



This project received funding from the European Union's Horizon 2020 Research and Innovation program under Grant Agreement n° 727848.



## Research on the quality of hand-made breads

Different genetically heterogeneous varieties show great variations both within the same type and within the same year. This kind of research contributes to a greater understanding of the phenomenon.

### Quality of wheat in the production chain of hand-made bread

The production requirements for the making of hand-made bread (HMB) geared toward producing varieties suitable for different contexts, needs and uses have led some scientists to develop methods and protocols aimed at a greater understanding of their diversity [1] [2]. The close relationship between bread-producing farmers and their customers means that the sensory qualities of the final product play a fundamental role. The approaches adopted are applied throughout the production chain, from the seed to the bread; these attempt to establish a connection between agronomic, nutritional and sensory characteristics. Methods of evaluation are brought as close as possible to real practice. This type of research also contributes to better communication about bread quality and can be applied to longer production chains.

### Methodological results

An important aspect of the study of bread quality beginning from this wheat typology concerns the bread-making protocol. Rather than being characterized by a pre-established method—as required by an “under-the-same-conditions” scientific approach—this protocol must be adapted to each single variety under analysis. Standard methods indeed propose intensive production with fixed parameters for bread making (hydration rate, fermentation time). Such methods are not suitable to the reality of bread-producing farmers, nor to the great varieties of local wheat. Given that the technological behavior of flours shows great differences from one variety to another (e.g., hydration rate and variations in enzymatic activity), these standardized practices lead to a differentiation of breads on the basis of the defects of an undifferentiated production process and not of the effective expression of the characteristics of the grains used in them. The bread-making protocol usually applied in HMB production includes limited manual kneading, a high hydration rate and long fermentation times. The aim here has been to propose, test and adapt a protocol that permits the regulation of graph parameters based on tested genotypes and on the experience of expert bread-makers in the production of similar doughs (consistency, optimal fermentation), up to the baking stage. The research context limits the application of sensory methodologies, which imply the formation of a group of evaluators and, consequently, a series of constraints on the means of farmers and on artisanal bread-making. Napping's method, based on a representation of sensory ranges, is applied and constantly refined in light of results. This test has been validated by metrologists of perception and consists in measuring sensorial ranges perceived between different breads by each taster. When the overall data of these perception measurements are processed, the prevalent differences perceived by most of the tasters are illustrated.

### Scientific results

These specific research methodologies have enabled scientists to improve their knowledge of the diversity as well as the common characteristics of these different varieties of wheat.

Possible connections have been brought to light between several agronomic, nutritional and sensory characteristics of the different varieties. Local or ancient varieties are characterized by:

- their rich and diversified mineral content, which can influence aroma. The most complex aromas are particularly rich in zinc and magnesium. Nutritional wealth likewise seems correlated to stalk height.
- an abundance of rhamnose and ribose, which when compared to genetically pure lines could also play a part in determining the aromas of ripe wheat which are characteristic of these varieties.

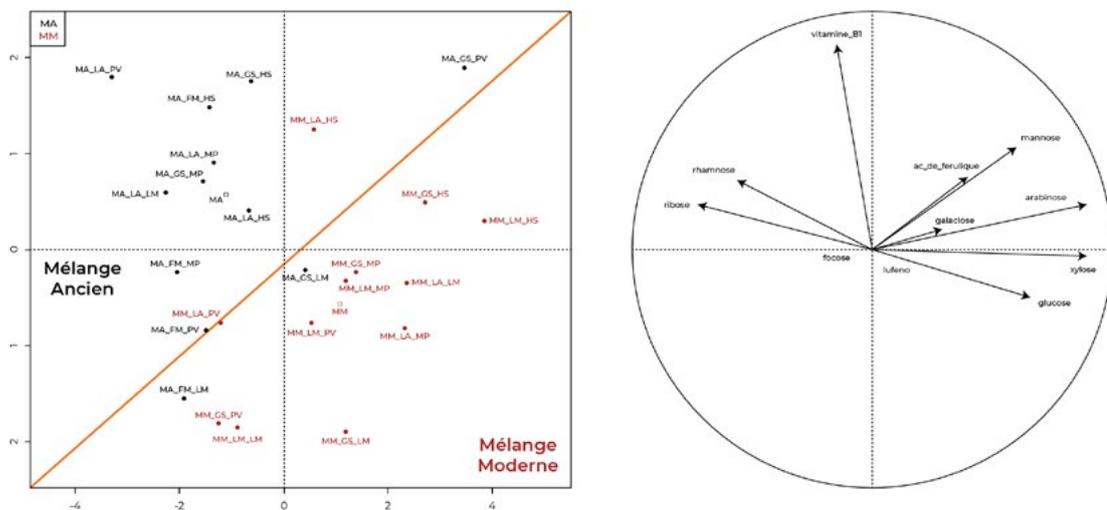
### Prospects

The various factors that may influence the sensory qualities of breads have been analyzed: genetic factors, the cultural environment and not least the practices of bread making. New and recent research has also examined other possible factors, including the influence of microorganisms present in yeasts on the

final quality of breads [4]. New hypotheses triggered by research observations and results have emerged, which are able to indicate new lines of analysis. Some studies, for example, look at the possible correlation between stalk height and nutritional density in different genetic varieties, while others examine the relationship between differences in mineral content and aromatic diversity.



1: Napping Test during Let's Liberate Diversity 17 in Belgium.



2: AFM of nutritional measurements of ancient and modern varieties (BAKERY).

## Recommended Reading

Vindras-Fouillet, C., Ranke, O., Anglade, J.P., Tauvriep-Letage, B., Chable, V., Goldringer, I. 2014. "Sensory analyses and nutritional qualities of hand-made breads with organic grown wheat bread populations", in *Food and Nutrition science* (5), pp. 1860-1874. <http://dx.doi.org/10.4236/fns.2014.519199>

Vindras-Fouillet, C., Rouellat, V., Hyacinthe, A., Chable, V., 2016. "Empirical knowledge in Participatory research: integration of the sensory quality of bread in the plant breeding process of Wheat in France", in *Universal Journal of Agricultural Research* (4), pp. 5-14. Doi: 10.13189/ujar.2016.040102

Faye, P., Brémaud, D., Durand Daubin, M., Courcoux, P., Giboreau, A., Nicod, H. 2004. "Perceptive free sorting and verbalization tasks with naïve subject: an alternative to descriptive mappings", in *Food Quality and Preference* (15), pp.781-791

Løje, H., Møller, B., Laustsen, A. and Hansen, Å. (2003) "Chemical Composition, Functional Properties and Sensory Profiling of Einkorn (*Triticum monococcum* L.)", in *Journal of Cereal Science*, 37, pp. 231-240. <http://dx.doi.org/10.1006/jcrs.2002.0498>