

# Notes on Tree Diseases and Associated Microorganisms Observed from 1977 to 1985 in the Philippines

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## Introduction

The intensive and cooperative survey of diseases of woody plants in the Philippines was initially carried out by the present authors from February 2 to April 30, 1977. At that time the senior author was associated with the College of Forestry, University of the Philippines at Los Baños (UPLB), as a visiting scientist sent from the Tropical Agriculture Research Center (TARC) of Japan. In addition, the supplemental surveys were conducted by the authors from August 3 to October 2, 1977, February 2 to 13, 1981 and January 10 to February 19, 1985, as one of the activities of the RP-Japan Forest Development Project, to which the senior author was assigned as a technical consultant sent by Japan International Cooperation Agency (JICA).

A total of 38 sites were visited from which diseased materials were collected. During the surveys, a total of 134 diseases including 80 newly discovered ones affecting 76 tree species belonging to 61 genera and 30 families were recorded. Preliminary results of the surveys and identification of the associated microorganisms had been partly reported earlier<sup>1-23</sup>. Detailed record on these surveys will be published in near future in the Bulletin of Forestry and Forest Products Research Institute (FFPRI). In the present paper the

highlights of the survey results are reported.

The authors are indebted to the staff members of the College of Forestry, UPLB, the Bureau of Forest Development of the Philippines (BFD), the RP-Japan Forest Development Project, Research Division of TARC and Forest Development Division of JICA, for their generosity in providing the convenience for the surveys.

## Materials and methods

### 1) *Collection sites*

During the surveys the authors visited 38 sites of forest nurseries, natural and artificial forests, and ornamental plantations in Luzon, Cebu and Mindanao Islands as shown in Fig. 1 and Table 1. The sites were distributed in 17 provinces of the Philippines.

### 2) *Host identification and pathological studies*

Identification of host plants was done by the junior author. Isolation of microorganisms from the diseased materials was carried out mainly at UPLB-CF, the Philippines, while supplemental works were conducted at FFPRI, Japan. Microscopic examination was carried out in both laboratories of UPLB-CF and FFPRI. Inoculation tests for important or interesting microorganisms were carried out in both laboratories, to confirm their pathogenicity and to provide supplemental

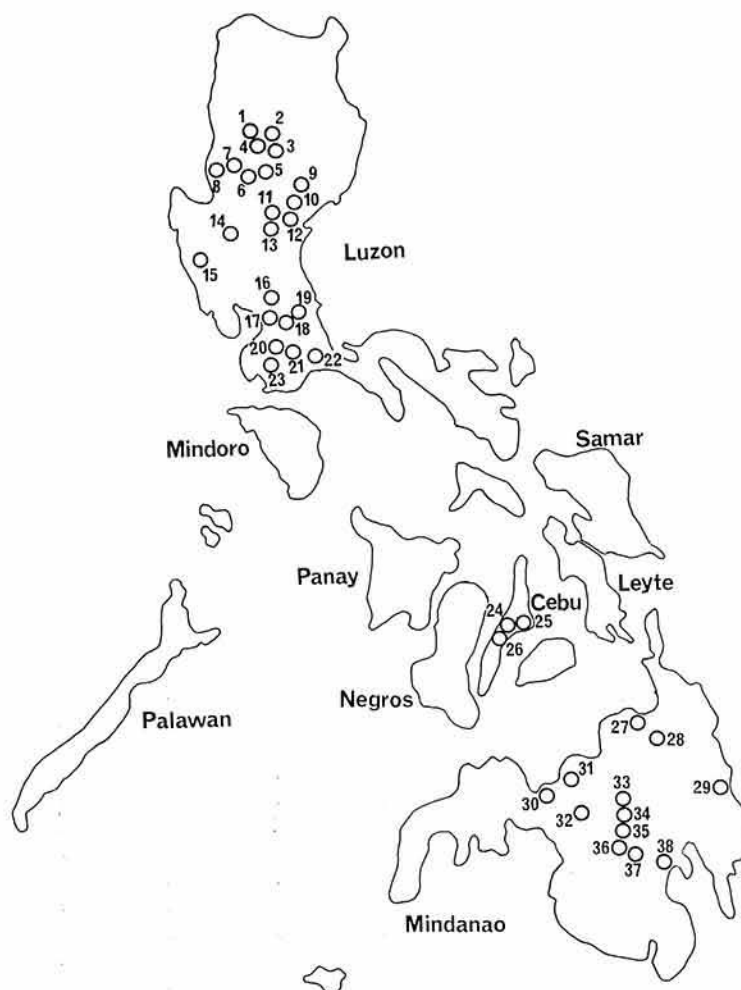


Fig. 1. Sites in the Philippines where diseased materials were observed and collected

