

Enhanced Plant Performance: Seed Encapsulation with Controlled-Release Fertilizers

Study Overview *A summary of research published in the Archives of Agronomy and Soil Science (2023) investigating how seed encapsulation performs in different soil types and its potential to reduce fertilizer use.*

Study Goal

This study wanted to answer a critical question: **Can we grow better tomatoes using significantly less fertilizer?**

Researchers tested the KAPSOL™ technology in two very different environments:

1. **Sandy Soil:** Nutrient-poor soil that typically struggles to support plant growth.
2. **Organic Soil:** Rich, commercial-grade potting soil.

The goal was to see if packaging the seed with a precise dose of "Controlled-Release Fertilizer" (CRF) inside a gelatin capsule could boost growth and survival compared to traditional planting methods.

Key Findings

1. Superior Sprouting in Rich Soil

One of the most surprising findings occurred in the nutrient-rich organic soil.

- **Better Emergence:** Seeds planted inside the capsules actually sprouted *better* than the normal bare seeds.
- **The Numbers:** **93.3%** of the encapsulated seeds sprouted, compared to only **73.3%** of the standard seeds.
- **Takeaway:** The capsule did not act as a barrier; instead, it helped more seeds successfully start their life cycle.

2. Massive Growth with Micro-Dosing

The study tested adding small amounts of slow-release fertilizer (brands like Florikan and Osmocote) inside the capsule.

- **Huge Biomass Gains:** In organic soil, plants grown with the fertilizer capsules were massive compared to the controls. Their total weight (biomass) was **325% to 730% greater**.
- **Thriving in Poor Soil:** In the poor sandy soil, normal plants barely survived (growing

only ~5 cm tall). The encapsulated plants thrived, growing to **~60 cm (2 feet)** tall.

3. Extreme Efficiency

The study highlighted just how efficient this delivery system is.

- **Doing More with Less:** The robust growth described above was achieved using only about **3%** of the amount of fertilizer typically used in commercial farming.
- **Precision:** Because the nutrients are right next to the seed and released slowly, the plant uses almost all of it, rather than it washing away into the environment.

4. The Capsule Bonus

Even without extra fertilizer, the capsule shell proved useful.

- **Biostimulant:** In sandy soil, plants grown from empty capsules (no fertilizer) still grew taller than the control plants.
- **Why?** The gelatin shell breaks down into nitrogen and amino acids, acting as a "starter snack" for the young seedling.

Conclusion

The study concludes that encapsulating seeds is a highly effective way to grow tomatoes. It works in both poor and rich soils, boosting plant size and sprouting rates. Most importantly, it demonstrates that farmers could potentially drastically reduce the amount of fertilizer they apply to their fields—saving money and protecting the environment—without sacrificing plant growth, simply by delivering the nutrients precisely with the seed.

Works Cited

Touchette, B. W., & Cox, D. S. (2023). Enhanced plant performance in tomato (*Lycopersicon esculentum*) through seed encapsulation with controlled-release fertilizers. *Archives of Agronomy and Soil Science*, 69, 2862-2877. <https://doi.org/10.1080/03650340.2023.2179620>