Aproaches to Plantain Pest Management in Andean South America

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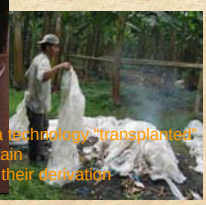
Studies were conducted to evaluate control methods to manage plantain constrains in Ecuador. The most important disease as define by producers was Black Sigatoka (*Mycosphaerella fijiensis*). Poor agronomic practices on plantations of more than 30 years, debilitated by endemic populations of the Banana stem borer, and a non define nematodes and viruses attack complete the picture. Underlying it another problem was determined: the area could become dependant on same chemical control being used on bananas, with relative success since different responses to the disease from each crop were not being taken into account. The IPM CRSP participation focus the problem from three different angles: Defining causes of crop constrains from both the agronomic and socioeconomic point of view; development of IPM practices to increase yield; and defining channels to deliver technologies to farmers.

Applying basic IPM practices to the crop, improved the general well being of plantations: Plantain yield increased more than 1.5 times, and rate of return of bunches, was reduced in around two months. Natural resistance to pest and diseases increased, and a combination of fungicides and forecasting of the disease reduce spraying frequency. IPM practices plus the enthomopathogen *Beauveria bassiana* diminished weevil population. A nematode survey of the area showed that *Meloidogyne sp* and *Helicotylenchus sp* are the main nematodes in the region. Working with groups of farmers, a series of Teaching units were prepared including photographs, questions and experimental tasks that shows research results and biological information related to plantain IPM.

❖ Socioeconomic and biological survey

Socioeconomic information about farmers and regions where the identified crops were being grown were needed (a) to develop strategies for technology and information transfer and (b) to identify factors that influence adoption of IPM on those crops;



Banana technology "transplanted" to plantain with all their derivation

Crop constrains derived mainly from poor management practices

The area and the crop suffer from lack of technical support and poor information.

There was not formal (and very poor informal) research for plantain so the project started hiring & training personnel

Base line survey included not only actual knowledge about the crop and the technology applied but perceptions producers have about problems identification and a gender analysis.

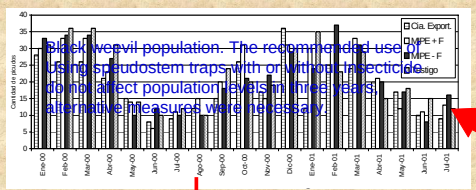
At this stage become evident an amount of misidentification of the problems which lead to an excessive and useless employed of pesticides and practices

Problem perceptions of cause of plantain constrains from farmers in El Carmen, Manabí province, Ecuador

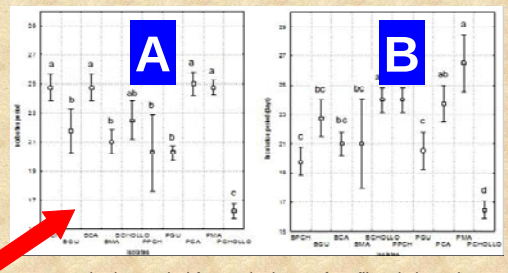
Constrain	Perception by Sex		Total
	Female (%)	Male (%)	
Bacterias	22,5	29,6	27,7
Dedos maduros	11,7	6,7	8
Hongos	0,9	3,2	2,6
No reconoce	4,5	0	1,2
Picudo	27,9	18,1	20,7
Sigatoka	18	28,1	25,4
Virosis	14,4	14,4	14,4

❖ Development of knowledge and IPM practices

Information was used to better defined transfer tools



Black weevil population. The recommended use of Using pseudostem traps with or without insecticide do not affect population levels in three years, alternative measures were necessary



Incubation period for ten isolates of M. fijensis inoculate on banana (A) and plantain (B).

