

**SUNLIGHT PHOTOCONVERSION
FOR GREENHOUSE FILMS**

**SECURE CROP YIELDS &
INCREASE REVENUES**

**PROMOTE SUSTAINABLE
AGRICULTURE**

*Light is one of the most important factor
that controls growth and development throughout the
plant life cycle.*

NATURE Scientific Review



ADDED VALUE GREENHOUSE FILMS

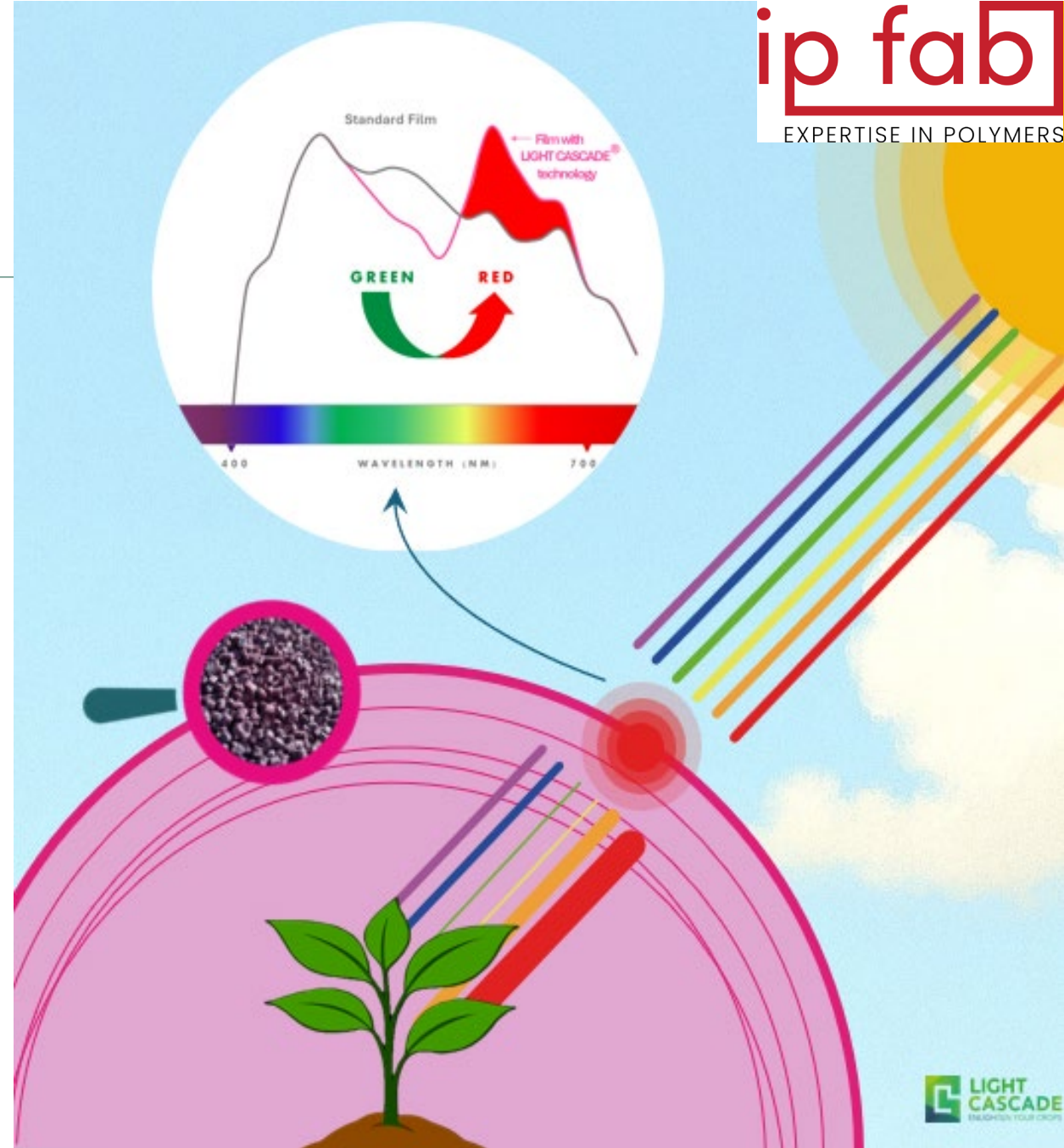
LIGHT CASCADE® TECHNOLOGY

adapts sunlight quality to plant need by
converting a portion of the sunlight
spectrum into wavelengths that stimulate
photosynthesis

