Review of: "Technological quality of wheat grains and flour as affected by nitrogen fertilization and weather conditions"

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Potential competing interests: No potential competing interests to declare.

The objective of this research study was assess the technological quality of wheat grains and flour influenced by the interaction among genotype, N fertilization and weather conditions in 3 different environments of wheat crop adaptation in southern Brazil, aiming to support farmers and the bakery industry sector in their decision-making processes.

Overall, I found the paper well-structured, organised and easy to read.

In order to improve the manuscript I would recommend the following changes as indicated for each section below;

Title

Technological quality of wheat grains and flour as affected by nitrogen fertilization and weather conditions

Please revise my comment below regarding the definition of the term ‘Environment’ to make sure it is clear to define whether to change the title or not (regarding weather conditions only)

Introduction

It is well-structured and provides sufficient evidence from previous studies.

Matherials and Methods

Environmental characteristics of the experimental sites

I would change the title of this section to*Soil and Environmental characteristics of the experimental sites.*

Please provide further data related to the main soil characteristics, wherever possible, in order to better understand the

soil types and initial conditions of the macro/micro nutrients availability at the moment of sowing. E.g. Carbon (C) and N content at least in the upper layer of the soil.

Also, a brief mention in this section that there were no nutrient limitation or other factors affecting crop performance throughout the experiment (such as pest, diseases).

It is not clear to me what do you mean by ´environment´ in this research. Is it the combination of weather + irrigation, OR weather + site location conditions?

It would be good to add a brief statement to clarify this term in this section.

Further soil / site / environmental conditions could be added briefly in-text or as a Table to provide valuable data that would improve the manuscript.

Experimental design and establishment of the treatments

Please re-elaborate the following paragraph to specify design and replication.

'The experiments were carried out in a randomized complete block design, with three replications, using a 10 × 2 factorial arrangement with ten wheat genotypes (cultivars:…) and two N rates (40 and 120 kg ha^{-1}).´

Could you please clarify what specifically was replicated? Which treatments? Which was the experimental unit (the plot?)?

´The N rates were determined according to Foloni et al. (2016) and RCBPTT (2016)´ Would it be possible to specify the fertiliser N criteria to define those 2 N rates for your study? The reference is not easy to find to check for the N balance or criteria used in your experiment.

Wheat technological quality analyses of grains and flour

Please add the acronym ´TKW´ right after the term ´Thousand-kernel weight …´

Pleas add references right after to the following statement *´The genotypes have a predominantly medium development cycle, except Sintonia and Quartzo that have an early cycle, and Sinuelo which cycle ranges from medium to late.*

Regarding the commercial classification, Sintonia is classified as improver wheat flour and Mestre and Toruk as bread/improver wheat.´

Results

Weather conditions during the wheat-growing season

Weather conditions are well-summarised in Fig. 1. I found this chart really useful and very clear. However, I would recommend moving **weather conditions** to the **methodology** section. Weather conditions, characterised here by rainfall and temperature, are more related to site/seasonal characteristics than to a ´result´ in your research study in particular. This is associated to my comment above regarding what you define as 'environment´ here to support your experimental aim.

Please clarify if irrigation, which is a manipulation of the water conditions of the site, is to be used as a definition of environment. It would be vital to further consider this point to ensure the Title of the manuscript is clear and informative enough, relative to your research aim. Was it only the weather conditions, or the environmental, or the combination of site /soil and water conditions that improved the technological quality of wheat?

Furthermore, I would encourage providing here a brief statement and a reference to the definition of ´water deficit´ under the experimental conditions (how did you define the water deficit, was it the same for all cultivars and environments?).

In Londrina ´The topdressing N fertilization was carried out on the 25th day, preceded by 33.7 mm of rainfall (in five consecutive days), and received another 190.8 mm in the 14 days following the fertilization. However, further clarification or inference about any possible N losses events (such as nitrous oxide emissions or nitrate leaching) occurring after the N fertilizer application, in relation to the study site under those rainfall / irrigation conditions are vital to ensure no other factors affecting the N fertiliser treatments. Maybe cite previous studies on those soils about any N losses.

