



AGRICULTURE

SOLUTIONS

THE SUSTAINABLE  
CHOICE



# INZEA® BIOPOLYMERS FOR AGRICULTURAL APPLICATIONS

INZEA® biopolymers range offers multiple options for the agricultural sector to transition from the use of conventional plastics towards the use of **sustainable biodegradable solutions**. These biodegradable biopolymers can directly **replace conventional plastics without** the need to **change agricultural equipment**.



## MULCH FILM

Certified biodegradable materials for mulch films that **integrate into the soil** after use, **reducing labor and waste management costs** while **maintaining crop protection and soil health**.



## TWINES

Biodegradable twines and plant supports that **decompose together** with crop residues, **eliminating waste separation** and streamlining composting processes.



## CLIPS & FASTENERS

Sustainable clips and fastening elements made from INZEA® biopolymers, designed for plant guiding and support, offering mechanical performance with **full soil biodegradability**.

## TESTS & CERTIFICATIONS

### DIN CERTCO Biodegradable in SOIL (For mulch film grades)



This certification guarantees that the material is **biodegradable in natural soil** without harming the environment. Based on Din Certco protocol aligned with **EN 17033**, it confirms that the product:

- Achieves **90% biodegradation in soil within 24 months**.
- Leaves **no toxic residues** or harmful effects on plants neither earthworms.
- Passes strict **eco-toxicity and chemical safety tests**.
- Does **not inhibit** soil nitrification.

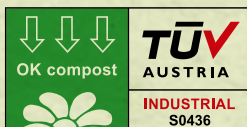
### TÜV Austria OK Biodegradable SOIL (For mulch film grades)



Is a certification label that guarantees a product's complete biodegradability in natural soil conditions. It ensures that the material will break down in the soil without leaving toxic residues or causing environmental harm, according to strict test criteria:

- Achieves **90% biodegradation in soil within 24 months**.
- Leaves **no toxic residues** or harmful effects on plants.
- Passes strict **eco-toxicity and chemical safety tests**.
- Does **not inhibit** soil nitrification.

### TÜV Austria OK compost INDUSTRIAL



Guarantees that a material is **compostable in industrial composting facilities** under controlled conditions. It is based on the European standard **EN 13432**, recognised for industrial compostability.

- **≥ 90 % biodegradation within 6 months at 58±2°C with a 50–60% RH.**
- **Disintegration:** less than 10% of fragments >2 mm after 12 weeks.
- **No negative impact** on final compost quality (eco-toxicity, plant growth).
- **Heavy metal and chemical safety limits** must be respected.

## SimaPro

### LIFE CYCLE ASSESSMENTS:

NUREL calculates product carbon footprint of all our products using **SimaPro software**, in accordance with the most recognized international standards.

# WHY CHOOSE INZEA® FOR AGRICULTURE?

INZEA® offers **bio-based solutions for agriculture** that combine **certified biodegradability** with **excellent agronomic performance**. Designed to integrate into existing farming systems, INZEA grades are compatible with **conventional machinery** and help **reduce environmental impact without compromising operational efficiency**.



## BIODEGRADABILITY STANDARD

Compliant with EN17033 and EN13432.



## DIRECT REPLACEMENT

Can replace conventional plastics in various applications without equipment changes.



## WASTE DISPOSAL

It does not generate plastic waste at the end of the crop; Films can be ploughed into the soil along with the harvest.



## COST REDUCTION

Substantially lowers labor costs by removing the need for plastic waste collection and disposal.



## NO MICROPLASTICS

Fully biodegradable; no plastic waste left after the crop cycle.



## SOIL ENRICHMENT

Once composted, INZEA returns biomass to the soil, enhancing its organic content and closing the natural cycle.

# MULCH FILM



INZEA® offers certified biodegradable biopolymers for mulch films specifically developed to address modern agricultural and environmental challenges. These films help **prevent plastic leakage** and the accumulation of microplastics in soil, **minimizing plastic waste** at its source.

