CHAPTER FIVE
BIOTIC STRESS FACTORS

The trees also suffer from various diseases caused by different biotic agents. These stress factors include fungi, bacteria, viruses, mycoplasmas, nematodes, insects, phanerogamic plants etc. The study of these biotic agents is essential because of their ability to multiply and create epidemics. A large number of diseases caused by these biotic agents are reported on trees. Some of them are less harmful and may cause tiny necrotic lesions on leaves and some may cause complete death of the plant. A particular pathogen may be mild on a tree or in a particular season but the same may cause severe infection when conditions for the development of the pathogen are favourable or the host is handicapped, because of abiotic stress factors. The diseases produce different types of symptoms on trees. Some of the diseases occur in a particular season. The biotic agents may invade leaves, branches, stems, roots, fruits, flowers etc. If any one of these parts is severely affected the host may succumb.

In literature, a large number of diseases on trees are reported to be caused by fungi. The diseases caused by insects and termites also cause a great problem for the trees. Bacterial, viral, mycoplasmal and nematode diseases are also reported from different parts of the world. Certain angiospermic parasites are known to adversely affect the trees.

During the survey of tree diseases in Nanded district, the diseases caused by fungi, bacteria, viruses, mycoplasmas, insects termites and
angiospermic parasites were noted. A report of these diseases is presented in the present chapter.

A) FUNGAL DISEASES

Fungi are among the largest categories of microorganisms that cause diseases in plants. This group contains more complex morphological forms, more diverse life cycles, and more species than any other microbial group. All major groups of fungi have important pathogens. They cause downy mildews, powdery mildews, rusts, smuts, leaf-spots, blights, cankers, root rots, fruit rots, wilts, diebacks, anthracnose and many other diseases in plants. These diseases are well studied in crop plants. However, the reports on tree diseases are comparatively less in number.

Like crop plants, the trees also suffer from various fungal diseases and produce different types of symptoms. They may either cause a negligible loss or a great loss to the infected trees. The fungal pathogens were found to cause leaf spots, cankers, powdery mildews, rusts, shot holes, dieback etc. A list of these diseases has been given in table 2. The diseases are described with the names of the host plants, and the causal organisms along with the descriptions of the symptoms in the following pages.

1) ACACIA NILOTICA (L.) Del.

Vernacular name – Babul

A) Disease – Die-back


Locality – Loha, Kandhar, Penoor
Wilting of Acacia is caused by the fungus *Fusarium oxysporum*. Plant wilting often results from vascular infection of the basal stem by the pathogen. Depending upon the age of the plant and environmental conditions. The wilting may result in slow death after one/two years, after the initial infection (Fig. 3).

**B) Disease – Stem Gall**

**Pathogen – Aecidium sp.**

**Locality – Penoor**

The galls appear on the stem of host plant and they appear as abnormal swellings on the stem. The galls were observed on the lower parts of the tree trunk. The galls are irregular in shape, solid and persistent (Fig. 4).

2) *ALBIZZIA LEBBECK* (L.) Willd.

**Vernacular name – Shirish**

**Disease – Leaf spot**

**Pathogen – Cercospora glauca Syd.**

**Locality – Nanded, Kinwat, Bhokar, Biloli, Kandhar.**

The symptoms occurs on both sides of leaflets, which are brownish to whitish grey in the centre surrounded by narrow brown to blackish ring (Fig.5). Sometimes the centre of the spots gives a deep greyish powdery appearance. The disease was observed during winter season.
3) *ANNONA SQUAMOSA* L.

Vernacular name – Custard apple

A) Disease – Leaf spot

**Pathogen – Cercospora annona Muller & Chupp.**

**Locality –** Loha, Kiroda, Kandhar, Mukhed.

The disease occurs on the leaves as minute water soaked lesions which enlarge to form round to irregular spots, measuring about 5 – 15 mm diameter. The spotted area is light brown in the beginning, later becomes dark. As the disease advances, the affected leaves turn yellow in colour (Fig. 6). The infection later spreads on the leaf petiole and stem, producing linear dark coloured deep seated lesions. This disease occurs on the leaf of host plant during winter season.

B) Disease – Leaf spot

**Pathogen – Macrophoma annona Kavkasidze.**

**Locality –** Kiroda, Loha, Benal, Kandhar, Nanded

The infection is observed on the leaves. Initially the spots are small, dark coloured and surrounded by a yellow halo. Some of the spots coalesce. The symptoms are more pronounced on the upper surface of the leaves (Fig. 7). As the disease advances black patches are seen on the leaf surface. This usually results in the deformed growth as small trees. This disease is generally found during winter season.
Fig. 3  Die back of *Acacia nilotica*

Fig. 4  Stem gall of *A. nilotica*

Fig. 5  Leaf spot of *Albizia lebbeck*

Fig. 6  Leaf spot of *Annona squamosa*
4) **AZADIRACHTA INDICA** A. Juss.

Vernacular name – Neem

A) Disease – Leaf spot

**Pathogen** – *Cercospora subsessilis* Syd.

**Locality** – Nanded, Loha, Kandhar, Kinwat.

This disease occurs on the leaflets of host plants during rainy season. Small black spots are seen on both the surfaces of the leaflets (Fig. 8). As the disease advances, the leaflets dry, lateron leaflets fall down.

B) Disease – Powdery mildew

**Pathogen** – *Oidium azadirachtae* Narayanswamy and Ramakr.

**Locality** – Nanded, Loha, Kinwat, Billoli, Bhokar.

The disease was observed during winter season. Symptoms of this disease appears on leaflets in the form of white cottony mass, which consists of fungal mycelium and conidia (Fig. 9). Such types of powdery appearance occurs on petiole and young branches also.

C) Disease – Dieback

**Pathogen** – *Helopetis antonii* Signoret.

**Locality** – Mahur, Kinwat, Ardhapur, Nanded.

The shoots of the plants are affected. Shoot becomes dry and lateron they fall down. In extreme cases, all shoots and leaves of the tree may be damaged and look reddish brown (Fig. 10). However, the affected trees do not completely die, but usually branches die. This disease is very common during summer in the study area.
Fig. 7  Leaf spot of *Annona squamosa*

Fig. 8  Leaf spot of *Azadirachta indica*

Fig. 9  Powdery mildew of *A. indica*

Fig. 10  Dieback of *A. indica*
D) Disease – Shot hole disease

Pathogen – *Pseudocercospora subsessilis* (H & P. Syd) Diegh.

Locality – Loha, Kandhar, Nanded.

The fungus causes leaf spot and shot hole diseases. The infected tissues first become light green and later turn brown. As the infected parts separate and fall down from the surrounding healthy tissues. The damaged leaflets eventually show holes of different size and shape, resulting into shot hole symptom, during winter and summer (Fig. 11).

5) *BAUHINIA RACEMOSA* Lam.

Vernacular name – Apta

Disease – Leaf spot

Pathogen – *Cercospora bauhinae* H & P Syd.

Locality – Loha, Kandhar, Mukhed, Biloli.

The disease occurs on the leaves as rounded to irregular shaped spots during rainy season. The spots are greyish to light brown in colour in the initial stages (Fig. 12). In severe infection the spots coalesce to form large patches and a major portion of the leaf is affected. In this situation, a large number of leaves on the tree are affected (Fig. 13).

6) *BOMBAX CEIBA* L.

Vernacular name – Katesawar

Disease – Dieback

Pathogen – *Botryodiplodia theobromae* Pat.

Locality – Kinwat, Degloor, Dharmabad.
The disease was observed during winter. The disease in the initial stages is characterised by dying of twigs from top to downwards, particularly in older trees, followed by complete defoliation (Fig. 14). The onset of dieback becomes evident by discolouration and darkening of the bark mostly near the terminals. The affected leaves turn brown and its margin roll; at this stage the twigs and branches start shrivelling and drying. Later complete defoliation takes place.

7) CASSIA FISTULA L.

Vernacular name – Bahava

Disease – Leaf spot

Pathogen – Cylindrodoesporium cassiae Chiponkar

Locality – Nanded, Kinwat, Mahur, Kandhar

The disease was observed during winter. The pathogen causes light brown and necrotic spots on leaves. Spots are observed on both surfaces of the leaf lamina (Fig. 15). Pathogen is present in dark brown to black acervuli formed on the infected leaves.

8) CITRUS AURANTIIUM L.

Vernacular name – Santra, Orange, acid lime.

Disease – Dieback

Pathogen – Sclerotium rolfsii Sacc.

Locality – Kinwat, Ardhapur, Mukhed, Limbgaon.

Small branches dry off beginning from tip. In severe cases of infection withered tip are seen all over the plant. The leaves dry off and fall
Fig. 11  Shot hole disease of *A. indica*

Fig. 12  Leaf spot of *Bauhinia racemosa*

Fig. 13  Leaf spot of *Bauhinia racemosa*

Fig. 14  Die back of *Bombax ceiba*
down. In advanced stage of infection the tree proceeds towards complete defoliation (Fig. 16). Later, the tree may die.

9) **CITRUS AURENTIFOLIA** (Christm.) Sw.

**Vernacular name** – Lemon, Nimbu, Lime.

**Disease** – Dieback

**Pathogen** – *Colletotrichum gloeosporioides* (Penz), Sacc.

**Locality** – Ardhapur, Limbgaon, Nanded, Kandhar

Symptoms of the disease are usually more pronounced in old plants. Small branches dry off beginning from tip (Fig. 17). In severe cases of infection, wither tips are seen all over the plant. As many branches dry and show necrosis up to considerable length, it results in dieback. Affected plants do not show vigorous finishing and show shedding of leaves. On mature leaves brown pimple like watery and cloudy spots occur, especially along the margin and tips.

10) **CITRUS SINENSIS** (Linn) Osbeck

**Vernacular name** – Sweet Lime, Mosambi.

**Disease** – Dieback

**Pathogen** – *Curvularia tuberculata* Jain

**Locality** – Pardi, Loha, Kandhar, Biloli.

Symptoms are usually more pronounced in old plants. Small branches dry off beginning from tip and in severe cases of infection withered tips are seen all over the plants. As many branches dry and show necrosis up to considerable length the symptoms are called as dieback.
Affected plants show shedding of leaves. In severe infection the complete tree dries (Fig. 18).

