



PREVALENCE, VARIABILITY AND MANAGEMENT OF BEAN SCAB (*Elsinoë phaseoli*) OF COMMON BEANS (*Phaseolus vulgaris*) IN KENYA

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Project site: Kakamega County

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BACKGROUND

- 2019 Masters research been varieties across different environments and planting times
- Bean scab was the stand-out diseases out doing Anthracnose, CBB, ALS and BMVs
- First described by Jenkins (1933) as occurring on Lima beans with *Elsinoë phaseoli* as the causal agent. Jenkins *Elsinoë* did not infect common beans.
- Scab on common beans unofficially reported in Zimbabwe (Then Rhodesia) in 1948 then unofficially reported in Kenya in a 1979.
- First official report in South Africa by A. J Philips in 1994. Base studies on its epidemiology
- Unofficially reported in Uganda in 2016 affecting cow pea. Genotyping not done.
- Scab of Cow pea also reported in West Africa.
- *E. phaseoli* for common beans appears to be endemic to Africa.

General objective: To improve common bean productivity by better understanding the prevalence and variability of bean scab causing yield losses in beans and available management options for the disease.

To determine the prevalence of *Elsinoë phaseoli* in Kenya

- Survey (**Mapping Prevalence + Farm Practice Questionnaire**)

To determine the variability of *Elsinoë phaseoli* in Kenya

- **Phenotyping + Genotyping + Pathogenicity**

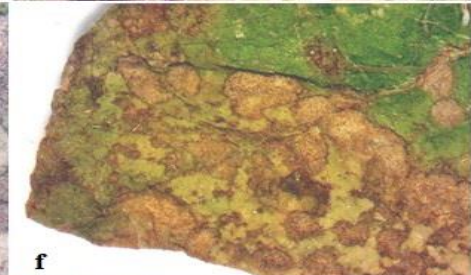
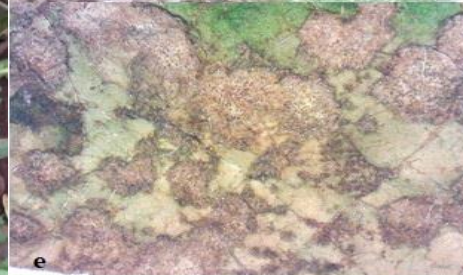
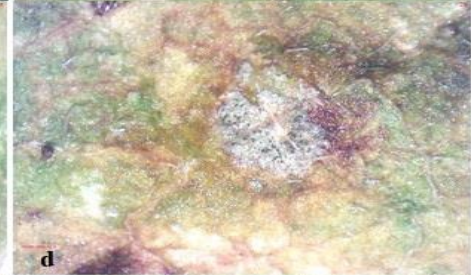
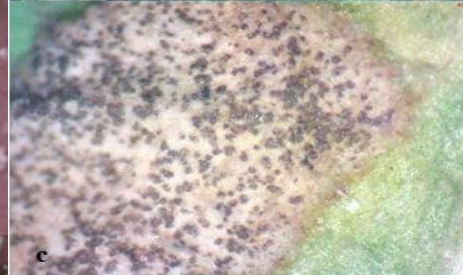
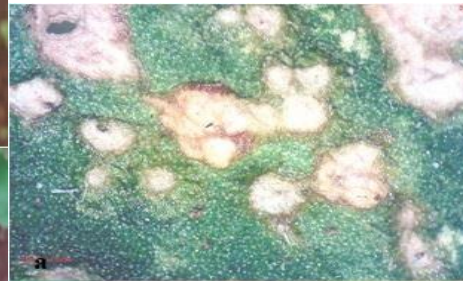
To determine effective management options for the control of bean scab

