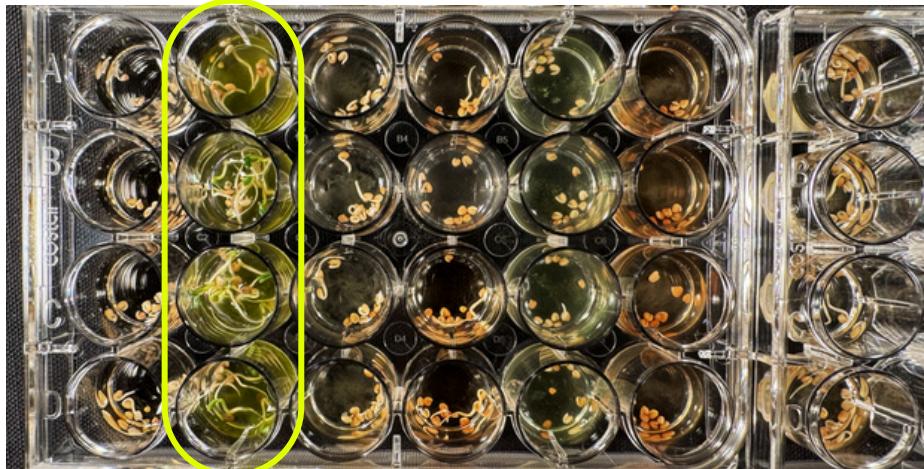
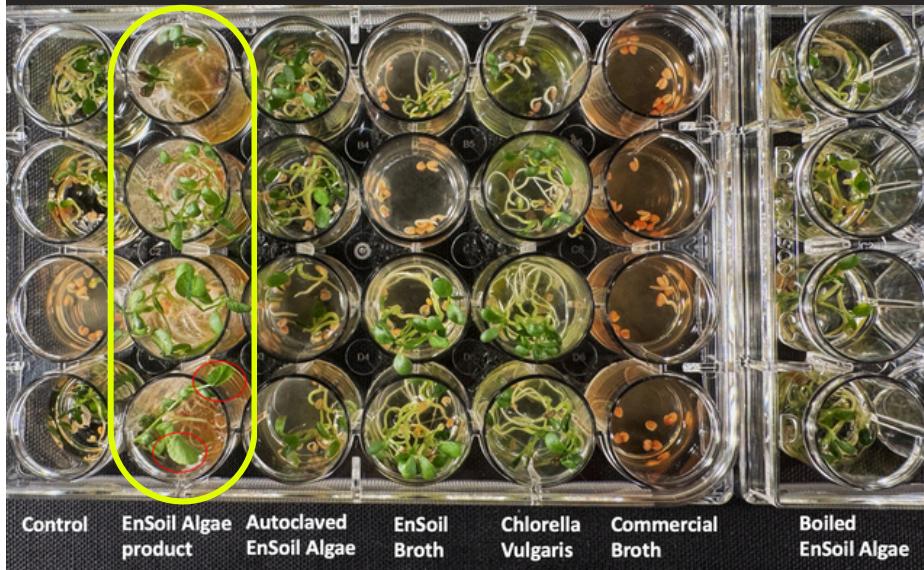


# Rutgers University

## Laboratory Tests Using EnSoil Algae™ product in Creeping Bluegrass (*Poa reptans*), Clover (*Trifolium repens*) and Tomato (*Solanum lycopersicum*)



Clover Germination: Day 4 (above) Day 12 (below)



[Link to the Full Study Here](#)

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## Methodology

### Treatments

- Control, EnSoil Algae™ product, EnSoil Algae™ only Boiled for 1 minute to kill algae, EnSoil Algae™ only autoclaved for 20 minutes to kill both algae and bacteria, EnSoil Algae™ Broth only, (Chlorella Vulgaris) product, and Commercial Broth.

### Plant Growth

- Seeds of Poa reptans grass were subjected to surface disinfection by shaking in a 3% sodium hypochlorite solution for 1 hr. 10 Seeds were subsequently placed onto agarose culture medium and then inoculated with 5% algae production suspension. 3 replicates per treatment.
- Seeds of tomato were subjected to surface disinfection by sequentially treating with 70% ethanol for 1 minute, followed by a 7.5% sodium hypochlorite solution shaking for 1 hr. 8 Seeds were placed onto agarose culture medium and then inoculated with 100% algae production suspension. 3 replicates per treatment.
- Seeds of Clover were surface disinfected for 1 hr by shaking in 4% sodium hypochlorite. 10 Seeds were placed onto agarose culture medium and then inoculated with 100% algae production suspension, or placed into algae production suspension directly. 3 or 4 replicates per treatment.
- Seeds on agarose were germinated and grown in lab ambient conditions for 7-13 days depending on the plant being tested. Plant growth promotional characters were assessed, including – germination, lateral root number, root length, root hair growth and Gravitropic Response.

