

**IDENTIFICATION AND MANAGEMENT OF PESTS AND DISEASES IN TREE  
NURSERIES AND PLANTATIONS: REPORT ON A TRAINING HELD AROUND  
JINJA FROM 18-22 OCTOBER 2010**

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## **Executive summary**

- Commercial forestry industry has remarkably grown in Uganda over the last decade. Along with this growth are eminent risks of pests and diseases. The vast majority of private nursery operators, tree plantation managers and forestry service providers lack basic knowledge on tree pests and diseases, and there have been very limited opportunities for them to build their capacity in this critical aspect of commercial forestry.
- A five-day training was conducted around Jinja district, Uganda. The training was aimed at equipping nursery and plantation managers with basic knowledge and skills necessary for the identification and management of pests and diseases in tree nurseries and plantations. The training was conducted through class lectures and discussions, nursery and plantation visits, and laboratory examination of pest and disease specimens. A total of 15 trainees participated in the training.
- All expectations outlined by trainees were covered, except dissemination of pest and disease information to tree growers and/or communities which was outside the scope of this training. We suggest that this should be taken into consideration in future training, especially of cadres involved in forestry extension.
- Trainees showed remarkable interest in learning and were enthusiastic to apply the knowledge and skills gained. Because pest and disease situations are dynamic, the trainees will require retooling as new pest and disease problems and solutions emerge.
- Considering that several nursery and plantation enterprises in Uganda still lack the knowledge and skills for diagnosing and managing pest and disease problems, we strongly recommend a similar course for those who missed the training reported here.
- The topics covered in this training are essential for pest and disease management. The possibilities of developing a standard training syllabus or training manual integrating these topics should be explored by key players in commercial forestry industry in Uganda such as the Uganda Timber Growers Association (UTGA), SPGS and Makerere University.
- Similar training can only be sustainable through active partnership between owners of nursery and plantation enterprises, training institutions and agencies championing commercial forestry. Umbrella associations of nursery and/or plantation owners such as UTGA should take the lead in sensitising their members of the importance of pest and diseases in their enterprises and the need to build capacity of their field staff in this discipline.

## CONTENTS

	Page
Executive summary.....	i
1.0 Introduction.....	1
2.0 Training Genesis and arrangement .....	1
3.0 Aim and objectives of training .....	2
4.0 Course details.....	2
5.0 Conclusions and recommendations.....	4
6.0 Acknowledgements.....	6
<b>Figures</b>	
Figure 1: Pictorials of field and laboratory activities.....	5
<b>Appendices</b>	
Appendix 1: Daily training programme.....	7
Appendix 2: Trainees' expectations.....	8
Appendix 3: Trainees' aspirations.....	9
Appendix 4: Questions and Answers.....	10

## **1.0 Introduction**

Over 20,000 ha of forest plantations have been established by private tree growers in Uganda in the last decade, and there is an upsurge of interest from the private sector in commercial forestry. Numerous private tree nurseries have also emerged in the country to supply the much needed planting stock. However, increasing tree nurseries and plantations in landscapes also increases the resources for tree pests, and therefore the risks for pest and disease outbreaks. Such tree health problems may be aggravated by several factors, for example, poor silvicultural practices, monoculture, planting trees in marginal areas and climate change.

Recent outbreaks of the conifer aphid, *Cinara cupressivora*, on cypress in eastern and central Africa, the sirex wood wasp, *Sirex noctilio* and *Fusarium* on pines in South Africa, and now the worldwide infestation by the gall-forming wasp, *Leptocybe invasa* on *Eucalyptus* illustrate how tree pest and disease problems raise serious concern to developers of tropical tree plantation enterprises. It is therefore imperative that nursery and plantation managers as well as their junior staff are equipped with basic knowledge of tree health problems for timely management interventions. In Uganda, the vast majority of private nursery operators, tree plantation managers and forestry service providers lack basic knowledge on tree pests and diseases, and there have been very limited opportunities for them to build their capacity in this critical aspect of plantation forestry.

