctum* L.	*Colletotrichum gleosporioides, C. capsica*	The leaves spreading dark spots and such leaves prematurely break off	Dithane, Tebuconazole	DMAPR, 2014; Mondal *et al*., 2018 [10, 33]
Colletotrichum leaf spot	*Origanum vulgare*	*Colletotrichum fuscum*	Reddish brown circular spots appear on leaves	Dithane,	DMAPR, 2014; Avan. M, 2021 [10, 5]
Colletotrichum leaf spot	*Pelargonium* spp.	*Colletotrichum gleosporioides,*	Reddish brown circular spots appear on leaves and subsequently leaves dry up and suffer premature fall	Dithane,	DMAPR, 2014; Avan. M, 2021 [10, 5]
Colletotrichum leaf spot	*Withania somnifera*	*Colletotrichum gleosporioides, C. dematium*	Irregular yellowish or brownish spots appear on the leaves and the spots coalesce to form patch	Mancozeb M-45 (0.25%) or Copper oxychloride 50WP at the rate of 0.4%	Mondal *et al*., 2018 [33]
Corynespora leaf spot	*Coleus forskohlii, Mentha arvensis* L., *Ocimum basilicum, Rauvolfia serpentina* (L.) Benth. ex Kurz	*Corynespora cassiicola*	Yellowish brown necrotic spots in the form of chlorotic halo appear on leaves	Mancozeb, *Pseudomonas* sp.+ Salicylic acid+ *Clerodendron inerme* leaf powder	DMAPR, 2014; Avan. M, 2021 [10, 5]
Curvularia leaf spot	*Cymbopogon citratus, C. flexuosus*	*Curvularia andropogonis*	Dark brown necrotic lesions appear on leaves	Mancozeb and Bordeaux mixture	Smitha *et al*., 2014 [56]; Avan. M, 2021 [5]
Curvularia leaf spot	*Lawsonia inermis* L., *Mentha arvensis* L.	*Curvularia lunata*	Dirty brown minute spots appear on leaves which become spherical.	Mancozeb and Bordeaux mixture	Smitha *et al*., 2014 [56]; Mondal *et al*., 2018 [33]
Curvularia leaf spot	*Rauvolfia serpentina* (L.) Benth. ex Kurz	*Curvularia trifolii*	Dark brown necrotic lesions appear on leaves	Mancozeb and Bordeaux mixture	Smitha *et al*., 2014 [56]; Avan. M, 2021 [5]
Diplocarpon leaf spot	*Rosa chinensi, Rosa damancena*	*Diplocarpon rosae*	On the upper surface of leaves brownish or blackish spots appear which turn dark purplish at margin	Trifloxystrobin+ Tebuconazole	IIHR, 2016; Avan. M, 2021 [19, 5]
Fungal leaf spot	*Ocimum sanctum* L.	*Alternaria sp., Cercospora ocimicola and Colletotrichum gloeosporioides*	Brown or black spots appear in collar having halo.	Application of potassium bicarbonate fungicide	Home Guides. Basil,2022; Sweta & Sundararaj, 2022 [58]
Leaf Spot	*Acorus calamus*	unidentified pathogen	Appearance of discolored spots on leaves	Captan@ 1g and Chlorpyrifos @20ml/10L	Sweta & Sundararaj, 2022 [58]
Leaf Spot	*Acorus calamus*	*Passalora acori (=Cercospora acori)*	Dark brown to black necrotic lesions appears, surrounded by yellow hallow with lighter grey centre.	Mancozeb or Carbendazim	Mondal *et al*., 2018 [33]
Leaf spot	*Adhatoda vasica* (L.) Nees.	*Septoria adhatodae*	The spots appear on both surfaces of leaf. The mature spots have ash-color center.	Carbendazim 50WP (0.1%)	Mondal *et al*., 2018 [33]
Leaf spot	*Adhatoda vasica* (L.) Nees.	*Rhizoctonia solani*	Dark brown raised irregular spots appear	Application of Benomyl 0.1% or Mancozeb 0.2% or Carbendazim	TNAU Agritech Portal. Chilli phdiseases,2022

				0.1%	
Leaf spot	*Adhatoda vasica* (L.) Nees.	*Alternaria alternata*	Fully developed spots look as water-soaked dark brown patches on leaf lamina.	Application of Benomyl 0.1% or Mancozeb 0.2% or Carbendazim 0.1%	TNAU Agritech Portal. Diseases flowers crossandra, 2022
Leaf spot	*Azadirachta indica* L.	*Pseudocercospora subsessilis*	Brown subcircular or irregular lesions having dark brown border appear on older leaves.	Application of *Trichoderma* and *Pseudomonas fluorescence.*	Mondal *et al*., 2018 [33]
Leaf spot	*Cassia angustifolia*	*Alternaria alternata*	Circular spots increase to covered the entire leaves	Spraying of fungicide like mancozeb and carbendazim	Mondal *et al*., 2018 [33]
Leaf spot	*Cassia angustifolia*	*Cercospora* spp.	Appearance of brown colored spots on lower surface	Spraying of fungicide like mancozeb and carbendazim	Mondal *et al*., 2018 [33]
Leaf spot	*Centella asiatica* L.	*Cercospora centellae*	Initially small, brownish spots appear on the dorsal leaf surface which subsequently turn to purplish brown and spread all along the upper surface of leaf lamina.	Seed treatment with mancozeb or soil to drenched with Bordeaux mixture	Authors' personal observation
Leaf spot	*Coleus forskohlii* Briq	*Corynespora casiicola*	The symptoms are initially brown and punctiform. Later, those become elliptical and subcircular, later turning to followed by pale brown	Mancozeb and carbendazim	Marimuthu *et al*., 2018 [27]
Leaf spot	*Coleus forskohlii* Briq, *Piper longum* Linn.	*Botryodiplodia theobromae*	Oval, round, irregular or angular necrotic spots surrounded by concentric rings appear	Spraying of Carbendazim 0.1% and Mancozeb 0.25%	Anupam & Jha, 2014 [3]
