

Soybean Rust Surveillance in the Caribbean

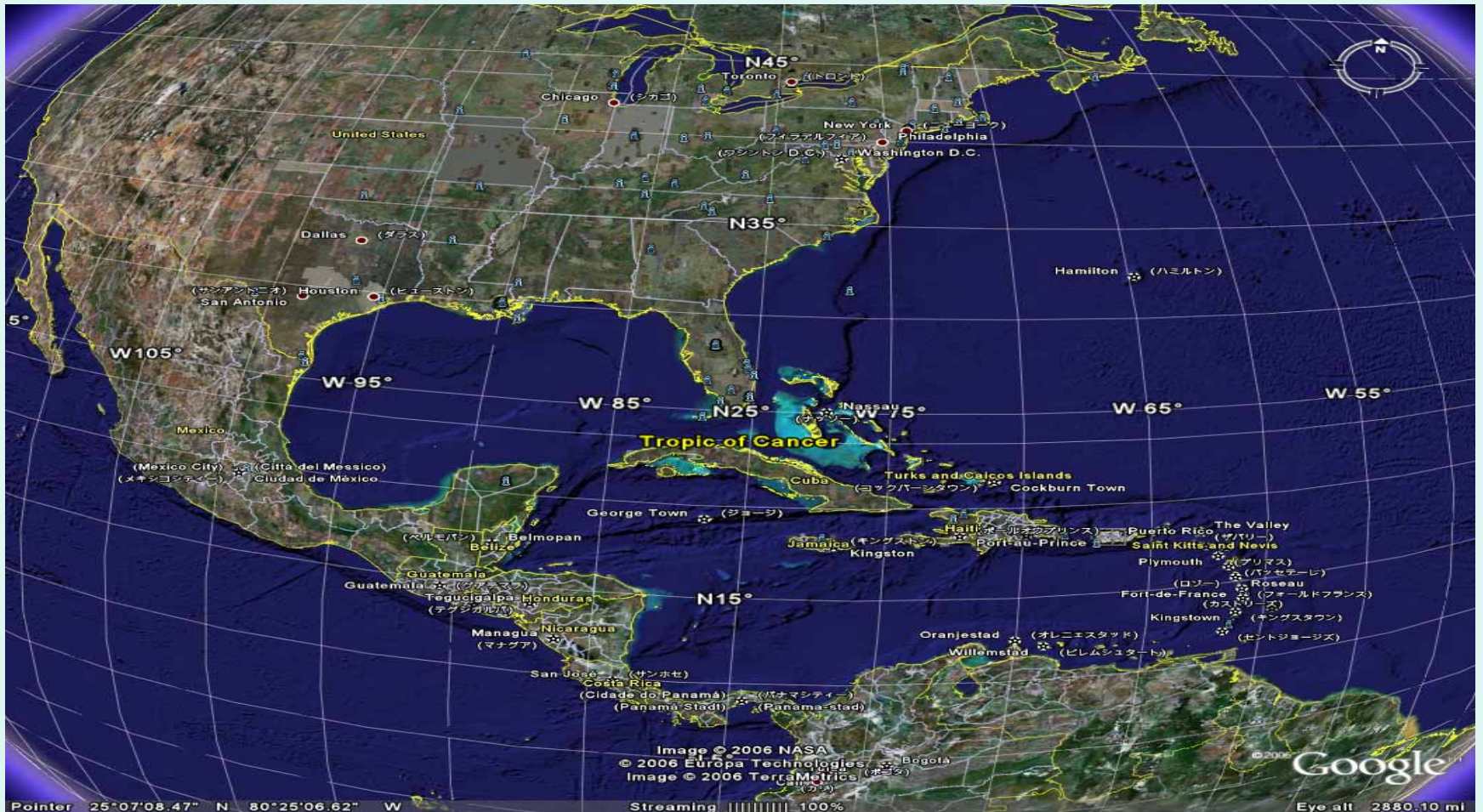
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USDA/APHIS**

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University of Puerto Rico**

The Caribbean



Soybean Production Areas in Puerto Rico



Seed Companies

Company	Location	Soybean area planted (acres)	Sentinel Plots 2005	Soybean Rust 2005
Pioneer	Juana Díaz Salinas Guayama	48	X	absent
Monsanto	Juana Diaz Isabela	700 80	X	absent
Syngenta	Santa Isabel Juana Diaz	100		absent
Mycogen	Salinas	80		absent
Illinois Crop Improvement	Salinas	100		absent
Bayer	Santa Isabel	50		absent

Phakopsora Rust in Puerto Rico

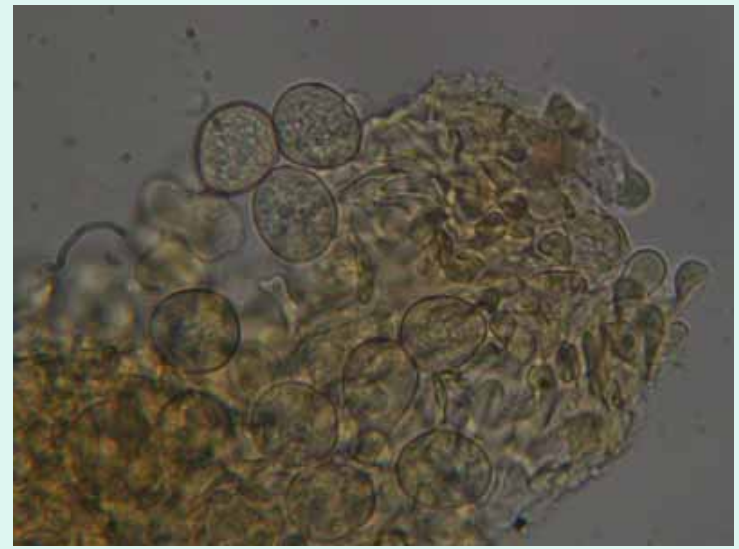
- First report of Phakopsora rust in Puerto Rico in 1915 in *Dolichus lablab* L. and *Teramnus uncinatus* L. (Arthur, 1915).
- Phakopsora rust reported in *Glycine max*, *Phaseolus coccineus*, *P. lunatus*, *P. vulgaris*, *Vigna repens* and *Pueraria phaseoloides*, (Melendez, 1976).
- Distribution of Phakopsora mainly in the cool and humid western highlands (500 to 850 m) (Vakili, 1976).
- In 1976 soybean (26 cultivars) were severely affected by rust (Vakili, 1976).
- Phakopsora rust from different locations had a wide range of pathogenicity for a number of legume species (Vakili, 1976).

1.- Arthur, J.C. 1915. Uredinales in Puerto Rico based on collections by F.L. Stevens. *Micologia* 7:315-332.

2.- Meléndez, P. 1976. The History of Phakopsora rust in Puerto Rico. Proceedings of the Workshop on Soybean rust in the Western Hemisphere. Mayaguez Institute of tropical Agriculture. pp 1-3.

3.- Vakili, N. 1976. Field observations and host range of soybean rust, *Phakopsora pachyrhizi*, in Puerto Rico Proceedings of the Workshop on Soybean rust in the Western Hemisphere. Mayaguez Institute of tropical Agriculture. pp 1-3.

***Lablab purpureus* leaves infected with *P. meibomia* from Adjuntas, PR. 2006**



Phakopsora Rust in Puerto Rico

- *Phakopsora meibomiaae* natural infections common in areas where moisture and shade were prevalent.
- Optimum temperature for infection was about 65 to 70 °F.
- *Phakopsora meibomiaae* infected 18 different legumes in the western highlands (600-850 m).
- No incidence of rust on *Dolichus lablab* or any leguminous species where rainfall was between 15 to 19 inches per year.
- In 1976, 200 replicated dry bean lines were attacked by soybean rust.

