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PRELIMINARY REPORT ON TREE DIEBACK IN BALOCHISTAN

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ABSTRACT

A survey of Quetta, Pashin and Ziarat, Balochistan, Pakistan was undertaken in April 2006 and tree dieback incidence in these areas was recorded. In Quetta the most affected angiospermic tree species was ash [*Fraxinus xanthoxyloides* (G. Don) DC] showing about 20% dieback incidence. Trees of all ages were found victim of the disease. However, older trees were found more susceptible to dieback than the younger. The other highly affected tree species was *Morus alba* showing about 10% dieback incidence. The lowest disease incidence of about 1% was recorded in *Robinia pseudoacacia* L. Some root infecting fungi may be the cause of dieback in these tree species. Among the gymnosperms, Afghan pine (*Pinus eldarica* Medw) exhibited about 10% dieback incidence. An unidentified aphid species is response for dieback in this pine. In Pashin, the most fertile district of the Balochistan, dieback incidence was almost zero. Generally apple is cultivated in the area and because of management practices, plants were healthy. In Ziarat Juniper (*Juniperus excelsa* M.B.) forests were severely suffering from dieback where about 20% trees were showing the disease symptoms. Drought, mistletoe *Arcethobium oxycedri* and fungus *Pyrofomes demidoffii* (Lev.) Katl. & Pouz are among the causes of juniper dieback in Ziarat.

Key-words: Die back, tree disease, Balochistan, fungal disease,

INTRODUCTION

Dieback refers to the progressive death of twigs and branches, which generally starts at the tips. Dieback affected trees typically have poor crowns, with sparse foliage and a large proportion of dead branches. Generally dieback symptoms are uniform through out the crown. However, a dying back tree may have localized symptoms such as apparently healthy branches adjacent to dead or dying branches. Usually dieback begins in the top of a plant and progresses downward, but it may starts on the lower branches, especially with the conifers. The exact symptoms depend on what is causing the dieback. 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 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 watercourses, girdling of trees by livestock, earthmoving, frost, hail, fire, wind and pruning (Gill *et al*., 2001; Javaid and Afzal 2001; Khan 2001; Bajwa *et al*., 2003).

Tree dieback in Pakistan has become a serious problem now a days. Javaid *et al*. (2004) have reported dieback in 21 tree species in plains of Punjab, including *Dalbergia sissoo* Roxb., *Acacia nilotica* (Lam) Willd. ex Delile., *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., *Psidum guajava* L., and *Albizia lebbeck* Benth., *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. Recently in another study conducted at Nathiagali and surrounding hills in NWFP, Javaid *et al.* (2006) reported that both angiosperms like *Populus ciliata* Boenm, *Quercus incana* W. Bartram, *Aesculus indica* Colehr. *Ulmus wallichiana* Planch. (2%) and *Acer pictum* Thunb. ex Murroy, and gymnosperms namely *Abies pindrow* Roxb., *Pinus wallichiana* A. B. Jackson and *Taxus baccata* L. are suffering from dieback in these hilly areas.

Balochistan is the largest province of Pakistan covering 44% of the land surface of the country. It is located in the south-west of Pakistan with altitude mainly ranging from 600-3010 meters. This is an extensive area of 347,190 km^2 with a number of distinct physical features. It is a vista of arid waste-lands, great deserts, and formidable mountain ranges of amazing rock formations. Most of Balochistan lies outside the Monsoon System of weather, therefore, the climate is extremely dry. The annual rainfall is of about 15 centimeters, and even less along the Makran Coast. In terms of physical geography, Balochistan has more in common with Western Asia than with the Sub-Continent. It is a sparsely populated area of the country because of its dry climate combined with the natural

geographical features. The north east of this province receives rain and snowfall which support juniper forests, cultivated land and orchards, producing apples, almonds, apricots, peaches and grapes. This preliminary survey report presents the status of tree dieback in Quetta, Ziarat and Pashin, Balochistan, Pakistan.

