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Bio Structuring Waveform Fields Enhance Microbial Growth and Cellular Organization in Agricultural Systems

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Abstract

Background and Objectives: *Optimising microbial growth and vitality is essential for sustainable, high-quality production in modern agriculture. However, classical biochemistry often fails to explain the rapid synchronisation observed in large cell populations, requiring further study of signal transfer mechanisms. This study investigates the impact of biostructuring and self-amplifying waveform fields, generated by the patented "Trasformer" device, on microbial cultures of agronomic interest.*

Methodology: *The Trasformer, defined as a quantum frequency focuser, was operated in self-resonant mode to induce a coherent state in aqueous media. Microbial cultures, including Lactobacillus spp., Metarhizium spp., and Aureobasidium pullulans, were monitored using optical microscopy and electron microscopy to assess growth dynamics and morphological organization.*

Results: *Significant increase in growth rates was observed, including a 25% reduction in fungal spore production time. Morphological analysis revealed the emergence of highly organised, non-conventional structural patterns, such as:*

- *Spiral growth in Metarhizium and hexagonal matrices in A. pullulans*
- *Filamentous lattices resembling metal-organic frameworks*
- *Increased extracellular vesicles production, indicating enhanced intercellular communication*
- *High environmental resilience, with treated water maintaining structural stability for months and resisting thermal stressors.*

Conclusions: *These findings validate models derived from Quantum Electrodynamics, which propose that the waveform-field treatment transforms water into an active coherent system and an efficient informational vector. These results advocate for a paradigm shift in agronomy, from purely biochemical models to resonance-based biophysical solutions. Providing prestructured water to crops may enhance biological stability and resilience, offering a high-efficiency alternative to reduce dependence on chemical inputs.*

Keywords: Trasformer Device, Water Coherence, Quantum Electrodynamics, Microbial Growth Kinetics, Sustainable Agriculture, Extracellular Vesicles, Pattern Formation

1. Introduction

In the modern agricultural landscape, the development of innovative methodologies to optimise the growth and vitality of cell cultures has become a priority for achieving sustainable, high-quality production. Classical biochemistry explains cellular communication through ligand–receptor interactions and other relatively slow, dissipative mechanisms. However, these models do not fully explain the rapid synchronisation and long-range coordination observed in large cell populations.

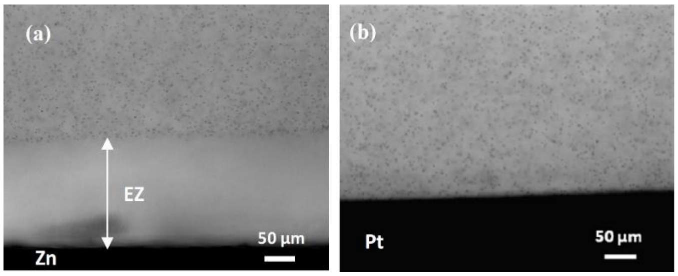

Figure 1: Image of an Exclusion Zone (EZ) forming near a zinc surface within a suspension of polystyrene microspheres (a); platinum, under similar conditions, does not exhibit an EZ (b) [6]. EZ thickness is dimensionally comparable to the "halos" observed around the cells.

Recently, scientific interest has shifted toward Quantum Electrodynamics (QED), which suggests that organic matter responds to chemical interactions and to resonance and phase coherence [1,2]. Within this framework, water is no longer considered a simple inert solvent, but an active coherent system fundamental to life. According to studies on Coherence Domains (CD) and Exclusion Zones (EZ) (Figure 1), water molecules can self-organise through phase-synchronised oscillations with electromagnetic fields, acting as a genuine biophysical communication infrastructure [3-6]. The ability to intentionally influence these aqueous structures offers revolutionary perspectives for the agronomic sector.

1.1. The "Trasformer" Device and Experimental Scope

The present study examines the efficacy of the "Trasformer", a patented electronic device designed to capture, amplify, and transfer frequency-related information to living organisms via treated aqueous media through biostructuring and self-amplifying wave fields. Experimental evidence indicates that applying these frequencies to bacterial and fungal cultures not only increases growth rates by up to 25% but also induces a profound structural reorganisation.

1.2. Emerging Biological Phenomena

Several phenomena previously unreported were observed following treatment with the Trasformer, including spiral or hexagonal colony development patterns and abundant extracellular vesicle (EV; exosome) production. This suggests an increase in cellular organisation and metabolic activity. In addition, the filamentous lattices observed in treated cultures morphologically resemble structures described in recent studies of metal-organic frameworks (MOF), highlighting a potential link between principles in advanced materials physics and cellular biology.

1.3. Research Objectives

The objective of this research is to document how induction of resonant states in culture water can act as an energetic and informational vector for biological systems. By improving the overall balance and organisation of biological development, this approach may facilitate new technological applications in plant nutrition and crop protection.