Leaf spot	*Datura metel* L., *Datura stramonium* L.	*Alternaria tennuissima, A. alternata, A. crassa*	Brownish spots appear initially towards the apical half of the leaf and at later stage the spots increase in size	Mancozeb 0.25%	Authors' personal observation
Leaf spot	*Datura innoxia, Terminalia bellerica*	*Alternaria alternata*	The spots become dark brown, round to oval or irregular with necrotic areas. Such leaf suffers defoliation.	Mancozeb and carbendazim	Tekade *et al.*,2015 [61]
Leaf spot	*Eupatorium triplinerve* Vahl	*Cercospora* sp	Appearance of purplish bronze spots on the entire upper surface of leaves and such leaves gradually became curved from tip downwards.	Seed treatment with mancozeb or soil to be drenched with Bordeaux mixture	Authors' personal observation
Leaf spot	*Morinda citrifolia* L.	*Cephaleuros minimus* (Pathogenic alga)	Appearance of light brown spots surrounded by diffused yellow halos.	Maintaining proper sanitation, removal of diseased plants	The Noni Website. College of Tropical Agriculture and Human Resources, 2022
Leaf spot	*Tabernaemontana divaricata* and *T. coronaria* (L.) R. Br. Ex Roem. & Schult	*Colletotrichum gloeosporioides*	Grey-brown spots with concentric markings appear on leaves which join together form patches	Application mancozeb 0.2% or carbendazim 0.1% and spraying of *Trichoderma virens*.	Sweta & Sundararaj, 2022 [58]
Leaf spot	*Tinospora cordifolia* (Thunb.) Miers	*Xanthomonas campestris*	Appearance of irregular black spots with yellowish halo on leaf lamina as well as on midrib, veins	Application of Bordeaux mixture, copper-mercury fungicides, copper oxychloride and streptomycin solution	Mondal *et al*., 2018 [33]
Leaf spot or Anthracnose	*Boerhavia diffusa* L.	*Colletotrichum capsica, C. gloeosporioides*	Light reddish lesions appear on leaves which gradually become enlarged, and straw color surrounded by reddish halo	Application mancozeb 0.2% or carbendazim 0.1%	Paul, 2013 [37]
Macrophomina leaf spot	*Chlorophytum borivilianum, Tinospora cordifolia* (Thunb.) Miers	*Macrophomina phaseolina*	Water-soaked lesions having dark brown border appear on leaves	*Trichoderma viride+ Pseudomonas fluorescens*	Senthamarai *et al.*, 2008 [51]; Avan. M, 2021 [5]
Phoma leaf spot	*Costus speciosus* Koen ex. Retz, *Tinospora cordifolia* (Thunb.) Miers	*Phoma putaminum*	Due to these disease alkaloid content decrease considerably	Application mancozeb or carbendazim	Marimuthu *et al*., 2018 [27]
Phoma leaf spot	*Origanum vulgare*	*Phoma herbarum*	Appearance of angular spots are common symptoms of this disease	Application of mancozeb or carbendazim	Avan. M, 2021 [5]
Red leaf spot	*Cymbopogon citratus, C. flexuosus, C.*	*Colletotrichum graminicola*	Tiny reddish dots appear on the leaf surface.	Bavistin (0.1%) then Dithane M-45(0.2%) at 10-20 days interval	Mahato *et al*., 2022 [26]

	martinii		Brown dots with concentric rings also appear on leaves.		
Stemphylum leaf spot	*Origanum vulgare*	*Stemphylium botryosum*	Large, light brown elliptical spots appear on stem and branches	Carbendazim, Propiconazole	Mondal *et al*., 2018 [33]; Avan. M, 2021 [5]
Stemphylum leaf spot and purple spot	*Asparagus officinalis* L.	*Stemphylium vesicarium*	Appearance of large elliptical lesions with well-defined reddish brown or black margins surrounded by diffused yellowish green zone and light brown	Mancozeb and Carbendazim	Mondal *et al*., 2018 [33]
Target leaf spot	*Rauvolfia serpentina* (L.) Benth. ex Kurz	*Corynespora cassiicola*	Initially dark brown spots on upper leaf surface and yellowish-brown spots on lower leaf surface	Application of mancozeb	Mondal *et al*., 2018 [33]
Lethal yellowing	*Cymbopogon citratus* (DC.) Stapf	*Pythium aphanidermatum*	Discoloration of roots and disintegration of cortical region	Spraying of Mancozeb, copper oxychloride and application of *Trichoderma*	Mondal *et al*., 2018 [33]
Little leaf	*Datura metel* L., *Datura stramonium* L.	*Candidatus Phytoplasma trifolii* (16SrVI group)	The disease plant shows reduction of leaf size and also of internodal length.	Spraying of systemic insecticide like dimethoate, imidacloprid.	Mondal *et al*., 2018 [33]
Little leaf	*Olax* sp.	An unidentified sp. of Phytoplasma	Shortening of leaf, becoming more intense greenish color and most of those leaf become withered compare to healthy leaf	Spraying of systemic insecticide	Authors' personal observation
Little leaf or grassy shoot	*Cymbopogon citratus, C. flexuosus, C. martinii*	*Balansia sclerotia*	Stunting of growth and appearance of little leaf abnormal inflorescence	Dithane Z-78 (0.3%) before flowering at the interval of 10-12 days	Mahato *et al*., 2022 [26]
Downy mildew	*Atropa belladonna* L.	*Pernospora parasitica*	Small white downy growth appears under surface of leaf	Copper oxychloride or mancozeb	Reddy, 2010 [44]
