
tritordeum
VIVAGRAN
The Golden Cereal
our web: www.tritordeum.com

Executive Summary

What is Tritordeum?

A natural, non-GMO cross between durum wheat and a wild barley (*Hordeum chilense*)

Suitable for baking, malting, feed

Sustainable: drought, disease resistance ; nitrogene use efficiency

Offers superior nutritional profile: more protein, fiber, lutein, and antioxidants ; less indigestible protein from gluten

Backed by IP, research (250+ papers), and a growing license network

tritordeum VIVAGRAN is a technology of Vivagran – www.vivagran.nl

Its Origin


“Tritordeum is a novel cereal crop, a natural cross between durum wheat and a wild barley”

Its journey started when...

A group of young Spanish plant breeders initiated an academic project to create a novel cereal crop species that would combine the robustness of barley and the baking quality of wheat.

After 4 expeditions to Latin America, they brought back home a collection of wild barleys and initiated a breeding program in Córdoba (Spain).

x Tritordeum

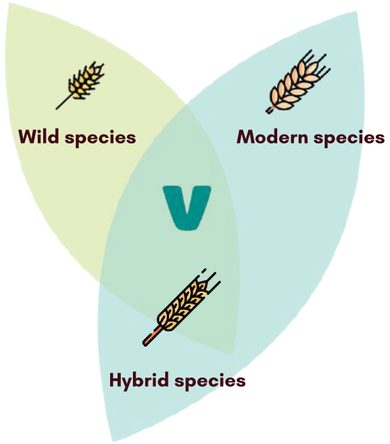
A new hexaploid cereal crop

HchHch
Barley
Hordeum chilense

AABB
Durum
Triticum durum

HchHch AABB
x Tritordeum

tritordeum
VIVAGRAN



The breeding technique is called:
Interspecific Hybridization.

The first wheat/barley cross was achieved in 1977.