11) **COCUS NUCIFERA** Linn.

**Vernacular name** – Coconut

**Disease** – Stem bleeding

**Pathogen** – *Ceratocystis paradoxa* (Dade) Moreau.

**Locality** – Loha, Kandhar, Penur, Limbgaon

Coconut trees are grown in a very small number in the district. On these cultivated trees the disease was observed. It is characterised by a redish brown ooze, which comes out from the stem cracks. Upon drying it form a black crust (Fig. 19). The infected portion is seen discoloured yellowish brown. Younger trees die at a early age, because of this disease.

12) **DALBARGIA SISSOO** Roxb.

**Vernacular name** – Shisam

A) **Disease** – Powdery mildew

**Pathogen** – *Phyllactinia dalbergiae*. Pirozynski

**Locality** – Kinwat, Bhokar, Mahur, Kandhar.

The disease was observed during winter. The infection on leaves starts as small spots. Later the fungus grows as white superficial powder on the lower surface of the leaves (Fig. 20). As the disease advances yellowish persistent dense mycelium grows on the lower surface of the leaves. Later on the spots produce dark black fruiting bodies called Clistothecia.
Fig. 15  Leaf spot of Cassia fistula

Fig. 16  Die back of Citrus aurantium

Fig. 17  Die back of C. aurentifolia

Fig. 18  Die back of C. sinensis
B) Disease – Rust

Pathogen – *Uredo sissoo* Syd. & Butler.

Locality – Kinwat, Bhokar, Biloli, Mukhed, Penur.

The pathogen attack shisham of all ages in nurseries, natural forests and plantations. During winter the uredia appear on the lower surface of the leaves in the form of minute powdery densely scattered brownish pustules (Fig. 21). The sori mature and the affected leaves are shed during the normal leaf fall period.

13) *EMBLICA OFFICINALIS* Gaertn.

Vernacular name – Amla

Disease – Rust

Pathogen – *Ravenelia emblica* Syd.

Locality – Ardhapur, Loha, Kandhar, Penoor

Small rust pustules appear on the leaflets. Affected leaves show black spots or brownish spots covering the entire surface of leaflets. Only some leaflets in the leaves were found affected (Fig. 22). The symptoms also occur on fruits and stems of the plant. Because of the attack of rust on fruits, premature fruit drop takes place. This disease is widely distributed in Nanded district. The rust pustules generally occur on the upper surface of leaflets. This disease appears during winter season.

14) *EUCALYPTUS GLOBULUS* Labill

Vernacular name – Eucalyptus

Disease – Leaf spot
Fig. 19  Stem bleeding of *Cocos nucifera*

Fig. 20  Powdery mildew of *Dalbergia sissoo*

Fig. 21  Rust of *D. sissoo*

Fig. 22  Rust of *Emblica officinalis*
Pathogen – *Cercospora eucalypti*

Locality – Nanded, Kinwat, Bhokar, Biloli.

During the winter season disease occurs on the leaves as minute water soaked lesions, which enlarge to form round to irregular spots. The spots are light brown in colour. The infections are generally observed on the upper surface of the leaves (Fig. 23).

15) *Ficus carica* Linn.

Vernacular name – Fig

Disease – Rust

Pathogen – *Cerotelium fici* (Cast) Arth.

Locality – Pardi, Limgaon, Biloli.

The rust produces small, round, brownish to black eruptive lesions on the leaves mostly on the lower surfaces; sometimes covering almost the entire leaf blade causing the leaves to drop off (Fig. 24).

Due to this rust drying of leaves takes place from tip of leaf blade. This disease occurs on host plant during winter season.

16) *Ficus elastica* Roxb. Ex Horn.

Vernacular name – Rubber tree

Disease – Leaf spot

Pathogen – *Corynespora cassiicola* Berk & Curt.

Locality – Kinwat, Mahur, Nanded, Biloli.

The disease occurs on leaves as pale coloured to dark brown lesions during winter season. Sometimes the spots coalesce to form large necrotic
patches, that covers a large photosynthetic area of leaves (Fig. 25). In severe cases the affected leaves fall down.

17) **FICUS RACEMOSA L.**

Vernacular name – Umbar

Disease – Powdery mildew

Pathogen – *Uncinula religiosa* Ramakr.

Locality – Nanded, Loha, Kandhar, Kinwat.

It is most common fungal disease found in this area. The leaves become whitish due to the deposition of white powder (Fig. 26). It was observed in humid condition in winter season. The disease in advanced stages results in severe defoliation. The white powder observed on the leaf surface contains mycelium and conidia. In early stage of this disease the white spots on the leaves are small and isolated but in severe condition it cover all the leaf area. Gradually leaves dry and fall off.

18) **FICUS RELIGIOSA** Linn.

Vernacular name – Peepal

Disease – Leaf spot

Pathogen – *Cercospora fici religiosae* Chiddarwar.

Locality – Nanded, Loha, Kandhar, Penur.

The disease occurs on the leaves as minute water soaked lesions which enlarge to form round to irregular spots during winter season. The spotted area is light brown to white in the beginning which later becomes dark grey. The lesions are surrounded by a yellow chlorotic halo (Fig. 27).
19) **GREVEIA TILAEFOLIA** Vahl.

Vernacular name – Dhaman

Disease – Leaf spot

Pathogen – *Phyllosticta sedgwickii* da Costa & Mund.

Locality – Kinwat, Nanded, Mahur, Biloli, Bhokar.

The disease was observed during winter season. Symptoms of this disease appears on leaves in all age trees. It is characterised by spots which vary in size and colours (Fig. 28). The margin of the spots also varies. There may have concentric markings with irregular circular margins. Spots may be isolated or they may coalesce. The spots are surrounded by chlorotic halos. As disease advances, the infected tissues became necrotic.

20) **IXORA PAVETTA** Andrews

Vernacular name – Lokhandi

Disease – Leaf spot

Pathogen – *Colletotrichum ixoraе – parvislorae* Patwardhan

Locality – Nanded, Kinwat, Mahur, Bhokar, Biloli.

The disease occurs on the host during winter. The symptoms of this disease are characterised by the appearance of spots on leaf surface. The spots are circular to irregular in shape. The spots shows dark brown to black in colours, with dark coloured margins (Fig. 29).

In severe cases several spots coalesce to form large irregular patches on the upper surface of leaves. The symptoms are not seen on lower surface. In advanced state of disease, leaves becomes dry and fall off.
21) **MANGIFERA INDICA** Linn.

Vernacular name – Mango

A) Disease – Powdery mildew

Pathogen – *Oidium mangiferae* Berthet.

Locality – Kinwat, Nanded, Kandhar, Mukhed.

The characteristic symptoms are the presence of white superficial powdery spots on all the aerial parts. On leaves infection starts in the form of small spots where the fungus growth takes place. The new leaves attacked mostly on the underside but in advanced cases both sides of leaves are attacked (Fig. 30). The powdery mass consists of mainly the fungal hyphae and the spores which can be seen in the form of dust. The disease was observed during winter season.

B) Disease – Die back

Pathogen – *Botrydiplodia theobromae* Pat.

Locality – Degloor, Ardhapur, Hadgaon.

The disease is characterised by drying of twigs from top to downwards, particularly in the older trees (Fig. 31), followed by complete defoliation (Fig. 32). It gives the tree an appearance of scorching at the top. The die back becomes evident by discolorations and darkening of the bark. The dark area advances and young green twigs start withering first at the base. The affected leaves turn brown and its margins roll upwards. At this stage the twig and branch start shrivelling, dries and falls.
Fig. 27  Leaf spot of *F. religiosa*

Fig. 28  Leaf spot of *Grevia tilaefolia*

Fig. 29  Leaf spot of *Ixora pavetta*

Fig. 30  Powdery mildew of *Mangifera indica*
C) Disease – Malformation

Pathogen – *Fusarium moniliforme* Sheld.

Locality – Bhokar, Kinwat, Nanded.

The symptoms of floral/blossom malformation appear with the inflorescences, where the flowers are much abnormal (Fig. 33). In the early stage of panicle formation there is no differentiation between the healthy and diseased panicle. Some branches with diseased inflorescence were found to produce both malformed as well as healthy panicles. The diseased inflorescences were clustered and rounded. Most of the flowers do not set fruit and the inflorescence continues to hang on the tree for months. The malformed heads dry up in black masses and persist on the tree for a long time even till next flowering season. The complex nature of the disease has also been attributed to several factors like nutrition, mites, viruses and fungi etc.

22) *MANILKARA ACHRAS* (Mill) Fosberg

Vernacular name – Sapota

Disease – Leaf spot

Pathogen – *Phaeophlleospora indica* Chinappa

Locality – Mukhed, Limbgaon, Kandhar.

The fungus causes large circular spots with sharp margins on the leaves. The spots turn dark brown to black, some times reddish brown, and vary in size (Fig. 34). Heavy infection causes defoliation. The disease was observed during winter season.
Fig. 31  Die back of *M. indica*

Fig. 32  Die back of *M. indica*

Fig. 33  Mango malformation

Fig. 34  Leaf spot of *Manilkara acharas*
23) **PONGAMIA PINNATA** Pier.

Vernacular name – Karanj

Disease – Leaf spot

Pathogen – *Sphaceloma pongamiae* Wani & Thirum.

Locality – Penur, Kiroda, Kandhar, Mukhed.

During rainy season, the disease is found on leaves, tender shoots and also on the pods. On leaves, initially the spots are circular and light coloured, which later turns brown (Fig. 35). In advanced stage, defoliation occurs. The spots on pods are brown to dark black in colour (Fig. 36).

24) **SANTALUM ALBUM** L.

Vernacular name – Chandan

Disease – Powdery mildew

Pathogen – *Oidium* sp.

Locality – Nanded, Mahur, Bhokar, Shitakhandi.

During winter, the disease appears on developing young shoot in the form of white, powdery mass on the leaves (Fig. 37). This results in shrinkage and defoliation. Small white spots are also seen on the young fruits.

25) **SEMECARPU S ANACARDIUM** Linn.

