

## **Tree dieback in Punjab, Pakistan**

**Arshad Javaid, Rukhsana Bajwa and Tehmina Anjum**

*Department of Mycology and Plant Pathology, University of the Punjab,  
Lahore 54590, Pakistan.*

### **Abstract**

Survey of 10 districts of Punjab viz. Sialkot, Gujranwala, Lahore, Faisalabad, Sheikhpura, Gujrat, Jehlem, Rawalpindi, Sargodha, and Hafizabad were undertaken from March 2003 to March 2004 to study the present status of tree dieback incidence in these areas. A total of 21 tree species were found victim of the dieback disease. The disease incidence, however, varied in different tree species. Furthermore, there was also difference in disease severity in different surveyed districts of the province. *Dalbergia sissoo* Roxb. and *Acacia nilotica* (Lam) Willd. ex Delile., were found to be the most affected species in all the districts. Among the commonly grown trees *Mangifera indica* L., *Eucalyptus citriodora* Hook., *E. camal-dulensis* Dehnh., *Populus hybrida* M. Bieb., *Ficus religiosa* L., *F. bengalensis* L., *Bombax ceiba* L., *Syzygium cumini* (L.) Skeels., *Psidium guajava* L., and *Albizia lebbek* Benth. were found affected with dieback. The less commonly cultivated species like *Toona ciliata* (Roxb.) M. Roemer, *Heterophragma adenophyllum* Seem. ex Benth. & Hook., *Ficus glomerata* Roxb., *Mimosup elengi*, *Terminalia arjuna* Wight & Arn., *Grevillea robusta* Cunn., *Ehretia acuminata* R. Br., *Platanus orientalis* L. and *Barringtonia acutangula* (L.) Gaertn. were also found victims of the dieback. Termites and fungi were found to be the most common biotic factors responsible for the disease. Among the abiotic factors generally drought and environmental pollution seemed to be the main causes for dieback initiation and severity.

### **Introduction**

Dieback refers to the progressive death of twigs and branches, which generally starts at the tips. Trees and shrubs affected by dieback syndrome may die within a year or two after symptoms first appear or in some cases survive indefinitely. Dieback-affected trees typically have poor crowns, with sparse foliage and a large proportion of dead branches. The affected trees may partially recover from new shoots growing out of the trunk and major branches. The root systems are similarly reduced. The exact symptoms depend on what is causing the dieback. There are a number of causes of dieback, which vary from region to region. Dieback is a complex phenomenon, with many interrelated causes. It is difficult to attribute an outbreak of dieback to any one single cause. It consists of a combination of environmental stresses and biotic disease organisms that interact to weaken and eventually killing of the plants. It usually begins after the trees are predisposed by an environmental stress (Aslam, 2004). Factors that can contribute to dieback in particular localities can include insects especially termites, fungi especially *Phytophthora*, drought, salinity, herbicide spray drift or spillage in water courses, girdling of trees by livestock, earthmoving, frost, hail fire, wind and pruning (Gill *et al.*, 2001; Javaid & Afzal 2001; Khan 2001; Bajwa *et al.*, 2003).

Pakistan is deficient in forests. The situation is becoming more alarming day-by-day due to increase in forest tree diseases. Amongst the most damaging diseases, dieback presently is the common one. The present investigation aimed to evaluate the status of tree dieback and its relation to different biotic and abiotic factors in 10 districts of the Punjab.

### **Materials and Methods**

Surveys of different districts of Punjab viz. Sialkot, Gujranwala, Lahore, Faisalabad, Sheikhpura, Gujrat, Jehlem, Rawalpindi, Sargodha and Hafizabad were undertaken from March 2003 to March 2004 to study the dieback incidence in trees of these areas. From each district plantations on roadside, canal banks and agricultural lands were studied.

### **Results and Discussion**

A total of 21 tree species were found affected with dieback disease in the surveyed districts of the Punjab. The frequency of the diseased plants was, however, different in different tree species. Furthermore, the disease severity also varied from place to place depending upon environmental and edaphic conditions. The most affected species were *Dalbergia sissoo* and *Acacia nilotica* followed by *Mangifera indica*, *Eucalyptus* spp., and *Toona ciliata* (Fig. 1).