50 years of Spanish research

IAS CSIC

vivagran

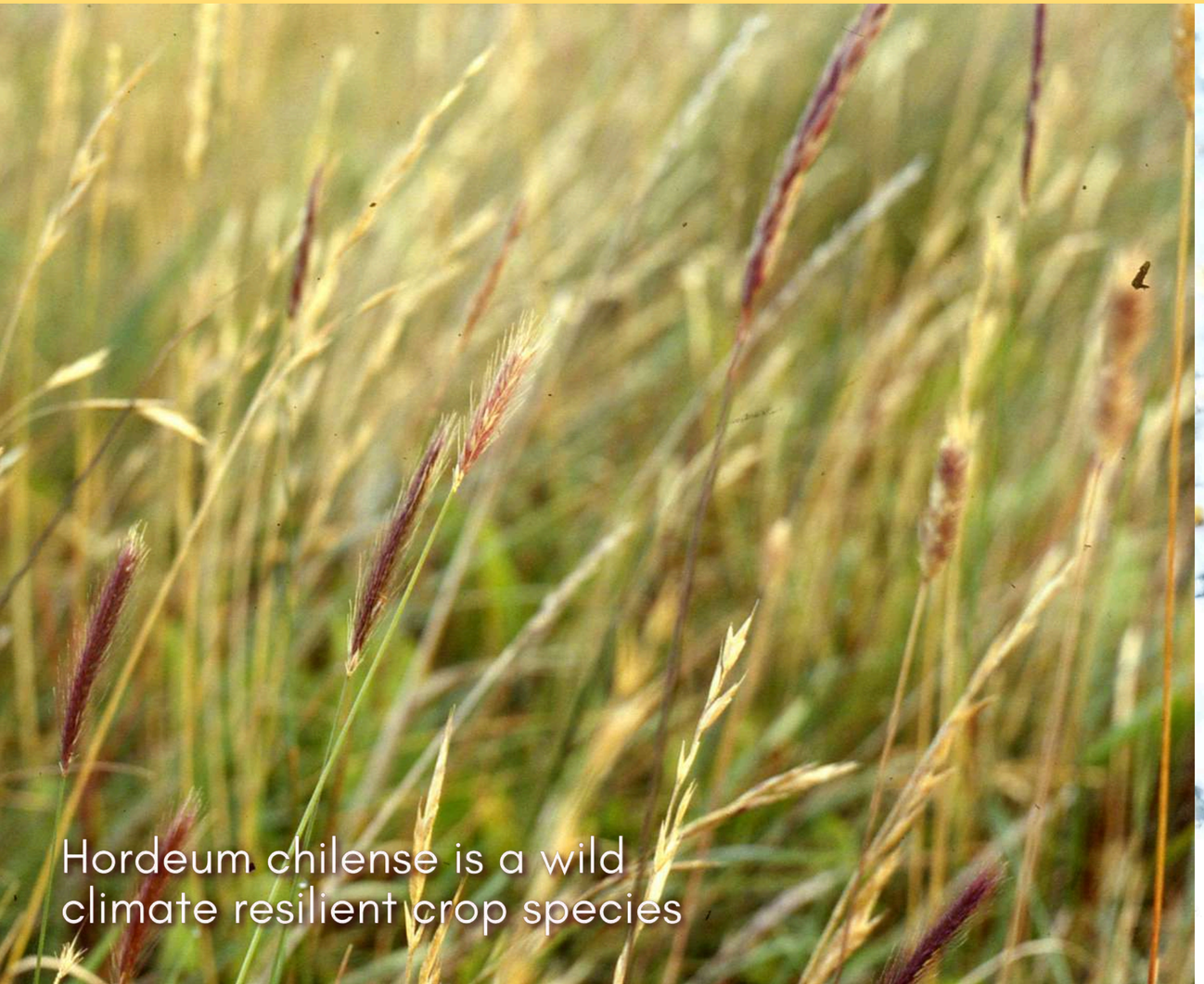
formerly agrasys ..because crops matter

Vivagran obtained exclusive global rights over this new species in 2006 and began its production and commercialization in 2014


Vivagran
“Vivagran holds a worldwide exclusivity over Tritordeum. The biotech company does breeding, production and licensing of its germplasm.”
Breeding Program in Córdoba, Spain

Why Tritordeum?

Combine robustness with baking quality



Hordeum chilense is a wild climate resilient crop species

Wheat is a bakeable and high yielding crop species

Why does Tritordeum matter?

Irreversible Climate-change.

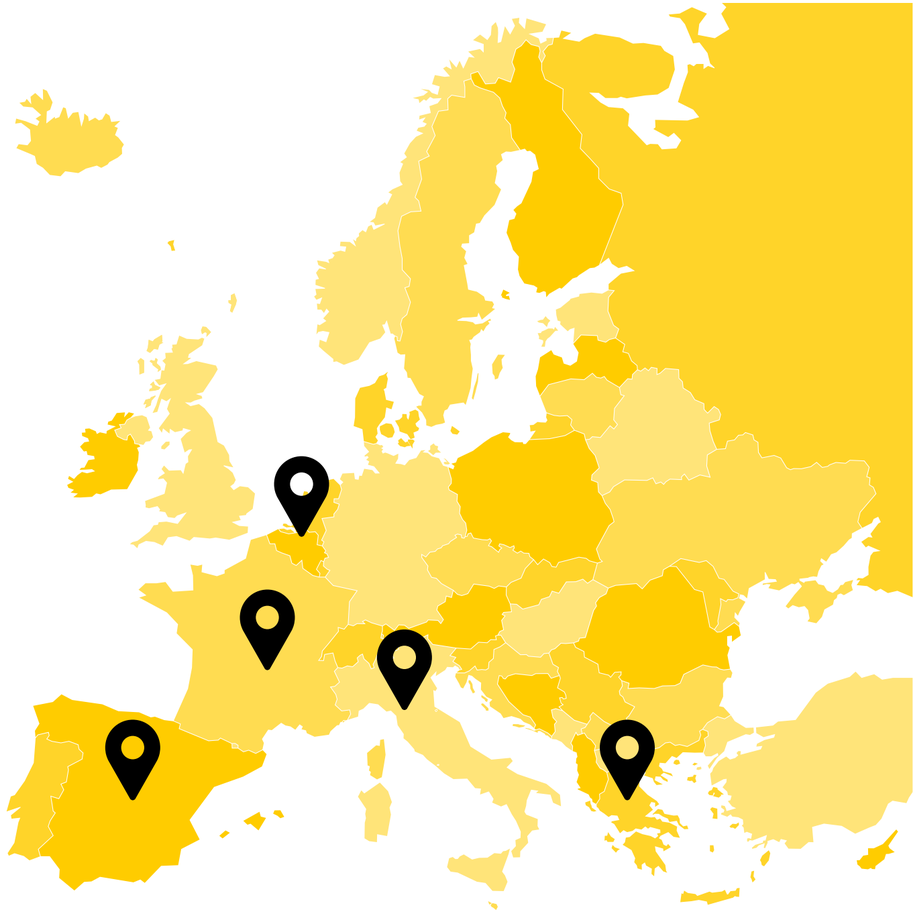
Industrial GHG Emissions.

Rising Intolerances and the need for Better Grains.

Cultivated in Europe and Australia

Conventional and organic farming

- Catalunya
- Aragon
- Castilla y Leon
- Castilla la Mancha
- Andalucía



- Spain
- France
- Italy
- Greece
- Netherlands
- Australia

Value Proposition

We have IP, know-how and control over:

The species

We hold worldwide exclusive licenses from the IAS-CSIC, where Tritordeum was co-developed. We have control over the germsplam collection.

The varieties

We register our commercial varieties at CPVO/UPOV offices for worldwide protection.