Vernacular name – Biba

Disease – Leaf spot

Pathogen – *Cercospora seneciosis grahamii* Thirum & Govinda

Locality – Kandhar, Biloli, Bhokar, Kinwat.
The disease occurs on the leaves of the tree as leaf spot. The spots vary in size, shape, colour, generally yellowish brown. The spots are surrounded by chlorotic halos (Fig. 38). The spot may be isolated or they may coalesce as they enlarge in size. The spots are most common on margins of the leaves. Because of leaf spots the drying of leaf margins takes place. The disease occurs on host plant during winter season.

26) *SYZYGIUM CUMINI* (L.) Skeels.

Vernacular name – Jamun

Disease – Leaf spot

Pathogen – *Mycosphaerella banbyeina* Vishwanathan

Locality – Bhokar, Kinwat, Biloli, Kandhar.

The disease occurs on the leaves as minute water soaked lesions which enlarges to form round to irregular spots. The spotted area is light brown in colour. Spots developing in large number on the leaf lamina give it a shape of blotch (Fig. 39). Infection often takes place on the leaf petiole and stem, producing linear dark coloured lesions. The disease was observed during winter season.

27) *TECTONA GRANDIS* L.f.

Vernacular name – Teak

A) Disease – Powdery mildew

Pathogen – *Uncinula tactonae* Salm.

Locality – Nanded, Kinwat, Bhokar, Degloor.
Fig. 35  Leaf spot of *Pongamia pinnata*  

Fig. 36  Spots on pods of *Pongamia pinnata*

Fig. 37  Powdery mildew of *Santalum album*

Fig. 38  Leaf spot of *Semecarpus anacardium*
It is most common fungal disease found in this area. Firstly lower surface of leaf is attacked by the fungus and turns powdery white with advancement of disease. Nearly all the leaves on a tree were found affected (Fig. 40). It causes defoliation and tree becomes leafless. It favours high temperature and humidity. The disease was observed during humid condition in winter season.

B) Disease – Leaf spot

Pathogen – *Cercospora tectonae* Stevens.

Locality – Kinwat, Mahur, Bhokar, Biloli, Mukhed

On teak leaves dull brown to greyish brown white spots are formed (Fig. 41), some of the spots later coalesce to form large blotches. Due to this disease the leaves become necrotic. A large number of leaves on a tree were found affected by this disease. The disease occurs on the leaf of host plant during winter season.

28) *TERMINALIA ARJUNA* (Roxb.) Wt. & Arn.

Vernacular name – Arjun Sadada

Disease – Powdery mildew


Locality – Mahur, Kinwat, Nanded, Biloli, Bhokar.

During winter season, powdery mildew disease was observed on the host plants at number of places in the study area. The leaf lamina turns powdery white (Fig. 42). The disease was found to be more pronounced on the older leaves than the young leaves.
Fig. 39  Leaf spot of *Syzygium cumini*

Fig. 40  Powdery mildew of *Tectona grandis*

Fig. 41  Leaf spot of *T. grandis*  Fig. 42  Powdery mildew of *Terminalia arjuna*
29) *TERMINALIA ELLIPTICA* Wild.

Vernacular name – Terminalia, Ain

Disease – Leaf spot.

Pathogen – *Cercospora terminaliae* Syd.

Locality – Mahur, Kinwat, Bhokar, Penur.

The disease was observed on the leaves of the tree. Initially the disease starts as small brownish spots which later enlarge in size (Fig.43). Generally they are developed towards the leaf margin. The spots become necrotic and are surrounded by yellow halo. Only a few leaves on tree are affected. The disease develops during winter season.

30) *TAMARINDUS INDICA* Linn.

Vernacular name – Imli

Disease – Leaf spot


Locality – Loha, Kinwat, Mahur, Bhokar, Biloli, Kandhar.

The disease is caused due to the pathogen *P. tamarandicola*. The symptoms occurs generally on the leaflets. The leaflets of host plant showed small black pustules on the leaf lamina (Fig.44). As the disease advances the black spots coalesce to form large sized pustules. In severe infection complete blackening of leaflets occurs and leaflets fall down.

31) *ZIZYPHUS MAURITIANA* Linn.

Vernacular name – Ber.

A) Disease – Powdery mildew
Fig. 43  Leaf spot of *T. elliptica*

Fig. 44  Leaf spot of *Tamarindus indica*
Pathogen – *Erysiphe acaciae* Blumer.

Locality – Kandhar, Biloli, Hadgaon, Bhokar.

A grey white powdery growth occurs on the leaf (Fig.45). Initially white powdery spots develop on lower side of leaf. With the advancement of the disease the powdery growth may become dark grey. The white powdery growth of the fungus was also observed on stem and fruits. The disease was observed during winter season.

B) Disease – Rust

Pathogen – *Phakopsora zizyphi vulgaris*. K(P. Henn.) Diet.

Locality – Loha, Sanegaon, Bhokar, Biloli.

This disease occurs on the leaf of host plants during winter season. The symptoms occurs on the upper as well as lower side of leaves. The pustules may be erumpent / submerged, minute, circular, spreading irregularly on the leaf surfaces (Fig.46). Rust pustules are surrounded by chlorotic haloes. Sometimes several rust pustules coalesce to cover large area of the leaf blade. The colour of the pustules also varies from brown, red, yellow to dark.

C) Disease – Powdery mildew

Pathogen – *Oidium erysipoides f. sp. zizyphi* Fr.

Locality – Loha, Sanegaon, Pardi, Kandhar.

The disease was observed during winter season. The disease appears on developing young shoots in the form of white powdery mass on the leaves (Fig.47), which results in shrinkage and defoliation. Small white
Fig. 45  Powdery mildew of *Zizyphus mauritiana*

Fig. 46  Rust of *Z. mauritiana*

Fig. 47  Powdery mildew of *Z. mauritiana*
spots also seen on the young fruits, which later enlarge. This disease starts in November and lasts upto April. However with rise in temperature after February, the disease reduces comparatively.

In all forty one fungal diseases were observed on trees in Nanded district, during the course of present investigation (Table 2). Of these eighteen are leaf spot diseases (Table 3), nine were powdery mildews (Table 4) seven were dieback disease (Table 5), four were leaf rust (Table 6), and three were other diseases, viz., stem gall, shot hole and stem bleeding (Table 7). Of these dieback diseases were found to be serious problem in trees. Dieback of *Citrus* species were observed in orchards.

**B) BACTERIAL DISEASES**

The diseases caused by bacteria on trees of Nanded district were comparatively less severe than the fungal diseases. Bacteria are known to cause local lesions, cankers, wilts, soft rots, galls etc. The infections caused by bacteria are reported on cereals, pulses, legumes, vegetables, fruit plants, ornamental plants, commercial plants etc. They may affect the leaves, twigs, stem, fruits etc. Some of the diseases caused by bacteria are known to cause serious damage in the field as well as in storage. However, the bacterial diseases of trees have not been paid much attention in comparison with fungal diseases. In the present investigation the bacterial diseases observed in Nanded district are studied and they are reported here. In all nine bacterial diseases were observed (Table 8) and they are described with respect to the causal organism and symptoms.
<table>
<thead>
<tr>
<th>S.No.</th>
<th>Host</th>
<th>Family</th>
<th>Name of the Disease</th>
<th>Pathogen</th>
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<tbody>
<tr>
<td>1A</td>
<td>Acacia nilotica (L) Del</td>
<td>Leguminocae</td>
<td>Die-back</td>
<td>Dothiorella pithyophilla Sacc et. Penz.</td>
</tr>
<tr>
<td>1B</td>
<td>Acacia nilotica</td>
<td>Leguminocae</td>
<td>Stem galls</td>
<td>Aecidium sp.</td>
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<td>2</td>
<td>Albizia lobbbeck L (Willd)</td>
<td>Leguminocae</td>
<td>Leaf Spot</td>
<td>Cercospora glauca Syd.</td>
</tr>
<tr>
<td>3A</td>
<td>Annona squamosa L.</td>
<td>Annonaceae</td>
<td>Leaf Spot</td>
<td>Cercospora annae Muller &amp; Chup.</td>
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<tr>
<td>3B</td>
<td>Annona squamosa</td>
<td>Annonaceae</td>
<td>Leaf Spot</td>
<td>Macrophoma annae Kavkasidze</td>
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<td>4A</td>
<td>Azadirachta indica A.Juss.</td>
<td>Meliaceae</td>
<td>Leaf Spot</td>
<td>Cercospora subessilis Syd.</td>
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<td>5</td>
<td>Azadirachta indica</td>
<td>Meliaceae</td>
<td>Powdery mildew</td>
<td>Oidium azadirachtae Narayanswamy &amp; Ramakr.</td>
</tr>
<tr>
<td>5</td>
<td>Azadirachta indica</td>
<td>Meliaceae</td>
<td>Die-back</td>
<td>Helopetis antonni Signoret</td>
</tr>
<tr>
<td>5</td>
<td>Azadirachta indica</td>
<td>Meliaceae</td>
<td>Shot hole</td>
<td>Pseudocercospora subessilis (H&amp;P.Syd) Diegh.</td>
</tr>
<tr>
<td>6</td>
<td>Bauhinia racemosa Lam</td>
<td>Leguminosae</td>
<td>Leaf Spot</td>
<td>Cercospora bauhinae H&amp;P. Syd.</td>
</tr>
<tr>
<td>6</td>
<td>Bombax ceiba L.</td>
<td>Bombaceae</td>
<td>Die-back</td>
<td>Botrydiploila theobrome Pat.</td>
</tr>
<tr>
<td>7</td>
<td>Cassia fistula L.</td>
<td>Leguminosae</td>
<td>Leaf Spot</td>
<td>Cylindrosporium cassiae Chiponkar</td>
</tr>
<tr>
<td>8</td>
<td>Citrus aurantium L.</td>
<td>Rutaceae</td>
<td>Die-back</td>
<td>Sclerotium rolfsii Sacc.</td>
</tr>
<tr>
<td>10</td>
<td>Citrus sinensis (Linn) Osbeck</td>
<td>Rutaceae</td>
<td>Die-back</td>
<td>Curvularia tuberculata Jain</td>
</tr>
<tr>
<td>11</td>
<td>Cocculus nicifera Linn</td>
<td>Palmaeae</td>
<td>Stem Bleeding</td>
<td>Ceratocystis paradoxa (Dade) Moreau</td>
</tr>
<tr>
<td>12A</td>
<td>Dalbergia sissou Roxb</td>
<td>Leguminocae</td>
<td>Powdery mildew</td>
<td>Phylactinae dalbergiae Pirozyski</td>
</tr>
<tr>
<td>B Dalbergia sissou</td>
<td>Leguminocae</td>
<td>Rust</td>
<td>Uredo sissou Syd. &amp; Butler</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Eucalyptus globulus Labill</td>
<td>Myrtaceae</td>
<td>Leaf Spot</td>
<td>Cercospora eucalypti</td>
</tr>
<tr>
<td>15</td>
<td>Ficus carisa Linn</td>
<td>Moraceae</td>
<td>Rust</td>
<td>Ceratium fici (Cast) Arth.</td>
</tr>
<tr>
<td>16</td>
<td>Ficus elastica Roxb. Horn</td>
<td>Moraceae</td>
<td>Leaf Spot</td>
<td>Corynespora cassinocola Berk &amp; Curt.</td>
</tr>
<tr>
<td>17</td>
<td>Ficus racemosa L.</td>
<td>Moraceae</td>
<td>Powdery mildew</td>
<td>Uncinula religiosa Ramakr.</td>
</tr>
<tr>
<td>18</td>
<td>Ficus religiosa Linn</td>
<td>Moraceae</td>
<td>Leaf Spot</td>
<td>Cercospora fici-religiosae Chiddarwar</td>
</tr>
<tr>
<td>19</td>
<td>Grewia tilaefolia Vahl.</td>
<td>Tiliaceae</td>
<td>Leaf Spot</td>
<td>Phyllosticta sedgwickii da Casta &amp; Mund</td>
</tr>
<tr>
<td>20</td>
<td>Ixora pavetta Andrews</td>
<td>Rubiaceae</td>
<td>Leaf Spot</td>
<td>Colletorichum ixorae parviflorae Patwardhan</td>
</tr>
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</table>