2. Materials and Methods

2.1. Instrumentation and Experimental Setup

2.1.1. The "Trasformer" Device

The core instrument used in this study was a Trasformer, a patented electronic apparatus with CE *(Conformité Européenne)* certification [7]. The instrument is defined as a waveform-field- generating electronic device, operating through frequency-magnetic-vibrational mechanisms designed to acquire, amplify, and transfer biostructuring waveforms [8]. In the configuration used (v.0), the device employs vacuum tube interactions to generate signals with high frequency coherence. Functionally, the apparatus is designed to capture vibrational information from physical entities (organic or inorganic) and convert it into electromagnetic signals absorbable by living organisms. In all experiments, the Transformer potentiometer was set to 70%.

2.1.1.1. Treatment Protocol and Self-Resonant Mode

Induction of the coherence state in culture media was performed in self-resonant mode. Interaction electrodes were immersed directly into the material to be treated (e.g. tap water or betaine powder). The treatment duration was 10÷30 s. The process was monitored using an analogue indicator; treatment was considered complete when the indicator needle reached the maximum, signalling total activation of the resonance mechanism. For standardisation, an information-transfer protocol was employed, whereby 1 mL of treated water was used to "inform" 400 mL of untreated water (final ratio: 2.5 mL/L).

2.1.2. Microscopic Analysis Equipment

Morphological verification and quantification of cellular structures and clusters, including EV and/or CD, were performed using multiple microscopy techniques:

- High-resolution optical microscopy: 10× eyepieces combined with 40× objectives (total magnification: 400×) and 100× oil-immersion objectives (total magnification: 1000×).
- Electron microscopy: A 5× lens was used for low-magnification analysis.
- Support systems: cultures were grown in Petri dishes and analysed using sequential dilution, vital counting, and Bürker chamber methods.

2.2. Water Preparation and Treatment

Selection of the aqueous medium was critical. Urban tap water, influenced by volcanic geological characteristics, and selected thermal waters showed significant effects, as the presence of solutes and electrolytes is necessary for inducing CD. Conversely, bi-distilled, demineralised, or rainwater did not yield any measurable effects. Treated waters demonstrated microscopy features and thermal stability even 5 months post-treatment.

2.3. Cell Lines and Culture Conditions

Experiments were conducted on microbial populations of agronomic interest:

- Bacteria: *Lactobacillus spp*. isolated from pollen and *Lactobacillus saccharomyces*.
- Fungi: *Metarhizium spp.* (entomopathogenic) and *A. pullulans*.
- Microalgae: *Dunaliella salina.*

Cultures were prepared from cryovials with an initial cell density of 10^{10} cells/mL, using appropriate media such as nutrient agar or potato dextrose agar.

2.4. Incubation and Control Protocols

Environmental and growth conditions were strictly controlled:

- Temperature and Humidity: incubation at 25 °C with 30% relative humidity.
- Biochemical Parameters: pH was maintained at 6.0–6.5 during growth and stabilised at 3–3.5 during the subsequent phase.
- Development Time: 24 h for bacteria and 48 h for fungi.
- Controls: Each test culture was compared with a control sample prepared using untreated water. Sterility was ensured by autoclaving and ultraviolet irradiation.

2.5. Analytical Techniques

2.5.1. Morphological Characterisation and Microscopy

High-resolution optical microscopy was used to determine cellular morphology and quantify EV. Low-magnification analysis (5×) was employed to evaluate macroscopic colony distribution and the influence of CD on growth plates. Non-conventional geometric growth patterns – such as spiral and hexagonal arrangements – were documented and compared with the disordered growth observed in control samples.

2.5.2. Microbiological Analysis and Vital Counts

Cell viability and density were monitored through standardised protocols, including sequential dilutions and vital counts with a Bürker chamber to determine the colony-forming units per mL. Growth rates were assessed by measuring the time required to reach saturation levels (10^{10} colonies).

2.5.3. Statistical Analysis and Validation

Validation was based on significant variations observed across >200 trials. Owing to experimental diversity, conventional statistical analysis of a single specific endpoint was not performed. Nevertheless, all trials conducted with tap water showed consistent and clear variation compared to those conducted using controls, indicating a definitive qualitative change due to the treatment.

3. Results

3.1. Growth Kinetics and Biological Vitality

Experimental trials conducted across multiple cell lines demonstrate that exposure to the biostructuring wave fields generated by the Trasformer induces a significant increase in growth rate and biomass production.

