



Ministry of Forestry  
Forest Department  
Forest Research Institute



## **Collecting Information of Health Problems of Some Exotic Forest Trees and Agricultural Crops in Myanmar**



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မြန်မာနိုင်ငံရှိ သစ်တောနှင့် စိုက်ပျိုးရေးဆိုင်ရာ နိုင်ငံခြားသစ်ပင်မျိုးစိတ်များ၏  
ကျန်းမာရေးပြဿနာများကို စုစည်းတင်ပြခြင်း

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သုတေသနအရာရှိ  
သစ်တောသုတေသနဌာန

စာတမ်းအကျဉ်း

မြန်မာနိုင်ငံ သစ်တောဦးစီးဌာနနှင့် စိုက်ပျိုးရေးလုပ်ငန်းတို့တွင် နိုင်ငံခြား သစ်ပင်မျိုးစိတ်များကို ရလဒ်များမျှော်မှန်း၍ ရှေးယခင်မှ ယခုတိုင် တင်သွင်းစိုက်ပျိုးခဲ့ကြပါသည်။ ထိုနိုင်ငံခြား သစ်ပင် မျိုးစိတ် များတွင် ရောဂါပိုးမွှားများ ကျရောက်တတ်ပြီး မြန်မာနိုင်ငံရှိ အမြောက်အများ စိုက်ပျိုးသော ဧရိယာများတွင် ရောဂါပိုးမွှားကျရောက်မှုများကို လေ့လာထားပါသည်။ ယနေ့ ကမ္ဘာတွင် နိုင်ငံခြား သစ်ပင်မျိုးစိတ်များ နှင့်စပ်လျဉ်း၍ ဆန့်ကျင်ဘက်အမြင်နှစ်မျိုးရှိရာ (၁)နိုင်ငံခြား သစ်ပင်မျိုးစိတ်များသည် စိုက်ပျိုးရာ၌ ဒေသ မျိုးများထက် စွန့်စားရသည်။ (ရောဂါပိုးမွှားကျရောက်လွယ်သည်ဟု ဆိုလိုခြင်းဖြစ်ပါသည်။) (၂)မှာ(၁)နှင့် ဆန့်ကျင်သောအမြင်ဖြစ်ပါသည်။ ထိုအမြင်နှစ်ခုအပေါ် အခြေခံ၍ စိုက်ခင်းတွင် ကျရောက်တတ်သော ရောဂါပိုးမွှား သတင်းအချက်အလက်များကို စုစည်းလေ့လာထားပါသည်။ လက်ခံပင်၊ ရောဂါ၊ ပိုးမွှား၊ စာရေးသူ၊ ထုတ်ဝေသည့်ခုနှစ်တို့ကိုဖော်ပြပြီး စာအုပ်အညွှန်းများကို စာရေးသူတို့၏ အမည်အက္ခရာစဉ် အလိုက် ရေးသားထားပါသည်။ သစ်တောအပင် အော်ရီရှား၊ ယူကလစ်၊ စင်ကိုနာ၊ နှင့် ဝါ၊ ဆီအုန်း၊ အာလူး၊ ရာဘာ၊ ပဲပုပ်စသည့်စိုက်ပျိုးရေး အပင် (၂၁)ပင်တို့တွင် ကျရောက်သော ရောဂါများ၊ ထင်းရှူး၊ မယ်ဇေနှင့် ကော်ဖီ၊ ဝါ၊ ဂျုံ စသည့်အပင်တို့တွင် ဖျက်ဆီးသော ပိုးမွှားများကို လေ့လာတင်ပြထားပါသည်။ အပင်တစ်မျိုးတည်းကို အမြောက်အများ စိုက်ပျိုးခြင်းသည်သာ ရောဂါပိုးမွှားတို့ကို ဖိတ်ခေါ်ကျရောက် စေသည်ဟု ယူဆနိုင်သလို နိုင်ငံခြားမှ တင်သွင်းခြင်း၊ နိုင်ငံခြားသို့တင်ပို့ခြင်းများကို သေချာစွာ စစ်ဆေး ဆောင်ရွက်သင့်ပြီး ထိုမျိုးစိတ်များဆိုင်ရာ ရောဂါပိုးမွှားကျန်းမာရေးပြဿနာဖြစ်ရခြင်းအကြောင်းအရင်းများကို လေ့လာဆန်းစစ်သော သုတေသနလုပ်ငန်းများ ကျယ်ကျယ်ပြန့်ပြန့် ဆောင်ရွက်သွားရမည်ဖြစ်ပါသည်။ ရောနှောသီးနှံစိုက်ခင်းများတည်ထောင်ရေးကို အားပေးဆောင်ရွက်သွားသင့်ပါသည်။ စိုက်ပျိုးရေးအပင်များ အတွက် ဒေသမျိုးများ၌ ကျရောက်သော ရောဂါပိုးမွှားများကို ဤစာတမ်း၌ လေ့လာထားခြင်းမရှိသဖြင့် နှိုင်းယှဉ်တင်ပြရန် အချက်အလက်များလိုအပ်နေပါသေးသည်။

