Datasheet

Product Overview

- **Product Name:** EF Polymer
- **Description:** EF is an eco-friendly, biodegradable polymer designed to improve water retention in soils, reduce irrigation needs, and enhance crop productivity. Tailored for sustainable agriculture, it is especially effective for tomatoes and other field crops.
- **Applications:** Ideal for both direct-seeded and transplanted tomatoes, as well as other vegetables and row crops. Suitable for water-scarce regions or areas with erratic rainfall.

Key Benefits

- Enhances soil water retention, reducing irrigation needs by up to 40%.
- Improves nutrient availability and minimizes leaching losses.
- Encourages healthy root development and boosts crop yields.
- Fully biodegradable and safe for the environment.

Technical Specifications

- **Composition:** Plant-based, organic, non-toxic polymer blend.
- **Appearance:** Fine powder or granules.
- **Water Absorption Capacity:** Absorbs up to 50x its weight in water.
- **pH Range:** Neutral (4.0 - 9.0).
- **Biodegradability:** 100% within one year under typical field conditions.

EF Polymer Dose-Response Performance in Bell Pepper Seedling Production Location: Reedley, California, USA (May – July 2026)	

1. Trial Overview

Greenhouse vegetable transplant production requires frequent irrigation to maintain adequate moisture levels in propagation substrates. EF Polymer is a biodegradable superabsorbent polymer designed to improve water retention and nutrient buffering in soil and growing media. This study evaluated EF Polymer at four incremental incorporation rates against an untreated control in a bell pepper transplant system.

The trial was conducted independently by SynTech Research USA in Reedley, California, under the direction of Dr. Parsa Tehranchian, and was rated **HIGH reliability** by the study director. The study ran from May 4 to July 8, 2026 (45 days after seeding).

Objectives

The trial aimed to evaluate:

- The effect of four EF Polymer incorporation rates (0.2, 0.5, 0.75, and 1.0% w/w) on substrate water retention over a full 45-day seedling cycle
- Soil chemical dynamics — pH, electrical conductivity, nitrate, phosphorus, and potassium — under each rate
- Pepper seedling growth response (height, leaf number, fresh biomass) at 45 days after seeding

Experimental Design and Treatments

- **Design:** Completely Randomized Design (CRD), 6 replicates per treatment
- **Experimental Unit:** 6-cell transplanting inserts (325 g potting mix per insert)
- **Media:** ACE basic potting mix (green waste compost, pumice, sphagnum peat moss, sand, dolomite lime)
- **Crop:** Pepper (Capsicum annuum; variety Banana pepper)
- **Conducted by:** SynTech Research USA, Reedley, CA — Study Director Dr. Parsa Tehranchian

Treatment Summary

Treatment	EF Polymer Rate (% w/w)
T1	0% (Control)
T2	0.2% EF Polymer
T3	0.5% EF Polymer
T4	0.75% EF Polymer
T5	1.0% EF Polymer

Polymer Application and Greenhouse Operations

- **Incorporation:** EF Polymer dry-mixed into the potting media using a concrete mixer to ensure uniform distribution
- **Day 0 Subirrigation:** 8 hours with a 180 ppm Miracle-Gro Plant Food solution, followed by a 10-minute drain
- **Maintenance:** Automated overhead misters every 6 hours
- **Weekly Irrigation:** Additional 60 mL per cell, 4 hours before each evaluation
- **Environment:** Greenhouse maintained at 90/75°F (day/night) under a 12-hour photoperiod

Data Collection

- **Soil Moisture & Mass Tracking:** recorded at 0, 7, 14, 30, and 45 days after seeding (DAS)
- **Soil Chemical Properties:** destructive substrate sampling at 0, 14, 30, and 45 DAS to analyze pH, EC, and N-P-K
- **Seedling Development:** plant height, leaf count, and fresh aboveground shoot biomass measured at 45 DAS

Treatment means were separated using Fisher's LSD (alpha = 0.05); differences described as "significant" below reflect this threshold.