- **Inoculum Source + Efficacy**

1. SYMPTOMS



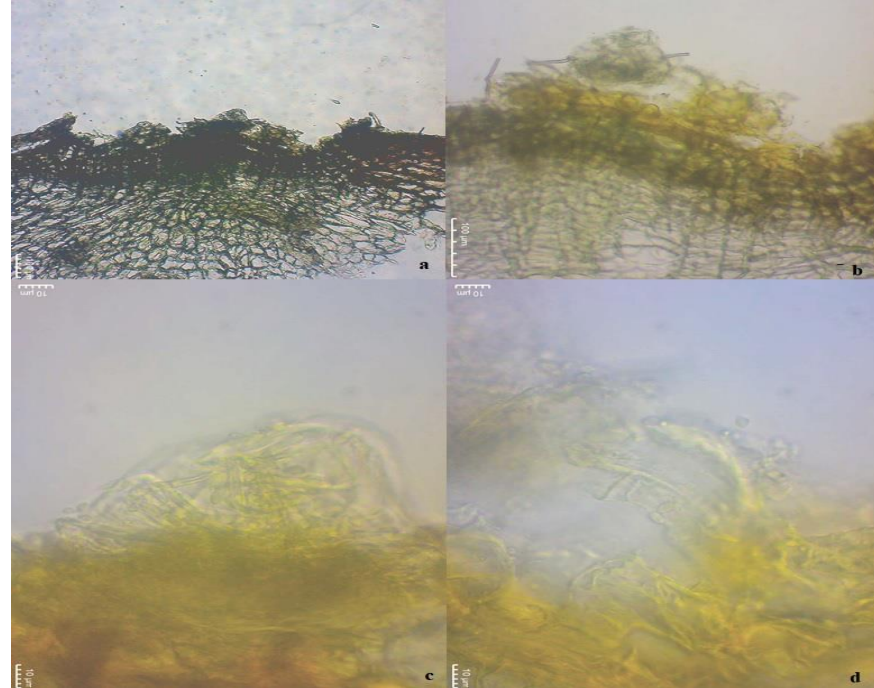
On leaves



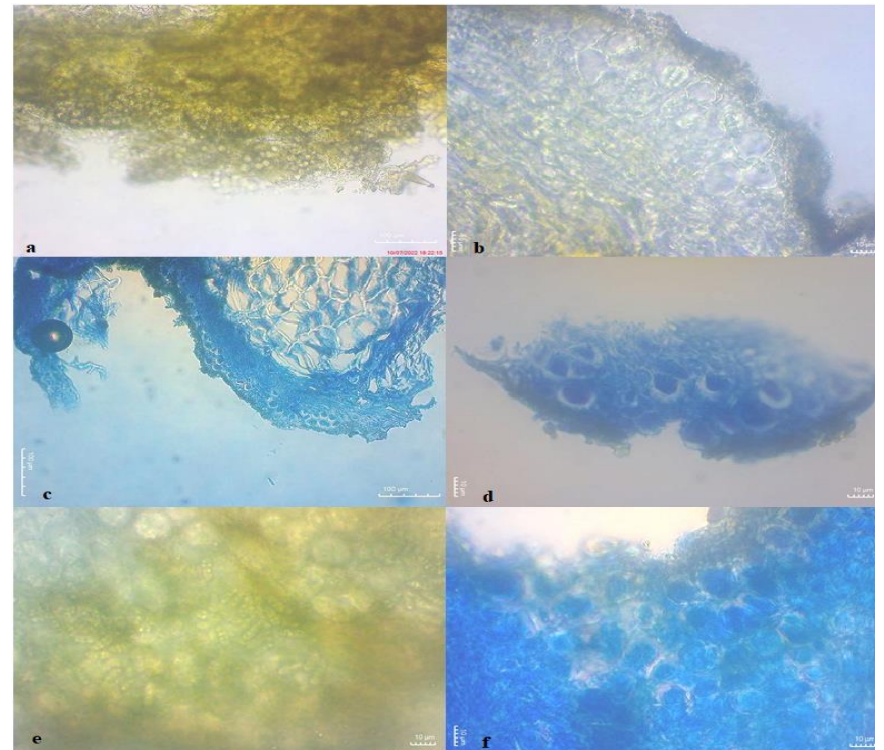
On Pods



2: MICROSCOPY



a-c, acervuli. d, Few hyaline conidia seen in acervuli



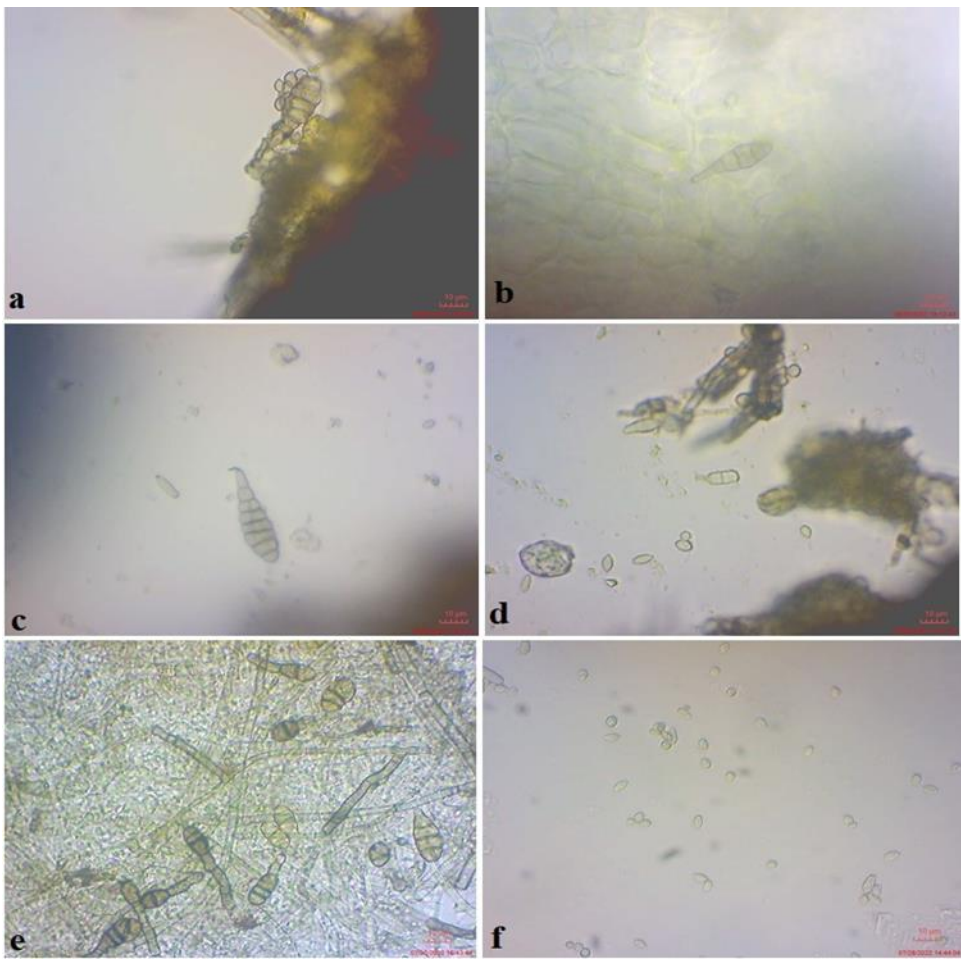
a, Ascomata + b, double walled asci . C-d, stained asci. e, ascospores