Tabel 1. Collection sites of tree diseases visited from 1977 to 1985 in the Philippines

Island	Province	Sites where diseased materials were collected
Luzon	Benguet	(1)* Atok, (2) Itogon, (3) Bobok, (4) Baguio,
		(5) Kennon Road Camp 4
	La Union	(6) Agoo, (7) Alipang, (8) Pugo
	Nueva Viscaya	(9) Santa Fe
	Nueva Ecija	(10) Carranglan, (11) Puncan, (12) Pantabangan,
		(13) Muñoz
	Tarlac	(14) Mayantoc
	Zambales	(15) Cabangan
	Bulacan	(16) Santa Maria
	Metropolitan Manila	(17) Manila, (18) Makati, (19) Quezon
	Laguna	(20) Calamba, (21) Los Baños
	Quezon	(22) Quezon National Park
	Batangas	(23) Taal

(Table 1. continued)

Cebu	Cebu	(24) Minglanilla Camp 7, (25) Buhisan, (26) Toledo
Mindanao	Agusan del Norte	(27) Nasipit, (28) Tungao
	Surigao del Sur	(29) Bislig
	Misamis Oriental	(30) Cagayan de Oro, (31) Malasag
	Bukidnon	(32) Talakag, (33) Impalutao, (34) Malaybalay,
		(35) Bancud, (36) Musuan, (37) Cabangahan
	City of Davao	(38) Davao

\* Numbers correspond to those in Fig. 1.

**Table 2. Summary list of host plants, number of disease and associated microorganisms recorded from 1977 to 1985 in the Philippines**

Subdivision or class	Family	Host Plant				Microorganism*		
		Number of Genus	Number of Species	Number of Disease	Number of Specimen	Number of Genus	Number of Species	Uniden- tified
Gymnosperma	Araucariaceae	1	1	1	1	1	1	0
	Pinaceae	1	5	23	54	11	12	1***
	Taxodiaceae	1	1	1	1	1	1	0
Monocotyledon	Gramineae	1	1	1	2	1	1	0
Dicotyledon	Anacardiaceae	2	2	4	9	4	4	0
	Apocynaceae	3	4	4	5	1	3	0
	Betulaceae	1	3	5	22	2	2	0
	Caricaceae	1	1	2	3	1	1	1
	Casuarinaceae	1	1	1	1	1	1	0
	Dipterocarpaceae	1	1	1	1	0	0	1
	Euphorbiaceae	4	6	6	9	4	4	1
	Lauraceae	2	2	2	2	1	1	1
	Leguminosae	11	14	31	77	22	26	0
	Lythraceae	2	2	4	6	1	2	2
	Malvaceae	1	1	1	1	1	1	0
	Meliaceae	2	2	5	9	6	6	0
	Moraceae	3	4	5	5	4	4	0
	Myrtaceae	2	4	10	12	8	9	1
	Nyctaginaceae	1	1	1	1	0	0	1
	Oleaceae	1	1	1	1	0	0	1
	Rhamnaceae	1	1	1	1	1	1	0
	Rosaceae	1	1	1	1	1	1	0
	Rubiaceae	5	5	5	9	4	4	1
	Sapotaceae	2	2	2	2	1	1	1
	Saxifragaceae	1	1	1	3	1	1	0
	Scrophulariaceae	1	1	4	8	4	4	0
	Tiliaceae	2	2	2	2	2	2	0
	Ulmaceae	1	1	1	1	0	0	1
	Verbenaceae	3	3	6	19	4	5	1
	Vitaceae	1	1	1	1	0	0	1
	Unidentified	1	1	1	1	1	1	0
Total		61	76	134	270	53**	85**	15

\* Besides these organisms 2 hyperparasitic fungi were recorded on *Dendrocallamus* (Gramineae, 2 specimens) and on *Shorea* (Dipterocarpaceae, 1 specimen).

\*\* This numeral is less than the mathematical summation of the numbers listed above because the latter includes overlap of genus or species.