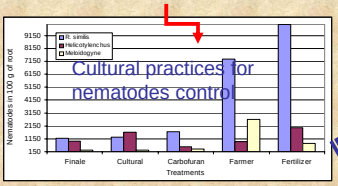
Using an IPM approach, two experiments were initially established with the objective of having a straight forward response to the alternatives Farmers were facing inEl Carmen region in Ecuador: (a)re-habilitation or (b) planting again, to replace their old plantation. Tactics on trial were: In the first case (a), the technical package being appled & recommended by the export companies was considered a treatment, in comparison with two IPM management strategies with and without fungicides. For the second trial (b) three factors (varieties, planting system -crop density-, and levels of management) were tested.

This two experiments were multi purpose: Besides observing plantain response to treatments, it serve as a basis to train young scientists and farmers on a holistic approach to the crop and at the same time defining which areas required a more specific study. The latter were then object of specific studies which in time help to adjust main management practices

Economic analysis support biological results, giving higher yields in shorter times

Mass production of *local strains* of *Beauveria bassiana*, identified as biocontrol agents for plantain stem borer is in progress combined with another Project to scale up this technology between farmers.

Nematode	Relative frecuency (%)	
	Dry Season	Rainy season
Meloidogyne spp.	39,84	49,65
Helicotylenchus spp.	39,32	38,45
Radopholus similis	19,40	10,90
Pratylenchus spp.	1,42	1,0



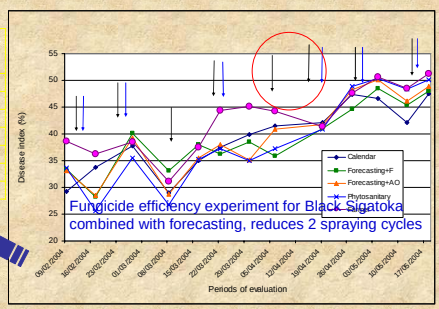
Cultural practices for nematodes control

Harvest return (days) and average weight of bunches in plantain cv. Barraganete, during 3 cicles. Rehabilitation trial, INIAP – IPM/CRSP. El Carmen. Ecuador.

TREATMENTS	Segundo Ciclo		Tercer Ciclo		Cuarto ciclo	
	Return (days)	Peso (Kg)	Retorno (días)	Peso (Kg)	Return (días)	Weight (Kg)
Cia. Exportadora	295	8,76	375	10,07	340	8,00
MIP - Fungicidas	276	11,44	281	11,88	301	10,70
MIP - Fungicidas	286	10,99	278	10,80	302	9,00
Testigo (agricultor)	347	9,34	325	9,69	353	7,8

Area Under Disease Progress Curve of Black Sigatoka (*Mycosphaerella fijiensis*) in plantain cv Barraganete, during 3 years Rehabilitation trial, INIAP – IPM/CRSP. El Carmen. Ecuador

TREATMENTS	YEARS		
	2000	2001	2002
Cia.Export	11308,30 a	8099,20 b	10858,40 a
IPM+ Fungicide	10878,30 a	7375,00 a	9488,90
IPM- Fungicide	11127,90 a	7542,30 ab	9741,10
Control	12591,40 b	9017,70 c	11348,60
CV %	2,85	3,29	4,9



Fungicide efficiency experiment for Black Sigatoka combined with forecasting, reduces 2 spraying cycles

Variable Costs and marginal rate of return on two IPM experiments with plantain in El Carmen region, Ecuador, after three years.

No dominates Treatments		Variable Costs ($/Ha)		Marginal rate of return %	
New Planting	Rehabilit.	New Planting	Rehabilit.	New Planting	Rehabilit.
Single rows + IPM	*Farmer*	381,92	146,88		
Double rows + Traditional Mngmnt	*IPM + No Fung*	475,[illegible]	358,09	458,72	370,94
Double rows +	*IPM + Fung*	632,61	466,93	349,[illegible]	

❖ Defining tool delivery technologies

Establishment of technological levels with farmers (participative diagnostic)

Illustrating IPM principles and The low of minimum

• Priorization problems (Stairs method)

• **Transfer modules design & validated**

Framing new triners "Facilitadores"

Bioassays demonstrate biological principles and living cycles

New facilitators are now using with confidence the modules developed and *de mutto propio*, have started new groups