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.

Kale Production and Water Use Efficiency

Location: Texas A&M AgriLife Research Station, Weslaco, Hidalgo County, Texas, USA
Season: 2025 growing season
Crop: Dwarf Blue Curled Scotch Kale

Study Overview

A field trial was conducted at Texas A&M AgriLife Research Station (Weslaco, TX) to evaluate EF Polymer performance in kale under three irrigation programs (100%, 75%, and 50% of full irrigation) with and without polymer. The study assessed biomass yield, water use efficiency (WUE), and supporting soil indicators including volumetric water content (VWC), soil temperature, and soil electrical conductivity (EC).

Overall, EF Polymer showed the most practical value under moderate deficit irrigation (75%), where performance indicated strong potential for water savings while maintaining productivity. Under severe deficit irrigation (50%), polymer effects were limited by extreme water constraint.

1. Trial Overview

Background

Vegetable production in high-evaporative-demand regions requires efficient irrigation strategies. EF Polymer is a biodegradable superabsorbent polymer designed to enhance soil moisture buffering between irrigation events and improve crop productivity per unit water applied. This trial was designed to test whether EF Polymer can support kale production under reduced irrigation and improve water-use efficiency.

Objectives

1. Evaluate the impact of EF Polymer on kale production under varying water input levels.
2. Assess EF Polymer's role in soil moisture retention under varying irrigation conditions.

2. Experimental Design and Treatments

Design

- **Design:** Randomized Complete Block Design (RCBD)
- **Replications:** 4
- **Treatments:** 6
- **Total plots:** 24 experimental units
- **Plot size:** 2 rows × 20 ft
- **Row spacing:** 40 inches (3.3 ft)
- **In-row spacing:** ~6–8 inches

Treatment Summary

Treatment	Polymer Rate	Irrigation Level	Description
T01	0	100%	Control (no polymer)
T02	0	75%	Deficit irrigation (no polymer)
T03	0	50%	Severe deficit (no polymer)
T04	125 lbs/ac	100%	Polymer + full irrigation
T05	125 lbs/ac	75%	Polymer + moderate deficit
T06	125 lbs/ac	50%	Polymer + severe deficit

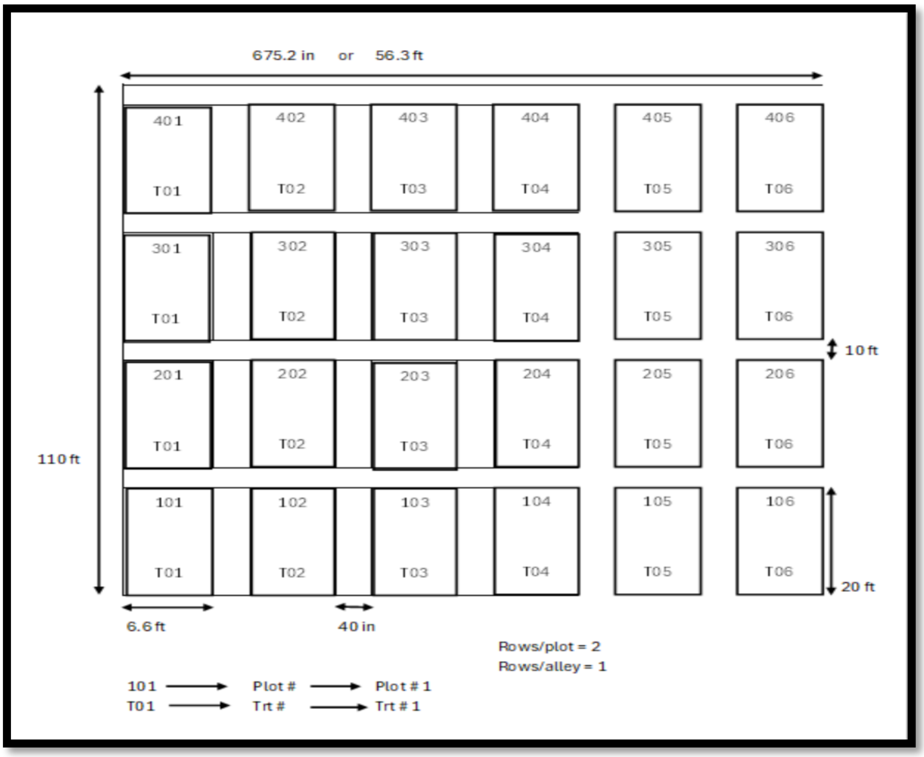

Figure 1. Experimental design and plot layout (RCBD; 6 treatments × 4 reps)

3. **Field Operations and Polymer Application**
   Field operations followed standard station practice: the site was cultivated, disked, bedded, and prepared for planting, after which subsurface drip tape was installed to

run the full length of each 2-row, 20-ft plot with valves on the lay-flat mainline to deliver treatment-specific irrigation rates (100%, 75%, or 50%). EF Polymer (BB size) was then surface-broadcast pre-plant (as a blended amendment with fertilizer) and incorporated into the bed to approximately 2–3 inches. Kale was planted shortly thereafter (in this setup, planting was slightly deeper than the incorporation depth), placing the polymer zone above the drip line (~4 inches below seed level) and within the active root zone to buffer soil moisture between irrigation events.