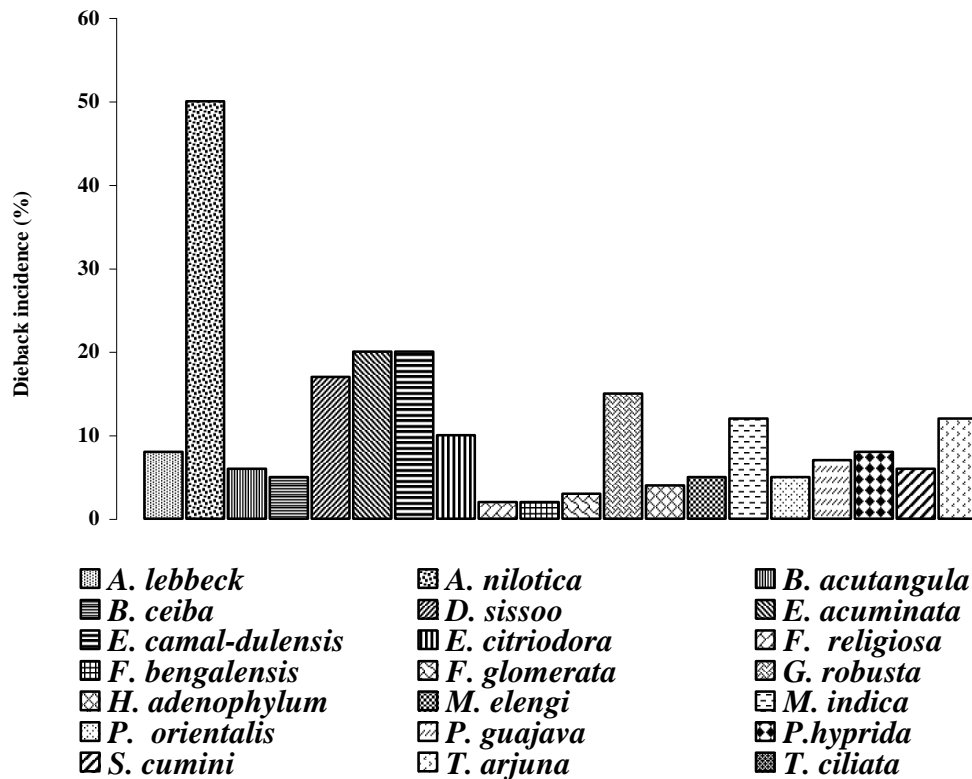


Fig. 1: Dieback incidence in different tree species in Punjab

*D. sissoo* (Fig. 2-A) was found severely suffering from dieback disease in all the surveyed districts of the province. The highest percentage of mortality of shisham, ranging from 60 – 80 %, was recorded along the canal banks. The mortality rate along the roadsides especially along highways was also fairly high ranging from 20 – 30 %. The least mortality and disease incidence of 10 % or below was recorded on shisham trees growing on agricultural lands either in linear rows along the boundaries of the field or as scattered plants. The death of all the dead shisham trees had not taken place because of dieback disease only. There is another equally important disease i.e., wilt which is prevailing in the country and is responsible for shisham decline (Bajwa *et al.*, 2003). Dieback incidence and severity had no relation with soil pH and texture. More than 15% living trees were found to be suffering from dieback. Dieback incidence is also reported in the Tarai tract of Nepal, believed to be homeland of shisham. The shisham dieback has been reported in literature as early as 1900 but has never assumed an alarming proportion. It was in 1998 that this disease was reported as an epidemic in

central irrigated tract of Punjab province (Naz, 2002). The disease severity was found to be associated with environmental stresses especially drought and high soil moisture content. The causal agent of this disease is still controversial. In the present study *Fusarium oxysporum* was isolated from the root samples collected from drought stressed dying back trees at Punjab University Lahore. Conversely, Gill *et al.*, (2001) claimed that *Phytophthora cinnamomi* is the only cause of this disease. According to Sharma *et al.*, (2000) *Ganoderma lucidum* may be the cause of shisham dieback. Another fungus *Phellinus gilvus* has also been isolated from the roots of dying back shisham trees (Bakshi, 1974).

Similar to that of *D. sissoo*, *A. nilotica* (Fig. 2-B) was also found severely attacked by dieback in all the surveyed areas. The tree is considered to be native of Pakistan and is a xerophytic species yet the disease severity was found to be associated with drought stress. The highly affected districts were Gujranwala and Sialkot where about 30% trees were found dead. The tree mortality along some roadsides was even above 50%. Disease was more prevalent

along roadsides and canal banks than on or near agricultural lands. Among the living trees more than 80% trees were showing dieback symptoms. The dieback incidence in Gujrat, Jehlem and Rawalpindi districts was also found alarming. In districts Lahore, Sheikhpura and Faisalabad more than 50% plants were showing dieback symptoms along roadsides. Inside Lahore city disease incidence is below 20%. In Sargodha district the dieback incidence was comparatively low with about 20% plants showing dieback symptoms.

