PRELIMINARY INVESTIGATION OF COMMON DISEASES OF ACACIA SPECIES IN MYANMAR

Wai Wai Than*

ABSTRACT

The investigations were carried out concerning diseases of Acacia species in forest nurseries and plantations in Myanmar. Foliar diseases of *Acacia spp.* caused by fungi which included powdery mildew, black mildew and leaf spot were investigated. Foliar diseases were quite severe resulting in premature defoliation. Stem disease and root rot disease were also common. Root disease caused by *Ganoderma sp.* was found to be most serious. An unidentified dieback causing mortality of trees was observed and recorded. Diseases such as canker and heart rot, which are equally serious, were investigated.

* Assistant Research Officer, Forest Research Institute

1. INTRODUCTION

There are more than 1000 species included in the genus *Acacia* Mill. (Leguminosae - Mimosoidae) widely distributed in tropical and subtropical areas of Africa, the Americas, Asia and Australia. Acacias are important species for social and industrial reforestation, reaching now two million hactares worldwide (Old *et. al.,* 2000).

A number of Australian Acacia species are widely planted many countries, including Myanmar. CSIRO* was established in 1961 as an Australian national seed collection and distribution centre to assist other nations through the provision of forest tree seeds. The CSIRO provided the Acacia seeds to Forest Research Institute of Yezin for establishment of plantations in some locations of Myanmar. The Acacia plantations have been established for provenance trial, fuel, papermaking, gum-extraction, as windbreaks, fodder, shade and shelter and for soil conservation since 1979-1987 in Meiktila, Thazi, Kyaukpadaung, Minbu, Yenan Chaung, Chauk, Myingyan, Monywa, Shwebo, Chaung Oo and Khin Oo townships. (Mehm Ko Ko Gyi & Kyi Win , 1991; Tun Aung *et. al*, 1994; Saw Win & Mya Win, 1996). The species which have been planted in Myanmar are *Acacia aulocarpa*, *A. auriculiformis*, *A. carrasicarpa, A. catechu, A. leucophloea, A. mangium and A. senegal.*

The present investigations were carried out with the following objectives:

- To observe symptoms of common diseases of Acacia species in Myanmar.
- To diagnose the causal pathogen of the Acacia diseases.
- To describe the disease control according to literature.

The report is not a complete account of all diseases recorded on Acacia in Myanmar.

2. LITERATURE REVIEW

Old *et.al* (2000) described that Phyllodes of some Acacia species showed a range of fungal spots, blotches and tip necrosis symptoms. Powdery mildew, caused by a species of *Oidium*, could be found on seedlings in most nurseries where tropical Acacia were grown. Damage to young nursery seedlings could be observed and the mortality rate of 75% had been reported in Thailand.

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* Commonwealth Scientific and Industrial Research Organization

IUFRO (1996) cited leaf fungus *Cercospora* was observed in the SPA* of *A,.crassicarpa* at Northern part of Australia. The first symptoms were noticed at the age of six months. The damage was in the upper crown of the trees and significant crown defoliation had occurred in many trees.

Severe canker disease was reported from India, Indonesia and Thailand (Old *et.al,* 2000). They observed some cankers resulted from the invasion of stems by a range of fungal pathogens. Typical avenues for invasion by canker-causing fungi were wounds, and damage caused by insect.

Lee (1997) published that trees in tropical rainforests were hosts to a range of root and butt rot pathogens, typically of the genera *Phellinus, Rigidoporus and Gadonerma*. As these fungi spread underground by growth in soil, or by root contact between healthy and diseased trees, the result was an expending patch of dying and dead trees.

According to Lee (1997), heart rot could be very high incidence 50-98% of trees being affected. And volume of wood could be small when she studied in Malaysia.

3. MATERIALS AND METHODS

The general survey on diseases was carried out in nurseries and plantations of the Acacia spp. Disease symptoms were recorded and samples were collected for laboratory examination as follow:

- Direct examination of the slice cutting of infected plant tissue using microscope.
- Isolation from diseased tissue on Potato Dextrose Agar (PDA) and made a pure culture.
- Preparation of slides from pure cultured organism and observation were made using microscope.
- Identification of causal pathogen.

4. RESULTS AND DISCUSSIONS

A total of nine diseases were observed as given below.

I. Powdery Mildew

Powdery mildew caused by a species of *Oidium* sp. was found on seedlings in most nurseries. Damage to young seedlings was severe and mortality have been reported in Nyaung Shwe forest nursery (Southern Shan State).

White patches caused by powdery hyphae and spores were found on the leaves (Plate 1). These patches increased and coalesced, spreading to whole leaves.

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* Seed Production Area

The upper surfaces of leaves become heavily infected with powdery hyphae. The infected leaves eventually resulted in early defoliation.