## **Collecting Information of Health Problems of Some Exotic Forest Trees and Agricultural Crops in Myanmar**

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### **Abstract**

Myanmar Forest Department and Agriculture Services introduced some exotic species with expected benefit from long time ago to until now. The exotic species were attacked by disease and pest problems. Today, it has two opposite views: exotic species plantations are at greater risk, and less risk in compare to indigenous species. Therefore, the study focused on pathogen and pest outbreak in widely planted areas to determine which view is closely related to this finding. Host, pathogen, pest, author and published year were described in the text and table. Literatures were listed and the lists of references were arranged in the alphabetical order of authors' name. Four species of forestry host (Acacia, Eucalypt, Fir-dragon, Cinchona) and twenty species of agricultural host (Cotton, Oil palm, Potato, Rubber, Soy bean, etc.) for pathogenic problems; six species of forestry host (Pine, Mezali etc.) and nine species of agricultural host (Coffee, Cotton, Wheat etc.) for pest problems were mentioned according to getting information. The conclusion from this study is: monoculture is caused increase pest problem, the risk of pest outbreak is greater in monoculture whether indigenous or exotic in forestry but it could not be concluded in agriculture as forestry because diseases and pest information of agricultural indigenous crops were not recorded to compare in this study. As well as import and export plant species should be inspected carefully at the quarantine section; research must be conducted extensively in the plantations of both indigenous and exotic species for analyzing the causes of health problems. And also, mix plantation should be encouraged and established in the future programs.

**Key Words:** Monoculture, Exotic, Indigenous, Mix plantation, Pathogen, Pest.

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## Introduction

Myanmar Forest Department introduced some exotic species for dry zone greening, medicine, fuel wood, industry such as Acacia, Eucalypt, Cinchona, Pine etc. and also Agriculture Services imported some exotic species for food, oil, fiber and industry e.g. Coffee, Cotton, Oil palm, Potato, Rubber, and etc.

Over the past few decades there has been an expansion of plantation both native and exotic species in Myanmar as well as in other regions. When extensive areas were planted up as monoculture, it was favorable to disease & pest problems. Weakness in awareness, quarantine, and surveillance to deal with bio-security issue may be health problems.

However, they are still planted due to necessary with expected benefit from long time ago to until now. Disease and pest problems of the exotic species outbreak consequently and could not be controlled effectively in nurseries and plantations.

Objectives of this paper were;

- Scientific information available on exotic plant health status in Myanmar at greater or less risk.
- Aim to safeguard the health & vitality of forests & agriculture with special references to diseases & pests
- Aim to reduce the spread and impact of diseases and pests on forestry, agriculture and the environment
- Sustainable disease & pest management of forest and agriculture developed and promoted

## Literature Review

K.s.S.Nair (2001) made a critical assessment of the risk of pest outbreak in exotic tree species in the tropical forest plantation. To date, there have been two opposing views: plantations of exotic trees are at greater risk compared to indigenous species and conversely, that exotics are at lesser risk. The species chosen were *Acacia mangium*, *Eucalyptus spp.*, *Gmelina arborea* Roxb. , *Hevea brasiliensis* Muell., *Leucaena leucocephala* (Lam.)De Wit., *Pinus caribaea* Moore, *Swietenia macrophylla* King. and *Tectona grandis* L.f. The result showed that (1) monoculture itself caused an increase in the pest problems; and (2) the pest risk of exotics was variable, for some species similar to that of native plantations, while greater or less for others. It should develop a pest risk rating system for different tree species for different locations, based on criteria.

