Sub-theme:

Pest Surveillance in Phytosanitary Systems

Title:

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Tree seed-borne fungal pathogens associated with Indian Sandalwood (*S. album*) imported from India.

Presented by:

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Introduction

- The Indian sandalwood (*Santalum album*) is in the family Santalaceae which are hemiparasites
- Indian sandalwood (S. album) is found in the tropical dry deciduous forests of India.
- It is the most valued South Indian tree which is the source of the world famous “Indian sandal wood oil” a major ingredient in cosmetics, medicines and perfumes produced worldwide.
- Seed is the most preferred propagation material for production of seedlings due to ease of storage.
- Tree germplasm health has received less attention compared to agricultural crops

Introduction cont'

- The first step in disease control is to prevent movement of the pathogens from infested to non-infested areas by restricting the transfer of seeds, vegetative propagules, plants and plant products.
- NEMA authorized the introduction of Indian Sandalwood and the authorization was granted to Sandalwood Plantations Ltd in year 2020. (EIA done)
- The seeds were imported by KEPHIS and KEFRI from Jajan nursery garden orchard, India.
- Sandalwood Plantations Ltd therefore requested KEFRI to undertake seed health testing before raising seedlings for planting.
- MOU with KEFRI

Problem Statement

- The term seed-borne describes the state of any micro-organism being carried with, on or in the seed.
- Seed-borne micro-organisms may reduce germination and seed longevity in storage of all types of seeds
- Infestation can occur during harvesting, processing and storage.
- Seed can also distribute pathogens to new areas.
- Seed borne pathogens present a serious threat to seedlings establishment

Justification

- Seed borne pathogens can result to seed rots, reduced germination and pre and post emergence loss.
- Fungal attack on seeds caused by Fusarium, Alternaria and Aspergillus were found on *S. album* in India.
- There is no evidence that the seeds were tested during importation.
- It is possible for pathogens to enter a country even after Phytosanitary measures have been taken into account
- Seed health testing is important in order to reduce risks of introduction of pathogens.

Objectives

- To assess the presence, isolate and identify seed-borne fungi in seeds of Indian Sandalwood (*Santalum album*) imported from India at the Kenya Forestry Seed Centre.

Methodology

- A total of 650 seeds of *S. Album* from Dindigul, India were collected from the Seed Centre at KEFRI after random sampling using a seed sampler.
- The seeds were tested using a previously developed Standard Operating Procedure (SOP). The protocol involved Standard blotter and Agar plate methods.
- For agar method, 100 seeds of *S. album* were surface sterilized with 2.5% sodium hypochlorite for 10 minutes, rinsed with sterile distilled water, blotted dry with filter papers and placed on Malt Extract Agar (MEA) media. Another 100 non-surface sterilized seeds were placed in Malt Extract Agar. seeds were placed in each petri dish

Methodology cont’

- For the blotter method, 200 seeds were treated as for the agar method (surface sterilized with 2.5% sodium hypochlorite for 10 minutes) but were not blotted but placed on wet filter papers using distilled water in germination trays. Another 200 seeds were set without surface sterilization.
- All the fungi that grew were identified to genera level and recorded as percentage occurrence in all the treatments.

Results

- The results of the tests showed that several fungi were present on the tree seeds
- The blotter test gives an indication of the infection of the seed as shown by the presence of mycelium and fruiting bodies
- This method resulted to 26% of non-infected seeds after surface sterilization indicting that these were likely to germinate
- The main fungi found were in the genera Aspergillus, Fusarium, Penicillium and Rhizopus.
- The most prevalent were Aspergillus and Fusarium.
- Aspergillus fungi isolated may represent several species.

Results cont'

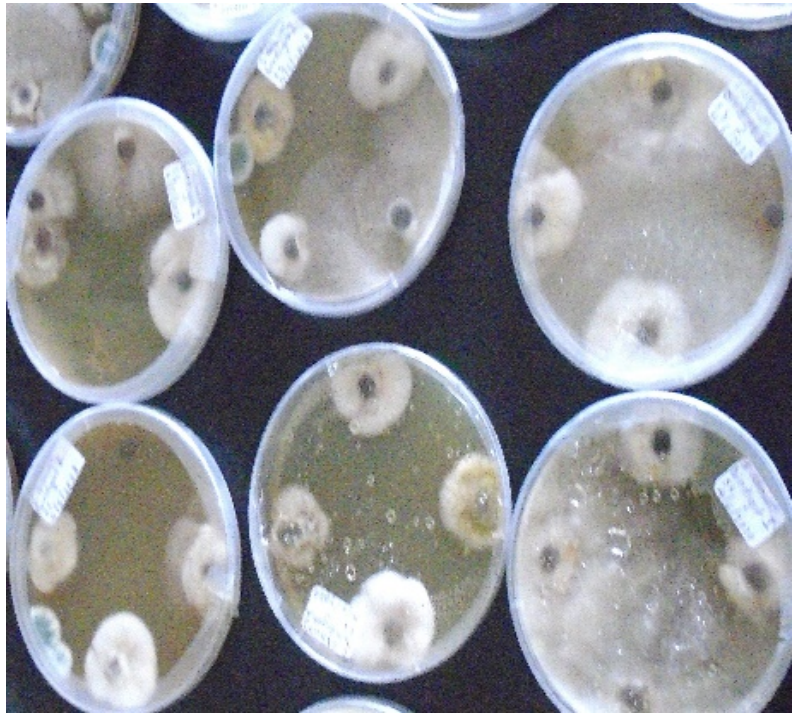
Percentage (%) fungal occurrence on Surface Sterilized (SS) and Non Surface Sterilized (NSS) seeds of *Santalum album* (Indian Sandalwood) on different media

