Title Effect of storage pre-treatments and conditions on the dehulling efficiency and cooking quality of red lentils

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Abstract

This study focuses on investigating the effect of post-harvest handling conditions and storage time on the dehulling efficiency and cooking quality of two varieties of red lentils, as well as optimizing dehulling conditions. Dehulling efficiency was studied with a Satake grain testing mill model TM05C. After the milling operation, the different fractions were separated and dehulling efficiency and dehulling losses were calculated. Dehulled samples were cooked and then tested with an Instron Universal Testing Machine equipped with an Ottawa texture cell fitted with an extrusion insert. Force-deformation diagrams were obtained and analyzed for slope of the curve, force ratio and deformation ratio. Slopes indicated the hardness of the sample while force and deformation ratios depicted if a sample was undercooked, overcooked or optimally cooked.

Response surface methodology was used to determine the effects of pre-milling moisture content, milling speed, and milling time. Dehulling efficiency and dehulling loss were the responses that were maximized and minimized, respectively, in order to optimize the milling operation.

The effects of storage time, storage moisture content and storage temperature, as well as the effect of different storage pre-treatments aiming to simulate post-harvest handling, were studied. Furthermore, for dehulling efficiency the effect of pre-milling treatment was included as well as the effect of cooking time in cooking quality tests.

Dehulling efficiency was mostly affected by the pre-milling moisture content, regardless of the storage conditions. Storage pre-treatments involving moisture content changes lowered the dehulling efficiency and increased the amount of broken and powder fractions of both varieties of red lentils, whereas freezing and thawing cycles had less of a negative effect on the dehulling characteristics. Drying temperature was a factor for the storage pre-treatment involving one drying cycle and it was found that higher temperature had less negative effect as compared to near-ambient temperatures, probably due to shorter drying times. Storage moisture content was only an important factor in the storage pre-treatments involving drying and rewetting cycles, while storage temperature had only minor effects on the dehulling

efficiency or losses. Storage time affected the dehulling characteristics but its contribution is lower compared to pre-milling moisture content and storage pre-treatment.

Textural parameters were mostly affected by storage time; samples became harder after storage. Similar to dehulling efficiency results, moisture content during storage affected the storage pre-treatments involving changes in the moisture before storage. Storage pre-treatment was also implicated in the changes in textural parameters, especially pre-treatments involving moisture changes within the samples, which seemed to increase the textural parameters and therefore the hardness of cooked samples.