A PATENTED SOLUTION

that improves light transmission properties of
greenhouse films

OFFER : Pigments or Masterbatch



NO CHANGE
TO EXISTING
PRACTICES

**NO CHANGE FOR FILM
MANUFACTURERS**

Recyclable



NO CHANGE FOR FARMERS

Does not interfere with pollination



**INNOVATIVE HIGH-MARGIN
PRODUCT FOR DISTRIBUTORS**

PROVEN AGRONOMIC BENEFITS

MORE THAN 130 TRIALS TO DEVELOP LIGHT CASCADE® MASTERBATCHES

> 10 % added value for farmers

- Crop yield gains of ~10%
- Improved Plant Health (resistance to pests and diseases)
- Optimized water and nutrient consumption
- Precocity (flowering & yields)
- Quality of fruits & vegetables (sugar content, color, etc.)
- Homogenous crop

Key crops tested



High Tunnels for Berries

“Doble roof” for key vegetables



LIGHT CASCADE® TWO VALIDATED FORMULATIONS

VEGETABLE FORMULATION FOR

- « **ONE-SEASON** » **DOUBLE ROOF**
- « **MULTI-SEASON** » **GREENHOUSE FILMS**

~400 HA INSTALLED IN SPAIN & ITALY SINCE 2021



BERRY FORMULATION FOR

- « **MULTI-SEASON** » **HIGH TUNNELS FILMS**
- « **MULTI-SEASON** » **GREENHOUSE FILMS**

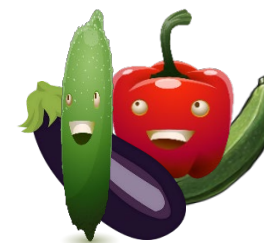


VEGETABLES SEGMENT :

AGRONOMIC BENEFITS

- « One-season » DOUBLE ROOF film
- « Multi-Season » GREENHOUSE film

SUNLIGHT TRANSMISSION SPECTRUM FOR VEGETABLES



Light measurement comparison

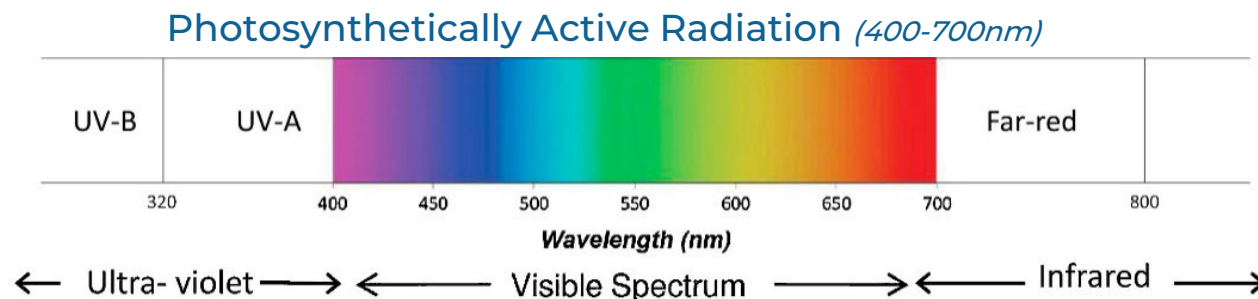
- **Standard Film** VS
- **LIGHT CASCADE Film** with *LitePlus® Veggie* additives

“Veggie” formulation :

for various vegetables (pepper, cucumber, eggplant, zucchini...)

- Absorbs Green wavelengths
- Reemits **+11%** Red wavelengths *(600 – 680 nm)*

Measured Sept. 28, 2021, at 09:01 am Sicily



PROVEN AGRONOMIC BENEFITS KEY VEGETABLES CROPS



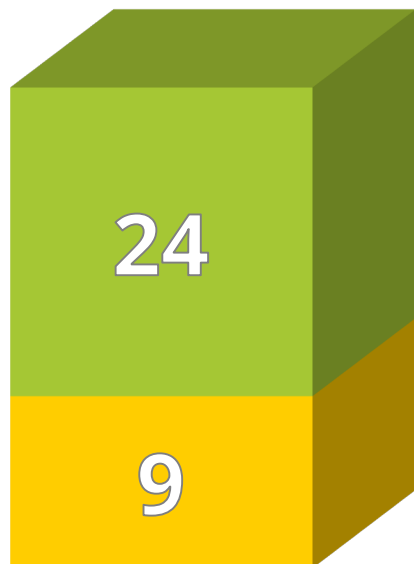
33 vegetable trials for 4 years in Spain, Italy, France and Morocco in