Contd...
Table 2... Contd.....

<table>
<thead>
<tr>
<th>No.</th>
<th>Scientific Name</th>
<th>Family</th>
<th>Disease (I)</th>
<th>Disease (II)</th>
</tr>
</thead>
<tbody>
<tr>
<td>21A</td>
<td>Mangifera indica Linn</td>
<td>Anacardiaceae</td>
<td>Powdery mildew</td>
<td>Oidium mangiferae Berthet</td>
</tr>
<tr>
<td>B</td>
<td>Mangifera indica Linn</td>
<td>Anacardiaceae</td>
<td>Die-back</td>
<td>Botrydiplodia theobromae Pat</td>
</tr>
<tr>
<td>C</td>
<td>Mangifera indica Linn</td>
<td>Anacardiaceae</td>
<td>Malformation</td>
<td>Fusarium moniliforme</td>
</tr>
<tr>
<td>22</td>
<td>Manilkara oehra (Mill) Fosberg</td>
<td>Sapotaceae</td>
<td>Leaf Spot</td>
<td>Phaeoppleospora indica Chinnappa</td>
</tr>
<tr>
<td>23</td>
<td>Pongamia pinnata Pier</td>
<td>Leguminosae</td>
<td>Leaf Spot</td>
<td>Sphaceloma pongamiae Wani &amp; Thiram</td>
</tr>
<tr>
<td>24</td>
<td>Santalum album L.</td>
<td>Santalaceae</td>
<td>Powdery mildew</td>
<td>Odium sp.</td>
</tr>
<tr>
<td>25</td>
<td>Semecarpus anacardium Linn.</td>
<td>Anacardiaceae</td>
<td>Leaf Spot</td>
<td>Cercospora seneciosis grahamii Thirum &amp; Govinda</td>
</tr>
<tr>
<td>26</td>
<td>Syzygium cumini (L) Skeels</td>
<td>Myrataceae</td>
<td>Leaf Spot</td>
<td>Mycosphaerella banbyeine Vishwanathan</td>
</tr>
<tr>
<td>B</td>
<td>Tectona grandis</td>
<td>Verbinaceae</td>
<td>Leaf spot</td>
<td>Cercospora tectonae Stevens.</td>
</tr>
<tr>
<td>28</td>
<td>Terminalia arjuna(Roxb) Wt &amp; AKN</td>
<td>Combrataceae</td>
<td>Powdery mildew</td>
<td>Phyllactinia corylea (Pers) Karst.</td>
</tr>
<tr>
<td>29</td>
<td>Terminalia elliptica Wild</td>
<td>Combrataceae</td>
<td>Leaf spot</td>
<td>Cercospora terminaliae Syd.</td>
</tr>
<tr>
<td>30</td>
<td>Tamarindus indica Linn</td>
<td>Leguminosae</td>
<td>Leaf spot</td>
<td>Phyllosticta tamarindicola Rao</td>
</tr>
<tr>
<td>31A</td>
<td>Zizyphus mauritiana Linn.</td>
<td>Rhamnaceae</td>
<td>Powdery mildew</td>
<td>Erysiphaceae acaciae Blumer</td>
</tr>
<tr>
<td>B</td>
<td>Zizyphus mauritiana</td>
<td>Rhamnaceae</td>
<td>Rust</td>
<td>Phakopsora ziziphi vulgaris K.(P. Henn) Diet.</td>
</tr>
<tr>
<td>C</td>
<td>Zizyphus mauritiana</td>
<td>Rhamnaceae</td>
<td>Powdery mildew</td>
<td>Oidium ezyshoides f.sp. ziziphi fr.</td>
</tr>
</tbody>
</table>
Table 3: Fungal leaf spot diseases of trees in Nanded district

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Host</th>
<th>Pathogen</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Albizia lebbeck</td>
<td>Cercospora glauca</td>
</tr>
<tr>
<td>2</td>
<td>Annona squamosa</td>
<td>Cercospora annonae</td>
</tr>
<tr>
<td>3</td>
<td>Annona squamosa</td>
<td>Macrophoma annonae</td>
</tr>
<tr>
<td>4</td>
<td>Azadirachta indica</td>
<td>Cercospora subsessilis</td>
</tr>
<tr>
<td>5</td>
<td>Bauhinia racemosa</td>
<td>Cercospora bauhinae</td>
</tr>
<tr>
<td>6</td>
<td>Cassia fistula</td>
<td>Cylindrosporum cassiae</td>
</tr>
<tr>
<td>7</td>
<td>Eucalyptus globules</td>
<td>Cercospora eucalypti</td>
</tr>
<tr>
<td>8</td>
<td>Ficus elastica</td>
<td>Corynespora cassiicola</td>
</tr>
<tr>
<td>9</td>
<td>Ficus religiosa</td>
<td>Cercospora fici religiosae</td>
</tr>
<tr>
<td>10</td>
<td>Grewia titiaefolia</td>
<td>Phyllosticta sedgwickii</td>
</tr>
<tr>
<td>11</td>
<td>Ixora pavetta</td>
<td>Colletotrichum ixorae parvipinulans</td>
</tr>
<tr>
<td>12</td>
<td>Manilkara acharas</td>
<td>Phaeophleospora indica</td>
</tr>
<tr>
<td>13</td>
<td>Pongamia pinnata</td>
<td>Sphaceloma pongamiae</td>
</tr>
<tr>
<td>14</td>
<td>Semecarpus anacardium</td>
<td>Cercospora senecionis grahamii</td>
</tr>
<tr>
<td>15</td>
<td>Syzygium cumini</td>
<td>Mycosphaerella bambycina</td>
</tr>
<tr>
<td>16</td>
<td>Tectona grandis</td>
<td>Cercosporae tectonae</td>
</tr>
<tr>
<td>17</td>
<td>Terminalia elliptica</td>
<td>Cercospora terminaliae</td>
</tr>
<tr>
<td>18</td>
<td>Tamarindus indica</td>
<td>Phyllosticta tamarindicola</td>
</tr>
</tbody>
</table>
Table 4: Powdery mildew of trees in Nanded district

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Host</th>
<th>Pathogen</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>Azadirachta indica</em></td>
<td><em>Oidium azadirachtae</em></td>
</tr>
<tr>
<td>2</td>
<td><em>Dalbargia sissoo</em></td>
<td><em>Phyllactinia dalbergiae</em> Pirozyski</td>
</tr>
<tr>
<td>3</td>
<td><em>Ficus racemosa</em></td>
<td><em>Uncinula religiosa</em> Ramakr.</td>
</tr>
<tr>
<td>4</td>
<td><em>Mangifera indica</em></td>
<td><em>Oidium mangiferae</em> Berthet.</td>
</tr>
<tr>
<td>5</td>
<td><em>Santalum album</em></td>
<td><em>Oidium</em> sp.</td>
</tr>
<tr>
<td>6</td>
<td><em>Tectona grandis</em></td>
<td><em>Unicinula tactionae</em></td>
</tr>
<tr>
<td>7</td>
<td><em>Terminalia arjuna</em></td>
<td><em>Phyllactinia corylea</em></td>
</tr>
<tr>
<td>8</td>
<td><em>Zizyphus mauritiana</em></td>
<td><em>Erysiphe acaciae</em></td>
</tr>
<tr>
<td>9</td>
<td><em>Zizyphus mauritiana</em></td>
<td><em>Oidium erysiphoideae</em> f.sp. <em>ziziphi</em></td>
</tr>
</tbody>
</table>

Table 5: Die back diseases of trees in Nanded district

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Host</th>
<th>Pathogen</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>Acacia nilotica</em></td>
<td><em>Dothiorella pithyophila</em></td>
</tr>
<tr>
<td>2</td>
<td><em>Azadirachta indica</em></td>
<td><em>Helopetis antonni</em> Signoret.</td>
</tr>
<tr>
<td>3</td>
<td><em>Bombax ceiba</em></td>
<td><em>Botrydiplodia theobroma</em> Pat.</td>
</tr>
<tr>
<td>4</td>
<td><em>Citrus aurantium</em></td>
<td><em>Sclerotium rolfsii</em> Saci.</td>
</tr>
<tr>
<td>5</td>
<td><em>Cirtus aurantifolia</em></td>
<td><em>Colletotrichum gloeosporids</em> (Pem) Sacc.</td>
</tr>
<tr>
<td>6</td>
<td><em>Citrus sinensis</em></td>
<td><em>Curvularia tuberculata</em> Jain.</td>
</tr>
<tr>
<td>7</td>
<td><em>Mangifera indica</em></td>
<td><em>Botrydiplodia theobromae</em></td>
</tr>
</tbody>
</table>
Table 6: Leaf rusts of trees in Nanded district