Soybean Rust Monitoring Puerto Rico



Sentinel Plots

Locations

- Juana Diaz
- Isabela
- Adjuntas

Plot size

10 Rows 10' x 10'
replicated four times

- Soybeans
early and late maturity
- Dry beans
Moncana and Morales

Insecticide

No insecticide

Evaluation

Weekly evaluations

Humid chamber

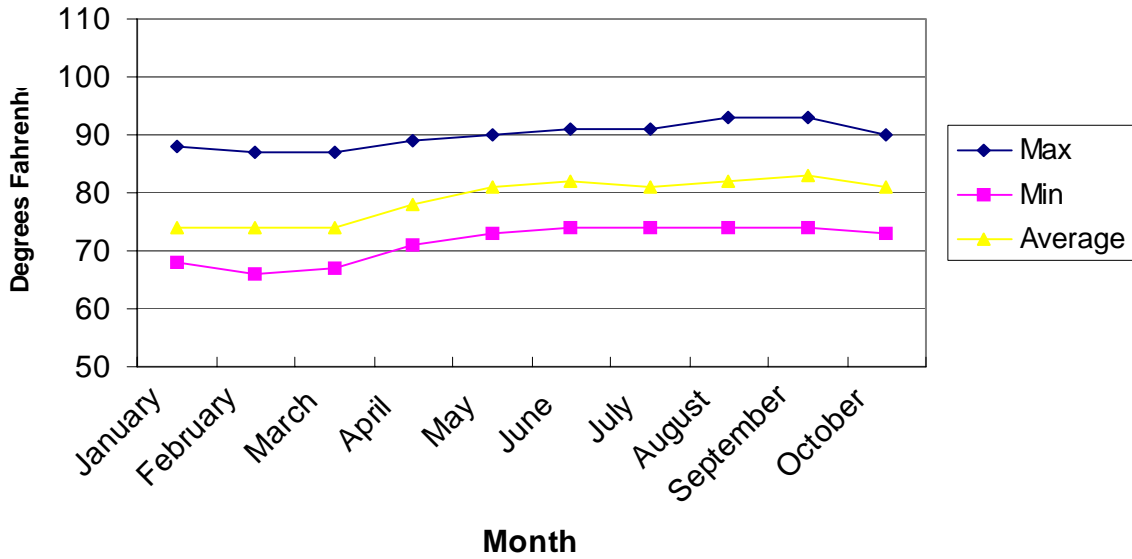
ELISA (2005-2006)

PCR (2006)

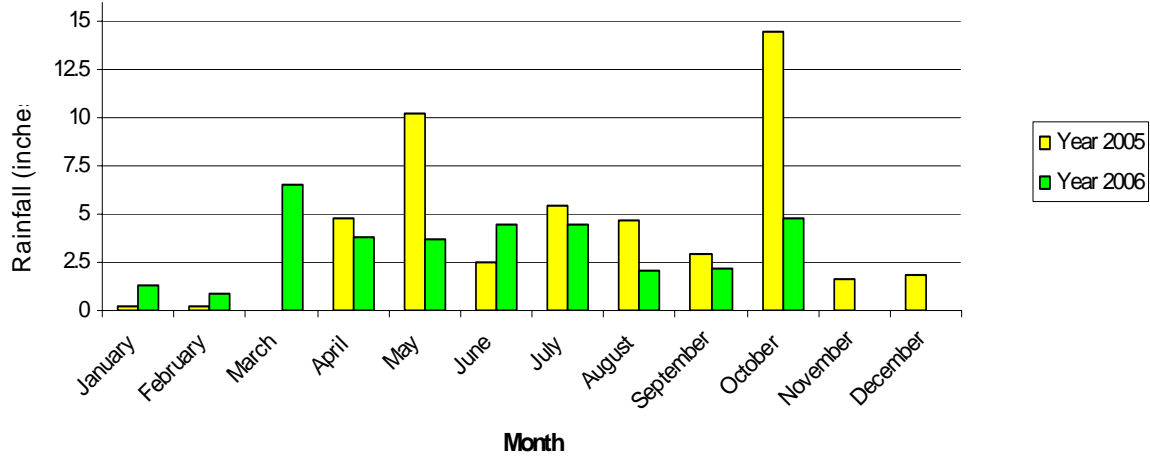


Juana Diaz - 2006

Air Temperatures Juana Diaz 2006



Precipitation - Juana Diaz



Sentinel Plots

Location	Dates of Planting	Crop	Suspects	Methods
Juana Diaz	November 2004	Soybean Dry Bean Cowpea	none	Humid Chamber Microscope
Juana Díaz	February 2005 October 2005 December 2005	Soybean Dry Bean Cowpea	none	Humid Chamber Microscope ELISA
Juana Díaz	January 2006 February 2006 May 2006 July 2006 August 2006 September 2006 October 2006 November 2006	Soybean Dry bean	none	Humid Chamber Microscope ELISA PCR

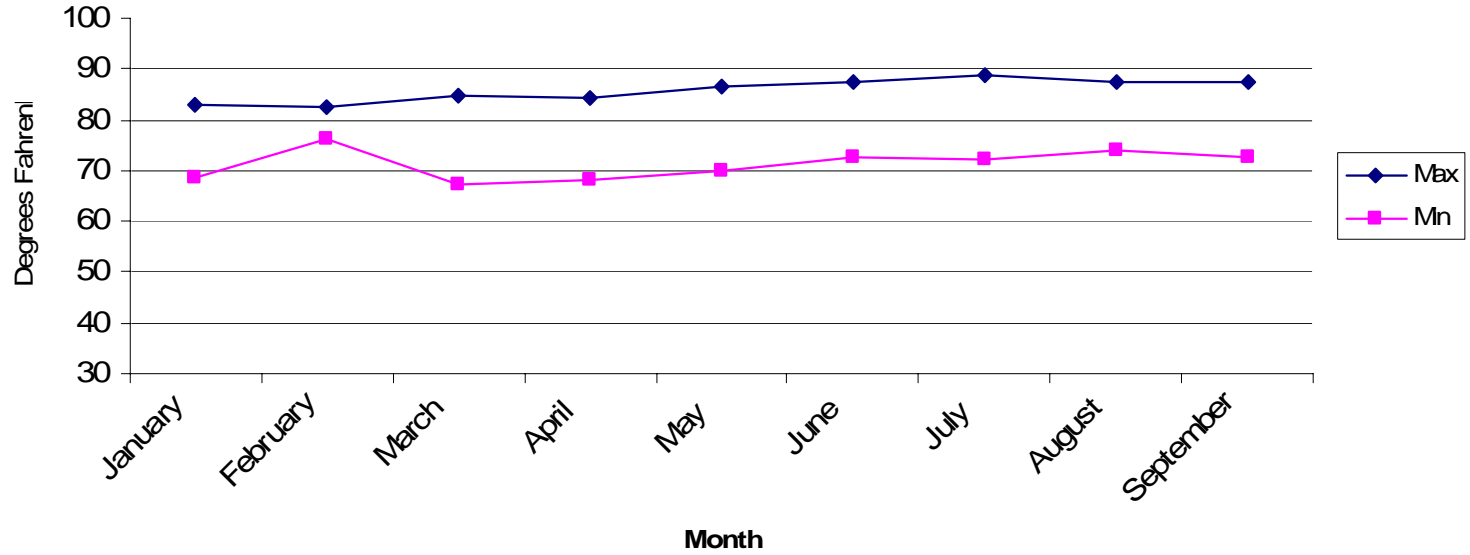
Sentinel Plots

Location	Dates of Planting	Crop	Major diseases	Insects
Juana Diaz	November 2004	Soybean	<i>Cercospora sojina</i>	<i>Cerotoma ruficornis</i>
		Dry Bean	<i>Xanthomonas campestris</i> <i>Sclerotium rolfsii</i>	
		Cowpea	<i>Oidium spp.</i>	
Juana Díaz	February 2005 October 2005 December 2005	Soybean	<i>Cercospora sojina</i> Virus	<i>Cerotoma ruficornis</i> <i>Omiodes indicata</i> <i>Spodoptera ornithogalli</i> <i>Diabrotica graminea</i>
		Dry Bean	<i>Xanthomonas campestris</i> <i>Sclerotium rolfsii</i>	
Juana Díaz	January 2006 February 2006 May 2006 July 2006 August 2006 September 2006 October 2006 November 2006	Soybean	<i>Cercospora sojina</i> <i>Phomopsis spp.</i> Virus	<i>Spissistilus festinus</i> <i>Aphis gossypii</i> <i>Cerotoma ruficornis</i> <i>Anticarsia gemmatalis</i> <i>Omiodes indicata</i>
		Dry Bean	<i>Macrophomina phaseolina</i>	

