A MODIFIED DEHULLING MACHINE FOR ABRASIVE DEHULLING OF QUINOA VERSION 2.0

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ABSTRACT

Most countries in the world are facing crisis in health due to either malnutrition or due to other civilization. In our previous paper we presented a simple machine which is modified rice dehuller to be used for Quinoa, but there are other good millets which need attention. Some governments are actively supporting cultivation of Millets such as finger millet, great millet, spiked millet, Italian millet, kodo millet, and barn yard millet, and little millet. These millet crops need little water and resilient to weather changes and three crops can be raised in a year. Our machine becomes very suitable for individual use and a common machine is also under development. Due to its size and weight of this dehuller version 1.0 we modified it to make it portable and affordable to each individual user.

Key words: Quinoa, De-hulling Machine, Millet

Introduction

Quinoa is a crop originating from South America, and is grown for its edible seeds, which have a high nutritional value. It gives a balanced source of all essential amino acids, and a range of other nutritious compounds. It contains good amount of minerals like phosphorus, magnesium and iron [1, 2]. The seeds can be used as a replacement of cereals and can be applied in certain diets due to gluten free [3]. Seeds of quinoa consist of an embryo with a radix and two cotyledons, a central perisperm containing food reserves, and an outer structure for chemical and physical protection [4]. So far seeds of one type of quinoa only has been studied histologically [4], but the type of quinoa investigated was not mentioned. Although their study provides useful information for the specific histology of quinoa seeds, it is known that large differences between species or other groups can exist with respect to their seed structure, even for closely related taxa [5]. The plant produces Saponins in the outer seed hull as defence against bird predation. These Saponins are a drawback for the food and feed application of quinoa, since Saponins possess a bitter taste and exhibit toxic effects [6, 7]. The outer layers of the seed hull, which contain the Saponins, can be removed from the seeds by washing or mechanical means, the type and extent of processing determine the quality and safety of the food/feed end product. Moreover, the type of treatment of quinoa is the distinguishing feature for classification of the seeds in tariff groups in the framework of customs regulations. Washing of cereal grains, in contrast to other treatments, is considered exclusively as a cleaning procedure. Therefore, washed cereals are classified in a tariff group with a low tax rate. Based on the mentioned circumstances, it is important to establish the type as well as the extent of the processing prior to use. There are several challenges with respect to the background and trade quality of the quinoa seeds on the market: a) quinoa is not a cereal in a botanic sense, and b) the type of treatment is not known. Mechanical removal of the seed hull or polishing as applied to real cereals, is not likely to be applied in the same way to quinoa seeds, because quinoa lacks the firm outer seed hulls as present in cereals [8]. The aim of the current study was to explore the possibility of histological examinations and foaming capacity measurements for determining the type and the intensity of treatment of quinoa seeds. A total of four seed batches were included in the study, the batches consisted of two reference materials with known background and two imported lots, belonging to two colour types. There are two methods for removal of Saponins from quinoa ie washing and mechanical milling. Washing method is not suitable for bulk processing. Lot of water consumption will be required. Drying is also required after washing before storing. Hence mechanical processing is most suitable for dehusking of grain. Though few types of equipment have been made

for mechanical processing there are some drawbacks seen in those systems. The draw backs are low capacity, more process wastages etc. To meet the above drawbacks a modified design was proposed in this paper. Saponins the outer cover of quinoa are generally bitter, so before consumption they must to be eliminated from quinoa. Traditionally, quinoa seeds are either mechanically dehulled to remove the bran, where the Saponins are predominantly located, or washed with water to remove bitterness prior to use. Wright et al. [8-9] report that during this washing process, valuable nutrients are also lost and the chemical composition and amino acid profiles in quinoa seeds may be altered. The final level of Saponins content in to-be consumed quinoa seeds remains a major concern in terms of its bitterness and possible negative biological effects. At present the paper aims at to discuss a second generation to our earlier version 1.0 [10] of an integrated portable single stage Dehulling machine for Quinoa and other millets.

Design Of The Equipment

The Figure 1 shown is the line diagram for the modified processing machine version 2.0. The entire process takes in a single stage. In this stage the entire 4 stages operations like the abrasive scratches to quinoa surfaces, first layer of removal, and second layer of removal of husk. Further final polishing takes place to make the grain attractive and uniform all around. There is a common Motor is used to drive the machine. The figure 2 shows the processed Quinoa and its husk.