STEP 3: CULTURE MORPHOLOGY CHALLENGES

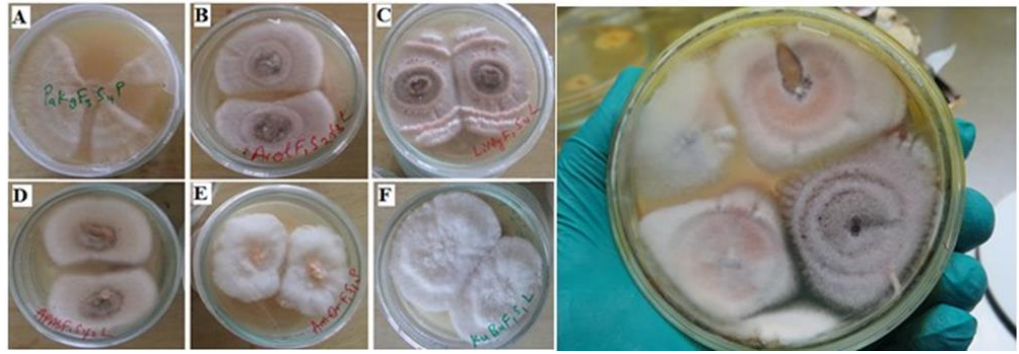
- Contaminants:
- slow growing
- Fertile structures often absent
- Lack of information and Reference points.
- Misinformation
- Time consuming process



List of protocols tried

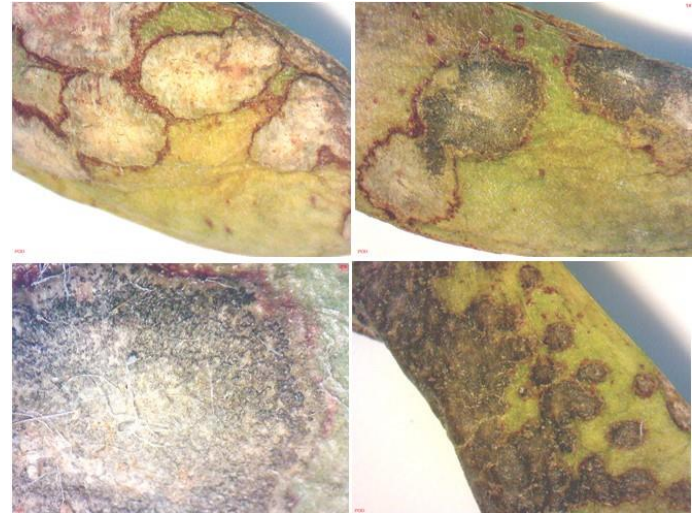


ATTEMPTS	SOURCE	APPLICATION	LESION TYPE	MEDIA	INCUBATION	LIGHT REGIME	PETRI DISH SIZE	RESULTS	CHALLENGE
Cut + Agar Block + Plate	Fan et al (2017)	General Elsinoe	Mainly pod and Stem	PDA, ACIDIFIED PDA	Desktop	12:12	90mm	"Unsuccessful" but contaminant free	Often Nothing Grew
Plating Lesions	Afutu (2016)	Cow Pea Scab	Mainly pod and Stem	PDA, ACIDIFIED PDA	Desktop	12:12	90mm	"Successful"	Fast Growing ("Tire 1") Contaminants
Drop Touch Technique	Own	N/A	Mainly pod and Stem	PDA, ACIDIFIED PDA	Desktop	12:12	90mm	Seemingly Unsuccessful but contaminant free	Reduced "Tire 1" contaminants. Favored "Tire 2" fungi
Diverse Media	Various sources + Expert advise + Own Modifications	Both Elsinoe and non-Elsinoe Isolation	Mainly pod and Stem	CMA, RWA, MEA, Full PDA, Half PDA, Acidified PDA	Desktop	12:12	90mm	"Unsuccessful" but varied effects on contaminants	Time consuming- Different Media + Different Fungal Morphological characteristic.
Streak 1	(1932) + Phillips (1994) + Schepher (2013)	Elsinoe phaseoli + Elsinoe pyri	Leaves + Acervuli Presence	PDA + Antibiotics	Desktop + Oven	12:12 + Darkness	90mm	"Unsuccessful"	Aggressive Bacterial Contamination + Crowded plate with both 10ul + Sul Streaks
Streak 2	(1932) + Phillips (1994) + Schepher (2013)	Elsinoe phaseoli + Elsinoe pyri	Leaves + Acervuli Presence	PDA + Antibiotics + Lactic Acid	Desktop	12:12	150mm		Aggressive Fungal Contaminants
Streak 3	(1932) + Phillips (1994) + Schepher (2013)	Elsinoe phaseoli + Elsinoe pyri	Leaves + Acervuli Presence	PDA + Antibiotics + Lactic Acid	Desktop THEN oven	12:12 THEN Darkness	150mm		Aggressive Bacterial Contamination
Streak + Media on Top*	own	N/A		PDA + Antibiotics + Lactic Acid	Desktop	12:12	150mm		Often Nothing Grew
Streak 5ul*	Modified Schepher (2013)	Elsinoe pyri	Leaves + Acervuli Presence	PDA + Antibiotics	Oven	Darkness	150mm		Crowded plates
Whole leaf plating	Own	N/A	N/A	N/A	N/A	N/A	150mm	Unsuccessful	Aggressive Contaminants
Tissue Sporulation Stimulation	Modified Schepher (2013)	Elsinoe pyri	Leaves	N/A	N/A	N/A	N/A	"Unsuccessful"	Leaves overgrown by contaminants