Species	***Santalum album* (Indian Sandalwood)**			
Media	**Standard Blotter method (%)**		**Agar plate method (%)**	
Fungi genera	**SS**	**NSS**	**SS**	**NSS**
Fusarium	31	-	49	11
Botryosphaeria	-	-	11	-
Aspergillus	17	31	13	2
Rhizopus	15	69	18	87
Penicillium	1	-	-	-
Rot	-	-	3	-
Other	-	-	5	-
No. infected	64	100	99	100
Non infected	26	-	1	-
Total	100	100	100	100

Results cont’

S. album seeds

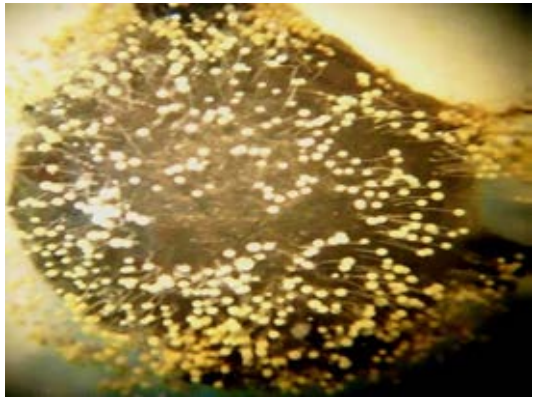
Blotter method



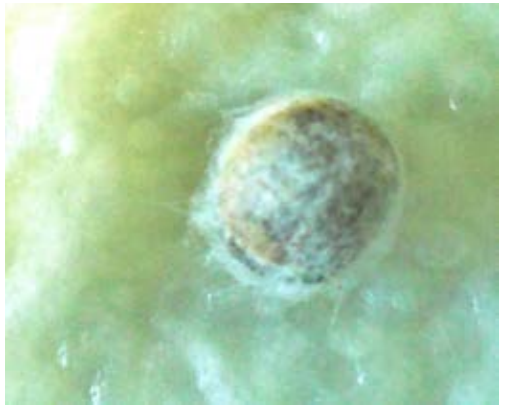
Agar plate method

Results cont’

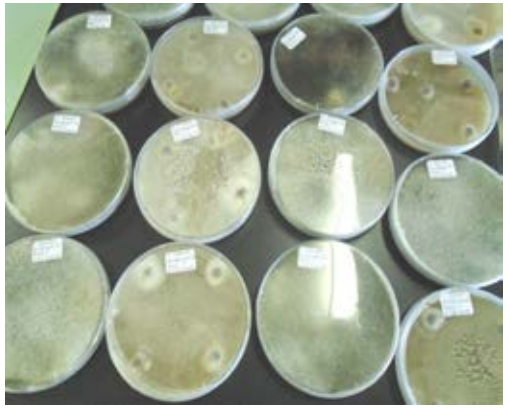
Isolation



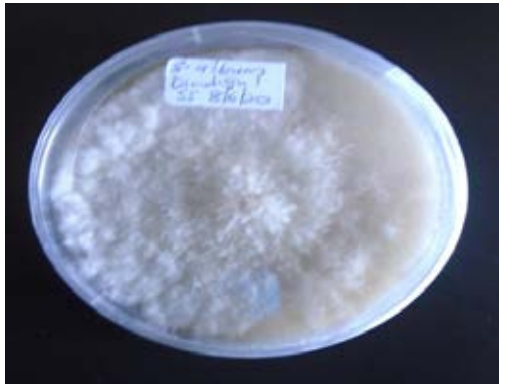
Aspergillus

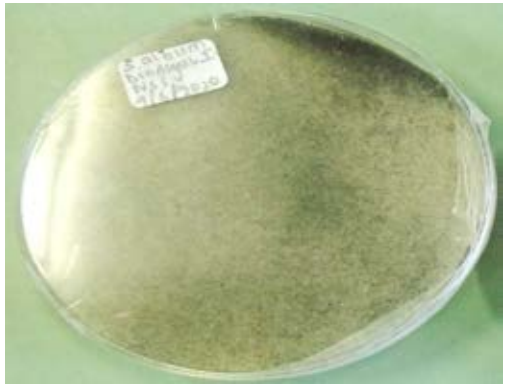


Fusarium



Rhizopus





Conclusion

- The blotter and agar methods were able to detect seed-borne fungi on seeds of Indian Sandalwood (*S. album*).
- Various fungi were isolated from *S. album* seeds
- The high infection of seeds by fungi observed was likely to reduce percentage germination after sowing.

Recommendations

- In order to increase germination, it is important to apply a fungicide before sowing.
- Some of the fungicides that can be used are: Benomyl, Bavistin (Carbendazim), Apron star, Seed Plus and Murtano.
- After the tests and recommendation, Benomyl (Ridomil) and Bavistin were applied to the seeds before sowing in the nursery.

Application of fungicide

Germinated seedlings

S. album seedlings in the nursery

Acknowledgements

Theme: *"Enhancing Phytosanitary Systems for Healthy Plants, Safe & Sustainable Trade"*
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