

From selection to cultivation with the support of all stakeholders: first registration in France of two bread wheat varieties after VCU in organic farming system

ROLLAND B.¹, FONTAINE L.², MAILLIARD A.³, OURY F.-X.⁴

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Abstract

As bread wheat is the most important cash crops for French organic farmers, the question of the kind of varieties farmers should be using is therefore very important. Most of varieties available were bred for intensive "conventional" farming systems (with high inputs of mineral fertilizers and pesticides), thus screening current varieties for organic conditions becomes a necessity to identify suitable varieties for organic farming conditions in a short term experiment. After 20 years of selection and screening combined in two different crop management systems, low inputs and organic, two lines, Hendrix and Skerzso, have been registered in the French official catalogue with the special mention « organic farming ». For the second year of seed production, 150 hectares were sown in autumn 2013 to be sold to organic farmers in September 2014. This successful process was possible with the support of the whole agricultural organic sector associated in the initiative.

Introduction

The acreage of winter bread wheat is considerable in French organic agriculture (about 48 000 ha in 2013). As bread wheat is one of the most important cash crops, available varieties are of great importance for farmers. That is why it is essential to evaluate wheat varieties to achieve a better understanding of their productivity and quality (and stability across years and sites) under French organic conditions. At the end of the years 1990, the request has been rising for new adapted varieties for organic farming conditions. Responding to this demand, French wheat breeders from Genetic and Plant Breeding department of INRA have decided to test their best breeding lines for hardiness in organic conditions from 2000-2001. We define a "hardy" genotype as a new variety, multiresistant against pests and which provide relative high yields in environments with high levels of constraints.

Materials and methods

These inbred lines initially intended to be cultivated in Integrated Pest Management (IPM) were selected in very low input conditions. Then their abilities to combine high yields with low nitrogen supply and to get high baking quality despite poor grain protein contents were evaluated in organic conditions. Just a few of them have supported these two strong constraints. In the first part of the programme three INRA stations located in North-West France (Lusignan, Le Moulon and Rennes) and organised as a network have supervised several variety on-farm trials in organic conditions during five years. The best lines were then tested in the ITAB network. This large network (about 30 locations each year) of comparative trials was created in 2002 to evaluate new released French and European varieties which were supposed to be suitable for organic conditions. This is the context in which agronomic abilities and baking quality of the two INRA inbred lines CF99102 (Skerzso) and RE04073 (Hendrix) were evaluated during three years (2006 to 2008). As they obtained good and quite stable results on the trials network, the question of their registration on national catalogue arose.

After a first failed attempt initiated in 2005 by a French private breeding company, ITAB network's participants and the entire French breeding sector have supported in 2009 the proposition formulated by INRA to set up an original registration test dedicated to organic conditions. This demand was accepted by the CTPS (French Permanent Technical Committee for the Selection of Cultivated Plants) and several VCU's (Value for Cultivation and Use) trials were led applying the methods of the standard experimentation. In the same time and for the first time in France, eight organic on-farm trials have taken place in north-west France.

¹ INRA, UMR1349 IGEPP, domaine de la Motte 35653 Le Rheu France; E-mail bernard.rolland@rennes.inra.fr

² Institut Technique de l'Agriculture Biologique (ITAB), 9 rue André Brouard – BP 70510, 49105 ANGERS Cedex 02, France, E-mail laurence.fontaine@itab.asso.fr, Internet www.itab.asso.fr

³ GEVES Groupe d'Etudes des Variétés et des Semences SEV Domaine de l'Anjouère 49370 LA POUZEZE
Aurelie.MAILLIARD@geves.fr

⁴ INRA UMR 1095 GDEC 234 av. du Brézet 63100 Clermont-Ferrand Francois-Xavier.OURY@clermont.inra.fr

These trials were sown and monitored with the assistance of several French actors involved in the organic sector: cooperatives (as BIOCER in Normandy), organic farmer group (GRAB Normandy), advisors (agricultural chambers from Ile-de-France, Maine-et-Loire, Nord-Pas de Calais, Picardie; technical institutes as Arvalis Institut du Végétal) and Agri-Obtentions which commercialise INRA's varieties.

