Influence of Sieve Openings Size for Hammer Mills on the Degree of Shredding and Grinding Energy Consumption for Maize

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Abstract: Grinding is the operation to reduce the geometrical dimensions of the particles by destroying their physical integrity, as a result of mechanical action on the material. Grinding operation efficiency consist in the conversion with minimum power consumption and maximum productivity gave one solid material in a powdery or granular product size and shape required. In this paper we determined that using a sieve with greater opening can reduce the energy consumption by 32%.

Keywords: milling, maize, grinding, specific energy

Introduction. Grinding grain is one of the factors affects the quality of the final product. It is very important that the cereals, which represent the highest component in fodder to be grinded as uniform as possible, and the amount of powder obtained to be as small as possible [2]. The operation of grinding is performed by hammer mills. Grinding cereal grains entering the grinding chamber of the mill is done by hitting them against the sieve or hammer walls. The grinding process lasts until the particles reach a size small enough to pass through the holes of the mills sieve.

Aims. The main objective of this paper was to determine the grinding fractions of maize grinding and the energy consumption.

Material and method. For experimental tests we used a hammer mill for grinding grains MB-7, 5 (7,5 kW - electric engine power, productivity 0,7 tons/hour).

Material used to experience was a corn. The mill was equipped with three different types of sieve used on mill (3-6-8 mm) (figure 1).

Fig. 1 Hammer mill MB 7.5 and 3 mm
For sifting was used a sieving machine AS 300. The grist result was separated using 3 types of sieve and 1 collector resulting 4 types of grist. From each sample was used a quantity of 500 g maize.

To measure the maize moisture we used a moisture meter Riela type and for energy measurement device was used Mavowatt 45 [1].

Results and Discussions. Experimental results are presented in figure 2.

![Graph A](image1.png)  
![Graph B](image2.png)  
![Graph C](image3.png)

**Fig. 2** Results regarding the size of milled particles according to the sieve opening  
A – 3 mm sieve opening; B - 6 mm sieve opening; C – 8 mm sieve opening

Experimental tests have shown that the milling of maize grains with 11.1% moisture level decreases with increasing grinding mill sieve size. With regard to the small fraction resulting from crushing (powder of less than 0.5 mm) the difference is relatively small due to the fact that the moisture content of the corn kernels was small and the grain was brittle. Regarding the specific energy consumption has been observed that it decreases with increasing hole sieve from 5,373 Kwh/t for 3 mm sieve to 3,745 Kwh/t for 8 mm sieve.

Conclusion. Experiments have shown that with increasing diameter of the holes in the sieve, milled grain with size over 0.63 mm is increasing (almost double), but the amount of material in the particle size of 0.5 mm is reduced in a smaller proportion. As expected energy required for grinding is decreasing with increasing diameter of the holes in the sieve.

REFERENCES