## Methodology

This study based on the collection of pathological and entomological research papers from Forest Research Institute (FRI) and Yezin Agriculture University (YAU), and extracted the relevant information. The focus of this study was on pathogen and pest outbreak of most widely planted in Myanmar as exotics. In addition, departmental reports were also reviewed to expression in this paper.

Host, pathogen, pest, author and published year were described in the text and table. Literatures were listed and the lists of references were arranged in the alphabetical order of authors' name. Four species of forestry host and twenty species of agricultural host for pathogenic problems; six species of forestry host and nine species of agricultural host for pest problems were mentioned according to getting information.

## Results

### Forestry Sector

#### Disease Problems

From 1997 to 2001, eucalyptus plantations were established in Salu Compartment, Bago Division under the joint project of Nippon Paper Industry (NPI) and Forest Department (FD) for paper pulp. During the time, hybrid *Eucalyptus urograndis*, and *E urophylla* were infected by a root rot fungus *Cylindrocladium sp.* and *Cylindrocarpon sp.* with a threat level of 50% in the plantations. (Wai Wai Than,2000).

Myanmar Pharmaceutical Factory (MPF) received cinchona seeds through UNICEF in 1980 to supply for quinine production. The seedlings were attacked by fungi *Fusarium sp* and *Rhizoctonia sp.* in Thandaung Gyi nursery (Wai Wai Than, 2001).

Seeds from many acacia species were distributed to Myanmar by Commonwealth Scientific and Industrial Research Organization (CSIRO) for fuel, provenance trial, windbreak, shade, and papermaking. The following diseases were documented, such as powdery mildew (*Oidium sp.*) in Nyaung Shwe, black mildew *Meliola sp.* in Salu Compartment; tar spot; witche's broom; stem canker *Nectria sp.*; heart rot *Fomes sp.*, *Polyporus sp.*; and root rot *Ganoderma sp.* in Yezin (Wai Wai Than, 2003).

Seeds of fir dragon were received from China in 2003 for species trial in forest nurseries of hilly region. In 2004, needle blight *Phytophthora sp.*; root collar necrosis *Fusarium sp.* and *Rhizoctonia sp.* were detected at the seedlings of Kut Khaing with 37.23% threat level (Wai Wai Than, 2004).

## Pest Problems

Trial plots of introduced Pinus were established in the 1983-84 about 400 to 500 acres for each area in Myanmar by Asia Development Bank (ADB) assistance including exotic *Pinus khasya*. Shoot borer *Petrova salweenensis* Miller and cone borer *Dioryctria sylvestrella* Rats were found in *Pinus khasya* plantations of Kalaw and Pyin Oo Lwin in 1986. *P. khasya* of Aungban and Tigaung Taung plantations were only 8 and 32 acres respectively and there were not found shoot borer and cone borer. Prior to introduction of exotics viz. *P. caribea*; *P. elliotii*; *P. maximinoi*; *P. occerpa*; *P. khasya*; *P. patula*; no record of shoot borer attack in the indigenous *P. khasya* Royle. ex Parl plantations and also the absence of reports of shoot borer on naturally *P. khasya* in Myanmar (Aung Zeya, 1992).

*Lantana camara*, L. Sein Na Ban was brought into Myanmar by British Colonialists before the World War II for esthetic reason. But, it happened unfortunately that the species played an invasive weed in the forest plantations (Wai Wai Than, 2005).

*Leucaena leucocephala*, Lam. De Wit, Baw Za Gaing was introduced around 1978 from Hawaii for testing multipurpose and fuel wood. Its natural regeneration is very good and makes the drive out or disappearance of native undergrowth (Wai Wai Than, 2005).

*Prosopis juliflora* DC. Ganda Seinn from Israel was introduced for dry zone greening that has sprouting from vigorous root, seed, and thorn are aggressive (Wai Wai Than, 2005).