Downy mildew	*Coleus forskohlii* Briq	*Peronospora belbahrii, P. lamii*	Initially brownish spots appear towards the apical part of the leaf. At later stage, the leaf becomes yellowish	Mancozeb, Metalaxyl Copper oxychloride, Streptomyces lydicus, potassium bicarbonate	Mondal *et al*., 2018 [33]
Downy mildew	*Ocimum sanctum* L.	*Peronospora belbahrii*	The most part of the leaf surface becomes discolored. Yellowish or light brownish necrotic spots occur on leaves	Mancozeb, metalaxyl, Acibenzolar-s-methyl, Mandipropamid, Azoxystrobin, Streptomyces lydicus, potassium bicarbonate	Mondal *et al*., 2018 [33]; Avan. M, 2021 [5]
Downy mildews	*Humulus lupulus*	*Pseudoperonospora humuli*	Necrotic lesions having yellow to light brown coloration occur in the leaves	Mancozeb, metalaxyl, Acibenzolar-s-methyl, Mandipropamid, Azoxystrobin, Streptomyces lydicus, potassium bicarbonate	Avan. M, 2021 [5]
Downy mildews	*Papaver somniferum*	*Peronospora* spp.	Yellow to light brown coloration occurs in the leaves	Mancozeb, metalaxyl, Acibenzolar-s-methyl, Mandipropamid, Azoxystrobin, Streptomyces lydicus, potassium bicarbonate	Avan. M, 2021 [5]
Downy mildews	*Plantago ovata*	*Pernospora plantaginis*	Yellowish or light brownish necrotic spots occur on leaves	Mancozeb, metalaxyl	Avan. M, 2021 [5]
Downy mildews	*Rosa sp.*	*Peronospora sparsa*	Necrotic lesions having yellow to light brown coloration occur in the leaves	Mancozeb, metalaxyl,	Avan. M, 2021 [5]
Downy mildews	*Rosmarinus officinalis*	*Peronospora lamii*	Yellowish or light brownish necrotic spots occur on leaves	Mancozeb, metalaxyl,	Avan. M, 2021 [5]
Powdery mildew	*Azadirachta indica* L.	*Oidium azadiractae*	Greyish powdery growth appears on young leaves	Spraying with wettable sulfur or carbendazim	Mondal *et al*., 2018 [33]
Powdery mildew	*Hibiscus rosa-sinensis* L.	*Podosphaera* sp.	Leaves become covered with white spots immediately, those turn grey and tan	Mixture of neem oil and water at the rate 2 table spoons neem oil in 3.785L water	Sweta & Sundararaj, 2022 [58]
Powdery mildew	*Humulus lupulus, Rosa damascena*	*Podosphaera macularis*	On the leaves, chlorotic spots and brownish discoloration appear	Boscalid+ Pyraclostrobin, Mandipropamid, Thyme and clove essential oil	Salamone *et al*., 2009; Avan. M, 2021 [5]
Powdery mildew	*Mentha arvensis* L.	*Erysiphe cichoracearum*	Appearance of raised blister like formation on leaves and those leaves become cover with white powdery mass	Boscalid+ Pyraclostrobin, Mandipropamid, Thyme and clove essential oil	Salamone *et al*.,2009; Mondal *et al*., 2018 [33]
Powdery mildew	*Rosa* sp.	*Sphaerotheca pannosa var. rosae*	Disease appears on leaves with chlorotic spots and	Boscalid+ Pyraclostrobin, Mandipropamid, Thyme and	Salamone *et al*., 2009; Avan. M, 2021 [5]

			brownish discoloration in powder form	clove essential oil	
Powdery mildew	*Salvia officinalis*	*Golovinomyces neosalviae*	Affected leaves become curled and bend towards stem	Boscalid+ Pyraclostrobin, Mandipropamid, Thyme and clove essential oil	Salamone *et al*., 2009; Avan. M, 2021 [5]
Powdery mildew	*Solanum nigrum*	*Leveilila taurica*	Production of powdery patches which enlarge to cover the whole leaf	Mixture of neem oil and water at the rate 2 table spoons neem oil in 3.785L water	Marimuthu *et al*., 2018 [27]
Powdery mildew and leaf spot	*Gymnema sylvestre* (Retz.)Schult	*Colletotrichum* sp., *C. gloeosporioides Pseudomonas syringae,*	Symptoms occur on under surface of leaves	Spray of water-soluble sulfur 3gm in 1L of water at 10-15 days interval	TNAU AgriTech Portal. Crop Protection. Gymnema,2022
Powdery mildews	*Cymbopogon citratus* (DC.) Stapf	*Erysiphe graminis*	Chlorotic spots and brownish discoloration appear on leaves	Boscalid+ Pyraclostrobin, Mandipropamid, Thyme and clove oil	Salamone *et al*., 2009; Avan. M, 2021 [5]
Powdery mildew	*Ocimum sanctum* L.	*Erysiphe biocellata*	White patches join together to form white powdery coating on the leaves	Eucalyptus leaf extract 10% and 10 days later application of Carbendazim 500gm	TNAU AgriTech Portal. Disease greengram,2022
Velvet bean severe mosaic virus	*Mucuna pruriens* (L.) DC.	Velvet bean severe mosaic virus (VbSMV)	Appearance of diffuse yellow spots in young leaves which later produce yellowish symptoms in the older leaves	Use of resistant cultivars	Zaim *et al*.,2011
Mosaic	*Datura metel* L., *Datura stramonium* L.	*Colombian datura virus*	Leaves and inflorescence at their young stage show mosaic symptoms. The leaves become yellow from the veins	Spraying of systemic insecticide like dimethoate 0.2%, imidacloprid 0.05%	Verma *et al.*, 2014
Mosaic	*Rauvolfia serpentina* (L.) Benth. ex Kurz	*Cucumber mosaic virus*	Gradually, yellowing appears on leaf	Use of resistant cultivars	Raj *et al*.,2007