## **2.0 Training genesis and arrangement**

The training was conceived by SPGS and conducted under a contract between the SPGS and Assoc. Prof. Philip Nyeko, in which the latter was the contractor. The contractor was tasked to:

- Facilitate a training course for SPGS staff and Clients' managers in identification and management of pests and diseases affecting tree plantations and nurseries in Uganda.
- Conduct the course from 18<sup>th</sup> to 22<sup>nd</sup> Oct. 2010 around Jinja. Note: SPGS was to organize venue(s), participants and transport to and from Jinja.
- Prepare handouts/training manual to be given to the trainees during the training course.
- Conduct a short test at the end of the course to appraise the trainees' understanding of the contents of the course.
- Prepare a concise report (max. 10 pages) of the training for SPGS with recommendations for future courses.

### **3.0 Aim and objectives of training**

The aim of the training was to equip participants with basic knowledge and skills necessary for the identification and management of tree pests and diseases. Specifically, the training focused on:

- (i) Recognition, interpretation and diagnosis of pest and disease problems in tree nurseries and plantations based on symptoms and signs
- (ii) Procedures of pest and disease sample collection, packaging and submission for laboratory diagnosis
- (iii) Basic principles and practice of pest and disease management in tree nurseries and plantations

Emphasis was placed on existing tree pest and disease problems in Uganda, but potentially threatening ones from other countries were also discussed. This was the first training organised for private tree growers in Uganda on tree pest and disease problems.

### **4.0 Course details**

This training was conducted around Jinja district, Uganda from 18 – 22<sup>nd</sup> October 2010. A total of 15 trainees attended the training, 4 of whom were from the SPGS and 11 were nursery and/or tree plantation managers of different private enterprises. The methods used in the training included:

- Presentations and provision of handouts by facilitators
- Class discussions
- Field visits to tree nurseries and plantations,
- Laboratory (naked eye and microscopic) examination of pest and disease specimens
- General question and answers
- Written test

A detailed programme for the training is provided in Appendix 1.

Prior to any presentation by the facilitators, trainees were asked to list their expectations of the training. Trainees' expectations included understanding the difference between tree pests and diseases, learning about tree pest and disease diagnosis and management, examples of common tree pests and diseases in Uganda and other countries, sources of technical advice on tree pests and diseases, how to disseminate tree pests and disease information to tree growers, and sharing information on nursery and plantation practices (Appendix 2).

Lectures presented by facilitators with class discussion included the following:

- (i) The concept of tree health: definitions (e.g. tree health and tree ill-health), abiotic and biotic causes of tree ill-health, categories of tree ill-health, recognising features of ill-health, and steps in diagnosing tree ill-health.
- (ii) Introduction to tree pathogens. This mainly focused on important definitions (e.g. tree disease, symptoms and signs), causative agents of tree diseases and their mode of infection, types of tree diseases, and environmental and cultural practices affecting build up of tree pathogens.
- (iii) Introduction to entomology: description of the general features of insects, definition of insect pests and why they damage trees, factors that may influence pest problems, and description of symptoms and signs of different types of insect damage on trees.
- (iv) Tree nursery and plantation diseases: examples of tree diseases in Uganda and relevant ones from other countries with emphasis on typical symptoms and signs of infection. Outline of specific management strategies.
- (v) Tree nursery and plantation pests: examples of tree pests in Uganda and threatening ones from other countries with emphasis on pest identity, typical symptoms and signs of infestation, host range, distribution, and damage type and magnitude.
- (vi) Collection and submission of pest and disease samples for diagnosis: access to diagnosis and advisory services, types of sample, collection of samples, preparation and dispatch of samples, feedback information and information checklist
- (vii) Management of pests and diseases in tree nurseries and plantations: definition and approaches of pest and disease management, pest and diseases in forest management, considerations for pest and disease management, stages of pest and disease considerations in forest management (planning, nursery, plantation), predisposing factors of pests and diseases in nursery, pest and disease management in nursery (physical/mechanical, silvicultural, folk medicine and chemical methods), pest and disease management in tree plantations (silvicultural, folk medicine, biological, host resistance and chemical methods), case studies.

Field visits were made to tree nurseries and plantations belonging to Nileply in Jinja and Green resources in Mayuge district. Various insect pest and disease problems were observed and discussed in the field. These included, among other, *Leptocybe invasa* and termite infestations on *Eucalyptus*, *Botryosphaeria* canker on *Eucalyptus*, leaf spots and blotching on *Eucalyptus*, caterpillars on pine seedlings, wilt on pine (Figure 1). A laboratory practical session was

conducted to closely examine specimens collected from the field using naked eyes, hand lenses and microscopes. Trainees individually examined specimens (Figure 1 k and l) and presented to class the symptoms and signs of pests and diseases observed on selected specimens.

