EFFECT OF SOIL TILLAGE AND FUNGICIDE APPLICATION ON WHEAT RHEOLOGICAL QUALITY ACROSS MULTIPLE GROWING SEASONS

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- Regenerative agriculture and wheat grains quality
- Impact of minimum tillage on dough rheology
- Products from regenerative agriculture flours: development and characterization

Regenerative agriculture strategies, such as minimum tillage, could offer a solution for agriculture to mitigate the negative effects of climate change by increasing soil carbon stock and improving the resilience of cropping systems. However, few studies have explored the impact of this practice on wheat technological quality, which is the objective of the present study.

In the experiment, a common breadmaking wheat cultivar was grown in several agronomic seasons, from 2021 to 2024, using a factorial design comparing two tillage systems—conventional ploughing (30 cm depth) versus minimum tillage (15 cm depth, disk harrowing) after maize as a previous crop—and two disease approaches: untreated versus synthetic fungicide application at flowering. All samples were evaluated for grain yield, kernel protein content, and flour gluten aggregation. For 2024 samples, additional flour quality assessments included starch pasting properties and dough mixing and extensional properties.

This multi-year study reveals a strong growing-season dependence of the effects of minimum tillage, previous crop residue management, and fungicide application on agronomic traits as well as grain and flour quality, largely driven by interannual variability in meteorological conditions during flowering and ripening and the consequent infection by Fusarium head blight–causing fungal species.

Concerning 2024 year, the agronomic season with the highest Fusarium head blight pressure, minimum tillage negatively affected kernel qualitative features, also reducing the technological quality of wheat flour, but fungicide application mitigated these effects.

In conclusion, although minimum tillage is a key practice for climate change mitigation in cereal farms, its season-dependent effects require effective fungal disease control—through fungicide application or other cropping system adaptations—to ensure successful implementation with also the preservation of wheat rheological quality.

Ongoing studies will provide deeper insights into the effects of this agronomic practice on wheat technological quality through baked products development and quality evaluation.

Keywords: regenerative agriculture; minimum tillage; wheat quality; gluten aggregation properties; dough mixing properties.

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Short Bio Presenting Author: Thomas Croci is a PhD Student at the University of Milan. He obtained his master's degree with full marks in Food Science and Technology, in 2020, from the University of Milan. His thesis project focused on a bibliographic analysis of the use of GlutoPeak for determining gluten aggregation properties. After completing his master's degree, from 2020 to 2024 Thomas worked as Research and Development Manager at an engineering company specialized in the supply of industrial plants for rice parboiling and precooking of cereals and legumes. His PhD project, in collaboration with Soremartec S.r.l. (Ferrero Group) and the University of Turin, focuses on evaluating the effects of regenerative agriculture strategies, proposed to mitigate the impact of climate change, on wheat flour quality and on selecting improvers and/or processes to ensure a consistently high quality of wheat flour over time.