- Production Efficiency: under controlled conditions, the use of treated water reduced the average production time of fungal spores by 25%.
- Saturation Rate: treated samples reached colony saturation density within 18 h, compared with 24 h in the control samples.
- Colonisation Morphology: control samples exhibited limited, punctiform growth, whereas plates prepared with treated water showed diffuse colonisation with significantly higher colony density (Figures 2 and 3).
- Vitalising halos: microscopic analysis revealed the presence of rounded background structures – referred to as "vitalising halos" – which appeared to function as attraction and aggregation centres for microbial cells (Figure 4). This effect was further validated by the microalga *D. salina*, which exhibited a qualitative-observed active tropism toward these halos and organised in satellite-like configurations to acquire energy or information (Figures 5–7).

Figure 2: Developmental morphology of bacterial colonies in untreated water.

Figure 3: Developmental morphology of bacterial colonies in treated water (same colonies as shown in Figure 2).

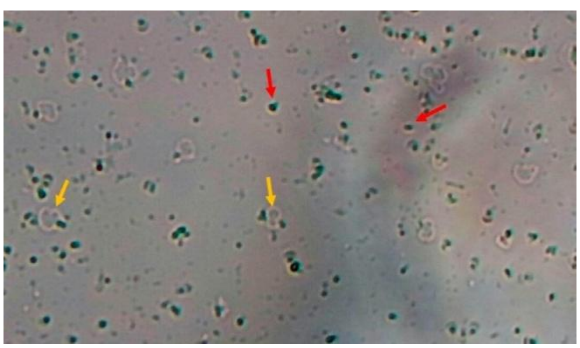

Figure 4: *Lactobacillus saccharomyces* culture highlighting roundish background structures around (red arrows) and between (yellow arrows) cells.

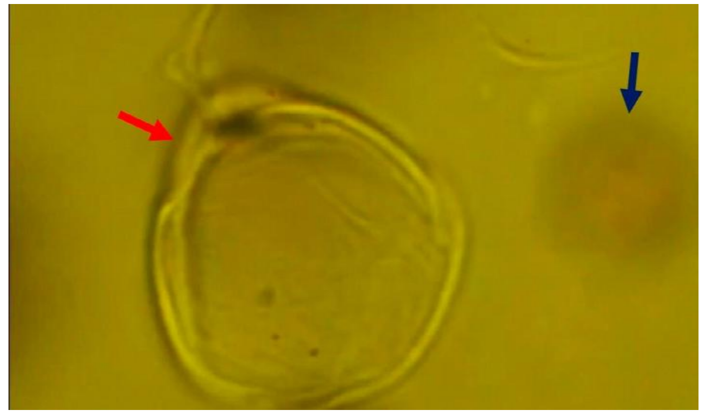

Figure 5: Attraction of *Dunaliella salina* cells toward vitalising and biostructuring halos: Phase 1 (halo indicated by red arrow, cell indicated by blue arrow).

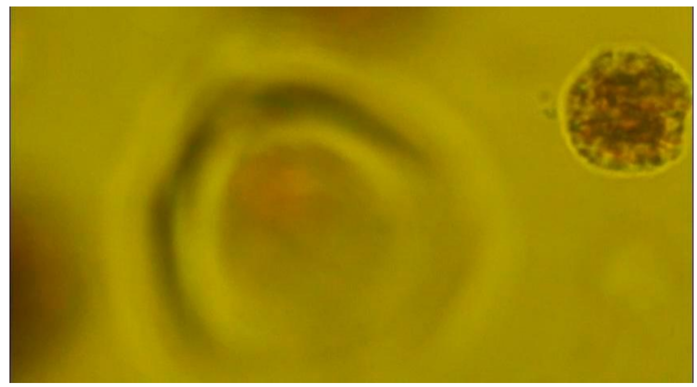

Figure 6: Attraction of *Dunaliella salina* cells toward vitalising and biostructuring halos: Phase 2 (6 s after Phase 1).

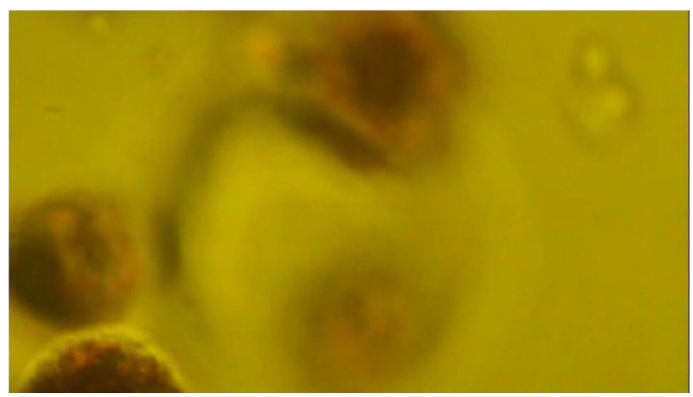

Figure 7: Attraction of *Dunaliella salina* cells toward vitalising and biostructuring halos: Phase 3 (20 s after Phase 1).