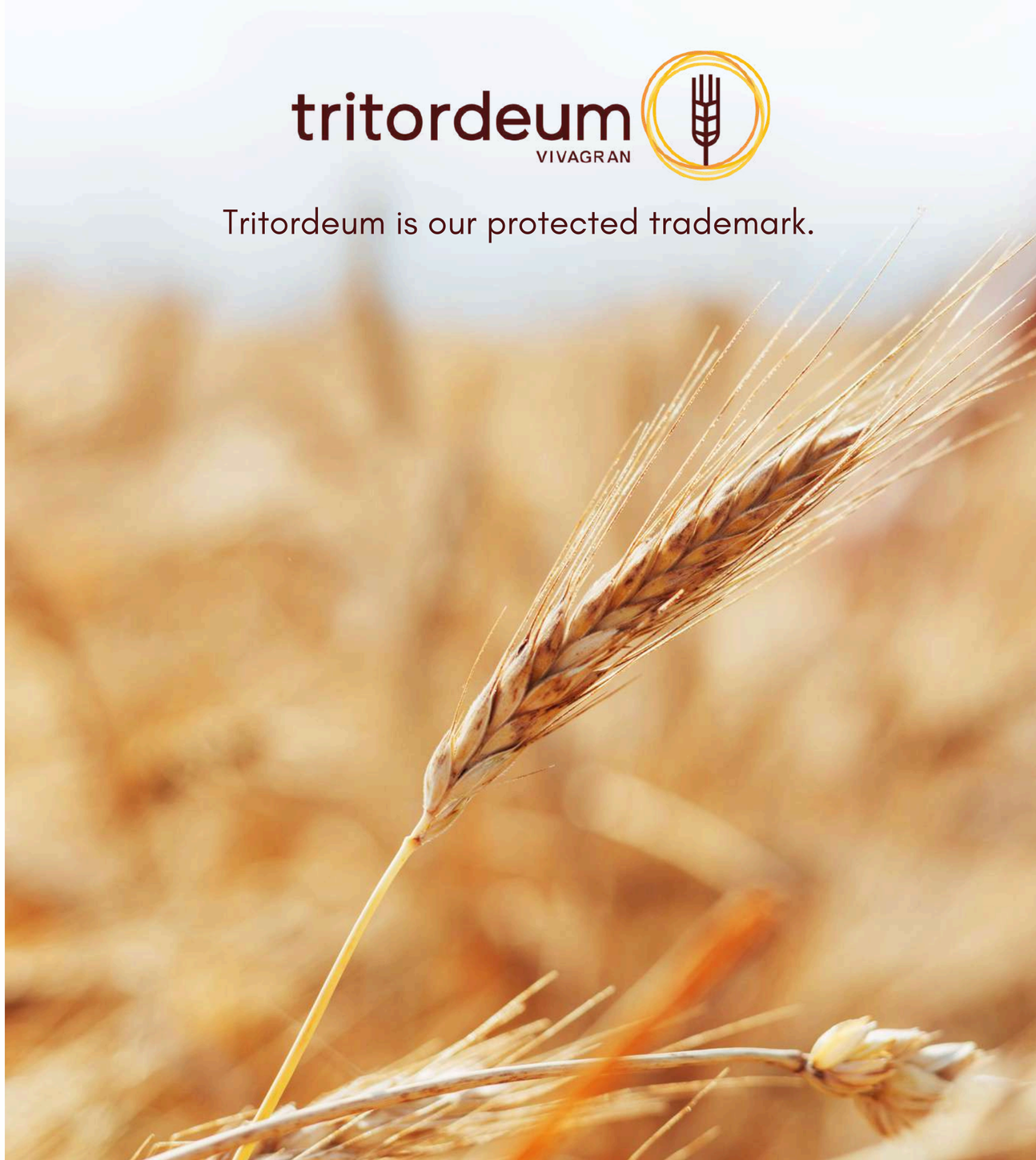
We hold a collection of 250+ lines.

The brand

Our cereal crop is branded for consumer awareness.

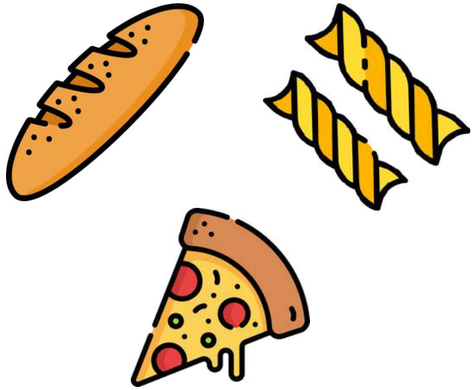
tritordeum VIVAGRAN

Tritordeum is our protected trademark.



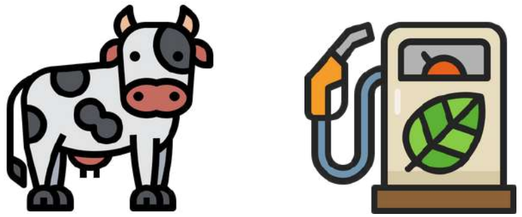
Sectors & Applications

Milling



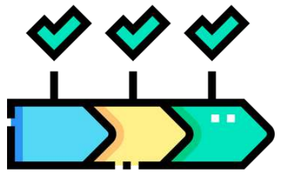
Malting

Feed



Exclusivity

A unique position in the cereal sector.



