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“Challenges to Organic Farming and Sustainable Land Use
in the Tropics and Subtropics”

Plant Health Protection in Organic Coffee Cultivation in Peru: a Basic Programme for Obtaining and Applying Ecologically Acceptable Bio-Insecticides and Fungicides

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This is a short description and follow-up of results so far achieved in our research in Peru. This is aimed at **CONTROLLING fungal diseases** and **insect-caused damage** in shade-grown COFFEE crops, by locally producing and applying ecologically sound **organic** “bio-fungicides” and “bio-insecticides”

The described production area lies in north-eastern Peru, in the Andes rainforest, a region of great **BIODIVERSITY** we aim at conserving by helping locally organized coffee growers towards **sustainable production**. Our organization has, working **together** with **GTZ – PDR/DIAM (Programa de Desarrollo Rural / Proyecto de Desarrollo Integral Alto Mayo)** who are very active in the Altomayo region, installed and equipped a laboratory in this tropical little-known region. The specialists engaged in this research work are in close contact with the coffee-growers. Field work often means walking for hours through dense jungle, or using canoes, to reach their small plots.

Our **MATERIAL AND METHODS** is as follows:

Re. our Phase 01 (March 2002-December 2002):

1. Gathering information: From Peruvian and foreign bibliographical data. Also orally reported information from local growers and above all, our field technicians, on observed interaction of plants or insects in the field.
2. Identification and taxonomy of the studied plants
3. Collection of research material (leaves, flowers, fruits, seeds etc.)
4. Treatment of samples: cleaning and preserving for later use
5. Preparation of vegetal biocides:
 - powders: the vegetal material is dried and then pulverised (ground)
 - infusions: boiling water is poured over the material and it is left to steep for several hours, before using
 - boiling: material is boiled in water during 30-60 minutes, and left standing for a couple of days
 - maceration: material is left tightly covered in a jar of water for 3-15 days (fermentation)
 - oils: ground seeds are left for 3 days in water; (supernatant) oil is obtained.

6. Tests with various aqueous extracts to select those which have effect on economically damaging insects or fungi.
7. Evaluating pre- and post-application effects in the field
8. Identifying application strength, frequency and seasonal timing. Field tests in each regional zone.

First **RESULTS:**

To the present, 3 tests have been completed in phase 01 :

FUNGICIDES (Mycofungicides):

Test 1

Plants used: *Equisetum arvense* leaves
 Azadirachta indica leaves and seeds
 Ficus atrax fruits
 Ricinus communis seeds and leaves
 Carica papaya leaves

In this experiment, the vegetal material was macerated for 20 days, Concentration 250gr/l. ; 3 applications at 15 days interval, with 4 l macerate per 20 l spray-pump. The effect on *Mycena citricolor* was tested for each macerate in a plot of 15 coffee-plants each.. Compared to *Azadirachta* macerate (2% reduction), *Equisetum* showed a limited effect of 0.8% reduction of the disease. The papaya leaves macerate stressed the coffee plants, resulting in defoliation, and the disease reappeared promptly. The other plant macerates had no effect whatever.

Test 2

This test used infusions of: *Mammea american* leaves
 Azadirachta indica leaves

The infusion was applied at intervals of 15 days to 2 plots consisting of 15 coffee-plants each in a coffee grove attacked by *Mycena citricolor*.

Neem showed a good effect: on average, each application brought a 4% reduction of the fungus. The *Mammea* macerate however, showed no effect at controlling the disease.

Test 3

This test used plants suggested by inhabitants of the region:

Equisetum arvense 10, 20, 30%
Agave americana 25, 50%
 “Patikina” *Croton adipatus* 10, 20, 30%
 “Matex” *Lonchocarpus nicou* mixed with *Clibadium remotifolium*

Maceration was for 3, 5 and 7 days.

Each treatment was done on 2 coffee plants, with 80 leaves evaluated and treated per plant.

3 applications, once daily, were made, to control *Pericullaria koleroga* .

Results:

“Matex” has a negative effect on the fungus: the mycelium wilts and dies , and can be controlled. However, the leaves are also affected and the spraying causes defoliation. 15 days after spraying, the defoliated area showed marked recupertion, with new leaves budding. So

now we are working on the concentration rates and application intervals of this macerate as an alternative control of this disease.

The *Agave americana* macerate (both concentrations) produces a degeneration of the fungus' mycelium: we are now trying higher concentrations of 60 and 70%.

The other macerates showed no effects .

INSECTICIDE

Macerate of *Mammea* was tested as a control for *Scrobipalpula absoluta*. 3 applications were made in intervals of 3 days, after the level of damage had reached 12 %. As a result, the infestation was controlled. We were therefore able to corroborate the findings of *Gaby Stoll* in her publication "*Natural Crop Protection in the Tropics*" *Margraf Verlag, 1989*" where she describes the insecticidal properties of *Mammea*.

We used macerate of *Mammea* in applications (250gr/l) with an interval of 15 days to control *Leucoptera coffeicola* with very good results.

Last minute Note:

A fourth test is being carried out with *Agave americana* 60 and 70%, "Catahua" (*Jura crepitans*) 50 and 60%, "Yuquilla" (*Euphorbia cotinoides*) 30% and *Croton adipatus* 60% to control *Pericullaria koleroga* in coffee plants.

We also visit the far-flung production zones regularly, collecting information and organizing meetings to explain and instruct the growers in identifying and treating the more important diseases and pests they might have in their coffee plots.

Phase 02 (November 2002 - December 2003)

In this phase, we shall use microorganisms that are found on or near the region's crops as natural controls to combat agricultural pests. Our project makes use of a basic laboratory to produce or cultivate these microorganisms. Further aims are:

- Collection of vegetal material (berries, leaves, fruit, stems, roots) parasitized by naturally controlling microorganisms e.g. *Beauveria spp.*, *Verticillium spp.* From soil probes we intend to isolate interesting *Trichoderma* and *Mycorrhiza spp.*
- Isolation of local strains of the studied fungi
- Bulk production of pest-controlling microorganisms
- Application in experimental plots ((areas))
- Studies in dosage and frequency of application
- Evaluation of results

Update on entomopathogens:

- A local strain of *Beauveria sp.* (from C.P.M. Pueblo Libre) was isolated. In about 15 days bulk production will enable its application in the combat of "broca del café" (*Hypothenemus hampei*) programmed for the month of October.
- Further local strains of *Beauveria* from Huascayacu, San Rafael, Shimpiyacu, Tornillo, Ganímedes and other localities are being isolated in the laboratory.

It is important to note **that work in phase 02 has been accelerated** due to the urgency of obtaining *Beauveria* for application to combat *Hypothenemus*. This pest attacks coffee berries when they are still small – preventive measures of applications should be timed to start in October of this year.

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