### Microscopy

- Diphenylamine sulfate stain was used to visualize endophytic bacteria and nitrates, purple.

**Table 1. Stimulation of Root and Root Hair Growth in *Poa reptans* After Inoculation of Algae Product in agarose-based 7-day seedling assays (November)**

	Germination Rate	Gravitropic Response	Ave. Lateral Root per plant	Root Length	Root hairs
Control	93.3%	0	0.82 ± 0.55	1.78 ± 0.51	+
EnSoil Product	100%	0	1.10 ± 0.71	1.89 ± 0.49	+++
Boiled EnSoil Algae	83.3%	0	1.00 ± 0.71	1.74 ± 0.49	+++
EnSoil Broth	76.7%	2	1.04 ± 0.77	1.77 ± 0.60	+
Chlorella Vulgaris	76.7%	0	1.00 ± 0.60	1.91 ± 0.42	++
Commercial Broth	86.7%	0	0.96 ± 0.92	1.85 ± 0.41	++

## Results

- After inoculation of EnSoil Algae™ Product, Poa plants exhibited increased lateral root and root hair formation, longer root length, as well as a higher proportion of plants displaying gravitropic responses.
- Among these three treatment, the effect of plant growth promotional effect was: EnSoil Algae™ Product > Boiled EnSoil Algae™ > (Chlorella Vulgaris)> Commercial Broth and EnSoil Algae™ Broth > control.

**Table 2. Stimulation of Root and Root Hair Growth in Tomato (*Solanum lycopersicum*) After Inoculation of Algae Product in agarose-based 13-day seedling assays (Jan.)**

	Germination Rate	Ave. Lateral Root per plant	Root Length (cm)	Root Hairs	GR
Control	49%	0.50	0.94 ± 0.78	+	0
EnSoil Algae Product	50%	2.17	1.91 ± 0.41	++	2
Autoclaved EnSoil Algae	54%	2.54	1.78 ± 0.83	++	1
Boiled EnSoil Algae	42%	1.40	1.72 ± 1.03	++	1
EnSoil Broth	63%	1.41	1.96 ± 1.11	++	0
Chlorella Vulgaris	58%	1.47	1.65 ± 0.72	++	1
Commercial Broth	42%	2.43	1.52 ± 0.52	+	1

## Results

- After inoculation of EnSoil Algae™ Product, Poa plants exhibited increased lateral root and root hair formation, longer root length, as well as a higher proportion of plants displaying gravitropic responses.
- Among these three treatment, the effect of plant growth promotional effect: EnSoil Algae™ Product and Autoclaved EnSoil Algae™ > Boiled EnSoil Algae™ > EnSoil Algae™ Broth > (Chlorella Vulgaris)> Commercial Broth > control.

**Table 3. Stimulation of Root and Root Hair Growth in Clover (*Trifolium repens*) After Inoculation of Algae Product in agarose-based 12-day seedling assays (March)**

	Germination Rate	Ave. Lateral Root per plant	Root Hairs	Expanding Leaf
Control	85%	1.03	-	0
EnSoil Algae Product	93%	1.36	+	11
Autoclaved EnSoil Algae	77%	1.26	+	2
Boiled EnSoil Algae	93%	1.21	+	0
EnSoil Broth	87%	0.81	+	3
Chlorella Vulgaris	87%	1.25	-	2
Commercial Broth	87%	0.69	+	1

\* Due to fungi killed EnSoil Product treatment in agarose plate experiment, the data of EnSoil Product treatment came from production suspension experiment.

## Results

- Among these three treatment, the effect of plant growth promotional effect: EnSoil Algae™ Product > Autoclaved EnSoil Algae™, Boiled EnSoil Algae™, (*Chlorella Vulgaris*), and EnSoil Algae™ Broth > Commercial Broth and control.

## Conclusion

- For promoting growth in Creeping bluegrass, Clover, and Tomato, EnSoil Algae™ Product is better than (*Chlorella Vulgaris*). Additionally, EnSoil Algae™ broth is superior to commercial broth.
- EnSoil Algae™ Product demonstrated the best performance among the tested three plant species. Its growth-promoting effect stems from both algae and broth. Algae aid in plant branching and root hair growth, while broth supports primary root elongation.
- Dead algae provide nutrients to sustain plants and promote the growth of endophytic bacteria. It's possible that dead algae may be absorbed into plant cells entirely.
- Overtime, the growth-promoting effect of EnSoil Algae™ broth improved, possibly due to the secretion of secondary metabolites by algae.