TOMATOES, PEPPERS, CUCUMBERS, ZUCCHINI, EGGPLANTS, LETTUCES AND BEANS

Number of trials Vegetable crops

(Double Roof LitePlus Veggie formulation - March 2023)

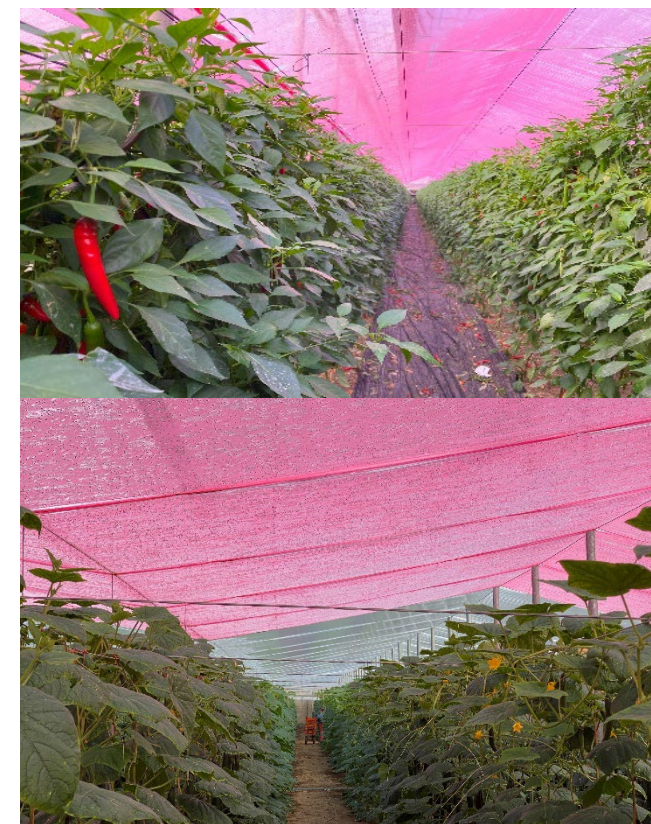
Crop Yield results



- Positive Results
From +6% to +28% yield increase
- Similar Results
From -1% to +4 % yield increase

• **+10 % Yield** on average

Most trials on
cucumber and pepper



2018-2022 PROVEN AGRONOMIC BENEFITS ON VEGETABLES



Crops	Experimental Farm	Year	Variety	LitePlus® Masterbatch Formulation	Yield (%) 	Precocity 	Fruit Quality	Pest & Disease 
	Spain tecnova CENTRO TECNOLÓGICO	2018	Calabonita	LitePlus® DR	+25% Yield Gain	Faster fruit development: -0,8 days	Similar quality	Not Evaluated
	Spanish Grower	2019- 2021	Chinese Eggplant	LitePlus® DR	+20% Est. Yield Gain	Similar	Similar quality	Not Evaluated
	Spain (2 trials) cajamar CAJA RURAL tecnova CENTRO TECNOLÓGICO	2018- 2019 2021- 2022	Canzion Palermo	LitePlus® DR	From +11% to +14,8% Yield Gain In reduced fertigation: +14,1%	Similar or Early yield: +27% In reduced fertigation: +26% Faster fruit development: From -10 to -17 days	Similar quality	Not Evaluated
	Spain – Grower tecnova CENTRO TECNOLÓGICO	2021- 2022	Chinese Beans	LitePlus® DR	+8,1% Yield Gain	Early yield: +62%	Not evaluated	Not Evaluated
	France IRHS Institut de Recherche en Horticulture et Semences INRAE l'Institut Agro	Jan-April 2021	Claudius (CF & RF)	LitePlus® ML	Fresh Weight: +13%	Similar	Not evaluated	Not evaluated