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Host</th>
<th>Pathogen</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>Dalbergia sissoo</em></td>
<td><em>Uredo sissoo</em></td>
</tr>
<tr>
<td>2</td>
<td><em>Emblica officinalis</em></td>
<td><em>Ravenelia emblicae</em></td>
</tr>
<tr>
<td>3</td>
<td><em>Ficus carica</em></td>
<td><em>Cerotelium fici</em></td>
</tr>
<tr>
<td>4</td>
<td><em>Zizyphus mauritiana</em></td>
<td><em>Phakopsora zizyphi vulgaris</em></td>
</tr>
</tbody>
</table>

Table 7: Typical diseases of trees in Nanded district

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Host</th>
<th>Disease</th>
<th>Pathogen</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>Acacia nilotica</em></td>
<td>Stem galls</td>
<td><em>Aecidium sp.</em></td>
</tr>
<tr>
<td>2</td>
<td><em>Azadirachta indica</em></td>
<td>Shot hole</td>
<td><em>Pseudocercospora subsessilis</em></td>
</tr>
<tr>
<td>3</td>
<td><em>Coccus nucifera</em></td>
<td>Stem bleeding</td>
<td><em>Ceratocystis paradoxa</em></td>
</tr>
<tr>
<td>S.No.</td>
<td>Host</td>
<td>Family</td>
<td>Name of the Disease</td>
</tr>
<tr>
<td>-------</td>
<td>-------------------------------</td>
<td>--------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>1</td>
<td>Annona squamosa L.</td>
<td>Annonaceae</td>
<td>Leaf necrosis</td>
</tr>
<tr>
<td>2</td>
<td>Bute monosperma Lam</td>
<td>Leguminosae</td>
<td>Leaf spot</td>
</tr>
<tr>
<td>3</td>
<td>Citrus aurantifolia (Chism) Sw.</td>
<td>Rutaceae</td>
<td>Citrus canker</td>
</tr>
<tr>
<td>4</td>
<td>Ficus benghalensis Linn</td>
<td>Moraceae/</td>
<td>Leaf spot</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urticaceae</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Ficus religiosa Linn</td>
<td>Moraceae/</td>
<td>Leaf spot</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urticaceae</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Mangifera indica Linn</td>
<td>Anacardiaceae</td>
<td>Black spot</td>
</tr>
<tr>
<td>7</td>
<td>Punicia granatum Linn</td>
<td>Punicaceae</td>
<td>Leaf spot</td>
</tr>
<tr>
<td>8</td>
<td>Psidium guajava L.</td>
<td>Myrtaceae</td>
<td>Leaf necrosis</td>
</tr>
<tr>
<td>9</td>
<td>Terminalia catappa L.</td>
<td>Combretaceae</td>
<td>Leaf spot</td>
</tr>
</tbody>
</table>
1) *ANNONA SQUAMOSA* L.

Vernacular name – Custard apple

Disease – Leaf necrosis

Pathogen ; *Xanthomonos annona* Papdiwal and Deshpande

Locality – Penoor, Nanded, Loha, Kandhar

Firstly the infection was observed on the leaf margin near the tip. It then spread from the margin inwards and downwards. In some cases the apex was completely affected. The lesions were irregular, spreading, dark brown in colour with yellow margin and raised on dorsal surface (Fig.48). The disease was observed during winter season.

2) *BUTEA MONOSPERMA* LAM.

Vernacular name – Flame of the forest, Palas

Disease – Leaf spot

Pathogen ; *Xanthomonos buteae* Bhatt, Patel


The disease was observed on the leaves of the trees in the study area. Brownish leaf spots developed on the leaves due to infection by the bacterium. Initially these spots formed as profuse, small water soaked lesions, having brownish centre with a surrounding yellow halo (Fig.49). In extreme cases, the entire leaf surface is covered with the spots causing premature defoliation. The disease is observed in winter season.
3) *CITRUS AURANTIFOLIA* (CHRISTM) SW.

Vernacular name – Nimbu

Disease – Citrus canker

Pathogen : *Xanthomonas axonopodis* pv. *citri* (Hasse) Vautain, Hoste,

Kerters and Swings

Locality – Loha, Kandhar, Kiroda, Biloli

The symptoms of the disease are observed on leaves. The lesions appear as small white specks at the very early stage. Later on these lesions develop into brown necrotic spots. The lesions further enlarge and become brownish which give a rough coryk appearance. The lesions are surrounded by yellow halo (Fig.50).

The symptoms were also seen on twigs, branches, petioles and fruits. The lesions on fruits were almost similar to those present on leaves (Fig.51). The fruit lesions were quite rough raised, brown to dark brown in colour, but without yellow halo. Only the rind of the fruit was affected, while the contents were normal.

4) *FICUS BENGALENSIS* Linn.

Vernacular name – Banyan

Disease – Leaf spot

Pathogen ; *Xanthomonos ficae* Papdiwal and Deshpande

Locality – Loha, Nanded, Kandhar, Kinwat.

The disease is characterised by the appearance of one to several minute irregular dark spots on the leaves in initial stages. Later, the spots
Fig. 48  Leaf necrosis of *Annona squamosa*

Fig. 49  Leaf spot of *Butea monosperma*

Fig. 50  Citrus canker
coalesced to form irregular patches, some remain isolated. Each spot had a greyish centre, surrounded by a dark coloured border (Fig.52). As the disease advances, the affected leaves drop down. Young leaves were more diseased than the old ones.

5) **FICUS RELIGIOSA** Linn.

Vernacular name – Peepal

Disease – Angular leaf spot

Pathogen : *Xanthomonas pv. fici* (Cavara) Dye

Locality – Loha, Nanded, Kandhar, Penur.

The disease is characterised by the appearance of one to several minute irregular dark brown spots on the leaves. The spots are of irregular size and slightly raised from the leaf lamina. In advanced stages, the spots coalesce and form large patches (Fig.53).

6) **MANGIFERA INDICA** Linn.

Vernacular name – Mango

Disease – Bacterial black spot

Pathogen : *Xanthomonas mangiferae indicae* (Patel et al.)

Robbs, Ribeiro and Kimura

Locality – Bhokar, Kinwat, Mukhed.

Symptoms appear on all above ground plant parts. On the leaves, the disease first appears as regular to angular, small water soaked lesions, measuring about 1–5 mm in diameter, usually crowded at the apex, which increase in size and turn brown to black in colour. These lesions are,
Fig. 51  Citrus canker

Fig. 52  Leaf spot of *Ficus bengalensis*

Fig. 53  Angular leaf spot of *F. religiosa*

Fig. 54  Black leaf spot of *Mangifera indica*
surrounded by yellow halo (Fig.54). Sometimes these lesions grouped to form a large necrotic patches. On branches, twigs and stem, raised dark brown spots developed. Sometimes longitudinal fissures occur on the branches, through which gum oozes out. On young fruits black to brown spots develop.

7) *PUNICA GRANATUM* Linn.

**Vernacular name – Pomegranate**

**Disease – Bacterial leaf spot**

**Pathogen : Xanthomonas axonopodis pv. punicae** (Hingorani & Singh)

Vanterin, Hoste, Kersters & Swings.

**Locality – Loha, Kandhar, Bhokar, Biloli.**

The disease is characterised by the appearance of one to several minute dark coloured irregular spots. Because of the development of spots, the leaves are often distorted and malformed (Fig.55). In severe infection, the leaves drop off prematurely. The normal growth of the plant is affected resulting in stunted and sickly appearance. The pathogen also infect the fruit and caused dark brown irregular slightly raised spots on the skin of the fruit.

8) *PSIDIUM GUAJAVA* L.

**Vernacular name – Guava**

**Disease – Leaf necrosis**

**Pathogen : Xanthomonas psideae**, Papdiwwal & Deshpande

**Locality – Penoor, Pangri, Loha, Kandhar.**
The apex of the leaf was attacked first. The infection then spread to both the sides of leaf margin. Affected portion turned dark brown in the beginning and later it became whitish crust (Fig. 56). The disease occurs on host plant during winter season.

9) **TERMINALIA CATAPPAL**

**Vernacular name – Bengal almond**

**Disease – Leaf spot**

**Pathogen:** *Xanthomonas pruni* (E.F. Smith) Dowson.

**Locality – Loha, Kandhar, Nanded, Penoor.**

The disease was observed on the leaves of the trees. The leaves showed numerous, round to angular, small, reddish spots turning brown (Fig. 57). The affected tissue dried and fell off causing shot holes. In some cases spots developed together and gave burnt, blighted appearance. In severe infection defoliation was observed. The disease was observed during the winter season.

**C) VIRAL DISEASES**

Viruses are another important biological factors responsible for causing heavy losses to plants. Viruses cause different types of symptoms on the host plant they invade. The major symptoms include mosaic, mottle, colorosis, leaf curl, leaf roll, yellow vein, sterility mosaic etc. These diseases are well studied in crop plants. In different crops, they are known to cause serious damages to the host plant.
Fig. 55 Leaf spot of *Punica granatum*

Fig. 56 Leaf necrosis of *Psidium guajava*

Fig. 57 Leaf spot of *Terminalia catappa*
Viruses are also known to cause diseases on trees in orchards, forests, or elsewhere. The viral diseases observed in the study area are described with respect to the host, pathogen, symptoms, and locality in the following pages (Table 9).

1) **CARICA PAPAYA** Linn.

