2024年第14期总314期

小麦遗传育种专题

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前沿资讯

1．Nutritionally Improved Wheat Bread Supplemented with Quinoa Flour of Large, Medium and Small Particle Sizes at Typical Doses(添加大、中、小粒径典型剂量藜麦粉的营养改良小麦面包)

简介：One of the food industry's challenges is to enhance bread quality from a nutritional point of view without impacting negatively sensorial characteristics and consumer decisions on product choice. This study aimed to assess the baking characteristics of wheat bread supplemented with quinoa flour (QF) of large, medium and small particle sizes at typical doses previously established based on an optimization process, and to evaluate the optimal bread from a physical, textural, nutritional, and sensorial point of view. The results showed a decrease in the Falling number index, water absorption, dough stability, speed of protein weakening, dough extensibility, and creep-recovery compliances for optimal wheat-quinoa composite samples with large and medium particle sizes; meanwhile, for the samples with small particle sizes an opposite trend was recorded, with the exception of dough extensibility. Dough fermentation parameters and bread volume rose for all optimal formulations, while firmness decreased compared to wheat bread. All optimal bread samples presented an improved nutritional profile depending on the particle size. The protein content was up to 19% higher, ash up to 13.8%, and lipids up to fifteen times higher. A noticeable enrichment in minerals (mainly K, Mg, Na, Zn, up to 2.3 times) and essential amino acids (with 13.53%) was also obtained for all optimal breads. From an acceptability point of view, the highest score (8.70) was recorded for the optimal bread with a QF of medium particle size. These findings offer processors new information which will be useful for diversifying bakery products with an enhanced nutritional profile.

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http://agri.nais.net.cn/file1/M00/10/3E/CsgkOEGpJW2AVrGWABWGPrL7Gsg600.pdf

2．Preharvest Durum Wheat Yield, Protein Content, and Protein Yield Estimation Using Unmanned Aerial Vehicle Imagery and Pléiades Satellite Data in Field Breeding Experiments(在田间育种试验中利用无人机图像和Pléiades卫星数据估算硬粒小麦收获前产量、蛋白质含量和蛋白质产量)

简介：Unmanned aerial vehicles (UAVs) are extensively used to gather remote sensing data, offering high image resolution and swift data acquisition despite being labor-intensive. In contrast, satellite-based remote sensing, providing sub-meter spatial resolution and frequent revisit times, could serve as an alternative data source for phenotyping. In this study, we separately evaluated pan-sharpened Pléiades satellite imagery (50 cm) and UAV imagery (2.5 cm) to phenotype durum wheat in small-plot (12 m × 1.10 m) breeding trials. The Gaussian process regression (GPR) algorithm, which provides predictions with

uncertainty estimates, was trained with spectral bands and a selected set of vegetation indexes (VIs) as independent variables. Grain protein content (GPC) was better predicted with Pléiades data at the growth stage of 20% of inflorescence emerged but with only moderate accuracy (validation R^2: 0.58). The grain yield (GY) and protein yield (PY) were better predicted using UAV data at the late milk and watery ripe growth stages, respectively (validation: R^2 0.67 and 0.62, respectively). The cumulative VIs (the sum of VIs over the available images within the growing season) did not increase the accuracy of the models for either sensor. When mapping the estimated parameters, the spatial resolution of Pléiades revealed certain limitations. Nevertheless, our findings regarding GPC suggested that the usefulness of pan-sharpened Pléiades images for phenotyping should not be dismissed and warrants further exploration, particularly for breeding experiments with larger plot sizes.