Mottling of belladonna	*Atropa belladonna* L.	*Belladonna mottle virus I*	Dark green mottle appear along with blistering and distortion of leaf, with stunting of growth	Destroying the affected plant	Mondal *et al*., 2018 [33]
Black necrotic spot	*Murraya koenigii (L.) Spring*	*Colletotrichum gloeosporioides*	Necrotic spots appeared scatterdly on upper surface of leaves and the spots coalesced to form blackish patch	Mancozeb, Carbendazim	Authors' personal observation
Leaf necrosis	*Atropa belladonna* L.	*Ascochyta atropae*	The affected leaf shows greyish, white irregular spots on upper leaf surface	Copper oxychloride or mancozeb	Reddy, 2010 [44]
Leaf necrotic	*Adhatoda vasica* (L.) Nees.	*Colletotrichum gloeosporioides*	Appearance of round light brown spots which later turn to irregular shape and those coalescence to form a patch	Application of Benomyl 0.1% or Mancozeb 0.2% or Carbendazim 0.1%	TNAU Agritech Portal. Chilli phdiseases, 2022
Phytophthora	*Hibiscus rosa-sinensis* L.	*Plagithmysus nicotianae* var. *nicotianae*	The affected plants produce brownish to blackish lesions	Application of metalaxyl, use of soil fumigation with chloropicrin	Gallup *et al*.,2006 [13]
Phytophthora crown, root and spear rot	*Asparagus officinalis* L.	*Phytophthora asparagi, P. megasperma* var. *sojae* and other *Phytophthora* spp.	Appearance of soft, water-soaked lesions on shoots	Providing good drainage system, avoiding over-watering and using disease free planting material	Mondal *et al.*, 2018 [33]
Phytoplasma disease	*Morinda citrifolia* L.	Phytoplasma (mycoplasma-like organisms or MLOs)	The affected plant shows growth and flowering abnormality showing stunting and die-back disease symptoms	Removal of infected plant and developing resistant plant	Davis *et al*., 2006 [8]
Charcoal rot	*Datura metel* L., *Datura stramonium* L.	*Macrophomina phaseoli*	Diseased leaf shows yellowing and stunting symptoms. Which increase with age of the plant gradually leaves also wither	Crop sanitization	Mondal *et al.*, 2018 [33]
Charcoal rot	*Mucuna pruriens* (L.) DC.	*Modiolula phaseolina*	The affected plant shows wilting, die prematurely	Crop sanitization and growing of small crop wheat or barley will reduce incidence of the disease	Abhinav *et al*., 2017 [1]
Collar rot	*Chlorophytum borivilianum*	*Corticium rolfsii*	Chlorosis appears on lower leaves and later small brown necrotic lesions appear in the collar area	Carbendazim, Mancozeb, *Trichoderma harzianum*	Mondal *et al*., 2018 [33]; Avan. M, 2021 [5]
Collar rot	*Mentha arvensis* L.	*Sclerotium rolfsii*	Initially yellowing and wilting of plant occurs	Use of biocontrol agent like *Trichoderma*	Mondal *et al.*, 2018
Collar rot	*Pogostemon cablin*	*Fusarium oxysporum, Rhizoctonia solani*	Chlorosis appears on lower leaves	Carbendazim, Mancozeb, *Trichoderma harzianum*	Mondal *et al*., 2018 [33]; Avan. M, 2021 [5]
Collar rot and seedling	*Mucuna pruriens* (L.) DC.	Unidentified	Lesions appear locally at the collar between the	*Pseudomonas fluorescens* mixed with 500kg FYM to the root	Vikaspedia. *Mucuna pruriens*

			stem and the root. The lesions develop on the stem to form a collar	region	
Collar rot and wilt	*Cymbopogon citratus* (DC.) Stapf	*Fusarium moniliforme*	Rotting of collar region along with wilting of plant	Mancozeb, Carbendazim 50WP at the rate of 0.1% and *Trichoderma harzianum*	Mondal *et al*., 2018 [33]
Crown rot	*Asparagus spp.*	*Phytophthora asparagi*, *P. megasperma* var. *sojae*, *Phytophthora* spp.	The infected crown become yellowish orange and rottening symptoms appear	Application of Carbendazim or Mancozeb and *Trichoderma* spp.	Mondal *et al*., 2018 [33]; Avan. M, 2021 [5]
Crown rot	*Papaver somniferum*	*Pleospora papaveracea*	Appearance of yellowish or orange crowns	Application of Carbendazim or Mancozeb and *Trichoderma* spp.	Mondal *et al*., 2018 [33]; Avan. M, 2021 [5]
Crown rot	*Rosa chinensis, Rosa damascena*	*Phythophthora* spp. *Alternaria* spp. *Rhizoctonia* spp. *Pythium* spp.	The symptoms include appearance of yellowish or orange crowns	Application of Carbendazim or Mancozeb and *Trichoderma* spp.	Mondal *et al*., 2018 [33]; Avan. M, 2021 [5]
Crown rot	*Salvia officinalis*	*Phytophthora cryptogea*	Appearance of yellowish or orange crowns	Application of Carbendazim or Mancozeb and *Trichoderma* spp.	Mondal *et al*., 2018 [33]; Avan. M, 2021 [5]
Dry fruit rot	*Morinda citrifolia* L.	*Alternaria alternata*, *Phytophthora morinda*, and *Colletotrichum gloeosporioides*	In case of fruits characteristics small, circular reddish brown sunken necrotic spots appear. Dull brown lesions appear on the flowers.	Treating the seeds with mancozeb	Marimuthu *et al*., 2018 [27]
Dry rot	*Cassia angustifolia*	*Macrophomina phaseolina*	Appearance of black lesion at the base of the plant	Treating the seeds with mancozeb or soil drenched with Bordeaux mixture	Chandel *et al*.,2014 [6]; Mondal *et al*., 2018 [33]
