



European Network for the Durable Exploitation of Crop Protection Strategies

IA3 activity: human resource exchange
SA3.2 sub-activity: foster the participation of research teams
from INCO target countries

ENDURE Grants for INCO scientists

Final activity report

(The form has to be filled in and sent to the activity leader – message should be sent to his p.a. elisa.scanzi@ibaf.cnr.it – within 15 days after the end of the visit)

1. Information about researcher and sending partner

Name and surname: Dr. Timothy Ipoola OLABIYI

Professional status: Senior Lecturer

Sending partner: Ladoke Akintola University of Technology, Ogbomoso, Nigeria

Institute/Department/Research Unit: Department of Agronomy/ Crop Protection

Address: (street, postal code, city) Ladoke Akintola University of Technology, P.M.B. 4000, Ogbomoso, Nigeria.

E-mail and phone number of the researcher: t.olabiyi@yahoo.co.uk
+2348065245297

2. Information about hosting partner

Hosting partner: Consiglio Nazionale delle Ricerche, Naples, Italy

Institute/Department/Research Unit: Istituto per la Protezione delle Piante

Address: Via Universita, 133, 80055 – Portici (NA) - Italy

Supervisor name: Dr Michelina Ruocco

Supervisor e-mail: ruocco@ipp.cnr.it

Supervisor phone number*: +393484454164, +390812539337

3. Information about the visit

Duration: 3 months.

Starting date: 1 October 2009

Ending date: 30 December 2009

4. Description of the activities and outcomes

Background and context:

Biological control of disease/ pathogen is the application of natural enemies in the control/ eradication of the pathogen population. Biological control is an environmentally friendly, scientifically proven and effective means of mitigating pathogens or pests through the use of natural enemies. A world estimated loss due to crop diseases was up to 12%, while a loss due to post-harvest food spoilage was between 10 and 50%. Effective control of crop losses due to pests (micro-organism, insect and weed) therefore holds the keys for steady and stable food supply of the world. Amongst all effective and recommended controls of the crop pests, biological control holds a great promise for the future. Basically, biological control has the advantages of being environmentally friendly and not hazardous to the health of human beings, livestock and wildlife; especially now that the whole world is clamouring for IPM methods of pest control.

Fungi of the genus *Trichoderma* have a track record of being antagonist to quite a number of agriculturally important pests. It had been most effective bio-pesticides applied for crop protection since the era of traditional farming and nascent organic agriculture. *Trichoderma* have some unique characteristics that make it scientifically proven and suitable bio-control agents against varieties of pathogenic organisms infecting economic food crops. These are: non-toxic to human beings, livestock and wildlife; non-pathogenic organism on crops; compatible with other control methods (physical, chemical, cultural, planting of resistance variety); effective at low concentrations; easy and cheap to culture or produce; could be bottled or prepared in another easily distributable pack; *Trichoderma* is ubiquitous.

Objective:

- To assess *Trichoderma* species as bio-control and growth promoters on vegetables
- To determine the effectiveness of different *Trichoderma* species on pathogens of vegetables
- To isolate and determine the chemical constituents of secondary metabolites produced by *Trichoderma*

Activities carried out: 1st Month (October): Preparation of PDA and PDB for fungal spore and mycelia growth; Production of bio-control agents (*T. harzianum* T 34 isolate, *T. harzianum* T 22 ATCC isolate, *T. harzianum* T 22 mik isolate, *T. atroviride* P 1 isolate, *T. viride*) and pathogenic fungi (*Rhizoctonia solani*, *R. prato*, *Alternaria alternata*, *Botrytis cinarea*); Development of *in-vitro* based competition bioassay for determining bio-control agent suitable for pathogen: bio-control agent – pathogen interaction (*T. harzianum* T 22 ATCC isolate, *T. harzianum* T 22 mik isolate, *T. viride* versus *Rhizoctonia solani*, *Botrytis cinarea*, *Phytophthora cinnamomum*).

Some illustrations and results:

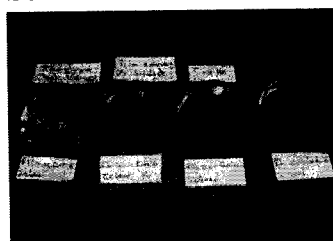


Fig.1: Competition assay between *Trichoderma* and pathogenic fungi (*R. solani*)

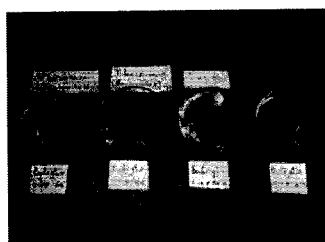


Fig.2: Competition assay between *Trichoderma* and pathogenic fungi (*B. cinarea*)

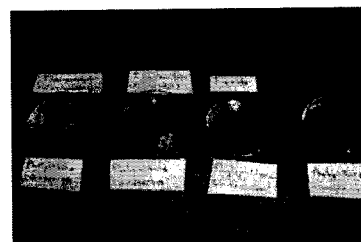


Fig.3: Competition assay between *Trichoderma* and pathogenic fungi (*P. cinnamomum*)