Controlled Value-Chain

Exclusivity from seed to food

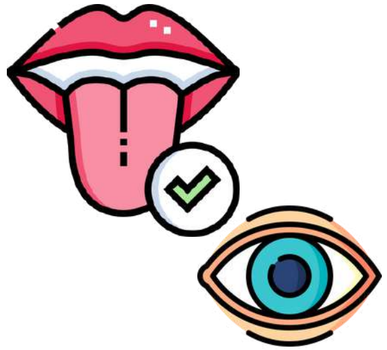
Sustainable margins

What makes it so special?

A game-changer in...

Nutrition

Applications



Sensory Quality

Sustainability

Nutrition

A Superior nutritional composition.

High Protein

14-18% on grain

High Lutein

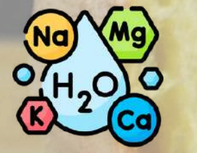
10x vs. wheat

High Fiber

+30% vs. wheat

Low Gluten*

-50% vs. wheat



High Vitamins / Minerals

B3, B5, E, calcium, magnesium, potassium

*indigestible immunogenic proteins from gluten - NOT FOR CELIACS

Applications

Bread

- Bakeable at 100%
- Improves workability
- Shortens mixing and proofing

Beer

- High quality malt specs
- Improves Foam stability
- Adapts to all beer styles

Pasta

- Durum-like mouthfeel
- Improves color
- Better Taste

Feed

- High biomass
- Excellent Feed values
- High appetence

Sensory Quality

Golden sweetness.

Golden color

Natural

Baking: shortbite

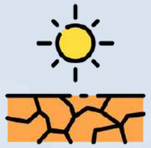
Brewing: crisp

Sweet taste

Biscuit/Honey flavor

Sustainability

Especially suitable for Regen Ag.



Drought/Heat resistance

- Thrives in high temperatures and water-scarce environments typical of Mediterranean climates.
- Efficient water use and heat tolerance from its wild barley parent, Hordeum chilense.
- Tritordeum and triticale had similar yields in low-yield environments.
- Tritordeum lines have higher protein contents, but less yield than bread wheat.
- Tritordeum and specific barley landraces enhance cereal resilience to extreme drought by maintaining ear photosynthesis, supporting stable grain yield under stress.

Nitrogen use efficiency

- Higher nitrate absorption efficiency in tritordeum in comparison to durum wheat.
- Under low nitrogen (LN) conditions, biomass production decreased by: Wheat-42%, Triticale-58%, Tritordeum-25%.
- Tritordeum, especially the Bulel cultivar, can achieve durum-like yields in Poland under spring sowing with moderate nitrogen, though it is sensitive to winter frost.

Improves soil quality

- Tritordeum, particularly cv. Bulel, showed a significant increase in the Bacteroidetes phylum under organic management. Bacteroidetes includes beneficial bacteria that enhance plant growth.
- In organic farming, Tritordeum has higher concentrations of minerals (Ca, Mg, S, Fe, Zn) and phenolic acids compared to durum wheat.

Competitive yields

- Thrives in high temperatures and water-scarce environments typical of Mediterranean climates.
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Diseases resistance (rusts, septoria,...)

- Tritordeum exhibits the highest resistance when compared to wheats, likely due to the Hch genome from Hordeum chilense.

Salinity resistance

- Tritordeum produced more biomass than durum wheat in all treatments of water salinity (1.8, 12, and 17 dS m^-1)
- Indicates better water use efficiency and ion balance under stress conditions.

Contributes to bio-diversity

- Tritordeum helps diversify genetic resources in agriculture, reducing reliance on a narrow set of major crops and contributing to the preservation of agrobiodiversity.

Multiple end uses

- Food: Bread, pasta, snacks – nutritious and belly-friendly.
- Beverages: Malted for beer and spirits.
- Feed: Byproducts used as sustainable animal feed.
- Bioenergy: Residues suited for biogas and biorefinery use.

Our research is vast

We have 250+ scientific publications.

Our most recent projects address topics such as:


