

Variety, processing and environment: the impact on nutritional content in gluten free grains

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Re-Cereal project

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6th September 2019



PROJECT **Nere-cereal MAIN GOALS**







- Transfer technology/expertise to farmers and to food industry
- Increase the potential of using minor crops in everyday foods







MINOR CROPS: OPPORTUNITIES AND CHALLENGES

- Gluten free market expansion is driving up demand for alternative crops
- Oats, buckwheat and millet: crops with high nutritional content and adapted to grow with low agricultural inputs
- Decreasing/negligible cultivated area for oats, buckwheat and millet in Italy and Austria. Millet and uckwheat come mostly from Asia







Limits identified at the beginning of the project:

- High costs due to low yields
- Few varieties available on the seed market
- **Limited experience** in agronomic practices
- Grains need *ad hoc* equipment to be processed
- **Consumers' attitude** (different flavours and texture)



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MILLET (Panicum miliaceum L.)



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STRATEGIES TO IMPROVE THE SHELF LIFE

Defatting (Supercritical CO₂)
→ loss of important nutritional value (mainly lipophilic vitamins)

Thermal Treatments (lipase inactivation) → change in water absorption

18th International Celiac Disease Symposium

Cryomilling (N₂ prevents oxidant cascade) \rightarrow good results

Exploit the antioxidant capacity of millet HUSK

ANTIOXIDANT CAPACITY OF MILLET HUSK

Typical antioxidants in foods: polyphenols, vitamins and phenolic acids

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MILLET NUTRITIONAL FATS

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WHOLE MILLET displays

- Fiber content increased (4x)
- Carbohydrates content decreased
- Mineral content increased (P, Fe)



ENVIRONMENTAL INFLUENCE



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New millet varieties, originating from Russian Federation (Quartett), USA (Horizon), Austria (GLRH 16106) and Poland (Gierczyckie) were cultivated in two different locations in North-Eastern Italy, Udine (UD) and Brunico (BR), with the same growing practices





BUCKWHEAT (Fagopyrum esculentum)



Pseudo-cereal

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High nutritional properties: rich in micronutrients (magnesium, zinc, vitamin E) protein, fiber and carbohydrate

High level of *rutin* content (a bioflavonoid with antithrombotic properties, used to promote cardio-health and blood circulation)



BUCKWHEAT PROCESSING PRACTICES









BUCKWHEAT ANALYSIS RESULTS



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SAMPLES	ANALYSIS (MEAN VALUES)							
	FAT (g/100g)	CARB (g/100 g)	SUGAR (mg/100g)	FIBER	utrition		ENERGY (Cal/100g)	ENERGY (Kj/100g)
BUCKWHEAT RAW MATERIAL	1,93±0,25	48,80	nflue	nces .	7	31,40	303	1273
DEHULLED BUCKWHEAT	ocess	ing	con	4,12	14,5± 0,56	11,47	343	1453
BUCKWHEAT HUSK		1	1	/	/	22,15	/	/
EUROPEAN STYLE BUCKWHEAT FLOUR	3,10±0,32	64,4	1,19±0,15	3,46	12,96±0,53	11,73	348	1473
ITALIAN STYLE BUCKWHEAT FLOUR	2,12±0,26	69,2	0,91±0,13	3,99	9,53±0,43	14,00	346	1463



OAT INTRODUCTION

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high proportion of fiber (such as beta-glucans), rich in vitamins B1 and B6, omega 3 and omega 6, iron, magnesium, and phosphorus.

Important aromatic profile

sweety taste, wholegrain note, moist mouthfeel in bread due to its water binding capacity, crunchiness in snacks





OAT: THE SENSORY CEREAL

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Ingredients	Product
Oat flour, water, maize starch, sourdough 12% (rice flour, water), buckwheat flour , whole rice flour, beet syrup, vegetable fibre, rice starch, sunflower oil, pea protein, millet flour, Oat flakes , thickener: hydroxypropyl methyl cellulose; yeast, salt, sugar, acidificants.	

A SAMPLE COMPANY AND A

- Nutritional points:
 - Source of phosphorus, Vit E
- Sensory profile:
 - Cereal flavour in particular millet, oat and buckwheat, nutty and sweet flavour, juicy mouthfeel





Thanks for your attention



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