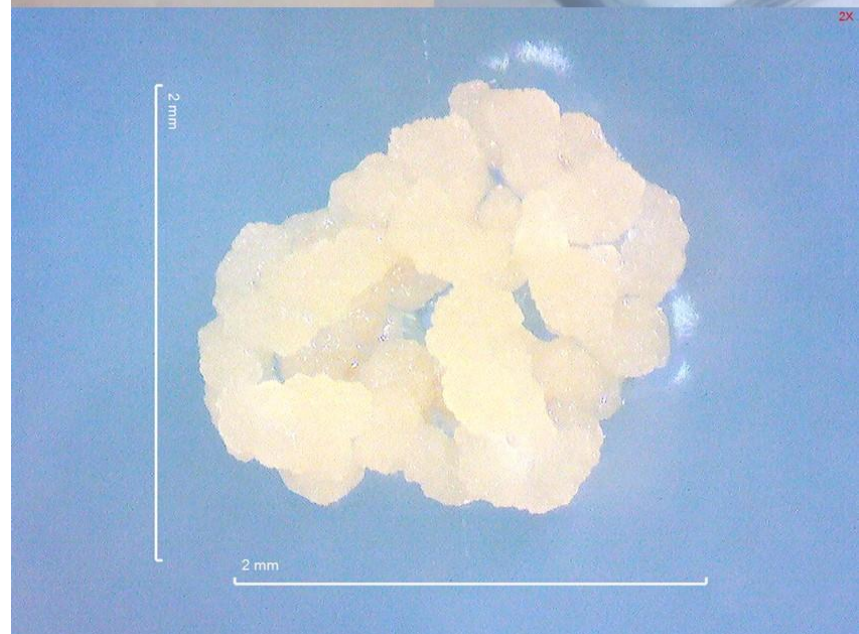
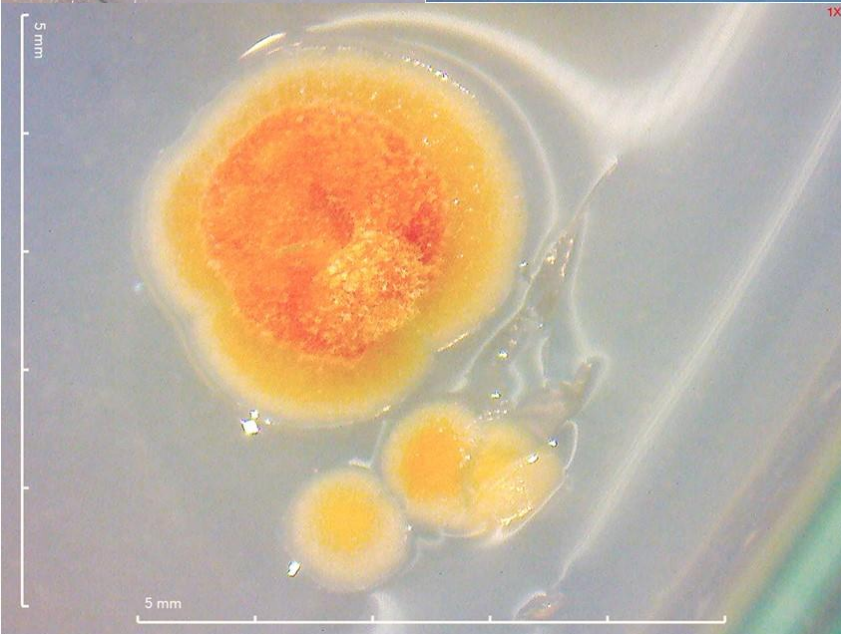
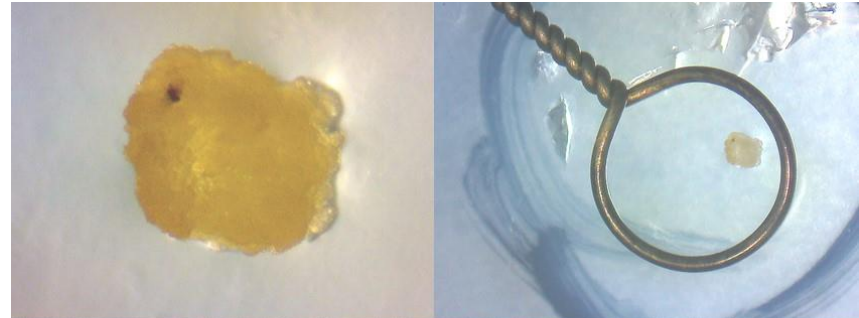


