IMPACT OF GERMINATION AND POLISHING PROCESS ON THE TECHNOLOGICAL AND NUTRITIONAL QUALITY OF RICE CULTIVATED IN THE BRAZILIAN *CERRADO*

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ABSTRACT: In this work, the effect of germination and polishing on the nutritional and technological profile of four different rice cultivars from Brazilian *Cerrado* were evaluated. The cultivars were germinated, processed and evaluated for the water uptake, germination index, falling number, rapid viscosity analysis and ferulic acid content. The results showed that the germination time for 24 h neither increase the levels of ferulic acid nor caused structural changes in the polysaccharide matrix of these cultivars, except for *Moti* cultivar. Longer germination times can improve these technological and nutritional aspects.
Keywords: germination, rice, cerrado, quality, ferulic acid.

INTRODUCTION

Rice (*Oryza sativa* L.) is one of the most produced cereals in the world, totalizing approximately 782 million tons of grains per year (FAOSTAT, 2017). Germination is a very simple, inexpensive, environmental-friendly and safe biological process used to improve the nutritional and sensorial quality of rice (SAHA; ROY, 2020). The consumption of germinated rice has been gaining prominence in recent years due to its numerous health benefits (KONGKACHUICHAI *et al.*, 2020). The objective of the work was to evaluate the impact of germination and polishing on technological and nutritional characteristics of four different rice cultivars grown in the Brazilian *Cerrado*.

MATERIAL AND METHODS

Material

Four rice cultivars (*Oryza sativa* L.), from the Active Germplasm Bank (BAG) of Embrapa Arroz e Feijão (Santo Antônio de Goiás/GO, Brazil): *BRS Formoso*, *Guaporé*, *EMPASC_104* and *Moti*, multiplied in 2018/2019 harvests, nuder flood-irrigation system were sent to Embrapa Agroindústria de Alimentos.

Germination process

Germination was performed according to the methodology described by ZHANG *et al.* (2014) with some modifications (4 h/30°C of soaking and 24 h/35°C) in germination chamber. After germination, the germinated paddy rice grains were dried in a circulated air oven at 50 ºC overnight prior to their removal of husk and pericarp by a rice polisher machine Suzuki (Santa Cruz do Rio Pardo-SP, Brazil) for 2 min in a and then ground in a hammer mil (HM) LM3100 (Perten Instruments AB, Huddinge, Sweden) fit with a 0.8 mm sieve aperture.

Seeds water uptake and germination rate

The water uptake index and the germination rate were performed according to the methodology described by ZARGARCHI; SAREMNEZHAD (2019).

Physical properties

The falling number was calculated according to method 56-81.04 (AACC, 2008) and viscosity properties was determined using a rapid viscosity analyzer (RVA) (Newport Scientific, Warriewood, Australia).

Determination of ferulic acid

Ferulic acid was measured according to the methodology proposed by (NASCIMENTO *et al.*, 2017*)*.

Statistical analysis

Graphical representations were also performed on GraphPad Prism software version 8.0 (GRAPH PAD software Inc, California, USA) and APC for R software version 1.10 (University of Auckland, Auckland, New Zeland).

RESULTS AND DISCUSSION

Moti, a glutinons cultivar preseted only 1,69 % of amylose, showed higher water uptake index (33%) e germination rate (132%) (Figure 1A). Germinated samples had less ferulic acid content than their respective controls (Figure 1B), indicating that the germination process reduced this compound, that is related to increase antioxidant property. One explanation for the result found, is that during immersion of grains in water, soluble phenolic compounds could have been leached, causing reduction of ferulic acid content, as observed by OWOLABI *et al.* (2018).

Figure 1 – Water uptake index and germination rate (A) and ferulic acid content (B) of rice cultivars.

