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 in Field Lettuce Production

INIFAP Research Trial · Aguascalientes, Mexico · Spring 2026

Study Overview

A field trial was conducted with INIFAP at the Pabellón Experimental Field in the Aguascalientes Valley, Mexico, to evaluate EF Polymer in head (iceberg) lettuce under reduced irrigation and fertilization.

The study was designed to assess whether EF Polymer can:

- Maintain yield and quality under reduced water and/or fertilizer
- Improve water- and fertilizer-use efficiency
- Buffer crop water status under input deficits

It is the most comprehensive lettuce trial in the EF Polymer program to date — a 16-treatment factorial spanning two irrigation levels, two fertilization levels, and four polymer doses.

Objectives

1. Evaluate EF Polymer dose effects on lettuce yield and head quality
2. Assess water-use and fertilizer-use efficiency under reduced inputs
3. Determine whether EF Polymer enables water and/or fertilizer reduction without loss of yield or quality

1. Trial Overview

Location & Conditions

- **Location:** Pabellón de Arteaga, Aguascalientes, Mexico (1,907 m elevation)
- **Climate:** temperate semi-arid; mean 16.8 °C; ~456 mm annual rainfall (~7 mm during the crop cycle)
- **Soil:** loam texture, alkaline (pH 8.09), low organic matter (1.07%), low fertility (N 4.47 ppm, P 13.5 ppm, K 552 ppm)
- **Irrigation:** subsurface drip, single line at bed centre; soil moisture tracked with tensiometers
- **Trial duration:** ~95–100 day cycle

Crop

- **Crop:** head / iceberg lettuce (Lactuca sativa)
- **Variety:** Judalinas RZ (tip-burn and Fusarium resistant; spring–summer window)
- **Planting density:** 74,000 plants/ha (double rows on 0.40 m beds)

2. Experimental Design and Treatments

Design

- **Design:** split-split-plot in randomized complete blocks
- **Replications:** 4 (16 treatments; 64 experimental units)
- **Factors:** Irrigation (main plot), Fertilization (mid plot), Polymer dose (sub-plot)

Plot Dimensions

- **Experimental unit:** 6 furrows × 0.90 m spacing × 25 m length

- **Useful plot:** the two central rows

Treatment Structure (factorial)

Factor	Levels
Irrigation (ETr)	100% · 75%
Fertilization	100% · 80%
Polymer dose	0 · 18.08 · 36.08 · 52.80 kg/ha

2 × 2 × 4 = 16 treatments, replicated across 4 blocks (64 experimental units).

3. Field Operations and Polymer Application

EF Polymer was applied pre-plant:

- Blended with granular starter fertilizer for each treatment
- Hand-applied at the assigned dose to the furrow centre (~15 cm)
- Incorporated immediately, after which the beds were shaped to protocol depth

4. Data Collection

- **Growth:** plant height, dry-matter accumulation
- **Water status:** relative water content (RWC), soil-moisture tension, water content at harvest
- **Yield & quality:** fresh-weight yield (t/ha), heads harvested, head weight, polar & equatorial diameter
- **Resource efficiency:** water productivity (kg/m³), fertilizer-use efficiency (N, P, K, Ca, Mg)

5. Results

5.1 Yield was driven by water and fertilizer, not polymer

Fresh-weight yield responded strongly to irrigation and, to a lesser degree, fertilization — but not to polymer. Full irrigation produced 71.5 t/ha versus 58.5 t/ha at 75% (a significant +13 t/ha). A 20% fertilizer cut reduced yield by ~5 t/ha, which the mixed-model analysis found non-significant. Polymer dose had no significant effect on yield. In short, yield tolerated a fertilizer cut but not a water cut.

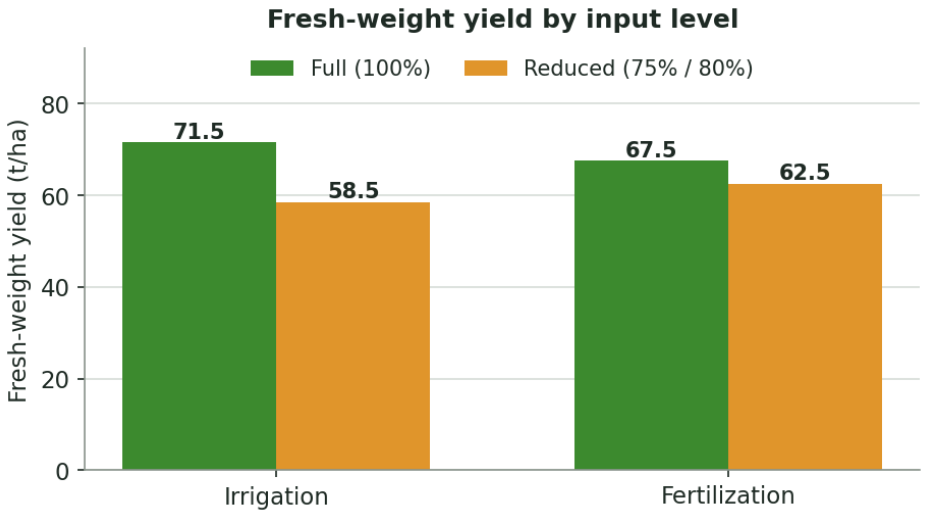


Figure 1. *Fresh-weight yield by input level. The irrigation effect was significant; the fertilizer effect was smaller and non-significant in the mixed model.*

5.2 Plant height held steady

Plant height did not respond significantly to water, fertilizer, or polymer — the crop showed strong growth homeostasis. The lowest-input treatment (75% water, 80% fertilizer, 0 polymer) produced essentially the same height as the most resource-intensive treatments.

