Extended Practice Abstract Nº 4

On-farm production and application of compost tea

Challenge

The challenge is to manage soil fertility patterns of Mediterranean crops to improve water efficiency, photosynthetic activity, nutrient balance and fruit quality.

Solution

Compost tea production is an on-farm practice that requires collecting and recycling organic by-products associated with other soil improvement techniques (mulching, green manuring, etc.).
Adequate knowledge of all the processes, product application and crop cycles is fundamental to achieve good results.

Benefits

Using compost tea can significantly contribute to maintaining soil organic matter quality, increasing farmers' monetary savings and enhancing biodiversity and on-farm adaptation to climate change.

Applicability box

Theme

- Agricultural by-product
- Biodiversity
- Climate change adaptation
- Organic fertilization

Context
It is a general technique that optimises development in extensive and organic farms, where nutrient cycles are fundamental.

Application time
Almost all year depending on crop needs.

Required implementation time
Between two and three months, starting from the raw material.

Period of impact
Medium- (crop effects) or long-term (soil) depending on the parameters considered.

Equipment
Bioextractor, oxygen pump, timer

Practical recommendation

How is it produced?

The production process involves using mature compost in a capacious bag made of mesh, placed in a bioextractor with a robust tank capable of containing the liquid mass and equipped with an aeration device.

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What has been done in the Oltre.bio OG?

The extraction was performed with a 1:5 v/v ratio (20%). The timer was set to 15 minutes (on) every 3 hours (off) to guarantee the right oxygenation. The process lasted five days and, before administration, a further dilution was opted for after measuring the electrical conductivity up to a ratio of 1:15 v/v.

- Cherry orchard: 3l/plant in soil + 250 ml/plant by foliar application. Distribution in three phases: beginning of flowering, post-set and veraison.
- Vineyards: 1.5l/plant. Distribution in three phases: shoot length approximately 15 cm, post-fruit setting and veraison.

What are the benefits of compost tea?

SUPPRESSIVITY

It can partially substitute fungicides, having suppressive properties due to antagonistic microorganisms and the abiotic component.

NUTRITIVE ACTION

Contains organic molecules and inorganic elements in solution that can exert a fast-acting nutritive action in combination with biostimulant effects.

Further information

Videos

- Oltre.bio. The new organic challenge: https://www.youtube.com/watch?v=4uijvoO302k&t=3s
- Discover the results of the project: https://www.youtube.com/watch?v=HiyblypTeno&t=188s

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- How to get compost and compost tea. Oltre.bio project demonstration day on 29/04/2022: https://www.youtube.com/watch?v=TeVOBrJDkPw

Web links

- https://feder.bio/progetti/oltre-bio/
- https://feder.bio/wp-content/uploads/2022/04/Programma-oltrebio-29-aprile_DEF-005.pdf
- https://feder.bio/compost-compost-tea-risorse-sostenibili-la-produzione-bio-ciliegie-uva-tavola/
- https://feder.bio/wp-content/uploads/2017/07/Compost-ed-estratti-per-la-sostenibilita-dei-sistemi-agricoli.pdf
- https://feder.bio/wp-content/uploads/2017/07/Poster-Oltrebio-23012023-2.pdf

Further reading

2 phytosanitary management notebooks:

- Phytosanitary protection of the cherry tree in organic farming: https://feder.bio/wp-content/uploads/2017/07/rev-29-NOV-22-Schede-impaginate_ciliegio.pdf
- Phytosanitary protection of table grapes in organic farming: https://feder.bio/wp-content/uploads/2017/07/REv-18-MAGGIO-2023-Schede-impaginate_vite.pdf

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This practice abstract was elaborated in the framework of CLIMED-FRUIT project.
Project website: www.climed-fruit.eu

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Cost/benefit analysis

Compost tea

Introduction – presentation of ex-ante and post-ante situation

In Mediterranean regions, organic farmers usually maintain soil fertility using on-farm compost (ex-ante). However, there is another possibility to obtain the same achievement using a derivate known as Compost Tea (CT) (ex-post). The use of CT has several added values:

- **Environmental:** CT production comes from on-farm by-products through an aerobic process of recovering carbon and nitrogen present in green residues or animal ones (such as manure),
- **Economic:** by-products are not waste anymore, but if reused in the farm, they are useful for a medium programming time of fertilisation, representing a good substitution for the external fertilisers,
- **Social**: in view of the implementation of circular economy strategies, the goals of sustainability can be better pursued,
- **Agronomic:** the application improves soil structure and permeability, as well as the soil microbiome.