*Eucalyptus*, a native of Australia, is an introduced genus in Pakistan. The most commonly cultivated species in Pakistan is *Eucalyptus citriodora* followed by *E. camal-dulensis*. These species are commonly cultivated along roadsides and as plantation on agricultural lands. Both the species were found victims of the dieback disease. *E. camal-dulensis* was found to be more susceptible to dieback than *E. citriodora* (Fig. 2-C). In almost all the surveyed areas the disease has set in. However, the disease incidence and severity varied at different localities. Generally 10 to 20% plants were found slightly to moderately diseased in different areas except Lahore. In Lahore city and surrounding areas the dieback incidence was above 30%. The disease severity was also of very high level inside this city. The disease severity seemed to be associated with drought and air pollution. Trees of all ages were found to be attacked by the disease. However, older plants were found to be more susceptible than the young ones. *Phytophthora cinnamomi* may be the cause of *Eucalyptus* dieback (Fig. 2-C).

Mango (*Mangifera indica* L.) is one of the most important foreign currency earning fruit crops of Pakistan. Mango tree is attacked by a number of diseases, in which dieback is important one (Fig. 2-D). This is a serious mango disease and commonly observed in almost every orchard. In the Punjab dieback and anthracnose are often observed together on diseased plants. The diseases become evident as discolouration and darkening of the bark some distance from the tip. It progresses downward involving bigger and bigger branches. As a result the leaves are shed. Affected twigs become evident when the bark is discoloured and darkened. Sometimes gum starts exuding from the diseased portions (Saleem, 1999). *Diplodia natalensis* Pole Evans has been reported to be responsible for this disease (Akhtar *et al.*, 1987). High summer temperature, relative humidity above 80% and rains favour disease development (Pathak, 1980). Almost all mango varieties are susceptible to this disease.

*Populus hybrida* is commonly planted on roadsides and canal banks, and sometimes on

agricultural lands also. This tree species is also suffering from dieback (Fig. 2-E). The disease is not very common. However, where disease is present, large number of trees become victim of it. More than 50% trees of *Populus hybrida* are affected by dieback along canal bank of BRB Lahore Branch. Generally older trees are more susceptible to the disease than young ones. The main causal agent is reported to be termite species *Coptotermes heimi* Wasmann (Javaid & Afzal, 2001).

*Toona ciliata* (Roxb.) M. Roemer is a native of Pakistan as well as of many other countries. This plant is generally planted for its dense shade. This tree is severely attacked by dieback disease nowadays (Fig. 2-F). About 20% plants were found to be infected by the disease. Many plants were found completely dead. Among the other commonly grown trees *Ficus religiosa*, *F. bengalensis* (Fig. 2-G), *Bombax ceiba* (Fig. 2-H), *syzygium cumuni* (Fig. 2-I), *Psidium guajava*, and *Albizia lebbeck* were showing symptoms of dieback. Many other tree species like *Heterophragma adenophyllum* (Fig. 2-J), *Ficus glomerata* (Fig. 2-K), *Mimops elengi*, *Terminalia arjuna* (Fig. 2 L), *Grevillea robusta* (Fig. 2-M), *Ehretia acuminata* (Fig. 2-N), *Barringtonia acutangula* and *Platanus orientalis* (Fig. 2-O), which are not commonly cultivated, were also found affected with dieback. The incidence and severity of dieback in these tree species ranged from moderate to very high level (Fig. 1).

Once the symptoms of dieback are evident, it is difficult to stop or reverse the progress of the disease. The key to control is early detection and prevention. The following measures will be helpful in maintaining the health of the trees.

1. Grow only species and varieties or cultivars of trees and shrubs that are well adapted to the area and site. Many shade and fruit trees have very specific site requirements and grow poorly or become victim of dieback or other diseases if these requirements are not met.
2. Maintain plant health by planting properly in a deep, fertile and well-drained soil. Fertilize every year in early spring or late fall (after leaf drop) following a soil test report.
3. Watering is beneficial during relatively dry autumns to insure that roots have adequate moisture during the winter dormant period.
4. Eliminate traffic over the tree root area if soil compaction is a problem. Loosen compacted soil and any pavement or soil fill and apply loose organic mulch.
5. Avoid wounding the trunk and roots.



