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Durum wheat quality management

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SUMMARY – This paper presents figures on durum wheat production in the Mediterranean Area. (7.1 million Mt per year) and its destination (85% for pasta). The main pasta quality aspects are “al dente” trait, low stickiness, yellow colour and wholesomeness. The reduction in protein content in Italy since 1994 is referred to and the reasons for this are discussed. The Barilla integrated quality management system is described with special attention to the durum breeding activity.

Key words: Durum wheat, quality, Italy.

RESUME – “Gestion de la qualité du blé dur”. Cet article présente des chiffres sur la production de blé dur dans la région méditerranéenne (7,1 millions tm par an) et sa destination (85% transformés en pâtes). Les principaux aspects de qualité des pâtes alimentaires sont la caractéristique “al dente”, la couleur jaune, que les pâtes ne “collent” pas et sont un aliment sain. La réduction de la teneur en protéine en Italie depuis 1994 est rapportée et on en discute les raisons. Le système intégré de gestion de la qualité de Barilla est décrit en accordant une attention spéciale à l’activité d’amélioration génétique du blé dur.

Mots-clés : Blé dur, qualité, Italie.

The Mediterranean Basin and North America are the main durum wheat (*Triticum turgidum* var. *durum* Desf.) production areas in the world. Durum wheat is a minor cereal crop (the world durum wheat is only 5% of the total wheat production), but of great relevance for areas like the Mediterranean regions, where it finds large use for human consumption: pasta, couscous, bulgur and bread.

In the European Union durum wheat is cropped mainly in Italy, Greece, France and Spain for a total yearly production of 7.1 million Mt (average last 5 y – Source: Barilla).

In Italy durum wheat is the main cereal crop with an average production of 4.1 million Mt per year (average last 5 y – Source: Barilla). The production is concentrated in Southern and Central Italy (the two Italian macroareas under the European subsidy regime) and it has a high variability in terms of yields and quality. Seasonal weather, environment, agronomic management and genetic background are the major reasons of this variability.

In Europe durum wheat is mainly used for pasta production (85%). In Mediterranean countries like Italy, France, Greece, pasta is made by law only with semolina and water. Therefore, pasta quality depends only on raw material characteristics and technology.

The main pasta quality aspects, identified by market research and consumer panels, are: (i) “al dente” trait; (ii) low stickiness; (iii) yellow color; and (iv) wholesomeness.

These pasta quality parameters are highly correlated with specific durum wheat characters:

“Al dente”,	Protein content
low stickiness	Protein composition
Color	Endosperm yellow pigment content
Wholesomeness	Crop, storage and milling management

The interaction between genotype and environment (both climatic and agronomic) strongly affects durum wheat quality. Protein content, for example, one of the major components of pasta quality, is the

parameter mainly influenced by the environment. Given a suitable variety for a specific location, agronomic management plays a significant role to control protein content and keep it as high as possible over time.

In Italy, since 1994, we have been recording the decline of protein content (Fig. 1). There are many causes to this negative trend. The change in the EU cereal subsidy regime, released in 1993, had, as a side effect, an important role in this phenomenon. With this reform, the subsidy component linked to the selling price was reduced, while direct subsidy, based on the extent of cropped area, gained more importance. The magnitude of such variation on the composition of farmers' revenue has been particularly relevant for durum wheat compared to other grains. In this way, the grain yield and quality lose importance on the farmers' income balance. Wheat growers may not be motivated to apply a sound agronomic management to obtain reasonable quantity and quality. The European industrial users pointed out this specific issue versus European Institutions asking for measures linking minimum quality requirement or practices to the subsidy mechanism.

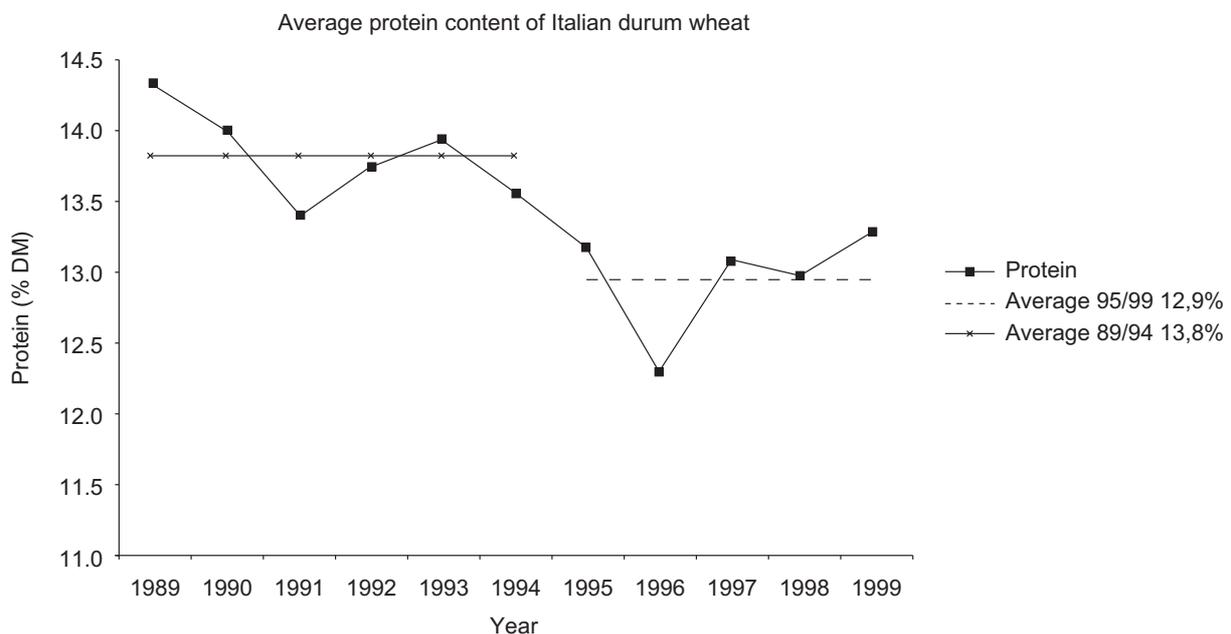


Fig. 1. Trend of Italian durum wheat protein content on commercial lots (source: Barilla Quality Map – 220 samples/year).

To maintain pasta standards consistent over time, Barilla set up an exclusive integrated quality management system based on:

- (i) Designed quality
 - New variety breeding for specific quality characters.
 - Pre-sowing cultivation contracts.
 - Cropping and storage disciplinary.
- (ii) Selected quality
 - Worldwide mapping and evaluation of new emerging varieties.
 - Survey of new potential production basins.
 - Worldwide quality and production mapping.
 - Yield and quality forecast system for Italian durum crop.

The “designed quality” tools allow Barilla to plan its own raw material characteristics to guarantee a reliable core supply of known quality durum before planting.

The breeding activity consists in the selection and release of new high and top level durum wheat varieties improved as to quality characters like color, protein content and protein quality. In order to

maximize the overall quality obtainable these varieties are cropped under cultivation contracts and everybody involved in the supply chain must respect the “Cropping and Storage Disciplinary”. The quote of raw material supplied under this system ranges between 15% and 25% of total.

The “selected quality” tools map the durum wheat production worldwide to better plan wheat purchase. A reliable picture of segmented durum wheat availability is necessary to find out commercial lots meeting quality standards for Barilla volumes. In particular for the main production areas in Italy, Barilla is developing an integrated simulation model for yield and quality (protein content) forecast in Italy, based on climatic, pedological and nutritional data. This should allow to predict these parameters weeks before harvest.