*Pennisetum spp.* (grass), Pan Myet. seeds were introduced in 1976 from Australia by Livestock Department (Animal Health Development and Artificial Insemination Project) for pasture. But, it was inversed as grass weed in teak plantations of Yangon Division (Wai Wai Than, 2008).

Introduced species *Cassia siamea* Lam, Mezali, was attacked by leaf defoliator, *Catopsilia crocale* Cramer in every cold season in Yezin (Win Win Myint, 2000).

## Agriculture Sector

### Disease Problems

Exotic commercial hybrids of tomato were mostly grown and some of those were found to be severely attacked by early blight in leaves and fruits caused by *Alternaria solani* in Yezin, Inlay lake and Chaung Oo township (Khin Hnin Yu, 2006).

*Phytophthora sp.* is one of the most important pathogenic fungi, attack various parts of the rubber causing black stripe of the tapping panel. Defoliation caused by *Phytophthora*

and yield loss due to the black stripe in Malaysia as well as in Myanmar (Maung Maung Myint, 1994).

Potato was introduced in the 19<sup>th</sup> century from China. New one was introduced from Bhutan in 1992 as resistant variety in some areas. Late blight of potato, *Phytophthora infestans* was widely distributed in planting sites, Shan State (Maung Maung Myint, 2004).

Banded leaf and sheath blight caused by *Rhizoctonia solani* Kuhn in maize plantations, Yezin. All hybrid varieties were infected (Maung Maung Thein, 2003).

Although oil palm has been introduced since 1921, new exotic variety was introduced from Costa Rica in 1996. In 2000, one of the major diseases, anthracnose *Collectotrichum gloeosporioides* could be found in Pha-auk, Mon State (Mi Khin Htay Than, 2003).

Soybean from China was mass cultivated in 1997, on which, rust caused by *Phakospora pachyrhizi* was widely occurrence in Heho and Aungban (Myint Yee, 1999).

Po Po Than (2003) mentioned plant parasitic nematodes on some economic crops. There were *Criconeoides* on citrus, maize, and sugarcane in Yezin and Nyaungpintha; *Helicotylenchus* on citrus, maize, pineapple and sugarcane in Yezin, and *Hoplolaimus*, *Pratylenchus* on cotton in Lungyaw Model Cotton Farm; *Hemicycliophora* on citrus in Yezin; *Hoplolaimus*, *Paratylenchus*, and *Tylenchorhynchus* on cashew in Okktwin; *Meloidogyne* on carrot, pineapple and tomato in Yezin; *Pratylenchus* on maize and tomato in Yezin; *Trophotylenchulus* on pineapple and tomato in Yezin; *Tylenchorhynchus* on maize, pineapple, sugarcane and tomato in Yezin; *Tylenchus* on pineapple, maize, sugarcane and tomato in Yezin ; *Xiphinema* on citrus in Yezin and orange in Shan State.

Angular leaf spot disease of cotton caused by *Xanthomonas campestris* pv. *malvacearum* was the only bacterial disease of economic important in Myanmar. New exotic varieties were multiplied for mass production in cotton research farms. They were found to be susceptible to angular leaf spot disease in Meiktila (Thet Yee Khaing, 2002).

In Myanmar, Muskmelon or netted melon has been widely cultivated since 1980s from Thailand. Downy mildew, *Pseudoperonospora cubensis* was a devastating foliar disease in Yezin (Tin Aye Aye Naing, 1999).

Sugarcane varieties from China were seriously attacked by red rot disease. Although importing new resistant varieties, usually occurred stem rot disease *Fusarium moniliforme* and red rot disease *Collectotrichum falcatum* in Phyu and Pyinmana (Yee Yee Thu, 1998).

## Pest Problems

Severity of damage caused by coffee white stem borer *Xylotrechus quadripes* chevlorat (Coleoptera: Cerambycidae) was the high incidence and great loss of yield on coffee in Pyin Oo Lwin (Aung Kyi *et.al*, 2004).

Grain borer, *Rhyzopertha dominica* (Coleoptera: Bostrichidae) was a serious pest of stored grain wheat in Yezin (Aye Aye Myint, 2003).