Drought resistance

Nitrogen Efficiency


Regenerative Farming

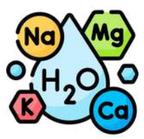

Soil Health


Feed Value

Malting Quality

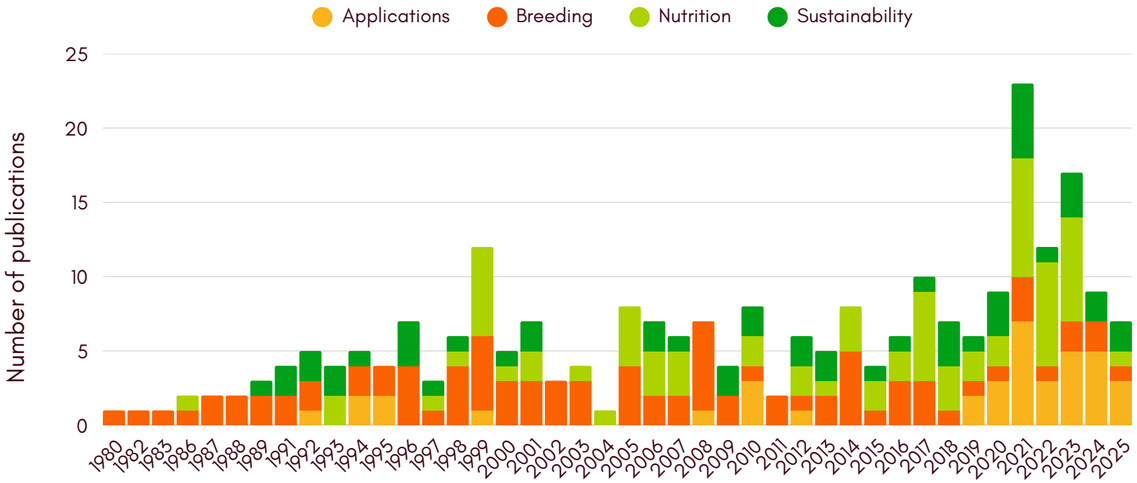

Brewing Distilling


Gut Health



Improved Nutrition


Traits Transfer



Article

A Tritordeum-Based Diet for Female Patients with Diarrhea-Predominant Irritable Bowel Syndrome: Effects on Abdominal Bloating and Psychological Symptoms

Giuseppe Riezzo [1,†], Laura Prospero [1,†], Antonella Orlando [1], Michele Linsalata [1], Benedetta D'Attoma [1], Antonia Ignazzi [1], Gianluigi Giannelli [2] and Francesco Russo [1,*]

Tritordeum: Creating a New Crop Species—The Successful Use of Plant Genetic Resources

Carmen M. Ávila [1], Cristina Rodríguez-Suárez [2] and Sergio G. Atienza [2,*]

Tritordeum, barley landraces and ear photosynthesis are key players in cereal resilience under future extreme drought conditions

Ander Yoldi-Achalandabaso [a,b,*], Aitor Agirresarobe [a], Artūrs Katamadze [b], Giulia Burini [b,c], Omar Vergara-Díaz [b], Mariana Mota [d], Cristina Oliveira [d], Usue Pérez-López [a], Rubén Vicente [b,c,*]

Article

Tritordeum: Promising Cultivars to Improve Health

Salvatore De Caro [1,†], Antonella Venezia [1,2,†], Luigia Di Stasio [1], Donatella Danzi [3], Domenico Pignone [4], Gianfranco Mamone [1] and Giuseppe Iacomino [1,*]

Consult publications **here**

Tritordeum's Competitive Landscape

	tritordeum VIVAGRAN	Wheats			Barley	Rye
		Bread	Durum	Spelt		
Technology						
Baking	✓	✓		✓		
Pasta	✓		✓			
Brewing	✓	✓			✓	
Distilling	✓				✓	
Feed	✓	✓			✓	✓
Nutrition						
High fiber (arabino x.)	✓					
High protein	✓					
High lutein	✓		✓		✓	
High digestibility	✓				✓	
Sensory profile						
Golden color	✓		✓			
Rich taste	✓					

Tritordeum's Target Audiences

Early Nutrition

Introduction of gluten in diet of infant

Gluten Sensitives

Reduce gluten intake and manage IBS/NCGS

Sport Nutrition

Improve performance of Athletes

Foodies

Better sensory profile (color, taste)

Our Impact

Hordeum chilense

The climate resilient “mother” crop

Hordeum chilense, a wild barley species, imparts key sustainability traits to Tritordeum. **These traits include enhanced drought and salinity tolerance**, making Tritordeum suitable for arid regions. H. chilense also boosts Tritordeum's **nitrogen use efficiency and disease resistance**, reducing the need for chemical inputs and improving its adaptability and resilience in various environmental conditions. This genetic contribution makes Tritordeum a sustainable crop for modern agriculture.

Hordeum chilense, Argentina (Río Grande - Tierra del Fuego)

Tritordeum Regen'

Our commitment to reducing our carbon footprint.

In 2024, Vivagran launched a program to cultivate Tritordeum using regenerative farming practices, supported by The Regen Academy, a team of agronomists dedicated to helping farmers transition to sustainable agriculture.

Our objectives* are clear:

*in comparison to wheat

learn more: www.tritordeum.com

Our impact

Low carbon. High nutrition. Better taste.

With our novel crop species:

We support farmers in adapting to climate change by minimizing yield loss risks and reducing the need for fertilizers and crop protection.

We help consumers boost their intake of protein, fiber, and essential nutrients while enhancing the taste of their favorite foods.

We promote biodiversity and innovation to the entire value-chain.

Our impact

Carbon Footprint.

