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EFFECT OF SOAKING TIME ON THE REMOVAL OF PERICARP OF GREEN PEPPER BERRIES

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ABSTRACT

White peppercorn is obtained from fresh pepper berries that undergo a few processes. The processes include harvesting, threshing (optional), soaking, rubbing, cleaning and drying. The most critical parts are soaking and rubbing. The current soaking method is soak the pepper berries in water for 12 – 14 days until the pericarp of the berries is rotten and the berries can be rubbed by stepping in a plastic container as used for covering food. At the same time water was pour in to dispose of the dirt and all the rotten pericarp. This method is apparently time-consuming, requires a large labour workforce and the productivity of white pepper is thus limited. In order to hasten the process, a stone disc mill is used in this study to rub the pepper berries. Different sizes of clearance of disc mill were tested to determine which one is superior and can produce a better quality of white pepper. The clearances chosen for testing were 7 mm, 6 mm and 5 mm. The samples were soaked for 4, 5 and 6 days at room temperature and tested using a stone disc mill to remove the pericarp for each day. The results show that the pericarp can be removed after the 4th day of soaking in water and the most efficient clearance is 5 mm.

Keywords: green pepper berries, pericarp, soaking, rubbing

INTRODUCTION

Generally, spices refers to the non-leafy parts such as the bark, root, buds, seeds, berry, or the fruit of tropical plants and trees [1]. Some spices that are found all over the world are cinnamon, cloves, sesame, white and black pepper, paprika and also saffron. One of the famous spices is pepper which is sold as white pepper or black pepper. Pepper is a highly appreciated spice and is also known as the “King of Spices” [2]. For black pepper production the berries are harvested when they have a greenish yellow colour [3], after which they will undergo a few processes such as threshing, fermentation, drying and others.

For white pepper production, the first step is harvesting by plucking the berries one by one by hand as the spike turns yellow or red and putting each berry in a collecting bag [4]. After harvesting, the pepper berries need to be soaked. In Sarawak, the current method is to soak the fresh pepper berries in running water (normally rivers) or a pond for 12-14 days after harvesting and threshing. This technique is called retting and is apparently time-consuming and requires a large amount of water [5]. This retting technique will causes the outer skin (pericarp) to become smooth and rotten. After the pericarp is rotten, the workers will rub off the pericarp from the pepper berries. In Sarawak, all of the farmers use a manual method to remove the outer skin of the pepper after the soaking process. The workers will step barefoot on the pepper berries for a few minutes until all of the skin is completely removed [6]. This method is widely used in Sarawak where most of the pepper is exported to other countries. This conventional method is unhygienic, requires a lot of man power and is also time-consuming [5]. After this process, the pepper berries will be cleaned and dried. This step is one of the most important procedures before the white pepper is graded and exported. The conventional method for white pepper is drying in the sun. Under sun drying, the duration of pepper being dried is very important to ensure that all pepper berries achieved uniform drying [7]. Otherwise, white pepper produced may suffer from heavy mould contamination and result in a poor quality of white pepper with a greyish and unattractive appearance.

The present work was undertaken to study the effect of different soaking times and effective clearance of the disc mill on removal of pericarp of green pepper berries.

MATERIALS AND METHODS

Sample Preparation

The green pepper berries were obtained from the Malaysian Pepper Board (MPB) in Johor, Malaysia in October 2011. The green pepper berries were fully matured fresh pepper berries that were harvested not more than eight hours previously. The pepper was fully matured when there are 2 – 3 pepper berries that turned to red colour. Once the green pepper berries were received, they were subjected to a manual sorting and selecting process. Only full mature pepper berries were selected. The over-small, immature and defective berries were rejected. Manual threshing was carried out to remove the leaves and spikes from the pepper berries. The selected green pepper berries were then put into a container with water and soaked at room temperature for six days. The experiment began after the fourth day of soaking storage and continued up until the sixth day. For each day of soaking storage, the experiment was undertaken with three different sizes of clearance which were 5 mm, 6 mm and 7 mm.