LIGHT
CASCADE
ENLIGHTEN YOUR CROPS

SUSTAINABLE AGRICULTURE

SPANISH PEPPER FARMER FEEDBACK

Winter 2023 / 2024

ip fab
EXPERTISE IN POLYMERS



**Yield Gains of +45%
in this 5 500 m²
greenhouse**

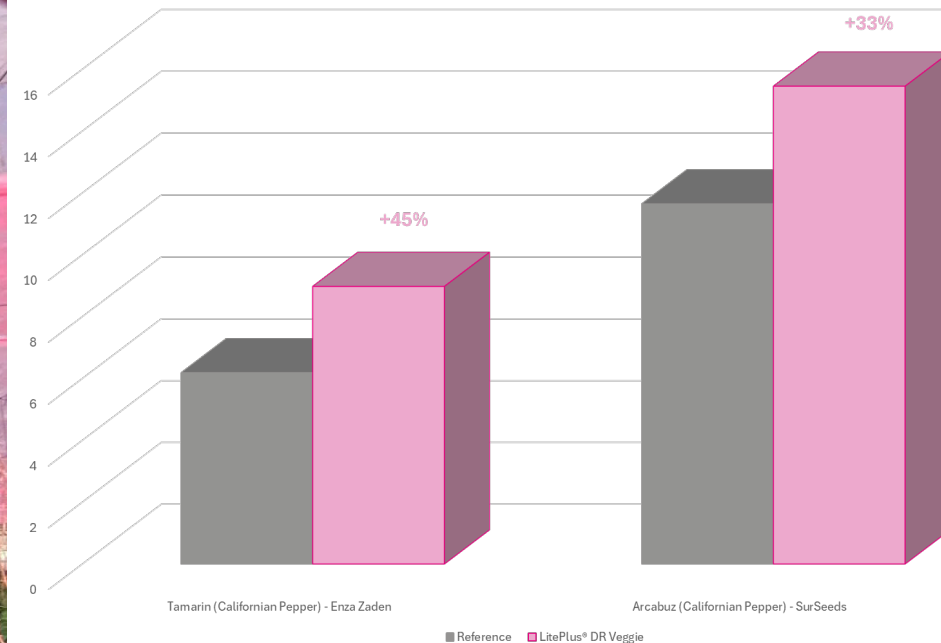


WITH CASCADE



WITHOUT

Overview Total Marketable Yield in kg/m² of 2 Pepper varieties at one farmer in Murcia Region - Season 2023/2024



**«I have far more peppers
per m² and I see much less
Botrytis impact below pink
film.»**

Mariano pepper farmer in San
Javier (Murcia Region - Spain)



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ENLIGHTEN YOUR CROPS

SUSTAINABLE AGRICULTURE

SPANISH CUCUMBER FARMER FEEDBACK

Winter 2023 / 2024



«My plants are more resistant to pests and diseases.

The thrips parvispinus infested my greenhouses and I had to use 14 boxes of useful insects for the part of the greenhouse covered with standard film and only 3 for the part with pink film. It means savings of more than 300 €.

It is also the 1st time in 20 years that I had no thrips at all and no white fly 1 month after transplantation. Look at the sticky yellow paper placed from the beginning»

Elias, cucumber farmer in
El Ejido (Almería Region - Spain)



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ENLIGHTEN YOUR CROPS

SUSTAINABLE AGRICULTURE

SPANISH CUCUMBER FARMER FEEDBACK

Winter 2023 / 2024

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EXPERTISE IN POLYMERS

30 La
Unión
Aniversario



« I transplanted my cucumbers 2 weeks later compared to my previous years and today I already collected the same amount of kg. In one month, at the end of this cycle, I will value the additional kg and revenue for me. My plants are also healthier and homogenous on the whole plant cycle.

I will extend to my whole farm next season »

Victor, cucumber farmer in Lújar (Granada region - Spain)



BERRIES SEGMENT :