Unlike conventional plastics, INZEA® biopolymers biodegrade directly in the field **without leaving residues**. Certified under EN 17033 and TÜV AUSTRIA OK biodegradable in SOIL, they preserve topsoil integrity and contribute to improve soil health.

INZEA biopolymers fully **deliver proven agronomic performance**. They are compatible with **conventional machinery**, ensuring **efficient crop protection**, while **maintaining soil temperature** and **moisture levels** comparable to traditional films.

As a **cost-effective solution**, that helps to **reduce labor, time, and waste management** by eliminating the film retrieval after harvest.

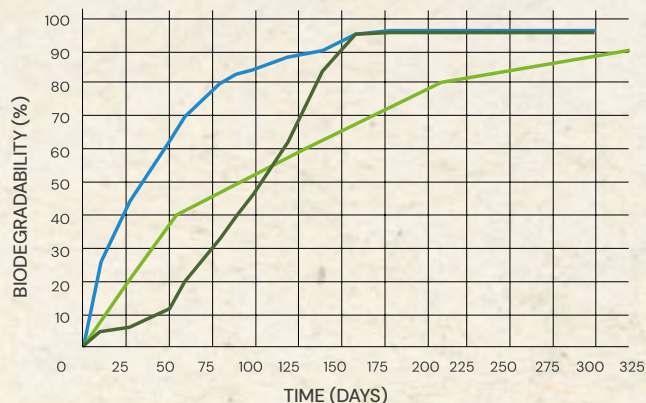
Discover our full range of biodegradable mulch film grades



## LIFE CYCLE OF BIODEGRADABLE MULCH FILM



## CERTIFIED SOIL BIODEGRADATION



INZEA® grades developed for agricultural mulch films are **certified to meet the EN 17033 standard**, which ensures that the films **biodegrade efficiently in soil** without causing **any environmental harm**.

INZEA® offers two biopolymer grades specifically developed for agricultural mulch films, both certified soil biodegradable.



## TWO GRADES ADAPTED TO YOUR NEEDS

INZEA offers **two distinct biopolymer grades** for agricultural mulch film, each tailored to the **specific moisture requirements of different crop, climates, and regions**.

Thanks to their outstanding adaptability to **humidity and environmental conditions**, these **biodegradable in soil** certified materials enable efficient in-field biodegradation. After harvest, the films can be **incorporated directly into the soil**, enhancing its quality while **eliminating plastic waste** and **simplifying post-crop management**.



**INZEA FO8M**<sup>1,2</sup>  
Highly moisture resistant and durable, suitable for long-cycle crops and humid climates  
**Example:** Cucumbers in Poland.

**INZEA FO9M**<sup>1</sup>  
Suitable for short-cycle crops and moderate humidity conditions.  
**Example:** Tomatoes and lettuces in the Mediterranean climate.

<sup>1</sup> Available in **black version** (please enquire for conditions).

<sup>2</sup> FO8 UV grade also available for **enhanced UV protection**.

## CROP DURATION AND MOISTURE ADAPTATION BY INZEA GRADE\*

	DURATION (MONTHS)	INZEA FO8M (µm)	INZEA FO9M (µm)
LETTUCE	2-3	10-12	12-15
TOMATO	4-5	12-15	15-18
PEPPER	5-6	12-15	15-18
AUBERGINE	5-6	12-15	15-18
COURGETTE	3-5	12-15	15-18
CUCUMBER	3-4	12-15	15-18
CORN	1	-	8-10

\* Evolution and duration of the material subject to climatic conditions

## PROCESSING PERFORMANCE OF INZEA® MULCH FILMS

### PERFORMANCE & STABILITY

INZEA offers **excellent performance** and **stability** in **conventional blown extrusion lines**, achieving a **wide thicknesses range** (8 - 100  $\mu\text{m}$ ).