Stone Disc Milling Machine

The stone disc milling machine was made from Italy as shown in Figure 1 below and is electrically operated by a motor. The speed of the motor is fixed at 1450 rpm and cannot be adjusted. The power of the motor is up to 1.5 hp. Meanwhile the clearance between the discs can be adjusted from 2 mm up to 10 mm. The soaked pepper berries were fed into the machine by a hopper at the top of the machine to fall down onto the rotary stone and the stone disc will rub against the pepper berries. After the pericarp of the pepper berries has been removed by rubbing, the white pepper will exit the machine through an outlet below the disc. This machine needs water to lubricate the flow of the rubbing process and to make sure the pepper berries will not get stuck in any component of the machine. The water flow will be same as the green pepper berries feeding hopper. The rubbed pepper berries will fall down into a basin to be collected from the outlet as shown in Figure 1 and will then undergo a sieving and cleaning process to obtain clean white pepper.

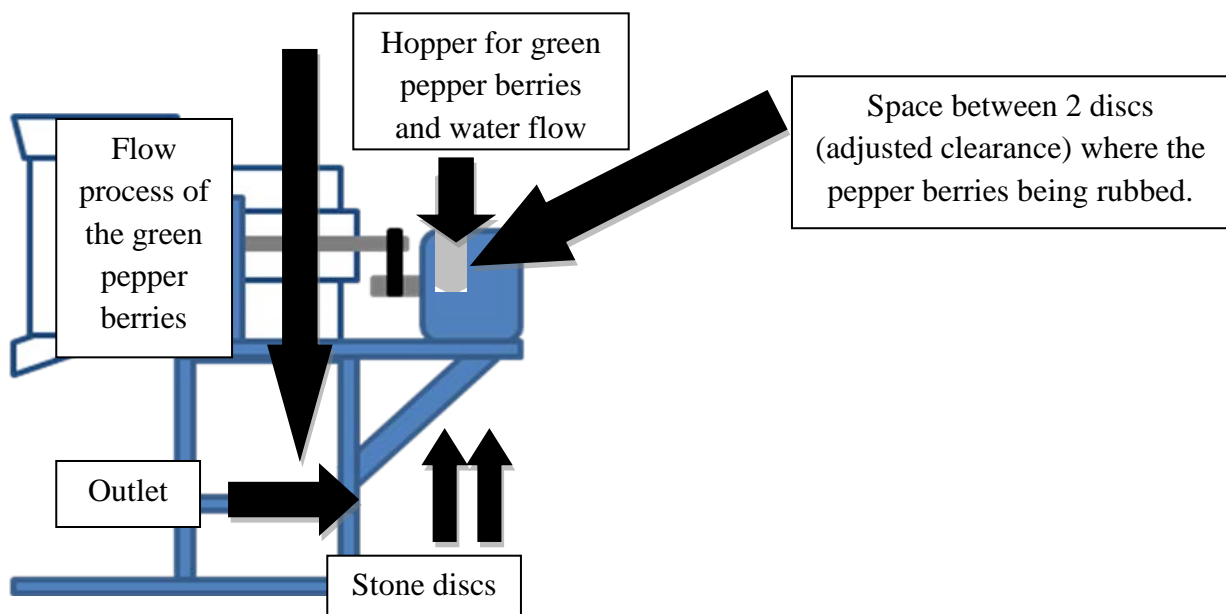


Fig. 1: Vertical Stone Milling Machine

RESULTS AND DISCUSSION

Four days soaking storage

After four days of soaking storage at room temperature, the pericarp of the pepper berries was rotten and could be removed by rubbing it with the hand but not all the pepper's pericarp can be removed. From the experiment, the results indicated that the best clearance for the rubbing process of the white pepper is 5 mm rather than 6 mm and 7 mm. On the fourth day of soaking storage, three clearance sizes between the two discs were tested. The best result was from the 5 mm (Figure 3 (A)) clearance compared to the 6 mm (Figure 3 (B)) and 7 mm clearance (Figure 3 (C)). At 5 mm of clearance, only 30% of the pepper berries were rubbed and the percentage of broken peppercorns was observed to be almost 0 %. The 7 mm clearance had the highest percentage of pepper berries still retaining the pericarp followed by the 6 mm clearance. In addition, by using these sizes of clearance, there is no crush peppercorn obtained.