MATERIALS AND METHODS

Survey of Quetta, Ziarat and the area between them in province Balochistan, Pakistan was undertaken during April 2006 to study dieback incidence in gymnospermic and angiospermic tree species. Dieback incidence in different trees was calculated by applying the following formula:

$$\text{Dieback incidence (\%)} = \frac{\text{No. of dying back tree of a species}}{\text{Total No. of trees of that species}} \times 100$$

RESULTS AND DISCUSSION

The *F. xanthoxyloides* is the most commonly cultivated tree. This species was found to be the most affected one by the dieback disease in the region. About 20% trees were found dying back (Fig. 1). Trees of all ages were affected with the disease. However, older trees were more susceptible to dieback than younger ones. In younger trees all the upper branches were found affected. In older trees two types of symptoms were observed. In some cases the whole crown was found affected. These symptoms are very similar to that of mango dieback where a fungus *Diplodia natalensis* Pole Evans has been reported associated with dying back branches (Akhtar *et al.*, 1987). In most cases the tree showed stag-headness condition with only few main dead branches at the top while the whole lower portion was quite healthy (Fig. 2). These symptoms are similar to those found in dying back *Dalbergia sissoo* Roxb. and many other trees species in Punjab where some root infecting fungi such as *Fusarium solani, Phytophthora cinamomi* are considered responsible for the menace (Javaid *et al*., 2004). However, the exact cause of dieback in this tree is not known so for.

Morus alba was the second most severely affected angiospermic species in Quetta exhibiting about 10% dieback incidence. Generally the upper portion become leafless and gradually grown becomes thin. Minimum dieback incidence of 1% was recorded in *R. pseudoacacia*. This tree species is also very common in the region (Fig. 1). Exact cause of dieback in these two species in unknown.

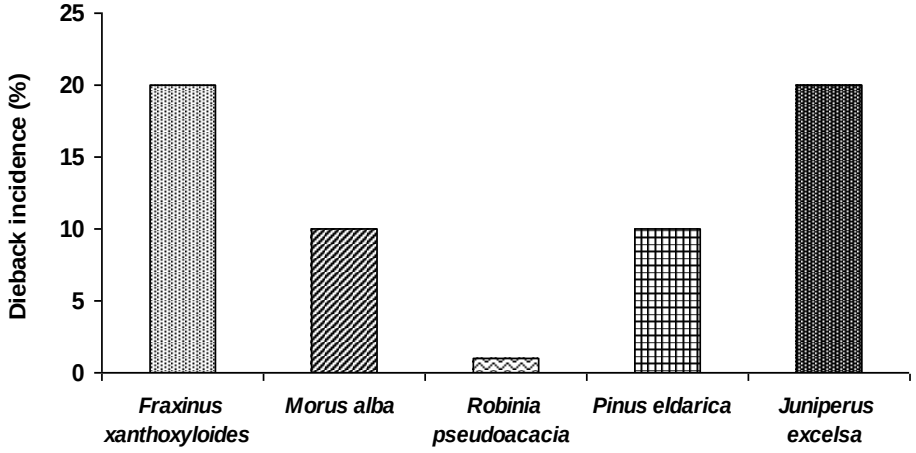

Fig. 1: Tree dieback incidence in Quetta and Ziarat, Balochistan.

Fig. 2 (A-C): *Fraxinus xanthoxyloides* trees of different ages showing symptoms of dieback.

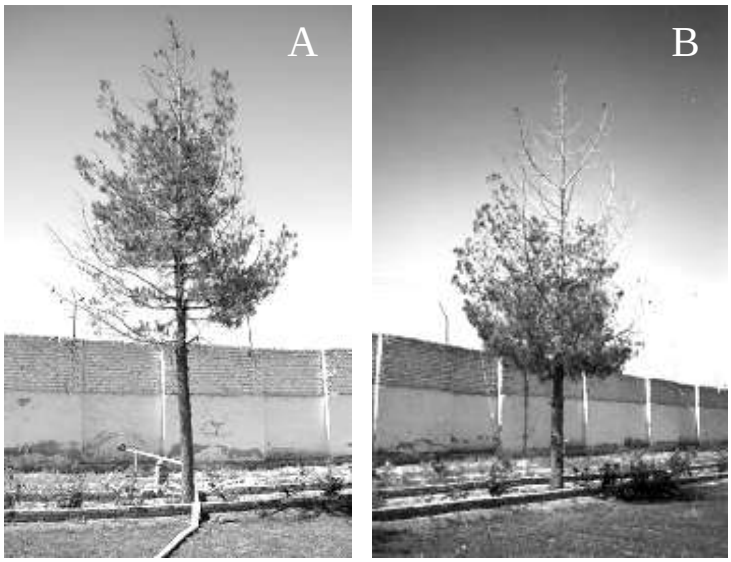

Fig. 3 (A&B): *Pinus eldarica* trees at Quetta showing different symptoms of dieback.