4. Data Collection
Soil Measurements

- **Volumetric water content (VWC)** – weekly
- **Soil temperature (°F)** – weekly
- **Soil EC (mS/cm)** – weekly

Plant Measurements

- Plant vigor observations
- Stand count (10–14 days after planting; may be used as covariate)
- SPAD/NDVI (weekly starting ~4 weeks after planting)
- Biomass yield at harvest

Water Performance

- Water use efficiency (WUE)

Weather data (rainfall and temperature) were recorded from local sources.

5. Results and Interpretation

5.1 Biomass Yield

Biomass differed across treatments, with the highest yields observed under polymer with full or moderate irrigation.

Key takeaways:

- **T04 (Polymer + 100%)** produced the highest biomass.
- **T05 (Polymer + 75%)** produced high biomass while reducing irrigation inputs.
- Under **50% irrigation**, polymer could not fully compensate for severe water limitation (T06).

Quantitative comparison:
Using the trial biomass dataset, mean dry biomass increased from approximately **521 kg/ha (T01)** to **1,232 kg/ha (T05)** — a **~136% increase** for polymer + 75% irrigation compared to the full-irrigation, no-polymer control.

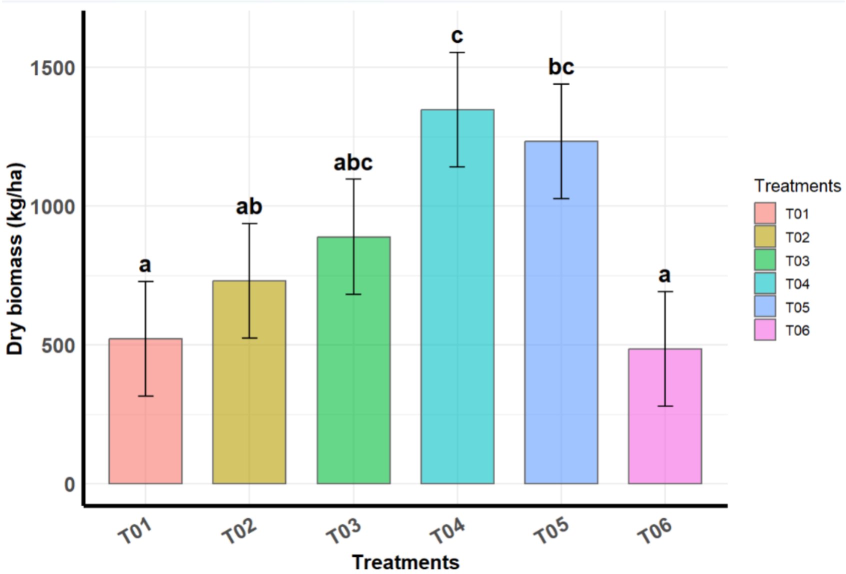

Figure 1. Dry biomass (kg/ha) by treatment (letters denote Tukey groupings).

5.2 Water Use Efficiency (WUE)

WUE was significantly affected by irrigation strategy and polymer use. The strongest practical result was that polymer enabled strong efficiency under reduced irrigation.

Key takeaways:

- **T05 (Polymer + 75%)** was among the top WUE treatments, representing a strong **yield–water savings balance**.
- Full irrigation without polymer (T01) showed the lowest WUE.
- Under severe deficit (50%), WUE could improve but was associated with yield limitations in some treatments.

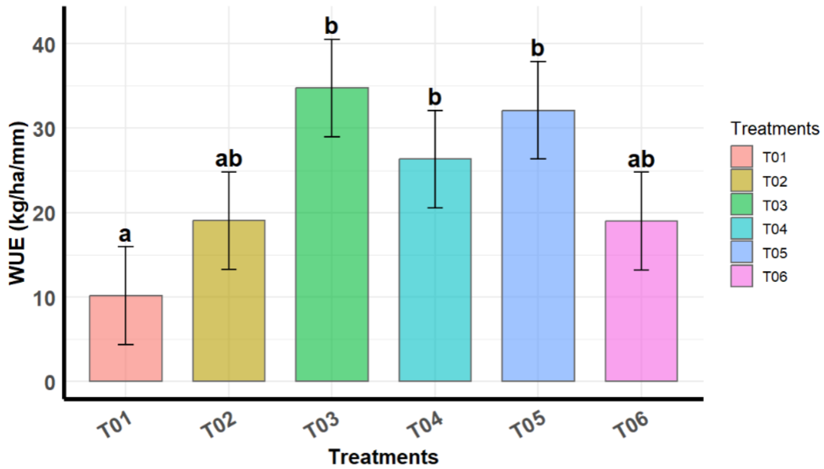

Figure 2. Water use efficiency (WUE; kg/ha/mm) by treatment (letters denote Tukey groupings).