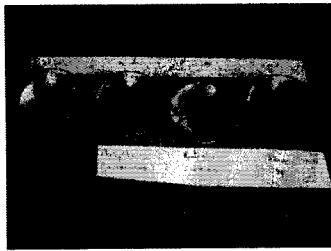


Fig. 4: Competition assay between *T. viride* and pathogenic fungus



Fig. 5: Competition assay between *T. harzianum* P 1 and pathogenic fungus

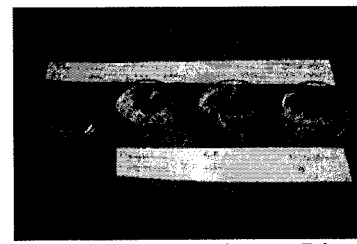


Fig. 6: Competition assay between *T. harzianum* T 22 ATCC and pathogenic fungus

2nd Month (November): Bio-fertilization effects of *Trichoderma* species on tomato (Inoculation of different tomato genotypes (Corbarino, LA 0716, LA 1777, N82, SM 36, TA 209) with some strains of *Trichoderma* (*T. harzianum* T 22 ATCC isolate, *T. atroviride* P 1 isolate) in the greenhouse); Extraction of the secondary metabolites produced by *Trichoderma* as bio-pesticides and/ or plant growth promoters; Effects of *Trichoderma* on the control of *Rhizoctonia* pathogen of tomato; Effects of *Trichoderma* on the control of *Sclerotinia* pathogen on onion.

Some illustrations and results:



Fig. 7: Secondary metabolites produced by *Trichoderma* in the separating flask

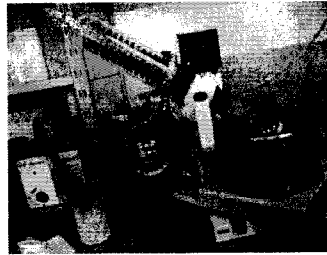


Fig. 8: Isolated secondary metabolites in the Buchi Rotavapor R-200



Fig. 9: Isolated secondary metabolites under UV light (254 nm)



Fig. 10: The scientist was preparing *Trichoderma* inoculum for greenhouse trial



Fig. 11: Effect of *Trichoderma* on the control of *Rhizoctonia* pathogen on tomato

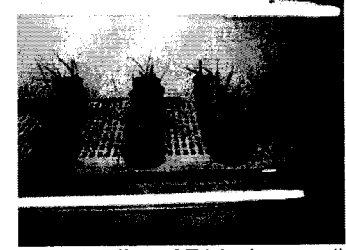


Fig. 12: Effect of *Trichoderma* on the control of *Sclerotinia* pathogen on onion

3rd Month (December): *Trichoderma* transformation; PCR of *Trichoderma* transformant gene; Effects of *Trichoderma* on the control of *Botrytis* pathogen on onion; Effects of *Trichoderma* on the control of *Alternaria* pathogen on onion; Preparation of slides for teaching purposes at home institution (LAUTECH, Nigeria); Anti-fungi bio-assay of secondary metabolite produced by *Trichoderma*; Presentation of 2 scientific papers at IPP-CNR, Naples, Italy.

Some illustrations and results:

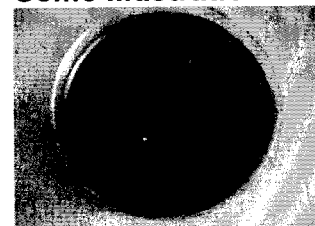


Fig. 13: Sporulation of transformant *Trichoderma* gene (day 4)



Fig. 14: Preparation of *Trichoderma* secondary metabolite for anti-fungi bio-assay

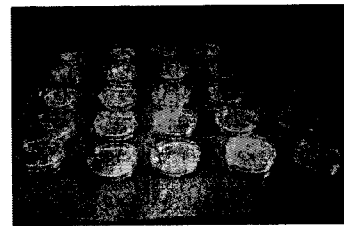


Fig. 15: Experiment on anti-fungi bio-assay of *Trichoderma* secondary metabolite

5. Links between visit activity and ENDURE

Describe links and relevance of your visit in relation to a specific ENDURE activity(ies) and sub-activity(ies) –
The visit actually corresponds to ENDURE activities and sub-activities in the following:

- 1A3. Human resource exchange
- RA4. Improving the basic understanding of the biology of the crop-pest systems
- RA 4.3. Exploitation of natural biological processes

6. Impact of the research:

On the researcher (Dr Olabiyi): The stay allowed me

- to increase my knowledge and skills in the use of *Trichoderma* spp. as biological control agents and plant growth promoter.
- to learn techniques used for the preparation of PDA, PDB and commercial production of bio-fungicides
- to learn the methods for the production of sterile inoculum culture of pathogens and bio-control agents
- to know how to maintain and produce inoculum culture for experiments
- to learn the production of sterile soil using laboratory-based equipment
- to learn in-vitro and in-vivo bio-assays for studying *Tricoderma* species and pathogens of tomato

On the sending partner:

- This project will enable the researcher (Dr Olabiyi) to set up an equivalent research programme on his return to Nigeria. This will provide the Dept. of Agronomy, LAUTECH to use similar control strategies for disease control in vegetable and other crops in Nigeria.

On the hosting partner:

- The work should also lead to future links and collaborations with IPP-CNR, Naples, Italy (host institution); Endure Crop Protection EU (host organization) and Ladoke Akintola University of Technology, Ogbomosho, Nigeria (home institution of the researcher).

Date of submission: 31 December 2009.



Dr. Maurizio Sattin
IA3 activity leader

Approved