5.3 EF Polymer recovered head size lost to a fertilizer cut

Cutting fertilizer by 20% reduced head size (polar diameter) by ~1.3–1.45 cm — a significant quality penalty. Under that fertilizer deficit, higher EF Polymer doses restored much of the lost size: +1.4 cm at 36 kg/ha ($p = 0.047$) and +2.05 cm at 53 kg/ha ($p = 0.005$) relative to the deficit baseline. Under full fertilization, polymer added no size. This is a nutrient-use-efficiency effect: by holding moisture in the root zone, EF Polymer helped the crop use the fertilizer that was present.

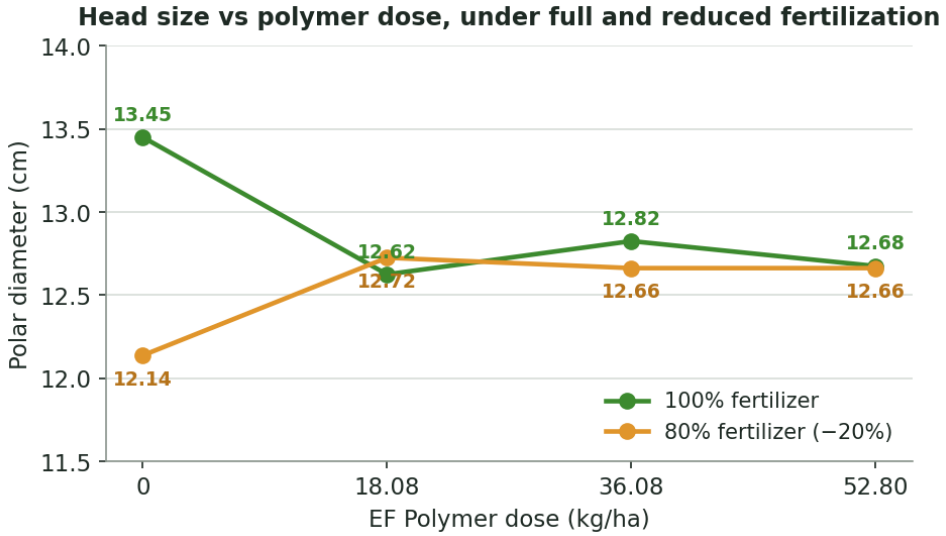


Figure 2. *Head size (polar diameter) by polymer dose. EF Polymer recovers size under a 20% fertilizer cut, but adds none under full fertilization.*

5.4 Water status was dose-dependent

Relative water content showed a significant three-way interaction. Under the toughest combination (75% water + 80% fertilizer), the lowest polymer dose (18 kg/ha) destabilised the crop — a −13.3% drop in RWC versus the optimal control ($p = 0.011$) — while higher doses (36–53 kg/ha) buffered the deficit and stabilised RWC near baseline. The dose must reach the retention threshold; too little under combined stress can underperform no polymer at all.

5.5 Efficiency traits tracked the inputs

Water productivity and fertilizer-use efficiency (N, P, K, Ca, Mg) rose with fuller irrigation and fertilization; the crop converted inputs to biomass most effectively when neither was limiting. Polymer did not raise these efficiency indices on its own in this trial.

6. Key Findings

- **No raw-yield lift:** yield was governed by water and fertilizer; EF Polymer did not increase yield in this well-watered trial.

- **Quality recovery under deficit:** higher doses restored head size lost to a fertilizer cut and buffered crop water status.
- **Strongly dose-dependent:** a low dose (18 kg/ha) backfired under combined water + fertilizer stress; 36–53 kg/ha protected quality and water status.
- **Water is non-negotiable:** yield tolerated a fertilizer cut but not a water cut.

7. Conclusions

In this well-watered, moderate-deficit system, EF Polymer did not lift raw lettuce yield — the soil retained adequate moisture even under 75% irrigation, leaving little for a water-retention amendment to act on. Its measurable value emerged under reduced inputs: higher doses (36–53 kg/ha) recovered head quality lost to a fertilizer cut and stabilised crop water status, while a low dose under combined stress was counterproductive. The results support a dose-matched strategy — pairing higher polymer doses with fertilizer savings — and point to a commercial-grower validation phase assessing high doses and post-harvest quality (shelf life and palatability).

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