In concluding the training, a review was made of the lessons learnt and trainees were asked about their aspirations. The specific responses are provided in Appendix 3. In general, the trainees were confident that they had gained knowledge and skills on tree pests and diseases, which they aspire to use in their various job requirements. Trainees were anxious to pass the knowledge and skills that they had gained to their colleagues and communities or individuals in need. However, the training facilitators cautioned the trainees to always pass the correct information and be honest to accept what they do not understand. Trainees were also given the opportunity to ask questions on issues they may require some clarifications. The questions raised and answers provided are presented in Appendix 4. Finally, the trainees were evaluated using a written test that comprised both theory and practical. The best performer in the test was awarded a book on plantation forestry in the tropics.

## **5.0 Conclusions and recommendations**

- The training was conducted successfully. All expectations of trainees were covered, except dissemination of pest and disease information to tree growers and/or communities which was outside the scope of this training. We suggest that this should be taken into consideration in future training of cadres involved in forestry extension.
- Trainees showed remarkable interest in learning and were enthusiastic to apply the knowledge and skills gained. Pest and disease situations are dynamic. The trainees will require retooling as new pest and disease problems and solutions emerge.
- The class size was limited to 15 trainees in order to optimise the learning process. Considering that several nursery and plantation enterprises in Uganda still lack the knowledge and skills for diagnosing and managing pest and disease problems, we strongly recommend a similar course for those who missed the training reported here.
- The topics covered in this training are crucial for the development of any nursery and plantation enterprise. The possibilities of developing a standard training syllabus or training manual integrating these topics should be explored by institutions such as the Uganda Timber Growers Association (UTGA), SPGS and Makerere University which are championing commercial forestry.



(a) Who observed these symptoms before?  
(Severe *Leptocybe* galls and leaf spots)



(b) Caterpillar on pine seedling



(c) Closer diagnosis



(d) Diagnosis may require hand lens



(e) *Botyrosphaeria* canker on *Eucalyptus*



(f) Pine wilt



(g) Digging out roots for diagnosis



(h) Termite damage on *Eucalyptus*



(i) Termite identification



(j) Diagnosis of *Leptocybe* attack



(k) Lab description of symptoms and signs



(l) Microscopy

Figure 1: Pictorials of field and laboratory activities.



## **6.0 Acknowledgements**

We gratefully thank SPGS for providing us the opportunity and financial support to facilitate the training. We are also grateful to the trainees for the keen interest exhibited during the training, and the employers of the trainees for supporting their staff.

### Appendix 1: Daily training programme

	Monday	Tuesday	Wednesday	Thursday	Friday
Date	18 <sup>th</sup>	19 <sup>th</sup>	20 <sup>th</sup>	21 <sup>st</sup>	22 <sup>nd</sup>
Morning	General Introductions Course expectations Introduction to tree health Introduction to Forest pathology	Lecture and discussion on tree nursery and plantation diseases	Field lecture on collection and submission of samples for disease and pest diagnosis  Field work (Busoga Forest Co.)	Lab exercises	Review of lessons learnt viz a vis aspirations  Q & A session  Course Evaluation
	Introduction to Forest Entomology	Lecture and discussion on tree nursery and plantation pests			Test
Lunch break					
Afternoon	Field reconnaissance Nileply Nsuube & Kagoma	Field work (nursery) Nileply Kagoma	Field work (BFC)	Lecture and discussion on management of pests and diseases in tree nurseries and plantations	Return to Kampala

