

Cereal-crops summary PDF

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Editorial note

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Scientific Report: Physicochemical Characterization of the ChitoHumus Biostimulant and Its Application Methodology for Cereal Crops

Research Base: Faculty of Exact Sciences and Technology, University of Latvia (LU), Department of Environmental Science Address: Jelgavas Street 1, Riga, Latvia Project: Conducted within the framework of LIAA Voucher No. 9.2-29-V-2025/64 Research Performer: Scientific Assistant Lauris Arbidans Report Date: 2026.

1. Application Methodology and Experimental Conditions

During laboratory trials, a specific application methodology for the ChitoHumus preparation was developed and tested to achieve maximum germination energy.

1.1. Concentrations (Dilution Ratios)

The experiments were conducted using four main dilution ranges of ChitoHumus with distilled water:

● 1:100 — high concentration (most effective for oats) ● 1:200 — moderately high concentration ● 1:350 — medium concentration (optimal for wheat) ● 1:500 — low concentration

1.2. Seed Preparation Process (Seed Treatment)

Two preparation methods were compared:

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1. Without treatment:

Seeds were soaked directly in the biostimulant solution. 2. With seed treatment:

Preliminary chemical activation of the seed coat using a 1% sodium hydroxide (NaOH) solution. This method is aimed at increasing seed coat permeability to the active components of the preparation (humic acids and chitin).

1.3. Cultivation Regime

● Duration: 7 days (168 hours) ● Control: Distilled water ● Measured parameters:

○ Shoot length ○ Root length ○ Fresh shoot mass ○ Fresh root mass

2. Physicochemical Characteristics of the Preparation

The effect of ChitoHumus is based on the high bioavailability of its components:

● Humic substance complex:

Fulvic acids (712 ± 21 mg/L) and humic acids (624 ± 12 mg/L) ● Chitin:

Purified biopolymer (~ 235 mg/L) that stimulates the plant immune response ● Mineral composition:

Dominated by potassium ($34,955$ μ g/L) and phosphorus ($17,370$ μ g/L) content.

3. Crop-Specific Results and Application Recommendations

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3.1. Oats (*Avena sativa*)

Recommended Scheme

Use of the 1:100 concentration without preliminary NaOH seed treatment.

Result

Maximum increase in shoot biomass (+54%).

At higher dilution levels (1:500), the biomass stimulation effect remains, but the intensity of root growth decreases.

3.2. Durum Wheat (*Triticum durum*)

Recommended Scheme

Combination of seed treatment (1% NaOH) followed by soaking in a 1:350 solution.

Result

Balanced plant development:

● Shoot biomass increase: +34% ● Root system biomass increase: +17%

Seed treatment is a critical factor for wheat because without it, high concentrations (1:100) may slightly inhibit root growth.

4. Scientific Conclusions of the University of Latvia

1. Mechanism of Action

ChitoHumus acts as a “metabolic intensifier,” increasing tissue density and biomass. 2. Effect of Seed Treatment

Preliminary NaOH treatment enhances the effect of the preparation on wheat but is unnecessary for oats.

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3. Safety

At the tested concentrations, the preparation showed no phytotoxicity for cereal crops and consistently exceeded control indicators in terms of dry biomass accumulation.

Document approved by: Faculty of Exact Sciences and Technology, University of Latvia.