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http://agri.nais.net.cn/file1/M00/03/6C/CsgkOWX_6J-AdTKAAdrSWLSry1o793.pdf

学术文献

1．An Impact Assessment of Par-Baking and Storage on the Quality of Wheat, Whole Wheat, and Whole Rye Breads（焙烤和贮存对小麦、全麦和黑麦面包品质的影响评价）

简介： Par-baking technology increases the production efficiency of bread. However, the degree of par-baking can vary significantly amongst product types and intended sales markets, leading to substantial differences in the quality attributes of the finished product. The objective of this study was to explore the impact of the degree of par-baking on the technological quality of wheat, whole wheat, and whole rye bread (95, 75, and 50% of full baking time). More specifically, this study focused on the starch pasting behavior of different flour formulations, the crumb core temperature during par-baking, and the influence of the degree of par-baking on the bread characteristics of (composite) wheat bread as a function of storage time. The quality attributes of par-baked bread (0 and 4 days after par-baking) and fully baked bread (0 and 2 days after full baking) were assessed. A reduction in the degree of par-baking from 95 to 50% resulted over time in 19.4% less hardening and 8.6% more cohesiveness for the re-baked wheat breads. Nevertheless, it also negatively impacted springiness (−9.1%) and adhesion (+475%). It is concluded that using the core temperature to define the degree of par-baking is not sufficient for bread loaves intended to be consumed over time, but the results indicate that reducing the degree of par-baking can be beneficial for certain quality aspects of the breads.

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http://agri.nais.net.cn/file1/M00/03/6C/CsgkOWX_pL-ADfpEABiYjRxcAhM905.pdf

2．The Effect of High-Pressure Pre-Soaking on the Water Absorption, Gelatinization Properties, and Microstructural Properties of Wheat Grains(高压预浸对小麦籽粒吸水性、糊化特性和微观结构特性的影响)

简介：High-pressure processing (HPP) is a novel technology that is used in many food processing operations to increase both the efficiency and a reduction in the energy and time required to modify and improve the physical and chemical properties of traditional food products. The objective of this study was to investigate the impacts of applying three treatments of a high hydrostatic pressure (HHP) and a control, i.e., 0, 100, 300 and 600 MPa, on the water absorption, gelatinization properties, and microstructural changes of wheat grains. The results indicated that the HHP treatments with a pressure of 300 and 600 MPa resulted in an increase of 16.724.8% in the mass of the grains; however, the pressure of 600 MPa did not result in a mass increase through water uptake. Further, the transition enthalpy increased with the HHP pressure, with 600 MPa defined as the threshold value for pressure. The results from this study demonstrated that a HHP treatment may enhance the soaking process of wheat grains and, thus, positively affect their gelatinization properties. These preliminary results may be used to improve the processing efficiency and quality of wheat-based products.

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http://agri.nais.net.cn/file1/M00/03/6C/CsgkOWX_3ruAXiz4ACYyN-xDHzg893.pdf

3．Characterization of Glutenin Genes in Bread Wheat by Third-Generation RNA Sequencing and the Development of a Glu-1Dx5 Marker Specific for the Extra Cysteine Residue(面包小麦谷蛋白基因的第三代RNA测序及半胱氨酸残基特异性Glu-1Dx5标记的建立)

简介：High-molecular-weight glutenin subunits (HMW-GS) and low-molecular-weight glutenin subunits (LMW-GS) in a mature grain play important roles in the formation of a glutenin macropolymer and gluten quality. To characterize the expressed glutenin genes of the bread wheat variety Xinmai 26 during seed development, a total of 18 full-length transcripts were obtained by the newly emerged third-generation RNA sequencing of the PacBio Sequel II platform, including 5 transcripts of HMW-GS genes and 13 transcripts of LMW-GS genes (8 intact genes and 5 pseudogenes). Combined with the patterns of sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE) and matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF-MS), allelic types of the obtained glutenin genes were, respectively, determined, wherein molecular characterization deduced by transcript1528 (1Dx5) and transcript907 (Glu-A3c) indicated their great influence on dough quality. In addition, a specific functional marker dCAPS5 was developed for the single-nucleotide substitution at position 353 of the 1Dx5 subunit, which

was further intensively compared with the other proposed markers to efficiently utilize the 1Dx5 subunit with the extra cysteine residue. This study provides an efficient method to accurately identify and utilize glutenin genes in bread wheat, which is helpful in understanding the contributions of glutenin genes to wheat quality.

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