

Manufacturer analytical review — scanned English version

Supplied interpretation, not an independent trial. Claims about mechanisms, fertilizer replacement, density or commercial returns require direct measurements and appropriate comparisons. The beet percentage also requires reconciliation with the trial replicates.

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Editorial note

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Source page 1

SIA JIKO Ent Professor Maris Klavins, Faculty of Riga, Latvia Chemistry, LU

A brief scientific and analytical review of research results on ChitoHumus complexes

Dear Professor Klavins,

As part of the completion of the research phase under LIAA voucher No. 9.2-29-V-2025/64, | present to your attention a brief scientific and analytical review of the results of characterization of the chitin-humic complex ChitoHumus, obtained by the research group of the Faculty of Chemistry of the University of Latvia under the leadership of Master Lauris Arbidans.

| 1. Physicochemical profile and rapid analysis of composition

A comprehensive analysis revealed a stable colloidal system with a high dry matter content (12.19 + 0.17%) and a pronounced dominance of fulvic acids over humic acids (712 + 21 mg/l versus 624 + 12 mg/l, respectively).

Spectroscopic methods confirmed the high biological activity of the matrix:

FTIR: The spectrum of humic acids reflects a classic heterogeneous structure with a high concentration of polar functional groups (O-H at 3600-3200 cm, carboxyl C=O at 1720-1700 cm), which determine the high cation exchange capacity and complexing potential of the preparation.

UV-Vis (EE = 7.8): Indicates a deep degree of humification and optical density of condensed aromatic

nuclei.

Bioactive component: Purified grayish-white mushroom chitin was isolated at a concentration of ~235 mg/L. Elemental analysis (ICP-OES) revealed a marked predominance of potassium (34955 + 1880 j1g/L) and phosphorus (17370 + 740 jag/L) with a complete absence of heavy metals.

| 2. Agronomic tests and emergent properties on cereal crops

During the evaluation of phytotoxicity and growth-promoting activity, strong interspecies selectivity was revealed. The product demonstrated an inhibitory effect on legumes (peas), but demonstrated exceptional efficacy on cereals.

Of particular scientific and practical interest is the comparison of the length and raw biomass metrics of oat (*Avena sativa*) and durum wheat (*Triticum durum*) sprouts:

Oats (1:100 dilution without priming): The increase in sprout length was only +7%, but the increase in sprout fresh weight at the same dose increased by +54%.

Durum wheat (1:350 dilution with priming): The crop demonstrated a strong synergistic response to pre-sowing treatment. Priming increased seedling weight by 34% and root mass by 17% compared to the control. At the maximum concentration (1:100) without priming, wheat also showed excellent growth dynamics, increasing seedling weight by 26%.

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Source page 2

A comparative analysis of these deviations indicates a sharp increase in the specific density of plant tissue and increased metabolic activity in cereals. A mathematical calculation of the ratio of accumulated fresh mass to linear

growth of the seedling (M/L) for oats shows that specific tissue density increased by 43.9% relative to the control:

$$P_y = M_y/L_y = 1 \quad P_1 = (1.54M)/(1.07 L) = 1.4392. \quad P_o - A_p = +43.9\%$$

The synergistic effect of co-crystallized humic substances, potassium-phosphorus compounds, and chitosan oligomers induces intense cell division and cell wall thickening without excessive linear elongation (etiolation). This morphogenetic shift opens up direct prospects for integrating the product into the hydroponic green fodder (HGF) industry.

13. The problem of "washing out" dry matter in the gas-to-liquid cycle

The main barrier to scaling vertical farms for sprouting grain for feed is negative dry matter balance (Dry Matter Loss). During the intensive 7-day hydroponic cycle, the active respiration of the germinating seed causes endosperm starch to be consumed. Ultimately, the total mass of the "green carpet" visually increases severalfold solely due to water absorption (tissue hydration), while the actual dry matter content drops by 10-15% compared to the original dry grain.

This "dilution" of dry matter critically reduces the zootechnical value of hydroponic fertilizers and worsens the economic efficiency (ROI) of the systems, turning this expensive technology into a process of "water packaging" into fiber. ChitoHumus's ability to intensify biomass accumulation in oats (+54% at 1:100) and durum wheat (+34% at 1:350 with priming) helps offset the carbon skeleton deficit, optimize the metabolic carbohydrate-to-water ratio, and revolutionize the economics of hydroponic feed production.

14. International validation and offer of scientific patronage

These results sparked interest from the American company FodderTech, a pioneer and recognized global leader in industrial equipment for commercial germination of peat. FodderTech systems are used worldwide, providing year-round feeding

in arid regions of the United States, Australia, and the Middle East.

As part of the technology partnership, an agreement was reached to include ChitoHumus in Fodder Tech's experimental testing protocols at their laboratory facilities in the United States. The objective of the testing is to evaluate the effect of the chitin-humic complex on dry matter growth and mold suppression in commercial hydroponic barley cultivation.

Dear Professor Klavins, since this research was conceived and took its first crucial steps under your leadership, it is critical for us that further international verification of the technology be based on a rigorous academic foundation. We understand that we are currently in the R&D phase, and we would be deeply grateful for your scientific patronage and expert guidance on this project.

For our part, we undertake to provide you with full access to the factual data of American tests for their use in your scientific work, and we also hope to see you as a scientific

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Source page 3

The project manager and co-author of future joint publications on the emergent properties of chitin-humic complexes in international peer-reviewed journals. Furthermore, successful validation in the US will allow us to further consider LU as

a priority partner for applications for large joint grants (LIAA, European funds).

Thank you for your scientific supervision. The fundamental data obtained by LU lays a solid foundation for commercializing the technology in the international market.

Sincerely, Yuri Vorobiev SIA JIKO Ent

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