Based on 2023 harvest data from Tritordeum productions in Spain and the Netherlands, the following carbon footprint calculations have been obtained for Tritordeum, spelt and malting barley

Tritordeum's carbon footprint is similar to malting barley (-8%), but **much better than spelt (-36%)**

Dryland conditions

	av. yield (t/ha)	av. kg CO_2e/ton exw farm**
Tritordeum	**3,16**	**114,12**
Malting Barley	6,76	124,58
Spelt*	4,59	178,97

Tritordeum varieties: Bulel and Coique
Malting barley variety: Irina (KWS)
Spelt varieties: Zollernfit, Frankenkorn

*hulled

**calculations done on ChatGPT

Value-Chain

Tritordeum's Target Partners

Seed companies
Multiplication

Cooperatives
Grains production

Millers
Production of flours

Maltsters
Production of malts

The value-chain

A closed-loop from seed to food.

Vivagran's licensees

Breeding → **Farming** → **Grain Processing** → **Food Processing** → **Retail** → **Consumers**

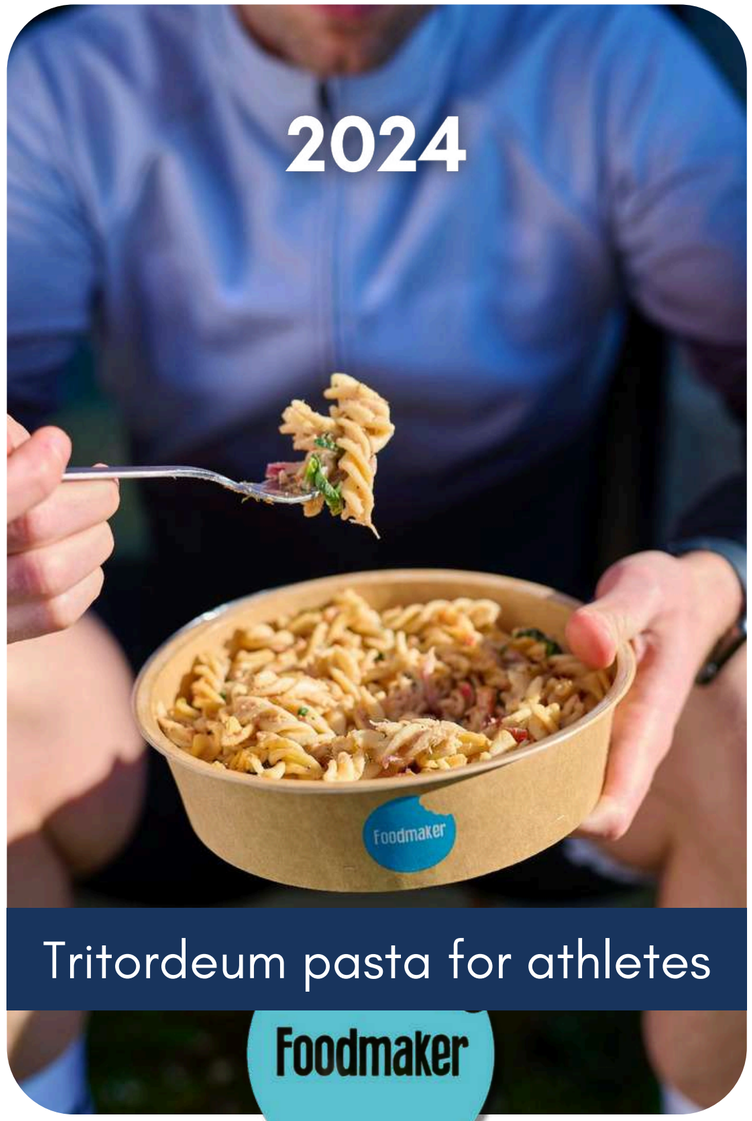
Revenue streams:

- Seed/Grain sales
- Species Licensing

Marketing Support

Recent commercial launches

A Tritordeum-based malt range



Tritordeum pasta for athletes

A healthy snack for kids

Integrated value chain

Fair prices to farmers

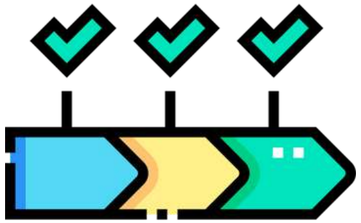
Linked to grain market indexes + premium

Reasoned agriculture

conventional, organic and regenerative

Local production

spanish and european harvests



Full traceability

from seed to food

Advantages

100% of production under contract

we are the buyer

Robust species

less or no use of fungicids

High purchase price

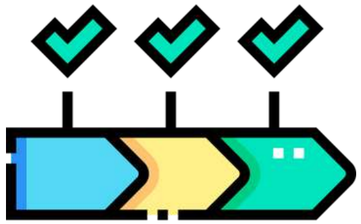
lonja + premium

Asesoramiento técnico

Vivagran + The Regen Academy

Conditions of farming contract

Hectares
Conv, Org or Regen
Variety produced
Field books



Full Traceability from seed to food

Quality controls before and after harvest

Payments:

- 25% at harvest
- 75% before end of year

Portfolio

Tritordeum Grain

Typical values

Hull-less

Specific weight: 72 Kg/hL (56 lb/bu)

Protein: 14-18%

Milling: like a bread wheat

Varieties: 2 commercial (Aucan, Bulel)

Production: Europe
Australia

Tritordeum Flour

Typical values

Extraction: 70% for refined / 95% for wholegrain

Protein: 13-15%

Allergen: Gluten

Declaration: Tritordeum flour (WHEAT, BARLEY)

Tritordeum is a natural cross between wheat and barley

Tritordeum Malt

Typical values

Extract: 80%

Diastatic power: > 400 Wk

Betaglucan: < 60 mg/L

Other traits: Tritordeum malt is low- LOX*
Tritordeum malt is non- GN**

*Lipoxygenase is an enzyme naturally present in cereal grains (like wheat, barley) that catalyzes the oxidation of lipids.

