

Unveiling protein changes in the context of climate change: revelations from a historical wheat seed collection

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The study of cereals' nutritional quality in relation to climate change is crucial for predicting future food security. There is a growing need for qualitative research focusing on nutritional and nutraceutical traits, alongside crop yields. Meteorological parameters, especially temperature, have a significant influence on plant phenology, which in turn affects kernel quality, including protein, sugars, fiber, and secondary metabolite content. Wheat, in particular, is highly sensitive to changes in its grain-filling stage.

While the literature extensively describes how rising temperatures impact wheat physiology and performance, comprehensive information on the effects of climate change on wheat phenology and its consequences for kernel quality remains limited. To address this gap, we conducted a case study in the Bologna plain (North of Italy). We analyzed daily weather data from a historical series spanning from 1952 to the present to evaluate climate change effects in the area and compared it with historical phenological data.

To explore the relationship between phenology and grain gluten quality, we examined a valuable collection of historical seeds harvested from the Bologna plain between 1951 and 1973. These seeds, stored in the Laras (Seed Research and Analysis Laboratory of the Department of Agricultural and Food Sciences, University of Bologna, Italy), were compared to modern seeds of the same cultivar currently grown in the area. This comparison highlighted the impact of the significant increase in mean annual air temperature in the area, resulting in a shortened duration required to reach major wheat phenological phases in the present period compared to the past period, ultimately affecting gluten accumulation.

In conclusion, our study provides deeper insights into the nutritional changes in wheat kernels resulting from phenological shifts, contributing to a better understanding of the implications for food security.