Varieties assessed in the ring-test had traits that are supposed to best answer organic constraints: good response to low level of nutrients, good competitive ability against weeds (leaf area, leaf inclination). Agronomic and quality parameters were assessed: yield (t/ha) and grain protein content (%), test weight (kg/hl), height (cm), ground cover, diseases notations, bread-making quality data evaluated by the French BIPEA test (NFV03-716).

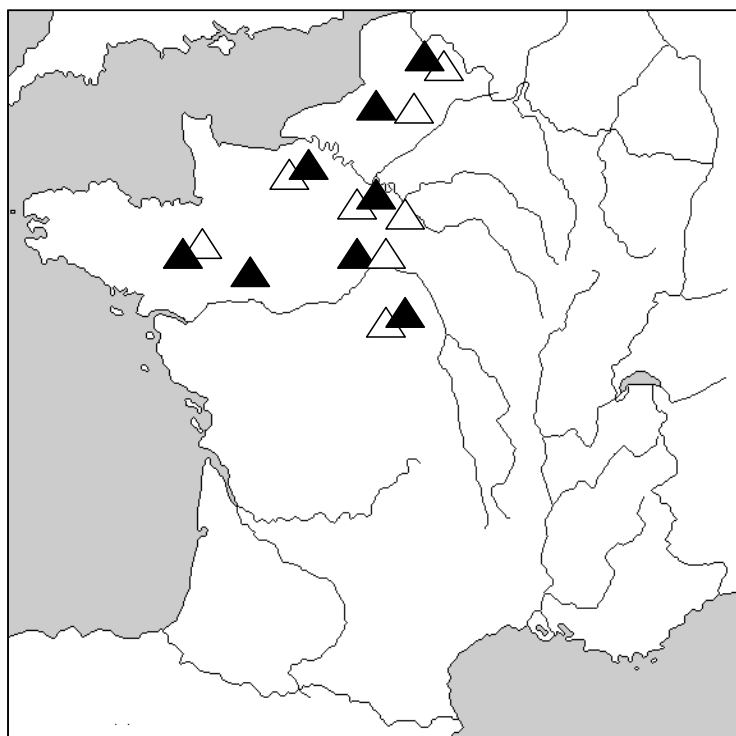


Figure 1: Location of wheat variety VCU trials in organic farming in France

Results

For 2 years (harvests 2010 and 2011), in this original VCU experimentation supervised by GEVES (official Variety and Seed Study and Control Group) in the ITAB network, Hendrix and Skerzco obtained higher yields than the two most cultivated organic varieties in France, Renan and Saturnus (Figure 2). In the same time the two INRA lines obtained the same baking notations than Renan (Figure 3), which is the reference for baking quality in organic conditions in France, allowing them to be inscribed in the official French catalogue with the special mention "organic farming". Apache a variety selected for high input conditions was productive but lost her baking ability (certified in high input management) under organic conditions.