Application of fungicides such as benomyl, chlorothalonil, triademefon, maneb and zineb gives effective control (Old *et. al.*, 2000. Josiah and Allen - Reid 1991) indicated that the disease can be controlled by placing diseased seedlings in direct sunlight for an extended period.

II. Black Mildew

The fungi that caused black mildew, *Meliola sp.* were found on leaves and stems of a wide range of Acacia species. *Meliola* which affected leaves were found in Forest Research Institute (Yezin) campus and Salu (Bago) Acacia plantations.

The fungus formed black spots on the surface of the phyllodes (Plate 2). Under heavy infestation, the entire leaf surface could be covered by the fungus. The scale insects and mealybugs excreted honeydew that provided a food source for fungal growth. The infection was more on the upper than the lower phyllode surface.

Spherical fruiting bodies, perithecium developed among the hyphae. Ascospores were pigmented septate and could be observed in sac-shaped ascus (Plate 3).

De Guzman (1977) indicated that heavily infected phyllodes turned yellow and growth of seedlings stunted. However, on older trees, the black mildew did not cause any serious damage. Black mildew could be controlled by spraying fungicides and insecticides to eliminate insects and bugs.

III. Foliar Spot

Foliar spots caused by different fungi were common diseases of various trees including tropical Acacias. The leaf spots limited in extent with necrotic areas bounded by brown, black or discolored margins. Severe infection caused yellowing and drying of the leaf and premature defoliation.

(a) Collectotrichum foliar spot

The fruiting structures of *Collectotrichum sp.* called acervuli, were dark and sterile, setae, conidia hyaline and were ovoid or ellipsoidal in shape (Plate 4).

It may be advisable to use fungicides, chlorothalonil, to control it in the nursery (Barnard & Schroeder, 1984).

(b) Phaeotrichoconis folia spot

A widespread disease Phaeotrichoconis fungus on *A. mangium* was observed in Myanmar. The disease started by developing circular spot of dark brown colour on leaflets. The spots formed necrotic brown areas. Conidia have long beak-like appendages. Conidia were visible on slice cutting of leaf, under the microscope. (Plate 5)

The severely affected leaf dried up and defoliated.

(c) Cercospora foliar spot.

The infection occurred on young as well as mature leaves. The symptoms were blotches and brown necrotic areas. First, dark brown in colour on the tip of phyllode appeared and downwards to the centre of the phyllode seen as dark brown zonation lines in the necrotic region. Under the light microscope, conidia and conidiophores were observed on leaf cutting. Severe infection may cause premature defoliation (Plate 6).

IV. Yellowing

Any pathogen which could not be detected when infected leaves were investigated in the laboratory.

Symptom of deficiency tended to appear first on young shoots that could not obtain sufficient iron from older tissues. Such deficiency may have caused interveinal chlorosis and slow growth at first irregularly from branch to branch within a tree. This could be variable among trees of the same species in a given locality (Plate 7).

V. Stem canker

Canker was a common disease in Acacia species in the tropics. Cankers were dead areas of bark along stem axis. Symptoms appeared when the dieback occurred in the trees partially or completely girdled, causing crown dieback. The pathogen gained access to stem tissue through wounds and killed cambial tissue and sapwood but did not cause decay. The host produced callus tissue around the canker, and the margin of the canker cracks (Plate 8).

Infertile soils and climates caused more susceptible condition for canker diseases (Crist and Schoeneweiss, 1975).

Canker caused by *Nectria sp.* produced two-celled ascospores; hyaline, ovoid or ellipsoid.

Cankers on the main stem, reduced the vigor and such trees were liabled to wind breakage. Sanitation, removal and/or burning of cankered limbs or the whole trees where possible, was often the only control measure. Spraying with a fungicide such as captafol or 8:8:100 Bordeaux mixture immediately after leaf fall helps reduce *Nectria* infections in trees (Agrios, 1997).

VI. Dieback

This disease, also known as branch wilt, limb wilt or canker, occurred in a tree where summer heat becomes intense. The incidence of dieback could be a combined impacts of site, soil, climatic conditions, insects, and a range of pathogenic fungi.

Symptom appeared during summer. Leaves wilted on scattered branches and turned brown, cling to dead twigs or senesced and dropped prematurely (Plate 9). Pathogen was not known. In a typical outbreak of dieback, general decline in the growth rate of trees was observed. Within two years, the foliage of the majority of trees previously healthy become progressively sickly and sparse in shoots and then branches dieback.

The control depended upon avoiding or minimizing stress caused by water shortage or extreme temperatures. Sanitary pruning was also practiced to eliminate the infected twigs and branches.