AGRONOMIC BENEFITS

- « *Multi-Season* » *HIGH TUNNEL* film
- « *Multi-Season* » *GREENHOUSE* film



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SUNLIGHT TRANSMISSION SPECTRUM FOR BERRIES



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EXPERTISE IN POLYMERS

Light measurement comparison

- Standard Film VS
- LIGHT CASCADE Film with **LitePlus® Berry** additives

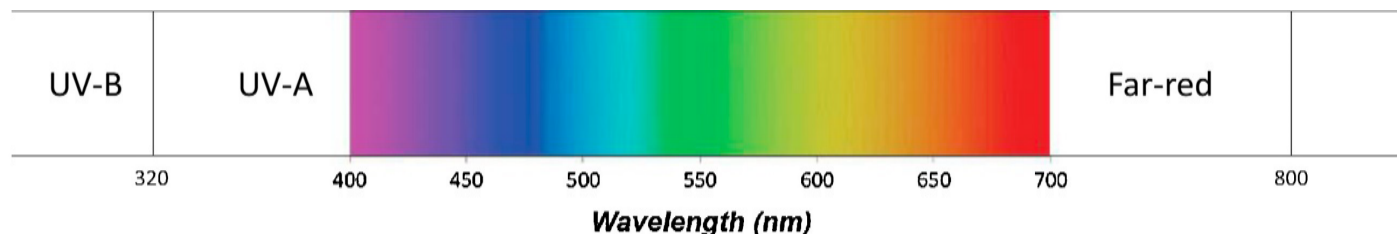
“Berry” formulation :

- Absorbs in the green wavelengths
- Reemits **+20%** Red wavelengths (*600 – 680 nm*)

Measured March 24, 2022, at 03:30 pm



Photosynthetically Active Radiation (400-700nm)



← Ultra- violet → ← Visible Spectrum → ← Infrared →

PROVEN AGRONOMIC BENEFITS ON BERRIES



32 trials for 5 years in Spain, Italy, France, UK, USA and Morocco in

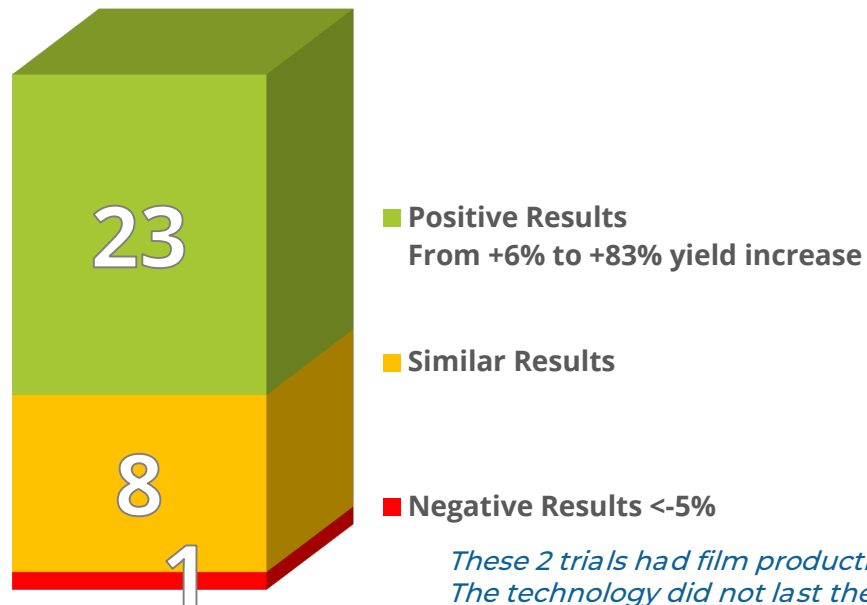
STRAWBERRIES, RASPBERRIES, BLUEBERRIES, BLACKBERRIES & BLACURRANT



Number of Trials on Berries

(LitePlus Berry formulation - March 2023)

Crop Yield results



• **+11% Yield Gain**

Promising results for multi-year crops:

- Blueberry
- Raspberry using same cane for 2 years

Good results on everbearing strawberries



LIGHT
CASCADE

PROVEN AGRONOMIC BENEFITS ON BERRIES



Crops	Experimental Farm	Year	Variety	LitePlus® Masterbatch	Yield (%) 	Precocity 	Fruit Quality	Pest & Disease 
	Spain (2 trials) 	• 2016 • 2021	• San Rafael • Adelita	LitePlus® Berry	Yield Gain : +14.5%, +13% Early Yield : +15.5%, +13%	Open Flowers: +24%, +30%, +61%, +76%	• Similar Firmness • Sugar Content/Brix +0.5°, +2°, +4°	Aphids: -39%, -62%
	France 	2018 to 2020 (2-year trial)	• Tulameen	LitePlus® Berry	Yield Gain : +29% Early Yield Gain : +30%	Not Evaluated	Brix +0.4°	Not Evaluated
	Spain (4 trials) 	2018 to 2022	• Ventura • Grower's variety • Snowchaser (4-year-old & 2-year-old trees)	LitePlus® Berry	Yield Gain : +61%, +12%, +6%, +32% Early Yield Gain : +8.5%, +62%	Not Evaluated	Similar quality	Not Evaluated
	Morocco 	2021 - 2022	• Atlas	LitePlus® Berry	Yield Gain : +12% Early Yield Gain: +20%	Not Evaluated	Similar quality	Not Evaluated