In Myanmar, cashew was grown in 1982, its rapid expansion and the problem of insect pests was one of the constraints in getting high yield. Eight species of insects: leaf miner *Acrocercops syngramma*; tea mosquito bug *Helopeltis antonii*; ladybird beetle *Micraspis* sp.; weevil *Apion* sp.; thrips *Selenothrips rubrocinctus*; mayfly *Hexagenia bilineata*; lace wing *Micromus tasmaniae* and spider *Lycosa* sp. were recorded in Yezin and Kyait Hto by In Kyine Khaing, (2003).

Maize weevil *Sitophilus zeamais* M. was a problem also in Yezin for the control (Khin Aye Pwint Khaing, 2002).

Groundnut is one of the most important oilseed crops. Leafhopper *Empoasca kerri* (Pruthi) was found throughout tropical countries as well as in Myanmar (Khin Mar Myaing, 2006).

Ohnmar Myo Aung *et.al*, (2004) described twenty six insect pests (19 families in 9 order) from cotton. The five major pest were aphid *Aphis gossypii*; jassid *Empoasca* sp. ; thrips *Thrips tabaci*; american bollworm *Helicoverpa ermigerc*; and pink bollworm *Pectimophora gassypiclla* in Shwedaung and Wuntwin township.

The effective cultivation of sunflower in Myanmar began in 1977 and moth *Homoeosoma nebulella* Hb. and broomrape *Orobanche cumana* were started incidence (Pau Siam Kam, 2000).

Cabbage diamondback moth, *Ptutella xylostella* (Lepidoptera: Yponomeutidae) was the most destructive Brassicae crop pest in Tatkon (Thil Bahadur, 2006).

## Conclusions and Discussions

In the forestry sector, hybrid eucalypt was attacked by root rot fungi in the plantations according to the reference of Wai Wai Than 2000. The hybrid eucalypt plantation was in Bago division. It has high rain fall and in the most of low land areas where the planted trees were infected in the rainy season. Therefore, it can be concluded that site selection was a

problem in the case. And also in the agriculture sector, hybrid tomato was attacked by early blight (Khin Hnin Yu, 2006) and new one resistant variety of potato was infected widely by late blight in planting sites (Maung Maung Myint, 2004). All hybrid varieties of maize were infected by banded leaf and sheath blight in the plantations (Maung Maung Thein, 2003). Although importing new resistant varieties of sugarcane from China were also seriously attacked by red rot disease (Yee Yee Thu, 1998). It mentioned that disease problems could not be solved by breeding until high resistant varieties were available.

K.s.S.Nair (2001) described that monoculture itself caused an increase in the pest problems. It is agreed with the author because now stem borer is a big problem in the indigenous teak pure plantations. Some scientists say “establishment of indigenous species are preferable than exotic because they are adapted to the local environment; have generally resistance to local disease and pest. It is impossible to be accepted because teak is native species and it was planted in systematically in Myanmar but stem borer occurrence is seriously in the teak plantations. It means monoculture large plantation is at greater risk in both native and exotic species. Therefore, pest risk of exotics was no differences with native plantations whether more or less. But it could not be concluded in agriculture as forestry because diseases and pest information of agricultural indigenous crops were not recorded to compare in this study.

Aung Zeya (1992) found that shoot borer and cone borer in pine plantations. No record of shoot borer attack was in indigenous *Pinus khasya* plantations and natural pine forest prior to introduction of exotic pines. The problem shows that indigenous pine was affected from exotic species and it means exotic species is greater risk in some area. At the other hand, small acres plantations were not attacked by those borers it seemed establishment of large monoculture was pointed as a problem.

Nevertheless scientists should consider not only pure plantation affect but also other factors: genetic base of the planted stock, site selection, climate change, culture practices and their environment.

However, monoculture is caused itself increase disease and pest problems, the risk of problems outbreak is therefore dynamics that should be possible to encourage and establish mix plantations for the future programs.