- Thickened shell formation: when the Trasformer was directly applied to the glycine betaine powder prior to dissolution in untreated tap water, the resulting solution displayed altered structural organisation. The treated solution showed the formation of "thickened cellular shells", a cautious wording to describe something still unclear, that it whether these structures represent membranes, extracellular matrices, or imaging artefacts. The thickened cellular shells are arranged in a more ordered and well-distributed manner (Figure 8) than the untreated solutions (Figure 9). At higher magnification, treated samples revealed more defined structures and clearer cellular halos than untreated samples (Figures 10 and 11).

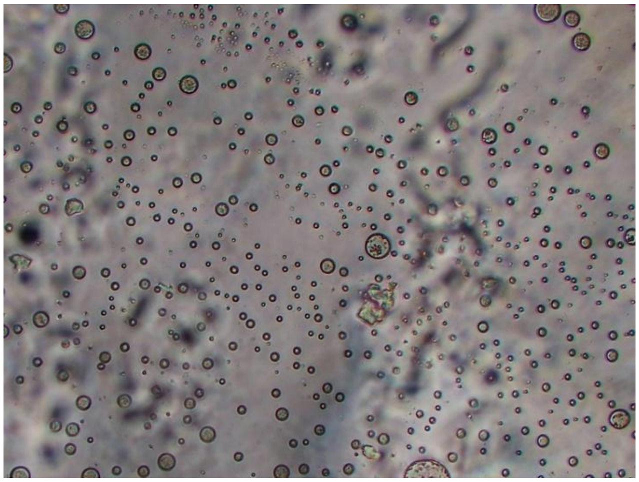

Figure 8: Treated *glycine betaine*.

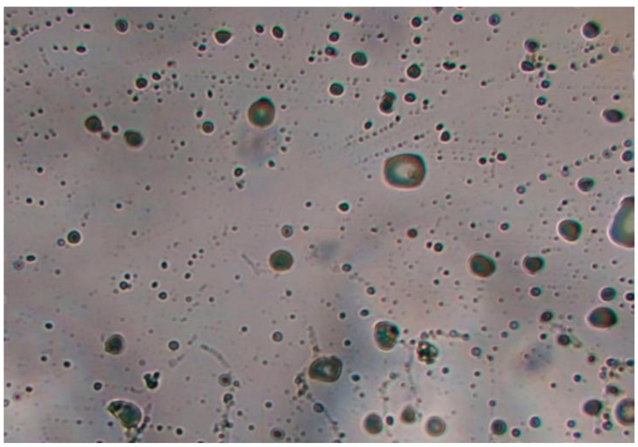

Figure 9: Untreated *glycine betaine*.

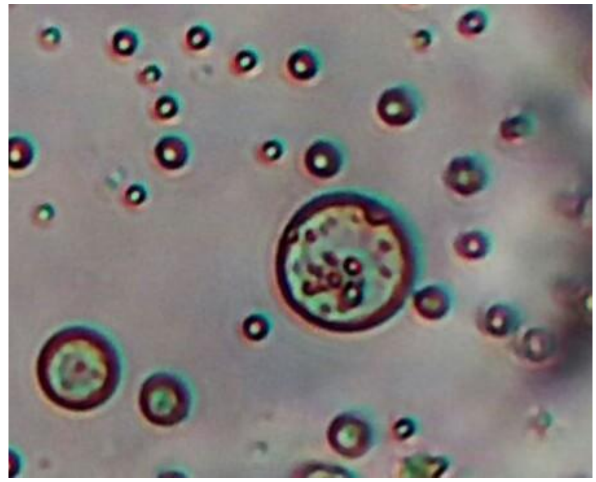

Figure 10: Detail of treated *glycine betaine*.

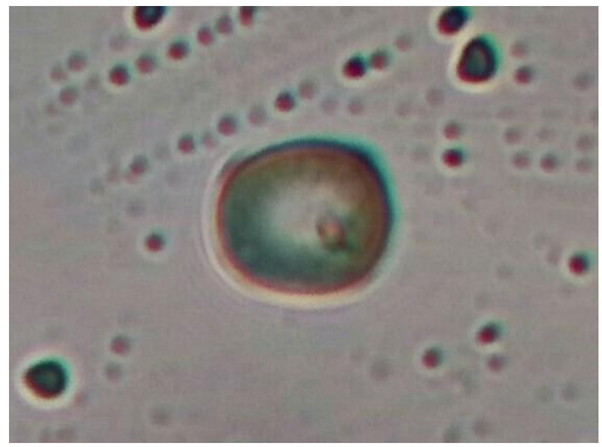

Figure 11: Detail of untreated *glycine betain*.

