A PARTECIPATORY APPROACH FOR THE DEVELOPMENT OF ORGANIC BREAD CHAINS: AGRONOMIC AND QUALITY ASPECTS OF LOCAL VARIETIES OF WHEAT (Triticum aestivum spp.)

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Introduction

Bread wheat production in Italy is insufficient to satisfy the national demand. The massive import (4.7 Mt/y) does not stimulate the selection of grains of quality, in particular for the organic seed. However, diversified seed varieties suited to different environments are necessary, responding to the needs of the organic and biodynamic farms. Conventional varieties are mostly characterized by a high genetic uniformity and selected under conventional agriculture, which traditionally require the use of high energy inputs in terms of fertilizers, herbicides, insecticides and fungicides and water. The genetic improvement programs conducted to date on cereals were mainly aimed at obtaining high yields and improved technological characteristics better suited to an industrial model of transformation, thus neglecting the nutritional, functional, digestibility and potential allergenicity. Involving farmers in a participatory process of selection is an important tool at the disposal of agricultural research for obtaining varieties suitable for organic farming systems (Ceccharelli, 2009). In Italy, bread production was liberalized as an activity related to agriculture in 2006. This leads to some technical considerations about whether the farm is able to produce the typical Italian commercial bread, or rather a type of bread that can go beyond that offered by the current market. The INRAN Guidelines for an Italian healthy diet (INRAN, 2003), says that it would be preferable to use whole grain products. In fact, epidemiological studies have associated the consumption of whole grain and whole-grain products with reduced incidence of chronic diseases such as cardiovascular disease, diabetes and cancer (Slavin 2004). In order to incorporate environmentally friendly methods into the farming system used for whole bread production used within the whole project, in recent times, a renewed interest in old varieties of wheat and in particular to their yield productivity and baking quality under organic management (Hildermann et al. 2009) and their nutraceutical properties (Dinelli et al., 2007, Soft et al. 2010).

Aims

In order to protect and enhance the cultivation of cereals for the production of bread with high environmental, nutritional and health benefits, it is important to identify varieties suitable for the purpose. Researchers, producers, processors, bakers and consumers are collaborating on research projects aimed at:

- the restoration and enhancement of agronomic traits of local varieties of old and new constitution of wheat belonging to the genus Triticum;
- assessing their adaptability to marginal environments and cultivation using organic methods;
- define agronomic and technological characteristics, nutritional and functional properties of grains from different varieties;
- assessing sensorial quality and consumer preferences of organic bread, obtained with stone-ground whole wheat and traditional techniques (sourdough);
- promote the exchange of experiences of producers and researchers on the cultivation, conservation and improvement of varieties;
- promote the exchange of knowledge on the use and processing;
- developing local supply chains for the production of quality bread.

Materials and methods

In Piedmont, these goals were searched:

- In 2008/2009 at the Raccoonpi Park has been compared some old varieties of wheat (Sieve, Verna, Gentil Rosso, Andriolo, Infallitabile), with a modern variety (Blasco) aimed at the production of bread with label of the Park (Migliorini and Ferrari, 2012: Migliorini et al. in press);
- In 2010/2011 and 2011/2012, within a project of varietal comparison of wheat (Triticum aestivum spp.) for bread-making quality, five old varieties (Sieve, Verna, Gentil Rosso, Andriolo and Gambo di ferro) and three modern (Bolero FP, Blasco FPS and Arabia BF) were tested in two years in two hills areas of Piedmont: FARM1 in Costa Vescovato (Alessandria province) and FARM2 in Barge (Cuneo province).
- In 2012/2013, two old varieties (Frassineto and Abbondanza) and a modern reference variety (Bologna FP), were added to the trial together with two variety mixtures (mixture 1 and mixture 2). Mixtures 1 is a blend of the old 7 varieties listed above (the 5 tested in 2010 and 2011 and the 2 added in 2012). Mixture 2 is a population that contains several hundreds of breeding lines obtained by one of the authors (SC) from the bread wheat breeding program of the International Centre for Agriculture Research in Dry Areas (Migliorini et al. 2014).
- In 2013/2014 a catalogue field has been established in Pollenzo with the following varieties of cereals: Verna, Sieve, Solina, Gentilioso, Infallitabile, Frassineto, Autonomia A, Nok. Est Mottin, Villa Gori, Segale, Cappelli, Farro, Turanicum, Monococco, Abbondanza, mixture 1 and mixture 2. The activity has been developed in collaboration with the students of the Advanced Apprenticeship “Corso di Alto Apprendistato” of UNISG (http://www.unisg.it/apprendistatopresentazione).

Each project has specific materials and methods that can be found in the publications.

Results and discussion

The results show that:

- the agronomic productivity on all the local varieties have an average low yield, but in line with the national average provincial data, and in some cases greater than the modern varieties and the best results are obtained with mixtures;
- the height of the plants of old varieties is far above the average, and this makes them interesting for the competition with weeds even if in some cases present problems of lodging (Gambo di ferro). Moreover, have good resistance to disease;
- the hectolitric weight is above the national standards, confirming the excellent quality of these varieties. The results of W and P/L as well as the Falling number show that only Andriolo is of bread-making quality, while the grains and protein content of the gluten index is typical of strength wheat and high bread-making quality;
- total anthocyanins, total polyphenols, flavonoids and yellow pigment contents discriminate significantly the varieties;
- the whole-bread sensorial test, total flavonoids increased the flavor intensity, total polyphenols favoured pore quantity, free polyphenols favoured grain colour, yellow pigment promoted crumbliness texture and salty taste, high total anthocyanins content repressed the negative nutty and toasted odour and the sweet taste;
- the results of the sensory test conducted with a group of 233 consumers shows that the average values of acceptability, observed for all breads obtained from wheat old varieties, are significantly higher than the average score found for the bread product with flour commercial reference.

Conclusion

The research results have revealed that there are good prospects for the use of old varieties for organic farming and the ability to create a short chain for a typical and innovative product.

Reference