Exotic trees lantana, leucaena, prosopis and grass pennisetum are now stated as forest invasive species by IUCN (World Conservation Union), FAO (United Nations Food & Agriculture Organization), CAB (Commonwealth Agricultural Bureau). First they were introduced with good intension but they become aggressive, influence and control measure

was costly and not effective in the forestry. Their biological and environmental impacts would be study before introducing.

Phytosanitary certification program should be carried out more by trained personnel with adequate resources for import and export matters. To release new species or varieties, not only investigation for their adaptability and yield but also susceptibility in health and environmental impacts of exotic should be determined.

### **Recommendations**

More effort is necessary to obtain more information on introducing the exotic species, to focus on scientific findings of disease and pest outbreak in the plantations, and to analyze the causes of health problems which was with original introduced plant materials or exotic species were widely planted in an area as monoculture.

Long term surveillances are required for checking the ever increasing plant invasion or introducing.

Knowledge and expertise in undertaking impact assessments for exotic species and native species are essential in this field. Biological control and appropriate management are effective ways and less impact on environment, but it needs technologies and experiences for successful. Prediction and early detection are necessary to be warning prior to epidemic outbreak.

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**Table 1. Pathogen Incidence of Exotic Species in Myanmar**

No.	Host	Disease	Pathogen	Author
1.	<i>Lycopersicon esculentum</i> Mill. Tomato	Early blight	<i>Alternaria solani</i>	Khin Hninn Yu(2006)
2.	<i>Hevea brasiliensis</i> Muell. Rubber	Black stripe Leaf fall	<i>Phytophthora sp.</i>	M M Myint (1994)
3.	<i>Solanum tuberosum</i> L. Potato	Late blight	<i>Phytophthora infestans</i>	M M Myint (2004)
4.	<i>Zea mays</i> L. Maize	Banded leaf and Sheath blight	<i>Rhizoctonia solani</i> Kuhn	M M Thein (2003)
5.	<i>Elaeis guineensis</i> Jacq Oil palm	Anthracnose	<i>Collectotrichum gloeosporioides</i>	Mi Khin Htay Than(2003)
6.	<i>Glycine max</i> L. Soy bean	Leaf rust	<i>Phakospora pachyrhizi</i>	Myint Yee (1999)
7.	Citrus ,Maize, Sugarcane,	Parasitic nematodes	<i>Criconemoides</i>	Po Po Than (2003)
8.	Citrus, Cotton, Maize, Pineapple Sugarcane,	—    —	<i>Helicotylenchus</i>	—    —
9.	Citrus	—    —	<i>Hemicycliophora</i>	—    —
10.	Cashew, Cotton, Tomato	—    —	<i>Hoplolaimus</i>	—    —
11.	Carrot, Pineapple, Tomato	—    —	<i>Meloidogyne</i>	—    —
12.	Cashew	—    —	<i>Paratylenchus</i>	—    —
13.	Cotton, Maize, Tomato	—    —	<i>Pratylenchus</i>	—    —
14.	Pineapple, Tomato	—    —	<i>Trophotylenchulus</i>	—    —
15.	Cashew, Maize, Pineapple, Sugarcane, Tomato	—    —	<i>Tylenchorhynchus</i>	—    —
16.	Pineapple, Maize, Sugarcane, Tomato	—    —	<i>Tylenchus</i>	—    —
17.	Citrus, Orange	—    —	<i>Xiphinema</i>	—    —