### MASTERBATCHES

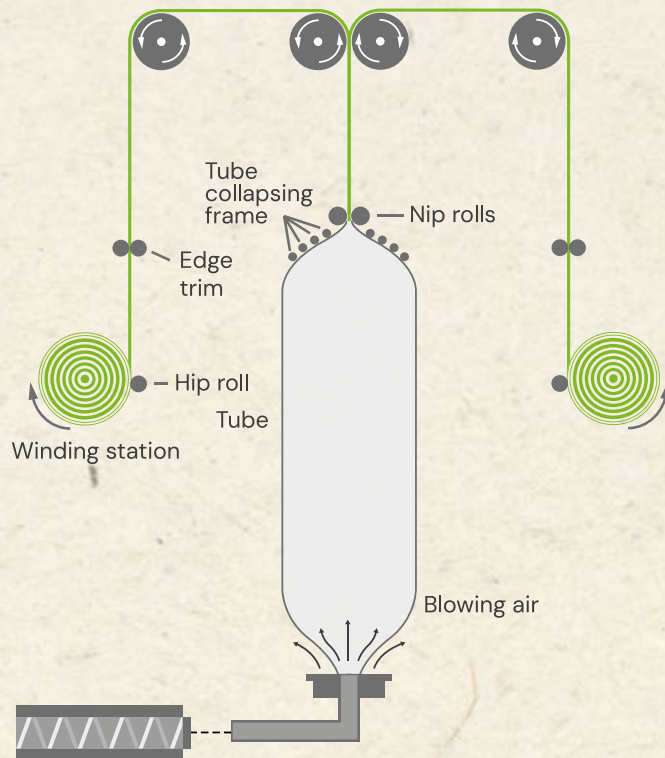
**Good compatibility** with **compostable black masterbatches**. INZEA grades for agricultural mulch film production are **also available in black colour**.

### MECHANIZATION



Excellent field performance using **standard machinery** at the **same speed**.

### MONO- & CO- EXTRUSION

INZEA grades are suitable for both **standard monolayer** and **coextrusion lines**, offering **versatility** in film processing.



## MECHANICAL PROPERTIES OF INZEA® MULCH FILMS

	THICKNESS ( $\mu\text{m}$ )	MODULUS MD (MPa) ISO 527-3	STRESS AT BREAK MD (MPa) ISO 527-3	STRAIN AT BREAK MD (%) ISO 527-3	WVTR 30 °C/90% HR (G/m <sup>2</sup> day atm) ASTM E398-20
 INZEA F08M	10	100	20	200	1,500
 INZEA F09M	10	100	20	300	2,200

\* All tests carried out with a monolayer airblown pilot line BUR = 3,0

## TWINES



The INZEA® biopolymers range includes specific grades designed for the production of **agricultural twines**. These materials can be processed using **conventional equipment**, following **standard manufacturing practices** for twine.

To meet the needs of sustainable farming, INZEA® offers compostable grades certified as **TÜV AUSTRIA OK compost INDUSTRIAL**.

This certification ensures that the twine can be **composted together with plant biomass** and sent directly to industrial composting facilities after harvest, **eliminating the need for waste separation and simplifying end-of-life management**.



	THICKNESS (µm)	MODULUS MD (MPa) ISO 527-3
 INZEA F15C	20	1.500
 INZEA F16C	20	1.700

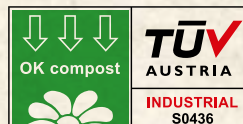
\* All tests carried out with a monolayer airblown pilot line BUR = 2,1

## CLIPS & FASTENERS



INZEA® offers specific grades with **mechanical properties optimized for clip applications**, combining suitable elongation and flexural resistance to ensure reliable performance in use.

These compostable clips and fastening elements can be **easily processed using conventional injection moulding techniques**. INZEA® materials are certified according to **EN 13432 or EN 17033**, depending on **application requirements**, offering a truly sustainable end-of-life solution.



## CIRCULAR LIFE CYCLE



Biodegradable twines and clips **support plant growth**.



After harvest, supports and plant residues **remain in the field**.



COLLECTED AND COMPOSTED TOGETHER IN **INDUSTRIAL COMPOSTING PLANT**.



The resulting **compost enriches the soil** for new crops.



These crops may become raw materials for **future biopolymers**.



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