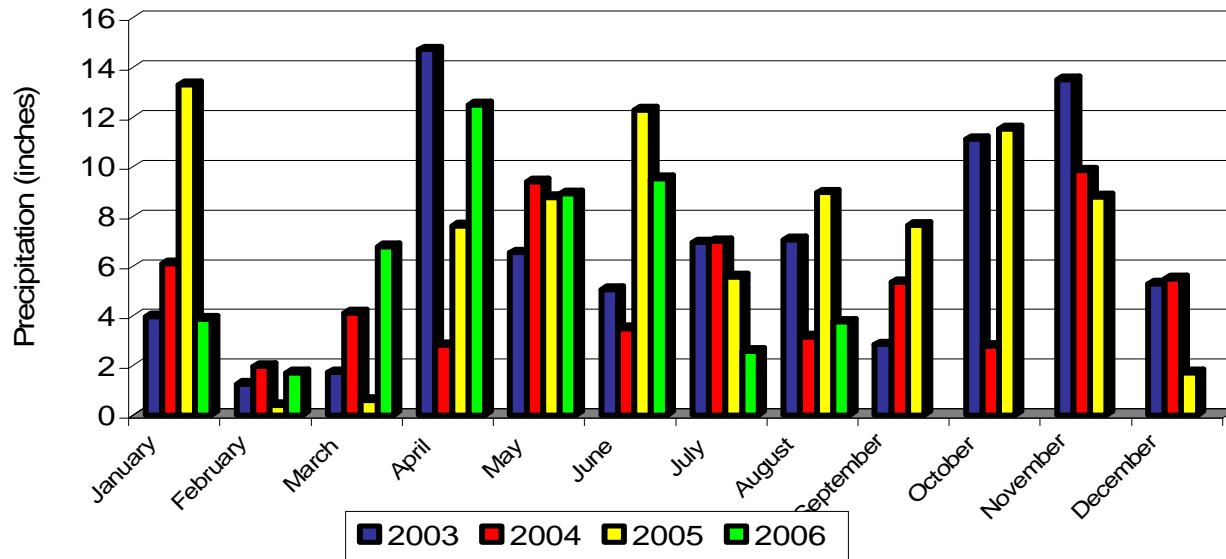
Glycine max – Juana Diaz 2006



Air Temperature - Isabela 2006



Precipitation - Isabela



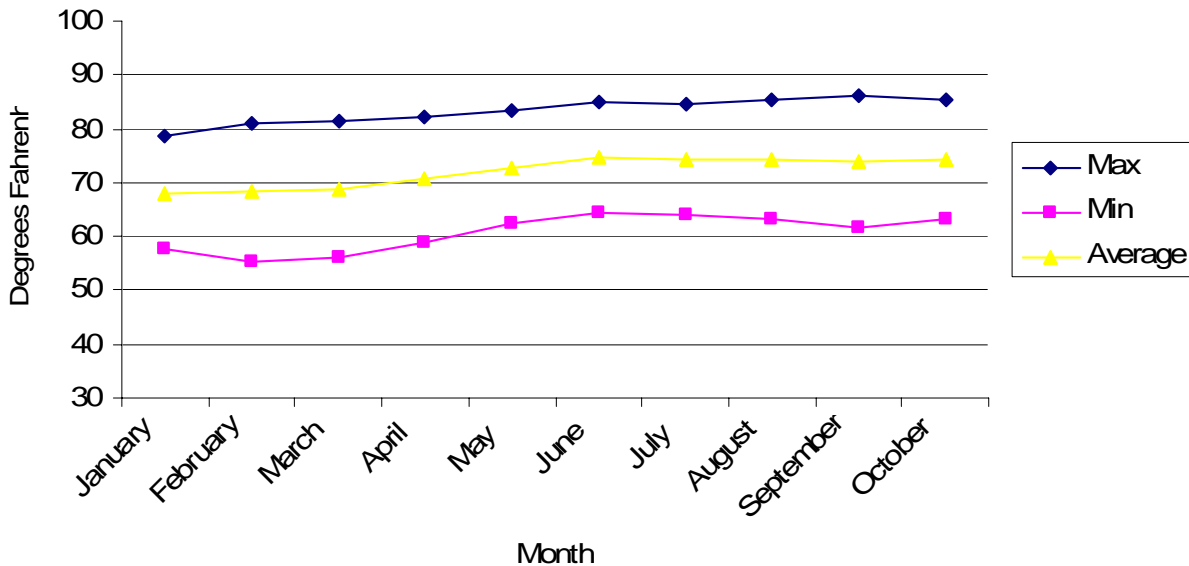
Sentinel Plots

Location	Dates of Planting	Soybean Rust Suspect	Suspects	Methods
Isabela	December 2005	Soybeans	none	Humid Chamber Microscope
		Dry beans	none	
		Pigeon Peas	none	
Isabela	February 2006	Soybeans	4 leaves	Humid Chamber Microscope ELISA
	March 2006			
	April 2006	Dry Beans	none	
	July 2006			
	September 2006			
	October 2006			
	Pigeon Peas	none		