**Vernacular name** – Papaya

**Disease** – Papaya Leaf curl

**Pathogen** : Tobacco leaf curl virus

**Locality** – Kandhar, Bhokar, Kinwat, Biloli

The disease is characterised by severe curling, crinkling and deformation of leaves. Mostly the young leaves are affected. They show vein clearing, reduced size, inward rolling of the leaves, and thickening of the veins (Fig.58). The petioles are twisted. The diseased leaves becomes leathery and brittle. The plants are stunted and in advanced stages defoliation was observed. The fruits developed are of abnormal size and have no commercial value.

B) **Disease – Ring spot of papaya**

**Pathogen** : Papaya ring spot virus (PRSV)

**Locality** – Penur, Kandhar, Loha, Limbgaon.

The infected papaya plant by PRSV in the fields showed characteristic symptoms on foliage, petiole, stem, and fruits (Fig.59). The foliage symptoms include mosaic, severe distortion and shortening of leaves (Fig.60). Symptoms on stem and petiole were light green to dark green,
Fig. 58 Papaya leaf curl

Fig. 59 Ring spot of papaya

Fig. 60 Ring spot of papaya
Table 9: Viral diseases of trees observed in Nanded district

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Host</th>
<th>Family</th>
<th>Name of the disease</th>
<th>Pathogen</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A</td>
<td><em>Carica papaya</em> Linn.</td>
<td>Caricaceae</td>
<td>Leaf curl</td>
<td>Tobacco leaf curl virus</td>
</tr>
<tr>
<td>B</td>
<td><em>Carica papaya</em> Linn</td>
<td>Caricaceae</td>
<td>Ring spot</td>
<td>Papaya ring spot virus (PRSV)</td>
</tr>
<tr>
<td>C</td>
<td><em>Carica papaya</em> Linn</td>
<td>Caricaceae</td>
<td>Mosaic</td>
<td>Papaya mosaic virus</td>
</tr>
<tr>
<td>2</td>
<td><em>Citrus aurantium</em> L.</td>
<td>Rutaceae</td>
<td>Tristeza</td>
<td>Virus</td>
</tr>
</tbody>
</table>
water soaked spots and streaks. The fruits from infected papaya trees exhibited water soaked dark green circular spots (Fig.61) and rings, which often coalesced to form large rings and line pattern.

C) Disease – Papaya mosaic

Pathogen : Papaya Mosaic Virus

Locality – Loha, Penur, Kandhar, Nanded

The disease was observed on papaya plants of all age groups, but it was most serious on young plants. The top young leaves of the diseased plants were much reduced in size and showed blister like patches of dark green tissue alternating with yellowish green lamina, and puckering (Fig.62). The leaf petiole was of reduced in length and the top leaves assume upright position. The infected plant showed degeneration and marked reduction in growth. The fruits on diseased plants developed circular water soaked lesions with central solid spots.

2) *CITRUS AURANTIUM*

Disease – Tristeza

Pathogen – Virus

The infected leaves of santra tree loose dark green lustre, become dull, chlorotic and exhibit curling. The leaf lamina slowly becomes totally yellow. In advanced stage of infection defoliation takes place from top leaves and later the whole twig becomes defoliated (Fig.63).
Fig. 61  Ring spot of papaya

Fig. 62  Papaya Mosaic

Fig. 63  Tristeza disease of *Citrus*
D) MYCOPLASMA DISEASES

Mycoplasma diseases cause a great loss to the plants they infect. They produce different types of symptoms like little leaf, greening, phyllody, small leaf, etc. They are known to infect crop plants as well as woody plants. The mycoplasma disease observed during the course of present investigation is described here with respect to its host, pathogen, symptoms and locality.

1) Zizyphus mauritiana Lamk.

Vernacular name – Ber

Family – Rhamnaceae

Disease – Witche’s Broom disease of Jujube

Pathogen : Mycoplasma like organism

Locality – Loha, Kandhar, Biloli, Kinwat.

Symptoms of this disease appear in the form of severe reduction in leaf size and shortening of internodes. This results in crowding of leaves on leaf bearing branches. In advanced stage of the disease, the leaves become yellow and finally reddish. The flower of the infected trees shows phyllody (Fig.64). The diseased parts rarely bear any fruit, although healthy parts of the same tree bears normal flowers and fruits.

E) INSECT GALLS

The study of plant galls has gained considerable significance in investigations in the field of plant pathology. The galls are produced by bacteria, fungi, and insects also. The galls produced on trees under the
MYCOPLASMA DISEASES

Fig. 64 Witche’s broom disease of *Zizyphus mauritiana*
influence of insects parasites are characteristic. They are produced on leaves (Fig.65), shoots, fruits, flowers, buds, inflorescences etc. The galls observed on different parts of trees in Nanded district (Table 10) were studied, and their symptoms were recorded with respect to their hosts. A brief report of this investigation is presented in the following pages.

1) *Azadirachta indica* A. Juss.

**Disease – Stem galls**

**Locality** – Bahaddarpura, Kandhar.

The stem galls found on the tree trunk of Neem trees are oval to ellipsoidal. The galls are solid hard, rough, dark and persistent. They were observed at different places on the same tree (Fig. 66).

2) *Cardia sinensis* Lamk.

**Disease – Leaf galls**

**Locality** – Kandhar, Kinwat, Biloli.

The galls observed on the leaves of the tree are globose, hard, green to greenish brown in colour, generally solitary (Fig.67).

3) *Cassia fistula* L.

**Disease – Stem galls**

**Locality** – Nanded, Kandhar, Bhokar

The stem galls observed on the tree trunk are subglobose, hard, solid, woody, persistent and brown in colour. The gall surface may be smooth or wrinkled. The old galls persist for several years (Fig.68).
Fig. 65 Leaf galls

Fig. 66 Stem galls on *Azadirachta indica*

Fig. 67 Leaf galls on *Cardia sinensis*
Table 10: Insect galls observed on the trees of Nanded district

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Host</th>
<th>Family</th>
<th>Name of the disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>Azadirachta indica</em> A.Juss</td>
<td>Meliaceae</td>
<td>Stem galls</td>
</tr>
<tr>
<td>2</td>
<td><em>Cardia sinensis</em> Lamk</td>
<td>Ehretiaceae</td>
<td>Leaf galls</td>
</tr>
<tr>
<td>3</td>
<td><em>Cassia fistula</em> L.</td>
<td>Leguminocae</td>
<td>Stem galls</td>
</tr>
<tr>
<td>4</td>
<td><em>Ficus racemosa</em> L.</td>
<td>Moraceae</td>
<td>Leaf galls</td>
</tr>
<tr>
<td>5</td>
<td><em>Hardwickia binata</em> Roxb.</td>
<td>Leguminocae</td>
<td>Stem galls</td>
</tr>
<tr>
<td>6</td>
<td><em>Leucaena leucocephala</em> (Lam) De Wit.</td>
<td>Leguminocae</td>
<td>Stem galls</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td><em>Mangifera indica</em> Linn.</td>
<td>Anacardiaceae</td>
<td>Stem galls</td>
</tr>
<tr>
<td>8</td>
<td><em>Pongamia pinnata</em> Piaer</td>
<td>Leguminocae</td>
<td>Leaf galls</td>
</tr>
<tr>
<td>9</td>
<td><em>Syzygium cumini</em> (L). Skeels.</td>
<td>Myrtaceae</td>
<td>Leaf galls</td>
</tr>
<tr>
<td>10A</td>
<td><em>Semicarpus anacardium</em> Linn.</td>
<td>Anacardiaceae</td>
<td>Stem galls</td>
</tr>
<tr>
<td>B</td>
<td><em>Semicarpus anacardium</em></td>
<td>Anacardiaceae</td>
<td>Leaf galls</td>
</tr>
<tr>
<td>11</td>
<td><em>Zizyphus mauritiana</em> L.</td>
<td>Rhamnaceae</td>
<td>Shoot axis gall</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

74
4) *Ficus racemosa* L.

Disease – Leaf galls

Pathogen: It appears to be caused by *Pruropsylla depresse*. Craaw ford.

Locality – Loha, Nanded, Kandhar.

The leaf shows unilocular pouch gall. They are large spherical and converse bulges. They are yellowish brown to reddish brown in colour. The galls are generally, thick walled and almost solid (Fig.69). In young galls, a small fistular opening is found, while in the older galls this passage closes due to the cell proliferation. The insect lays egg on lower surface of leaf. The feeding of nymph on the sap stimulate the development of galls.

5) *Hardwickia binata* Roxb.

Disease – Stem galls

Locality – Kandhar, Kinwat, Mahur.

The galls were observed on tree trunk and because of hypertrophy they enlarged in size and covered the complete circumference of the tree trunk. They were oval, hard, woody and persistent. The colour of the galls was nearly of the same colour of that of stem, but latter darkens (Fig.70).

6) *Leucaena leucaephala* (Lam.) De Wit.

Disease – Stem galls

Locality – Loha, Nanded, Kandhar.

The galls were observed on the tree trunk. They were globose, hard, woody, persistent and generally of the same colour of that of wood. The
Fig. 68  Stem galls on *Cassia fistula*

Fig. 69  Leaf galls on *Ficus racemosa*

Fig. 70  Stem galls on *Hardwickia binata*
galls were found isolated and with age they proliferate and attain a larger size. The surface was rough and contorted (Fig. 71).

7) *Mangifera indica* Linn.

**Disease — Stem galls**

**Locality** — Penur, Kandhar, Nanded, Kinwat.

Galls are seen on tree trunk. The galls on the bases of tree trunks are larger in size. They are irregular in form and rough. Several galls are seen on branches also (Fig. 72). The galls were found to be hard and persistent.

8) *Pongamia pinnata* Piaer.

**Disease — Leaf galls**

**Pathogen** : *It appears to be caused by Eriophyes cheriani*, Massee

**Locality** — Kinwat, Mahur, Nanded, Kandhar.

The galls are epiphyllous and long. The galls are simple and free, glabrous, green and unilocular. They are, pedicillate, mostly on the leaflet of the host (Fig. 73). Gall cavity large with long many unicellular pointed heads. Gall tissue consists of simple and closely packed parenchyma cells.

The galls are formed by the joint infection of *Eriophyes cherian* mite in association with midge *Microdiplosis pongamia*. Neither the mite, nor the midge can form the gall independently. The galls are formed during rainy season.

9) *Syzygium cumini* (L.) Skeels.

