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Fermented Forest Litter

What is it about?

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SESSION 2: Innovative farming practices

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OVERVIEW

What are we talking about ?

- Fermented Forest Litter, FerFoLi (LiFoFer)
- an empirical method
- mainly used in the tropics
- adaptation to temperate climate by e.g. Terre & Humanisme (T&H, a french NGO)

ORIGINS

HISTORY

- in 1895 Nobbe+Hiltner used *Rhizobium sp.* as biofertiliser
- 1980ies, Prof. Terugo Higa, Japan : discovered effective microorganisms, Bokashi (fermented organic waste)
- boiled rice – coloured mould
- 1990ies, spread to SE Asia and Latin America (Costa Rica)
- tested in Cuba, Experimental Station Indio Hatuey ESIH of Matanzas Univ. of Cuba
- 2003-2006 experience in Zurich, CH, (EM vs. sterilised EM)
- 2015, Andrah Pradesh, IN (dung instead of litter)
- since 2019 in EU, FR, experiences and tests by FIBL, CIRAD, IRD, agronomists, NGO's, farmers, technicians

INTRODUCTION

Claims

- looking for nature-based solutions
- to improve nutritional balance of plants
- bio-fertiliser plant growth promoting bacteria
- plant growth promoting rhizobacteria
- colonise roots after inoculation
- Phytostimulation abiotic stress tolerance (heat, drought)
- Biocontrol
- to prevent or cure diseases
- to stimulate growth
- All these are hypothesis !

CLAIMS

BASICS

- bio-protector
- nutritional balance prevents diseases
- effective microorganisms EM
- forest litter = high microbial diversity : bacterial and fungal communities (mycorhiza)

fermentation leads to :

- + easily assimilated nutrients
- - C/N
- - pH
- - fungi

METHOD

PRINCIPLES

- Steps to produce liquid containing beneficial microorganisms from forest litter (most diverse),
- instead of commercial EM (expensive, standardised), take local forest litter and do it yourself !

Low cost and low tech nature-based solution

- 15Kg of litter –> 17000 l solution –> 130ha.
- EUR 0,03-0,10 /l -> EUR 4-13 /ha. (but depending on soil, OM content, plants, climate)
- Easily created from native microorganisms from local forest litter

METHOD

PREPARATION

Take local forest litter (3/10) - add :

- source of “slow” sugars and fibers – wheat bran (4/10)
- source of “rapid” sugars (mono and di-saccharides)– sugarcane or sugarbeet molasses (1/10)
- source of lactobacteria, protein and lactose – whey (1/10)
- (H2O)
- One month solid-state fermentation

then:

- One week fermentation as “liquid” fermentation = activation : (5% of solid phase + 5% molasses + H2O)

Two successive fermentations !

- dilution to 2 to 10% according to use
- Option, incorporate wood ash for minerals (2-4 kg /100 l liquid FerFoLi)

RESULTS

FINDINGS

- FerFoLi contains lactic acid bacteria and yeasts
- but little knowledge about chemical (gas and liquid chromatography, mass spectrometry: lactic acid, acetic acid, ethanol, ethyl-acetate, 2 plant hormones: Salicylic ac and abscisic ac.)+ microbial characterisation : qPCR, real-time, metabarcoding
- biofertiliser market is increasing, but costs are high for small farmers, so better produce themselves
- reduction of stress (draught, heat) in grapevines
- higher levels of aminoacids in sap of raspberries treated with FerFoLi, prolin increase by +18%, protects plants against stress.
- Higher survival in broiler, bigger eggs.

The differences in different litter proveniences are converted to a relatively similar product by the selection via anaerobic and copiotropic fermentation (=stress) mainly containing lactic bacteria and yeasts.

RESULTS

several findings as mentioned in litterature, by :

- composition and characteristics
- effects on soils (improved water retention, soil structure, incorporating organic matter, but survival in aerobic and oligotrophic habitat such as soil ?)
- effects on compost
- effects on plant growth and production
- effects on husbandry (probiotics, sanitation, bad smell)
- effects on polluted waters (against eutrophication)
- obstacles and levers for spread and experimentation (are the microorganisms efficient, e.g. as fertiliser ? Are some molecules (enzymes, plant hormones) bio-active ? Which mechanisms ?)

FINAL

CONCLUSION

- seems promising (but needs strong and thorough agronomic experiments)
- need for proof
- Explore other promising applications (e.g. pest control)

Questions ?