EVALUATION OF COOKING TIME OF ITALIAN RICE VARIETIES
Evaluation by panel test and with gelatinization time

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Introduction
To know the correct cooking time, specific for each variety of rice, is essential for their correct use. The international standard does not currently provide any kind of methodology to achieve this goal; the only information available to date regarding rice cooking results from the standard for the determination of the gelatinization time of rice, which is the time required for 90% of the rice grains to be completely gelatinized (ISO 14684:2004). By cooking the rice at that time t, from a sensorial point of view, turns out to be over cooked.

Goals
The goal of this study is to find a robust method for defining the correct cooking time of different rice varieties both through evaluation by a panel of judges and with a correlation of the gelatinization time data.

Materials and Methods
An evaluation was then carried out on 10 ethnic variegated varieties of Italian rice (Aiace, Arborio, Baldo, Carnaroli, Loto (long A), Gange, S. Andrea, Thalibonnet (long B), Salerno (round), Vialone Nano (medium)), evaluating their behaviour, cooking them at different times, using a panel of assessors. Rice samples were cooked starting from 10 minutes and repeating cooking every 2 minutes (10, 12, 14, ...). For each session, the panel of assessors was called to evaluate the degree of cooking on a pre-established scale (underdone, slightly under cooked, optimal cooking, slightly over cooking, over cooked). At each timing, the data processing graph is processed to provide a Gaussian who sees the correspondence of its maximum with the majority of rankings data (Fig.3).

The optimal cooking time for the single rice variety examined is the time at which the Gaussian average (ix its maximum) is represented by the “optimal cooking” judgment by the assessor (untrained, but simple consumers).

Results and Discussion
Sensory Evaluation and Evaluation by Gelatinization Time
The sensory evaluation was conducted by two separate laboratories (ENR and ERSAF), respectively by 13 and 11 judges.

From figure 4 to figure 7 are reported the graphs for the different types of rice (long A, long B, round and medium). With the exception of Aiace and Loto, there is a good agreement between the data of the cooking times found in the two separate laboratories (Table 1).

Applying this ISO standard (ISO 14684:2004) it was possible to determine the gel time for all the rice varieties of the study, as showed in Table 2.

Conclusions
By the results achieved, it is possible to compare graphically the time of gelatinization with the cooking time of the different varieties, obtained by two different laboratories (Graph 1).

There is a good match between the results of cooking times obtained from the two separate laboratories. It is possible to notice that the gelatination time is always greater than the corresponding cooking time determined through panel test.

The differences between gel-time and CT are reported in Table 3. There are very high value of difference, such as 8.5 minutes for Aiace (lab 1) and 8 minutes for Baldo in both laboratories. The smallest differences there are for Carnaroli and Vialone Nano (2-3 minutes).

The Table 3 shows the percentage of decrease of the gel-time, compared to CT for both laboratories.

Definitely it can be stated that it’s not possible to indicate the gel-time as CT time because it causes an overcooking of rice of about 2.8 minutes. It’s further complicated to determined the right CT by the value of gel-time, but it’s possible to derive an indicative CT.

An indicative ‘at dente’ CT for rice should be considered as “gel-time minus 20%” (CT 39%). This situation is represented in Graph 1 only for the variety Baldo (about 4 minutes) there is a large deviation between experimental and calculated CT.

Knowing the correct cooking time, it was possible to evaluate the sensory profile of the different rice varieties (Figures 4).

...standard proposal
The standard project for the determination of rice cooking time is currently being studied by the Rice Working Group in UNI (the Italian Standard Body). The standard will be divided in two parts:
Part 1: Rice – Determination of cooking time by gelatinization test
Part 2: Rice – Determination of cooking time

References
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