Specifically in short term cycle crops (tomatoes, zucchini, and similar other crops), compost tea can be considered as a fertiliser, with local application concentrated in the crop lifecycle. The analysis is conducted in the context of the south of Italy, particularly in the Puglia region. The geographical area is strongly dedicated to organic agriculture and, consequently, to the production of fruits with excellent organoleptic and nutritional characteristics. The described approach has allowed the development of sustainable technologies from an economic and environmental perspective, which satisfy the needs of producers and consumers.

Economical costs and benefits

Legend

Estimated indicator

Measured indicator

	Ex-ante (total amount €/ha)	Ex-post (total amount €/ha)
Variable costs		
Seedings/plants	**500 €/Ha**	**500 €/ha**
Fertilizers	**2000 €/Ha** *Buying market fertilizer*	**1000 €/ha** *Production of compost tea*
Pesticides	**1000 €/ha**	**1000 €/ha**
Water	**1000 €/ha**	**700 €/ha**
Labour	**1000 €/ha**	**1500 €/ha** *Brewing machine*
Machine costs	**1000 €/ha**	**1000 €/ha**
Revenues	**None**	**1000 €/ha** *as saved cost of fertilisers*
TOTAL	**6500 €/ha**	**5700 €/ha**
COMPARISON	Global decrease of 12% of the cost:	

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Environnemental costs and benefits

Energy	Indicator approximate deterioration between 1 and 24%: 
The indicator used is relative to fuel (intended as fuel amount necessary to produce CT) and, in particular, to gasoline as unit of measurement (0,5L of Gasoline to produce 10 kg of compost tea).	
Water	Indicator approximate improvement around 10%: 
The use of CT proves to increase soil permeability thus fostering water savings (intended as water saved from further irrigation turns : around 10%).	
Soil	Indicator approximate improvement from 75% and up: 
Soil quality (increase/maintenance of soil permeability and porosity) proves to be consistently increased, together with the unit of measurement, i.e. level of nutrients in soil analysis.	
Air	Unmeasured impact: 
No direct relationship between the practice and the indicator in question	
Biodiversity	Indicator approximate deterioration between 1 and 24%: 
Biodiversity (intended as the reuse of farm by-products as fertilisers) is slightly decreased.	

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Extended Practice Abstract Nº 4

Oltre.bio – Innovative Management of Organic Cherry Growing and Organic Table Viticulture

Short description of the OG

Oltre.bio links agriculture with government and research in the Apulia region. It focused on two main crops, organic table grapes and cherries, using an ecosystem approach to improve crop quality through soil and water management. Agronomic and post-harvest techniques were keys to success. By prioritising sustainability and organic practices, Oltre.bio aimed to produce top-quality fruit while promoting environmental conservation and biodiversity.

Benefits

Increasing soil fertility and managing adversity by using advanced sensors to analyse adversity early. Rationalizing and better managing the irrigation supply, post-harvest and packaging.

Stage of implementation

The project ended in February 2023.

Applicability box

Theme

Climate change adaptation
Organic fertilization
Pest management
Soil health
Value chain
Water-use efficiency
Digital technologies

Context

Apulia region, South of Italy.
On-farm composting to produce compost tea, application of DSS to improve water-use efficiency, sustainable adversity management and innovative packaging to increase shelf-life represent best practices at the experimental level in the region.

Duration

4 years (2019-2023)

Partners involved.

Producer organisations, research bodies, universities, regional institutions, innovation brokers.

Budget

495.000,00€

Particularity

In the context of the Apulia region, which is particularly suited to agriculture, the project aimed to create an ecosystem between private companies, research bodies, and regional institutions to foster soil health and water-use efficiency. This objective was pursued through innovative solutions experimented on-farm.

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Main achieved or expected results

- ***Improved soil fertility***

Public opinion is shifting towards sustainably produced agri-food products with a low environmental impact. The recovery of waste and organic residues through on-farm composting is key to achieving sustainability in agroecosystems (Fig. 1).

Figure 1. On-farm composting at the CREA-AA experimental farm

Compost tea is a liquid extract of organic and inorganic molecules and microorganisms (Fig. 2). The process usually lasts about 5–8 days. The Oltre.bio project aimed to enhance the understanding of compost tea production and its application in organic cherry orchards and vineyards in Apulia (Fig. 2).