**Disease — Leaf galls**

**Locality** — Loha, Kinwat, Bhokar, Sonkhed.

76
Fig. 71  Stem galls on *Leucaena leucophala*  Fig. 72  Stem galls on *Mangifera indica*

Fig. 73  Leaf galls on *Pongamia pinnata*
Galls were observed on the leaves. Mostly they were hemispherical in shape, sometimes globose. The galls may be isolated or in some cases they were found to be fused. The smooth, but hard galls were greenish or yellowish in colour (Fig.74).

10) *Semecarpus anacardium* Linn.

A) Disease – Stem galls

**Locality** – Kinwat, Mahur, Gaul, Kandhar.

The galls were found on the tree trunk as well as on the branches. They were globose or ellipsoidal and develop more in number on the tree trunk (Fig.75). They were hard, woody, persistent and of the same colour of the wood, with rough surface.

B) Disease – Leaf galls

**Locality** – Biloli, Hadgaon, Degloor, Kinwat.

The galls observed on the leaves are yellowish green in colour. They may be hemispherical to globose in shape. They are hard and persistent. Mostly they are isolated, but rarely fused. The infected leaves become wrinkled (Fig.76).

11) *Zizyphus mauritiana* L.

**Disease – Shoot axis gall**

**Locality** – Loha, Pardi, Penur, Limbgaon.

The galls recorded in the shoot axis were globose, lobed, rough, hard, reddish brown in colour, sometimes solitary but often crowded on the
branches, growing continuously. When old, the galls become brittle and converted into a black powder (Fig.77).

F) EFFECT OF TERMITES ON TREES

The termites generally attack in nursery plants and cause damage to seedlings, saplings, transplants and cuttings. Under favourable conditions they cause serious problems resulting in total loss of planting material. The damage is subterranean and the termites attack the root system causing death of plant materials.

The termites causes injury and damage to trees also, even well matured trees are also attacked and killed. The attack is more pronounced during the dry season when the young plants are less resistant.

During the course of present study 22 trees were found affected by the termite attack (Table 11). The observations recorded on these hosts are described in the following pages.

1. *Azadirachta indica*

**V.N. – Neem**

**Disease – Termite attack**

**Locality – Loha, Kinwat, Nanded, Kandhar**

The termite attack was observed on the tree trunk of the host plant. Because of the termite attack, the bark of the tree was removed from the plants (Fig.78). The damage was found greater in agricultural soils than in sandy ones. The attack usually begin at the roots and it spreads to the upper parts. In older plants, however, the bark and the underlying tissue may also
Fig. 74  Leaf galls on *Syzygium cumini*

Fig. 75  Stem galls on *Semecarpus anacardium*

Fig. 76  Leaf galls on *S. anacardium*

Fig. 77  Shoot axis galls of *Zizyphus mauritiana*
<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Host</th>
<th>Family</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>Azadirachta indica</em></td>
<td>Meliaceae</td>
</tr>
<tr>
<td>2</td>
<td><em>Alianthus excelsa</em></td>
<td>Simarubiaceae</td>
</tr>
<tr>
<td>3</td>
<td><em>Albizia lebbeck</em></td>
<td>Leguminaceae</td>
</tr>
<tr>
<td>4</td>
<td><em>Acacia nilotica</em></td>
<td>Leguminaceae</td>
</tr>
<tr>
<td>5</td>
<td><em>Butea monosperma</em></td>
<td>Leguminaceae</td>
</tr>
<tr>
<td>6</td>
<td><em>Boswellia serrata</em></td>
<td>Burseriaceae</td>
</tr>
<tr>
<td>7</td>
<td><em>Cassia fistula</em></td>
<td>Leguminaceae</td>
</tr>
<tr>
<td>8</td>
<td><em>Cocos nucifera</em></td>
<td>Arecales</td>
</tr>
<tr>
<td>9</td>
<td><em>Caesalpinia pulcherima</em></td>
<td>Leguminaceae</td>
</tr>
<tr>
<td>10</td>
<td><em>Dalbergia sissoo</em></td>
<td>Leguminaceae</td>
</tr>
<tr>
<td>11</td>
<td><em>Delonix regia</em></td>
<td>Leguminaceae</td>
</tr>
<tr>
<td>12</td>
<td><em>Eucalyptus globules</em></td>
<td>Myrtaceae</td>
</tr>
<tr>
<td>13</td>
<td><em>Ficus religiosa</em></td>
<td>Moraceae/Urticaceae</td>
</tr>
<tr>
<td>14</td>
<td><em>Ficus recemosa</em></td>
<td>Moraceae/Urticaceae</td>
</tr>
<tr>
<td>15</td>
<td><em>Leucaena leucocephala</em></td>
<td>Leguminaceae</td>
</tr>
<tr>
<td>16</td>
<td><em>Madhuca indica</em></td>
<td>Sapotaceae</td>
</tr>
<tr>
<td>17</td>
<td><em>Mangifera indica</em></td>
<td>Anacardiaceae</td>
</tr>
<tr>
<td>18</td>
<td><em>Polyalthia longifolia</em></td>
<td>Annonaceae</td>
</tr>
<tr>
<td>19</td>
<td><em>Syzygium cumini</em></td>
<td>Myrtaceae</td>
</tr>
<tr>
<td>20</td>
<td><em>Tamarindus indica</em></td>
<td>Leguminaceae</td>
</tr>
<tr>
<td>21</td>
<td><em>Tectona grandis</em></td>
<td>Verbenaceae</td>
</tr>
<tr>
<td>22</td>
<td><em>Zizyphus mauritiana</em></td>
<td>Rhamnaceae</td>
</tr>
</tbody>
</table>

Table 11: Termite attack observed on trees in Nanded district
be eaten up; gradually the pith is reached and a slow hollowing out of the stem occurs, resulting in ultimate death.

2. *Ailanthus excelsa* Roxb.

V.N. – Maharukh

Disease – Termite attack

Locality – Loha, Kandhar, Kinwat.

The termite attack usually begins at the roots and then spreads to the upper parts, covering nearly the total area of the trunk (Fig.79). The trunk of affected trees are heavily damaged because of the infection. Majority of the trees in the study area were found affected by the termites.

3. *Albizia lebbek*

V.N. – Shirish

Disease – Termite attack

Locality – Mahur, Mukhed, Ardhapur.

The attack of termite on the host plants usually begins from the lower part of the tree and then it fastly covers the trunk area. Because of the attack not only trunk but the underlying tissues also get affected. In some cases the affected tissues are found to be removed, leaving a decayed appearance (Fig.80).

4. *Acacia nilotica*

V.N. – Babhul

Disease – Termite attack

Locality – Loha, Nanded, Kinwat, Penur.
The termite attack was observed on a few trees of Babul in the study area. The attack was found to start from the base of the trunk and gradually attack the upper part (Fig.81). The bark is attacked in the initial stages and then the underlying tissues were damaged. In severe infection, a substantial portion of wood is found to be removed from the affected tree trunk, giving a ugly decayed appearance (Fig.82).

5. **Butea monosperma**

V.N. – Flame of the forest, Palas

Disease – Termite attack

Locality – Kinwat.

In the forests of the study area the termite attack was observed on the hosts. The attack was from base to apex. The attack of the termite was initially observed on the trunk (Fig.83), which then gradually covered the whole tree; even young branches were also found affected by the termite attack (Fig.84).


V.N. – Salai

Disease – Termite attack

Locality – Nanded, Bhokar, Biloli.

Severe infection was observed on salai trees at different places in Nanded district. At the base of the tree, a substantial portion of the trunk was found attacked by the termites (Fig.85) and it was found to persist for a
long time. All the branches of the tree were found affected by the termites (Fig.86).

7. *Cassia fistula*

V.N. – Bahava

**Disease – Termite attack**

**Locality** – Loha, Nanded, Gaul, Penur.

Termite attack was observed on the tree trunks of the host plant. The attack was more at the base of the tree (Fig.87). In severe infection, the whole tree trunk was found affected by the attack (Fig.88). The bark of the tree was found damaged because of the termites; the tree appearing normal from a distance.

8. *Cocos nucifera*

V.N. – Coconut

**Disease – Termite attack**

**Locality** – Limgaon, Penur, Kandhar.

Coconut trees are planted in some bunglows and fields in the study area. Some of them were found attacked by the termites. The attack was from base towards the apex of the trees. Only barks of the trees were found damaged because of the attack (Fig.89).

9. *Caesalpinia pulcherima Sw.*

V.N. – Sankasur

**Disease – Termite attack**

**Locality** – Nanded, Berali, Malakoli.
The host trees were found attacked by the termites. Infection started from base of the tree and gradually progressed to cover the upper part, thus affecting the whole trunk (Fig.90). On branches also the infection was observed (Fig.91). On young branches, the infection was found to be severe affecting the total epidermal portion. On young branches, gall like or blister like structures were seen in large number (Fig.92). The affected parts of the tree showed that in addition to bark, the underlying tissues are also attacked. This results in decayed appearance of the wood (Fig.93).

10. *Dalbergia sissoo*

V.N. – Shisam

**Disease – Termite attack**

**Locality** – Bhokar, Biloli.

The old trees of Dalbergia were found attacked by the termites. The attack was from lower portion of the stem progressing upwards. Bark of the tree was found affected by the attack (Fig.94). Though the attack persisted for a long time, the trees were alive and looking normal from a distance.


V.N. – Gulmohor

**Disease – Termite attack**

**Locality** – Loha, Kinwat, Kandhar.

Old trees of Gulmohor were found affected by the termites in the study area. The attack was more severe in the basal portion of the tree. The infection persists for a long time. Initially the attack is on the bark of the
trees but later other tissues below it were also damaged. This resulted in
decay of live wood (Fig.95).


V.N. – *Eucalyptus*  
Disease – Termite attack  
Locality – Nanded, Kinwat, Mahur.

Severe infection of termites was observed on the eucalyptus trees. The attack was observed on complete circumference of the affected trees. The attack was on the bark of the tree trunks. The affected trunks showed muddy appearance against the silvery white colour of the wood in the background (Fig.96).

13.  *Ficus religiosa*  

V.N. – Peepal  
Disease – Termite attack  
Locality – Kandhar, Kinwat, Mahur.