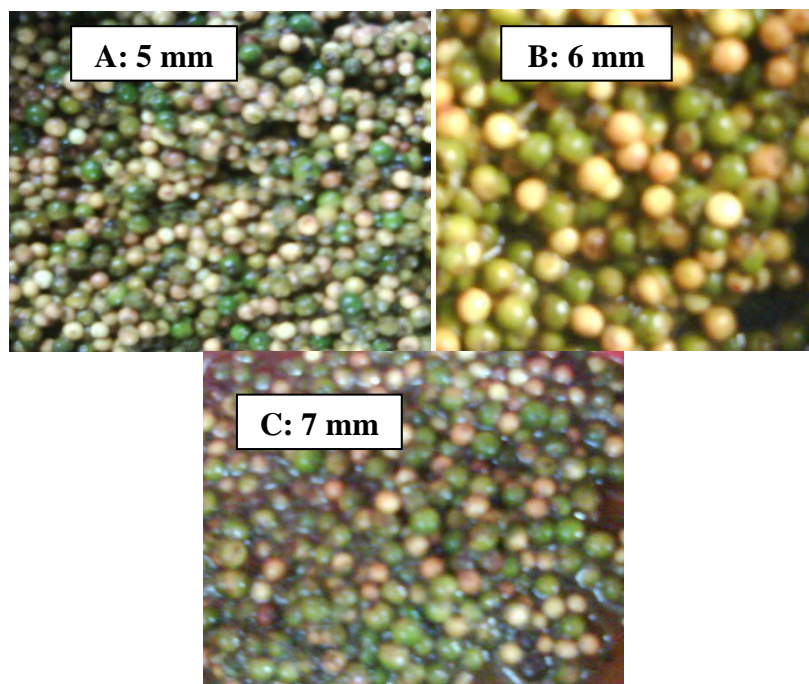


Fig. 2: Different pepper produced from three different size of clearance at fourth days soaking storage
Fifth days soaking storage

On the fifth day of soaking storage, three clearance sizes between the two discs were tested. The best result was also from the 5 mm (Figure 3 (A)) clearance compared to the 6 mm (Figure 3 (B)) and 7 mm clearance (Figure 3 (C)). At 5 mm of clearance, only 50% of the pepper berries were rubbed and the percentage of broken peppercorns was observed to be almost 0 %. The 7 mm clearance had the highest percentage of pepper berries still retaining the pericarp followed by the 6 mm clearance. In addition, by using these sizes of clearance, there is no crush peppercorn obtained.

