Huma Pro® Stimulates Rhizophagy Cycle of Microbes to Increase Root Growth

Research Report

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Huma® Products: Huma Pro®

Objective

The purpose of this research project was to evaluate how humic acids stimulate microbial activity and initiation of the rhizophagy cycle (in which plants cultivate microbes on their roots and then absorb them to extract their nutrients). Huma® Huma Pro®, a liquid 6% humic acid product, was used as the humic acid biostimulant source.

Biostimulant for Microorganisms

It is widely known and accepted that most plants generally obtain nutrients through absorption of dissolved inorganic nutrients from soils. It is also widely known that soil microorganisms (microbes) play an important role in making those nutrients available to plant roots. Only recently has the mechanism of plant-root/microbe nutrient transfer been understood, a process now termed the "rhizophagy cycle."

In the rhizophagy cycle, plants appear to manipulate microbes by (1) secreting root exudates around root tips to stimulate bacterial growth, (2) triggering bacteria to enter root tips, (3) extracting the nutrients from the bacteria, and (4) depositing surviving bacteria back into the soil through the root tips to maximize new nutrient acquisition by bacteria. Microbes exiting the roots also stimulate the production of additional root hairs. This general process is known to provide nitrogen and some other nutrients to plants. ***Humic acids are known to stimulate microbial activity and may play an important role in the rhizophagy cycle in plant roots.***

Materials & Methods

Huma Pro®, a 6% liquid humic acid, was incorporated into agarose at concentrations of 0%, 0.01%, and 0.10% humic acids. Seeds of tall fescure, annual bluegrass (*Poa annua*), and beefsteak tomato were surface disinfected in 3% NaOCl for 30 minutes to reduce microbial load on seedlings. Seeds were germinated and grown for 6 days on agarose (a polysaccharide derived from seaweed) with and without the Huma® product.

Results

Table 1. Tomato Seedling Root Growth After 6 Days

Treatment	Root Length	Roots Growing Down
0.00% Humic Acid	15.9 ± 3.3 mm	9%
0.01% Humic Acid	23.3 ± 3.9 mm	16%
0.10% Humic Acid	27.5 ± 3.8 mm	51%

Table 2. Bluegrass Seedling Root Growth After 6 Days

Treatment	Root Length	Roots Growing Down
0.00% Humic Acid	199.6 ± 59.9 µ	41%
0.01% Humic Acid	551.9 ± 114.8 µ	88.5%
0.10% Humic Acid	–	89.5%

Table 3. Tall Fescue Seedling Root Growth After 8 Days

Treatment	Root Length	Roots Growing Down
0.00% Humic Acid	9.5 ± 0.7 mm	8.7%
0.01% Humic Acid	19.25 ± 5.56 mm	65.5%
0.10% Humic Acid	37.9 ± 5.06 mm	83.3%

Table 4. Tall Fescue Shoot Growth After 8 Days

Treatment	Shoot Length
0.00% Humic Acid	12.0 ± 2.9 mm
0.10% Humic Acid	21.7 ± 2.1 mm

Conclusions

Huma Pro® promotes seedling development in the seedlings tested. Root **length** in seedlings treated with Huma Pro® increased 73% (tomato) to almost 300% (tall fescue), roots **growing downward** increased 7 percentage points (tomato) to almost 75 percentage points (bluegrass), and **shoot length** increased 80% for tall fescue. Huma Pro® acts to stimulate the root microbiome and shows evidence of stimulating the rhizophagy cycle. Stimulation of the rhizophagy cycle in plants should result in increased nutrient absorption in plants.

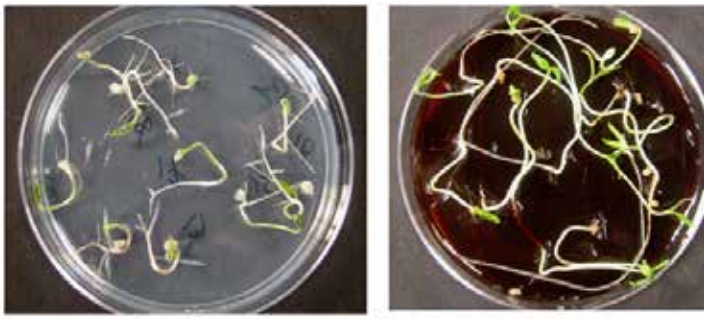

Figure 1. Tomato Seedlings in Agarose, without Huma Pro® (Left) and with Huma Pro® (Right)

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