## **Appendix 2: Trainees' expectations**

- Learn how to fast control tree pests and diseases
- Know the difference between tree plantation pests and diseases
- Learn more about tree pests, their damage and solutions
- Know courses of pest and disease problems
- Learn about yellowing and drying of pine trees
- Learn about trees dying from their tip only
- Control measure for crickets in nurseries and plantations
- Get information on control measures for a beetle damaging *Jatropha* species
- Learn how to control blue gum chalcid and pine wilt
- Learn how best to disseminate pest and disease information to tree growers and/or communities
- Learn methods of pest and disease identification
- Understand symptoms of tree pests and diseases
- Share experience on nursery and plantation activities
- Learn about soil types best suited for nursery seedlings
- Learn about common pests and diseases in tree nurseries in Uganda
- Learn about prevention and control of pests and diseases using chemical and biological methods
- Learn about common pests and diseases of trees
- Get information on sources of help for tree pest and disease problems
- Get information on sources of chemicals for controlling tree pests and diseases
- Understand diagnosis of pests and diseases that affect seedlings and trees
- Understand procedures of collecting and handling pest and disease specimens, and where to take them for solutions
- How to monitor affected trees and what aspects to be recorded
- Prevention of pests in nurseries
- Practices that promote pest and disease development and spread in nurseries and plantations
- Be informed on sources of packaged mycorrhiza for pines in Uganda, if any

### **Appendix 3: Trainees' aspirations**

- To be a better nursery manager, ensuring especially prevention of pests and diseases in nurseries
- Train other people on pests and diseases in nurseries
- Pass on pest and disease diagnosis and management skills to communities planting trees
- Enrich SPGS training modules and guidelines
- Explain to tree planting group members the causes and management of common pest and disease problems such as the blue gum chalcid
- Use experience gained in the training for teaching Forestry college students
- Link up with extension agents to disseminate pest and disease knowledge and skills to tree farmers
- Refer farmers, where necessary, to relevant pest and disease experts or institutions
- Request employer for allocation of funds for managing pest and disease problems
- Make more money through better management of nursery pests and diseases
- Train other nursery operators on pest and disease management knowledge and skills
- Be a key contact person for group members on pests and disease problems

## **Appendix 4: Questions and Answers**

### ***1. How can trainees get to know information on training opportunities?***

Trainings are often advertised extensively. There are several ways of getting information about training, e.g. through personal contacts with individuals working in training institutions and professionals in the discipline of training sought; surfing the Internet and WebPage of training institutions; reading newsletter adverts, etc. Trainees need to be proactive in looking for training rather than waiting to be told of opportunities available.

### ***2. Does the recommendation of chemicals for controlling termites mean that other methods have failed?***

The use of chemicals is one possible termite control option. Chemicals must be applied in an integrated manner, taking into account best forestry practices that are critical in preventing or reducing termite damage.

### ***3. What can be recommended to Nileply regarding the canker disease on their Eucalyptus? Should they cut the trees or what?***

Because *Botryosphaeria* may infect trees without disease symptoms developing, it is not advisable for Nileply to cut only trees with visible symptoms of the canker disease in order to reduce the spread of the disease. Apparently healthy trees may be infected by the fungus already! The decision to cut the trees or not depends on the objective of growing them. *Botryosphaeria* canker rarely kills trees. It may be advisable to leave the trees to reach merchantable size and clear cut them for various products (e.g. firewood, transmission poles and veneers) depending on their quality of wood.

### ***4. Is it advisable for people to collect Pine seeds from local mother trees?***

No. The mother trees of the pine species we have in Uganda do not produce improved seeds. The quality of the trees from such seed sources is very poor compared to improved seeds imported from e.g. Australia and Brazil. Even trees we are growing currently from such improved seeds will not produce for us improved seeds. So we either continue importing improved seeds or initiate serious tree breeding programmes in the country.

### ***5. Do the facilitators of this training have a provision to check on tree farmers and nursery operators for tree and disease problems?***

Yes. The primary responsibilities of teaching staff at Makerere University are teaching, research and outreach. On-spot pest and disease assessment and advice to tree farmers fall directly under outreach. However, the University can only provide time and personnel. This means that farmers cater for other costs that may be necessary for the outreach services.

### ***6. If one cuts down a Eucalyptus stand infested by the blue gum chalcid, how long should s/he wait before planting the site again with Eucalyptus?***

The issue here should not be how long to wait because the pest is already in the landscape. Rather one should consider whether or not to plant the germplasm that was heavily infested by the pest. Before deciding to plant the same germplasm, considerations must be given to what went wrong in the first planting. E.g. were planted seedlings infested in the nursery, is the germplasm suitable for the site, etc. If best practices were followed in the first planting, and one only needs to plant *Eucalyptus*, it may be advisable to plant *Eucalyptus* germplasm (species, provenance, clones or hybrids) which are resistant or highly tolerant to the chalcid, and suitable for the site.