\*\*\* Physiological disease.

evidences for identifying them.

### Highlights of the results

A total of 270 specimens of diseases affecting 76 tree species belonging to 30 families were collected from 38 sites in Luzon, Cebu and Mindanao of the Philippines (Tables 2 and 4). These collections represented 134 diseases and 2 hyperparasites (Tables 3 and 4). The genera of pathogenic agents and their host families are also shown in Tables 2 and 4.

The various diseases may be classified into the following types; soil-borne diseases 14%, stem and twig diseases 14%, and leaf, needle and fruit diseases 72% (Table 3).

Among the diseases observed, 80 were recorded as new to the Philippines. These newly-recorded diseases, which affected 49 tree species, are as follows:

Root-knot nematode disease of *Paulownia taiwaniana* and *Psidium guajava*; charcoal rot of *Pinus caribaea*, *P. elliottii*, *P. kesiya* and *P. oocarpa*; Pythium root rot of *Pinus caribaea*; stem rot of *Swietenia macrophylla*; Botryodiplodia canker of *Acacia mangium* and *Albizia falcata*; Botryosphaeria canker of *Paulownia taiwaniana*; Phomopsis canker of *Acacia auriculiformis*, *Albizia falcata* and *Paulownia taiwaniana*; Cryphonectria canker of *Eucalyptus deglupta*; 2 dieback of *Cassia fruticosa*; twig blight of *Pterocarpus indicus*;

stem blight of *Pinus caribaea* and *Pterocarpus indicus*; dieback anthracnose of *Pterocarpus indicus*; blue stain of *Pinus kesiya*; sooty mold of *Acacia auriculiformis*, *Aleurites trisperma*, *Gmelina arborea* and *Mangifera indica*; powdery mildew of *Acacia mangium*, *Eucalyptus citriodora*, *Samanea saman* and *Tamarindus indicus*; 2 anthracnose diseases of *Hydrangea macrophylla*, *Lansium domesticum*, *Leucaena leucocephala*, *Pinus caribaea* and *Pterocarpus indicus*; rust disease of *Albizia procera*, *Alnus japonica*, *A. maritima*, *Cassia multijuga*, *Cicca acida*, *Dendrocallamus merillianus* and *Tectona grandis*; Pestalotia disease of *Anacardium occidentale*, *Calliandra haematocephala*, *Pinus kesiya* and *Psidium guajava*; yellow leaf disease of *Leucaena leucocephala*; yellow leaf spot disease of *Gardenia phyllostrei*; gray leaf spot disease of *Gmelina arborea* and *Mangifera indica*; black powdery spot disease of *Carica papaya* and *Eucalyptus* sp.; brown leaf spot disease of *Alnus japonica*, *A. maritima*, *A. nepalensis*, *Alstonia macrophylla*, *Anthocephalus chinensis*, *Eucalyptus deglupta*, *Gmelina arborea*, *Manihot glaziovii*, *Plumeria alba*, *P. rubra*, *Pterocarpus indicus* and *Vitex parviflora*; Cercospora leaf spot disease of *Lawsonia inermis*, *Mussaenda philippica*, *Nerium oleander*, *Paulownia taiwaniana*, *Persea americana* and *Zizyphus mauritiana*; leaf spot disease of *Antidesma bunius* and *Microcos stylocarpa*; 2 leaf blotch diseases of *Pterocarpus indicus*; needle blight of *Araucaria heterophylla*, *Pinus*

Table 3. Classification of diseases of woody plants observed in the philippines from 1977 to 1985

Kind of diseases		Pathogen		Host	
		Genus	Species	Genus	Species
Root	19	6	8(44)*	8	11
(Soil-borne diseases)					
Stem and twig	19	14	19(29)	10	12
(Canker and dieback diseases)					
Leaf, needle and fruit	96	36	76(197)	59	72
(Leaf and needle diseases)					
Total	134	53**	85**(270)	61**	76**

\* Numerals in parentheses: Number of specimens.

\*\* See Table 2.

