

Germination and Water Requirement for Cooking of Dehulled Rice at Different Degree of Polishing

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Introduction

Rice (*Oryza sativa* L.) is a cereal and it is the staple food of the most parts of the world including the South and the South East Asia, the Middle East, Latin America, and the West Indies. Rice cultivation occupies 34 percent of the total arable lands in Sri Lanka and is cultivated as a wetland crop in all the districts. At present, Sri Lanka is exporting rice with high grain quality to several countries like United States of America, Canada, Germany and Australia. Retaining seed viability of red rice even after milling is a problem faced in rice exportation as most foreign countries consider red rice as a weed. In addition, varying water requirement for cooking rice at different degrees of polishing is another problem. Determination of the influence of de-hulling and degree of polishing on germination of rice grains, determination of the water requirement for cooking of rice at different degrees of polishing, influence of degree of polishing on cooking time and volume expansion of cooked rice were the objectives of this research.

Methodology

The selected varieties were CIC 300 and BW 272-6b and each was polished as 0, 20, 40, 60, 80 and 100% degrees of polishing using laboratory rice polisher by changing the polishing time. Rice of each variety with each degree of polishing and the rough rice of each variety was subjected to the germination test. Germination percentages were observed. Each degree of polishing of each variety was cooked with six different amounts of water, varied as 1, 1.5, 2, 2.5, 3 and 3.5 cups per one cup of rice. Cooked rice quality was ranked from one to six according to quality parameters like appearance, texture etc. Lower ranks represent higher cooked rice quality. Volume expansion of cooked rice and cooking time were also recorded at each degree of polishing of each variety.

Results and discussion

Germination percentages of rough rice and just dehulled (0 degree of polishing) rice grains of CIC 300 and BW 272-6b are presented in Table 1. Grain germination of dehulled rice was found to be similar to that of rough rice. Therefore, just dehulling rice will not reduce germination of rice grains irrespective of the variety. Thus exporting just dehulled rice or unpolished rice is not advisable due to its ability to germinate similar to rough rice.

Table 1: Germination percentages of rough rice and just dehulled rice grains for CIC 300 and BW 272-6b

Dehulling	Variety	
	CIC 300	BW272-6b
Rough Rice	98.5	98.5
Just Dehulled Rice Grain	97.5	96.5

Response of grain germination of CIC 300 and BW 272-6b at different degrees of polishing presented in Figure 1. Germination percentage of CIC 300 became zero at 40% degree of polishing while grain germination percentage became zero in BW 272-6b at 60% degree of polishing. Therefore to make the grain germination percentage zero, polishing of CIC 300 rice grains has to be increased at least up to 40% and polishing of rice grains of BW 272-6b has to be increased up to 60%.

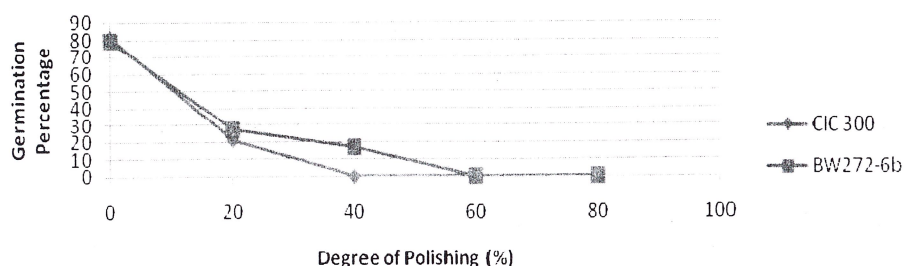


Figure 1. Response of grain germination of CIC 300 and BW 272-6b at different degrees of polishing

Interaction effect of Variety X Degree of polishing was studied using response curves showed in Fig. 2. As degree of polishing increased, volume expansion of CIC 300 increased up to 40% degree of polishing and then stabilized. However, BW 272-6b showed a gradual increase in volume expansion of cooked rice up to 100% degree of polishing. BW 272-6b always showed a higher volume expansion than that of CIC 300.

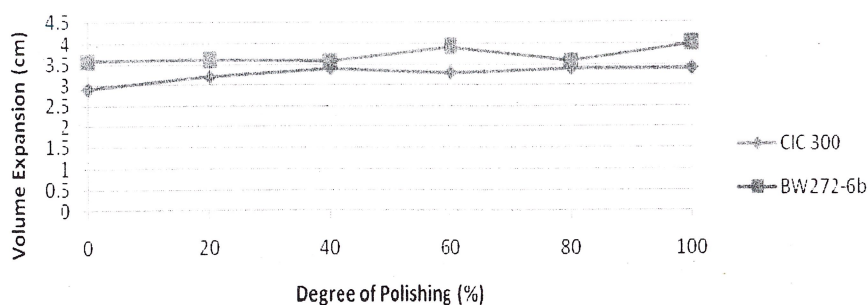


Figure 2: Response of CIC 300 and BW 272-6b at different degrees of polishing with respect to volume expansion

Irrespective of the variety, volume of cooked rice increased with the increase of the amount of water used for cooking. At the beginning, volume expansion of cooked rice increased

with an increasing rate and then followed by a diminishing rate with the excess amount of water. These results corroborated with the findings of Nayak *et al.* (2003).

Time taken for cooking increased with the increasing amount of water used for cooking. This was in agreement with Vegas (2006); comparatively a longer time is needed to evaporate more water in the container for brown rice. At the beginning cooking time increased with increasing rate and in latter part increased with a diminishing rate. Time taken for cooking decreased with the increase in degree of polishing irrespective of the variety.

Quantity of water needed for the best cooked rice quality at different degrees of polishing for CIC 300 and BW 272-6b is shown in Fig. 3. For CIC 300, one and half cups of water per one cup of rice was the best level of water for 40, 60, 80 and 100% degrees of polishing except for the unpolished (0%) rice and 20% polished rice that required two cups of water for the best quality cooked rice. For BW272-6b, one and half cups of water per one cup of rice were the best water level for, 60, 80 and 100% degree of polishing for the best cooked rice quality. However, two, two and half and three and half cups of water per one cup of rice were the best amount of water for the best cooked rice quality at 40% polished, 20% polished and unpolished rice, respectively.

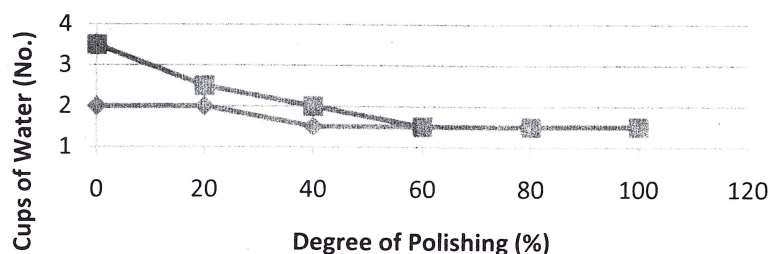


Figure 3: Cups of water needed for the best cooked rice quality at different levels of polishing for CIC 300 and BW 272-6b

Conclusions

Just dehulling of rice did not reduce seed germination. To make the grain germination percentage to zero, degree of polishing of CIC 300 has to be increased up to 40% while degree of polishing of BW 272-6b has to be increased up to 60%. Volume expansion of cooked rice increased with the increasing amount of water used for cooking. Cooking time increased with the increased amount of water used for cooking irrespective of the variety and degree of polishing. Cooking time decreased with the increasing degree of polishing irrespective of the variety and amount of water used for cooking. One and half cups of water per one cup of rice were the best level of water for higher degrees of polishing for both varieties.

References

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