BEAN SCAB ISOLATION PROTOCOL

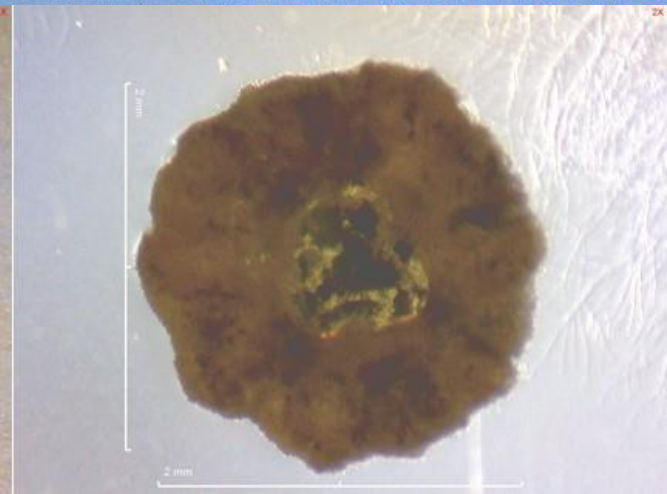
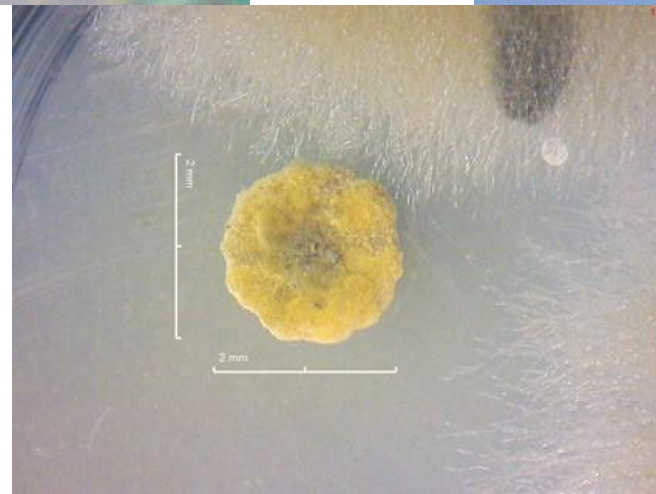
- **Step 1:** Collect samples
- **Step 2:** Tween 20 solution
- **Step 3:** Surface sterilization



- **Step 4:** cut scab lesions
- **Step 5:** Let the lesions sit in solution.
- **Step 8:** Streak on media.
- **Step 8:** Incubate at 23 degrees Celsius in the dark.



Figures: Scab colonies. 4-6 days after incubation.