Figure 2. Production of compost tea at the CREA-AA experimental company

- ***Water use efficiency by using the Decision Support System (DSS) in organic table grape vineyards***

At farm level, the sensors measure soil moisture, temperature, electrical conductivity and atmospheric pressure. Data is gathered in Blueleaf software to aid farmers in making informed decisions, enhancing their awareness and efficiency in the field (Fig. 3).

Figure 3: Communication method between hardware and software

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- ***Innovative packaging to increase the shelf life of organic cherries and organic table grapes***

BlowDevice® technology, patented by UNIBAS and Ninetek Ltd, gives the packaging breathable characteristics to extend the shelf life of perishable organic fruit (Fig. 4). The device was recognized as a 'key technology' in Europe. A packaging machine for industrial use has been developed.

Figure 4. Organic table grapes stored under MAP in packaging equipped with BlowDevice®

- ***Adversity management***

Different natural extracts were tested on the farms at blooming and before harvest to control the incidence of pre- and post-harvest rot in the main crops. Chitosan was the most effective product, reducing the development of rot by over 68% in post-harvest cherries (Fig. 5).

Figure 5. Application of treatment and the effect of natural extracts to control post-harvest rot

- ***Phytosanitary and agronomic bulletins***

Oltre.bio partners carried out weekly field inspections on the farms involved in the project. The data collected on phytosanitary management and technical guidance were disseminated through 39 bulletins.

- ***Phytosanitary management notebooks***

The main project outcome was the development of two notebooks dedicated to pest management for farm companies and technicians.

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Existing materials

Videos

- Oltre.bio. The new organic challenge: https://www.youtube.com/watch?v=4uijvoO302k&t=3s
- Discover the results of the project: https://www.youtube.com/watch?v=HiyblypTeno&t=188s
- How to get compost and compost tea. Oltre.bio project demonstration day on 29/04/2022: https://www.youtube.com/watch?v=TeVOBrJDkPw

Web links

- https://feder.bio/progetti/oltre-bio/
- Compost and extracts for the sustainability of agricultural systems: https://feder.bio/wp-content/uploads/2017/07/Compost-ed-estratti-per-la-sostenibilita-dei-sistemi-agricoli.pdf
- On-farm compost: https://feder.bio/wp-content/uploads/2017/07/Poster-Oltrebio-23012023-1.pdf
- Compost tea: https://feder.bio/wp-content/uploads/2017/07/Poster-Oltrebio-23012023-2.pdf
- Organic cherry growing: a demonstration day in the field: https://www.fruitjournal.com/cerasicoltura-bio-una-giornata-dimostrativa-in-campo-2/
- Innovative strategies for the control of pests and fungal agents: monitoring activities at the service of operators: https://feder.bio/wp-content/uploads/2017/07/monitoraggio-e-strategia-di-controllo-dei-parassiti-nel-ciliegeto-bio-1.pdf
- Organic cherry growing: a demonstration day in the field: https://www.fruitjournal.com/cerasicoltura-bio-una-giornata-dimostrativa-in-campo-2/
- BlowDevice®
- BlowDevice®: the eco-sustainable solution for the shelf-life of table grapes: https://feder.bio/wp-content/uploads/2017/07/Blow-device_Uvadatavola_II_Apr-Mag-2022.pdf
- Oltre.bio, innovative results for the organic table grape market: https://www.rinnovabili.it/agrifood/oltre-bio-risultati-innovativi-per-il-mercato-delluva-da-tavola-biologica/
- 39 phytosanitary and agronomic bulletins:
  - 21 bulletins in 2021: https://feder.bio/wp-content/uploads/2017/07/Bollettino-fitosanitario-e-agronomico-N-1-OLTREBIO_-rev-01.pdf
  - 18 bulletins in 2022: https://feder.bio/wp-content/uploads/2017/07/Bollettino-Fitosanitario-ed-agronomico-N-6.pdf
- 2 phytosanitary management notebooks:
  - Phytosanitary protection of the cherry tree in organic farming: https://feder.bio/wp-content/uploads/2017/07/rev-29-NOV-22-Schede-impaginate_ciliegio.pdf
  - Phytosanitary protection of table grapes in organic farming: https://feder.bio/wp-content/uploads/2017/07/REv-18-MAGGIO-2023-Schede-impaginate_vite.pdf

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Further reading

Effect of Materials and Assembly Methods on Gas Selectivity of Blow® Device: https://link.springer.com/chapter/10.1007/978-3-030-39299-4_80

Effect of Packaging Technology on the Quality of Pre-cooled Clementine Fruit: https://link.springer.com/chapter/10.1007/978-3-030-39299-4_78

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