5.3 Volumetric Water Content (VWC)

Average VWC differed modestly across treatments and was strongly influenced by irrigation level.

Key takeaways:

- Polymer did **not** significantly raise overall VWC across treatments.
- Polymer helped **maintain moisture under moderate irrigation**, particularly in **T05**, suggesting improved buffering between irrigation events.
- **T06 (Polymer + 50%)** showed the lowest VWC, indicating severe deficit irrigation reduced moisture regardless of polymer.

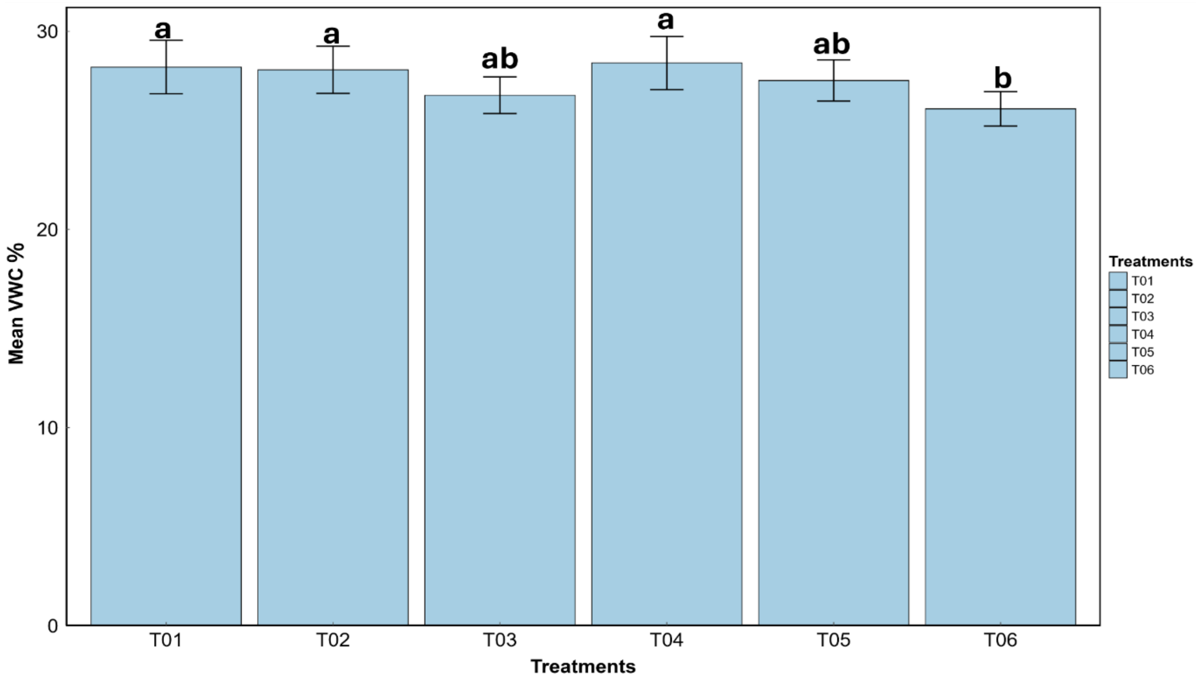

Figure 3. Mean volumetric water content (VWC; %) by treatment (letters denote Tukey groupings).

6. Key Findings

- **Best overall performance: T05 (Polymer + 75% irrigation)** delivered high WUE and strong biomass, supporting a practical strategy for water savings.
- **Water savings potential:** Results support deficit irrigation strategies (~25% reduction) when paired with EF Polymer in drip-irrigated kale.
- **Severe deficit limitation:** Under 50% irrigation, polymer may delay stress effects but cannot fully overcome extreme water limitation.
- **Soil response:** Polymer helped stabilize soil moisture under moderate irrigation.

7. Practical Implications for Kale Growers

These results suggest EF Polymer is most effective as a water management tool in drip-irrigated kale, especially under moderate deficit irrigation.

Grower-relevant implications:

- EF Polymer can support higher productivity per unit water applied (improved WUE).
- EF Polymer is best positioned to help growers reduce irrigation (~25%) with less yield risk than severe deficit programs.
- For field use, polymer placement should be optimized relative to seed and drip line depth:
    - Polymer should ideally be above the drip line and within reach of active roots.

8. Conclusion

The TAMU kale trial indicates EF Polymer performs best when integrated into optimized irrigation programs. Under moderate irrigation reduction (75%), polymer-supported treatments delivered strong WUE with competitive biomass production, supporting practical water-saving strategies. Under severe deficit irrigation (50%), polymer benefits were constrained by extreme water limitation.

Overall conclusion: EF Polymer shows strong potential to support water-use efficiency and productivity in kale, particularly under moderate deficit irrigation strategies.