**A:** *Delbergia sissoo*



**B:** *Acacia nilotica*



**C:** *Eucalyptus citriodora*



**D:** *Mangifera indica*



**E:** *Populus hybrida*



**F:** *Toona ciliata*



**G:** *Ficus bengalensis*



**H:** *Bombox ceiba*



**I:** *Syzygium cumini*



**J:** *Heterophragma adenophyllum*



**K:** *Ficus glomerata*



**L:** *Terminalia arjuna*



**M:** *Grevillea robusta*



**N:** *Ehretia acuminata*



**O:** *Platanus orientalis*

**Fig. 2(A – O):** Dieback in different fruit and shade trees in Punjab

6. Measures should be taken to reduce the environmental pollution. The carbon dioxide, and oxides of sulphur and nitrogen result in acid rain. Acid rain can affect the soil nutrient complex as nutrients are washed away and heavy metal ions are mobilized. These toxic

ions can then be taken up by the tree roots resulting in lowered tree resistance to diseases and extremes of weather.

7. Grasses and litter under the tree cover should not be burnt, as it is a common practice in plantations along the roadsides.

8. Avoid changes in the growing sites. Any change in drainage, any damage to the roots from trenching or construction, or any other site change almost always results in root damage and decline. Removal of four inches of topsoil can destroy 50 to 75 percent of the essential feeder roots and provide injuries that increase the chances of root or trunk decay. Soil fill will induce drought, reduce the exchange of gases to the roots, and lead to invasion by root decay fungi.
9. Make timely applications of a suggested insecticide to keep the feeding of defoliating insects, borers, and other wood attacking pests at a minimum.
10. If dieback symptoms appear, and no specific cause can be determined, try fertilization and watering. Judicious pruning to remove all dead, dying, diseased, and crowded or rubbing branches may also reduce the stress on the root system and encourage renewed vigor.

With proper care and management the rate of dieback can be reduced and further problems would be prevented.

## References

- Akhtar CM, 1987. Investigations on the biological control of *Rhizoctonia solani* and *Fusarium oxysporum* f. *lini* causing root rot and wilt diseases in cotton and linseed crops respectively. Final report of PL480 Project AARI and Univ. Agri. Faisalabad.
- Aslam M, 2004. Brief on Mango killer or mango quick decline or mango dieback. Ministry of Food, Agriculture and Livestock, Islamabad.
- Bajwa R, Javaid A, Shah MBM. 2003. Extent of shisham (*Dalbergia sissoo* Roxb.) decline in Sialkot, Gujranwala, Lahore and Sargodha districts. *Mycopath*, **1**: 1-5
- Bakshi BK, 1974. Control of root disease in plantation in reforested stands. *Indian Forester*, **100**: 77-78.
- Gill MA, Ahmad I, Khan AU, Aslam M, Ali S, Rafique RM, Khan M, 2001. *Phytophthora cinnamomi* – A cause of shisham decline in Punjab, Pakistan. *Proceedings of 3<sup>rd</sup> National Conference of Plant Pathology, Oct. 1-3, 2001, NARC, Islamabad*. pp.33-37.
- Javaid A, Afzal M, 2001. Incidence of Termite Attack on Trees in University of Punjab, Quaid-e-Azam Campus, Lahore, Pakistan. *Pakistan Journal of Zoology*, **33**: 80-82.
- Khan SM, 2001. Tree decline in the Pakistan. *Proceedings of 3<sup>rd</sup> National Conference of Plant Pathology, Oct. 1-3, 2001, NARC, Islamabad*. pp.15-16.
- Naz SI, 2002. The vanishing shisham tree. *The Daily Dawn*. 4 January 2002, Lahore, Pakistan.
- Pathak VN., 1980. Diseases of fruit crops. Oxford and IBH Pub. Co. Delhi and Bombay.
- Saleem A, 1999. Recent development in the management of mango diseases. In: *Proc. of 2<sup>nd</sup> National Conference of Plant Pathology, Sept. 27-29, 1999. University of Agriculture, Faisalabad*. pp. 6-11.
- Sharma MK, Singaland RM, Pokhriyal TC, 2000. *Dalbergia sissoo* in India. In: *Proc. of the Sub-regional Seminar on Dieback of Sissoo (Dalbergia sissoo), Katmandu, Nepal, 25-28 April 2000*. pp. 5-16.