

Final Report on the Summer Student Placement of Stephen Piper



The monies kindly donated by the James Rennie Bequest fund enabled me to spend thirteen-weeks of my summer vacation at CATIE, Turrialba, Costa Rica, under the able supervision of Dr. Ulrike Krauss and her two affable assistants Adolfo Martinez and Eduardo Hidalgo. Dr. Krauss is involved in a five-year research project investigating the efficacy of indigenous mycoparasites at controlling two diseases of cacao, Moniliasis (Frosty pod) being endemic to all but the cacao growing regions of Brazil in Latin America, and *Phytophthora* (Black pod) being pandemic to cacao plantations globally.

Based at CATIE (Centro Agrónomico Tropical de Investigación y Enseñanza) on the outskirts of Turrialba in the Valle Central, the work undertaken involved: attendance of a workshop, the installation and sampling of a field survival trial (FST) of biocontrol agents, a laboratory bench-based investigation of mycoparasite efficacy. I was also given the opportunity to visit various trial sites throughout the cacao growing regions of Costa Rica and Panama, learning and assisting in the preparation and application of biocontrol inoculum and familiarising myself with the methodology employed by accompanying extensionists.

The workshop "*Research Methodology in Biocontrol of Plant Diseases, with Special Reference to Fungal Diseases of Cocoa*" organised by Dr. Krauss at CATIE, running from the 28th June to the 4th July inclusive, was most informative. This workshop covered all aspects of the methodology employed in the identification and biocontrol of fungal diseases related to cocoa production and was attended by researchers and facilitators from: the United Kingdom, the United States of America, Latin America, the Caribbean and Africa. With laboratory practicals and site visits supplementing the presentations and discussion, this was a most invaluable experience and an excellent introduction to the problems encountered in the implementation of disease control methodology in cacao production was obtained. Manuals issued for this workshop have been presented to three libraries in Scotland, the SAC Agriculture and Darwin libraries at Kings Buildings and in the library at SAC Auchincruive.

Invited into Ulrike's office one day, I was presented with an A4 sheet of paper covered in sketches and doodles, presented to me as Ulrike's thoughts on the field survival trial that she asked me to undertake. After a brief brainstorming session, involving Ulrike, Adolfo, Eduardo and myself, the plans were laid for the experiment to be installed by myself, with the assistance of Adolfo and Eduardo when and if required. Five treatments were to be applied in this trial; two ultra-violet protectants, one adherent, a positive (unprotected mycoparasite inoculum) control and a (negative) water control. Laboratory preparations involved the inoculation of PDA agar petri dishes with a *Phytophthora* host (employing the pre-colonised plate method) the inoculation of growth medium (using the rice bag method of location of Hebbar and Lumsden 1999) with a strain of *Gliocladium*. Three locations (all within close walking distance) in Cabiria, CATIE's onsite germplasm bank, were chosen for the experiment site, each containing one cacao clone-type (UF29). Cacao pods (85) of an appropriate size and age for the experiment were randomly selected and tagged, the severity of the disease high-lighted here by the number of pods succumbing to the disease before the experiment could be installed. Finally, the mixing of the inoculum and inoculation with each of the prescribed treatments were undertaken and applied to the respective pods at each location. The methodology used for this exercise was exactly the same as of that used to apply inoculum at all of the project's associated trial and experimental sites.

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This experimental site was then sampled for 56 days, to determine the field survival of the mycoparasite and the efficacy of the adjuncts. The data collected are to be analysed and to form part of a larger report, and a possible publication, to be prepared in the near future.

The laboratory, bench-based experiments, were designed to investigate the host range, comparative growth and compatibility of promising mycoparasitic fungi, already in use on experimental and field trial sites associated with the project. Preparation involved the pre-colonisation of PDA agar petri dishes with each of the mycoparasites under investigation (*Gliocladium* and *Trichoderma* spp.), the two mycopathogens (*Monilophthora rorei* and *Phytophthora palmivora*) and two entomopathogenic fungi (*Beauveria bassiana* and *Metarhizium anisopliae*). These pre-colonised petri dishes were then challenged with a representative of each of the mycoparasites under investigation, incubated and then observed, using the method as described by Krauss *et. al.* (1998). Again these data are being analysed and will be encompassed in a larger report or publication to be prepared in the near future.

Visits to each of the experimental and trial sites were also undertaken, mostly in the company of Ulrike's assistant, the most affable Adolfo Martinez. The experimental sites at La Lola, a CATIE experimental research station situated on the lowland plains, comprised of two relatively abandoned cacao germplasm plots, one plot having a high incidence of "frosty" pod, the other having a high incidence of "black" pod. The trial sites, six in the Talamanca region of Costa Rica and five in the Bocas del Toro region of Panama, are all situated in producing cacao small-holdings, treatment application and evaluation were undertaken with assistance from the farmers, local co-operatives and extension workers. For each of these visits mycoparasitic fungi were cultured, using the rice-bag method, transported to the sites where the inoculum was prepared using low-tech methodology, the inoculum being applied using hand sprayers. This was rather hot and sweaty work, but the experience gained made it well worth the effort. The experience and skills gained from this introduction to extension methodologies and the role played by extension workers, will no doubt, stand me in good stead for my future ambitions.

I would therefore like to extend my thanks to the James Rennie Bequest committee, for funding this undergraduate summer vacation placement, without which this most valuable experience may well never have occurred. I would also like to extend my thanks to Dr. Ulrike Krauss, a most capable and approachable supervisor and to Ulrike's two assistants, Adolfo and Eduardo, along with all those working in Fitoproteccion. The memories, experiences and skills gained during my stay at CATIE, a most pleasant working environment, surrounded by the most pleasant of people, will always remain with me.

Pura Vida!

Hebbar. K. P. and Lumsden R. D. Formulation and Fermentation of Biocontrol Agents of Cacao Fungal Pathogens: Example of *Trichoderma* Species. In "*Research Methodology in Biocontrol of Plant Diseases, with Special Reference to Fungal Diseases of Cocoa*" edited by Krauss. U and Hebbar P. (1999), CATIE, Costa Rica, pp 63-68.

Krauss. U., Bidwell. R. and Ince. J. (1998) *Isolation and preliminary evaluation of mycoparasites as biocontrol agents of crown rot of banana*. Biological Control. Vol. 13, pp111-119. Academic Press.