VII. Witches' brooms

Witches brooms were formed as dense masses of adventitious twigs. The affected trees were stunted in growth. The shape of phyllode near the shoot apex were transformed into needle like structures (Plate 10). This gave rise to the appearance of witches' broom. Plate 11, this dwarf caused witches' broom on branches, leaves were small and fan-like arrangement of branches.

Witches' broom caused by fungi or virus or mycoplasma or other parasites, as well as environmental and genetic factors, would also induced these types of symptoms (Manion, 1981).The only practicable control measure in forest stands could be removal of diseased parts of trees.

VIII. Heart Rot

Heart rot is known to occur in a wide range of tree species. In Acacia plantations, many unidentified saprophytic wood decay fungi were observed fruiting on woody debris, dead branches and on living trees.

A variety of basidiomycete fungi was collected from heart rotted *Acacia auriculiformis*. *Fomes, Polyporus,*and *Schizophyllum* were most common on diseased trees (Plate 12, 13).

Wounds were usually the entry points for the wood decay fungi.

Pruning and singling operations should be carried out only on young and small-diameter branches.

IX. Root Rot

The fungi *Ganoderma sp.* causing root rot affected on *A. auriculiformis*. Fructifications of the causal organism were found on the roots of dead and growing trees. The affected trees had dieback on upper crown.. Roots were decayed and turned greyish black.

During a survey of root rot disease done at Forest Research Institute campus, root rot diseases were observed on three standing trees. Fruiting bodies were present on the root from July to September. One was dead and the remaining four trees were apparently affected root by root within the group of *A. auriculiformis* trees. Apparently, the group of trees cannot be survived in few years. (Plate 14,15)

Fungicide treatments have not been tested in tropical Acacia plantations.

5. CONCLUSION AND RECOMMENDATION

The incidences of these diseases have been investigated in Australia, India, Indonesia, Malaysia and Thailand. However, the Acacia diseases in Myanmar have not been reported by any plant pathologist. This appear to be the first report of significant diseases on tropical Acacias in Myanmar. Everyone of the preliminary investigated diseases should be studied more thoroughly.

Leaf spot symptoms on different species of Acacia are variable. The diseases occur when species are poorly adapted to site condition.

Temperature and humidity may be related with these infections. Powdery mildew and black mildew appeared at the end of the growing season.

Witches' broom is a low incidence in Acacia plantations and malformation possibly indicated that it could be the result of parasite and environmental effects.

Stem canker, dieback and heart rot are the most prevalent and destructive diseases in plantations. Root rot has wide distribution and the mortality rate was so high that it killed the effected plants.

Systematic survey on diseases should be continued because many varieties of the species have been introduced and widely planted in Myanmar. Genetic improvement should be favoured because improvements in silviculture is expected to reduce diseases incidence. Improvement in genetic and silvicultural methods, which can reduce the disease incidences, are imperatives.

List of Plates

6. REFERENCES

1. Banard, E.L. and Schroeder,R.A.1984. Anthracnose of Acacia in Florida. Proceedings of the Florida State Horticultural Society.
2. Crist, C.R. and Schoeneweiss, D.F. 1975. The Influence of Controlled Stresses on susceptibility of European White Birch Stems to Attack by *Botryosphaeria dothidea*. Phytopathology 65:369-373.
3. CSIRO. 1982. Australian Acacias. Leaflet No. 0, Revised 1982. Canberra, CSIRO.
4. De, Guzman. 1977. Potentially Dangerous Diseases of Forest Trees in the Philippines. Biotrop special publication.
5. IUFRO. 1996. Impact of Diseases and Insect Pests in Tropical Forests. Proceedings of the IUFRO Symposium 23-26 Nov, 1993. Peechi, India.
6. Josiah, S.J. and Allen-Reid, D.1991. Important Nursery Insects and Diseases in Haiti and their management. Proceedings of the first meeting of IUFRO working party, 22-30 Aug, 1990.
7. Lee, S.S. 1997. Diseases of Some Tropical Acacias in Penisular Malaysia. Proceedings of an International Workshop. Sumatra. 1996.
8. Manion, P.D. 1981. Tree Disease Concepts. Prentice-Hall, Inc, Englewood Cliffs, New Jersey 07632.
9. Mehm Ko Ko Gyi & Kyi Win. 1991. Trial Planting of *Acacia senegal* and *A. auriculiformis* in the Central Dry Zone of Myanmar. FRI.
10. Old K. M *et al*. 2000. A manual of Diseases of Tropical Acacias in Australia, South-East Asia and India. Center for International Forestry Research (CIFOR) Indonesia.
11. Saw Win & Mya Win. 1996. Site Preparations, Species and Spacing Trial for Pulpwood Plantations. FRI.
12. Tun Aung *et.al.* 1994. Study on the Quality of Gum from *Acacia senegal*. FRI.