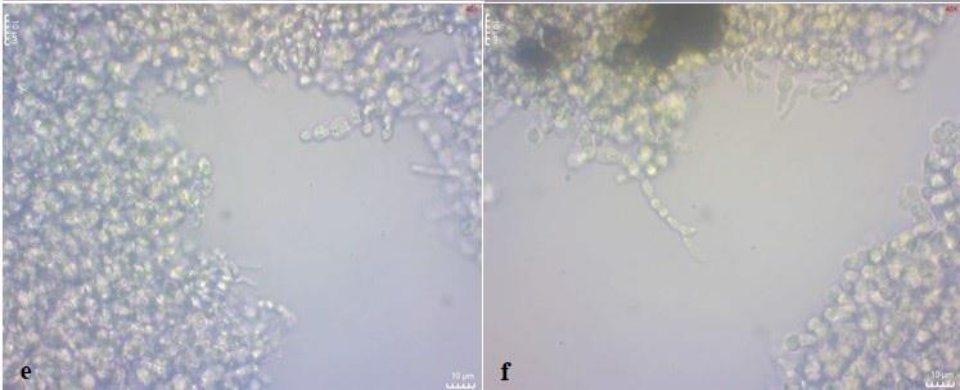
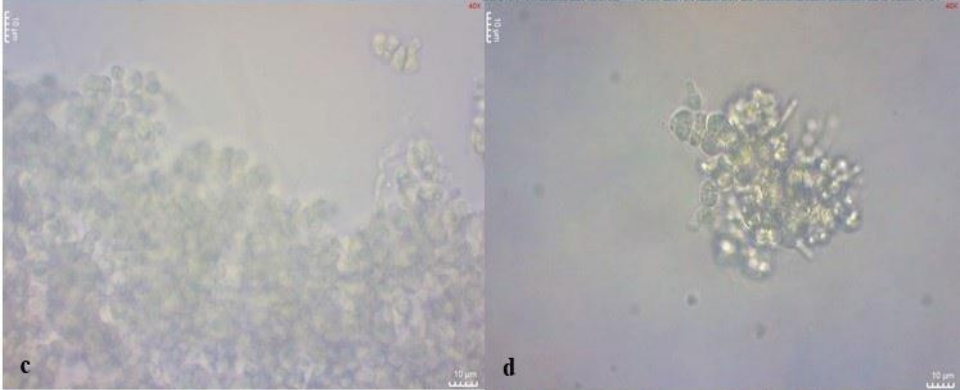
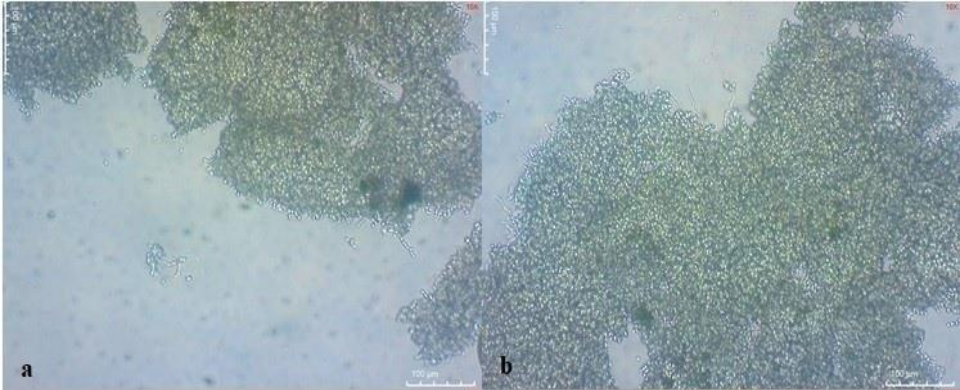
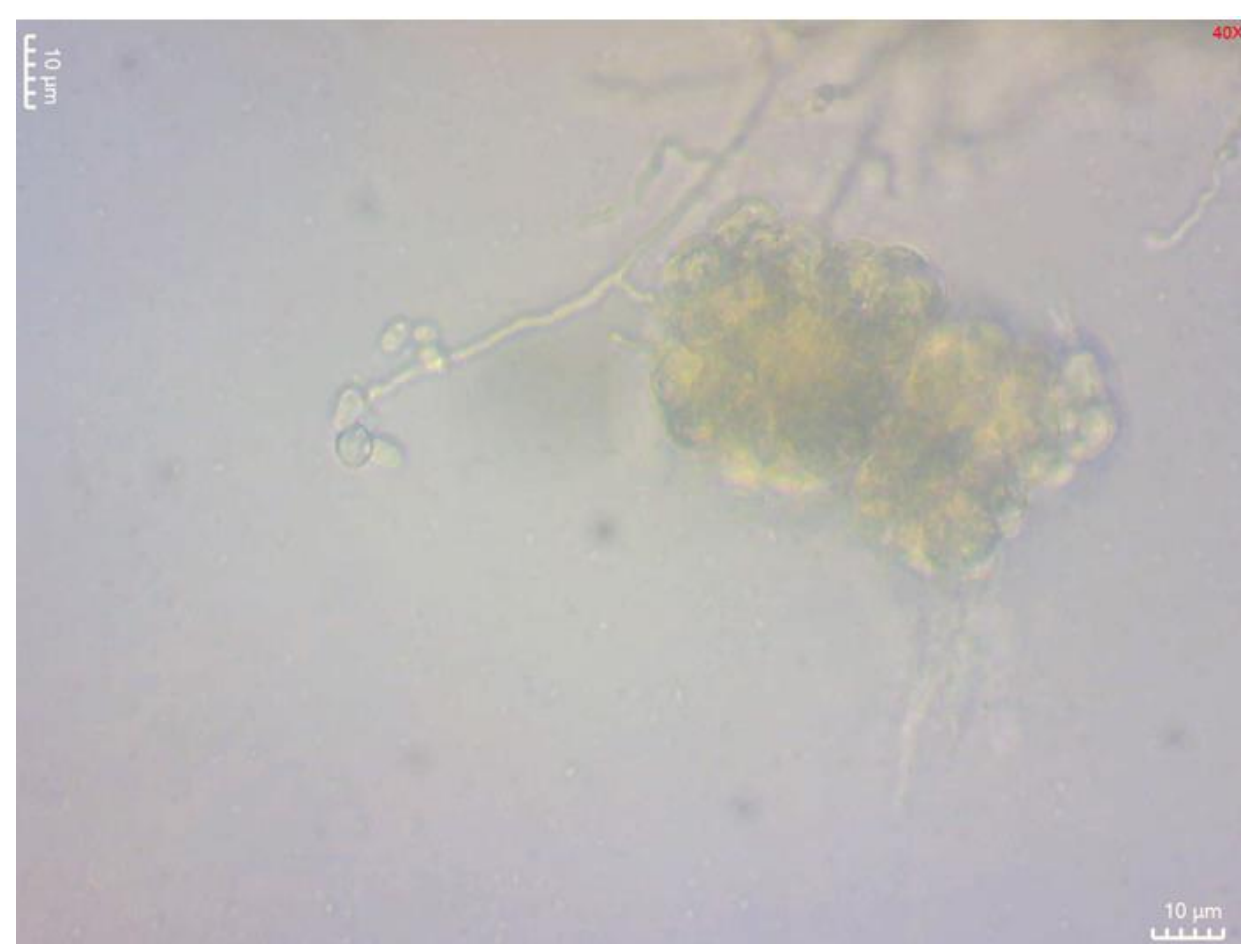
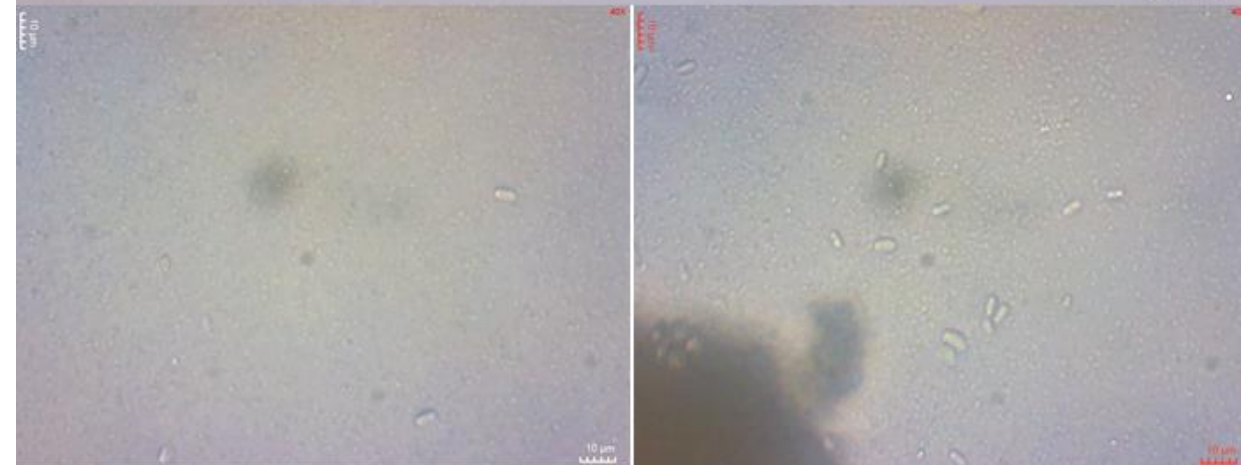


Figure 8: Dimorphic ? more comparable to pseudo-hyphae in yeasts than the true hyphae of molds.