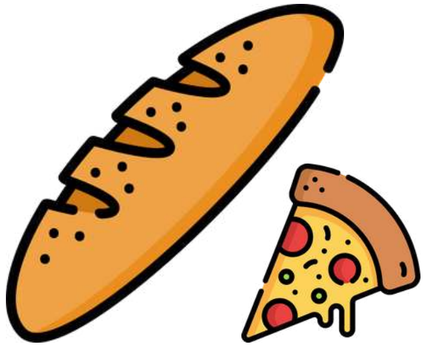
**refers to varieties that do not produce glucosidic nitriles upon glucosinolate breakdown

Portfolio of Tritordeum flours

CATEGORY	ARTICLES	FORMATS	EXTRACTIONS
Refined Flours	HCCR-E	25 Kg	69-72 %
	HCER-E	25, 5 y 0,5 Kg	75-80 %
Wholegrain Flours	HCCI-E	25 Kg	92-95%
	HCEI-E	25, 5 Kg	95-98%

All flours have no additives

Applications



Fermented Doughs

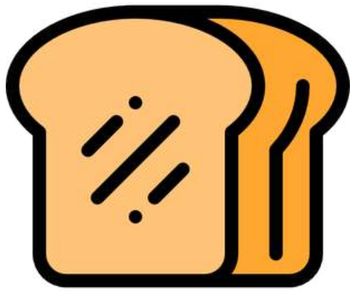
Bread, pizza,...

Self-rising Batters

Muffin, sponge cake...

Rich Doughs

Cookies, snacks...



Natural Additive

in smaller % in any recipe

Substitutes 1 to 1 bread wheat flour

100% Tritordeum Bread

with refined flour

golden color

caramelized
crust

Other applications

Baking Tritordeum

Baking Tritordeum bread

Process and tips.

Opportunities in formulation

Reduction on egg and sugar

- Lutein will compensate yellow color
- Sweet taste of Tritordeum

Improve nutritional profile

- Less immunogenic proteins from gluten
- More fiber, especially arabinoxyalns and fructans
- More lutein
- More minerals and antioxidants

Improve workability and shorten baking process

- Extensibility of dough
- Enzymatic activity, especially alpha and beta amylases

Improve appeal of baked goods

- Natural golden yellow color
- Sweet, nutty, biscuit-like taste

Tritordeum can enhance sensory attributes even when used in a smaller % in the recipe

Direct Baking process

Indirect (retarded) Baking process

Tritordeum flours have excellent water retention, a **minimum of 65%** is recommended

Tritordeum doughs require a **slow speed, short mixing**, to avoid damaging the gluten

Tritordeum doughs are very enzymatic, therefore a **mild dough temperature (below25˚C)** is recommended, especially in retarded process

Tritordeum doughs are **very extensible, less elastic**, and may have more initial stickiness compared to wheat

After a period of resting, the dough become very **easy to shape, the stickiness is gone**, and it feels **softer** than wheat-based doughs

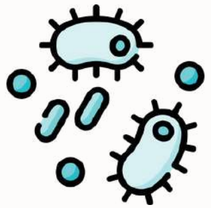
Due to its good enzymatic activity, the dough requires **usually 30% less proofing** than a wheat-based equivalent

The final bread volume is obtained mostly during baking, rather than proofing stage. The **crust coloration during baking is more intense**

Baking Tritordeum bread

Sourdough.