3.2. Vesicular Formations (EV) and Structural Frameworks

Treatment induced pronounced structural reorganisation in both aqueous media and cell cultures, characterised by complex frameworks and vesicular formations.

- EV: treatment enhanced the production of EV (exosomes), which are responsible for intercellular communication and transport of biochemicals such as RNA, proteins, and metabolites (Figure 12).
- Molecular dynamics: high-magnification observations (1000×) of treated water clusters revealed an increased molecular motion or dynamic clustering (Figure 13) consistent with regions described as activated CD [3,4] and energy reserves.
- Filamentous lattices: In Metarhizium cultures, the gradual formation of sub-hyphal filamentous networks resembling spiderweb-like lattices was documented (Figures 14–17). These structures resemble MOF architectures typically found in rare minerals [9] and advanced materials [10] (Figure 18).

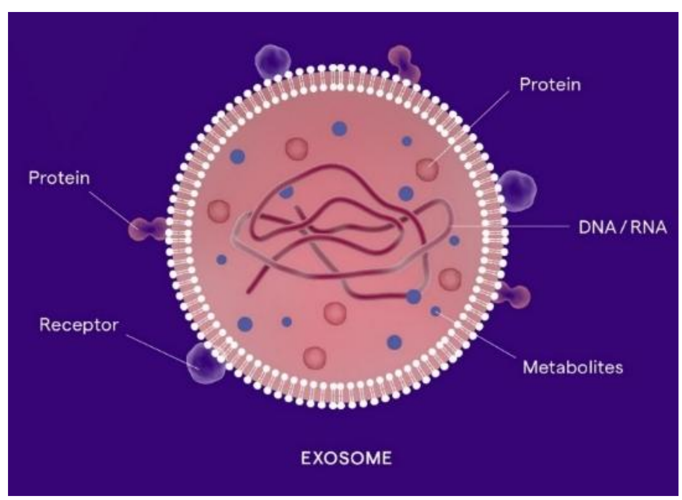

Figure 12: Composition of an *exosome* (extracellular vesicle; EV) [18].

Figure 13: High-magnification frame within a treated water cluster, showing an "energetic molecular dance" of semi-transparent elements with subtle shadows or inclusions.

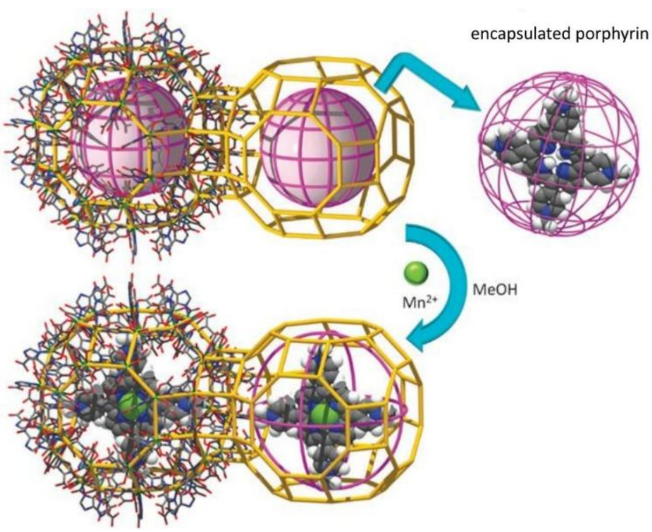

Figure 18: Schematic representation of a rho-ZMOF-1 cage, showing the full framework structure (left) and basic lattice (right), capable of encapsulating and metallising a porphyrin ring [10].

Figure 14: Sequence of photographs taken at 5 s intervals showing the gradual emergence of a filamentous lattice around fungal hyphae following contrast application; Phase 1.

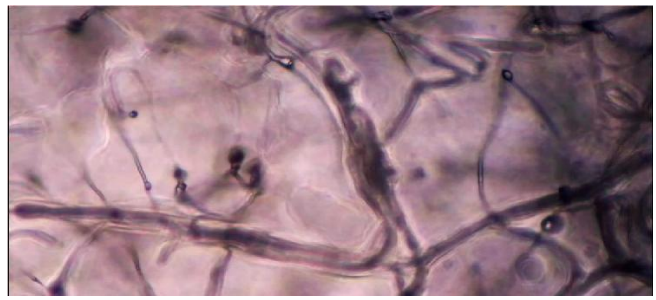

Figure 15: Sequence of photographs; Phase 2.

