Comparison between characterizations of Italian rice varieties

Cinzia Simonetti 1, Laura Galassi 2, Mauro Correggia 1, Piergiorgio Bianchini 1

1 ENR – Laboratorio Chimico Molecolare (LCM) – Centro Ricerche sul Riso – ERSAF; 2 Laboratorio di Analisi Sensoriale

Introduction

The characterization of rice has been carried out by chemical analysis which require the use of more or less sophisticated equipment and trained technicians to the application of analytical methods. The descriptive analysis is a new experience in the evaluation of Italian rice that allows to describe and quantify the sensory properties of the different varieties. As with the traditional analysis is fundamental the illumination technique and the choice of the adequate analytical methods as well as the equipment for the sensory analysis is the basic choice of assessors who will be part of the panel and their training.

Goals

Ten heterogeneous varieties of Italian rice were characterized both from a traditional point of view, namely, chemical, physical and textural (length and width, gel-time, resistance to extraction, stickiness, amylose content) and sensory, involving a panel of tasters selected, chosen and trained. The analytical data will then be compared in order to bring out similarities and differences.

Materials and Methods

The ten rice varieties selected for the purpose are: Aisiaco, Artemio, Baldo, Camarati, Loto (long A); Gango, S. Andrea, Thabbronat (long B); S. Renato (medium). The classification in: long A and B, medium and medium is according to the European legislation (Reg CE 1234, 2007).

In the LCM were carried out the following analytical determinations: length and width [UNI EN ISO 11467:2012] with an image analyzer WinDSEELDE; determination of texture, that is the resistance to extrusion, in the next called for simplicity hardness (UNI EN ISO 11477:2012) and stickiness MTV14 with a texture analyzer TA.XT.plus (SMM) per time with the manual Ranghino method (UNI EN ISO 14864:2004) which is correlated in cooking time of varieties (Simonetti et al. 2013) and the amylose content (UNISO 6647-1:2008) with a UV-UV spectrophotometer (Perkin Elmer).

The sensory evaluation were made in the ERSAF laboratory (constituted in cooperation with the ISO 8589:2007), was carried out the sensory profile (ISO 13329:2003) of each variety prior identified of perceived sensory characteristics (descriptions) that are measured quantitatively to define the analogous differences between different varieties of the same product.

Evaluating the results show clearly that the Garime is a very peculiar variety than all the others, for the following characteristics: robust of popcorn, the aroma and moist of bread scents, sweet, hardness, habity, popcorn and flavors. The Sello rice differed in chewiness and the Artemio one in bitterness and wood flavor.

Results and Discussion

SENSORY EVALUATION

The sensory profile is the complete description of the sensory properties of a product (rice), obtained by listing the sensory attributes and assigning an intensity value to each attribute. It is obtained by tasting statistically the data obtained by 11 judges (Fig. 2).

Figure 1 – Bar chart: texture analysis TA.XT plus details on the determination of stickiness, detail on the determination of hardness, image analyzer WinDSEELDE detail on the determination of length and width of the LCM – AINSY – the leading supplier (ERSAF).

Figure 2 – Scatterplot showing sensory profile of 10 Italian rice varieties

Chemical, Physical, Textural and Sensory Evaluation

On rice

When the data are classified in a principal component analysis (PCA) of the results in Table 1, is possible to make the sensory characterization of the first group of varieties and within the same group, it is made with the radar chart. They are overlapping and reported for group membership (as reported in Table 1). The data reported in Table 2 are clustered in different lots, the second group is characterized by low amylose and high stickiness, high hardness and low stickiness are typical for the varieties like the Garima rice. The third group is characterized by high amylose and low stickiness, high hardness.

The third group emerged from the sensory samples and the presence of Camarati and Valore Nane, different in dimensionality (respectively a long A and long B), but comparable for amylose content and consequent hardness and stickiness; they are heterogeneous for the parameter: gel-time.

Comparing the chemical-physical and textural determinations with sensory emerged a close analogy between the sensory character chewiness and hardness, as well as between adhesiveness and stickiness. This is particularly evident for the variety Aisiaco which presents the highest hardness and the highest score for the character chewiness. The varieties Loto and S. Andrea are the ones with more marked character adhesiveness and which have the highest value of stickiness. The score of the character chewiness for both, is the lowest among the varieties and similarly their hardness are the lowest recorded.

PCA ON CHEMICAL, PHYSICAL AND TEXTURAL PROPERTIES

After the data normalization of the results in Table 1, is possible to make the sensory characterization of the first group of varieties and within the same group, it is made with the radar chart. Two sets of scatter plots are considered (PC1 and PC2). (PC1 and PC2).

Figure 4 – PCA on Table 1. a) Left: variables (factors) right: samples (varieties)

CONCLUSIONS

From this work it appears that there is agreement between sensory analysis and chemical physical and textual characterization of milled rice. In fact there is an analogy between the texture analysis (hardness and stickiness) and some sensory characters (texturized stickiness and adhesiveness). Noteworthily is the fact that this correspondence is marked even if the expert's data are obtained with different analytical techniques (instrumental and sensory analysis) and the methods of preparing the samples are different. From the practical point of view, the tests carried out with the equipment, in particular the above-mentioned analysis of texture (hardness and stickiness) are faster for execution and usability of the results than sensory analysis. On the other hand we must not forget that rice is a staple food, so it is important the sensory characterization however by a panel of tasters, representing consumers who use the food rice. The sensory characterization undoubtedly provides a more complete and accurate information than the current instrumental characterization that however provides a good approximation (on some parameters) given the demonstrated agreement between the results.

Thanks to this work today there is an available card of sensory characterization of rice, which represents a new high level of innovation as it allows to express objective decision based on the quality of the product, comparing the sensory profiles of the different varieties and explain them to the consumers preferences.

The future perspective of this work is to use the card for sensory evaluation of rice in combination with the production analysis to bring out the peculiarities linked to the territory. Will be taken into consideration some varieties of Italian rice (Baldo and Camarati) grown in different area (Lombardy, Piedmont and Emilia-Romagna), but in the same year (2013). The preliminary work conducted in 2012 [2] revealed significant differences linked to the territory. Thanks to the combined assessment of soil maps, Link the growing area with its characterization will allow to derive important information about the typology of origin of the product.

Figure 5 – Scatterplot showing sensory profile of some rice varieties grown in different location (2012)

Acknowledgments

The research was supported by the Project Grand Culture and Rice (Sensometric Sensory – Regione Lombardia – ERSAF – Azienda Nazionale).