Fruit rots	*Emblica officinalis*	*Phomopsis phyllanthi*	Fruits show wet rotting symptoms	Mancozeb	Avan. M, 2021 [5]
Inflorescence and fruit rot	*Rauvolfia serpentina* (L.) Benth. ex Kurz	*Rhizopus stolonifera*	Water-soaked lesions and flower buds appear initially and later slimy wet rot symptoms appear on inflorescence and peduncle	Mancozeb	Mondal *et al*., 2018 [33]; Avan. M, 2021 [5]
Leaf rot	*Piper longum* Linn.	*Fusarium pallidoroseum* and *Rhizoctonia solani*	Affected leaves become yellow and dry up gradually	Soil drenching with COC-0.25% with pretreatment of bulbs with benomyl 15% + mancozeb 60%	Anupam & Jha,2014 [3]
Leaf rots	*Aloe vera* L. *(Aloe barbadensis* Mill	*Sclerotium rolfsii, Colletotrichium dematium, Phoma sp.* & Rhizoctonia bataticola	Appearance of water-soaked spots on leaves	Soil drenching with COC-0.25% with pretreatment of bulbs with benomyl 15% + mancozeb 60%	Avan. M, 2021 [5]
Pythium rhizome rot	*Costus speciosus* Koen ex. Retz	*Pythium spirosum*	Diseased rhizome turns dirty brown and leaves become yellowish brown	Copper oxychloride or mancozeb	Mondal *et al*., 2018 [33]
Rhizome rot	*Costus speciosus* Koen ex. Retz	*Fusarium solani*	The rhizome become light brown and offense it emits.	Mancozeb	Mondal *et al*., 2018 [33]
Root and foot rot	*Datura metel* L., *Datura stramonium* L.	*Corticium solani*	The affected plant shows brownish black discoloration of leaves which later get detached from the stem	Mancozeb and carbendazim	Mondal *et al*., 2018 [33]
Root rot	*Aloe vera* L. *(Aloe barbadensis* Mill	*Fusarium oxysporum*,*Phytophthora* spp. & *Pythium* spp.	The symptoms include dark brown mushy root tips and dark mushy lower leaves	Application of Mancozeb, Copper oxychloride, disposing of infected plants and using washed pruning tools with 70% alcohol followed by air dry	Mondal *et al*., 2018 [33]
Root rot	*Andrographis paniculata (Burm.f.) Wall. ex Nees, Carthamus tinctoria, Rauvolfia serpentina* (L.) Benth. ex Kurz., *Sesamum indicum.*	*Macrophomina phaseolina*	The roots became blackened due to rotting. The plants start wilting, leaves become yellow and white cottony mycelial growth in the collar region	Application of Mancozeb, Copper oxychloride	Mondal *et al*., 2018 [33]
Root rot	*Asparagus spp.*	*Fusarium oxysporum, F. asparagi F. proliferatum, F. moniliforme, F. solani, F. redolens, Phytophthora asparagi, P. megasperma* var. *sojae, Phytophthora* spp. *Rhizoctonia solani*	Yellowing of leaves and wilting of plants	Application of Mancozeb, Copper oxychloride and *Trichoderma harzianum*,*T. viride* + *Pseudomonas fluorescens* and *Glomus fasciculatum*	Ingle *et al*., 2014 [20]
Root rot	*Azadirachta indica* L.	*Ganoderma lucidium*	Yellowing of lower leaves which gradually proceed on upper side also and plants look drooping	Root feeding with carbendazim @ (20ml/100ml of water) and with biocontrol agent like *Trichoderma*	Mondal *et al*., 2018 [33]

Root rot	*Chlorophytum borivilianum*	*Aspergillus flavus, Haemofonectira haematococca, Rhizoctonia bataticola, R. solani, Fusarium solani, F. oxysporum,*	Leaves become yellow and incase of severe infestation complete rottening occurs which cause death of the plant. Dark brown spots also are formed in the collar region.	Application of Mancozeb, Copper oxychloride and use of biocontrol agent like *Glomus fasciculatum*	Tekade *et al*., 2009 [60]
Root rot	*Gloriosa superba*	*Macrophomina phaseolina*	Root rotting and producing yellowing of leaves followed by development of dark lesions on the stems as well as black sclerotial bodies	Application of Mancozeb, Copper oxychloride	Marimuthu *et al*., 2018 [27]
Root rot	*Lavandula* spp.	*Phythophthora nicotianae*, *P. palmivora, P. cinnamomic, P. cactorum*	Yellowing of leaves drying of plants and growth of mycelium in the collar region of the plants	Carbendazim + Mancozeb and *Trichoderma viride* + *Pseudomonas fluorescens*	Ingle *et al*., 2014 [20]
Root rot	*Morinda citrifolia* L.	*Fusarium proliferatum*	Normally yellowing and roting symptoms appear. Roots become dark brown to black, discolored and show rottening	Seed treatment with fungicide	Sweta & Sundararaj, 2022 [58]
Root rot	*Ocimum sanctum* L., *Pelargonium spp.*	*Rhizoctonia solani*, *Pythium* spp.	The failure of germination of seeds and collapsing germinated seedlings along with brownish shriveled area at stem base.	Application of Mancozeb, Copper oxychloride and use biocontrol agent like *Glomus fasciculatum*	Moreira *et al*.,2015 [35]; Mondal *et al.*, 2018
Root rot	*Origanum dubium, Origanum vulgare, Salvia officinalis*	*Rhizoctonia solani, Fusarium spp., Phytophthora tentaculata*	Plants start wilting, leaves become yellow and white cottony mycelial growth appears	Application of Mancozeb, Copper oxychloride and use of biocontrol agent like *Trichoderma harzianum* are suggested	Mondal *et al*., 2018 [33]; Avan. M, 2021 [5]