**Table 4. Pathogenic agents associated with tree diseases recorded from 1977 to 1985 in the Philippines**

Group	Pathogenic agent		Host		Pathogenic agent distribution		
	Genus	Species	Genus	Species	Luzon	Cebu	Mindanao
Fungi	<i>Aecidium</i>	1	1	1(1)*	1(1)*		
	<i>Antennellopsis</i>	1	1	1(1)	1(1)		
	<i>Asperisporium</i>	1	1	1(2)	1(2)		
	<i>Asterina</i>	1	1	1(1)		1(1)*	
	<i>Botryodiplodia</i>	1	3	3(4)	1(3)	1(1)	
	<i>Botryosphaeria</i>	1	1	1(2)	1(1)		1(1)*
	<i>Caecoma</i>	1	1	1(1)		1(1)	
	<i>Calonectria</i>	1	1	1(1)			1(1)
	<i>Camptomeris</i>	1	1	1(3)	1(1)		1(2)
	<i>Ceratiasystis</i>	1	1	1(2)	1(2)		
	<i>Cercospora</i>	18	18	23(56)	11(36)	10(11)	6(9)
	<i>Colletotrichum</i>	1	2	2(2)	1(1)		1(1)
	<i>Corticium</i>	2	2	2(2)		1(1)	1(1)
	<i>Crossospora</i>	1	1	1(2)	1(2)		
	<i>Cryphonectria</i>	1	1	1(1)			1(1)
	<i>Diaporthe</i>	1	3	3(5)	1(4)		1(1)
	<i>Diatrypella</i>	1	1	1(1)	1(1)		
	<i>Ellisiopsis</i>	1	1	1(3)	1(2)	1(1)	
	<i>Exosporium</i>	1	1	1(8)	1(4)	1(2)	1(2)
	<i>Fusarium</i>	2	6	9(28)	2(21)	1(1)	2(6)
	<i>Glomerella</i>	1	6	6(12)	1(9)	1(3)	
	<i>Guignardia</i>	1	1	1(1)			1(1)
	<i>Hamaspora</i>	1	1	1(1)		1(1)	
	<i>Hemileia</i>	1	1	1(3)	1(3)		
	<i>Lophodermium</i>	1	1	3(6)	1(4)		1(2)
	<i>Macrophoma</i>	2	2	2(2)	2(2)		
	<i>Macrophomina</i>	1	1	4(4)	1(4)		
	<i>Melampsoridium</i>	1	1	2(12)	2(12)		
	<i>Meliola</i>	2	2	2(3)	1(1)	1(1)	1(1)
	<i>Mycosphaerella</i>	2	2	2(6)	2(6)		
	<i>Nectria</i>	1	1	1(1)	1(1)		
	<i>Oidium</i>	1	4	4(4)	1(4)		
	<i>Olivea</i>	1	1	1(9)	1(7)	1(2)	
	<i>Ophionectria</i> ***	1	1	1(2)	1(2)		
	<i>Periconia</i> ***	1	1	1(1)			1(1)
	<i>Pestalotiopsis</i>	4	4	4(5)	4(5)		
	<i>Phaeoisariopsis</i>	2	2	2(3)	2(3)		
	<i>Phaeoseptoria</i>	1	1	1(1)	1(1)		
	<i>Phakopsora</i>	2	2	2(2)	1(1)	1(1)	
	<i>Phyllachora</i>	3	3	4(12)	2(10)	1(2)	
	<i>Phyllosticta</i>	2	2	2(2)	2(2)		
	<i>Puccinia</i>	1	1	1(2)	1(2)		
	<i>Pythium</i>	1	1	1(1)			1(1)
	<i>Ravenelia</i>	2	2	2(3)	2(3)		
	<i>Rhizoctonia</i>	1	6	6(9)	1(5)	1(1)	1(3)
	<i>Robillarda</i>	1	1	1(1)	1(1)		
	<i>Septoria</i>	1	1	3(10)	1(10)		
<i>Uredo</i>	1	1	1(1)			1(1)	
<i>Valsa</i>	1	1	1(1)	1(1)			
<i>Volutella</i>	1	1	1(1)			1(1)	
	Unidentified	(6)	6	6(6)	(4)(4)	(2)(2)	
Alga	<i>Cephaleuros</i>	1	2	2(2)	1(2)		
Nematode	<i>Meloidogyne</i>	2	2	2(3)	1(1)		1(2)

(Table 4. continued)

Pathogenic agent			Host		Pathogenic agent distribution		
Group	Genus	Species	Genus	Species	Luzon	Cebu	Mindanao
Mite	<i>Eriophyes</i>	1	1	1( 1)		1( 1)	
Virus	Unidentified	1	1	1( 1)	1( 1)		
Mistletoe	Unidentified	1	1	1( 1)	1( 1)		
Physiological disease		1	1	1( 6)	1( 1)		1( 5)
Unidentified		(6)	6	6( 6)	(1)(1)	(3)( 3)	(2)(2)
Total		88	61**	76**(273)	65(192)	25(36)	26(45)

\* See Table 3. \*\* See Table 2. \*\*\* Hyperparasite.