Conidia oblong shaped +
Hyaline + no septation +
Guttulate



Objective 3: INTEGRATED MANAGEMENT OF SCAB (*Elsinoë phaseoli*) OF COMMON BEAN (*Phaseolus vulgaris*) IN KENYA.

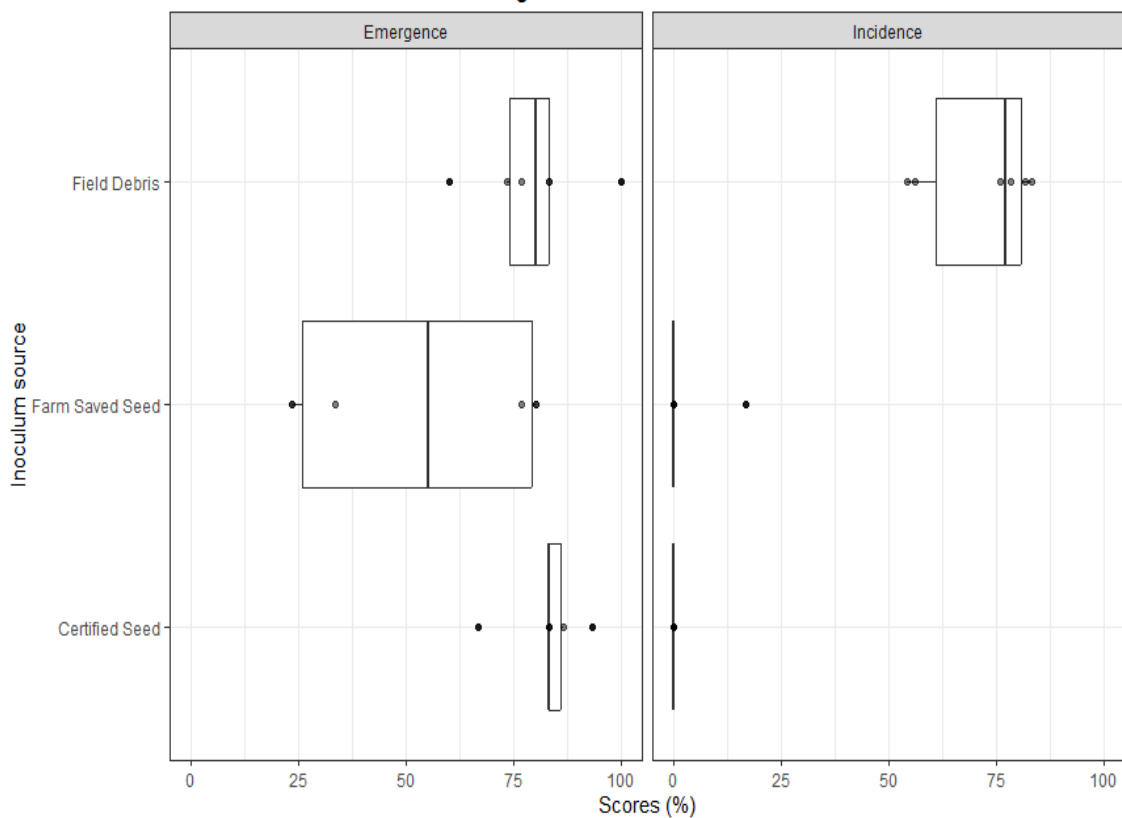


← Activity 3.1: Inoculum source study

Design

↓ Results

Inoculum source treatments emergence and bean scab incidence



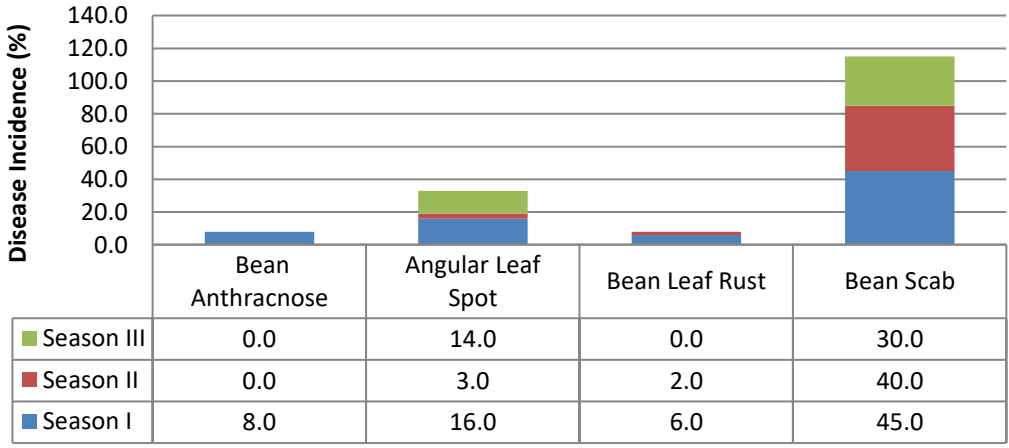
Activity 3.2: Fungicides + cropping systems



RESULTS:

- SCAB:** Cultural* only= V.mix crop
- Snn1:** Cultural under carbendazin and copper oxchloride
- ALS:** All
- Rust & Anth:** Cultural + Chemical