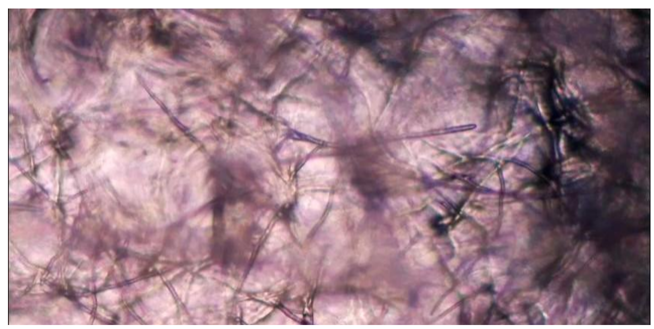

Figure 16: Sequence of photographs; Phase 3.

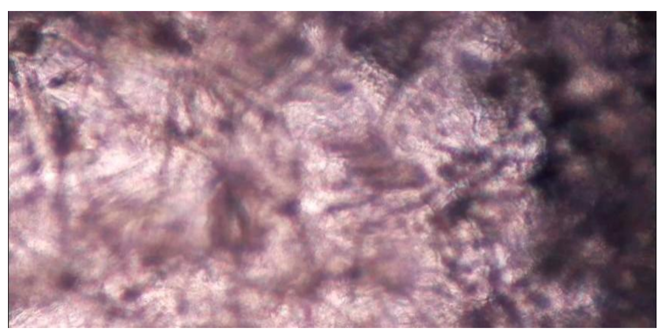

Figure 17: Sequence of photographs; Phase 4.

3.3 Geometric Anomalies and Spatial Organisation

A primary outcome of the experiments was the emergence of highly organised, non-conventional growth morphologies, which suggest that structured water conveys pre-existing structural information.

- Spiral development: Metarhizium cultures evolved from radial expansion to spiral growth patterns (Figure 19), a morphology not commonly reported for this specific species.
- Hexagonal matrix: *A. pullulans* exhibited colony growth arranged in a regular hexagonal matrix (Figure 20), contrasting with the disordered patterns observed in control samples.
- Crystalline symmetry: isolated *Lactobacillus* strains displayed a "crystalline" growth pattern (Figure 21), characterised by near-perfect radial symmetry expanding from a central origin.

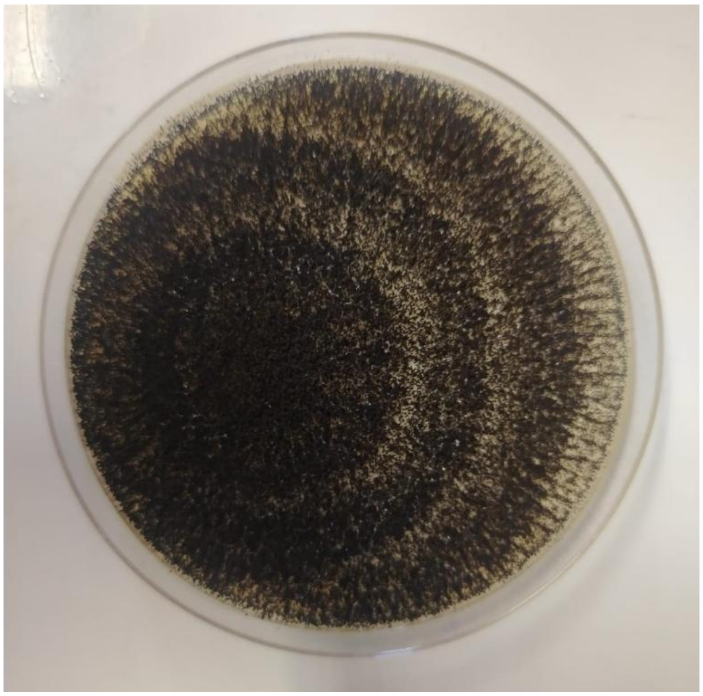

Figure 19: In cultures of the entomopathogenic fungus *Metarhizium*, development geometry evolved from radial expansion into a spiral pattern.

Figure 20: *Aureobasidium pullulans* culture exhibiting a predominantly hexagonal growth pattern.

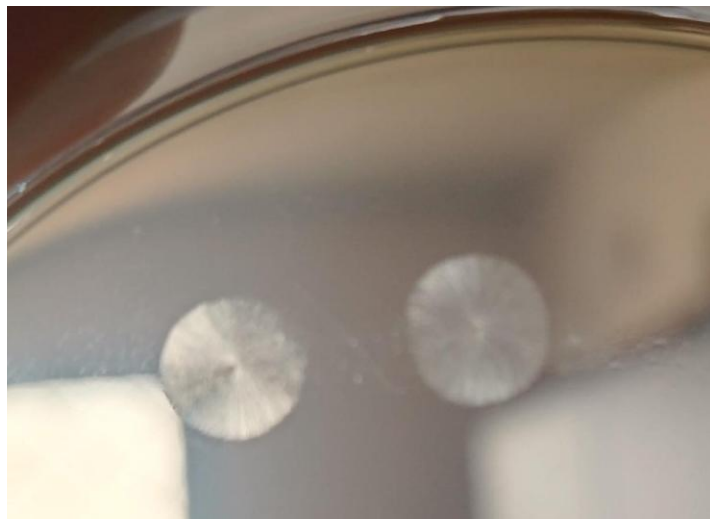

Figure 21: Image of "crystalline" bacterial growth in treated water.