The termite attack was observed on the branches of the trees. The galls like structures were seen on the young stems of the trees. Because of this the appearance of stem surface was changed. On the tender stems small warty structures were seen (Fig.97).

14.  *Ficus racemosa*  

V.N. – Umbar  
Disease – Termite attack  
Locality – Bahaddarpura, Gaul, Ambulga, Kandhar.
The attack of termites was observed on the lower portion of the tree first, which then spread to other parts (Fig.98). Even young tender branches of the trees were found affected. On stem it gave muddy appearance, while on branches it formed blister like structures (Fig.99). Bark and the underlying tissues were found damaged because of the attack.

15. *Leucaena leuccephala*

V.N. – Subabbul

Disease – Termite attack

Locality – Mahur, Bhokar, Biloli, Degloor.

Older trees in the study area were found attacked by the termites. The attack started on the lower parts of the trees and with time it appeared on he upper parts of the tree trunk. Comparatively a small area of the trunk was found affected (Fig.100). The attack was found to affect the bark of the trees.


V.N. – Moha

Disease – Termite attack

Locality – Kinwat, Bhokar, Nanded.

A small number of host trees in the study area were found affected by the termites. The attack was observed from base to upper branches (Fig.101). Initially the bark was found attacked but later lower tissues were also damaged. In later stages decayed parts were observed on the affected trees.
17. *Mangifera indica*

V.N. – Mango

**Disease – Termite attack**

**Locality** – Kinwat, Kandhar, Mukhed.

Mango trees were also found affected by the termite attack. It was observed on older trees. It caused serious damage to the affected parts. Bark and a small portion of lower tissues were damaged. It caused decayed appearance of tree trunk (Fig.102).


V.N. – Ashok

**Disease – Termite attack**

**Locality** – Loha, Nanded, Kandhar.

Severe termite attack was observed on the Ashoka trees in Nanded district. Older trees were found affected. It covered a large area of tree trunk and it appeared muddy (Fig.103). Bark of the tree was found affected by the termites.

19. *Syzygium cumini*

V.N. – Jamun

**Disease – Termite attack**

**Locality** – Nanded, Kinwat, Mahur.

Termite attack was observed on old (Fig.104) as well as young trees (Fig.105) of Jamun. The attack was observed on all the parts of the stem and branches.
Another type of termite attack was also observed on the older trees. It produced blister like structures on the tree trunk (Fig.106). These structures were oval in shape and dark brown to dark blue in colour. They developed in clusters (Fig.107).

20. *Tamarindus indica*

V.N. – Imli

Disease – Termite attack

Locality – Loha, Kandhar, Biloli.

Older trees of Imli were found affected by the termite attack. It was observed on the tree trunks. It appeared as large muddy patches on the trunk (Fig.108). Bark of the tree was found affected because of the attack.

21. *Tectona grandis*

V.N. – Teak

Disease – Termite attack

Locality – Kinwat, Mahur.

Teak trees in the forests of Nanded district were found affected by the termites. Initially it starts from base and later it covers the total tree trunk (Fig.109). Bark of the tree was found damaged by the termite attack.

22. *Zizyphus mauritiana*

V.N. – Ber

Disease – Termite attack

Locality – Loha, Bargaon.
Ber trees in the study area were found affected by the termites. Older trees were affected. The attack was initially observed on the lower parts and later it spread to other parts of the trunk and branches. It affected the bark and the underlying tissues causing decay of the affected plant parts (Fig. 110). The muddy covering persisted on the trees for a long time.

G) PHANEROGAMIC PARASITES

Phanerogamic parasites are known to cause considerable damage on host plants. Certain parasites viz., *Loranthus* sp., *Orobranche* sp., *Striga* sp., *Cuscuta* sp. are well documented in literature for their occurrence on various angiospermic plants.

During the present investigation, nine trees in the study area were found to be attacked by the angiospermic parasite *Cuscuta reflexa* and one by *pee pal* (Table 12). The occurrence of phanerogamic parasites on the host plants are described hereafter.

1. *Acacia nilotica*

V.N – Babhul

Parasite – *Cuscuta reflexa*

Locality – Loha, Penur, Kandhar.

The dodder was observed on old trees of *A. nilotica*. The parasite formed a dense mass on the branches. The development of the parasite was very fast. It formed a dense, tangled mat of leafless yellow to yellow green strands on the host plants (Fig. 111). Its occurrence was found to be severe in monsoon season.
Table 12: Occurrence of phanerogamic parasites on trees in Nanded district

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Host</th>
<th>Family</th>
<th>Pathogen</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Acacia nilotica</td>
<td>Leguminaceae</td>
<td>Cuscuta reflexa</td>
</tr>
<tr>
<td>2</td>
<td>Azardirachta indica</td>
<td>Meliaceae</td>
<td>C. reflexa</td>
</tr>
<tr>
<td>3</td>
<td>Butea monosperma</td>
<td>Leguminaceae</td>
<td>C. reflexa</td>
</tr>
<tr>
<td>4</td>
<td>Cassia siamea</td>
<td>Caesalpiniaceae</td>
<td>C. reflexa</td>
</tr>
<tr>
<td>5</td>
<td>Ficus benghalensis</td>
<td>Moraceae</td>
<td>C. reflexa</td>
</tr>
<tr>
<td>6</td>
<td>Ficus racemosa</td>
<td>Moraceae/ Urticaceae</td>
<td>C. reflexa</td>
</tr>
<tr>
<td>7</td>
<td>Mangifera indica</td>
<td>Anacardiaceae</td>
<td>Peepal</td>
</tr>
<tr>
<td>8</td>
<td>Millingtonia hortensis</td>
<td>Bignoniaceae</td>
<td>C. reflexa</td>
</tr>
<tr>
<td>9</td>
<td>Thivetia peruviana</td>
<td>Apocyanaceae</td>
<td>C. reflexa</td>
</tr>
<tr>
<td>10</td>
<td>Zizyphus mauritiana</td>
<td>Rhamnaceae</td>
<td>C. reflexa</td>
</tr>
</tbody>
</table>
2. **Azadirachta indica**

V.N – Neem

Parasite – *Cuscuta reflexa*

Locality – Loha, Nanded, Kandhar, Penur.

The occurrence of *C. reflexa* was found in monsoon (Fig.112). The parasite encircled the host plants, sending haustoria into it, which reached the vascular tissue. The parasite vine was swollen at the points of contact with host plant. The swellings were girdle like and usually associated with the haustorial coils. The development of the parasite was very fast.

3. **Butea monosperma** Lam.

V.N – Flame of the forest, Palas

Parasite – *Cuscuta reflexa*

Locality – Mukhed, Ardhapur, Limgaon.

Some trees of *B. monosperma* were found attacked by the dodder in the study area (Fig.113). The occurrence was recorded in monsoon season. The parasitic vine formed yellow green network on the branches. Its development was fast.

4. **Cassia siamea** Lam.

V.N – Kashid

Parasite – *Cuscuta reflexa*

Locality – Nanded, Kandhar, Loha.

The dodder was observed on the trees of *C. siamea* in the study area. It was found on lower branches of the tree, where it formed a very dense
Fig. 111  *Acacia nilotica*

Fig. 112  *Azadirachta indica*

Fig. 113  *Butea monosperma*
yellow coloured mat (Fig.114). The upper branches were not found invaded by the parasite. It was recorded during monsoon and its development was rather fast. Some portion of the parasitic vine was found hanging from the upper side.

5. *Ficus benghalensis*

V.N. – Banyan

Parasite: *Cuscuta reflexa*

Disease: Phanerogamic parasite

The dodder was recorded on well grown banyan trees. Majority of the branches of the tree were covered by the parasitic vine. The vine was yellow-green in color. Some vines were intermingled with the branches and some others were found hanging in air (Fig.115). The occurrence of the dodder on banyan was recorded during monsoon.

6. *Ficus racemosa Linn.*

V.N – Umber

Disease – *C. reflexa*

Locality – Kinwat, Bhokar, Mahur, Biloli.

The dodder was recorded on *F. racemosa* sp. Some trees were found severely infected by the angiospermic parasite (Fig.116). All branches of the affected trees were covered by the development of the parasite. The parasitic vine was yellow green in colour. Some part of the vine was also found hanging from the branches. The infection was observed during monsoon.
Fig. 114  Cassia siamea

Fig. 115  Ficus bengaleusis

Fig. 116  Ficus racemosa
7. *Mangifera indica*

Disease : Phanerogamic parasite peepal

Parasite – *Ficus religiosa*

In the study area, a tree of peepal was found growing on a mango tree. Both the trees were found well-grown. The peepal tree was present on the tip of the tree trunk, amongst the crowded branches of mango tree (Fig.117).


V.N – Bruch

Parasite – *Cuscuta reflexa*

Disease – Phanerogamic parasities

Locality – Mahur, Biloli, Penoor.

The parasite was found to infect *M. hortensis* trees, which were growing in rows (Fig.118). Initially the development of parasite was mild and observed on one tree in monsoon season. From it the development was very fast and it formed dense mat on the trees. From one tree it spread to another tree and all the trees, growing in row, were found affected by the parasite. Initially the colour of parasitic vine was yellow green but during winter the colour changed to brown. It was found to be persistent for a long time. The dried vines were also found remaining attached to the trees.


V.N – Aakash Neem

Parasite – *Cuscuta reflexa*
Locality – Loha, Kandhar, Penoor.

*T. peruviana* trees found growing near city area were found attacked by the dodder. The parasite occurred during monsoon and it speedily covered all the branches of the tree and the leaves were found masked by the vines (Fig.119). Some portion of the vine was found hanging from the branches. The parasitic vine was found swollen at the point of contact with the host.


V.N – Ber

Parasite – *Cuscuta reflexa*

Locality – Loha, Kandhar, Kiroda, Penur.

Severe infection of *C. reflexa* was observed on Ber trees in Nanded district. The parasite occurred on the trees in early monsoon it developed very fast and soon it covered the whole tree. Dense yellow green threads were observed on the host and the complete tree was found hidden under this (Fig.120). Some of the threads turned brown and dried in due course. The severely affected trees were found under developed and some of them were found on the verge of drying.