KEY RESULT 1

EF Polymer Significantly Increased Soil Water Retention

What we observed:

- Soil moisture content was significantly higher in every EF Polymer treatment than the untreated control at all four sampling dates (0, 14, 30, and 45 DAS)
- The response was clearly rate-dependent: at Day 0 (6 hr after subirrigation), control moisture measured 33.90%, rising step-wise to 56.25% at the 1.0% EFP rate — a 66% relative increase
- The benefit persisted through the full 45-day cycle: at the final assessment, EFP-treated substrates held 30.97–33.47% moisture versus 25.60% for the untreated control

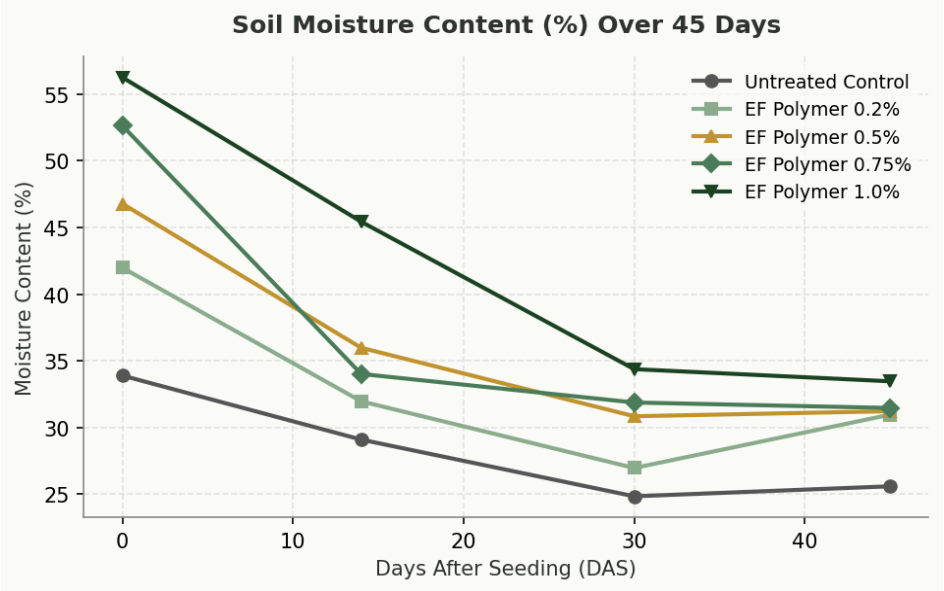


Figure 1: Soil moisture content (%) over 45 days across treatments.

KEY RESULT 2

EF Polymer Influenced Soil Chemical Dynamics

- **Soil pH:** Increased significantly with increasing polymer rate (6.83 in control vs. up to 7.63 at the 0.75% rate), though differences narrowed later in the cycle
- **Electrical Conductivity (EC):** Not significantly affected by treatment; EC declined over time across all treatments
- **Nitrate (NO_3-N):** Not significantly affected by EF Polymer at any sampling date
- **Potassium (K):** Treatment effects were inconsistent across the study, with no consistent rate-dependent pattern
- **Phosphorus (PO_4-P):** Declined significantly with increasing polymer rate (37.57 mg/L in control vs. 19.20 mg/L at the 1.0% rate at Day 0), most likely reflecting dilution from increased substrate water retention rather than a reduction in total phosphorus availability