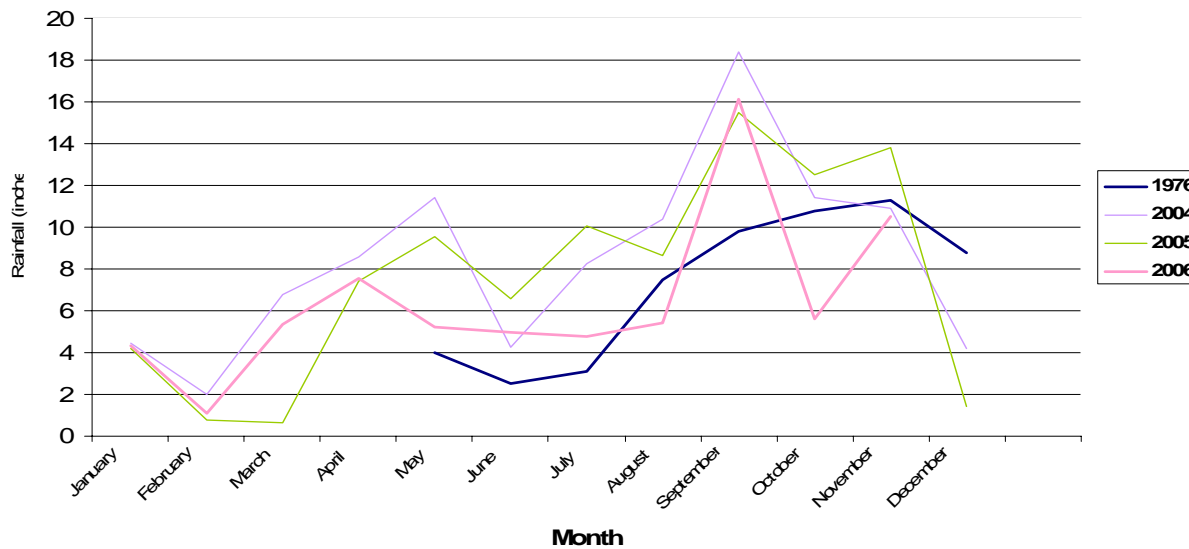
Sentinel Plots

Location	Dates of Planting	Soybean Rust Suspect	Major diseases	Insects
Isabela	December 2005	Soybeans	<i>Xanthomonas campestris</i>	<ul style="list-style-type: none"> <i>Cerotoma ruficornis</i> <i>Anticarsia gemmatalis</i> <i>Omiodes indicata</i>
		Dry beans	<i>Xanthomonas campestris</i>	
		Pigeon Peas	<i>Uredo cajani</i>	
Isabela	February 2006 September 2006 October 2006	Soybeans	<i>Sclerotium rolsfii</i> <i>Peronospora manshurica</i> Virus	<ul style="list-style-type: none"> <i>Aphis gossypii</i> <i>Spodoptera ornithogalli</i> <i>Cerotoma ruficornis</i> <i>Anticarsia gemmatalis</i> <i>Omiodes indicata</i>
		Dry Beans	<i>Xanthomonas campestris</i> <i>Pseudomonas syringae</i>	
		Pigeon Peas	<i>Uredo cajani</i>	

Air Temperatures Adjuntas 2006



Precipitation - Adjuntas



Sentinel Plots

Location	Dates of Planting	Soybean Rust Suspect	Suspects	Methods
Adjuntas	February 2006	Soybean Dry Bean	none	Humid Chamber Microscope
Adjuntas	March 2006 August 2006	Soybean Dry Bean	R5 5 leaves	ELISA PCR Samples analyzed University of Florida
Adjuntas	September 2006 October 2006	Soybean Dry Bean	R6 3 leaves	ELISA PCR Samples analyzed USDA - APHIS

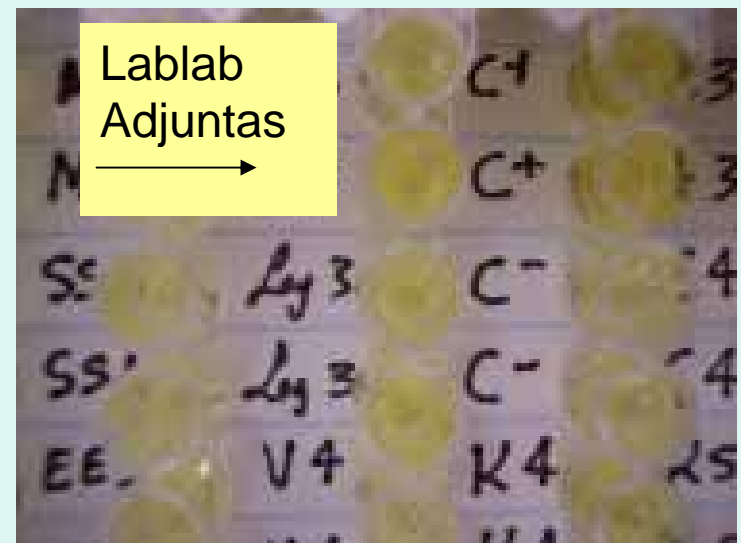
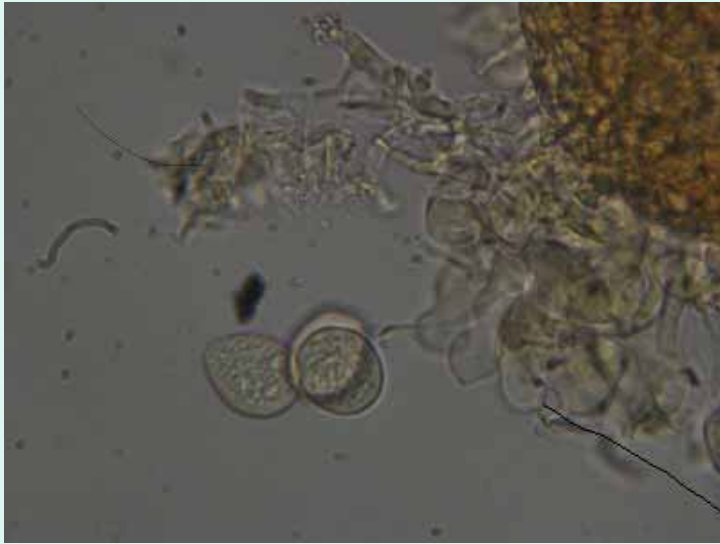
Sentinel Plots

Location	Dates of Planting	Soybean Rust Suspect	Major diseases	Insects
Adjuntas	February 2006	Soybean Dry Beans	<i>Sclerotium rolfsii</i> <i>Xanthomonas campestris</i>	<i>Omiodes indicata</i> { <i>Cerotoma ruficornis</i> <i>Diabrotica graminea</i>
Adjuntas	March 2006 August 2006	Soybean Dry Beans	<i>Cercospora sojina</i> <i>Xanthomonas campestris</i>	<i>Omiodes indicata</i> { <i>Cerotoma ruficornis</i> <i>Diabrotica graminea</i>
Adjuntas	September 2006 October 2006	Soybean Dry Beans	<i>Cercospora sojina</i> <i>Xanthomonas campestris</i>	

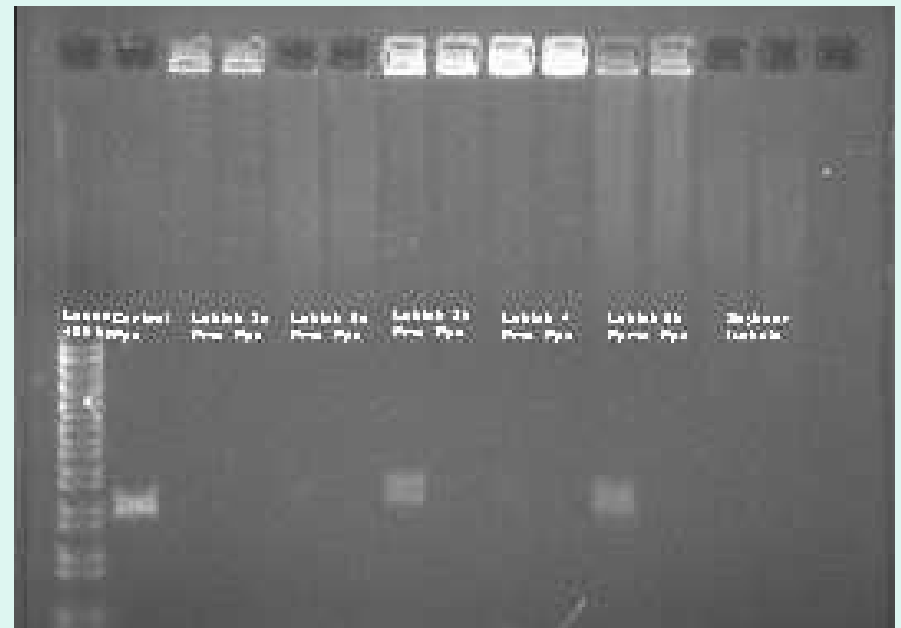
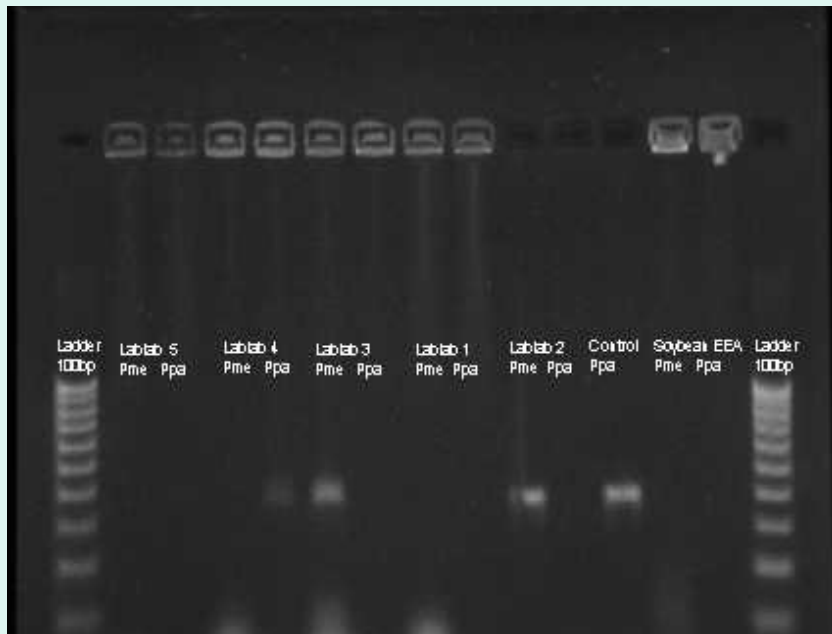
Legumes surveyed

