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THE RIVET WHEAT

AT FIRST GLANCE

During the 20th century, landraces of various wheat forms were gradually substituted by standardized pure lines of soft and durum wheat. In that context, Rivet wheat case illustrates the contemporary resurgence of forgotten crops in organic farming.

Embedding crop diversity and networking for local high quality food systems

Origin of Rivet wheat

Cereals are a cornerstone of European agriculture, culture and diets. Among them, Rivet wheat (*Triticum turgidum*) - also named Poulard, Cone or English wheat - is a free-threshing tetraploid cereal, which differentiated throughout the Neolithic era from other descendants of domesticated emmer (*Triticum Dicoccon*) like Durum, Polish, Khorasan and Persian wheat. Archaeological findings suggest that Rivet wheat's spread from Fertile Crescent and arrived in Europe by the Mediterranean route.

Why a forgotten crop? Its limits and qualities

Across its evolutionary process in cold and mountainous environments, Rivet wheat acquired a good tolerance to frost, wind and humidity. It has the capacity to grow in poor soils, shows a strong weed competitiveness and a good resistance to diseases. Consistently with the hardness of the kernel, it has been traditionally used for pasta and biscuit elaboration.

A beam of rustic features revealed inappropriate to the industrialization of agriculture. Once appreciated to repeal large predators, barbs challenge the mechanized threshing. On rich soils, Rivet wheat's long straw (1.80m) cause lodging, an additional factor of abandon at a time when its use for cattle feeding faced the competency of imported soya bean. Compared to newly bred varieties, Rivet wheat occupy the fields during a long period (from October-November to August), presents an uneven ripening, a late heading and a modest yield (from 2 to 2.5 tones per hectare). Regarding later processing, colour as well as physical properties of the grain didn't fit with the modern standards for bread and pasta making.

Thanks to good performance for organic farming that goes along with positive feedbacks from consumers, Rivet wheat attracts today the interest of some farmers, processors and sellers.

DIVERSIFOOD approach to this issue

An exploration of Rivet wheat situation at the present time in France has been carried to highlight actors and forms of organization, involved knowledge and practices, emerging questions and first answers. A parallel step was to organize the networks of farmers and

pasta, biscuit or bread makers interested in Rivet wheat. Interacting with producers and processers' experience, a global analysis (agronomic, technological, nutritional and sensorial) describes Rivet wheat's diversity and general qualities, focuses on its limits and benefits, evaluates the potential to interact with the biotic environment.

DIVERSIFOOD results regarding this issue

In France, an overview of the network of farmers that grow Rivet nowadays has been drawn. Since 2006, different groups (GABB Anjou, GAB65) started taking out several wheat varieties from different Germplasm Banks. They multiplied the samples, eventually created population mixtures and operated selection in a way that initiated co-adaptation processes between seeds, environment and practices. Informal seed transfer could rely on network-shaped associations (as "Réseau Semences Paysannes). As a result more than 30 landraces are being multiplied in different regions. In The Netherlands, from five accessions adapted to local climate, lodging susceptible due to high ear weight, accessions were selected in 2016/17. In UK, first trials at Doves farm in southern England revealed overall good performance. More than 200 farmers participated to showcase of selected Rivet varieties at a National Organic Combinable Crops event in 2017.

Technological analyses of landraces show a great variability of kernel hardness, gluten and global protein content, gliadin/glutenin ratio and other parameters conditioning physical properties of grain. That makes Rivet wheat theoretically suitable for both bakery and pasta/pastry making. Consistently, bakers observed significant differences in elasticity and extensibility among the varieties they tested. Some of them judge the dough too strong and mix Rivet with soft wheat to facilitate preparation while still bringing new aromas to their bread. Indeed, they detected a release of special aromas at early stages of the preparation. During the bread testing sessions that operated comparisons between soft/durum wheat and Rivet wheat, tasters noticed more perfumed, biscuit-like and tendentiously more acidic flavours of Rivet wheat, associated with differences of texture, a more brownish colour and a denser crumb.

The way forward

1 - DIVERSIFOOD will extend the investigation new sources of diversity exploring past uses of potential interest, focusing on Rivet wheat origin and evolution, assessing available landraces already in farms or still in Germplasm Banks. Field experiments are complementing farmers' initiatives - the 197 rivet accessions founded in Spanish seed conservatory are being tested and multiplied. Other accessions will be evaluated soon.

2 - Promising innovations related to cultivation and processing are to explore. Which adaptations of dough preparation and fermentation allow to obtain a good bread volume and to stick out the appreciated organoleptic characteristics of Rivet flour? How can the different behaviours and qualities of Rivet landraces can be translated into a coherent array of selection strategies?

This Innovation Factsheet is the result of the collective work of DIVERSIFOOD partners, coordinated by Véronique Chable (INRA) with the support of Raquel Martin-Castillo, Paul de la Grandville, Antoine Cormery (INRA), Ambrogio Costanzo (ORC) et Estelle Serpolay-Besson (ITAB).