The most common gymnosperm found in Quetta is Afghan pine *P. eldarica*. This tree species was also found severely suffering from dieback. About 10% plants were found victim of the disease (Fig. 1). An aphid species is responsible for the disease. This organism sucks on the leaves. Gradually leaves become brittle and brown in colour and ultimately fall. Generally fall of leaves starts from top and progress towards bottom. However, in some cases the needles from branches of lower portion of the tree may fall. Consequently the tree crown become thin and ultimately tree become dead (Fig. 3).

Juniper species are among the slowest growing trees in the world. An area of 0.141 m ha of Juniper Forests in Balochistan is considered as the largest block of *Juniperus excelsa* in the world and only Ziarat valley constitutes a compact block of 0.071 m ha (Anonymous, 2003). District Ziarat encompassing an area of 926 km^2 is a roughly rectangular mountainous tract ranging in height from 1800 to 3488 m. The present survey of Ziarat revealed that about 20% or more juniper trees in Ziarat are suffering from dieback (Fig. 1). A tree generally showed typical symptoms of dieback i.e. dying of branches starts at the top and progressively moves downwards (Fig. 4). Plant growing inside the residential areas exhibited lower incidence of disease as compared to plants growing surrounding hills possibly because of management practices. Both abiotic and biotic factors seem to be responsible of dieback in

Ziarat. Among abiotic factors, drought is the major one, prevailing in the region since many years. There are reports of reduction of 316 mm rainfall in through 1992 – 2001 accompanied by 2.4 ºC rise in mean maximum and 0.9 ºC rise in mean minimum temperature in the same period (Chaudhary and Aslam, 2005). A tree weakens by drought stress may be renders more susceptible to attack by one or more organisms or agents. Juniper trees growing in this region are known to infested by dwrf mistletoe, *Arcethobium oxycedri* (Zakaullah, 1977; Atta *et al.*, 2002; Chaudhary and Aslam, 2005). This pathogenic parasite caused reduction in vigour and growth, poor seed development, malformation of woody tissues, top drying and predisposition to insect pests and other diseases. Trees affected by this parasite are under more water stress than healthy ones (Zakaullah and Badsha, 1977). The fungus *P. demidoffii*, causing heart rot in junipers, may be the cause of dieback (Khan, 1989; Chaudhary and Aslam, 2005). It enters through branches attacked by or killed by the attack of dwarf mistletoe, dead branch stubs and root connections. Root disturbance and soil moisture fluctuations play an important role in the prevalence of this disease (Zakaulla, 1979).Junipers are also known to be infested with by different kinds of stem and fruit borers (Chaudhry and Rehman, 1979) which may play a secondary role in severity of dieback.

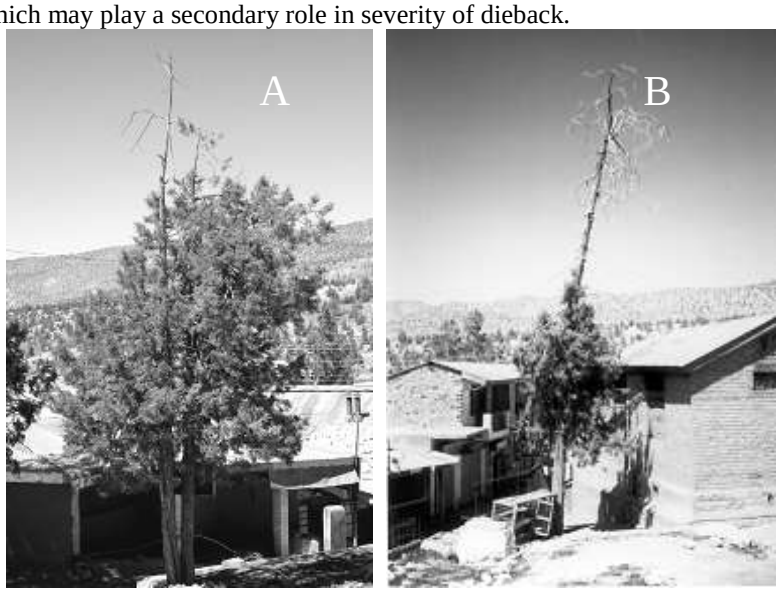

Fig. 4 (A&B): Juniper trees at Ziarat showing different stages of dieback.

Most of the area between Quetta and Ziarat generally belongs to district Pashin. It is the most fertile district of Baluchistan. Tree dieback in this region, especially along the roadside was negligible. Generally apple orchards are grown in the area. The absence of dieback in this region may be attributed to the proper irrigation and other management practices.

This is only the preliminary study regarding tree dieback in some parts of Balochistan. There is need to carry out extensive studies in these and other parts of the province to find out the incidence, severity, causes and control measures of dieback.

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