- *Albizia lebeck*
- *Cajanus cajan*
- *Cannavalia* sp.
- *Clitoria* sp.
- *Chamaecrista* sp.
- *Crotolaria pallida*
- *Desmodium* sp.
- *Glycine* sp.
- *Glycine max*
- *Inga vera*
- *Lupinus* sp.
- *Lablab purpureus*
- *Macroptillium lathyroides*
- *Macroptillium* spp.
- *Mucuna pruriens*
- *Phaseolus vulgaris*
- *Pueraria lobata*
- *Pueraria phaseoloides*
- *Rhynchosia minima*
- *Mimosa ceratonia*
- *Mucuna deeringiana*
- *Vigna luteola*
- *Vigna vexillata*
- *Vigna* spp.
- *Vigna mungo*

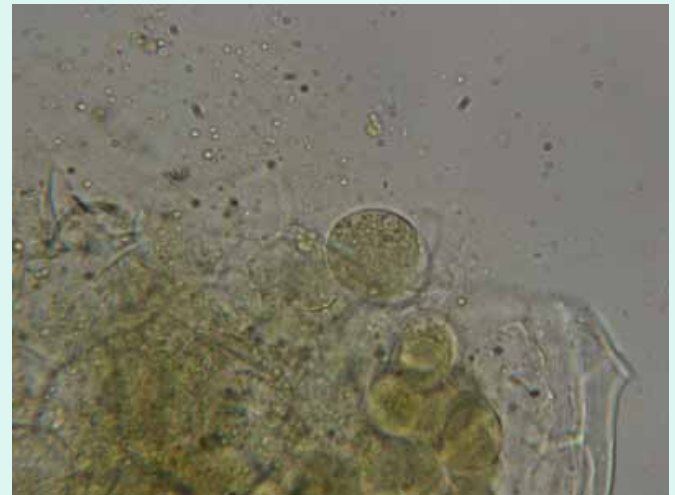
ELISA test on *Lablab purpureus* leaves infected with *P. meibomiaae*.