Figure 1 Schematic sketch of modified Quinoa processing machine

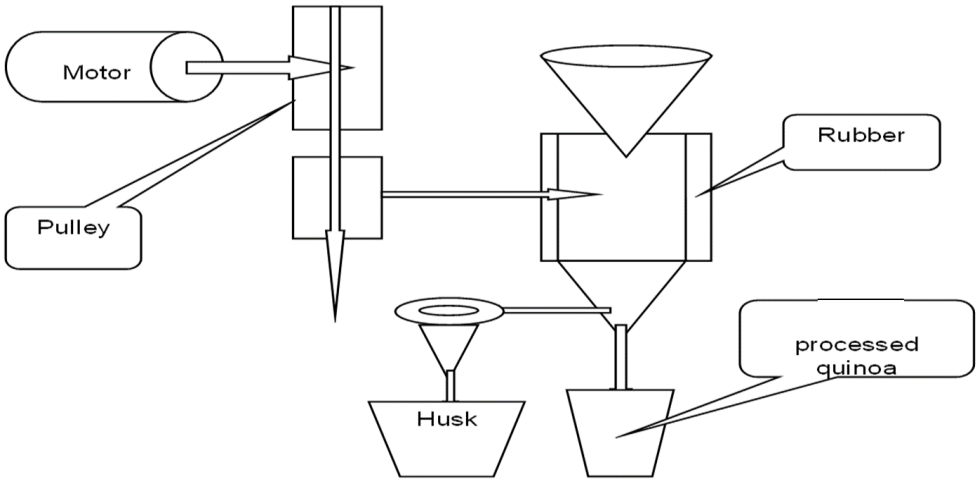
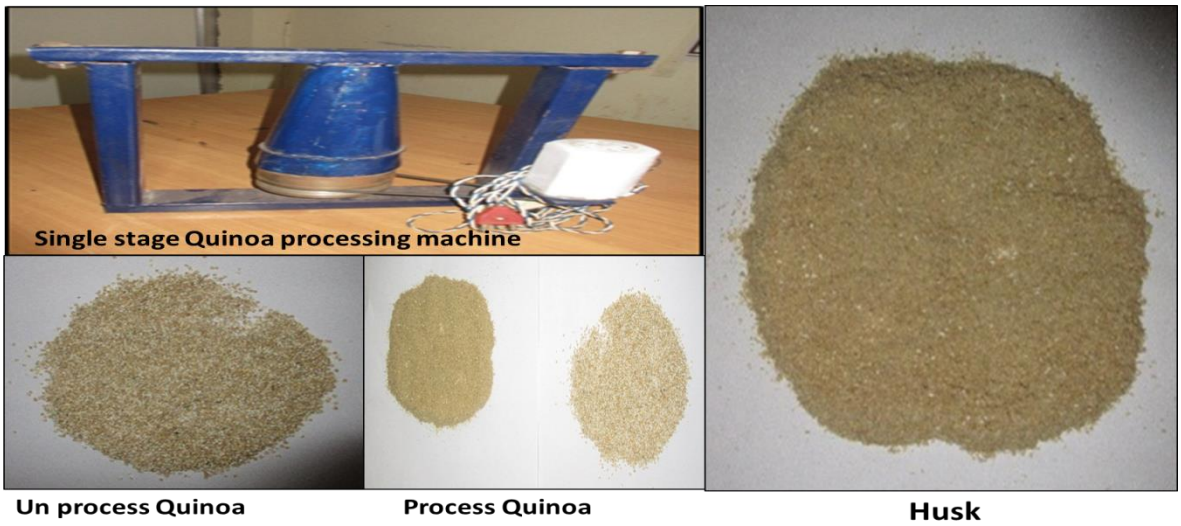


Figure 2 Quinoa processing machine version 2.0, unprocessed Quinoa, Processed Quinoa & Husk.



Result & Discussion

Figure 2 shows the machine and processed Quinoa along with husk. At present Saponins contents in Quinoa is about 2 to 4% which has to remove. The thickness of outer layer containing Saponins is around 0.4 mm thick. In a single step all dehusking is possible. In this machine the earlier 4 stages converted to a single stage. This way we saved lot of power during processing operation.

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