Do you have any data about the evapotranspiration of wheat during the experiment to support or discuss later regarding drought, which is mentioned in the paper?

Valuable information is presented in Table 4 and 5. Please note that number notation showed in Tables differ from the one used in the body of the manuscript. Please try to use the same criteria throughout the paper for decimal notation (e.g. 70.5 in text vs. 25,10 in Table 4). Decide whether point or comma is to be used and whether one or two numbers are to be used as decimals after notation.

I found this paragraph clear enough and suitable to discuss later (see my comment below regarding N rates)

Increasing N rates from 40 to 120 kg ha-1 enhanced the concentrations of grain protein and wet gluten. However, it did not influence dough gluten strength and the commercial classification of the flour.

However here, I would use a HIGH N fertiliser rate or similar (see my comment below regarding N rates).

Nitrogen fertilization also influenced the flour yield, dough tenacity and elasticity index, depending on the genotype × environment interaction. Environments with higher temperatures favored the flour yield and wet gluten concentration, while lower temperatures increased the thousand-kernel weight and falling number.

Please define water deficit to make such an statement.

Water deficit increased the dough extensibility and grain protein concentration, whereas higher water availability favored the falling number, dough tenacity, and tenacity/extensibility ratio.

Discussion

Technological quality of grains and flour as influenced by nitrogen fertilization under different environmental conditions

I found the following paragraph not very suitable for the discussion section, probably worth to either moving it to the Introduction section or removing it;

Hectoliter weight is defined by the different characteristics of the grains, including their uniformity, form, density and size. For this reason, the milling industry considers the HW as an indicator of grain quality, being used as a parameter for wheat trade (Karaoğlu et al., 2010).

I would recommend replacing the word ´better´ to ´increased´ relative to other environment. Again, please provide a clear definition of water deficit and also add the ranges used to classify as to ¨low, moderate or high water deficit ´to support and enrich your discussion and conclusion.

The better water supply in $PG_{rainfed}$ and L_{irrig} favored the dough tenacity and, consequently, the P/L ratio. In contrast, the

***moderate wate**r deficit in $L_{rainfed}$ provided a higher dough extensibility than that of the other environments. According to Park et al. (2014), ….The **moderate water deficit** in $L_{rainfed}$ promoted a higher grain protein concentration as compared to that of the other environments ($PG_{rainfed}$ and L_{irrig}), where the water availability was higher. Other studies have also found that moderate water deficit provides greater grain protein concentration, which was attributed to increased grain N concentration in drought conditions (Haberle et al., 2008; Casagrande et al., 2009; Zhao et al., 2009).*

Being that your research was based in one experimental year with 2 N fertiliser rates (as treatments), careful should be taken to conclude in the following paragraph below in particular, and throughout the paper in general. Probably worth to support this with further evidence or to mention that you have imposed 2 contrasting N fertiliser treatments based on experimental data. It would be more suitable to relate to as e.g. low vs. high (40N vs. 120N, depending on what it is considered low or high for those environments). Some of the limitations of your study could be stated here. Potential improvements and considerations for future research highlighted or addressed here, and then in the Conclusion section, which is lacking.

*Finally, **increasing N rates increased** the concentrations of grain protein and wet gluten, although these increases did not alter the Brazilian commercial classification of the flour produced by the wheat genotypes. Therefore, N fertilization can be managed by focusing on grain yield at a suitable cost-benefit ratio, instead of trying to improve the quality of grains and flour.*

Again, clarify your definition of the**environmental conditions** to discuss the following paragraph;

Based on the obtained outcomes, there is evidence that the traits related to the technological quality of grains and flour vary mainly due to genotype and **environmental c**onditions than N fertilization, as observed by Kadar et al. (2019). This finding may be attributed to the distinct adaptability of each genetic material to specific environmental conditions, which directly influence the quality of wheat grains (Xue et al., 2016).

Please re-elaborate the following paragraph; “This finding may be attributed to the high number of record pairs (n = 180) in the dataset, which produced a highly significant correlation, but with a lower correlation coefficient (Cohen, 1988)”.

Conclusion

This section would be improved after incorporating some of the points addressed here and from other reviewers.