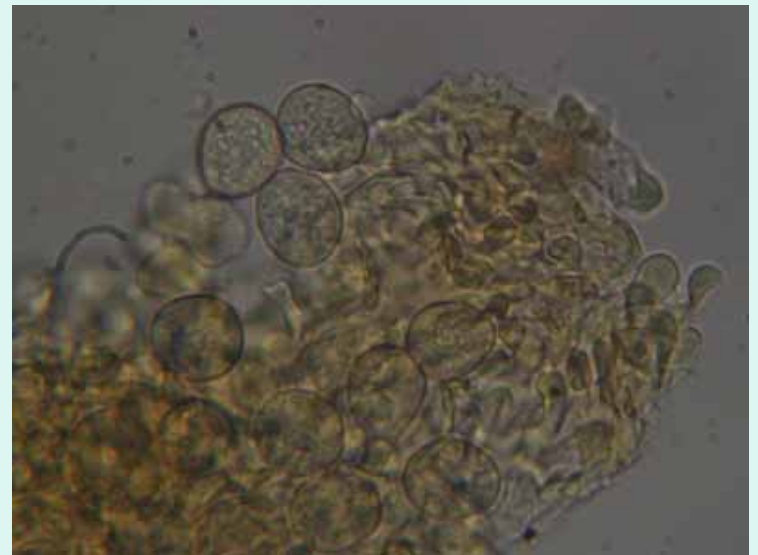
Lablab samples - PCR



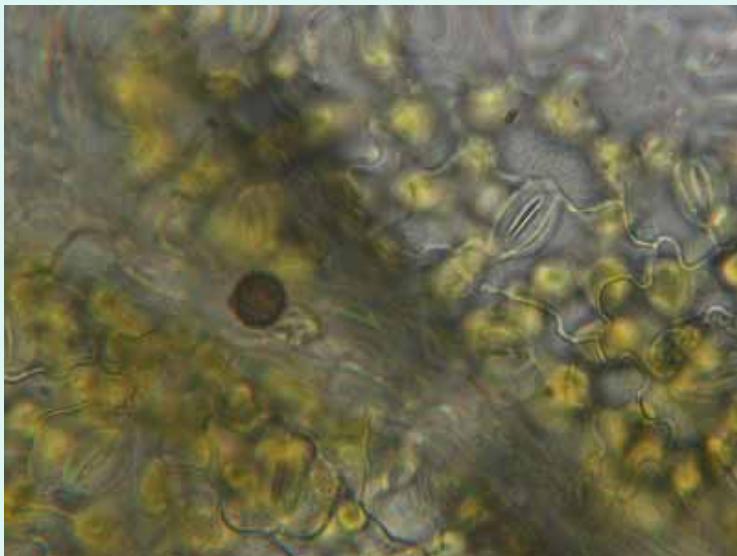
Vigna spp. - Utuado



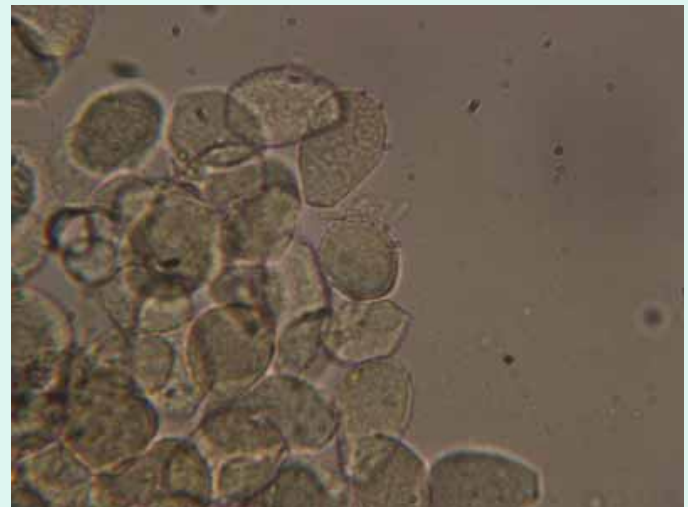
Tropical kudzu – Adjuntas



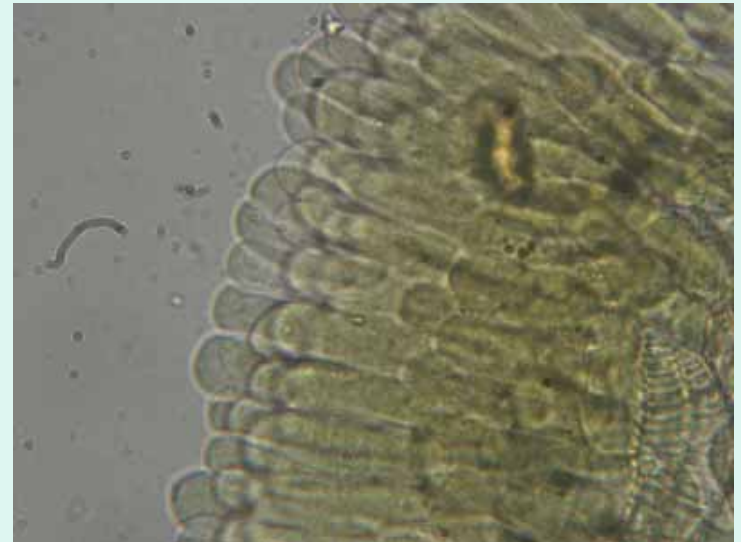
Mucuna pruriens - Utuado



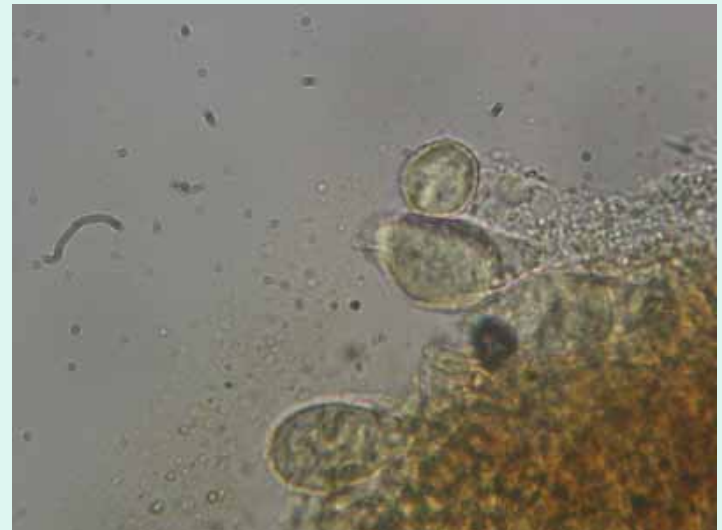
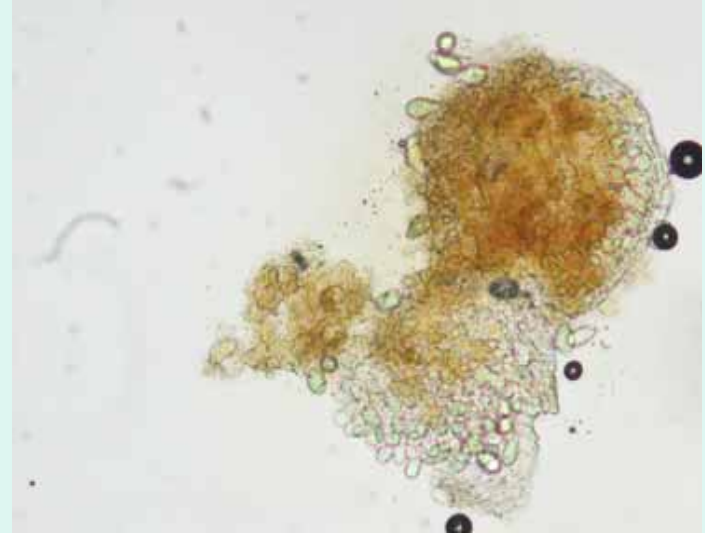
Mucuna - Isabelela



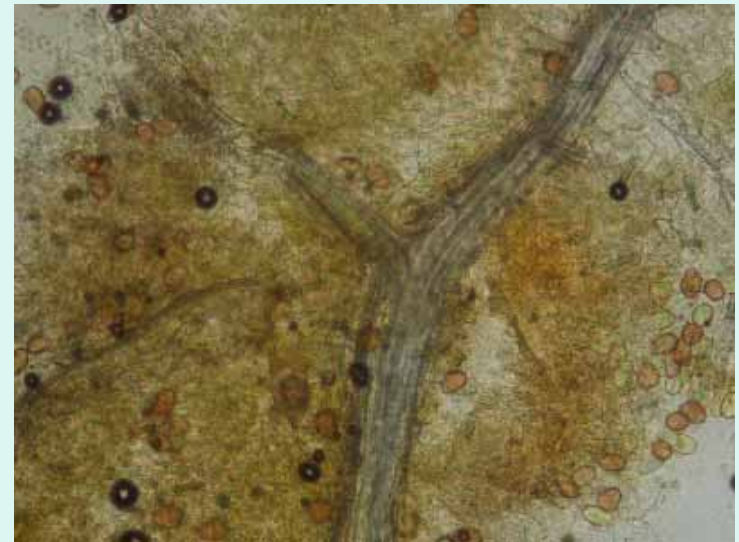
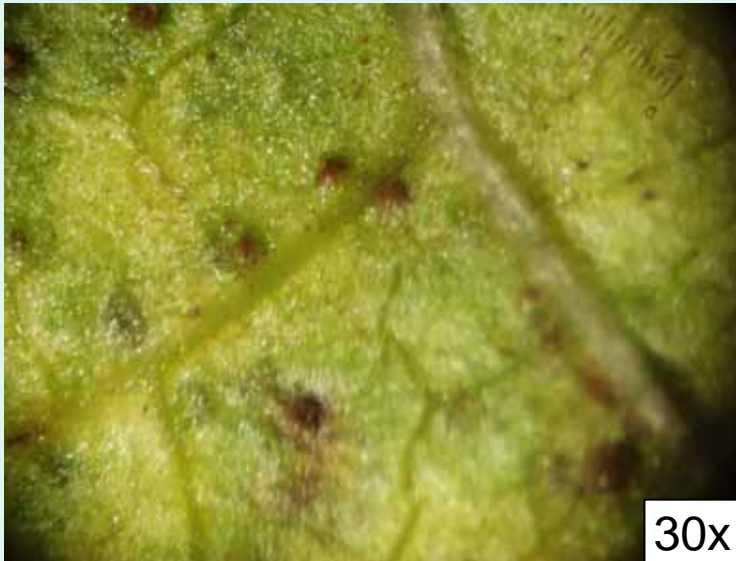
Crotalaria pallida - Yahuecas



