

Use of Gelatin Capsules as a Form of Seed Enhancement in Tomato

Study Overview A summary of research investigating the effectiveness of seed encapsulation using gelatin capsules to improve germination, plant performance, and the delivery of controlled-release fertilizers.

Study Goal

The study aimed to evaluate the potential of using pharmaceutical gelatin capsules as an advanced seed enhancement technology. Specifically, researchers wanted to determine:

1. **Emergence:** Does encapsulating tomato seeds affect their ability to sprout and emerge from the soil?
2. **Performance:** Does the capsule itself influence plant growth, root development, and fruit production?
3. **Delivery:** Can capsules effectively deliver controlled-release fertilizers (CRFs) alongside the seed to further boost plant health?

Key Findings

1. Seedling Emergence

The study compared non-encapsulated control seeds with seeds inside gelatin capsules (both with and without fertilizer).

- **Minor Delay:** Encapsulation generally caused a slight delay in emergence. Capsules without fertilizer delayed emergence by **1 day**, while capsules with fertilizer delayed it by **1 to 2 days**. One fertilizer type (Coor's) caused a longer delay (up to 8 days).
- **Total Success:** Despite the initial delay, there was **no statistical difference** in the final percentage of seeds that successfully emerged after 30 days compared to the control group.

2. Biostimulant Effect of Gelatin

A significant finding was that the gelatin capsule itself acts as a growth booster, even without added fertilizer.

- **Early Roots:** By the third week, plants grown from empty capsules had **twice as much root mass** as the control plants.
- **Fruit Production:** Plants from non-fertilized capsules produced significantly more ripe fruit by mass than the control plants.
- **Conclusion:** This confirms previous research suggesting that gelatin (a protein) acts as a biostimulant, providing nutrients like nitrogen that help the plant grow.

3. Fertilizer Delivery and Plant Growth

The study tested three different controlled-release fertilizers (Coor's, Florikan, and Osmocote) inside the capsules.

- **Bigger Plants:** The addition of fertilizers, particularly **Florikan**, resulted in plants with significantly greater aboveground, belowground, and total biomass compared to controls.
- **More Flowers:** Fertilized plants produced significantly more flowers. For example, the Osmocote group produced an average of **16.5 flowers per plant** compared to **8.3** for the control group.
- **Larger Fruit:** All encapsulated treatments (with or without fertilizer) produced larger fruit. The average weight of individual fruits was **16.9% to 19.6% heavier** than fruit from the control plants.

4. Advantages Over Traditional Coatings

The study highlights why capsules may be superior to traditional seed coatings (like films or pellets).

- **Volume:** Capsules have empty space that allows for much larger volumes of additives than a thin coating can hold.
- **Separation:** The capsule filler separates the seed from the chemicals, potentially reducing the risk of damage (phytotoxicity) that can happen when chemicals touch the seed directly.
- **Safety & Uniformity:** Capsules prevent worker exposure to dust and chemicals and create a uniform shape that is easy to plant with machines.

Conclusion

The study concludes that seed encapsulation is a promising technology. While there is a minor delay in sprouting, the benefits—including better root development, larger plants, more flowers, and significantly heavier fruit—outweigh this initial lag. The gelatin capsule acts as a beneficial biostimulant on its own, and the system effectively delivers fertilizers to further enhance growth.

Works Cited

Touchette, B. W., & Cox, D. S. (n.d.). *Use of Gelatin Capsules as a Form of Seed Enhancement in Tomato (Lycopersicon esculentum)*. Studies conducted at Elon University.