Root rot	*Origanum* spp.	*Rhizoctonia solani, Macrophomina phaseolina*	Leaves become yellow and roots become brown to black	Application of Mancozeb, Copper oxychloride	Mondal *et al*., 2018 [33]; Avan. M, 2021 [5]
Root rot	*Rosa chinensis, Rosa damascena*	*Phythophthora* spp. *Alternaria* spp. *Rhizoctonia* spp. *Pythium* spp.	At the rotted portion, black sclerotic spots appear	Application of Mancozeb, Copper oxychloride and using biocontrol agent like *Glomus fasciculatum*	Mondal *et al.*, 2018 [33]
Root rot and wilt	*Coleus forskohlii* Briq	*Fusarium chlamydosporum, F. solani Macrophomina phaseolina, Ralstonia solanacearum*	Yellowing and wilting of leaves and brown to black roots with decaying roots and plants become unhealthy	Application of Mancozeb, Copper oxychloride and use of biocontrol agent like *Glomus fasciculatum*	Mondal *et al.*, 2018 [33]
Root rot/ wilt	*Atropa belladonna* L.	*Fusarium solani*	At advance stage, it producs drooping and yellowing symptoms of older branches/ leaves.	Application of Carbendazim 50WP (0.1%)	Mondal *et al.*, 2018 [33]
Bacterial soft rot	*Aloe vera* L. *(Aloe barbadensis* Mill	*Pectobacterium chrysanthemi*	Appearance of slimy soft rot at the base of the whorl. Sometimes water-soaked lesions appear at the base of leaves	Application of fungicide and infected plants must be removed to avoid spread of disease	Pervez *et al.*,2016; [38] Mondal *et al*., 2018 [33]
Soft rot of fruit	*Morinda citrifolia* L.	*Pantoea agglomerans*	Symptoms include brown water-soaked lesions on both mature and unripe fruits and within 24-48 hours the lesions spread on the entire fruit	Carbendazim	Marimuthu *et al*., 2018 [27]
Basal stem rot	*Aloe vera* L. *(Aloe barbadensis* Mill	*Fusarium oxysporum*	The infection starts from leaf edge causing drying, rotting (plant tips) and turning to brownish color	Mancozeb-45(0.25%) or Carbendazim 50WP (0.2%)	Kawuri *et al*., 2012 [23]
Basal rot	*Acorus calamus,*	*Sclerotium rolfsii,*	The pathogen attack basal part of the leaves and gradually its spread to the total leaf.	Use of biocontrol agent like *Trichoderma*	Mondal *et al*., 2018 [33]
Stem rot	*Asparagus* spp.	*Fusarium oxysporum* f. sp. *asparagi F. proliferatum F. moniliforme, F. solani, F. redolens,*	Appearance of water-soaked lesions, the fleshy tissue becomes weak and the water in the tissue comes out, the affected part becomes brown	Carbendazim or Mancozeb and *Trichoderma viride* + *Pseudomonas fluorescens* and *Bacillus subtilis*	Kamalakannan *et al*., 2003 [22]
Stem rot	*Dianthus caryophyllus, Origanum dubium, Rosmarinus officinalis*	*Rhizoctonia solani, Sclerotinia sclerotiorum*	Pale greenish water-soaked lesions appear on the infected plant and the	Carbendazim or Mancozeb and *Trichoderma* spp., *Glomus fasciculatum* and *G. mosesae*	Mondal *et al*., 2018 [33]; Avan. M, 2021 [5]

			plants become weak		
Stem rot	*Lavandula spp.*, *Origanum vulgare*	*Phytophthora nicotianae*, *P. palmivora*, *P. innamomic*, *P. cactorum*, *P. tentaculata*	Appearance of water-soaked lesions	Carbendazim or Mancozeb	Mondal *et al*., 2018 [33]; Avan. M, 2021 [5]
Stem rot	*Salvia officinalis*	*Phomopsis sclarea*	Pale greenish water-soaked lesions appear on the infected plant	Carbendazim or Mancozeb	Mondal *et al*., 2018 [33]; Avan. M, 2021 [5]
Stolon rot	*Mentha arvensis* L.	*Rhizoctonia solani* & *R. bataticola*	Pinkish brown lesions appear on underground stolon which gradually turn to dark brown to black patches.	Mancozeb and carbendazim	Mondal *et al*., 2018 [33]
Stolon rot	*Mentha arvensis* L.	*Thielavia basicola*	The stolon shows typical wilting of plants.	Using healthy disease-free stolon in healthy crops	Mondal *et al*., 2018 [33]
Stolon rot	*Mentha* spp.	*Macrophomina phaseoli*, *Rhizoctonia solani*, *R. bataticola*, *Thielavia basicola*	The disease shows fading in the stolon and rotting starts at later stage	Mancozeb or Carbendazim	Mondal *et al*., 2018 [33]; Avan. M, 2021 [5]
Wet rot	*Rauvolfia serpentina* (L.) Benth. ex Kurz	*Rhizopus stolonifer*	The infected area becomes red where rotting starts	Mancozeb or Copper oxychloride	Shukla *et al*., 2006 [53]; Mondal *et al*., 2018 [33]; Avan. M, 2021 [5]
White rot	*Centella asiatica* L.	*Sclerotinia sclerotiorum*	Petiolar region of leaf turns white and mycelial growth appears	Mancozeb, Copper oxychloride	Mondal *et al*., 2018 [33]
Leaf rust	*Adhatoda vasica* (L.) Nees.	*Aecidium adhatodae*	Symptoms appear on upper leaf surface	Spraying of Zineb 2.5kg/ha or Propiconazole @0.1%	TNAU Agritech Portal. Diseases cereals wheat, 2022