3.4 Information Transfer and Stability

The propagation of biostructuring effects within aqueous media proved to be both rapid and highly efficient.

- Transfer efficiency: a small fraction of treated water (1 mL per 400 mL of untreated water; 2.5 mL/L) was sufficient to instantaneously "inform" the entire volume of the recipient fluid.
- Long-term stability: treated water maintained its vitalising efficacy for >5 months.
- Environmental resilience: structural coherence remained intact despite exposure to thermal stress (temperature: 0–45°C) and container opening.
- Thermal inertia: treated water exhibited atypical thermal inertia, tending to stabilise near 16°C and requiring significantly higher energy input for heat variation. A preliminary observation suggests a potential increase in specific heat.

4. Discussion

4.1 Beyond Classical Biochemistry: The QED Perspective

The results obtained in this study challenge the limitations of classical organic biochemistry, which primarily describes cellular communication as an exclusive ligand–receptor–mediated process characterised by slow kinetics and significant energy dissipation. The observed 25% acceleration in fungal growth and the rapid synchronisation of microbial populations suggest the involvement of a more efficient physical communication infrastructure. According to QED [11,1,12,2], such coordination is mediated by water CD [3,4], which allows molecules to "tune in" through the coherent exchange of photons. The Trasformer acts as a catalyst for this coherence, emitting weak electromagnetic fields (predominantly photonic in nature) [13,14,15] that promote the synchronisation of cellular rhythms (entrainment) and amplify vital biological signals.

4.2 Water as an Active Operating System

Experimental evidence confirms that water functions as an inert solvent and an active, coherent system essential to biological organisation. The lack of reactivity in bi-distilled or demineralised water demonstrates that the presence of solutes and electrolytes is essential for the induction and stabilisation of CD and EZ [5,6]. In this context, treated intracellular and extracellular water serves as the bridge between quantum physics and biology, functioning as an energy reserve that guides subsequent biochemical processes. The considerable thermal and temporal stability of treated water suggests a phase transition toward a more stable and energetically favourable ground state. It is also hypothesised that this state correlates with the role of water as a preservative agent for microbial life over geological timescales, as evidenced by ancient fluid inclusions [16] (Figure 22), where cells exhibit halo-like structures similar to those observed in the present study.

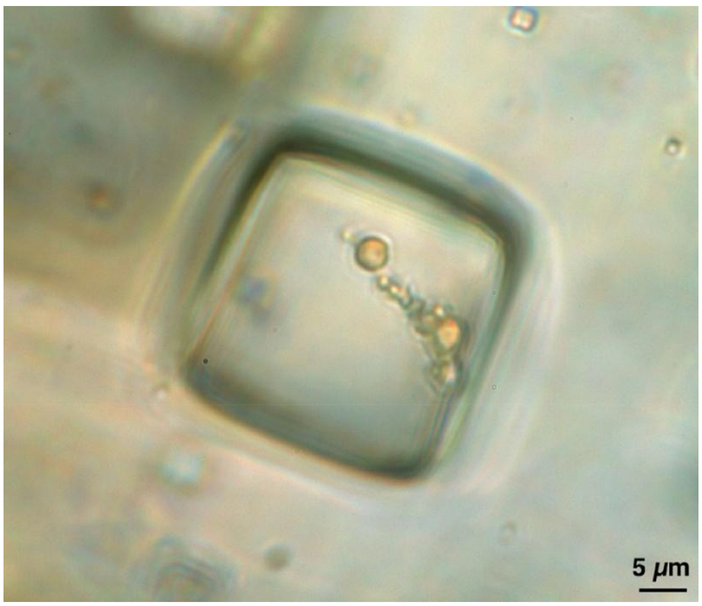

Figure 22: Ancient fluid inclusion (approximately 267 million years old [21]) containing revivable microbial cells, discovered in *stratified halide* from the Permian Nippewalla Group at a depth of 429 m in Kansas, USA [16]. The microbial cells exhibit transparent halos and shell thickening similar to those observed in Trasformer-treated cell cultures.

4.3 Interpretation of Geometric Patterns and EV Formation

The emergence of spiral [17] and hexagonal growth geometries, not commonly reported for the analysed strains, suggests that water structured by the Trasformer conveys "a priori" organisational information capable of directing biological development toward harmonic sequences. This superior organisation is linked to the formation of structural frameworks similar to MOFs [10], highlighting nature's ability to produce open-framework architectures in organic environments.

