Effects of sprouting process on the bread-making performance of durum wheat

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- *Effects of sprouting on protein and starch properties*
- *Changes in dough rheology as affected by sprouting time*
- *Assessment of bread characteristics when semolina from sprouted wheat is used in bread-making*

Durum wheat is characterized by low bread-making performance, due to its high protein tenacity. The development of a specific enzymatic pattern during the sprouting process may improve the technological performance of durum wheat in bread-making.

This study aimed at evaluating the effects of durum wheat sprouting under controlled conditions on starch and protein characteristics and the relation between chemical/rheological changes and bread-making performance.
Durum wheat kernels were sprouted at lab scale (Molino Quaglia S.p.A., Vighizzolo d'Este, Padova, Italy) at 20 °C and 90 % relative humidity, and sampled after 24, 38, 48, and 62 hours and then milled into semolina flour. Amylase activity was directly (by Ceralpha Method) and indirectly (through the Falling Number) evaluated upon sprouting. In addition, protein (AACCI 46-12.01), total starch (AACCI 76-13.01), damaged starch (AACCI 76-31.01), and simple sugars (Megazyme® enzymatic kit) were measured. Protein and starch features were evaluated in terms of gluten aggregation kinetics (by the Glutopeak®) and pasting properties (by the Rapid Visco Analizer®; RVA), respectively. Finally, dough leavening properties and specific volume of bread were measured.

As regards starch properties, sprouting led to drastic decreases in viscosity values during heating and cooling, due to the increased amylase activity during the sprouting process. In the presence of the enzyme inhibitor ($AgNO_3$), peak and final viscosity greatly increased, indicating that the pasting and gelatinization properties of starch were not compromised by sprouting. Despite the proteolytic activity developed during sprouting, the gluten proteins were still able to aggregate. However, the indices from the GlutoPeak test suggested a weakening of the gluten network. No significant differences were detected between 36 and 48 h, whereas the sample sprouted for 62 h showed the worst aggregation properties, giving rise to a bread with the lowest specific volume (2.69 mL/g). On the contrary, the best results in terms of dough development (180 mL) and bread specific volume (3.1 mL/g) were obtained using semolina from wheat sprouted up to 38 h. The PCA analysis highlighted a particular importance of the chemical indices to distinguish the unsprouted from the sprouted samples, while the changes in gluten were decisive in distinguishing the samples subject to different sprouting hours (24-38 h; 62 h). In conclusion, despite the accumulation of hydrolytic enzymes, sprouting under controlled conditions did not compromise the technological properties of semolina up to 48 h of germination. Furthermore, the germination process led to an improvement in the characteristics of the bread made from semolina obtained from durum wheat sprouted for 38 hours.

Gaetano Cardone is a PhD student (1st year) at the Università degli Studi di Milano. He is currently researching the effects of sprouting on cereals/grains and their relationship with technological performances.