PROVEN AGRONOMIC BENEFITS ON RASPBERRIE



- 7 Blueberry trials : +10 % average yield gain

Crops	Experimental Farm	Year	Variety	LitePlus® Masterbatch	Yield (%) 	Precocity 	Fruit Quality	Pest Diseases 
	Spain 	• 2016 • 2021	• San Rafael • Adelita	LitePlus® Berry	Yield Gain : +14.5%, +13% Early Yield : +15.5%, +13%	Open Flowers: +24%, +30%, +61%, +76%	• Similar Firmness • Sugar Content/Brix +0.5°, +2°, +4°	Aphids: -39%, -62%
	France 	2018 to 2020 (2-year trial)	• Tulameen	LitePlus® Berry	Yield Gain : +29% Early Yield Gain : +30%	Not Evaluated	Brix +0.4°	Not Evaluated

PROVEN AGRONOMIC BENEFITS ON BLUEBERRIES



- 9 Blueberry trials : >+15 % average yield gain
- Second year carry-over effect measured by grower and observed by University of Pisa

Crop	Experimental Farm	Variety	Yield (%) 	Precocity 	Fruit Quality	Pest & Disease 
	Spain, Huelva 	• Ventura	+61%	Flowering & early production	Similar	Not Evaluated
	Spain, Huelva Grower's trial 	• Snowchaser (4-year-old & 2-year-old trees)	> +40%	• Early production • +26% First harvest	Not Evaluated	Not Evaluated
	Spain, Huelva Grower's trial 	• Ventura	+12% Second year Carry over effect	Not Evaluated	Not Evaluated	Not Evaluated
	Morocco INRA 	• Atlas	Yield Gain : +12%	Early Yield Gain: +20%	Similar quality	Not Evaluated
	Italy, Univ Pisa 	• Duke	Research trial • +73% flowers • +10% single fruit weight	Potential Carry over effect: • +54% new shoot number, • +20% new shoot length, • +27% New shoot diameter		

PROVEN AGRONOMIC BENEFITS ON STRAWBERRIES



- 14 Strawberry trials : +5 % average yield gain
- Strongest results on everbearing varieties with peak effect on second fruiting wave
- Lower gains on non everbearing types (young plant flower induction effect)
- Some variability between varieties

Crop	Experimental Farm	Variety	Yield (%) 	Precocity 	Fruit Quality	Pest & Disease 
	Spain Huelva 	• Grower's variety	+14%	Not Evaluated	+1° Brix	Not Evaluated
	Spain Huelva 	• Rociera	Reduced fertigation: +9% Early Yield : +16%	Open Flowers: +36%	Similar • Color, • Acidity, Sugar Content	Thrips: -12%
	Morocco INRA  (2 trials)	• Sabrina, • Palmeritas	Trial 1 : +35% Trial 2: +14% & +6%	Similar	+0.9° Brix, > Dry Weight	Not Evaluated
	Italy, Basilicata 	• Candonga	Yield Gain: +14% Early Yield Gain: +25%	Better floral induction	Not Evaluated	Not evaluated
	France Balandrai 	• Gariguette	Yield Gain: +5% Second prod. Wave: +12% <i>Young plant flower induction effect</i>	Similar	Not Evaluated	Not evaluated

MULTI-SEASON AGRONOMIC TRIALS CONFIRMATION



AGRONOMIC BENEFITS CONFIRMED ON MULTI-SEASON FILMS

Phytotron trial



**Agro Research
Institute
Angers, France**

- Installation Dec 2021
- 2 varieties : 'Clery' & 'Dream'
- Fruiting 10th February 2022
- Trend seen by IRHS
 - Precocity
 - Higher yields
 - Less rotten fruits



**Experimental farm
Almería, Spain**

- Installation July 2022
- 2 Pepper varieties:
 - ✓ Kation F1 (HM Clause)
 - ✓ Yuko (Vilmorin)
- Transplantation: 27 July 2022
- Agro benefits confirmed: Yield gain +13% & +9%