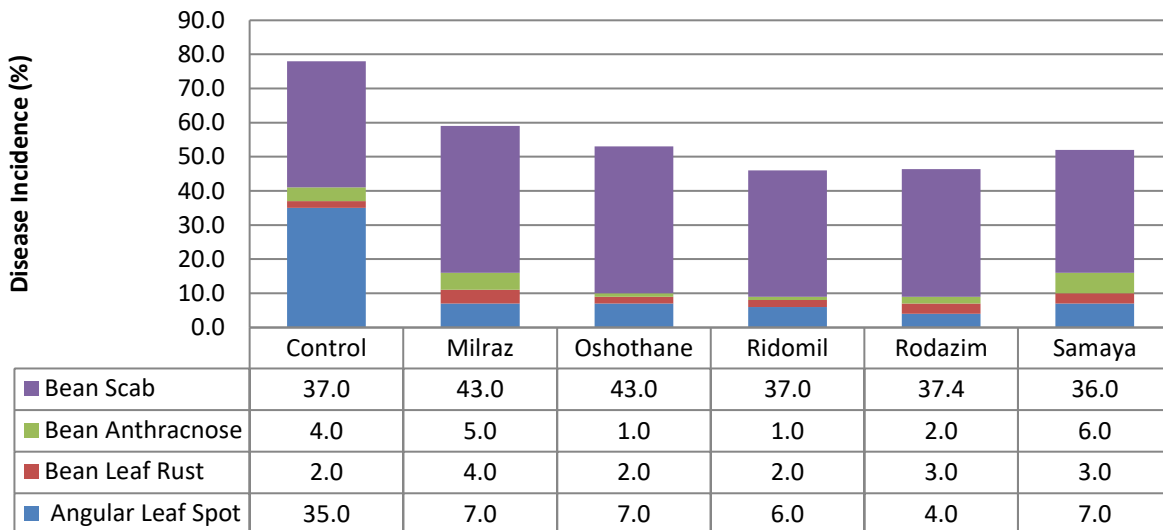
incidence* proportion of fungal diseases per season



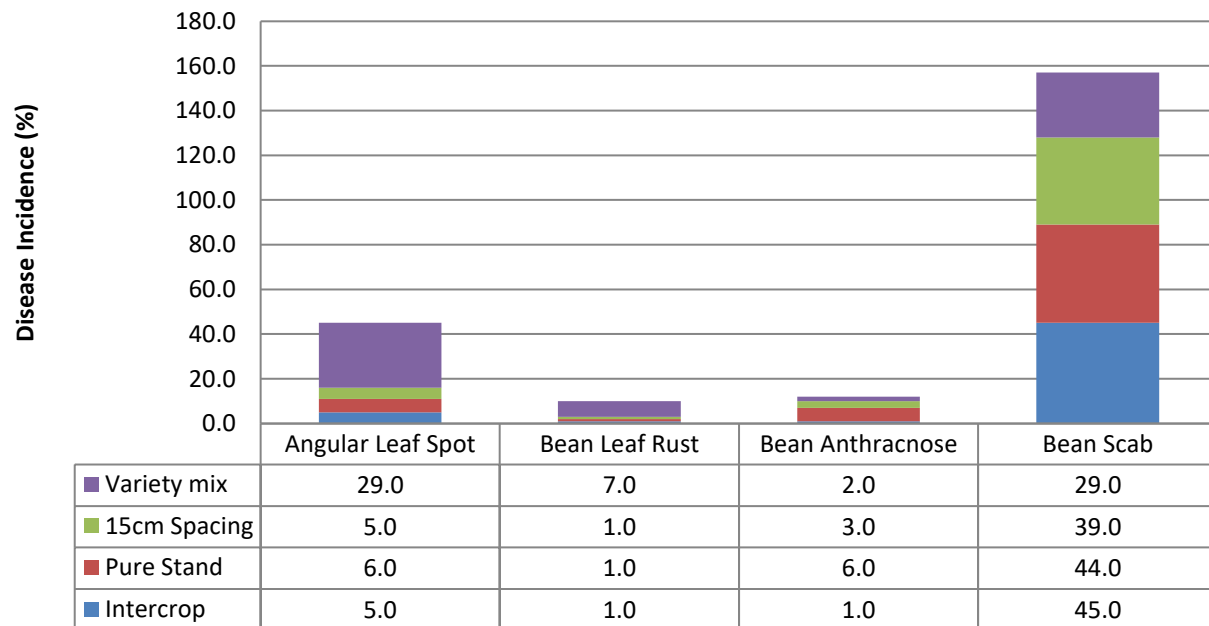
DATA: R=tidyverse + emmeans + ggplot2

* Not true incidence

Combined incidence under fungicide



Combined incidence under cropping systems



Conclusion and recommendation

- **Field residue** is the **primary source** of *E. phaseoli inoculum*.
- Population increase and land fragmentation=**hypothetical reason for increased scab**
- Cultural + Fungicide **Effective** on ALS, Anth & Rust
- Resistant cultivars= only chance a subsistence bean farmer has against scab
- *also increasing the farmers' knowledge and access to certified resistant bean seeds*



TIME FRAME

ACTIVITY	WORK PLAN DURATION
Objective 2 Activity 1: Assessment of phenotypic characteristics of <i>Elsinoë phaseoli</i> in Kenya	4 MONTHS
Objective 2 Activity 1: Assessment of phenotypic characteristics of <i>Elsinoë phaseoli</i> in Kenya	
Objective 2 Activity 2: Assessment of growth rate of <i>E. phaseoli</i> isolates in vitro	
Objective 2 Activity 3: Assessment of pathogenicity of <i>E. phaseoli</i> Isolates	
Objective 2 Activity 4: Assessment of genotypic variations of <i>Elsinoë phaseoli</i> in Kenya	
Objective 3 Activity 3: Weather factors that favour the development of bean scab	3 MONTHS
Thesis write up, defence and submission	12 MONTHS

Kirkhouse Trust

THANK YOU!!!



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Kenya Agricultural & Livestock Research Organization