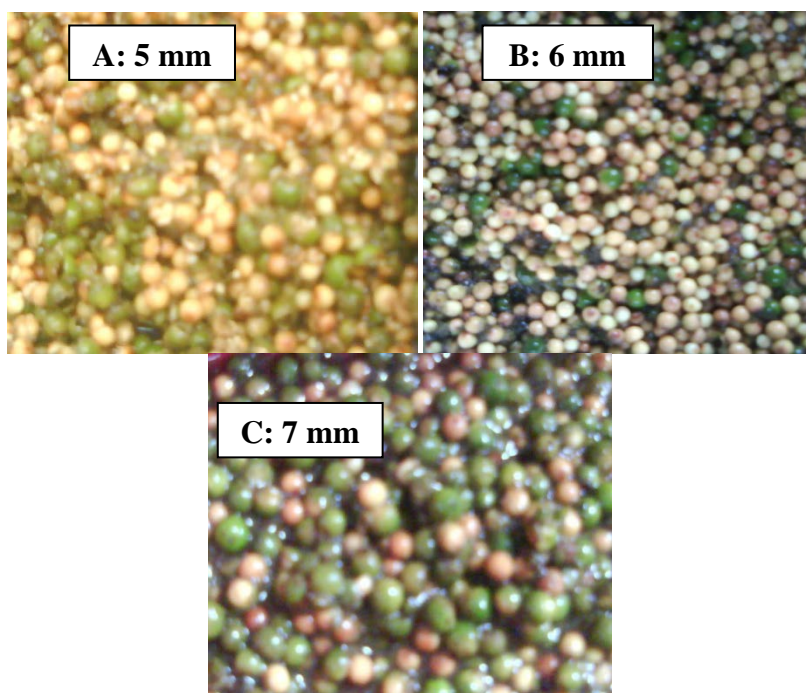


Fig. 3: Different pepper produced from three different size of clearance at fifth days soaking storage
Sixth days soaking storage

On the sixth day of soaking storage, three clearance sizes between the two discs were tested. The best result was still from the 5 mm (Figure 3 (A)) clearance compared to the 6 mm (Figure 3 (B)) and 7 mm clearance (Figure 3 (C)). At 5 mm of clearance, all of the pepper berries were rubbed clean and the percentage of broken peppercorns was observed to be almost 0 %. The 7 mm clearance had the highest percentage of pepper berries still retaining the pericarp followed by the 6 mm clearance.

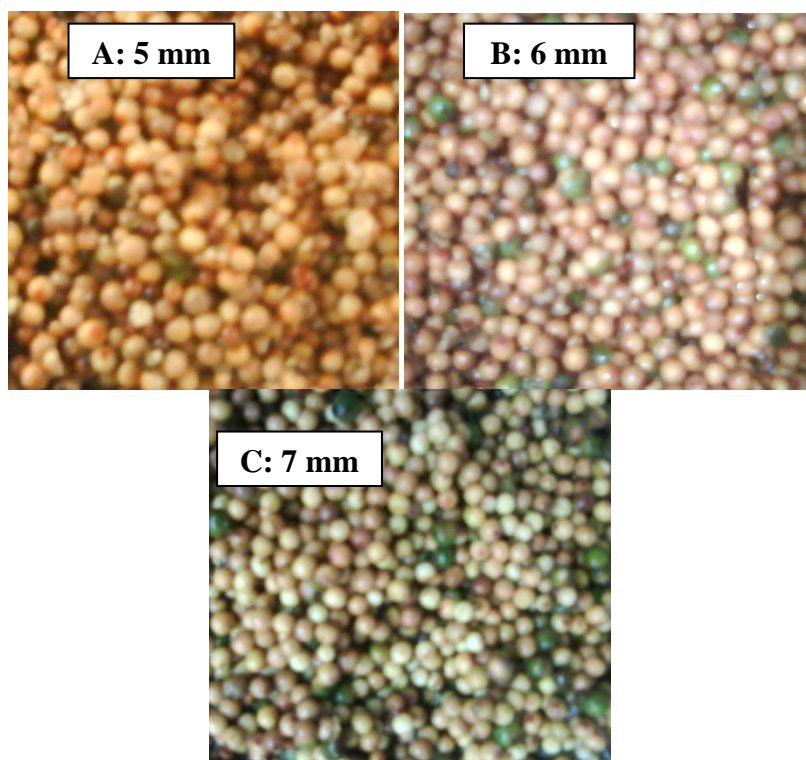


Fig. 4: Different pepper produced from three different size of clearance at sixth days soaking storage.

CONCLUSION

From the experiments undertaken, the best clearance for the rubbing process as part of the production of white pepper is 5 mm. Meanwhile for the soaking storage, the pericarp of the peppers can be removed from the fourth day but from 3kg of pepper, only 1kg can be easily removed. The best soaking storage is at sixth days soaking that almost all of the pericarp can be removed. The combination of the grinding clearance and the period of soaking storage are very important in order to produce better quality white pepper. The best condition for producing high quality white pepper is to use a 5 mm clearance size after the sixth day of soaking storage at room temperature.

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