**Table 5. Classification of fungal pathogens recorded from 1977 to 1985 in the Philippines**

Subdivision	Number of diseases	Pathogen		Host	
		Genus	Species	Genus	Species
Mastigomycotina	1	1	1( 1)*	1	1
Ascomycotina	30	17	21( 58)	28	31
Basidiomycotina	15	12	15( 39)	15	16
Deuteromycotina	70	20	44(148)	59	72
Unidentified	6		( 6)	6	6
Total***	122	50	81(252)	55**	70**

\* See Table 3. \*\* See Table 2. \*\*\* Included 2 hyperparasites.

*caribaea*, *P. elliotii*, *P. kesiya*, *P. merkusii*, *P. oocarpa* and *Taxodium mucronatum*, and *Macrophoma* blight of *Pinus merkusii*.

On the other hand, a total of 86 pathogens were associated with the various diseases (Table 4). They belong to 56 genera, of which 3 have not been identified. These pathogens affected 76 tree species belonging to 61 genera. Most of them were recorded in Luzon. Majority of the pathogens were fungi and they constitute 93%. The breakdown of fungal pathogens are Deuteromycetes 54%, Ascomycetes 26% and Basidiomycetes 19% (Table 5).

Ten species of fungi were described as new species from this survey. These are:

*Calonectria pini-caribaeae* on *Pinus*, *Cercospora alstoniae* on *Alstonia*, *C. philippinensis* on *Mussaenda*, *Guignardia gmelinae* on *Gmelina*, *Macrophoma luzonensis* on *Mangifera*, *Mycosphaerella luzonensis* on *Gardenia*, *M. piliostigmatis* on *Piliostigma*, *Phaeoisariopsis*

*anthocephala* on *Anthocephalus*, *Phyllosticta microcosi* on *Microcos* and *Volutella pini-caribaeae* on *Pinus*.

In addition to these new fungi, 37 species belonging to 24 genera were added to the Philippine fungal flora. They are:

*Antenellopsis vulgaris* on *Mangifera*, *Asperisporium caricae* on *Carica*, *Asterina punctiformis* on *Aleurites*, *Botryosphaeria dothidea* on *Paulownia*, *Ceratocystis ips* on *Pinus*, *Cercospora eucalypti* on *Eucalyptus*, *C. gmelinae* on *Gmelina*, *C. kurimaensis* on *Nerium*, *C. lawsoniae-albae* on *Lawsonia*, *C. paulowniae* on *Paulownia*, *C. pini-densiflorae* on *Pinus*, *C. plumeriae* on *Plumeria*, *C. pterocarpicola* on *Pterocarpus*, *C. purpurea* on *Persea*, *C. sequoiae* on *Taxodium*, *C. viticis* on *Vitex*, *C. zizyphi* on *Zizyphus*, *Cryphonectria nitschkei* on *Eucalyptus*, *Diaporthe eria* on *Acacia*, *Albizia* and *Pterocarpus*, *Diatrypella favacea* on *Cassia*, *Ellisiopsis gellesiae* on *Pterocarpus*, *Exosporium leucaenae* on *Leu-*

*caena*, *Lophodermium australe* on *Pinus*, *Macrophoma micromegala* on *Pinus*, *Melampsorium hiratsukanum* on *Alnus*, *Meliola koeae* on *Acacia*, *Olivea tectonae* on *Tectona*, *Periconia shyamala* on *Shorea*, *Pestalotiopsis disseminata* on *Pinus*, *P. heucherae* on *Psidium*, *P. langloisii* on *Calliandra*, *Phaeoseptoria eucalypti* on *Eucalyptus*, *Phyllosticta brasiliensis* on *Araucaria*, *Ravenelia berkeleyi* on *Cassia*, *Robillarda trachycarpi* on *Pterocarpus*, *Septoria alni* on *Alnus* and *Valsa kitajimana* on *Cassia*.

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