Rust	*Acorus calamus*, *Mucuna pruriens* (L.) DC.	*Uromyces acori*, *U. mucunae*	Reddish brown pustules appear on both leaf surfaces	Carbendazim 50WP @ 500g/Ra or Tricyclozole 75 WP@ 500g/Ra	Mondal *et al*., 2018 [33]; Sweta & Sundararaj, 2022 [58]
Rust	*Aloe vera* L. *(Aloe barbadensis* Mill	*Phakospora pachyrhizi*, *Uromyces aloes*	Symptoms include appearance of small pale yellowish spots of leaves which expand and later turn brown with orange spore mass on under surface of leaves causing defoliation	Application of Sulfur/Copper oxychloride and Trifloxystrobin/Propiconazole)	Mekonnen and Manahlie, 2018 [32]
Rust	*Asparagus officinalis* L. *Cymbopogon citratus*, *C. flexuosus*, *C. martinii*, *Mentha arvensis* L., *Origanum vulgare*, *Pelargonium* spp., *Pimpinella anisum*, *Wedelia chinensis* (Osbeck) Merr.	*Puccinia asparagi*, *P. nakanishikii*, *P. menthae*, *P. pelargonii-zonalis*, *P. pimpinellae*, *Puccinia* sp.	Light green patches appear on new spear which mature into yellow or pale orange pustules in concentric ring patterns. Appearance of yellowish red spots on lower leaf surface which later turn to rusty pustules	Spraying fungicide like Mancozeb or chlorothalonil are suggested. Application of Sulfur/Copper oxychloride	Singh, 2006; Mondal *et al*., 2018 [33]; Avan, M. 2021 [5]
Rust	*Coffea arabica* L.	*Hemileia vastatrix*	The infected leaf lamina becomes yellowish with circular brownish spots, 8-10 in number, appear on the upper surface of leaf	Maintaining proper sanitation and application of suitable fungicide like mancozeb	Authors' personal observation
Rust	*Dianthus caryophyllus*	*Uromyces dianthi*	The under surfaces of leaf turn yellowish, red spots appear with rusty pustules	Application of Sulfur/Copper oxychloride and Trifloxystrobin/Propiconazole)	Mekonnen and Manahlie, 2018 [32]; Mondal *et al*., 2018 [33]
Rust	*Hibiscus rosa-sinensis* L.	*Kuehneola malvicola*	Initially minute orange-brown spots appear on under surface of leaves while on the upper surface, yellow orange spots appear	Maintaining proper sanitation and application of suitable fungicide	McRitchie, 1996
Rust	*Rosa sp.*	*Caeoma sp.*	Yellowish red spots on lower leaves surface which later turn to rust pustules	*Bacillus subtilis*, *Trichoderma harzianum*, *Maesa lanceolata*, *Milletia ferruginea* extracts	Saber *et al*.,2009; Mekonnen *et al*.,2014; Avan, M. 2021 [5]
Rust	*Tabernaemontana divaricata* and *T. coronaria* (L.) R. Br. Ex Roem. & Schult	*Uredo manilensis*	Appearance of chlorotic flecks which develop into necrotic spots with orange to reddish brown, sub-epidermal uredinia	Application of drip irrigation, using organic fertilizer and avoiding use of excessive nitrogen fertilizer will control this disease	Martínez *et al*., 2011 [28]
Sooty mold	*Morinda citrifolia* L.	Sooty mold Caused by a Ubiquitous, airborne fungus	Appearance of black powdery mold on upper leaf surface	Heavy wind with rain will wash of sooty mold from the leaves	The Noni Website. College of Tropical Agriculture and Human Resources, 2022

Smut	*Cymbopogon citratus, C. flexuosus, C. martinii*	*Tolyposporium christensenii*	This disease is inflorescence borne, affects oil yield and seed production	Dithane Z-78 (0-3%) at the time of flower initiation	Mahato *et al*., 2022 [26]
wart	*Andrographis paniculata (Burm.f.) Wall. ex Nees*	*Synchytrium lepidagathidis*	The affected parts become curly and deformed and the growth of inflorescence becomes stunted.	Clean-cultivation	Mondal *et al*., 2018 [33]
Wart	*Boerhavia diffusa* L.	*Synchytrium boerhaviae*	The symptoms appear on aerial tender parts of the plant giving gall like appearance. The color of gall initially becomes dark pinkish.	Clean-cultivation and discarding the diseased plant parts will stop the spreading of the disease.	Mondal *et al*., 2018 [33]
Bacterial wilt	*Azadirachta indica* L.	*Pseudomonas azadiractae*	The affected plant shows wilting though the leaves may look green	Application of *Trichoderma* and *Pseudomonas fluorescence.*	Mondal *et al*., 2018 [33]
Fusarium wilt	*Morinda citrifolia* L.	*Fusarium oxysporum*	In case of wilt disease, the leaves slowly dry up, but never turn yellow and remain green.	Application of Mycostop (1-2gm/100sq.ft), excess nitrogen application should be avoided, application of natural herbicide	Planet Natural. Fusarium wilt [Internet], 2022
Fusarium wilt	*Ocimum sanctum* L.	*Fusarium oxysporum, F. basilicum*	Yellowing of shoots appear at the initial stage. At the advancing stage, the plants wilt and die	Mancozeb or Carbendazim and application of biocontrol agent like *Trichoderma* with organic manure	Moreira *et al*.,2015 [35]; Mondal *et al*., 2018 [33]
Southern bacterial wilt	*Centella asiatica* L.	*Ralstonia solanacearum*	Disease enters into plant system through roots and causes vascular wilt, in most cases plants die	Maintaining good sanitation pesticidal treatment when necessary	Mondal *et al*., 2018 [33]
