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Researches regarding the grinding resistance of the wheat grain

I. Danciu*, Cristina Danciu, I. Banu, M. Vaduva, M. Mester

Lucian Blaga University, The Faculty of Agricultural Sciences, Food Industry and Environmental Protection, Sibiu, 5-7 Ion Ratiu str., Romania

Abstract

In the industrial milling process of the wheat, 60-75 % from the total specific energy consumption is used in the grinding process. The measurement of the grinding resistance of the wheat kernel can estimate the energy consumption in the grinding process, for diminuate the total energy consumption in the milling process.

A micromill was designed to determine the grinding resistance of the cereals grain by simultaneously measurements of the compression efforts and the shearing efforts.

Keywords: wheat grain, grinding resistance, resistant moment

1. Introduction

The wheat kernel resistance can be determinate with a standard mechanical instrument which can measure the compression and the shearing resistance. But the measurements are not very accurate because of the shape and the size of the wheat grain and also the size of the stamp. This is the reason for it was made a grinding resistance appreciation by a micromill which reproduces the same conditions of the industrial milling process. The industrial grinding of the wheat is using two rollers with differential speed. The grains are in the same time under the compression and the shearing efforts. They are no shearing efforts and maximum compression efforts when the rollers have the same speed. The shearing efforts appear when the rollers have differential speed. In the grinding process, the speed ratio (k) between the rollers is from 1:1,5 to 1:2,5.

2. Materials and Method

The materials are reperesented by five Romanian wheat cultivars: *Apache*, *apullum*, *Boema*, *Dropia*, *Flamura 85*.

The qualitative analysis consists in : moisture content, vitreousness, hectolitric weight, the mass variation of 1000 grains, gluten content, hardness.

Apparatus: technical balance, farinotom (for vitreousness), hectolitric balance (for hectolitric weight), INFRAMATIC 8606 from Perten, micromill to measure the grinding resistance of the wheat grain.

3. Results and Discussions

Table 1 presents the qualitative indicators for the five cultivars.

All the analysed cultivars have a hectolitric weight over 80 kg/hl and the vitreousnees between 30 and 40%. The Flamura 85 has the highest grain dimensional size with the lowest number of grains in 100 g.

From the results of the experiments were obtained the curves of the resistance moment variation for two pairs of corrugated break rollers : one with 9 flutes/cm and the other pair roll with 7 flutes/cm. Both cases are with a sharp to sharp (S-S) roll disposition and differential speed (1:2,5).

* Corresponding author: *e-mail address*: ioan.danciu@ulbsibiu.ro

Table 1. Absorbance values read for tofu and sufu extracts

Indicator \ Cultivator	Apache	Apullum	Boema	Dropia	Flamura 85
Hectolitric weight [kg/hl]	81,1	84,1	81,9	83,8	83,6
Vitreousness [%]	38	40	33	36	37
Hardness	114	116	119	122	123
Gluten content [%]	22,2	20,3	23,3	25,3	25,1
Moisture content [%]	10,2	10,4	10,1	10,2	10,3
The mass variation of 1000 grains [g]	34,03	37,78	42,07	42,03	42,34
The number of the grains in 100 g	2639	2372	2137	2137	2119

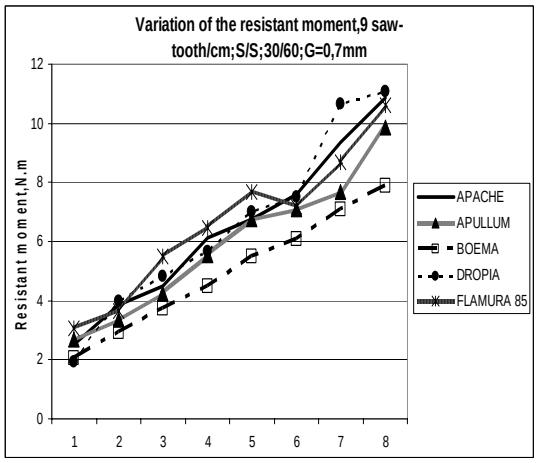

Figure 1. The variation of the resistant moment for 9saw-tooth/cm, S/S, 30/60, G=0,7mm roll characteristics