No.	Host	Disease	Pathogen	Author
18.	<i>Gossypium arboretum</i> L. <i>G. barbadense</i> L. <i>G. hirsutum</i> L. Cotton	Angular leaf spot	<i>Xanthomonas campestris</i> pv <i>malvacearum</i>	Thet Yee Khaing (2002)
19.	<i>Cucumis melo</i> L. Muskmelon	Downy mildew	<i>Pseudoperonospora cubensis</i>	T A A Naing (1999)
20.	<i>Eucalyptus urophylla</i> <i>E.urograndis</i>	Root rot	<i>Cylindrocarpon</i> sp	Wai Wai Than (2000)
21.	Cinchona	Shoot blight	<i>Fusarium</i> sp, <i>Rhizoctonia</i>	Wai Wai Than (2001)
22.	<i>Acacia auriculiformis</i> A.Cunn <i>A.mangium</i>	Powdery mildew; Black mildew; Canker; Die back; Witches' broom; Heart rot;  Stem rot Root rot	<i>Oidium</i> sp.; <i>Miliola</i> sp.; <i>Nectria</i> sp.; - - <i>Fomes</i> sp.; <i>Polyporus</i> sp.; <i>Schizophyllum</i> sp; <i>Ganoderma</i> sp.;	Wai Wai Than (2003)
23.	<i>Abies fabri</i> Craib	Needle blight	<i>Fusarium</i> sp.; <i>Rhizoctonia</i> sp.; <i>Phytophthora</i> sp.;	Wai Wai Than (2004)
24.	<i>Saccharum officinarum</i> L. sugarcane	Red rot	<i>Fusarium moniliforme</i> ; <i>Collectotrichum falcatum</i> ;	Yee Yee Thu (1998)

**Table 2. Pest Incidence of Exotic species in Myanmar**

No.	Host	Insect	Pest	Author
1.	<i>Lycopersicon esculentum</i> Mill. Tomato	Leaf miners; Spide mite; Tomato mired; Cutworms	<i>Liriomyza sativae</i> , ; <i>Tetranychus sp.</i> , ; <i>Nesidiocoris tenuis</i> ,; <i>Spodotera sp.</i> ;	Anon
2.	<i>Coffea arabica</i> L.	Stem borer	<i>Xylotrechus quadripes</i>	Aung Kyi <i>et al.</i> (2004)
3.	<i>Pinus khasya</i> Royle ex Parl	Shoot borer; Cone borer	<i>Petrova salweenensis</i> ; <i>Dioryctria sylvestrella</i>	AungZeya (1992)
4.	<i>Triticum sp.</i> Wheat	Grain borer	<i>Rhyzopertha dominica</i>	Aye Aye Myint (2003)
5.	<i>Anacardium accidentale</i> Linn. Cashew	Leaf miner; Tea mosquito bug; Lady bird beetle; Weevil; Thrips; Mayfly; Lace wing; Spider;	<i>Acrocercops syngamma</i> ; <i>Helopeltis antonii</i> ; <i>Micraspis sp.</i> ; <i>Apion sp.</i> ; <i>Selenothrips rubrocinctus</i> ; <i>Hexagenia bilineata</i> ; <i>Micromus tasmaniae</i> ; <i>Lycosa sp.</i> ;	In Kyine Khaing (2003)
6.	Maize	weevil	<i>Sitophilus zeamais</i> M.	K A P Khaing (2002)
7.	<i>Arachis hypogaea</i> L. Ground nut	Leafhopper	<i>Empoasca kerri</i> Pruthi	Khin Mar Myaing (2006)
8.	<i>Gossypium spp.</i> Cotton	Aphid; Jassid; Thrips; American bollworm; Pink bollworm;	<i>Aphis gossypii</i> ; <i>Empoasca spp.</i> ; <i>Thrips tabaci</i> ; <i>Helicoverpa ermigerc</i> ; <i>Pectimophora gassypiclla</i> ;	Ohnmar Myo Aung <i>et al.</i> (2004)
9.	<i>Helianthus annuus</i> L. Sunflower	Moth Broomrape	<i>Homoeosoma nebulella</i> <i>Orobanche cumana</i>	Pau Sian Kam (2000)
10.	<i>Brassica oleracea</i> var <i>capitata</i> cabbage	Diamondback moth	<i>Ptutella xylostella</i>	T Bahadur(2006)
11.	Forest plantation	Weed	<i>Lantana camara</i> L.	WWThan (2005)
12.	Diturbed areas, Upland, Urban	Weed	<i>Leucana leucocephla</i> Lam. De Wit	WWThan(2005)
13.	Dry land	Weed	<i>Prosopis juliflora</i> DC	WWThan(2005)
14.	<i>Tectona grandis</i> L.f. Teak	Weed	<i>Pennisetum spp.</i>	WW Than (2008)
15.	<i>Cassia siamea</i> Lam. Mezali	Leaf defoliator	<i>Catopsilia crocale</i> Cramer.	Win Win Myint (2000)

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