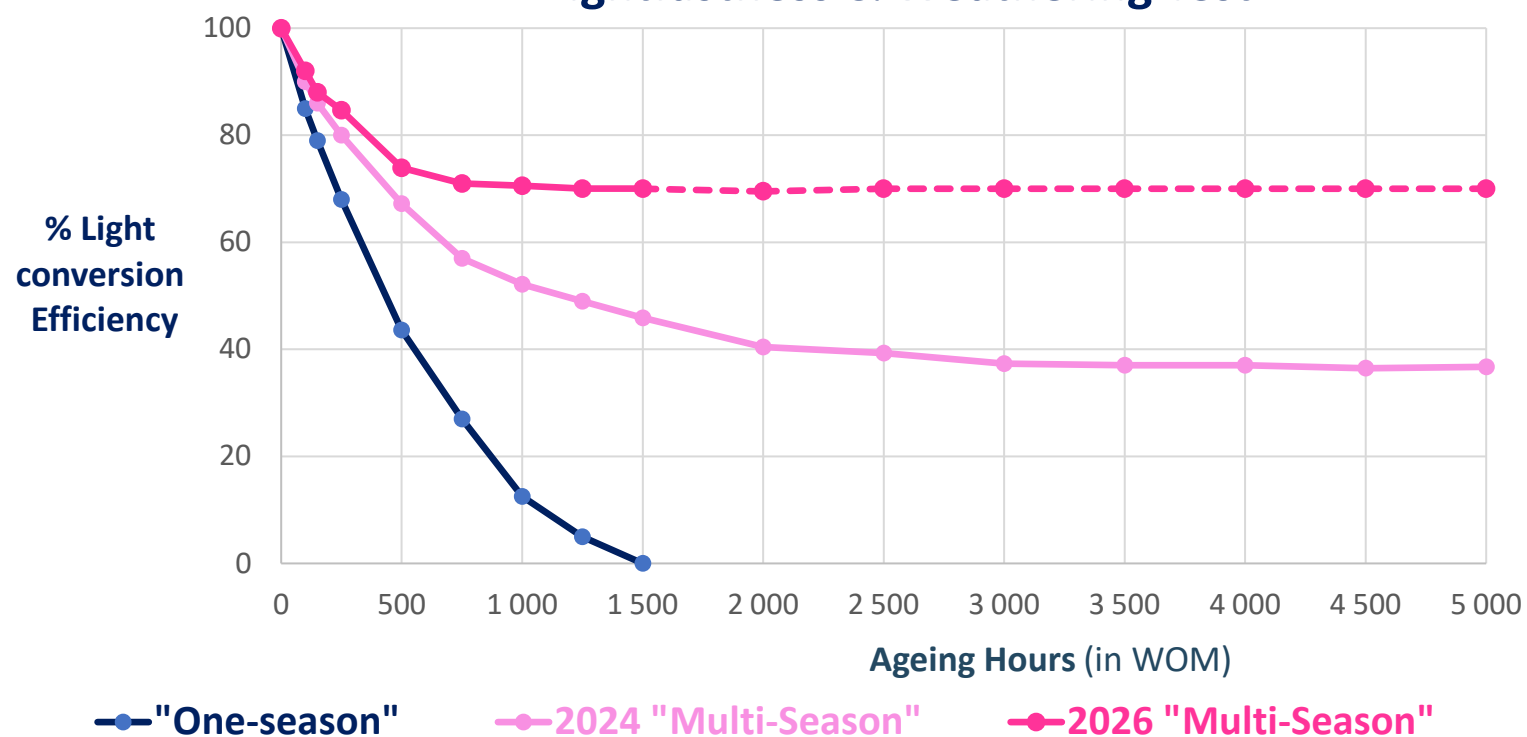
**SERAIL Experimental farm
Lyon area, France**

- Installation June 2022
- Pepper variety: Relys (HM Clause)
- Agro benefits confirmed:
 - ✓ Yield gain +18%
 - ✓ Water saving



“MULTI-SEASON” MAGIC[☼]LITE AGEING SITUATION

**“One-season” VS “Multi-season”
Lightfastness & Weathering Test**



Source:
LIGHT CASCADE
according to standard
EN ISO 4892-2