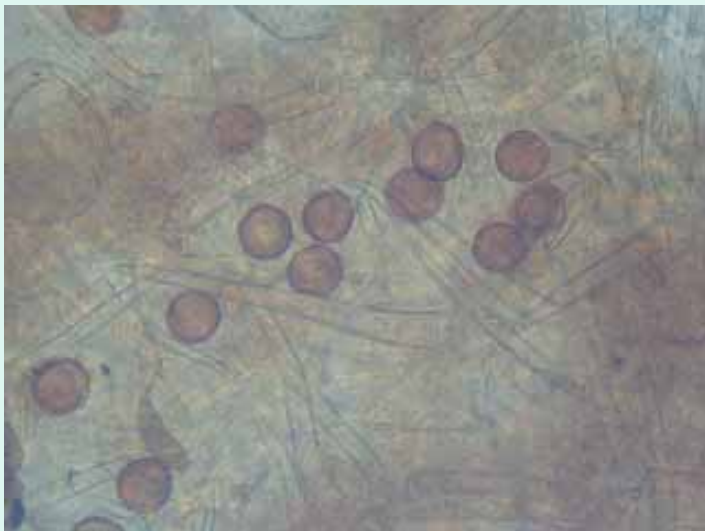
Macroptilium lathyroides - Castañer



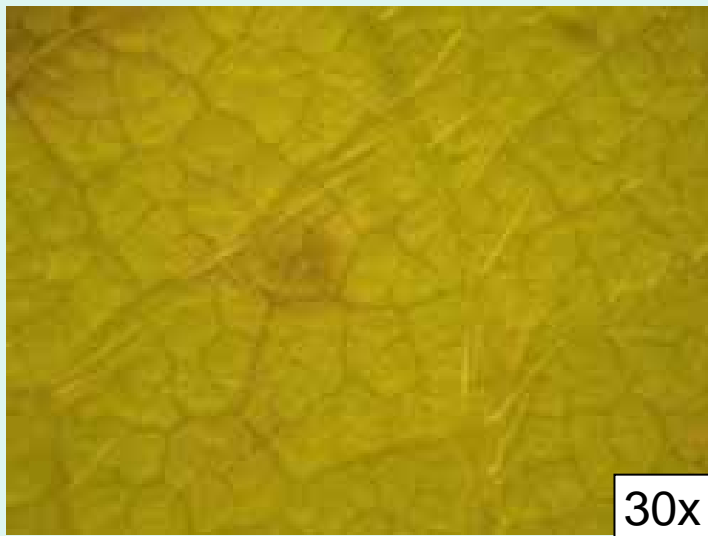
Macroptilium spp. - Castañer

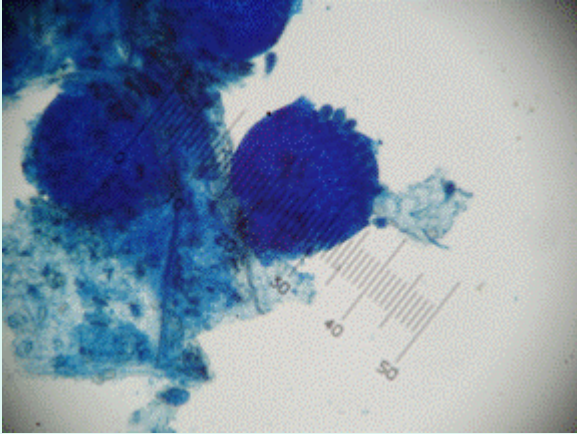


Cajanus cajan - Isabelela

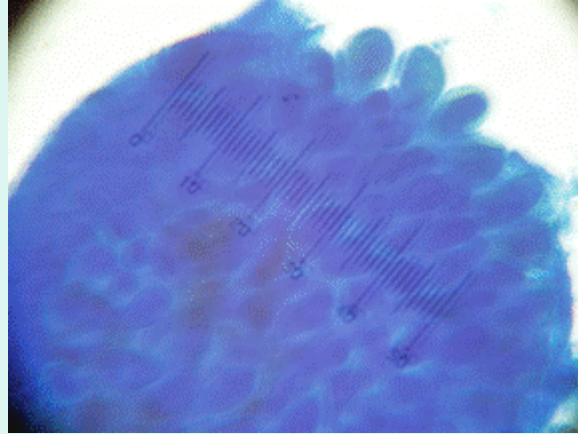


Pachyrhizus erosus - Isabelita

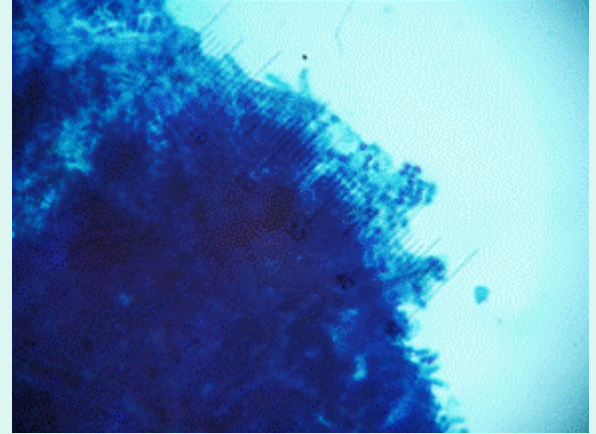




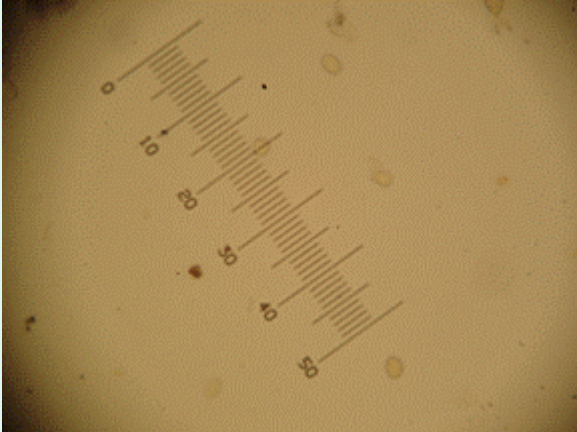
Canavalia 10X



Canavalia 40X



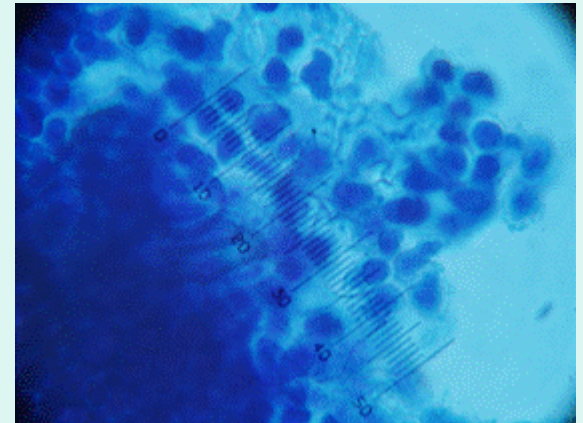
Jícama 10X



Mucuna 10X

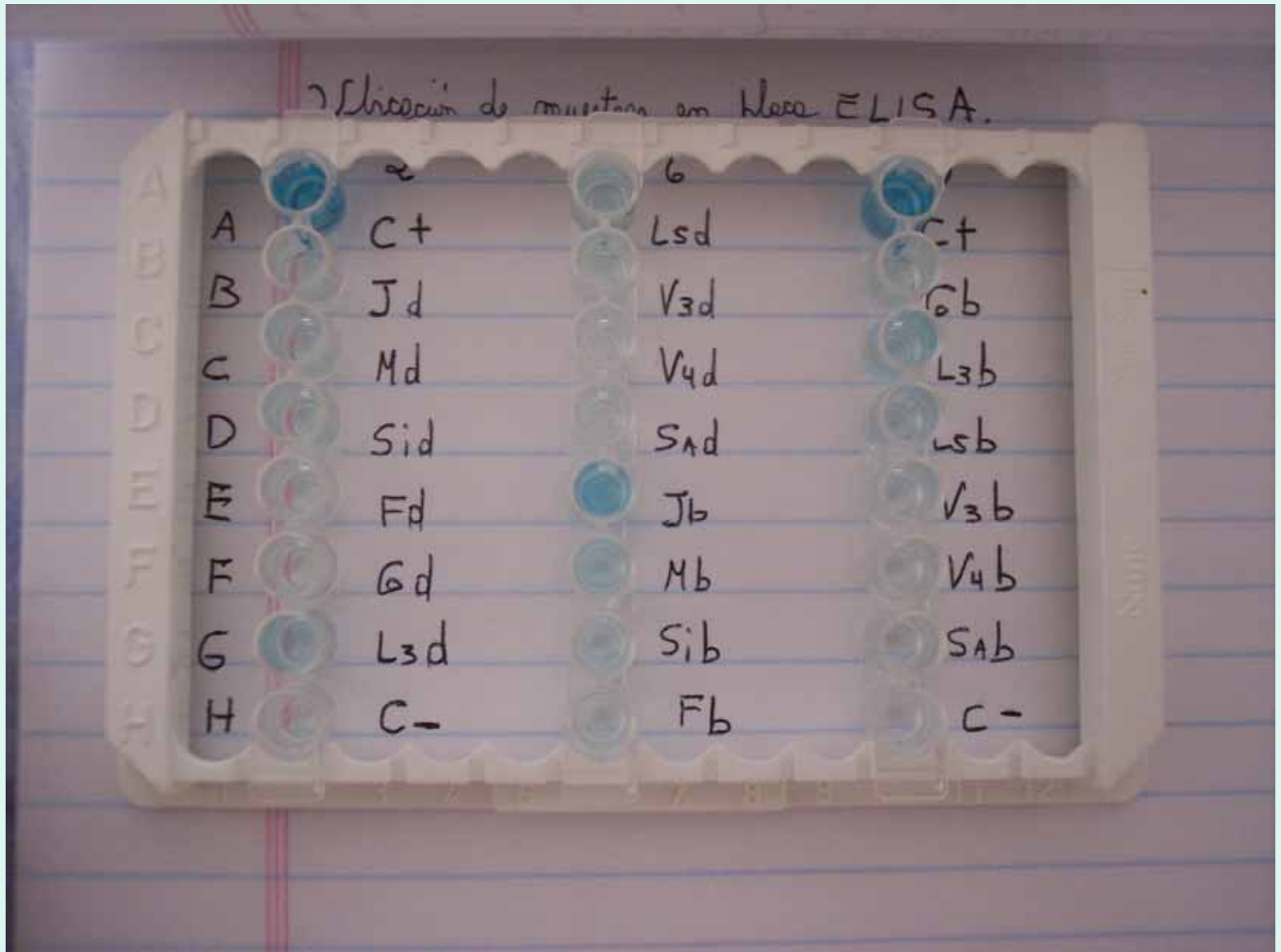


Mucuna 40X

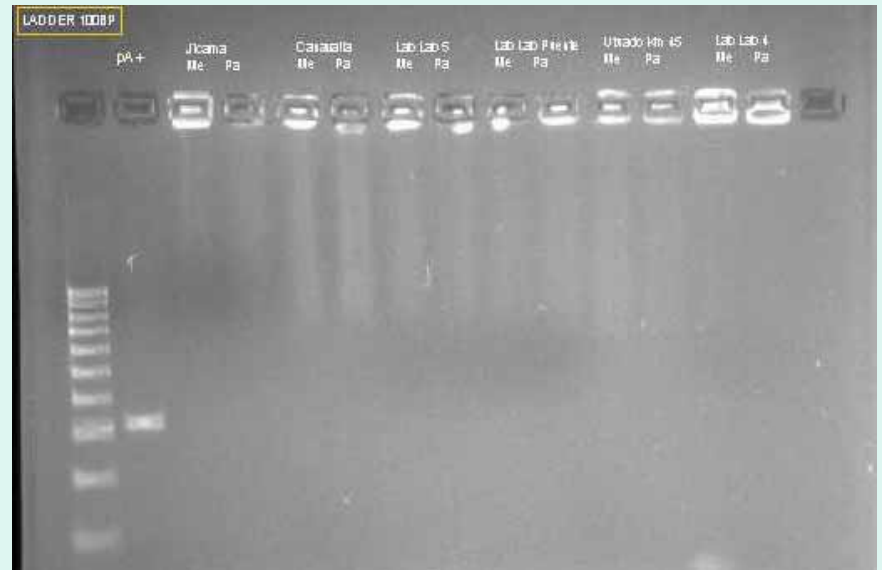


Jícama 40X

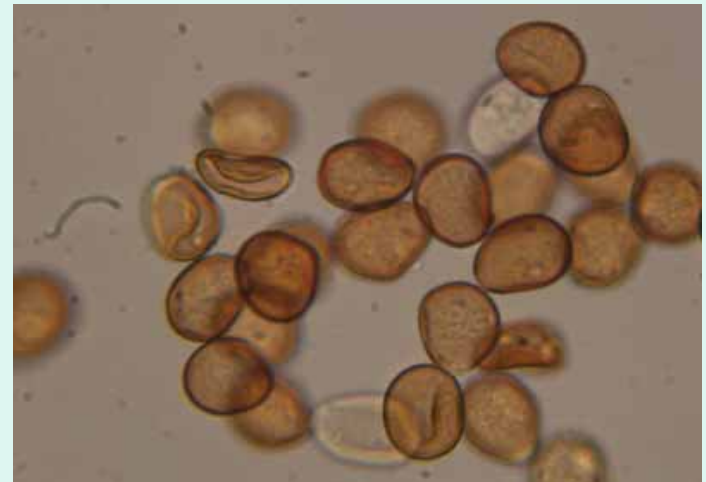
ELISA test



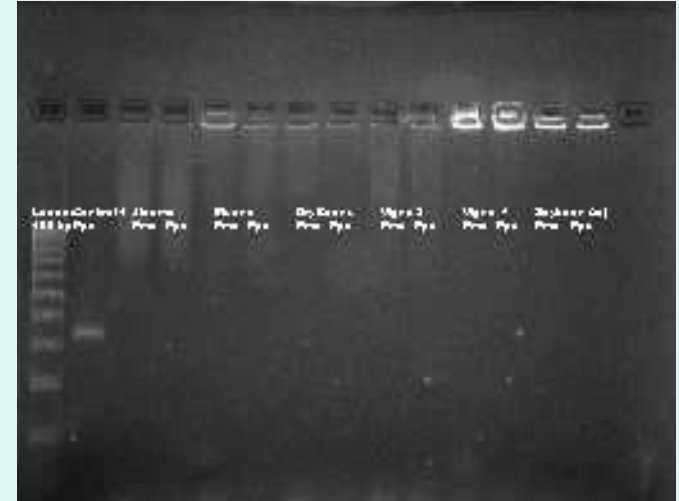
Legumes - PCR



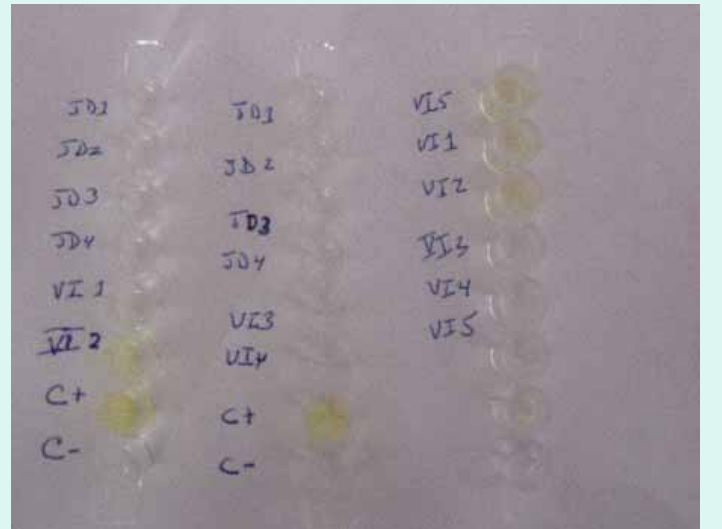
Wild soybean - Castañer



Phaseolus vulgaris – Juana Diaz



Vigna unguiculata - Juana Diaz



Other countries

Countries	Soybean (acres)	Dry Bean (acres)	Others (acres)	Surveillance	Methods
Cuba	7,400	234,307	-	Plant Health Service sentinel plots	Visual
Dominican Republic	0	37,400	74,131 Pigeon peas	none	Visual
Jamaica	0	5,089	Vicia faba 8,445	none	-
Haiti	0	small holdings	small holdings	none	-
Virgin Islands	0	0	0	none	-
Puerto Rico	1,200	1,000	1,000 Pigeon peas	University of Puerto Rico APHIS/PPQ	Visual Microscope ELISA PCR

Acknowledgments

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Dr. Luis Perez Vicente Plant Health Service (Cuba)

Dr. Russell Duncan USDA/APHIS

Dr. Lisa Myers Ministry of Agriculture and Lands (Jamaica)

Dr. Jeffery S. Austin USDA/APHIS (Haiti)

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Agr. Juan Perez Monsanto Caribe

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Ing. Byron Vega University of Puerto Rico