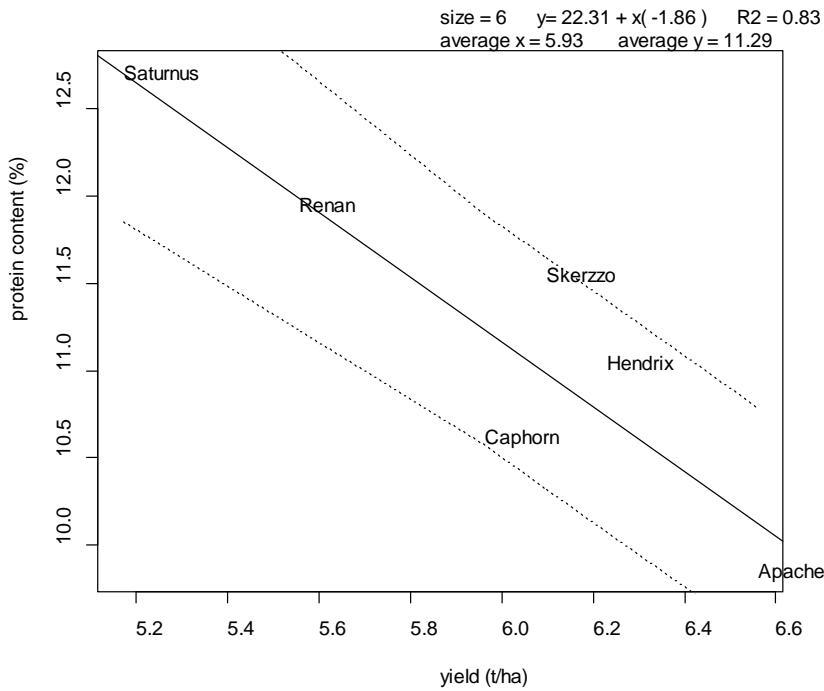


Figure 2: Relative performance (yield and protein content) for years 2010 and 2011 (data combined across 14 organic sites)

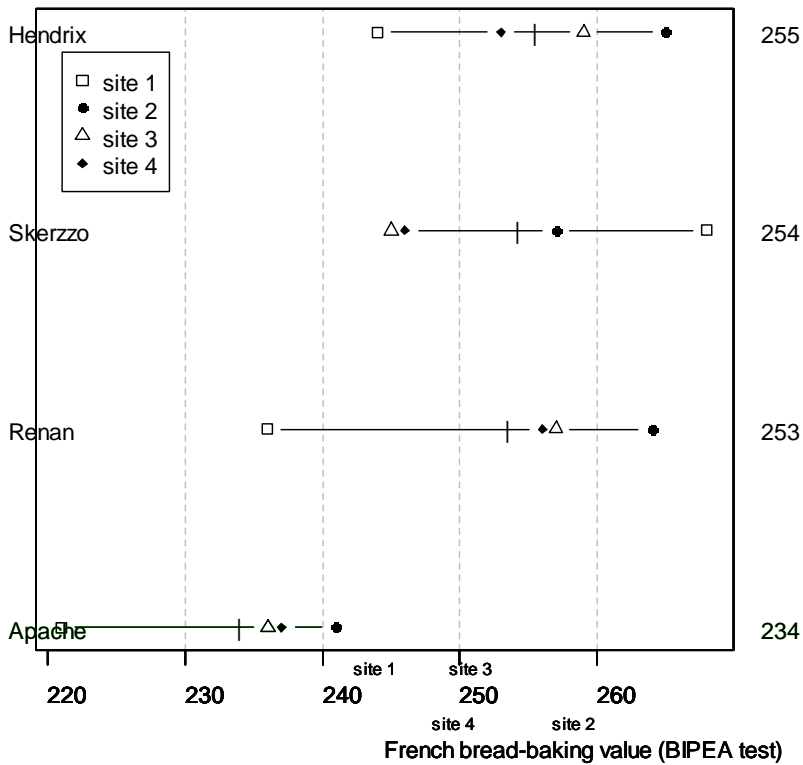


Figure 3: Relative performance of wheat varieties for baking value, for year 2010 (data combined across 4 trials).

Discussion

Results have demonstrated that CF99102 (Skerzzo) and RE04073 (Hendrix) provided higher yield than the two most cultivated varieties in organic farming system. Furthermore their baking qualities were good, according to French test. Besides, it is important to underline that this organic trial network is used to study specific traits required for organic farming, such as competitive ability against weeds, in order to transfer them as selection criteria in dedicated breeding programs. These official trials gave also the opportunity to show the relevance of a professional VCU testing under organic conditions. This experience, supported by all stakeholders, had dissolved many doubts expressed by several contradictors.

Conclusions

Organic farmers need bread wheat varieties suitable for both organic conditions (agronomic traits) and organic market demand (quality traits). Nine years of selection and screening under low input management followed by nine more years under organic conditions, led to the registration of Skerzzo and Hendrix in the French catalogue with the special mention « Organic Farming ». This work was realized thanks to a strong collaboration between INRA, GEVES and all organizations involved in the ITAB network.

Now the way is open in France for new organic registrations in the official catalogue, like in Austria or Switzerland. INRA's breeders are carrying on their researches to create new varieties with all the traits researched by producers and particularly a strong ability to cover the soil to suppress weeds more efficiently. For the second year of seed production, 150 hectares were sown in autumn 2013 to be sold to organic farmers in September 2014. This successful process has been possible thanks to the support of the whole agricultural organic sector associated in the initiative.

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