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► **To cite this version:**

Lucie Lebert, François Buche, Thierry Aussenac, Arnaud Sorin. Functionalization of wheat aleurone-rich flour for bread and baked products applications. Ozone days, Oct 2022, Beauvais, France. hal-04262834

HAL Id: hal-04262834

<https://normandie-univ.hal.science/hal-04262834>

Submitted on 30 Oct 2023

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Functionalization of wheat aleurone-rich flour for bread and baked products applications

Fonctionnalisation de farine de blé riche en aleurone pour des applications en panification

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Context & Objective



Flour mill company's objective:

Optimizing wheat flour **milling fractions** to improve artisanal bread and baked products **nutritional profile**

→ Literature exists on bran optimization by pre-treatments but there is an increased interest in the **aleurone layer**, which has a high potential for **nutritional** and **technological benefits**.

Though its transformation by mechanical treatments have already been studied, few investigated the **effect of oxidative, thermal or biological treatments** on this specific layer.

The aleurone layer

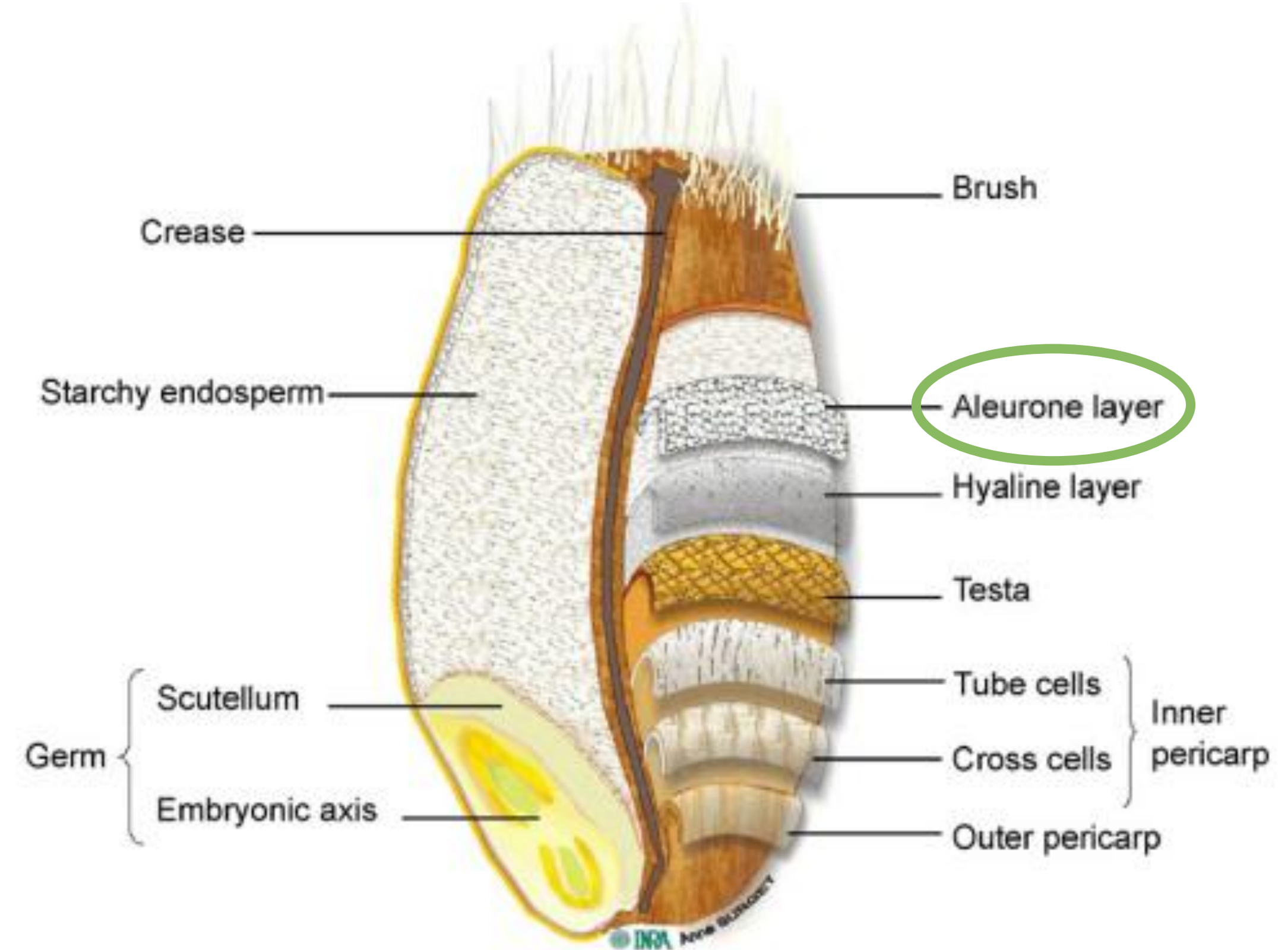
- Single layer of **living cells**
 - Represents 5-8 % of the whole grain and **50 % of the bran**
 - Role: synthesis and release of hydrolyzing enzymes during grain germination for the mobilization of endosperm starch and protein
- Living barrier for defense and protection

(Brouns *et al.*, 2012 ; Burton and Fincher, 2014 ; Meziani *et al.*, 2021)

Nutritional & health benefits

- Source of:
 - **Dietary fibers** (arabinoxylan, β -glucan)
 - **Vitamins** (B1, B2, B3, B6, B9, E)
 - **Minerals** (P, K, Mg, Mn, Fe)
 - **Phytates**
 - **Phenolic antioxidants** (mainly ferulic acid)
 - Proteins (containing **lysine**)
 - Plant sterols
- Prolonged anti-inflammatory effect, decreased colon cancer risk, contribution to obesity and hyperlipidemia prevention...

(Antoine *et al.*, 2002, 2004 ; Brouns *et al.*, 2012 ; Mateo Anson *et al.*, 2009, 2010 ; Sagara *et al.*, 2007)



(Surget and Barron, 2005)

Methodology

Pre-treatment



Aleurone-rich flour

Ozonation
Fermentation
Thermal treatment



Dough

Modified technological properties



Artisanal bread & baked products

Modified end-product organoleptic and nutritional profile

Analytical materials



A4F,
HPLC...



Mixograph,
Aleveograph



Volumeter,
Texturometer



Potential effects of ozone-treated aleurone-rich flour

Bleaching effect
↗ glutenin insolubility and fibers solubility
↘ α -amylase activity

Strengthened gluten network
↗ tenacity (P) and viscosity during pasting
↘ extensibility (L)

↗ specific volume and light color
↘ staling rate

(Goze *et al.*, 2017 ; Sandhu *et al.*, 2010 ; Violleau *et al.*, 2012 ; Zhu, 2018)

Expected results

Aleurone-rich flour with satisfying technological properties for artisanal bread and baked products production showing acceptable organoleptic characteristics, improved nutritional profile, and enhanced health benefits.

Acknowledgments: this work is supported by Foricher Les Moulins and UniLaSalle

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