Stem and rhizome	*Mentha arvensis* L.	*Phoma strasseri*	Reddening of leaves, stunting growth and wilting of plant	Mancozeb and carbendazim	Kalra *et al*.,2008, Mondal *et al*., 2018 [33]
Wilt	*Adhatoda vasica* (L.) Nees.	*Fusarium oxysporum*	The leaves wilt but do not turn yellow, remain green. Subsequently they may turn dark brown.	Application of Mycostop (1-2gm/100 sq.ft.),	Sweta & Sundararaj, 2022 [58]
Wilt	*Carthamus tinctorius*	*Fusarium oxysporum* f. sp. *carthami*	The plants start fading with appearance of cottony growth around the main root	Benomyl or Mancozeb or Carbendazim and *Trichoderma viride*	Szezeponek and Mazur, 2006 [59]; Mondal *et al*., 2018 [33]; Avan. M, 2021 [5]
Wilt	*Cassia angustifolia, Plantago ovata, Tabernaemontana divaricata* and *T. coronaria* (L.) R. Br. Ex Roem. & Schult	*Fusarium oxysporum*	The leaves of the affected plant become yellow and drooping, and starts rottening on stem closer to soil vascular system showing discoloration	Use biocontrol agent like *Trichoderma viride*	Magar and Barhate,2013
Wilt	*Coleus forskohlii* Briq	*Ralstonia solanacearum*	The plants become fade and cottony growth appear around the main root	Benomyl or Mancozeb or Carbendazim and *Trichoderma viride*	Szezeponek and Mazur, 2006 [59]
Wilt	*Datura metel* L., *Datura stramonium* L.	*Sclerotium rolfsii*	In case of the disease discoloration of collar region appear, the plants show drooping and drying symptoms	Mancozeb and carbendazim	Nuge and Setshogo, 2008 [36]
Wilt	*Dianthus caryophyllus, Emblica officinalis, Vetiveria zizanioides, Sesamum indicum*	*Fusarium oxysporum, Fusarium* sp.	Appearance of cottony growth around the main root	Benomyl or Mancozeb or Carbendazim and *Trichoderma viride*	Szezeponek and Mazur, 2006 [59]; Mondal *et al*., 2018 [33]; Avan. M, 2021 [5]
Wilt	*Hibiscus rosa-sinensis* L.	*Fusarium oxysporum* and *Verticillium*	The green leaves gradually become dark with the start of wilting.	Application of 500gm bleaching powder in 2L of warm water	Sweta & Sundararaj, 2022 [58]
Wilt	*Humulus lupulus, Mentha arvensis* L., *Mentha* spp., *Pelargonium* spp.	*Verticillium alba-atrum,*	The disease symptoms like dwarfing, unilateral branching and wilting appear. The spread of the disease occurs when infected stolon are used during propagation.	Benomyl or Mancozeb or Carbendazim and Use of biocontrol agent like *Trichoderma* and *Gliocladium virens*	Mondal *et al*., 2018 [33]; Avan. M, 2021 [5]
Wilt	*Lavandula* spp.	*Fusarium sporotrichioides, F. oxysporum, F. solani, Sclerotinia sclerotiorum*	The plants become fade and cottony growth appears around the main root	Benomyl and *Trichoderma viride* + *Pseudomonas fluorescens*+ *Bacillus subtilis*	Szezeponek and Mazur, 2006 [59]; Senthamarai *et al*., 2008 [51]; Elewa *et al*., 2011 [11]; Avan. M, 2021 [5]
Wilt	*Rosmarinus officinalis*	*Phytophthora citrophthora, Rhizoctonia solani, Fusarium oxysporum,*	The plants start fading with appearance of cottony growth around the main root	Benomyl or Mancozeb or Carbendazim and *Trichoderma viride*	Szezeponek and Mazur, 2006 [59]; Avan. M, 2021 [5]
Witches' Broom of	*Andrographis paniculata (Burm.f.)*	*Phytoplasma* (16SrII-D)	Phytoplasma disease is exhibited by proliferation	Spraying of systemic insecticide like dimethoate, imidacloprid.	Saeed *et al*., 2015 [48]

Kalmegh	*Wall. ex Nees*		of shoots giving appearance of witches' broom effect along with stunted growth and little leaf disease		
Yellow vein leaf curl disease	*Andrographis paniculata (Burm.f.) Wall. ex Nees*	Virus (Eclipta yellow vein virus along with a Betasatellite associated)	The disease symptoms include appearance of yellow vein on younger leaves and at later stage the up-curling of leaves appear	Destroying and discarding the affected plants	Mondal *et al*., 2018 [33]

Conclusion

- From the present database, the following conclusion may be drawn.
- It is clear that a reasonably good amount of work has been done in India by various workers on fungal, bacterial, viral and mycoplasma diseases of medicinal plants but those are most scattered therefore, it will be highly desirable to have a compendium so that be available information can be reached under one cover
- The symptoms of disease should be more pin pointed and avoiding overlapping of those for easy identification of the disease and causal organism
- Regarding management of the diseases in most of the cases chemical fungicide etc has been used. Since in the present days emphasis has been laid on the use of herbal pesticides, it is therefore needed switch over to herbal pesticides, mainly plant extracts as are used in case of insect pest management
- It will be highly useful if a pictorial key is made to identified the major diseases of medicinal plants.

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