In parallel, the increased production of EV (exosomes; Figures 12 and 23) [18–20] induced by the treatment represents a "pluripotent" communication mechanism. Unlike single signal molecules, these vesicles transport a complex cargo of proteins and RNA that accelerate growth and improve the overall culture balance. The dynamic molecular motion observed within treated clusters ("molecular dance") suggests regions of active fluid restructuring that support vesicle-mediated signalling (Figure 13).

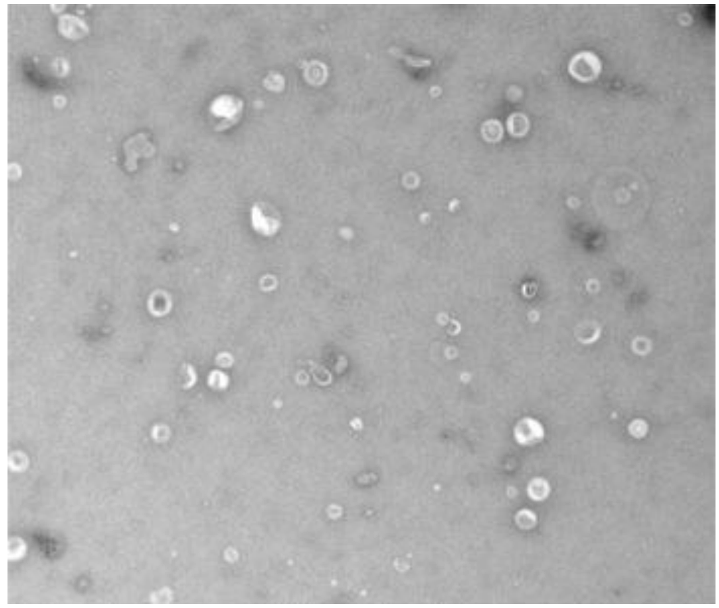

Figure 23: Exosomes [19].

4.4 Implications for Sustainable Agriculture

The ability to "inform" large volumes of water with minimal doses (2.5 mL/L) offers revolutionary perspectives for phyto-nutrition and crop protection. Providing pre-structured water equips plants with a "health status" that optimises intercellular communication and resilience to environmental stress. This approach elevates cellular vitality without significant reliance on chemical inputs, instead leveraging a state of resonance to maintain the biological "orchestra" in perfect harmonic balance.

To conclude with a clarifying analogy, traditional biochemical communication can be likened to paper letters hand-delivered between cells – a slow process prone to delay and loss. In contrast, the Trasformer treatment is portrayed as providing the system with a high-speed, quantum "Wi-Fi" network, in which structured water instantaneously transmits growth instructions to individual cells. This enables the entire "biological city" to expand in a rapid, orderly, and perfectly synchronised manner.

4.5 Study limitations and future directions

The findings are based on a limited set of microbial models. Broader validation and field-scale studies will be required to establish translational relevance.

5. Conclusions

This study demonstrates that the application of specific waveform fields generated by the Trasformer device significantly modifies the internal organisation of water, acting as a biostructuring and amplifying factor for vital phenomena. Experimental observations from bacterial and fungal cultures revealed substantial deviations from control groups, including an average 25% increase in growth rate and overall enhancement in both the quality and quantity of biological yield.

5.1 Biophysical and Morphological Insights

From a physical perspective, the findings validate models based on QED, in which treatment induces the formation of CD and EZ. Within this framework, water transitions from a simple inert solvent to an active coherent system and an efficient informational vector. The notable stability of this resonant state – persisting under thermal stress and remaining unaltered over long time periods – suggests the establishment of a more stable and functional energy phase.

Under a morphological profile, the results provide evidence of:

- Enhanced intercellular communication: abundant secretion of EV (exosomes).
- Emergence of "a priori" information: non-conventional growth geometries, such as spiral structures in *Metarhizium* and hexagonal matrices in *A. pullulans*, indicate that the signal impressed by the Trasformer provides cells with "a priori" structural instructions.
- Advanced structural architectures: the apparent "geometrisation" of growth highlights parallels between cellular biology and the chemistry of advanced materials, specifically MOF, opening new horizons in the understanding of organic architectures.

5.2 A Paradigm Shift in Agronomy

In conclusion, this study proposes a conceptual shift in agronomic practice, from a purely biochemical framework to one based on resonance and phase coherence. Providing "structured" water to plant organisms equips them with an optimised communication infrastructure that promotes overall biological balance and cellular health. The potential technological applications of this approach may revolutionise phyto nutrition, reducing dependence on chemical inputs in favour of sustainable, high-efficiency biophysical solutions.

AI Declaration

During the preparation of this work, the authors used NotebookLM (Google) to format and translate the text. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

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