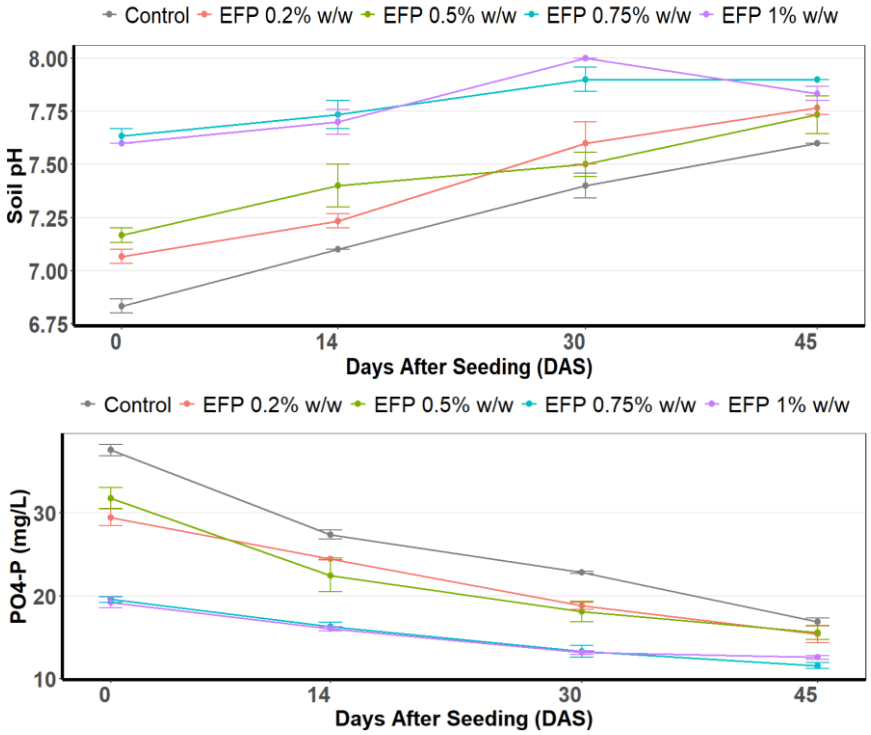


Figure 2: Soil pH and phosphorus (PO4-P) concentration across treatments — the two chemistry parameters most clearly affected by EF Polymer rate.

Overall, EF Polymer did not disrupt the substrate's core nutrient chemistry (EC, nitrate) at any rate tested. The rise in pH and decline in extractable phosphorus at higher rates are consistent with increased water retention diluting the soil solution, and should be accounted for in fertility planning at higher incorporation rates.

KEY RESULT 3

Seedling Growth Was Reduced at All Tested Rates

What we observed:

- Plant height, leaf number, and fresh aboveground biomass were all significantly lower in every EF Polymer treatment than in the untreated control at 45 DAS

- Control plants reached 5.42 in in height with 6.2 leaves and 1.198 g fresh biomass; EFP-treated plants ranged from 3.92–4.58 in, 4.8–5.5 leaves, and 0.810–0.893 g biomass
- Among the four EF Polymer rates, 0.2% w/w consistently showed the smallest growth penalty — the tallest, leafiest, and heaviest seedlings of the polymer treatments

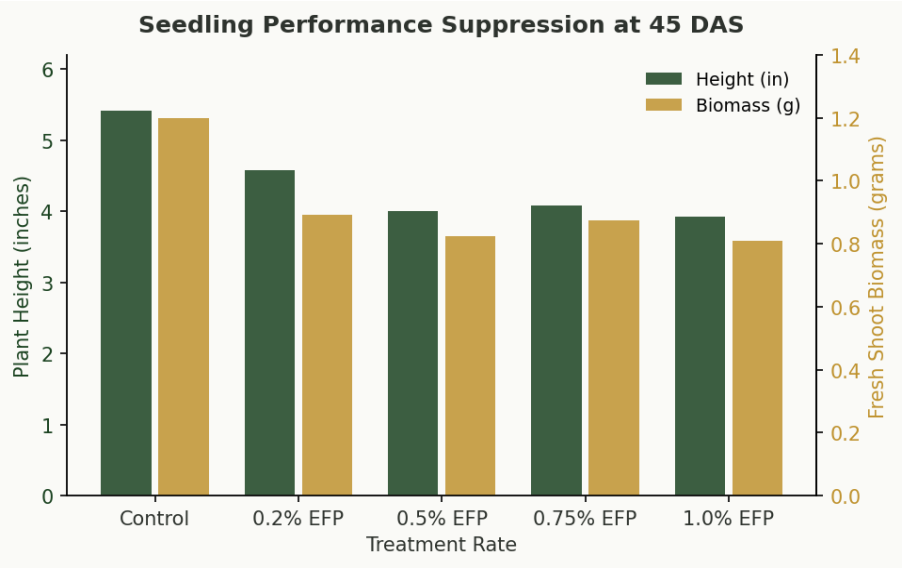


Figure 3: Plant height and fresh shoot biomass at 45 DAS across treatments.



Figure 4: Seedling height comparison across treatments at 45 days after seeding.

Conclusion

This SynTech dose-response study confirmed that EF Polymer significantly and consistently improves substrate water retention in greenhouse pepper transplant production, across all four rates tested and throughout the full 45-day seedling cycle. At the rates evaluated, this water retention benefit came with a measurable reduction in seedling growth relative to the untreated control.

Key conclusions include:

- EF Polymer significantly increased soil moisture retention at every rate and every sampling date, with the largest gains at the 0.75–1.0% w/w rates
- The polymer did not disrupt EC or nitrate availability, though phosphorus concentrations declined with increasing rate, most likely due to dilution
- Seedling height, leaf number, and biomass were significantly reduced at all rates tested relative to the untreated control, with the smallest penalty at the 0.2% w/w rate

Overall, EF Polymer demonstrates strong, reliable water retention performance in greenhouse substrates.

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