Tritordeum natural sourdough

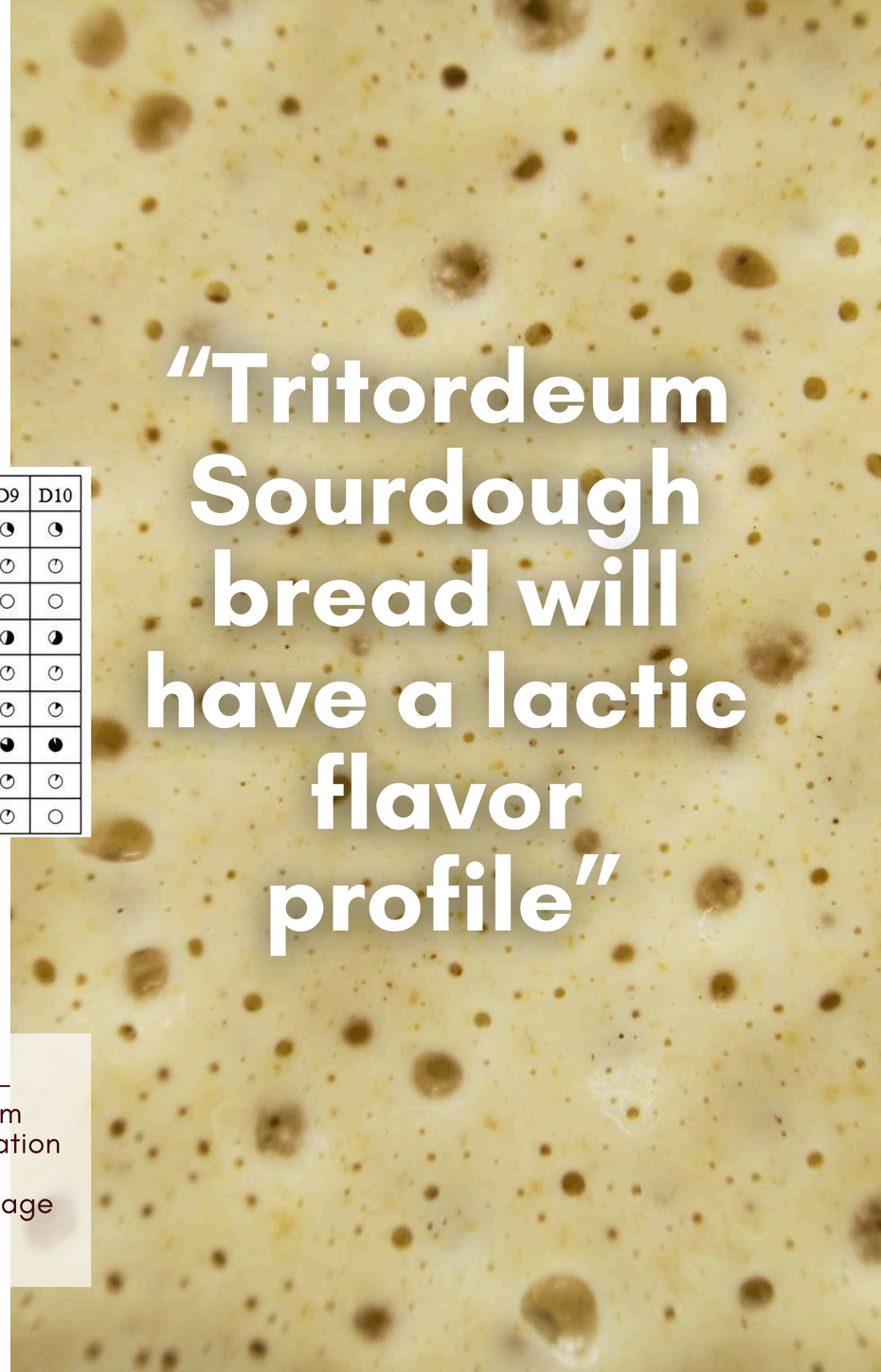


After 10 days of fermentation, the Tritordeum sourdough has a high content of Saccharomyces cerevisiae, **Lactiplantibacillus plantarum** and **Weissella confusa**.

Closest relative (% identity)	Genbank Accession No.	D0	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
Weissella confusa (100)	NR_113258.1	◕	◕	◕	◕	◕	◑	◔	◔	◔	◔	◔
Weissella confusa/W. cibaria (99)	NR_113258.1/ NR_036924.1	◔	◔	◔	◔	◔	◔	◔	◴	◴	◴	◴
Weissella paramesenteroides (98)	NR_104568.1	◴	◴	◴	◴	◴	◴	◴	○	○	○	○
Lactiplantibacillus plantarum (99)	NR_104573.1	○	○	○	○	○	◑	◑	◑	◑	◑	◑
Latilactobacillus curvatus (99)	NR_042437.1	○	○	○	○	○	◴	◴	◴	◴	◴	◴
Leuconostoc mesenteroides (99)	NR_074957.1	○	○	○	○	○	◴	◴	◴	◔	◔	◔
Saccharomyces cerevisiae (99)	MN559526.1	●	●	●	●	◕	◕	◕	◕	◕	◕	◕
Clavispora lusitaniae (100)	KY106929.1	○	○	○	○	◴	◴	◴	◴	◴	◴	◴
Pichia kudriavzevii (99)	KX237674.1	○	○	○	○	○	○	○	◴	◴	◴	○

Source: Sourdough performances of the golden cereal Tritordeum: Dynamics of microbial ecology, biochemical and nutritional features, Kashika Arora, 2022

Species of lactic acid bacteria and yeasts identified through the culture-dependent method during the preparation and propagation of Tritordeum sourdough. Samples were taken after dough mixing and before fermentation (D0) and after 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10 (D1-D10) days of sourdough propagation. The individual pie charts in each cell represent the percentage of identified microorganism at the respective day of propagation.



“Tritordeum Sourdough bread will have a lactic flavor profile”

Discover more at: **www.tritordeum.com**

Or scan this QR code:

tritordeum
VIVAGRAN

Contact us: evassiliadis@vivagran.nl