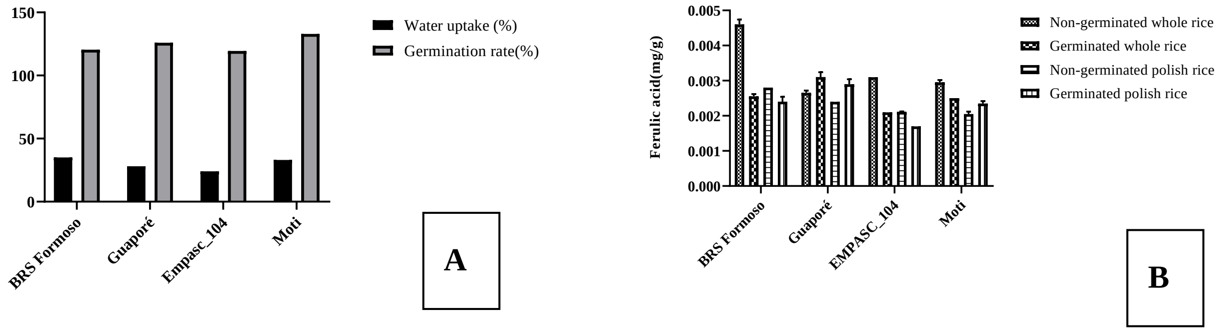
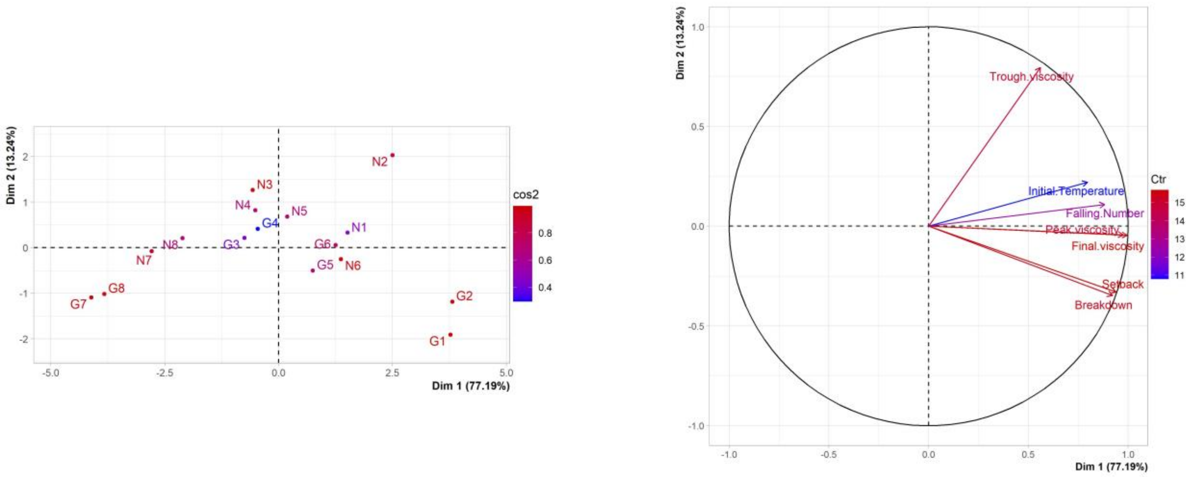


Figure 2. Principal component analysis of the physical properties of germinated and non-germinated rice.



Subtitle: N1=non-germinated whole *BRS Formoso*; N2=non-germinated polish *BRS Formoso*; N3=non-germinated whole *Guaporé*; N4=non-germinated polish *Guaporé*; N5=non-germinated whole *EMPASC_104*; N6=non-germinated polish *EMPASC_104*; N7=non-germinated whole *Moti*; N8=non-germinated polish *Moti*; G1=germinated whole *BRS Formoso*; G2=germinated polish *BRS Formoso*; G3=germinated whole *Guaporé*; G4=germinated polish *Guaporé*; G5= germinated whole *EMPASC_104*; G6= germinated polish *EMPASC_104*; G7= germinated whole *Moti* and G8= germinated polish *Moti*.

From Figure 2, the viscosity readings indicate that germination time was probably not able to increase the enzymatic activity and starch degradation, as previously reported 36h germination the best time for initial α-amylase activity(ZHENG *et al*., 2006).

CONCLUSION

Germination caused changes in rice starch mainly in the cultivar *Moti* (waxy starch). In general, germination in 24 h did not change physical properties and did not increase the ferulic acid content, since the germinated samples presented a lower contentof this compound than samples not germinated.

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