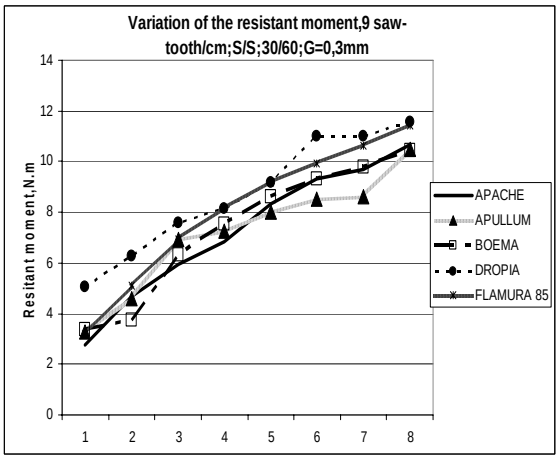

Figure 3. The variation of the resistant moment for 9saw-tooth/cm, S/S, 30/60, G=0,3mm roll characteristics.

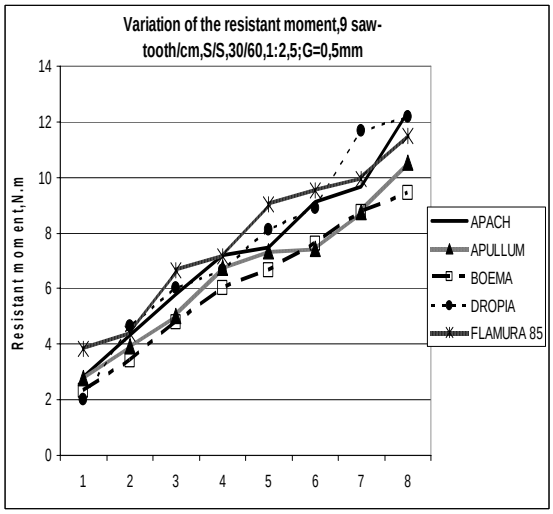

Figure 2. The variation of the resistant moment for 9saw- tooth/cm, S/S, 30/60, G=0,5mm roll characteristics.

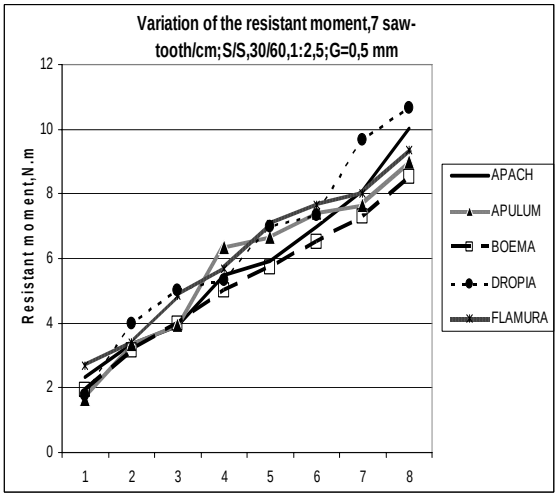

Figure 4. The variation of the resistant moment for 7saw-tooth/cm,S/S, 30/60, G=0,7mm roll characteristics.

The lowest values for the resistant moment were obtained for the Boema cultivar and the highest value for the *Dropia cultivar.*

4. Conclusions

A higher resistant moment was obtained for an increased number of grains (from 1 grain to 8); when the gap between the roll decrease, the resistant moment increase. Also there is a higher resistant moment value for a higher vitrousness of the grain.

The micromill designed for determination of the grinding resistance of the cereals, can be used in an industrial mill plant, because it has the advantage of obtaining the cumulative compression and shearing efforts like in the industrial process.

The resistant moment can be obtained also for the middling grinding process, step which can lead to the economic optimization of the cereal processing.

Acknowledgements

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References

1. Danciu, I. (2000), *Macinarea cerealelor*, Ed. Univ. Lucian Blaga Sibiu, ISBN 973-651-095-6
2. Danciu,I, Danciu, C, (2005), *Evolutions in the cleaning process of the middlings, on the wheat grinding*,Buletin USAMV-Cluj-Napoca / Romania, 60/2005,ISSN 1454-2382,p 474.